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імені В. Н. КАРАЗІНА

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Хусам-Алдін Нізар Аль-Малкаві, Британський університет в Дубаї, Об'єднані Арабські Емірати

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Банки сучасного та майбутнього

Banks of the present and the future

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Babenko Maksym
PhD,
Education and Research Institute "Karazin Banking Institute"
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: babenkomv2011@gmail.com
ORCID ID: 0000-0001-6792-3465
Novikova Tetyana
PhD in Economics, Associate Professor,
Education and Research Institute "Karazin Banking Institute"
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: tvnovikova75@gmail.com
ORCID ID: 0000-0002-0428-4181
Kotkovskyi Volodymyr
Doctor of Public Administration,
Education and Research Institute "Karazin Banking Institute"
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: kotkovskyi@karazin.ua
ORCID ID: 0009-0005-8259-1936
Denchyk Iryna
Senior Lecturer
Education and Research Institute "Karazin Banking Institute"
V. N. Karazin Kharkiv National University,
Svobody Sq., 4, Kharkiv, 61022, Ukraine
e-mail: irina.denchik@karazin.ua
ORCID ID: 0000-0003-1594-1084

Transformation of the Ukrainian banking sector marketing under conditions of war and digitalization

Abstract. The digitalization of Ukraine's banking sector creates new opportunities for improving marketing efficiency, building customer trust, and developing innovative financial services. During wartime, digital marketing becomes a key tool for banks' adaptation to crisis conditions, ensuring flexibility, resilience, and competitiveness in a rapidly changing financial environment.

Problem statement. The war and the rapid development of digital technologies have changed the operational environment of Ukrainian banks, highlighting the need to transform marketing strategies. However, the uneven level of digital readiness among banks, insufficient professional competence in digital marketing, and growing cybersecurity threats hinder the modernization of marketing systems.

Unresolved aspects of the problem. Despite the active introduction of digital tools, there is still no unified model for assessing the effectiveness of digital marketing in Ukrainian banks. Insufficiently studied remain the issues of integrating international experience, managing reputational risks, and ensuring data protection in the digital environment.

Purpose of the article. The purpose of the study is to analyze the transformation of marketing processes in Ukraine's banking sector under the influence of digitalization and wartime challenges and to determine the main directions for improving the effectiveness of banks' marketing strategies.

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Presentation of the main material. The study applies a comprehensive approach combining the analysis of scientific sources, statistical data, and a practical case of JSC CB “PrivatBank.” The article examines the impact of digital technologies, artificial intelligence, and online platforms on customer engagement, service promotion, and competitiveness. The SWOT analysis of PrivatBank’s marketing strategy revealed key strengths — a robust digital ecosystem, innovation, and customer orientation — as well as threats related to cybersecurity and market instability.

Conclusions. Digital marketing serves as an important driver of the Ukrainian banking sector’s development during wartime, enhancing its adaptability and financial stability. The research results can be applied to improve strategic marketing management, advance customer service, and shape effective models of digital communication.

Keywords: *digital marketing, digital transformation, banking sector, innovation, customer engagement, competitiveness, financial resilience, social responsibility, artificial intelligence.*

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Introduction. In the modern economic environment, characterized by instability and the rapid development of digital technologies, marketing in the banking sector is becoming one of the key factors in ensuring the competitiveness and sustainability of financial institutions. The digital transformation of the economy has fundamentally changed the mechanisms of interaction between banks and their customers, requiring new approaches to communication, brand management, and the promotion of financial services. Digitalization has led to the emergence of new tools — online platforms, mobile banking, artificial intelligence, and big data analytics — that significantly expand the opportunities for banks to improve customer service and operational efficiency.

The banking sector of Ukraine has undergone a particularly profound transformation since the beginning of the full-scale war. The crisis conditions of wartime have intensified the need for flexible and customer-oriented marketing strategies, capable of maintaining trust and loyalty in an unstable environment. The adaptation of marketing activities to new realities requires not only technological innovation but also a rethinking of the principles of interaction with clients, brand positioning, and communication ethics in times of social stress and uncertainty.

Modern Ukrainian banks are actively introducing digital marketing tools — from social media campaigns and targeted advertising to personalized online services and mobile applications. Such digital solutions allow banks to maintain constant communication with clients, ensure service accessibility, and build a strong emotional connection with the brand. At the same time, the growing role of digital marketing is associated with new challenges: information security threats, the need to protect personal data, and the preservation of a positive corporate image in the context of intense competition and social responsibility.

Therefore, the study of the transformation of banking marketing in Ukraine in the conditions of war and digitalization is of high scientific and practical importance. It makes it possible to identify the main trends in marketing development, analyze the impact of digital technologies on the financial services market, and determine the role of marketing in strengthening the stability and resilience of banks in times of crisis. The research focuses on identifying the innovative components of banking marketing that contribute to building long-term relationships with customers and ensuring sustainable development of the financial sector.

Literature review. The transformation of marketing in the banking sector under the influence of digitalization has become a central topic in modern economic research. Numerous Ukrainian and international scholars emphasize that digital technologies are radically changing the principles of marketing management, customer interaction, and the competitiveness of financial institutions. The transition from traditional to digital banking models is accompanied by the integration of innovative tools such as mobile applications, big data analytics, artificial intelligence, and online communication platforms.

According to Bastari et al. [1], digitalization in the banking sector contributes to increasing motivation, improving service quality, and enhancing the overall efficiency of financial institutions. The authors highlight that the integration of digital tools requires not only technological adaptation but also changes in the corporate culture of banks, which should focus on innovation and customer engagement. Similar conclusions are drawn by Danik and Torlopov [2], who note that digital transformation in Ukrainian banks significantly affects their operational efficiency, marketing strategies, and long-term competitiveness.

A number of scholars have studied the impact of digitalization on the structure of the banking sector and its adaptation to global trends. Hantsiak, Verheliuk, and Fomov [3] argue that the digital transformation of the banking system forms a new paradigm of interaction with clients, where the focus shifts from the sale of standard services to the creation of personalized financial solutions. Meier et al. [8] stress that the digitalization of financial systems, as demonstrated by the Swiss experience, ensures transparency, speed, and flexibility of banking operations, while maintaining the stability of national financial markets.

Modern research also pays attention to the challenges of digital banking in the context of sustainable development. Skvarciany, Lapinskaitė, and Stasytytė [13] explore the efficiency of the digital economy and its relationship with sustainable development indicators, concluding that digital tools enable more rational use of resources and the formation of innovative business models. Similarly, Kostiuk et al. [6] emphasize that the development of digital banking services in Ukraine stimulates business growth, improves financial infrastructure, and enhances customer satisfaction through innovative solutions.

The importance of marketing in the digital environment is highlighted in studies by Hrytsenko and Kozhushko [4], who identify the main trends in banking marketing in Ukraine. They note that digital technologies have redefined the role of marketing departments, shifting their focus toward data-driven decision-making, interactive communications, and the personalization of customer experiences. Tsilnyk [14] develops the theoretical basis for optimizing the interaction of marketing technologies under digitalization, emphasizing the need for a systematic approach to the integration of digital tools into marketing strategies.

At the same time, researchers focus on the risks associated with digitalization. Ivanov and Pylypenko [5] analyze the structural transformations of the banking sector during martial law and point out the growing significance of digital resilience and cybersecurity. Similar concerns are expressed by Nwoke [11], who explores global FinTech innovations and the risks they pose to traditional banking systems. Radhakrishnan and Shankar [12] examine the evolution of digital banking and emphasize that the success of financial institutions increasingly depends on their ability to balance technological innovation with consumer trust and data protection.

Ukrainian scholars also address the issue of digital management in corporate banking. Kretov et al. [7] show that digitalization has become a key factor in the modernization of corporate banking processes, improving customer communication and internal management efficiency. Furthermore, the Ministry of Finance of Ukraine [9] and the National Bank of Ukraine [10] provide valuable statistical insights into the dynamics of digital service implementation and the competitiveness of banks in the domestic market.

Empirical evidence indicates that Ukrainian banks are actively adopting global best practices in digital marketing and customer relationship management. Zarutska et al. [15] reveal that during times of military crisis, Ukrainian banks adjusted their business models to focus on social responsibility, brand trust, and online communication channels, which helped maintain stability and customer loyalty. These findings are consistent with the conclusions of Kretov et al. [7] and Hantsiak et al. [3], who stress that digital marketing is a decisive factor in the resilience and adaptability of the banking system.

Thus, the reviewed literature demonstrates that the digital transformation of marketing in the banking sector is a complex, multidimensional process that combines technological innovation, strategic management, and customer-centric approaches. Ukrainian and foreign researchers agree

that digitalization not only improves service efficiency but also creates a new type of marketing environment based on personalization, trust, and social responsibility. However, the rapid development of technologies and wartime challenges require continuous adaptation of marketing strategies to ensure financial stability and sustainable development of the banking sector.

Purpose, objectives and research methods. The purpose of this study is to analyze the transformation of marketing in the Ukrainian banking sector under the dual influence of war and digitalization, and to determine the strategic directions for its further development. The research seeks to identify how digital technologies, innovative tools, and changing customer behavior contribute to the modernization of marketing management in financial institutions.

To achieve this purpose, the following objectives were defined:

1. To examine the theoretical foundations of digital marketing and its application in the banking sector.
2. To analyze the main digital transformation trends affecting the Ukrainian banking system during wartime conditions.
3. To study the practical aspects of implementing digital marketing tools in Ukrainian banks, with a focus on JSC CB “PrivatBank.”
4. To evaluate the effectiveness of marketing strategies in enhancing customer loyalty, brand positioning, and competitiveness.
5. To identify opportunities and challenges associated with the integration of innovative digital solutions in the marketing activities of banks.

The methodological framework of the study is based on a systematic approach, combining theoretical and empirical research methods. General scientific methods such as analysis, synthesis, induction, and deduction were used to study the essence and evolution of banking marketing. Comparative and structural analysis allowed for identifying the key features of digital marketing transformation in Ukrainian banks. The graphical and tabular methods were applied to visualize statistical data and present the results of marketing performance analysis. The study also employed the SWOT analysis to assess the strengths, weaknesses, opportunities, and threats of PrivatBank’s marketing strategy in the context of war and digitalization.

Research results. In today's competitive environment, characterized by rapid technological development, marketing in the banking sector plays a key role in building a positive image of the institution, attracting new customers, maintaining their loyalty and ensuring profitability. This activity covers a wide range of measures aimed at effective promotion of banking products and services among the target audience.

The effective organization of marketing activities in the banking sector is of particular importance, as it facilitates the implementation of the latest solutions in the promotion of financial products and services, as well as the formation of close and long-term relationships with customers. Successful marketing management in a bank involves not only creating a positive public image, but also actively developing innovative products that can meet new customer needs. Therefore, the study of the organization and management of marketing activities in the banking environment is relevant, as it determines the ability of banks to adapt to technological changes and remain leaders in a competitive market.

Marketing in the banking sector plays a key role in building a positive image of the institution, attracting new customers, maintaining their loyalty and ensuring profitability. A modern bank's marketing strategy involves not only informing customers about the services available, but also a deep understanding of their needs, preferences and behavioral patterns. Successful implementation of such strategies allows banks to strengthen customer interaction, increase customer satisfaction and build long-term relationships.

In a competitive environment, banking institutions are actively implementing digital marketing tools, ranging from targeted advertising and email campaigns to social media promotion, SEO optimization, and consumer behavior analytics. Online banking and mobile applications have

become the main channels of communication with customers, and their effective promotion helps to popularize new services and functionality [1].

To increase customer engagement, banks also offer various loyalty programs, cash bonuses, and personalized offers. Such measures help banks to stand out from the competition, build a strong brand, and adapt their products to market needs [10].

Marketing activities in the banking sector have become an integral part of the sustainable development strategy. It not only maintains the competitiveness of the institution but also contributes to its dynamic growth, allowing it to respond quickly to changes in consumer expectations and technological trends.

Effective marketing activities of a bank are based on clearly defined tasks aimed at achieving the strategic and tactical goals of the institution. Banking marketing tasks cover both analytical and practical aspects of management: from studying customer needs to developing competitive financial products and building long-term relationships with the target audience. Fig. 1 systematizes the main tasks of bank marketing that ensure the stable functioning of a banking institution in a dynamic market environment.

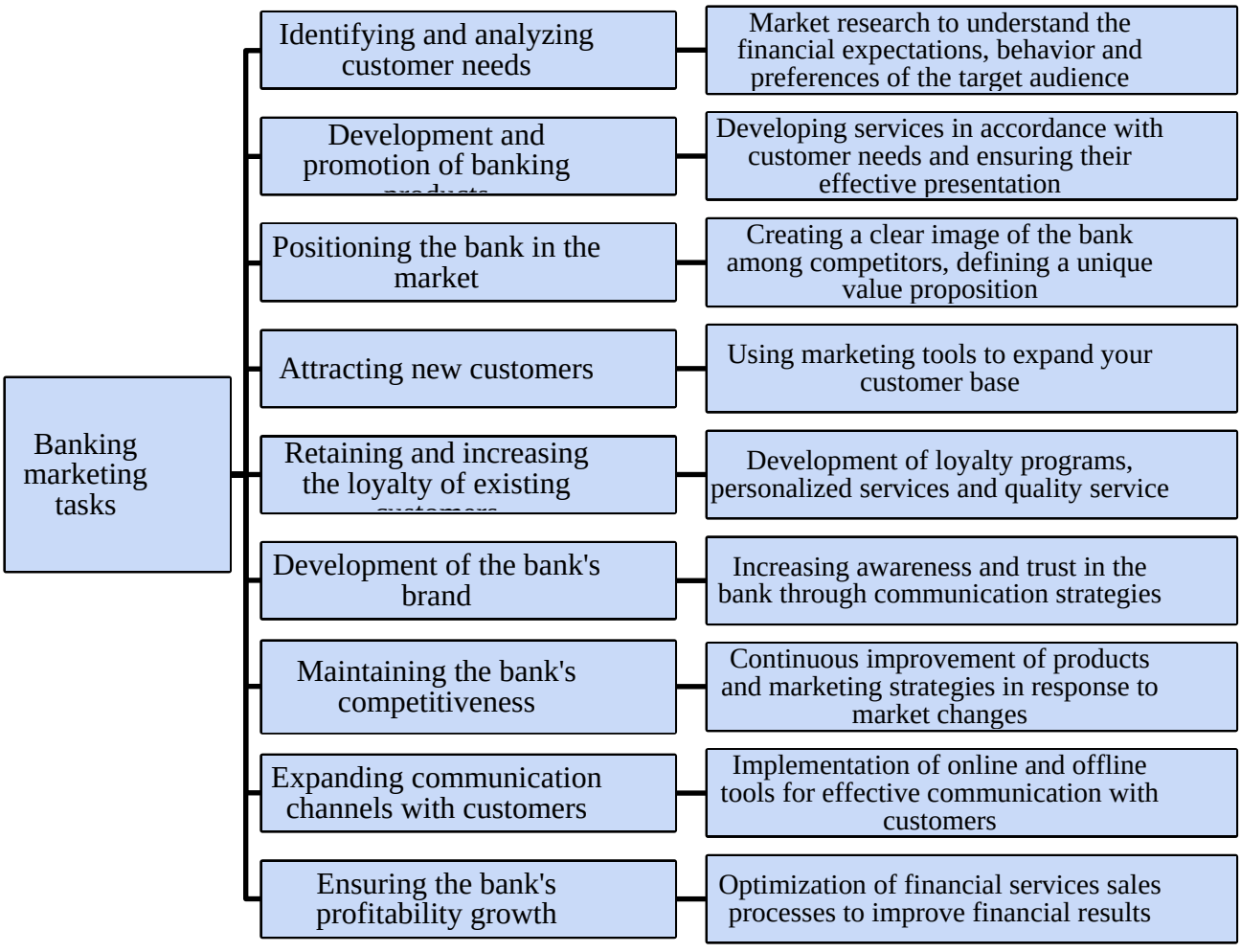

Figure 1. Tasks of bank marketing
Source: complied by the authors based on [9, 10]

One of the key tasks of marketing in the banking sector is to attract new customers by actively engaging with potential audiences. This includes analyzing customer needs, creating attractive offers, and communicating the benefits of banking products through effective communication channels. To attract customers, banks use personalized approaches, such as individual email campaigns, social media activity, and online consultations. This format of

communication contributes to a positive customer experience and brand trust. Customer retention is an equally important component of the marketing strategy. Banks strive to develop long-term relationships by providing quality service and flexible financial solutions adapted to changing customer needs. Regular service updates, personalized offers, and round-the-clock support help maintain loyalty and increase customer satisfaction.

Banking marketing is based on an extended model of the marketing mix (7P), which includes not only traditional elements but also components specific to the service sector [11]. Each of the elements performs an important function in building an effective customer relationship strategy. Table 1 shows the main elements of bank marketing and their brief description, which allows to better understand the logic and structure of marketing activities in the banking sector.

Table 1. The main elements of bank marketing

№	An element of bank marketing	Characteristics
1	Product	Banking services and products (loans, deposits, insurance, online services), their quality, accessibility and innovation
2	Price	Service fees, interest rates, commissions, and flexibility of pricing policy depending on the target audience
3	Place	Channels of distribution of banking products: branches, online banking, mobile applications, partner networks
4	Promotion	Tools for attracting customers: advertising, PR, promotions, loyalty programs, digital marketing
5	People	Bank employees who directly interact with customers, their qualifications, service culture and communication skills
6	Process	Internal customer service processes: speed, convenience, automation, quality standards
7	Physical evidence	Material attributes of the bank: branch design, mobile application interfaces, brand image, certificates and awards

Source: complied by the authors based on [9, 10]

Bank marketing performs an important educational function, helping customers to better understand financial products and make informed decisions.

In today's environment, bank marketing has become an integral part of every financial institution's activities, with one of its key tasks being to create competitive advantages in the market and ensure financial stability, which is especially important during the martial law in Ukraine.

One of the banks that has demonstrated high financial stability in times of war is PrivatBank, whose marketing strategy is focused on comprehensive coverage of target audiences in all market segments. To this end, the bank is actively implementing modern communication tools, digital technologies and automated analytics systems.

PrivatBank sees marketing not only as a promotional tool, but also as a key component of creating long-term value for customers, strengthening the brand and increasing competitiveness in the Ukrainian financial services market.

In 2022-2025, PrivatBank continued to implement a multi-level marketing strategy aimed at strengthening customer loyalty, digitalizing banking services, and maintaining its leading position in the Ukrainian financial market. The focus remained on customer focus, product innovation, and support for socially responsible initiatives [12].

During this period, the bank actively used digital marketing tools: targeted advertising, email marketing, SMM, content marketing, SEO/SEM. An important role was played by the Privat24 mobile application, which was not only a service platform but also a channel of communication with customers (push notifications, personalized offers, banner ads).

During the war, PrivatBank implemented a number of marketing campaigns to support new products, including: “Cash at the cash desk”, “Top-up at the cash desk”, “Online practice”, Credit holidays, debt restructuring, etc.

Promotion included comprehensive advertising campaigns in the media, social networks, and email newsletters. As part of the brand strategy, a series of outdoor advertisements was also created, using bright colors and informal style, telling about specific services of the bank. that made the brand closer to people and more modern. During the martial law, the bank actively supported the Armed Forces and volunteer movements, initiating security programs for customers. This became part of the image marketing strategy that formed a positive emotional connection with the brand.

JSC CB PrivatBank is an innovative leader that consistently holds the lead among Ukrainian banks thanks to its bold and progressive decisions.

Digital platforms have become a key element of PrivatBank's marketing strategy, providing not only convenient communication with customers but also effective promotion of products and services. The Privat24 mobile application, the bank's official website, and social media pages (Facebook, Instagram, YouTube, and TikTok) form the digital environment where most customer interactions take place. Through these channels, the bank not only provides information about new services, promotions, and products, but also builds its brand, maintains trust, and responds promptly to feedback. Due to the high speed of content updates, the ability to personalize communications and wide reach, digital platforms ensure high efficiency of marketing campaigns.

Affiliate marketing is another important tool in building long-term customer loyalty. PrivatBank actively cooperates with large retail chains, government agencies, educational initiatives and digital platforms. Such cooperation allows us to create joint projects with a double benefit for both partners and clients of the bank. For example, the integration of financial services into online learning platforms (such as JuniorBank or courses for entrepreneurs), participation in government support programs, and affiliate programs with cashback in stores allow the bank to be as present as possible in the customer's daily life.

Event marketing and PR activities have become an important element of the bank's promotion as an expert, innovative and responsible financial market player. PrivatBank regularly participates in financial conferences, industry forums and discussions, where it shares its experience, presents its own cases and innovations. The bank is also actively recognized in prestigious ratings and awards, such as FinAwards and PaySpace Magazine Awards, receiving awards for the introduction of the latest financial technologies, development of customer services and social responsibility. Participation in such events not only enhances the bank's reputational capital but also builds trust among customers, partners and regulators.

The combination of these tools - digital channels, affiliate programs, and public activity - forms a holistic, multi-level marketing ecosystem in which JSC CB PrivatBank does not just sell financial services, but builds sustainable relationships with the audience, adapting to modern challenges and expectations of new generations of customers [13].

Due to active digitalization, large-scale marketing campaigns, and continuous improvement of services, PrivatBank has significantly increased the volume of daily transactions. According to the NBU, the bank accounts for a significant share of all non-cash transactions in Ukraine.

PrivatBank is consistently ranked among the three most recognizable and trusted brands in Ukraine, according to research by local and international analytical agencies. Due to consistent branding, effective advertising campaigns, active social position, and emotional closeness to customers, the bank's brand is associated with reliability, speed, and technology. Support for socially important projects, transparent communication during crises, and a willingness to admit mistakes all contribute to the bank's positive image among different age and social groups.

In addition to its success in the market, PrivatBank plays a key role in the financial stability of the country. It is one of the largest taxpayers in the banking sector, actively lending to businesses, supporting government social initiatives and providing access to financial services in the most remote regions. Thanks to its national coverage and digital infrastructure, the bank performs an important function of financial inclusion, increasing the level of financial literacy among the population.

Indicators of the effectiveness of marketing activities of JSC CB “PrivatBank” are shown in Table 2.

Table 2. Indicators of the effectiveness of marketing activities of JSC CB "PrivatBank"

Indicator	2022	2023	2024	2025 (forecast)
Number of active clients, mln	20.5	21.7	22.8	24.0
Privat24 users, mln	12.3	13.9	15.5	17.0
Number of advertising campaigns	60+	75+	80+	90+
Banking market share, %	28%	30%	31%	32%
Digital marketing coverage, mln	35	45	50	60

Source: compiled by the author based on the company's materials.

The SWOT-analysis of the marketing strategy of JSC CB PrivatBank structuredly covers the strengths, weaknesses, opportunities and threats that have influenced or may influence the bank's marketing policy (Table 3).

Table 3. SWOT Analysis of PrivatBank's marketing strategy for 2022-2025

S – Strengths	W – Weaknesses
- Leading positions in the banking sector of Ukraine; - Brand awareness and high customer trust; - Strong digital ecosystem; - Active implementation of innovative products; - Flexibility and adaptability of marketing during the war; - Strong support of the state as an owner.	- Reputational risks associated with martial law; - Limited global marketing - focus is mainly on the domestic market; - Technical failures during heavy loads on Privat24; - Slowdown in the perception of new products by the conservative part of the population.
O – Opportunities	**T – Threats**
- Development of personalized marketing based on Big Data and AI; - Engaging young audiences through TikTok and YouTube; - Expanding the international presence of the Ukrainian embassy abroad during the war; - Further growth of digital banking; - Partnership marketing activities with well-known Ukrainian brands.	- War and political instability affecting marketing investments; - High cybersecurity risks and possible loss of customer confidence; - Changes in legislation that may limit banks' communications with customers; - Increased activity of competitors in the banking services market and overloading of consumers with bank offers

Source: complied by the authors

PrivatBank has a strong marketing potential thanks to its brand recognition, technological solutions, and developed digital infrastructure. At the same time, the bank must respond to reputational challenges, changes in consumer behavior, and competition from new players. Strengthening customer data analytics, personalizing offers, and partnering with innovative companies are key to further strengthening its position.

Thus, the integration of innovative technologies opens up new opportunities for banks: improving the level of customer service, strengthening competitive positions, and improving internal processes. Ukrainian banks are actively implementing both technological and managerial innovations: digital services, transformation of business processes, focus on efficiency, implementation of CRM systems, benchmarking and development of customer loyalty programs. All of this is shaping a new quality of banking services in the face of full-scale disruption.

The main driver of digital transformation is the ability of modern technologies to quickly process and analyze large amounts of data. Artificial intelligence, cloud services, mobile applications, social media, the Internet of Things, edge computing, and robotic process automation are fundamentally changing the way banking is done. For Ukrainian financial institutions, digitalization is a new stage of evolution and a challenge at the same time.

Modern banks are actively moving to digital service channels, focusing on mobile and internet banking. This allows customers to conveniently conduct financial transactions 24/7 without having to visit branches. This approach not only improves the user experience, but also allows financial institutions to optimize costs by reducing physical infrastructure.

The development of strategic management in banks today is increasingly focused on automation and analytics. A key role in this process is played by Big Data technology, which processes large amounts of data to create personalized financial solutions. This allows banks to more accurately predict customer behavior, identify potential fraudulent activities, and sell their products and services more effectively while reducing operating costs.

Among the latest technologies being actively implemented in the financial sector is Near Field Communication (NFC), which is rapidly spreading around the world. It allows for contactless payments using smartphones, gradually replacing traditional payment cards. In addition, biometric solutions are growing in popularity: fingerprints, face or retinal recognition are increasingly being used to identify customers, increasing the level of protection of financial transactions and strengthening trust in banking services.

Modern digital technologies are significantly changing approaches to strategic management in the banking sector, including transforming marketing methods. Online marketing, which is increasingly referred to as digital marketing or interactive marketing, is becoming an integral element of the banking development strategy. Its key goal is not only to expand the audience reach but also to ensure a customer-oriented approach to communications and services [11].

Traditional marketing tools are adapting to the new digital realities: social networks, mobile applications, personalized messages, and data analytics allow banks to get closer to customers and form long-term relationships.

Digital marketing offers banking institutions a number of competitive advantages:

- increasing brand awareness through a stable presence in the online environment;
- personalized information and reaching a wider target audience;
- convenience and functionality of service platforms;
- forming an emotional connection through interactive tools;
- enhancing customer engagement through high-quality visual content.

These opportunities create conditions for increasing customer loyalty, as they value the availability of services, ease of use, and time savings (Fig. 2).

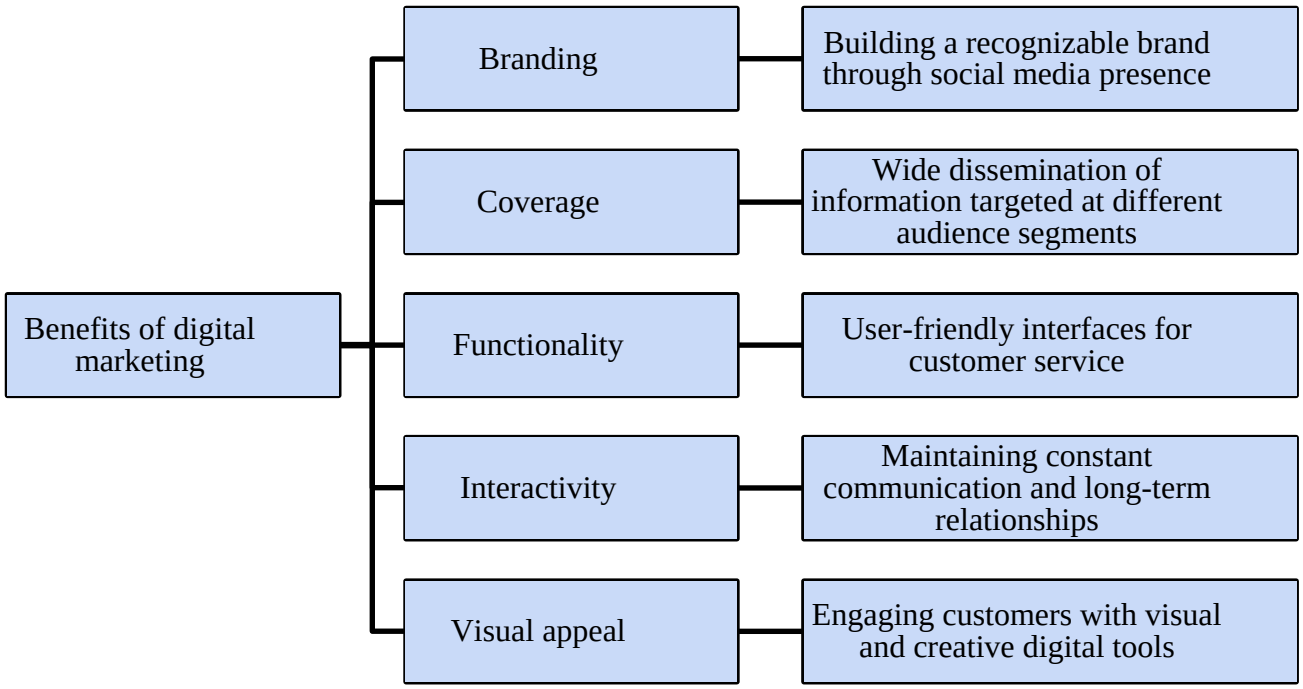

Figure 2. Benefits of digital marketing in the banking sector
Source: complied by the authors

Banks that effectively implement digital strategies are able to provide customers with more flexible, faster and more personalized services that meet the requirements of today's dynamic market.

In Ukraine, one of the most dynamic areas of banking services transformation is the development of mobile banking, which reduces staffing costs for banks and provides customers with convenient access to financial transactions 24/7. Smartphones are becoming a universal tool for managing finances, which contributes to the growth of the digital customer base. Mobility, convenience and time savings make mobile banking increasingly popular among Ukrainian consumers.

Along with the development of mobile applications, voice assistants such as Siri, Google Assistant, and GPT assistants (based on ChatGPT) are being increasingly introduced. They have already become a part of users' everyday lives and are increasingly used by banks as new channels of customer interaction. A striking example is the introduction of Erica, a virtual assistant by Bank of America that provides personalized advice via voice commands, text messages, and interactive menus. This technology has already proven its effectiveness by serving millions of customers.

Banking innovations cover all areas of the institutions' activities - from improving products and services to optimizing operational processes and expanding marketing opportunities. The experience of Ukrainian banks demonstrates that the integration of the latest technologies contributes to sustainable growth, strengthening market positions and increasing profitability.

Among the key technology trends, artificial intelligence (AI) and machine learning (ML) occupy a special place. These tools allow processing large amounts of data, predicting customer behavior, mitigating risks, and creating personalized offers with high accuracy. Big Data analytics is becoming critical for the effective functioning of digital sales channels and building flexible business models.

The widespread use of digital tools, the development of mobile banking and intelligent services are key to the sustainable development of the banking sector in times of war. They allow to adapt to new customer demands, increase efficiency and create competitive advantages in the modern financial services market [12].

Table 4 shows the options for using artificial intelligence technologies and analyzing consumer activity.

Table 4. Potential of artificial intelligence and customer data analytics in sales growth

№	Prospect	Description	Ways of implementation
1	Personalization of offers	Generate customized recommendations based on customer purchase history, behavior, and preferences	Implementation of recommendation systems, use of CRM systems with AI modules
2	Marketing automation	Mailings, targeting, and advertising campaigns that can be customized in real time	Integrating AI into email marketing platforms, launching chatbots to attract customers
3	Optimization of pricing policy	Adaptation of prices to customer motivation and market conditions	Implementation of AI platforms for dynamic pricing, price sensitivity analysis
4	Demand forecasting	Predict demand for goods and services	Use of machine learning models, integration with ERP and inventory management systems
5	Reducing customer churn	Identification of the risk of losing customers and timely intervention	Building churn prediction models, automated retention triggers
6	Identification of new market segments	Discovering new target groups by analyzing behavioral patterns	Customer clustering, market segmentation using AI analytics
7	Increasing conversion	Adaptation of sales channels to more effective interaction scenarios	A/B testing with AI analytics, personalized sales funnels

Source: complied by the authors based on [9, 10]

One of the most striking examples of the effective use of artificial intelligence in the banking sector is the practice implemented by the Polish bank mBank (Export Development Bank).

Thanks to digital solutions, the bank's clients have been able to access banking consultations around the clock, perform standard financial transactions, and receive reference information via online chat.

The peculiarity of this service is that instead of a bank employee, an intelligent chatbot built on the basis of artificial intelligence and machine learning algorithms communicates with the client. The system is able to independently analyze typical customer requests, queries, and behavioral scenarios, which allows it to learn to give accurate answers, advise customers, and perform basic operations after verifying their identity. One of the key advantages is the continuity of communication: a customer can start a dialog on a smartphone and continue it on another device, while the system “remembers” where they stopped and preserves the context of the conversation.

At the same time, the use of AI in banks is not limited to the customer service sector. It opens up great opportunities for improving management and analytics efficiency. For example, Kotak Mahindra Bank in India has implemented an intelligent platform that combines artificial intelligence and machine learning. This system allows the bank's top management to promptly request and receive key statistics and analytical data, build predictive models, and respond quickly to changes in financial performance. Thus, modern technologies are becoming an integral tool for making strategically important decisions.

The transition to innovative banking business models will provide Ukrainian banks with a number of significant advantages [9]:

1. Improving the quality of banking products and services. Thanks to the introduction of the latest technologies, banks will be able to expand their product lines, improve the characteristics of existing products, and attract new customers, increasing their share in the financial services market.
2. Improving the efficiency of banking operations. Innovations will help reduce costs, which will lead to improved results in the financial, marketing, organizational, and human resources areas. This will increase the overall efficiency of the bank's operations.
3. Optimization of the risk level and increase of liquidity. Innovative products that appear on the market will contribute to better risk management and improve the bank's liquidity, increasing its attractiveness to investors.
4. Achieving strategic and social effects. The introduction of innovations will help strengthen the bank's market position and increase customer satisfaction with new products and services. This will allow the bank to reach a new level of technological development.
5. Entering the international financial market. The use of innovative technologies of international level will allow Ukrainian banks to compete in the global financial market.
6. Currently, no banks in Ukraine have implemented voice assistants or voice control systems for applications, and there are no technologies for interacting with cryptocurrencies or electronic digital signatures. However, big data analysis technologies are actively developing, which is a major trend in the financial services market.

In today's environment, when the banking sector faces numerous challenges caused by the war, bank marketing requires flexibility and adaptation to new realities. The crisis is forcing banks to consider new approaches to customer service, introduce innovative technologies and revise strategies for interacting with target groups. In a time of war, it is important not only to support existing customers but also to attract new ones, which requires a quick response and flexible solutions. Accordingly, banking institutions should focus on adapting marketing strategies to the changing environment, taking into account the specifics of the current situation.

Table 5 shows the key prospects for the development of marketing in the banking sector during the war, as well as their impact on the activities of financial institutions.

In view of the above, we can conclude that the successful development of bank marketing in times of war requires a combination of innovative approaches, adaptation to changing customer demand, and a quick response to crisis situations. Banks that are able to effectively use digital technologies, adapt marketing strategies to the current needs of consumers and respond appropriately to environmental challenges will have a competitive advantage in an unstable

environment. Maintaining customer confidence through transparent communications and support for social initiatives will also be important, which will help strengthen the banks' image and increase their influence in the market.

Table 5. Prospects for the development of bank marketing in times of war

Prospect	Description	Impact on the banking sector
Adapting to new conditions	Banks are forced to adapt their marketing strategies to the new environment, in particular, taking into account changes in customer behavior during the war	Increased flexibility and responsiveness to changes in the market and demand
Digital platforms and online services	Developing digital channels for customer service through mobile applications and online banking	Increasing the availability of banking services to customers in areas with limited physical access
Personalization of marketing offers	Use data analysis to create customized offers focused on the specific needs of customers during the war	Increase customer loyalty by taking into account their needs and priorities
Crisis marketing and communication	Developing special communication strategies that focus on customer support in times of crisis	Strengthening the bank's credibility and image as a stable and reliable institution in times of crisis
Flexibility of offers and adaptability	Offering products that take into account changes in the financial conditions of customers, such as loan restructuring and deferred payments	Improving customer relations and customer satisfaction, maintaining the customer base
Attracting new customers through social media	Active use of social media to raise awareness of banking services and attract new customers	Expanding the customer base through new channels of communication and interaction
Support for social initiatives	Banks can take an active part in supporting social initiatives related to the war (donations, assistance to the Armed Forces)	Improving the bank's image in the eyes of the public, strengthening social responsibility
Innovations in security and data protection	Implementation of new technologies to protect customer data while increasing online operations	Increasing the level of trust in banking services, especially in the context of digitalization

Source: complied by the authors based on [9, 10]

The conducted research confirms that the transformation of marketing in the Ukrainian banking sector is a multifaceted process influenced simultaneously by technological, economic, and geopolitical factors. Digitalization has become the dominant trend, determining the competitiveness and adaptability of financial institutions. The analysis of theoretical sources and empirical data reveals that the digital transformation of marketing is not limited to the use of technological tools but involves a fundamental change in management philosophy and customer relationships.

Discussion. The case of JSC CB “PrivatBank” illustrates how the successful integration of digital technologies into marketing strategies can ensure the resilience and stability of a financial institution even under wartime conditions. The bank’s marketing activities are based on a combination of technological innovation, social responsibility, and customer focus. The systematic use of online communication platforms, mobile applications, and personalized digital campaigns allows the bank to strengthen its brand and maintain trust in a turbulent environment [7; 15]. The SWOT analysis demonstrates that the bank’s competitive advantages lie in its strong digital ecosystem, flexibility, and innovation-oriented management, while the main challenges are related to reputational risks, cybersecurity threats, and market uncertainty.

The findings align with those of Meier et al. [8] and Radhakrishnan & Shankar [12], who emphasize that digital transformation is a strategic instrument for sustainable banking development. The integration of artificial intelligence, big data analytics, and automation enhances decision-making efficiency, customer segmentation, and product personalization. Ukrainian banks increasingly rely on digital ecosystems similar to those implemented in the EU and the United States, which provide

omnichannel communication and integrate marketing with customer data platforms. This trend reflects the global shift toward data-driven and customer-centric banking models [1; 11].

At the same time, wartime challenges have led to the emergence of crisis marketing strategies that prioritize transparency, empathy, and social engagement. As shown by Zarutska et al. [15], Ukrainian banks have intensified their social communication and participation in humanitarian and defense initiatives, strengthening public trust and positioning themselves as socially responsible institutions. Such an approach supports not only brand loyalty but also contributes to social cohesion and the image of the banking system as a pillar of national resilience.

Another significant aspect revealed by the study is the growing role of personalized digital marketing. The use of artificial intelligence and machine learning in communication processes enables banks to predict customer behavior, prevent churn, and tailor offers to individual needs [11; 12]. These technologies enhance operational efficiency while maintaining high levels of customer satisfaction and loyalty. However, researchers such as Ivanov and Pylypenko [5] and Nwoke [11] point out that the rapid expansion of digital technologies creates new vulnerabilities, requiring constant attention to cybersecurity, regulatory compliance, and ethical data use.

Thus, the discussion of research results highlights that Ukrainian banks, despite operating in extremely difficult conditions, demonstrate a remarkable capacity for digital adaptation and marketing innovation. The combination of technological advancement, analytical management tools, and human-centered marketing ensures not only their financial sustainability but also the modernization of the national financial system. Continuous investment in digital infrastructure, personnel training, and innovative communication strategies remains essential for strengthening competitiveness and maintaining long-term customer trust.

Conclusions. The conducted study made it possible to comprehensively assess the transformation of marketing in the Ukrainian banking sector under the influence of digitalization and wartime challenges. The analysis confirmed that digital marketing is becoming a key component of the strategic development of financial institutions, ensuring their adaptability, competitiveness, and customer orientation in a dynamically changing environment.

The study demonstrated that the effective use of digital tools — including social media, mobile applications, artificial intelligence, and big data analytics — contributes to the creation of personalized financial services and strengthens customer trust. The example of JSC CB “PrivatBank” illustrates that the integration of digital marketing strategies enables banks to maintain market leadership, increase customer loyalty, and enhance operational efficiency even in crisis conditions.

It has been established that the main drivers of marketing transformation are technological innovation, customer experience management, and the ability to analyze and interpret large volumes of data. At the same time, the digitalization process requires continuous improvement of cybersecurity measures, compliance with ethical communication standards, and the development of new mechanisms for protecting personal data.

The SWOT analysis of PrivatBank’s marketing strategy confirmed that flexibility, brand awareness, and the developed digital ecosystem are key strengths that support stability and resilience. However, reputational risks, limited international activity, and growing cybersecurity threats remain important challenges that need to be addressed strategically.

The research results have both theoretical and practical implications. They enrich the understanding of digital transformation processes in the financial sector and can serve as a basis for improving marketing management systems in Ukrainian banks. In practice, the conclusions can be applied to develop adaptive marketing strategies, improve digital communication with customers, and strengthen financial institutions’ competitiveness during crises.

Further research should focus on studying the impact of artificial intelligence and data-driven decision-making on customer satisfaction, as well as exploring new forms of digital banking communications, including voice assistants, chatbots, and virtual financial ecosystems. Such developments will determine the future trajectory of marketing in the Ukrainian banking sector and its integration into the global digital economy.

References

1. Bastari, A., Eliyana, A., Syabarrudin, A., Arief, Z., & Emur, A. P. (2020). Digitalization in banking sector: The role of intrinsic motivation. *Heliyon, 6*(12), e05801. https://doi.org/10.1016/j.heliyon.2020.e05801
2. Danik, N., & Torlopov, A. (2024). The impact of digital transformation on the banking sector of Ukraine. *International Science Journal of Management, Economics & Finance, 3*(3), 95–103. https://doi.org/10.46299/j.isjmef.20240303.09
3. Hantsiak, M., Verheliuk, Y., & Fomov, D. (2025). Digital transformation of the banking system: Global guidelines for Ukraine. *Finansy Ukrainy, 2025*(3), 45–60. https://doi.org/10.33763/finukr2025.03.045
4. Hrytsenko, L., & Kozhushko, I. (2023). Banking marketing development trends in the context of digitalization. *Visnyk of Sumy State University. Economy Series, 4*, 53–63. https://doi.org/10.21272/1817-9215.2023.4-06
5. Ivanov, M., & Pylypenko, A. (2025). Building a structural model of the banking sector in the conditions of martial state in Ukraine. *Management and Entrepreneurship: Trends of Development, 2*(32), 197–205. https://doi.org/10.26661/2522-1566/2025-2/32-16
6. Kostiuk, V., Muravskyi, O., Avramchyk, L., Lutsenko, V., & Ciobanu, G. (2025). Evolution of digital banking services in Ukraine: Impact on business development and financial infrastructure. *Economics and Business Management, 16*(2), 134–151. https://doi.org/10.31548/economics/2.2025.134
7. Kretov, D., Kretova, O., Zherdetska, L., & Chaikovskyi, Y. (2024). Digitalization management in the corporate banking sector of Ukraine. *Economics Ecology Socium, 8*, 92–103. https://doi.org/10.61954/2616-7107/2024.8.3-8
8. Meier, H. B., Marthinsen, J. E., Gantenbein, P. A., & Weber, S. S. (2023). *Swiss finance: Banking, finance, and digitalization.* Springer International Publishing. https://doi.org/10.1007/978-3-031-23194-0
9. Ministry of Finance of Ukraine. (2024, April 11). *People's rating of banks.* https://minfin.com.ua/ua/banks/top/2021-05-24 [In Ukrainian]
10. National Bank of Ukraine. (2024). *Statistics.* https://bank.gov.ua/ua/statistic
11. Nwoke, J. (2024). Digital transformation in financial services and FinTech: Trends, innovations and emerging technologies. *International Journal of Finance, 9*(6), 1–24. https://doi.org/10.47941/ijf.2224
12. Radhakrishnan, G. V., & Shankar, U. (2024). The evolution of digital banking: The role of fintech in transforming financial services. *South Eastern European Journal of Public Health,* 2939–2952. https://doi.org/10.70135/seejph.vi.2970
13. Skvarciany, V., Lapinskaitė, I., & Stasytytė, V. (2023). Efficiency of digital economy in the context of sustainable development: DEA–Tobit. *Prague Economic Papers, 32*(2), 129–158. https://doi.org/10.18267/j.pep.824
14. Tsilnyk, O. Ya. (2025). Theoretical foundations of optimizing the interaction of marketing technologies in the conditions of economic digitalization. *Academic Visions, (39).* https://www.academy-vision.org/index.php/av/article/view/1934 [In Ukrainian]
15. Zarutska, O., Ponomarova, O., Pavlov, R., Pavlova, T., & Levkovich, O. (2022). Changes in Ukrainian banks' business models in times of military crisis. *Financial and Credit Activity: Problems of Theory and Practice, 6*(47), 3923. https://doi.org/10.55643/fcaptp.6.47.2022.3923 [In Ukrainian]

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Бабенко Максим
Доктор філософії
Навчально-науковий інститут «Каразінський банківський інститут»
Харківського національного університету імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: babenkomv2011@gmail.com
ORCID ID: 0000-0001-6792-3465
Новікова Тетяна
Кандидат економічних наук, доцент
Навчально-науковий інститут «Каразінський банківський інститут»
Харківського національного університету імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: tvnovikova75@gmail.com
ORCID ID: 0000-0002-0428-4181
Котковський Володимир
Доктор наук з державного управління
Навчально-науковий інститут «Каразінський банківський інститут»
Харківського національного університету імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: kotkovskyi@karazin.ua
ORCID ID : 0009-0005-8259-1936
Денчик Ірина
Старший викладач
Навчально-науковий інститут "Каразінський банківський інститут"
Харківський національний університет імені В.Н. Каразіна
майдан Свободи, 4, Харків, 61022, Україна
e-mail: irina.denchik@karazin.ua
ORCID ID: 0000-0003-1594-1084

Трансформація маркетингу банківського сектору України в умовах війни та цифровізації

Анотація. Цифровізація банківського сектору України створює нові можливості для підвищення ефективності маркетингу, зміцнення довіри клієнтів та розвитку інноваційних фінансових послуг. У воєнний час цифровий маркетинг стає ключовим інструментом адаптації банків до кризових умов, забезпечуючи гнучкість, стійкість та конкурентоспроможність у швидкозмінному фінансовому середовищі.

Постановка проблеми. Війна та стрімкий розвиток цифрових технологій змінили операційне середовище українських банків, підкресливши необхідність трансформації маркетингових стратегій. Однак нерівномірний рівень цифрової готовності банків, недостатня професійна компетентність у сфері цифрового маркетингу та загрози у кібербезпеці сповільнюють модернізацію маркетингових систем.

Нерозв'язані аспекти. Незважаючи на активне впровадження цифрових інструментів, досі не існує єдиної моделі оцінки ефективності цифрового маркетингу в українських банках. Недостатньо вивченими залишаються питання інтеграції міжнародного досвіду, управління репутаційними ризиками та забезпечення захисту даних у цифровому середовищі.

Мета статті. Метою дослідження є аналіз трансформації маркетингових процесів у банківському секторі України під впливом цифровізації та викликів воєнного часу, а також визначення основних напрямків підвищення ефективності маркетингових стратегій банків.

Основний матеріал. У дослідженні застосовується комплексний підхід, що поєднує аналіз наукових джерел, статистичних даних та практичний приклад АТ КБ «ПриватБанк». У статті розглядається вплив цифрових технологій, штучного інтелекту та онлайн-платформ на залучення клієнтів, просування послуг та конкурентоспроможність. SWOT-аналіз маркетингової стратегії ПриватБанку виявив ключові сильні сторони: надійну цифрову екосистему, інновації та орієнтацію на клієнта, а також загрози, пов'язані з кібербезпекою та нестабільністю ринку.

Висновки. Цифровий маркетинг є важливим фактором розвитку банківського сектору України в умовах війни, підвищуючи його адаптивність та фінансову стабільність. Результати дослідження можуть бути використані для вдосконалення стратегічного маркетингового менеджменту, підвищення якості обслуговування клієнтів та формування ефективних моделей цифрової комунікації.

Ключові слова*: цифровий маркетинг, цифрова трансформація, банківський сектор, інновації, клієнтоорієнтованість, конкурентоспроможність, фінансова стійкість, соціальна відповідальність, штучний інтелект.*

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Список літератури

1. Bastari A., Eliyana A., Syabarrudin A., Arief Z., Emur A. P. Digitalization in banking sector: The role of intrinsic motivation. *Heliyon.* 2020. Vol. 6, No. 12. e05801. DOI: https://doi.org/10.1016/j.heliyon.2020.e05801
2. Danik N., Torlopov A. The impact of digital transformation on the banking sector of Ukraine. *International Science Journal of Management, Economics & Finance.* 2024. Vol. 3, No. 3. P. 95–103. DOI: https://doi.org/10.46299/j.isjmef.20240303.09
3. Hantsiak M., Verheliuk Y., Fomov D. Digital transformation of the banking system: Global guidelines for Ukraine. *Finansy Ukrainy.* 2025. No. 3. P. 45–60. DOI: https://doi.org/10.33763/finukr2025.03.045
4. Hrytsenko L., Kozhushko I. Banking marketing development trends in the context of digitalization. *Visnyk of Sumy State University. Economy Series.* 2023. No. 4. P. 53–63. DOI: https://doi.org/10.21272/1817-9215.2023.4-06
5. Ivanov M., Pylypenko A. Building a structural model of the banking sector in the conditions of martial state in Ukraine. *Management and Entrepreneurship: Trends of Development.* 2025. No. 2(32). P. 197–205. DOI: https://doi.org/10.26661/2522-1566/2025-2/32-16
6. Kostiuk V., Muravskyi O., Avramchyk L., Lutsenko V., Ciobanu G. Evolution of digital banking services in Ukraine: Impact on business development and financial infrastructure. *Economics and Business Management.* 2025. Vol. 16, No. 2. P. 134–151. DOI: https://doi.org/10.31548/economics/2.2025.134
7. Kretov D., Kretova O., Zherdetska L., Chaikovskyi Y. Digitalization management in the corporate banking sector of Ukraine. Economics Ecology Socium. 2024. Vol. 8. P. 92–103. DOI: https://doi.org/10.61954/2616-7107/2024.8.3-8
8. Meier H. B., Marthinsen J. E., Gantenbein P. A., Weber S. S. *Swiss finance: Banking, finance, and digitalization.* Springer International Publishing. 2023. DOI: https://doi.org/10.1007/978-3-031-23194-0
9. *Міністерство фінансів України. Народний рейтинг банків. 11.04.2024. URL:* https://minfin.com.ua/ua/banks/top/2021-05-24
10. Національний банк України. Статистика. 2024. URL: https://bank.gov.ua/ua/statistic
11. Nwoke J. Digital transformation in financial services and FinTech: Trends, innovations and emerging technologies. International Journal of Finance. 2024. Vol. 9, No. 6. P. 1–24. DOI: https://doi.org/10.47941/ijf.2224
12. Radhakrishnan G. V., Shankar U. The evolution of digital banking: The role of fintech in transforming financial services. South Eastern European Journal of Public Health. 2024. P. 2939–2952. DOI: https://doi.org/10.70135/seejph.vi.2970
13. Skvarciany V., Lapinskaitė I., Stasytytė V. Efficiency of digital economy in the context of sustainable development: DEA–Tobit. *Prague Economic Papers.* 2023. Vol. 32, No. 2. P. 129–158. DOI: https://doi.org/10.18267/j.pep.824
14. Цільник О. Я. Теоретичні засади оптимізації взаємодії маркетингових технологій в умовах цифровізації економіки. *Академічні візії.* 2025. Вип. 39. URL: https://www.academy-vision.org/index.php/av/article/view/1934
15. Заруцька О., Пономарьова О., Павлов Р., Павлова Т., Левкович О. Зміни у бізнес-моделях українських банків у період воєнної кризи. Financial and Credit Activity: Problems of Theory and Practice. 2022. Vol. 6, No. 47. P. 3923. https://doi.org/10.55643/fcaptp.6.47.2022.3923

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Kochorba Valeriia
PhD in Economics, Associate Professor, Deputy Director,
Education and Research Institute "Karazin Banking Institute"
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: V.y.kochorba@karazin.ua
ORCID ID: 0000-0002-5509-680X
Kolomiiets Yuliia
PhD candidate at the Department of Finance, Banking and Insurance
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: yuliya.kolomiiets@student.karazin.ua
ORCID ID: 0009-0009-9703-4541

Forecasting bank cash flows using intelligent systems

Abstract. The object of the study is the processes of cash flow management in the banking system of Ukraine, which is characterized by high dynamism, increased risks caused by war and economic instability, as well as rapid adaptation to digital technologies and European standards. The article emphasizes the critical importance of effective cash flow management to maintain financial stability and ensure uninterrupted operations of the bank in the face of uncertainty.

Problem statement. The main problem studied in the article is the lack of efficiency of traditional methods of forecasting and managing cash flows in modern realities. These methods are unable to adequately process large amounts of data, take into account complex nonlinear dependencies, and respond quickly to unpredictable changes caused by both war and digital transformation. This creates liquidity risks, leads to suboptimal use of capital, and reduces the overall resilience of the banking system.

Unresolved aspects of the problem. Today, there are gaps in the integration of the latest intelligent systems directly into the bank's operational and strategic processes. There are still unanswered questions about how to turn highly accurate predictions obtained through machine learning into concrete, managerial decisions that will minimize risks.

Purpose of the article. The aim of the article is to develop comprehensive recommendations for improving cash flow management in a bank using intelligent systems. For this purpose, a three-dimensional approach is used, which combines Big Data analysis, improving the accuracy of forecasts using machine learning, and their integration into a management decision support system.

Presentation of the main material. The authors of the article use a three-dimensional coordinate system of "analysis-prediction-integration" to structure the research. Practical examples for forecasting liquidity, assessing borrowers' solvency, and the effectiveness of marketing campaigns are considered. The use of LSTM, SVM, Random Forest, and RNN models to improve forecasting accuracy is detailed. To integrate the forecasting results into the bank's risk management system, specific solutions are proposed, such as the use of automated dashboards, early warning systems, and dynamic scoring.

Conclusions. The recommendations proposed in this article allow banks to move from reactive to proactive cash flow management. This helps to significantly reduce operational risks, optimize capital, increase profitability and strengthen competitive positions. The practical value of the study lies in the provision of specific tools and scenarios for the implementation of intelligent systems in daily operations, which is extremely important for ensuring the financial stability of the Ukrainian banking system in the face of uncertainty.

Keywords: *risk, integration, machine learning, liquidity, financial stability of the bank, risk management system of the bank.*

Formulas: –; fig.: 3; tabl.: 3; bibl.: 12.

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Introduction. The issue of improving the efficiency of cash flow management in the bank's risk management system is extremely relevant for Ukraine, especially given the current realities: constant risks due to the war, at the same time as the rapid development of digital banking technologies and compliance with EU conditions for the functioning of the banking system.

The war causes significant economic instability, which directly affects banks' cash flows. Unpredictable events, changes in consumer and investment behavior, and infrastructure destruction pose huge challenges for liquidity forecasting and management. Banks need to have reliable mechanisms to quickly adapt to changing conditions. At the same time, there is a growing risk that the bank will not be able to meet its obligations due to deposit outflows or lack of external funding. Effective cash flow management is key to preventing liquidity crises and maintaining financial stability. The digitalization of banking (online banking, mobile applications, instant payments) significantly accelerates the movement of funds and changes traditional cash flow models. This requires banks to review and modernize their existing forecasting and management systems.

Cash flow forecasting using intelligent systems is particularly relevant. The large amounts of data generated by digital transactions can only be efficiently processed using machine learning and artificial intelligence algorithms. This will allow banks to make more accurate forecasts, identify hidden patterns, and respond quickly to changes.

At the same time, the development of digital technologies also creates new risks associated with cybercrime and system failures. Cash flow management should take these risks into account by integrating security measures and contingency plans.

To create a holistic and effective bank cash flow management system, three components are important, which are complementary and critical: forecasting the bank's cash flows provides a basis for decision-making; developing scenarios for managing the bank's cash flows allows preparing for different scenarios, which is especially important in an environment of uncertainty; formulating recommendations for choosing a cash flow management strategy provides practical tools for making informed management decisions.

The basic component of the bank's cash flow management system is cash flow forecasting based on intelligent systems, as cash flow management in a modern bank, especially in the digital economy, requires not only an understanding of past trends but also accurate forecasting of the future.

Literature review. A review of scientific papers on the topic under consideration allows us to identify key approaches to its study.

Classical works on liquidity and cash flow management, such as those by Allen E. Bukhari and his colleagues [5], focused on models that used time series analysis methods to forecast cash flows. The main idea of these approaches was to extrapolate past trends to the future. However, classical methods do not take into account nonlinear dependencies, which makes them ineffective in financial crises. The limitations of traditional methods are particularly evident in the digital economy, when the volume and speed of data generation require more sophisticated tools.

With the advent of Big Data technologies and the development of computing power, scientific thought has begun to shift toward intelligent systems. Michael Nolan [9] emphasizes in his study that Big Data provides banks with the opportunity to analyze not only traditional financial indicators, but also huge amounts of unstructured data (customer behavior in social networks, geographic data, real-time transaction information). This allows them to get a more complete picture of the client's financial situation and market trends.

The works of researchers such as Robert Shlepachuk [11], Weixi Chen, Walayat Hussain, and others [6] demonstrate the effectiveness of machine learning for cash flow forecasting. They showed that neural networks significantly outperform classical models in forecasting accuracy, especially for short-term periods. This is due to their ability to detect complex, hidden patterns in large amounts of data that are nonlinear and volatile.

Thus, scientific thought has evolved from classical econometric models to complex intelligent systems. The work of these and other researchers is becoming the basis for the

development of more complex hybrid models that combine different machine learning algorithms, as well as on the ethical use of AI and cybersecurity in the context of cash flow management.

Purpose, objectives and research methods. Traditional forecasting methods often fail to cope with the complexity and volume of data generated by digital banking operations. That's why intelligent systems based on Big Data and machine learning are becoming an indispensable tool for improving the accuracy and efficiency of cash flow forecasting. This allows the bank not only to optimize its liquidity but also to effectively manage the risks associated with cash flows.

The purpose of the study is to develop and substantiate comprehensive recommendations for improving the efficiency of cash flow management in the bank's risk management system in the context of economic instability caused by the war and rapid digital transformation. The study aims to demonstrate how the integration of intelligent systems based on Big Data and machine learning can transform traditional approaches to forecasting and managing financial flows, turning them into a proactive tool for reducing risks and optimizing a bank's operations.

To achieve this goal, the study set and solved the following tasks: analyzed the possibilities and advantages of using Big Data technologies and analytical tools for analyzing and forecasting cash flows; identified key machine learning models that can be used to improve the accuracy of cash flow forecasts; developed practical scenarios and recommendations for integrating forecasting results into the bank's management decision support system.

The study uses a set of general scientific and special methods, such as the method of system analysis and synthesis to form a holistic concept of cash flow management; the method of analysis and generalization to study the experience of using intelligent systems in the banking sector; the method of scenario planning to develop practical recommendations in the format of "Task - Decision - Result" chains, which allows preparing for different scenarios and the method of data visualization to present key conclusions.

Research results. To develop recommendations for improving the methods of analyzing and forecasting the bank's cash flows, we will apply a three-dimensional approach based on the construction of a coordinate system (Fig. 1), in which we consider the following axes: A (analysis) - the state of analysis and forecasting of cash flows using Big Data and analytical tools; FA (forecast accuracy) - the state of accuracy of cash flow forecasting, I (integration) - integration of cash flow forecasting into the bank's decision support system.

Each R (recommendation) for improving the methods of analysis and forecasting of the bank's cash flows will depend on the current state of IS use in the three areas indicated - $R_t\,(A_t\,, FA_t\,, I_t\,)$.

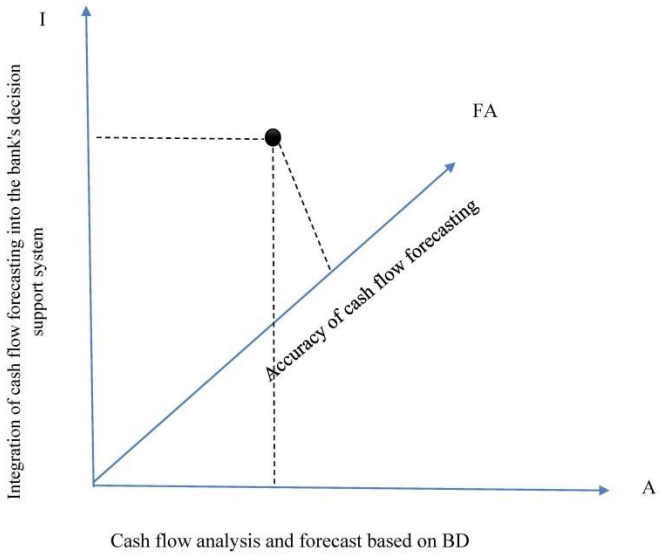

Figure 1. Coordinate system for forecasting bank cash flows based on intelligent systems
Source: prepared by the authors

Discussion.

Let's take a closer look at Axis A, i.e., the possibilities of improving cash flow analysis and forecasting using Big Data and analytical tools. Large volumes of data generated by banking activities can be used to obtain valuable analytical data and make accurate forecasts.

The conceptual scheme of applying Big Data and analytical tools for analyzing and forecasting cash flow is shown in Figure 2.

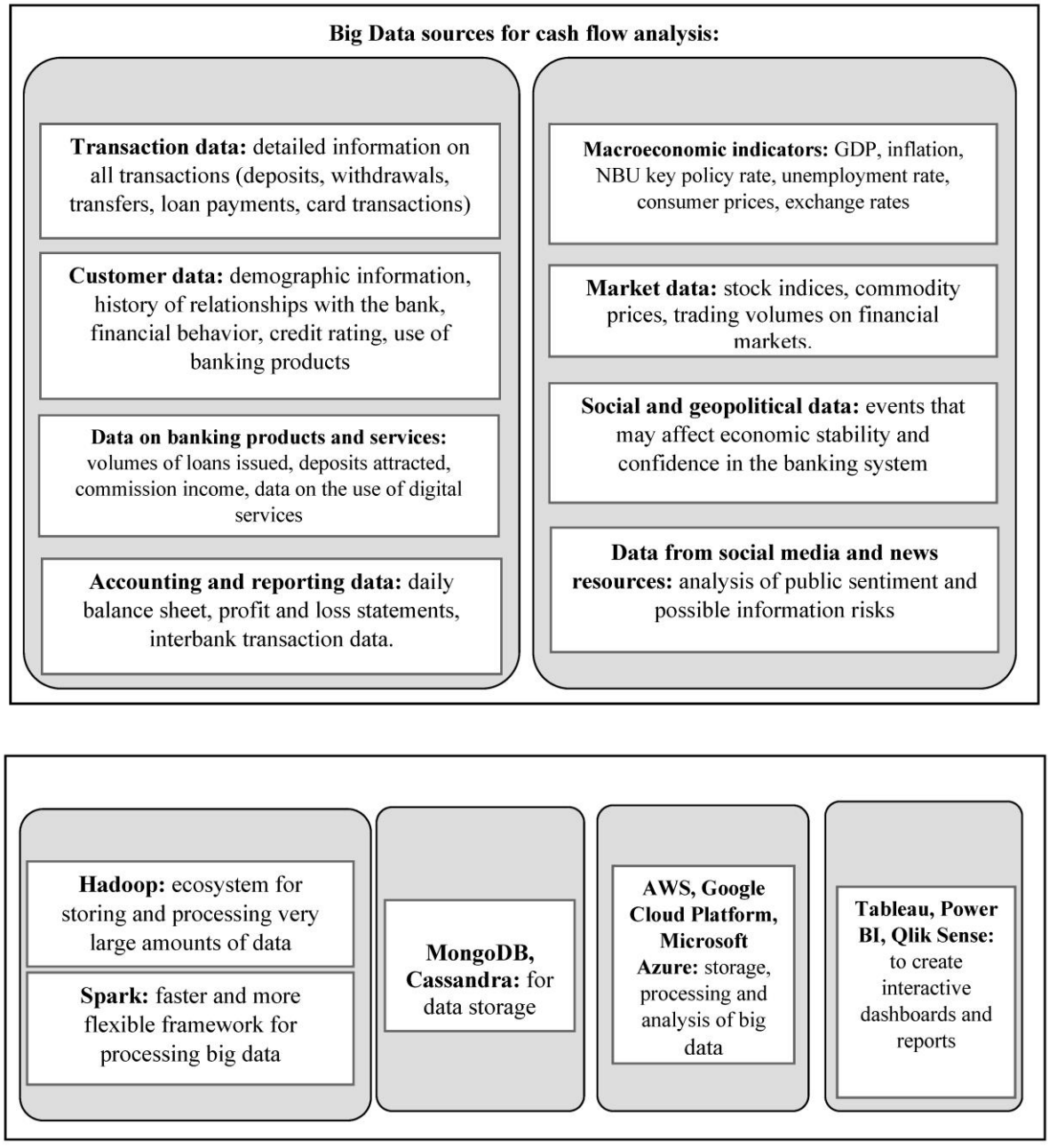

Figure 2. Scheme for applying Big Data and analytical tools to analyse and forecast cash flows.
Source: prepared by the authors

Table 1. A chain of recommendations: 'Task' > 'Relevance' > 'Solution' > 'Result', regarding the application of Big Data and analytical tools for cash flow forecasting

Bank's objectives	Relevance	Solutions using Big Data and analytics		Expected result
		Data sources	Tools	
Daily liquidity forecasting and cash management	The need to accurately forecast daily cash inflows and outflows, customer account balances	**Internal:** Historical data of all transactions (withdrawals, deposits, transfers, payments) broken down by time, client type, transaction type, and geography. Data on salaries, pensions, and social benefits. Data on loan debt and repayment schedules. **External:** Calendar data (holidays, weekends, payment days), weather conditions (affecting branch attendance), macroeconomic indicators, data on competitors' activities.	**Collection and storage:** Apache Kafka (real-time transactional data transfer), Hadoop Distributed File System (HDFS), or cloud storage (storage of huge amounts of data). **Processing:** Apache Spark for fast data processing and aggregation, feature extraction. **Modeling:** LSTM (Long Short-Term Memory) or GRU (Gated Recurrent Unit) - neural networks for forecasting daily cash flows, GBoost/LightGBM for identifying key factors affecting cash outflows/inflows	Highly accurate forecasts of cash requirements and expected account balances, which allows optimizing collection routes, reducing cash logistics costs, and minimizing funds that are "frozen" in the form of excess reserves. The forecast accuracy can increase by 15-20% compared to traditional methods.
Assessment and forecasting of borrowers' solvency (default forecast)	The need to take into account dynamic changes in the client's financial condition, which will increase the accuracy of default forecasts	**Internal:** Data on customer transactions (regularity of income/expenses, balance dynamics), frequency of use of banking products, loan repayment history, overdrafts, data from the suspicious transaction monitoring system. **External:** Data from credit bureaus, public data on court decisions, tax arrears (for legal entities), macroeconomic indicators (changes in unemployment rates in the borrower's industry), data from social networks.	**Collection and storage:** Apache Flink (real-time data stream analysis). Data Lake (consolidation of heterogeneous data). **Processing:** Spark Streaming, Python with Pandas and NumPy libraries (data preparation) **Modeling:** Random Forest, Gradient Boosting (binary classification (default/non-default, effective processing of a large number of heterogeneous features). Deep neural networks (detection of complex hidden patterns in customer financial behavior that may indicate increased risk).	Dynamic assessment of default risk for each borrower. Subsequent interaction with customers showing early signs of financial difficulties (loan restructuring, reduction of monthly payments), reducing the level of problem debt and optimizing the formation of reserves. The accuracy of default forecasts can increase by 10-25%.
Forecasting demand for banking products and the effectiveness of marketing campaigns	The need to identify products that will be in demand in the future and optimize marketing budgets	**Internal:** Customer purchase history, interaction with mobile apps/online banking, calls to the call center, demographic data, transaction history. **External:** Socio-demographic data by region, competitor data, news about changes in legislation affecting the banking market, trends in social media and internet search.	**Collection and storage:** Google BigQuery or Snowflake (integration of structured and unstructured data from various sources). **Processing:** Apache Hive or Presto (execution of complex queries and data aggregation). **Modeling:** collaborative filtering or deep learning-based recommendation systems (personalized product recommendations). Regression models (forecasting demand for specific products). **Clustering using K-Means or DBSCAN methods** (segmenting customers based on their behavior and needs).	Reliable forecasts, demand for products in specific customer segments, personalization of marketing offers. As a result, increased campaign conversion, reduced marketing costs, and optimized cash flow from product sales.

Source: prepared by the authors based on [2, 4, 12]

Given that detailed internal data of specific banks is confidential, this section of the study will provide generalized examples of real banking tasks and recommendations or scenarios for solving them in the form of a specific "task-solution-result" chain. Let us form a chain: 'Bank task' - 'Relevance' - 'Solution' - 'Result' in order to formulate recommendations on the use of Big Data and analytical tools for forecasting cash flows in a bank (Table 1).

The table shows that the integration of Big Data and analytical tools allows banks not only to collect and store huge amounts of information, but also to transform it into valuable knowledge for accurate forecasting and effective cash flow management. This is the fundamental basis for building an effective risk management system in the digital economy.

Let us consider in more detail the FA axis, i.e., the direction of improving the accuracy of cash flow forecasting based on the use of machine learning models, the advantages of which are studied in detail in [11-12]. Let us present specific cash flow forecasting tasks in banks in the form of a chain 'Task' - 'Relevance' - 'Solution' - 'Result', and formulate recommendations on the use of machine learning models to improve the accuracy of the forecasts obtained (Table 2).

Table 2. Recommendation chain: 'Task' > 'Relevance' > 'Solution' > 'Result' for improving the accuracy of bank cash flow forecasts using machine learning models

Bank's task	Relevance of the task	Solution	Result
Optimizing liquidity management with LSTM, which can identify hidden risk factors	Accurate forecasts of daily cash flows are necessary to maintain optimal liquidity levels. Inaccurate forecasting can lead to excess reserves or cash shortages, which can cause liquidity risks and the need for expensive borrowing. Traditional econometric models often cannot handle the complex nonlinearities and long-term dependencies in daily transaction data.	Implementation of a long short-term memory (LSTM) model for forecasting daily cash inflows, taking into account data on transfer volumes, number of payments, customer salaries, loan maturity dates, as well as external factors such as macroeconomic indicators (GDP, inflation) and calendar events.	Increased forecasting accuracy, more accurate assessment of liquidity needs, optimization of capital allocation. Reduction of idle assets in reserves and minimization of short-term borrowing needs. The result is increased profitability and reduced operational risks.
Detecting anomalous cash flows to prevent fraud and money laundering using SVM and Random Forest (SVM can effectively recognize "normal" and "anomalous" features, while Random Forest helps identify which specific transaction features indicate a potential anomaly.	The constant threat of fraud and money laundering. The need to identify hidden anomalies in a huge volume of financial transactions.	Development of a monitoring system based on Support Vector Machines (SVM) for identifying anomalous transactions and Random Forest for classifying and determining factors affecting the anomaly. The basis for training models is transaction data (amounts, frequency, geography of operations, types of counterparties), as well as signs indicating fraudulent or suspicious operations.	Implementation of a system for automatic detection of potentially suspicious transactions that deviate from established customer behavior patterns, which will increase the effectiveness of financial monitoring and anti-fraud departments, allowing them to respond more quickly to threats, reduce financial losses, and ensure compliance with regulatory requirements.
Forecasting transaction volumes for infrastructure planning and customer experience management using recurrent neural networks (RNN) and gradient boosting (XGBoost). RNNs are effective for analyzing sequential data, while XGBoost effectively identifies complex relationships between various factors that affect cash flows.	The importance of forecasting future transaction volumes for effective planning of IT infrastructure, customer support resources, and network optimization. An inaccurate forecast can lead to system overloads, service delays, or, conversely, excessive investment.	Using RNN to analyze cash flow time series, taking into account their seasonality and cycles, as well as XGBoost to include additional factors (marketing campaigns, new product launches, macroeconomic events, holidays, and weekends).	Increased forecasting accuracy for future IT system planning, staffing allocation in contact centers and branches, and ATM cash optimization. The result is uninterrupted customer service, increased customer loyalty, and avoidance of unnecessary infrastructure costs.

Source: prepared by the authors based on [3,7,8]

Thus, using the specific banking tasks related to cash flow forecasting and analysis shown in the table as examples, we have examined the advantages of machine learning (nonlinear data processing, working with big data, adaptability) and specific models (LSTM, SVM, Random Forest, RNN, Gradient Boosting).

The success of cash flow forecasting depends not only on the accuracy of the models built, but also on the effectiveness of their integration into the bank's daily operations and strategic planning. This transforms forecast data into specific actions and management decisions. Let's take a closer look at axis I, i.e., the possibilities of integrating cash flow forecasting into the bank's decision support system, which shows how the developed models and obtained forecasts can be directly used in the bank's daily activities and strategic planning.

Possible directions for integrating cash flow forecasting into the bank's decision support system are grouped in Figure 3. The figure clearly shows how the results of Big Data analysis and machine learning can be directly applied in the practical activities of the bank. Figure 3 shows the interrelated areas: operational liquidity management, credit portfolio and default risk management, and strategic planning and new product development. Each area details specific scenarios, such as resource optimization, dynamic scoring, and customer behavior forecasting. The transition from simple forecasting to proactive management emphasizes that the effectiveness of intelligent systems depends not only on the accuracy of models, but also on their ability to be integrated into the bank's daily and strategic processes through tools such as dashboards and early warning systems.

Let us consider specific examples that reflect real scenarios of using forecasts in banking activities in the form of a chain: ‘Task’ - ‘Relevance’ - ‘Decision’ - 'Result', and formulate recommendations for integrating cash flow forecasting into the bank's decision support system (Table 3).

Table 3. A chain of recommendations regarding the integration of cash flow forecasting into the bank's activities: 'Task' – 'Relevance' – 'Solution' – 'Result'.

Task	Relevance	Solution	Result
Optimization of daily liquidity and cash management	Ensuring sufficient cash in branches and ATMs, as well as maintaining optimal liquidity levels for interbank settlements.	Automated liquidity dashboard; early warning system; automated recommendations; cash logistics optimization	Proactive work of the bank, reduction of operating costs, increased capital efficiency, minimization of liquidity risks, constant access for customers to the required amount of cash
Credit portfolio and default risk management	With a large credit portfolio, traditional creditworthiness assessment methods do not always accurately predict future defaults, leading to an increase in non-performing loans.	Dynamic scoring; risk segmentation; proactive actions; provisioning	Significant reduction in non-performing loans, improvement in credit portfolio quality, optimization of provisions, increased profitability
Strategic planning and development of new products	The need to develop new banking products and services that will meet the future needs of customers and ensure the bank's competitive position in the digital banking services market.	Forecasting customer behavior; identifying niches in the banking services market; developing innovative products; assessing the potential of new services	Launching innovative and in-demand products that meet market needs, increasing customer loyalty and ensuring a stable inflow of new cash flows, strengthening competitive positions in the banking system

Source: prepared by the authors based on [1,5,7-8]

Let's take a closer look at the solutions proposed to ensure the integration of cash flow forecasting into the bank's daily activities.

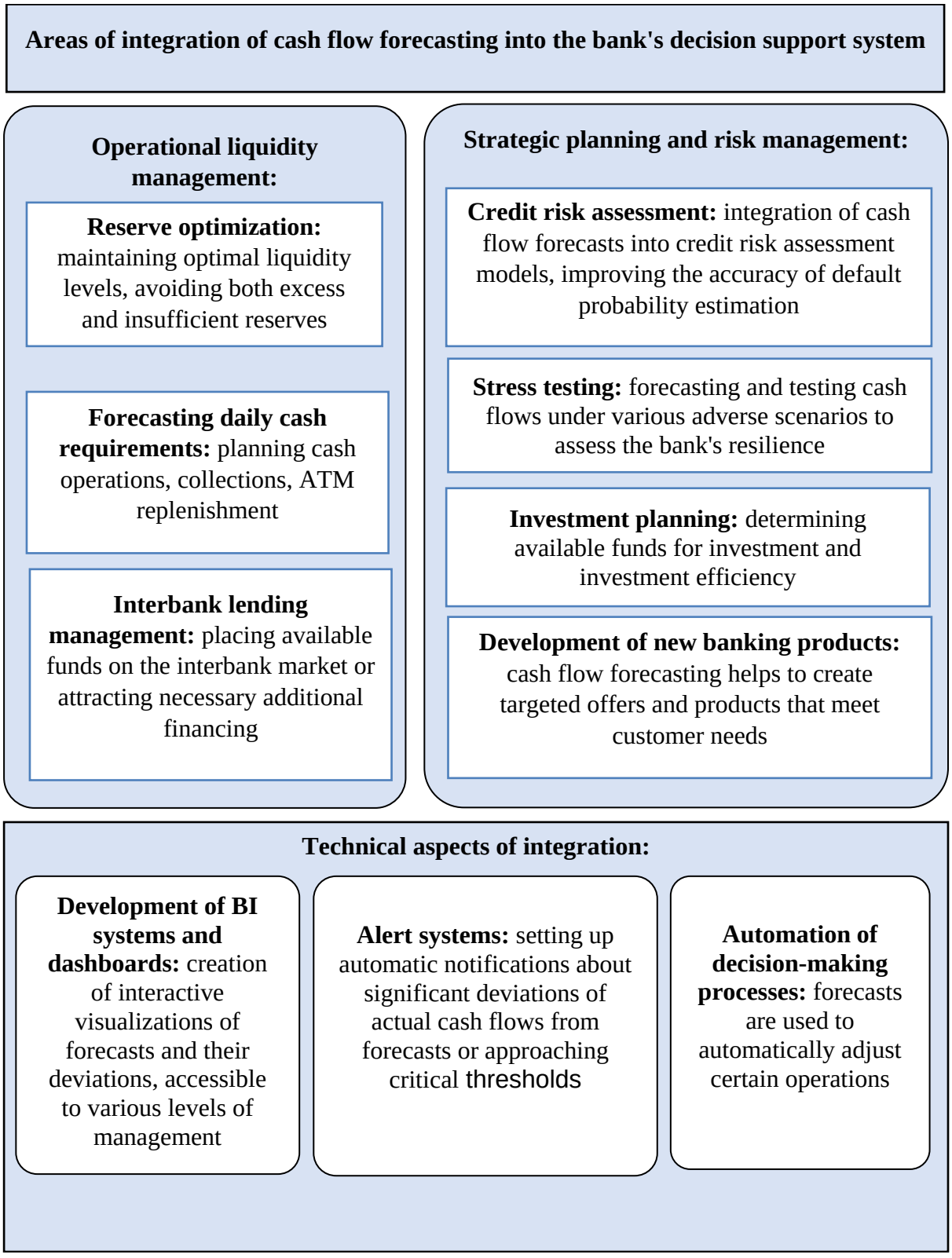

Figure 3. Directions for integrating cash flow forecasting into a bank's decision support system
Source: prepared by the authors

A dashboard is an information panel that displays key indicators that the owner of the tool or its users want to track. The purpose of creating a dashboard is to make a large amount of information understandable to a person. This is usually achieved through the visualization of dynamic data [10]. The development and implementation of an automated interactive bank liquidity dashboard involves the creation of a visual environment accessible to the treasury and management, which displays the following in real time:

- projected daily inflows and outflows of cash and non-cash funds;
- projected balances on correspondent accounts and in branch cash desks;
- critical liquidity thresholds;
- deviations of actual flows from projected ones in real time.

The development of an early warning system involves generating alerts (via SMS, email, or messages in the corporate system) for responsible bank employees in cases where the projected liquidity level approaches a critical mark or if actual outflows significantly exceed projections.

Setting up an automated recommendation system similarly involves generating specific measures (decisions) that will allow you to level out deviations in the current liquidity status from the forecasted one: reduce the amount of cash for collection in certain bank branches by a specific percentage, consider the possibility of placing excess funds on the interbank overnight market, prepare an application to attract additional liquidity on the interbank market in a certain amount, etc.

Cash logistics optimization involves the use of forecast data to optimize collection routes and schedules for replenishing/withdrawing cash from ATMs, which minimizes logistics costs and ensures uninterrupted customer access to cash.

The proposed solutions for credit portfolio and default risk management involve the use of dynamic scoring, i.e., continuous analysis of customer cash flows, taking into account forecasts obtained through machine learning. Also, in order to optimize the loan portfolio and reduce the risk of default, the bank segments borrowers according to the forecast values of their cash flows: if a significant decrease in income or an increase in irregular payments is forecast, the borrower is considered to have a high risk of default; if cash flows are stable, but there are external macroeconomic factors that may have a negative impact in the future, the risk is medium, and borrowers with stable and growing cash flows are considered low risk. With regard to segmented borrowers, the bank's proactive actions should be differentiated: the automated system should notify credit managers of the need to communicate with high-risk customers (offers of debt restructuring, credit holidays, consultations, etc.); for customers in the medium-risk segment – offers of loan insurance or financial advisory services to reduce risk; for customers in the low-risk segment – an individual approach to new banking products, increased limits, etc. In order to minimize credit risk in the event of default forecasts based on cash flow analysis, it is also advisable to obtain the necessary reserves for possible loan losses. This meets regulatory requirements and at the same time optimizes the bank's financial performance.

Understanding and predicting customer behavior based on machine learning can reveal an increase in online shopping spending, growing interest in investments, the need to develop new digital products, and more. Big Data is used to analyze which financial needs of customers remain unmet or how their cash flows may change under the influence of macroeconomic or technological trends, allowing attractive niches in the banking services market to be identified and innovative products to be developed. The same cash flow forecasts are used by the bank to model the potential volume of cash flows before launching a new product, as well as to assess the associated risks. This allows for informed decisions to be made regarding investments in development and marketing.

Conclusions. The article highlights the problem of improving the efficiency of cash flow management in the banking system of Ukraine, which is particularly relevant in the current conditions. It emphasizes the impact of risks associated with war, rapid development of digital technologies, and European integration requirements on the financial sector. To solve the problem,

the study proposes the use of intelligent systems based on Big Data, machine learning, and artificial intelligence for accurate cash flow forecasting. The proposed three-dimensional system for forecasting bank cash flows based on intelligent systems is aimed at improving cash flow forecasting methods using Big Data and machine learning and integrating them into the bank's decision-making system. will not only optimize the bank's daily operations, but also become a strategic tool for risk management and the achievement of long-term development goals.

References

1. Romanieiev, O. (2025). Upravlinnia likvidnistiu. *Fondexx*. Retrieved from: https://fondexx.com.ua/blog/upravlinnya-likvidnistyu [In Ukrainian]
2. Ali, R. (2025, February 19). The 8 top data challenges in financial services (with solutions). NetSuite. Retrieved from: https://www.netsuite.com/portal/resource/articles/financial-management/data-challenges-financial-services.shtml
3. Azzopardi, C. (2025, March 3). From resistance to readiness: Managing organisational change in the AI era. KPMG International. Retrieved from: https://kpmg.com/mt/en/home/insights/2025/03/from-resistance-to-readiness-managing-organisational-change-in-the-ai-era.html
4. Big Data in banks: what it is and what the benefits are for the banking sector. (2021, May 17). Kyivstar Hub. Retrieved from: https://hub.kyivstar.ua/articles/big-data-v-bankah-shho-cze-take-j-u-chomu-koristi-dlya-bankivsikogo-sektoru
5. Bukhari, A. H., Raja, M. A. Z., Sulaiman, M., Islam, S., Shoaib, M., & Kumam, P. (2020). Fractional neuro-sequential ARFIMA-LSTM for financial market forecasting. IEEE Access, 8, 71326–71338. DOI: https://doi.org/10.1109/ACCESS.2020.2987629
6. Chen, W., Hussain, W., Cauteruccio, F., & Zhang, X. (2024). Deep learning for financial time series prediction: A state-of-the-art review of standalone and hybrid models. *Not Listed – Awaiting Journal Creation*, 139(1), 187–224. Retrieved from: https://acuresearchbank.acu.edu.au/item/909xw/deep-learning-for-financial-time-series-prediction-a-state-of-the-art-review-of-standalone-and-hybrid-models
7. Cochennet, B., & Sen, P. (2025). ROI in AI: Measure value to deliver value. Slalom. Retrieved from https://www.slalom.com/us/en/insights/roi-ai-measure-value-deliver-value
8. Kaiwei, J., & Xinbei, L. (2023). Bank digital transformation, bank competitiveness and systemic risk. Frontiers in Physics, 11. https://doi.org/10.3389/fphy.2023.1297912
9. Nolan, M. (2025, February 27). AI in financial services 2025: Key insights from NVIDIA's latest survey. Avato. Retrieved July 10, 2025, from https://avato.co/ai-in-financial-services-2025-key-insights/
10. Sakshi, S. (2025). How is agentic AI transforming liquidity & risk management. HighRadius. Retrieved July 11, 2025, from https://www.highradius.com/resources/Blog/agentic-ai-in-liquidity-risk-management/
11. Ślepaczuk, R. (2025). Hybrid models for financial forecasting: Combining econometric, machine learning, and deep learning models. arXiv. Retrieved July 1, 2025, from https://arxiv.org/html/2505.19617v1
12. Weytjens, H., Lohmann, E., & Kleinsteuber, M. (2021). Cash flow prediction: MLP and LSTM compared to ARIMA and Prophet. Electronic Commerce Research, 10. Retrieved July 14, 2025, from https://www.researchgate.net/publication/334575706_Cash_flow_prediction_MLP_and_LSTM_compared_to_ARIMA_and_Prophet

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Кочорба Валерія
Кандидат економічних наук, доцент,
заступник директора Навчально-наукового інституту
«Каразінський банківський інститут»
Харківського національного університету імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: V.y.kochorba@karazin.ua
ORCID ID: 0000-0002-5509-680X
Коломієць Юлія
здобувач PhD кафедри фінансів, банківської справи та страхування
Харківського національного університету імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: yuliya.kolomiiets@student.karazin.ua
ORCID ID: 0009-0009-9703-4541

Прогнозування грошових потоків банку з використанням інтелектуальних систем

Анотація. Об'єктом дослідження є процеси управління грошовими потоками в банківській системі України, що характеризується високою динамічністю, посиленими ризиками, спричиненими війною та економічною нестабільністю, а також швидкою адаптацією до цифрових технологій і європейських стандартів. Підкреслюється критична важливість ефективного управління грошовими потоками для підтримки фінансової стабільності та забезпечення безперебійної діяльності банку в умовах невизначеності.

Постановка проблеми. Основна проблема, що досліджується у статті, полягає в недостатній ефективності традиційних методів прогнозування та управління грошовими потоками в сучасних реаліях. Ці методи не здатні адекватно обробляти великі обсяги даних, враховувати складні нелінійні залежності та швидко реагувати на непередбачувані зміни, спричинені як війною, так і цифровою трансформацією. Це створює ризики ліквідності, призводить до неоптимального використання капіталу та знижує загальну стійкість банківської системи.

Нерозв'язані аспекти. На сьогодні існують прогалини в інтеграції новітніх інтелектуальних систем безпосередньо в операційні та стратегічні процеси банку. Залишаються невизначеними питання щодо того, як саме перетворити високоточні прогнози, отримані за допомогою машинного навчання, на конкретні, управлінські рішення, що дозволять мінімізувати ризики.

Мета статті. Метою статті є розробка комплексних рекомендацій щодо удосконалення управління грошовими потоками в банку за допомогою інтелектуальних систем. Для цього використовується тривимірний підхід, який поєднує аналіз Big Data, підвищення точності прогнозів за допомогою машинного навчання та їх інтеграцію в систему підтримки прийняття управлінських рішень.

Основний матеріал. Автори статті застосовують тривимірну координатну систему «аналіз-прогнозування-інтеграція» для структуризації дослідження. Розглядаються практичні приклади для прогнозування ліквідності, оцінки платоспроможності позичальників та ефективності маркетингових кампаній. Деталізується використання моделей LSTM, SVM, Random Forest та RNN для підвищення точності прогнозування. Для інтеграції результатів прогнозування в систему ризик-менеджменту банку запропоновані конкретні рішення, такі як використання автоматизованих дашбордів, систем раннього попередження та динамічного скорингу.

Висновки. Запропоновані у статті рекомендації дозволяють банкам перейти від реактивного до проактивного управління грошовими потоками. Це сприяє суттєвому зниженню операційних ризиків, оптимізації капіталу, підвищенню прибутковості та зміцненню конкурентних позицій. Практична цінність дослідження полягає в наданні конкретних інструментів та сценаріїв для впровадження інтелектуальних систем у щоденну діяльність, що є надзвичайно важливим для забезпечення фінансової стійкості банківської системи України в умовах невизначеності.

Ключові слова: *ризик, інтеграція, машинне навчання, ліквідність, фінансова стійкість банку, система ризик-менеджменту банку.*

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Список літератури

1. Романєєв О. (2025). Управління ліквідністю. Fondexx. URL: https://fondexx.com.ua/blog/upravlinnya-likvidnistyu (дата звернення 10.07.2025).
2. Ali R. (2025). The 8 top data challenges in financial services (with solutions). NetSuite. February 19. URL: https://www.netsuite.com/portal/resource/articles/financial-management/data-challenges-financial-services.shtml (дата звернення 12.07.2025).

3. Azzopardi C. (2025). From resistance to readiness: managing organisational change in the AI era. KPMG International. 03. URL: https://kpmg.com/mt/en/home/insights/2025/03/from-resistance-to-readiness-managing-organisational-change-in-the-ai-era.html (дата звернення 10.07.2025).
4. Big Data в банках: що це таке й у чому користь для банківського сектору. 17 травня 2021. URL: https://hub.kyivstar.ua/articles/big-data-v-bankah-shho-cze-take-j-u-chomu-koristi-dlya-bankivsikogo-sektoru (дата звернення 10.03.2025).
5. Bukhari A. H., Raja M. A. Z., Sulaiman M., Islam S., Shoaib M., Kumam P. Fractional neuro-sequential ARFIMA-LSTM for financial market forecasting. IEEE Access, 2020, Vol. 8, pp. 71326–71338.
6. Chen W., Hussain W., Cauteruccio F., Zhang Xu. Deep learning for financial time series prediction: a state-of-the-art review of standalone and hybrid models. Not Listed – Awaiting Journal Creation, 2024, 139(1), pp. 187–224. URL: https://acuresearchbank.acu.edu.au/item/909xw/deep-learning-for-financial-time-series-prediction-a-state-of-the-art-review-of-standalone-and-hybrid-models (дата звернення 10.07.2025).
7. Cochennet B., Sen P. ROI in AI: Measure value to deliver value. URL: https://www.slalom.com/us/en/insights/roi-ai-measure-value-deliver-value (дата звернення 12.07.2025).
8. Kaiwei J., Xinbei L. Bank digital transformation, bank competitiveness and systemic risk. Frontiers in Physics, 2023, Vol. 11. URL: https://doi.org/10.3389/fphy.2023.1297912 (дата звернення 20.10.2024).
9. Nolan M. AI in financial services 2025: key insights from NVIDIA's latest survey. February 27, 2025. URL: https://avato.co/ai-in-financial-services-2025-key-insights/ (дата звернення 10.07.2025).
10. Sakshi S. (2025). How is agentic AI transforming liquidity & risk management. HighRadius. URL: https://www.highradius.com/resources/Blog/agentic-ai-in-liquidity-risk-management/ (дата звернення 11.07.2025).
11. Ślepaczuk R. Hybrid models for financial forecasting: combining econometric, machine learning, and deep learning models. 2025. URL: https://arxiv.org/html/2505.19617v1 (дата звернення 01.07.2025).
12. Weytjens H., Lohmann E., Kleinsteuber M. Cash flow prediction: MLP and LSTM compared to ARIMA and Prophet. Electronic Commerce Research, 2021, Vol. 10. URL: https://www.researchgate.net/publication/334575706_Cash_flow_prediction_MLP_and_LSTM_compared_to_ARIMA_and_Prophet

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Vlasov Volodymyr
Postgraduate
National Scientific Centre "Institute of Agrarian Economics"
st. Heroes of Defense, 10, 03127 Kyiv, Ukraine
e-mail: vlasov@poshta.me
ORCID ID: 0009-0001-2908-504X

Methodology of management accounting in supporting management processes of marketing activities of agricultural enterprises in Ukraine

Abstract. Management accounting in the marketing activities of Ukrainian agricultural enterprises is a key tool for effective decision-making under conditions of digital transformation, military disruption, and European integration. The study focuses on the adaptation of accounting systems to marketing needs, emphasizing cost analysis, profitability assessment, and integration with digital platforms such as CRM and ABC analysis.

Problem statement. The main problem lies in the lack of standardized approaches to accounting for marketing expenses, insufficient integration with digital tools, and a shortage of qualified personnel. These issues hinder the formation of data-driven marketing strategies and reduce the effectiveness of management decisions.

Unresolved aspects of the problem. Challenges include the limited structure of account 93 "Selling expenses," absence of unified methodologies for calculating marketing costs, and underutilization of ROI and segment analysis tools. The impact of biological asset variability and seasonal cycles on accounting remains insufficiently studied.

Purpose of the article. To analyze management accounting methods that support marketing processes in agricultural enterprises, and to propose practical recommendations for improving accounting systems in line with digital transformation and international standards.

Presentation of the main material. The article classifies accounting models by cost recording method, analytical structure, and level of digital integration. It highlights the role of ABC analysis, ROI tracking, and cost/profit center accounting in evaluating marketing effectiveness. Successful practices in export-oriented enterprises and the berry sector are examined.

Conclusions. Management accounting enhances marketing efficiency by enabling cost control, profitability analysis, and strategic planning. Its modernization is essential for improving competitiveness and sustainability in domestic and international markets.

Keywords: *management accounting, marketing of agricultural enterprises, costing, account 93, ABC analysis, digital transformation, ROI, CRM systems.*

JEL Classification: M41; Q13; L21; O33; D24

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Introduction. In the current conditions of the Ukrainian agricultural sector, management accounting methods are becoming particularly important as a basis for ensuring effective management processes. The growing complexity of marketing activities, digital transformation, unstable market conditions, and integration into the European economic space require agricultural enterprises to implement accounting systems capable of responding quickly to changes and providing accurate information for decision-making. Management accounting performs the function of internal information provision, allowing for the analysis of costs, assessment of profitability, formation of pricing policy, and control of the effectiveness of marketing activities. Therefore, research into management accounting methods — its tools, models, approaches, and practices — is key to understanding the mechanisms of marketing management in agricultural production and to developing strategies capable of ensuring the competitiveness of enterprises in a complex economic environment.

Literature review. In recent years, management accounting methods in supporting the management processes of marketing activities of agricultural enterprises in Ukraine have been the subject of active scientific analysis. Researchers focus on adapting accounting systems to the digital environment, classifying costs, automating document flow, implementing analytical tools, and integrating management accounting with marketing processes.

A publication by a group of authors led by Nitsenko V. (2017) examines the role of accounting and analytical information in the enterprise management system. It defines the functional tasks of accounting data that support management decision-making, particularly in the context of marketing activities. The authors emphasize that the quality of accounting information directly affects management efficiency and commercial performance.

In their study, Birchenko N., Lutsenko O., and Ostapenko R. (2025) justify the use of statistical methods in the transformation of accounting. The emphasis is on the use of digital technologies — artificial intelligence, cloud platforms, and blockchain — to improve reporting accuracy, cost transparency, and support management processes in agricultural marketing.

The work of Litvinenko V. and Kryvoshey O.V. (2025) analyzes the documentary support of marketing activities of agricultural enterprises. The authors point out the barriers associated with paper media and propose the introduction of uniform standards for digital document management that can be integrated into accounting systems for effective management of marketing processes.

The article by Kryvoshey O.V. (2025) proposes a model for digital accounting of the marketing activities of agricultural enterprises. The model is focused on the use of ERP systems, cloud platforms, and software solutions for small farms. The author argues that the digitization of accounting is a key factor in improving the effectiveness of marketing management.

The scientific work by Vysochan O. and Vodyanoy T.B. (2024) systematizes approaches to the classification of marketing costs. Four accounting models are identified: marketing, normative, differentiated, and synthetic. The correspondence of accounts is generalized, taking into account legislative requirements and current practice, which allows the system to be adapted to the specifics of agricultural marketing.

The publication by Shkromida V., Balanyuk I.F., Kuzmina T., and Gnatyuk T. (2024) substantiates the imperatives of forming an accounting system for managing marketing expenses. The authors emphasize automation, the use of ROI, CPA, and CLV indicators, and the adaptation of the system to market changes. The importance of integrating accounting with analytical software products to improve the effectiveness of marketing strategies is emphasized.

In the study by Vlasov V.O. (2024), a breakdown of account 93 “Sales expenses” for the agricultural sector is proposed. The author justifies the need to introduce sub-accounts for marketing expenses, which allows for a more accurate reflection of expenses for advertising, logistics, and participation in exhibitions. It also proposes additions to form 50 s.g. with new indicators that increase the analytical accuracy of management accounting.

Purpose, objectives, and research methods. The purpose of this study is to comprehensively examine management accounting methods in supporting the management processes of marketing activities of agricultural enterprises in Ukraine, taking into account current challenges, digital transformation, and the need to adapt to international standards. The main focus is on the analysis of accounting models, costing tools, accounting systems, and mechanisms for integrating accounting with marketing decisions.

The methodological basis of the study is a combination of general scientific and special methods. In particular, methods of analysis and synthesis, induction and deduction are used to study the theoretical foundations of management accounting and to generalize scientific approaches to its application in marketing activities. The abstraction method is used to identify typical cost accounting models in the agricultural sector. The structural-functional method is used to study the relationship between accounting tools and marketing processes. The systematization method is used to classify accounting approaches by type of enterprise, level of digitalization, and marketing activity. The logical generalization method is used to formulate conclusions and recommendations for improving management accounting methods in agricultural marketing.

Research results. Management accounting in Ukrainian agricultural enterprises ensures the collection, processing and analysis of financial information for making informed management decisions that are crucial for marketing activities. It allows controlling production costs, assessing the profitability of individual product lines and forming effective strategies for resource allocation and pricing, which directly affect marketing efficiency. In a highly competitive market, where a significant proportion of agricultural enterprises operate at a loss, management accounting becomes a tool for comprehensive analysis of market demand, adaptation of products to consumer requirements and production of competitive goods oriented towards export (Vlasov, 2024).

These functions are particularly relevant in the context of the transformation of the Ukrainian agricultural market. Arid climatic conditions and the consequences of the conflict are causing a decline in exports of cereals and legumes, particularly maize. At the same time, corn production is showing positive dynamics, and domestic grain prices are rising due to global uncertainty and high export demand. This encourages agribusinesses to introduce innovations such as precision farming, climate-resistant seeds and digital technologies, which form the basis of modern marketing strategies and contribute to product differentiation and the strengthening of Ukraine's position in international markets.

In this context, the marketing activities of agricultural enterprises are of strategic importance, especially in the context of war, economic instability and the prospect of European integration. To strengthen their positions in domestic and international markets, enterprises are actively implementing digital solutions — e-commerce, social media, CRM systems — as well as developing branding, reputation marketing and value propositions focused on long-term partnerships and attracting investment. At the same time, the sector faces logistics disruptions, funding shortages and high competition, which requires flexible, adaptive strategies: export diversification, resource optimisation and digital transformation for a stable market presence (Kvasova et al., 2023).

Given these challenges, the ability of companies to balance short-term tactical decisions and long-term strategic goals is particularly important. Successful agricultural companies develop flexible marketing strategies that allow them to adapt quickly to changes while maintaining a focus on sustainable business development. Such strategic flexibility becomes a competitive advantage in the current conditions of the Ukrainian agricultural market.

Management accounting in the marketing activities of agricultural enterprises is implemented through complex, data-driven approaches that divide agricultural operations into separate profit and cost centres. This allows producers to analyse each area of activity individually, rather than treating all income and expenses as a single entity. This approach makes it possible to calculate the actual break-even points for each unit of production and make faster, more informed decisions by

measuring variables such as profit margins by profit centres, cost trends compared to previous years, and the financial impact of strategy changes (Farmonaut, n.d.).

Various management accounting methods are used in this process: cash basis, accrual basis, hybrid approaches, and integrated systems. The cash basis method, popular among small businesses, records transactions at the time of cash flow and is consistent with tax reporting. The accrual method provides a more accurate reflection of financial results, allowing for effective tracking of expenses related to individual products or campaigns. Large enterprises often use hybrid or integrated systems that combine the advantages of both approaches and include tools for analysing costs, profit centres, marketing margins and resource optimisation. Such systems provide real-time analytical transparency, helping to identify profitable channels and activities, which contributes to informed decision-making and increased competitiveness (Table 1) (Mutual Agricultural Software Alliance, 2023).

Table 1. Management accounting methods and their application in the marketing activities of agricultural enterprises

Management accounting method	Application in the marketing activities of agricultural enterprises
Cash accounting	Tracking actual cash flows from marketing activities, easy to implement for small farms
Accrual method	Accurate reflection of marketing expenses and revenues in the relevant periods, effective for long-term marketing strategies
Hybrid methods	Combines the advantages of cash accounting and accrual accounting to balance tax optimisation and management information
Integrated management accounting systems	Comprehensive analysis of marketing activities, taking into account the interrelationships between different business areas

Source: constructed using (Mutual Agricultural Software Alliance, 2023).

Within the framework of marketing activities of Ukrainian agricultural enterprises, management accounting is based on the use of a number of tools that allow not only to record expenses, but also to analyse their effectiveness in the context of market behaviour. These tools include cost allocation models, cost and profit centre accounting, activity-based costing (ABC), and farm management software. They cover not only financial indicators but also operational data — production volumes, field locations, harvest year, responsible managers — which ensures informed marketing decisions. The ABC method deserves special attention, as it allows for the accurate allocation of costs based on actual resource consumption, the assessment of the profitability of individual market segments and sales channels, and the optimisation of the marketing budget by focusing resources on the most promising areas (Table 2) (Zarzycki, 2024).

Table 2. Modern management accounting tools in the marketing activities of agricultural enterprises

Management accounting tool	Functionality in marketing activities
Cost allocation models	Accurate determination of the cost of various types of products for pricing policy formation
Cost centre accounting	Control and optimisation of marketing costs by activity area
Profit centre analysis	Evaluation of the effectiveness of marketing strategies for different product lines
Activity-based costing (ABC)	Detailed analysis of marketing activity costs and their contribution to value creation
Farm management software	Automation of data collection and analysis to support marketing decisions
Integration with precision farming systems	Optimisation of marketing strategies based on field productivity and product quality data

Source: constructed using (Zarzycki, 2024).

The coordinated use of these tools allows companies to create flexible budgets that are adapted to changing market conditions. Activity-based budgeting and costing are complementary mechanisms: the former provides planning and control of marketing campaigns, taking into account seasonality and price volatility, while the latter details expenses by type of activity, allowing their actual profitability to be assessed. This approach is particularly effective for companies with a wide range of products and a multi-segment market presence.

Return on investment (ROI) analysis and segment analysis also play an important role in management accounting. ROI allows you to evaluate the effectiveness of marketing channel and campaign spending, identify profitable areas for investment, and justify budget allocation, taking into account long production cycles and the lag between expenses and revenues. Modern integrated accounting systems provide accurate long-term profitability estimates. Segment analysis, in turn, allows you to assess the profitability of individual market segments, regions, sales channels, and customer groups, which contributes to the formation of targeted strategies, optimisation of the product range, and strengthening of the competitive advantages of agricultural enterprises (Garrett, 2023).

Despite the availability of effective tools, the implementation of management accounting in the marketing activities of Ukrainian agricultural enterprises is in a transitional state. Large farms are already integrating marketing and sales functions into their accounting systems through financial reporting and specialised documentation, but the methodology for accounting for expenses, particularly within account 93 ‘Sales expenses’, remains non-standardised. There is ongoing debate in the scientific literature regarding the refinement of the structure of analytical accounts to more accurately reflect marketing, advertising and commercial expenses. Despite the export orientation of the agricultural sector and its significant contribution to GDP, accounting practices are being modernized gradually, under the influence of economic reforms and the need to comply with international standards. There are currently no unified statistical data on the full-scale implementation of management accounting in the marketing sphere (Mikhailova & Mikhailov, 2017).

At the same time, Ukrainian agribusinesses are demonstrating successful practices, especially in the context of military challenges and global market dynamics. The berry sector stands out for its implementation of data-driven digital strategies, actively using social media to reach international consumers, which ensures a positive return on investment even in the face of regulatory complexity. Farms are integrating CRM systems, e-commerce and automated communication tools, complemented by SWOT analysis to identify competitive advantages. The combination of ICT with traditional accounting methods contributes to effective production and sales management, expansion of export geography and brand strengthening through digital channels (Nitsenko et al., 2017).

The trend towards analysing the return on investment in digital marketing channels deserves special attention. Companies are implementing systems to track the effectiveness of online advertising, social media and e-commerce, which allows them to optimise marketing budgets and focus on the most profitable channels. This approach is critically important in the context of limited resources and high competition in international markets, where Ukrainian producers are seeking to strengthen their positions. At the same time, an analysis of management accounting practices in marketing activities reveals significant differentiation depending on the size of the enterprise and its export orientation. Large agricultural holdings, especially those attracting international investment, implement comprehensive management accounting systems that comply with international standards and provide detailed analysis of marketing costs and results. Medium and small enterprises often limit themselves to basic forms of accounting, which does not allow them to fully utilise the potential of management accounting to optimise marketing activities (Nitsenko & Rudenko, 2017).

However, on the path to full integration of management accounting into marketing activities, agricultural enterprises face a number of systemic challenges. One of the fundamental problems is the difficulty of accurately determining the cost of agricultural products due to the unique characteristics of biological assets and seasonal production cycles. This complicates the formation of a sound pricing policy and the assessment of the effectiveness of marketing activities, since without an accurate understanding of the cost price, it is impossible to correctly calculate the profitability of various marketing strategies and sales channels (Pylypenko et al., 2025).

Added to this are logistical disruptions and landmine clearance requirements caused by the ongoing war, which consume management resources and hinder systematic process improvement. In a situation where companies are forced to focus on solving urgent operational problems, the development of integrated management accounting systems often takes a back seat, limiting opportunities for strategic planning and analysis of marketing activities (Table 3) (Chukurna et al., 2018).

Table 3. Challenges and problems of implementing management accounting in the marketing system of agricultural enterprises

Category of challenges	Specific problems of implementing management accounting in marketing activities
Production and accounting	The complexity of determining cost due to the characteristics of biological assets and seasonal cycles
Technological	Imperfect integration of accounting software with other management tools, in particular geographic information systems
Infrastructure	Underdeveloped agricultural market infrastructure, volatile pricing, high market monopolisation
Human resources	Shortage of qualified personnel and insufficient expertise at the intersection of management accounting, marketing and digital technologies
Military and logistical	Logistical disruptions and requirements for demining territories, which consume management resources

Source: constructed using (Chukurna et al., 2018).

One of the most significant barriers to the effective implementation of management accounting in the marketing activities of Ukrainian agricultural enterprises is the shortage of qualified personnel and insufficient expertise at the intersection of management accounting, marketing, and digital technologies. This problem is particularly acute in small and medium-sized enterprises, which do not have the resources to attract highly qualified specialists or invest in comprehensive training programmes. The lack of specialists who understand the specifics of agricultural production, the principles of management accounting and modern marketing approaches significantly limits the possibilities for integrating these areas (Bila & Bilyi, 2025).

In addition to staffing challenges, there are difficulties in harmonising accounting and reporting systems with constantly changing EU requirements. This creates regulatory uncertainty and requires resource-intensive adaptation, especially for export-oriented enterprises that must ensure that their products and business processes comply with European standards of transparency and environmental friendliness. In addition, technological gaps — in particular, the limited adoption of digital tools and artificial intelligence — complicate the automation and integration of accounting with data-driven marketing decision-making. The imperfect integration of accounting software with other management tools, including geographic information systems, limits the possibilities for comprehensive analysis of the effectiveness of marketing activities in different regions and market segments. The lack of reliable real-time data on the status of biological assets at critical decision-making moments also complicates the process of planning and evaluating marketing strategies (Table 4) (Nitsenko & Gogol, 2018).

Table 4. The impact of management accounting implementation problems on the effectiveness of marketing activities of agricultural enterprises

Consequences of problems with implementing management accounting	Impact on the marketing activities of agricultural enterprises
Inaccurate assessment of the profitability of marketing activities	Inefficient allocation of the marketing budget, reduced ROI
Limited opportunities for segment analysis	Insufficiently targeted marketing strategies, loss of potential market niches
Lack of integration of production and marketing data	Inconsistency of production plans with marketing goals
Difficulty in adapting to European standards	Limited opportunities for export to premium EU markets
Low level of digitalisation of marketing processes	Loss of competitive advantages in digital marketing and e-commerce

Source: constructed using (Nitsenko & Gogol, 2018).

In addition to internal constraints, external structural factors that hinder the effectiveness of management accounting should also be taken into account. Underdeveloped agricultural market infrastructure, volatile and unpredictable pricing, high monopolisation, and insufficient transformation of many individual farms into commercially oriented enterprises hinder the use of effective marketing analysis and planning. Even well-designed management accounting systems can yield limited results due to external market constraints and structural problems in the industry. In addition, many agricultural enterprises in Ukraine have not fully implemented management accounting practices adapted to marketing, which limits their ability to engage in systematic, market-oriented management and strategic decision-making (Hrebenyk et al., 2023).

Discussion. The study confirms that management accounting is a key instrument for supporting marketing activities of Ukrainian agricultural enterprises, especially under conditions of digital transformation, military disruption, and integration into European markets (Bila & Bilyi, 2025). The complexity of agricultural production, seasonal cycles, and biological asset variability necessitates flexible accounting models that can respond to rapid changes and provide accurate data for decision-making (Zarzycki, 2024). Integration with marketing tools such as CRM systems, ABC analysis, and cost/profit center accounting enables enterprises to evaluate strategy effectiveness, optimize resource allocation, and improve pricing policies — particularly relevant for export-oriented agribusinesses (Garrett, 2023).

Effective enterprises increasingly apply hybrid accounting systems that combine cash and accrual principles, supported by digital platforms for real-time analytics and integration with precision farming technologies (Mutual Agricultural Software Alliance, 2023). However, implementation remains uneven: small and medium-sized enterprises often lack resources and expertise to adopt advanced solutions. A critical issue is the lack of standardization in accounting for marketing expenses, especially within account 93 “Selling expenses.” The absence of detailed sub-accounts and unified methodologies complicates ROI assessment, segment profitability analysis, and campaign evaluation. Introducing sub-accounts for advertising, logistics, and promotion would enhance analytical capacity and support targeted strategies (Vlasov, 2024).

Personnel shortages and insufficient interdisciplinary expertise at the intersection of accounting, marketing, and digital technologies further constrain effectiveness. Development of training programs and professional standards is essential to address this gap. External factors — underdeveloped infrastructure, market monopolization, and regulatory uncertainty — also impact management accounting. Enterprises must navigate volatile pricing, fragmented supply chains, and evolving EU compliance requirements, which demand flexible models and strategic foresight. Segment analysis, ROI tracking, and activity-based budgeting help mitigate these challenges by providing granular insights into market behavior and financial performance.

In the context of military risks and landmine contamination, management accounting must incorporate risk assessment tools and scenario modeling. Integration with GIS platforms and climate analytics enhances decision-making by linking financial data with environmental and

operational variables. Despite these challenges, Ukrainian agribusinesses demonstrate successful practices, especially in the berry sector, where digital strategies and CRM systems support international outreach and brand development. However, harmonizing accounting systems with EU standards remains a resource-intensive task, particularly for export-oriented enterprises.

Overall, the discussion underscores the need for a comprehensive approach to management accounting in agricultural marketing — one that combines financial rigor, digital innovation, and strategic adaptability. Standardized methodologies, investment in digital infrastructure, and capacity building are key priorities for enhancing competitiveness and sustainability of Ukrainian agricultural enterprises in both domestic and international markets.

Conclusions. Management accounting methodology is a multifaceted and complex tool that covers various aspects of marketing management in agricultural enterprises. It is based on the interaction of financial, production, analytical and digital components, which emphasises its systemic nature and strategic importance. An analysis of current accounting practices shows that, despite the diversity of approaches and the level of digitalisation, the effective application of management accounting contributes to increased cost transparency, resource optimisation and the formation of competitive marketing strategies.

Research confirms that the integration of accounting systems with marketing tools, the introduction of ABC analysis, cost and profit centre accounting, and the adaptation of account 93 ‘Selling expenses’ are critical elements for ensuring effective management. At the same time, accounting is highly dependent on personnel, technological, and regulatory factors, which complicates its implementation in an unstable market.

The current challenges facing the agricultural sector — military risks, logistical disruptions, a shortage of skilled personnel, and the need for harmonisation with international standards — require constant updating and improvement of management accounting methods. This requires not only local but also industry-wide efforts in the areas of standardisation, digital transformation, staff training and the development of adaptive accounting models.

Therefore, further research and practical implementation of effective approaches to management accounting in the marketing activities of agricultural enterprises is a key task for ensuring their sustainable development, competitiveness, and integration into global markets.

References

1. Bila, J., Bilyi, A. (2025). Problematic issues of management accounting in the agrarian enterprises. *Herald of Economics*, 4, 155–163. DOI: https://doi.org/10.35774/visnyk2024.04.155 [In Ukrainian]
2. Birchenko, N., Lutsenko, O., Ostapenko, R. (2025). Application of statistical analysis methods in the process of accounting optimisation. *Problems and prospects of economics and management*, 2(42), 373–383. DOI: https://doi.org/10.25140/2411-5215-2025-2(42)-373-383 [In Ukrainian]
3. Chukurna O., Nitsenko V., Mykhailova M., Odinokov R. Improvement of warehouse logistics system in the context of "Industry 4.0" technologies. *Economic Strategy and Development Prospects for the Trade and Services Sector*. 2018. Vol. 1(27). pp. 220-232. [In Ukrainian]
4. Garrett, C. J. (2023). Accounting Tools and Terms for Farms that save you time and money. *Farmbrite*. Retrieved from: https://www.farmbrite.com/post/accounting-tools-and-terms-for-farms-that-save-you-time-and-money [In Ukrainian]
5. Hrebenyk, T., Ivashchenko, M., Shcherbyna, O. (2023). Management of an organisation’s accounting department: Overcoming the challenges of martial law in Ukraine. *Scientific Bulletin of Mukachevo State University Series “Economics”*, 10(3), 9–21. DOI: https://doi.org/10.52566/msu-econ3.2023.09 [In Ukrainian]
6. Kryvoshey, O. V. (2025). Digital approaches to accounting and analysis of marketing activities of agribusiness in Ukraine: tools, methods and prospects. *Ukrainian Economic Journal*, 8, 32–39. DOI: https://doi.org/10.32782/2786-8273/2025-8-6 [in Ukrainian]
7. Kvasova, L., Kurbatska, L., Balkovyj, A. (2023). Development of a digital marketing strategy for a Ukrainian agricultural berry company in international markets. *Green, Blue and Digital Economy Journal*, 4(3), 25–31. DOI: https://doi.org/10.30525/2661-5169/2023-3-4 [In Ukrainian]
8. Lytvynenko, V., Kryvoshey, O. (2025). Documentary support for accounting for marketing activities in the context of the digital transformation of agribusiness enterprises. *Economy and Society*, 76. DOI: https://doi.org/10.32782/2524-0072/2025-76-20 [in Ukrainian]
9. Mikhailova, L., & Mikhailov, A. (2017). Innovative financial instruments for the formation of investment resources in the agricultural sector of Ukraine. *Modern Engineering and Innovative Technologies*, 5(07-05), 33–39. DOI: https://doi.org/10.30890/2567-5273.2019-07-05-069 [In Ukrainian]

10. Nitsenko, V., Sharapa, O., Burdeina, N., Hanzhurenko, I. (2017). Accounting and analytical information in the management system of a trading enterprise in Ukraine. *Bulletin of V.V. Dokuchaev Kharkiv National Agricultural University. Series 'Economic Sciences'*, 2, 3-18.
11. Nitsenko, V.S., Gogol, M.M. (2018). The current state of the management and accounting system at vertically integrated enterprises. *Bulletin of Sumy National Agrarian University. Series 'Economics and Management'*, 6(76), 49-52.
12. Nitsenko, V.S., & Rudenko, S.V. (2017). Risk management at the enterprises of agro-food sector. *Actual problems of innovative economy*, 3, 12-21.
13. Pylypenko, D., Shevchenko, N., Pylypenko, M. (2025). Economic risks of agricultural enterprises in Ukraine: Analysis of threats and mitigation strategies to ensure financial security. *Economic Forum*, 15(1), 58–73. DOI: https://doi.org/10.62763/ef/1.2025.58
14. Shkromida, V., Balanyuk, I., Kuzmin, T., Gnatyu, T. (2024). Imperatives for the formation of an accounting system for effective management of marketing costs of an enterprise. *Sustainable economic development*, 4(51), 116–120. DOI: https://doi.org/10.32782/2308-1988/2024-51-16 [in Ukrainian]
15. Farmonaut (n.d.). Strategic Agribusiness Marketing: 5 Powerful Trends For 2025. Retrieved from: https://farmonaut.com/blogs/strategic-agribusiness-marketing-5-powerful-trends-for-2025
16. Mutual Agricultural Software Alliance (2023). The ABCs of Farm Accounting Methods. Retrieved from: https://www.masa.ag/farm-management-software-blog/farm-accounting-method-costs-and-returns
17. Vlasov, V. (2024). Peculiarities of management accounting of costs for marketing and sales in agricultural enterprises. *Ukrainian Journal of Applied Economics and Technology*, 3, 16–21. DOI: https://doi.org/10.36887/2415-8453-2024-3-2
18. Vysochan, O. O., Vodyany, T. B. (2024). Accounting for marketing expenses of an enterprise. *Ukrainian Economic Journal*, 5, 28–34. DOI: https://doi.org/10.32782/2786-8273/2024-5-5 [in Ukrainian]
19. Zarzycki, N. (2024). The Importance of the Accrual Method of Accounting in Agriculture. *Ambrook*. Retrieved from: https://ambrook.com/education/ar-ap/the-importance-of-the-accrual-method-of-accounting-in-agriculture

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Власов Володимир
Аспірант
Національний науковий центр «Інститут аграрної економіки» НААН України
вул. Героїв Оборони, 10, 03127 Київ, Україна
e-mail: vlasov@poshta.me
ORCID ID: 0009-0001-2908-504X

Методика управлінського обліку у забезпеченні управлінських процесів маркетингової діяльності аграрних підприємств

Анотація. Управлінський облік у маркетинговій діяльності українських сільськогосподарських підприємств є ключовим інструментом для ефективного прийняття рішень в умовах цифрової трансформації, військових конфліктів та європейської інтеграції. Дослідження зосереджується на адаптації систем обліку до потреб маркетингу, акцентуючи увагу на аналізі витрат, оцінці рентабельності та інтеграції з цифровими платформами, такими як CRM та ABC-аналіз.

Постановка проблеми. Основна проблема полягає у відсутності стандартизованих підходів до обліку маркетингових витрат, недостатній інтеграції з цифровими інструментами та нестачі кваліфікованого персоналу. Ці питання перешкоджають формуванню маркетингових стратегій на основі даних та знижують ефективність управлінських рішень.

Невирішені аспекти проблеми. Серед викликів — обмежена структура рахунку 93 «Витрати на збут», відсутність уніфікованих методик розрахунку маркетингових витрат, недостатнє використання інструментів ROI та сегментного аналізу. Вплив мінливості біологічних активів та сезонних циклів на бухгалтерський облік залишається недостатньо вивченим.

Мета статті. Проаналізувати методи управлінського обліку, що підтримують маркетингові процеси в сільськогосподарських підприємствах, та запропонувати практичні рекомендації щодо вдосконалення систем бухгалтерського обліку відповідно до цифрової трансформації та міжнародних стандартів.

Основний матеріал. У статті класифіковано моделі бухгалтерського обліку за методом обліку витрат, аналітичною структурою та рівнем цифрової інтеграції. Підкреслено роль ABC-аналізу, відстеження ROI та обліку центрів витрат/прибутку в оцінці ефективності маркетингу. Розглянуто успішні практики на експортно-орієнтованих підприємствах та в ягідному секторі.

Висновки. Управлінський облік підвищує ефективність маркетингу, забезпечуючи контроль витрат, аналіз прибутковості та стратегічне планування. Його модернізація є необхідною для підвищення конкурентоспроможності та стійкості на внутрішньому та міжнародному ринках.

Ключові слова: *управлінський облік, маркетинг сільськогосподарських підприємств, калькуляція собівартості, рахунок 93, ABC-аналіз, цифрова трансформація, ROI, CRM-системи.*

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Список літератури

1. Бірченко Н., Луценко О., Остапенко Р. Застосування методів статистичного аналізу в процесі оптимізації бухгалтерського обліку. *Проблеми і перспективи економіки та управління.* 2025. Т. 2, вип. 42. URL: https://doi.org/10.25140/2411-5215-2025-2(42)-373-383.
2. Височан О. О., Водяний Т. Б. Облік маркетингових витрат підприємства. *Український економічний часопис*. 2024. № 5. С. 28–34. https://doi.org/10.32782/2786-8273/2024-5-5
3. Кривошей О. В. Цифрові підходи до обліку та аналізу маркетингової діяльності агробізнесу України: інструменти, методи та перспективи. *Український економічний часопис*. 2025. № 8. С. 32–39. https://doi.org/10.32782/2786-8273/2025-8-6
4. Литвиненко В., Кривошей О. Документальне забезпечення обліку маркетингової діяльності в умовах цифрової трансформації підприємств агробізнесу. *Економіка та суспільство*. 2025. № 76. https://doi.org/10.32782/2524-0072/2025-76-20
5. Михайлова, Л., & Михайлов, А. (2017). Innovative financial instruments for the formation of investment resources in the agricultural sector of Ukraine. *Modern Engineering and Innovative Technologies*, 5(07-05), 33–39. https://doi.org/10.30890/2567-5273.2019-07-05-069
6. Ніценко В.С., Гоголь М.М. Сучасний стан системи управління і обліку на вертикально-інтегрованих підприємствах. *Вісник Сумського національного аграрного університету. Серія «Економіка і менеджмент».* 2018. № 6(76). С. 49-52.
7. Ніценко В.С., Руденко С.В. Управління ризиками на підприємствах агропродовольчої сфери. *Актуальні проблеми інноваційної економіки*. 2017. № 3. С. 12-21.
8. Чукурна О.П., Ніценко В.С., Михайлова М.В., Одиноков Р.Д. Удосконалення системи складської логістики в контексті технологій «Індустрії 4.0». *Економічна стратегія і перспективи розвитку сфери торгівлі та послуг.* 2018. Вип. 1 (27). С. 220-232.

9. Шкромида В., Баланюк І., Кузьмін Т., Гнатю, Т. Імперативи формування облікової системи для ефективного управління витратами маркетингової діяльності підприємства. *Сталий розвиток економіки*. 2024. № 4(51). С. 116–120. https://doi.org/10.32782/2308-1988/2024-51-16
10. Bila J., Bilyi A. Problematic issues of management accounting in the agrarian enterprises. *Herald of Economics*. 2025. No. 4. P. 155–163. https://doi.org/10.35774/visnyk2024.04.155
11. Farmonaut. Strategic Agribusiness Marketing: 5 Powerful Trends For 2025. URL: https://farmonaut.com/blogs/strategic-agribusiness-marketing-5-powerful-trends-for-2025
12. Garrett C. J. Accounting Tools and Terms for Farms that save you time and MONEY. *Farmbrite*. 2023. URL: https://www.farmbrite.com/post/accounting-tools-and-terms-for-farms-that-save-you-time-and-money
13. Hrebenyk T., Ivashchenko M., Shcherbyna O. Management of an organisation's accounting department: Overcoming the challenges of martial law in Ukraine. *Scientific Bulletin of Mukachevo State University Series "Economics"*. 2023. Vol. 10, no. 3. P. 9–21. https://doi.org/10.52566/msu-econ3.2023.09
14. Kvasova L., Kurbatska L., Balkovyj A. Development of a digital marketing strategy for a ukrainian agricultural berry company in international markets. *Green, Blue and Digital Economy Journal*. 2023. Vol. 4, no. 3. P. 25–31. https://doi.org/10.30525/2661-5169/2023-3-4
15. Mutual Agricultural Software Alliance. The ABCs of Farm Accounting Methods. 2023. URL: https://www.masa.ag/farm-management-software-blog/farm-accounting-method-costs-and-returns
16. Nitsenko V., Sharapa O., Burdeina N., Hanzhurenko I. Accounting and analytical information in the management system of a trading enterprise in Ukraine. Вісник ХНАУ ім. В.В. Докучаєва. Серія «Економічні науки». 2017. № 2. С. 3-18.
17. Pylypenko D., Shevchenko N., Pylypenko M. Economic risks of agricultural enterprises in Ukraine: Analysis of threats and mitigation strategies to ensure financial security. *Економічний форум*. 2025. P. 58–73. URL: https://doi.org/10.62763/ef/1.2025.58
18. Vlasov V. Peculiarities of management accounting of costs for marketing and sales in agricultural enterprises. *Ukrainian Journal of Applied Economics and Technology*. 2024. Vol. 2024, no. 3. P. 16–21. URL: https://doi.org/10.36887/2415-8453-2024-3-2
19. Zarzycki N. The Importance of the Accrual Method of Accounting in Agriculture - Ambrook. *Ambrook*. URL: https://ambrook.com/education/ar-ap/the-importance-of-the-accrual-method-of-accounting-in-agriculture

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Galych Roman
PhD in Law, Associate Professor
Department of Banking Business and Financial Technologies,
Education and Research Institute "Karazin Banking Institute"
V.N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: r.v.galych@karazin.ua
ORCID ID: 0000-0001-7958-8174

Violation of the rights of consumers of financial services

Introduction. The article is devoted to the study of relationships that arise in the process of providing financial services by various financial institutions, as a result of which violations of consumer rights occur or may occur, taking into account current conditions.

Problem statement. The relevance of studying consumer rights violations in the field of financial services is undeniable in the modern world, especially with the growth of service users in cyberspace. However, the growing complexity of financial products and services requires a high level of consumer protection. Today, consumer rights violations in the financial sector can have serious consequences, including financial losses, loss of trust in financial institutions and socio-economic problems for consumers, and as a consequence, for the security of the financial system and the state.

Unresolved aspects of the problem. Thus, as seen, the study and analysis of problems related to violations of the rights of consumers of financial services and certain aspects of their prevention are relevant and important today. At the same time, we believe that the attention paid in previous studies is not comprehensive and requires consideration of certain aspects of violations of consumer rights and the search for appropriate solutions at the level of management, legislative initiatives, etc.

Purpose of the article. The goal of the work, in turn, is to develop a systematic approach to solving problems related to the violation of the rights of consumers of financial services.

Presentation of the main material. Particular attention is paid to such key problems as opaque contract terms, the impact of misleading advertising, excessive promises of investment returns is investigated, and the problem of illegal charges and commissions is also considered. Fraudulent actions and cybercrimes, such as the use of fraudulent schemes or forgery of documents. The article also considers the role of the Office for Financial Services Consumer Rights Protection. We use the following scientific methods: induction, deduction, comparative, systematisation method.

Conclusions. The study presents a systematic approach to solving the problem of violations of the rights of consumers of financial services. This, as expected, will relieve the judicial system, inspire confidence in potential consumers, promote technological progress, ensure the stability of the financial system, and ultimately establish Ukraine as a social, democratic, and legal state.

Keywords: *Consumer rights violations, financial services, opaque contract terms, deceptive advertising, unlawful charges, fraudulent actions, National Bank of Ukraine, mechanism for protecting consumers of financial services*

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Introduction. The Constitution of Ukraine defines a person as the highest social value [2]. Being in the position of a person as a consumer of services, in particular financial ones, such a person should have a high degree of protection, based on the above-mentioned constitutional postulate. The relevance of researching violations of consumer rights in the field of financial services is undeniable in today's world, especially with the growth of service users in cyberspace. Financial services have become a necessary component of social life, providing not only economic needs, but also social development. However, the growing complexity of financial products and services requires a high level of consumer protection. Today, violations of the rights of consumers in the financial sphere can have serious consequences, including financial losses, violations of trust in financial institutions, and socio-economic problems for consumers. Violations of the rights of consumers of financial services are actions or inactions of financial institutions that violate legally established rights and consumer interests. These may be actions that mislead, do not provide sufficient information, or impose unfavorable terms of the contract. Violation of consumer rights may also include withholding important information, improper charges or fees, fraudulent practices, and other improper practices that harm the financial well-being and interests of customers. Thus, as seen, the study and analysis of problems related to violations of the rights of consumers of financial services and certain aspects of their prevention are relevant and important today.

Literature review. It should be noted that the issue raised in our work has already received significant attention in various sources, both domestic and foreign publications, and this applies to both scientific literature and legislative acts, etc. In particular, the regulation of relations that are the subject of the study is of particular importance in a number of regulatory acts that, among other things, protect rights through the establishment of liability and other preventive measures: the Budapest Convention – is the first international document regulating the fight against cybercrime, the Council of Europe adopted that in November 2001, the Criminal Code of Ukraine, the Civil Code of Ukraine, etc. As our research in the field of consumer protection of financial services shows, careful attention is paid to these issues by: Kregul Yu.I., in particular, in his monograph of the same name, and the works of Mentukh M. are also interesting for reading. Relevant for today, in connection with the European integration of Ukraine, is the article by Hrebenyk V.I. dedicated to the guarantees of protection of the rights of consumers of banking services in the law of the European Union, as well as Odinak O. and Golota N., who rightly speak about the protection of the rights of consumers of financial services under martial law. However, it seems that the attention paid is not comprehensive and requires consideration of individual aspects of consumer rights violations and the search for appropriate solutions.

Purpose, objectives and research methods. Accordingly, the task of the article is to analyse the specifics of violations of consumer rights in the financial sector and existing approaches to violations of rights in this area. The aim of the work, in turn, is to develop a systematic approach to solving problems related to the violation of the rights of consumers of financial services. For this, we use the following scientific methods: general scientific method, induction, deduction, comparative method, systematisation method.

Research results. Indeed, Hrebenyk V.I. rightly points out that violations undermine consumer trust in financial institutions and can lead to significant financial losses [5]. As Klochko A. rightly writes, when characterizing crime in the financial sector, it is worth noting that institutions can be both objects of criminal attacks and instruments for achieving a criminal goal. This necessitates the classification of such crimes, which will allow us to identify certain features of their commission and determine recommendations for their prevention [6]. If we pay attention to criminal legislation, then: illegal actions with transfer documents, payment cards and other means of access to bank accounts, electronic money, equipment for their production (Article 200 of the Criminal Code), disclosure of commercial or banking secrets (Article 232 of the Criminal Code), etc. Special attention should be paid to some common criminal offenses, for example, fraud (Article 190 of the Criminal Code), misappropriation, embezzlement of property or taking possession of it by abuse of official position (Article 191 of the Criminal Code) [4]. As a rule, such offenses are identified as cybercrime. And they become particularly complex in the case of the participation of foreign entities. Here we should proceed from the CES No. 185 - Convention on Cybercrime [3].

Non-transparent contract terms in the financial sector are a serious problem that can lead to significant negative consequences for consumers. When financial institutions use complex and confusing terms in their contracts, it makes it difficult for customers to understand their rights and responsibilities. Consumers who sign such contracts may not be fully aware of all the terms and risks associated with the financial products or services they receive. This can lead to unjustified financial losses and undermine trust in financial institutions.

Hidden fees and additional fees are another form of opacity often found in financial contracts. Consumers may be pleasantly surprised by the initial terms of the contract, only to later discover that they have been charged additional costs that they were not informed about in advance. This may include account maintenance fees, early loan repayment penalties, or other hidden charges. Such practices not only cause financial losses to consumers, but also create a sense of deception and unfairness, which undermines the reputation of financial institutions [13].

The lack of transparency in financial contracts underscores the need for strict regulation and oversight by relevant government agencies. Consumer protection should include requirements for financial institutions to provide full and clear information about all terms and payments. This includes the use of plain language in contracts, as well as the obligation of financial institutions to inform consumers of all possible fees and additional costs before signing the contract.

In addition, consumers should be well informed about their rights and have access to resources to help them understand the terms of financial products. Financial literacy is a key factor in ensuring the protection of consumer rights. Education programs and information campaigns can significantly improve consumers' ability to evaluate contract terms and make informed financial decisions.

After all, transparency in financial contracts is the basis of trust between consumers and financial institutions. A lack of transparency undermines this trust and can have long-term negative consequences for the entire financial system. Ensuring transparency and fairness in financial contracts is a joint task of the state, financial institutions and consumers themselves. Only through joint efforts, it is possible to achieve a balance between the interests of all participants in the financial market and ensure stable development of the economy.

Financial misleading advertising is a serious problem that undermines consumers' trust in financial institutions and causes significant damage to their financial interests. Misleading advertising often takes the form of incorrect information about products and services in marketing materials. Consumers influenced by such advertising may be misled about the actual terms, value and benefits of the financial products offered. This may include exaggerating product benefits, glossing over risks, or misrepresenting costs and service terms. As a result, consumers make financial decisions based on incomplete or inaccurate information, which can lead to financial losses and disappointment [7].

Another form of misleading advertising is false promises about returns on investments or other financial products. Financial institutions may use optimistic forecasts and exaggerated promises to attract investors or customers. For example, promotional materials may promise a high level of return on investment without disclosing all associated risks or clarifying that the projected return is not guaranteed. This creates unrealistic expectations among consumers and can lead to significant financial losses when actual results do not match advertising promises.

Misleading advertising undermines the foundations of fair competition in the financial market and damages the reputation of all market participants. It can also have a negative impact on the economy as a whole, as it lowers the level of trust in financial institutions and reduces investment activity. Protecting consumers against misleading advertising is an important task for regulators and consumer protection organisations. It is necessary to introduce and strengthen legislative norms that oblige financial institutions to provide accurate and complete information about their products and services. In addition, consumers should have access to resources to help them evaluate the credibility of advertising and make informed financial decisions. This includes increasing the financial literacy of the population, as well as access to independent advice and information about financial products. Education programs and awareness campaigns can help

consumers recognize the signs of misleading advertising and avoid the pitfalls associated with it. after all, the fight against misleading advertising in the financial sphere is a joint task of the state, financial institutions and consumers. Only by joint efforts can we create a transparent and fair financial market, where consumer rights are protected, and information about products and services is reliable and complete. This will contribute to increasing trust in financial institutions, stimulate investment activity and contribute to the sustainable development of the economy.

Illegal charges in the financial sphere are a serious problem that can significantly affect the financial situation of consumers and their trust in financial institutions. When financial institutions charge fines or other fees without proper justification, it creates an unfair financial burden on customers. Such actions may occur due to errors in accounting systems, imperfect internal procedures, or even deliberate actions aimed at obtaining additional profits. Regardless of the cause, wrongful foreclosures undermine consumer confidence in financial institutions and can result in significant financial losses. The lack of a clear explanation of the reasons for the fines and their amounts adds even more complexity to this problem. When consumers receive chargeback notices without a detailed explanation, they can't understand what they've been charged for. This creates a sense of unfairness and can lead to conflicts between customers and financial institutions. Consumers have the right to know the exact reasons and grounds for any charges and to be able to appeal them if they believe they are unfair.

The protection of consumer rights against unlawful charges requires strict regulation and supervision by the relevant state authorities. Financial institutions must follow transparent and fair procedures when calculating fines and other payments. This includes the obligation to provide consumers with full and understandable information about the reasons and amounts of charges, as well as to ensure the possibility of contesting unlawful charges [8].

In addition, consumers should be informed of their rights and have access to resources to help them protect their interests. Increasing financial literacy and the population's awareness of their rights are key elements in ensuring fairness in the financial market. Information campaigns, counseling and training programs can help consumers better understand their rights and effectively defend them.

After all, preventing illegal charges and ensuring transparency in financial transactions is a joint task of the state, financial institutions and consumers themselves. Only joint efforts can create a financial system where consumer rights are reliably protected, and financial institutions act transparently and responsibly. This will contribute to increasing trust in financial institutions, reducing risks for consumers and ensuring sustainable development of the financial market.

Fraudulent actions in the financial sphere are one of the most serious threats to consumers and market stability. The use of fraudulent schemes to attract funds from consumers usually involves various types of fraud that can cause significant damage to people's financial situation. Criminals can offer investment opportunities that promise high returns with minimal risks, hiding the real conditions and risks. Such schemes often use psychological techniques to instill confidence in potential victims, making them more inclined to invest their money in dubious ventures. Fraud schemes can range from simple pyramid schemes to sophisticated investment scams, creating great financial risks for those who fall prey to the scammers. Falsifying documents or providing false information for the purpose of obtaining a profit is another form of fraudulent activity that can have disastrous consequences for consumers. Criminals can forge financial documents, such as contracts, reports or bank statements, to appear trustworthy and instill trust in customers. They may also provide false information about financial products, misleading customers about the terms and benefits of the services offered. This may include making false promises about investment returns or concealing true credit terms, resulting in financial losses for consumers [11].

Protection of consumer rights against fraudulent actions is a critically important task for regulatory bodies and law enforcement structures. Strict control and supervision of financial institutions and their activities should be implemented to prevent and detect fraud at an early stage. In addition, it is important to provide consumers with access to reliable information about financial products and services, as well as to increase their financial literacy. This will allow them to

recognize potential signs of fraud and avoid dangerous situations. The joint efforts of the state, financial institutions and consumers themselves can create a safer financial environment. It is important not only to rely on regulatory measures, but also to actively involve the public in the process of monitoring and detecting fraudulent activities. Information campaigns, educational programs and counseling services can significantly increase public awareness of the risks and methods of protection against fraudsters. After all, the effective fight against fraudulent actions in the financial sphere requires a comprehensive approach, which includes strict control by the state, transparency of the activities of financial institutions and active participation of consumers in the protection of their rights. This will contribute to increasing the level of trust in the financial system, reducing the risks of fraud and ensuring the stable and fair development of the financial market.

The National Bank of Ukraine plays a key role in protecting the rights of consumers of financial services. Within the framework of this mission, a special unit was created - the Office for Financial Services Consumer Rights Protection, which performs important functions to ensure fairness and transparency in the financial market.

The Office for Financial Services Consumer Rights Protection carries out various activities aimed at supporting and protecting the interests of clients of financial institutions. One of its main functions is to deal with appeals from citizens. This includes the processing of consumer complaints and requests, which allows identifying problem areas in the activities of financial institutions and promptly reacting to them. In addition, the management establishes requirements for financial institutions, ensuring their compliance with regulations and standards. These requirements are aimed at increasing the transparency and fairness of financial services provided to clients. The Department also oversees compliance with the legislation on the protection of the rights of consumers of financial services, which includes monitoring the activities of financial institutions to ensure their compliance with legal regulations. Management pays special attention to monitoring compliance with the legislation on advertising in the field of financial services. This is an important aspect, as false or misleading advertising can seriously harm consumers by misleading them about the terms and benefits of financial products. The Department conducts inspections of advertising materials, ensuring their compliance with legal requirements and protecting the interests of consumers. Thus, the National Bank of Ukraine, through the activities of the Office for Financial Services Consumer Rights Protection, is actively working to create a safe and fair financial environment. This ensures reliable protection of clients' rights, contributes to increasing the level of trust in financial institutions and the stability of the financial market as a whole [11].

It is also quite important to take into account judicial practice, in particular the decisions of the Supreme Court.

The case law published by the Supreme Court contains numerous examples of cases on the protection of the rights of consumers of banking services, relating to credit agreements, deposits, payment cards, etc. These cases demonstrate the variety of offenses that consumers face.

For example, in case No. 176/1445/22 of August 16, 2023, the Supreme Court ruled that the bank is obliged to prove that the client contributed to the loss or illegal use of personal data by his actions. In the absence of such evidence, the benefit of the doubt is interpreted in favor of the consumer. In this case, the bank was obliged to return the funds that were fraudulently debited to the client [9].

The Supreme Court also concluded that moral damages may be recovered even if not provided for in the contract. In particular, moral damages for breach of a consumer contract may be compensated even if the terms of the contract do not provide for the right to compensation for moral damages.

In such circumstances, compensation is provided in accordance with Articles 16 and 23 of the Civil Code of Ukraine and Articles 4 and 22 of the Law of Ukraine “On Protection of Consumer Rights” [12,15].

The Supreme Court came to this conclusion in its Resolution of May 10, 2023 in case No. 522/5513/19.

Looking at the dispute regarding compensation for moral damage for the bank's violation of the bank deposit agreement, the Grand Chamber of the Supreme Court stated that "the bank's violation of the obligation to return the deposit, despite the terms of the contract, is a product defect, thus, in accordance with Articles 4 and 22 of the Law of Ukraine "On Protection of Consumer Rights", compensation is provided for moral damage caused to the depositor by such improper provision of a financial service"[12,14].

Based on the provisions of Articles 16 and 23 of the Civil Code of Ukraine and the content of the right to compensation for moral damage in general as a way of protecting subjective civil law, compensation for moral damage must occur in any case of its occurrence – the right to compensation for moral (non-property) damage arises as a result of a violation of a person's right, regardless of the presence of special norms of civil law [15].

According to Articles 4 and 22 of the Law of Ukraine "On Consumer Rights Protection", the consumer's right to compensation for moral damage is provided in legal relations between consumers and manufacturers and sellers of goods, performers of works and service providers [12].

According to Part 8 of Article 18 of the Law of Ukraine "On Consumer Rights Protection", unclear or ambiguous provisions of contracts with consumers are interpreted in favor of the consumer.

The participation of a consumer in a contract as a weak party, subject to special legal protection in the relevant legal relations, narrows the effect of the principle of equality of participants in civil law relations and freedom of contract, in particular, in consumer credit agreements [12].

In the Resolution of the Supreme Court of August 23, 2023 in case No. 564/282/16-ts, the Supreme Court established that the related service for servicing credit debt specified in the credit agreement is not a credit or other banking service, and therefore is null and void [14].

The bank did not provide documents that would specify the content of the related service "for servicing credit debt", the procedure for providing this service, the procedure for its consumption, its consumer qualities of the service and the terms of providing this service. The text of the contract defines the content of this service vaguely [7]. Therefore, in accordance with Part 8 of Article 18 of the Law of Ukraine "On Protection of Consumer Rights", vague terms of contracts are interpreted in favor of the consumer [12].

Discussion. Violation of consumer rights in the financial sphere is a serious problem that requires attention and measures from government bodies, regulators and consumers themselves. Thanks to modern technologies and increased awareness, violations of this kind are becoming more visible, which contributes to the adoption of effective countermeasures. Important aspects of solving this problem are ensuring the transparency of the terms of contracts between financial institutions and consumers, curbing illegal charges and applying tough sanctions in cases of fraudulent actions. For this, it is important to strengthen the role of specialized bodies that monitor compliance with legislation and protect consumer rights, such as the Office for Financial Services Consumer Rights Protection of the National Bank of Ukraine. Overall, effective regulation and timely response to breaches are important to ensure consumer confidence in financial services and financial market stability. By working together, governments, regulators and the public can make significant progress in this direction, ensuring fairness and safety for all participants in the financial market. Special attention is required to develop, amend, and implement regulations to ensure information security and counter cyberterrorism. Our analysis shows that while legal frameworks, such as the Law of Ukraine "On Protection of Consumer Rights" and the Law of Ukraine "On Banks and Banking Activities", provide a basis for protecting consumer rights, their effective enforcement and regulatory oversight need to be strengthened.

In addition, consumer protection is not just a matter of protecting individual rights, it is related to the stability of the financial system. Undermining consumer trust through unfair banking practices can lead to systemic risks. That is why we support a multi-pronged approach that goes

beyond raising consumer awareness. This includes stronger regulatory measures, technological solutions to increase transparency, and industry self-regulation through codes of conduct.

Conclusions. First of all, our article analyses the specifics of consumer rights violations in the financial sector and existing approaches to rights violations in this area. As a result, a systematic approach to solving the problem of violations of the rights of consumers of financial services is presented. In particular, we have proven that the negative consequences of such violations are felt not only by clients, but also by financial organisations. At the same time, it was determined that the main emphasis and main place in the system of measures should be on the mechanism for protecting the consumer of financial services, and this will include measures to prevent violations, the presence of a powerful institution of responsibility, and comprehensive systemic activities of all stakeholders. In addition, the study clearly states that this is a security issue, both for the individual consumer and the business entity, as well as for the financial system and the state. Therefore, the cooperation of financial institutions, the regulator, the government, and the legislator should be aimed at ensuring the rights of consumers of financial services. In the latter, as proven in the work, the development of legislative acts on the protection of information security and countering cyberterrorism should be on the agenda, including with the aim of fully implementing international regulatory legal acts on the path of Ukraine`s integration into the EU. This and other things, it seems, will relieve the judicial system, inspire confidence in potential consumers, promote technological progress, ensure the stability of the financial system, and ultimately establish Ukraine as a social, democratic, and legal state.

References

1. Kovalenko, D., Obertynskyi, L. IMPLEMENTATION OF THE PROTECTION'S MECHANISM OF THE CONSUMER'S RIGHTS OF FINANCIAL SERVICES IN THE INTEGRATION OF UKRAINE INTO THE EUROPEAN UNION. *Journal of Strategic Economic Research*, (5), 2023. 101–109. https://doi.org/10.30857/2786-5398.2023.5.10
2. Constitution of Ukraine: Law of Ukraine dated 28.06.1996 No. 254k/96-VR. Retrieved from: https://zakon.rada.gov.ua/laws/show/254к/96-вр#Text [in Ukrainian].
3. Convention on Cybercrime: Ratification date: 07.09.2005. Retrieved from: https://www.coe.int/en/web/conventions.
4. Criminal Code of Ukraine: Law of Ukraine dated 05.04.2001 No. 2314-III. Retrieved from: https://zakon.rada.gov.ua/laws/show/2341-14#Text [in Ukrainian].
5. Hrebenyk V.I. (2013) Guarantees of the protection of the rights of consumers of banking services in the law of the European Union. *Youth Scientific Bulletin of the Ukrainian Academy of Banking of the NBU. Series: "Legal Sciences"*, No. 1 (3), pp. 48-58 [in Ukrainian].
6. Klochko A. M. (2014). Crimes in the sphere of banking activity. *Legal Bulletin of the Ukrainian Academy of Banking Affairs.* № 1, pp. 68-71. Retrieved from: http://nbuv.gov.ua/UJRN/Pvuabs_2014_1_17 [in Ukrainian].
7. Kregul Yu. I. (2018). Protection of the rights of consumers of financial services. *Monograph*, p. 264 [in Ukrainian].
8. Mentukh M. (2016). Protection of the rights of consumers of financial services. *Scientific Bulletin of Kherson State University. Series: legal sciences.* Issue 1, vol. 2, pp.58-62 [in Ukrainian].
9. Mysnyk N. (2023). Court disputes in the field of consumer protection. *Latest Ukrainian business news.* Retrieved from: https://biz.ligazakon.net/analitycs/224582_sudov-spori-u-sfer-zakhistu-prav-spozhivachv [in Ukrainian].
10. Odinak O., Golota N. (2022). Protection of the rights of consumers of financial services in the conditions of martial law. *Actual problems of jurisprudence*, pp. 43-48 [in Ukrainian].
11. Office for Financial Services Consumer Rights Protection. National Bank of Ukraine. Retrieved from: https://bank.gov.ua/ua/about/structure/department/division-of-the-rights-of-the-sponsors-of-financial-services [in Ukrainian].
12. On Consumer Rights Protection: Law of Ukraine dated 12.05.1991 No. 1023-XII. Retrieved from: https://zakon.rada.gov.ua/laws/show/1023-12#Text [in Ukrainian].
13. Free legal assistance. (2024). Protection of the rights of consumers of financial services. Retrieved from: https://legalaid.gov.ua/publikatsiyi/zahyst-prav-spozhyvachiv-finansovyh-poslug/ [in Ukrainian]. Supreme Court of Ukraine. Retrieved from https://supreme.court.gov.ua/supreme/ [in Ukrainian].
14. The Civil Code of Ukraine: Code of Ukraine dated 16.01.2003 No. 435-IV. Retrieved from: https://zakon.rada.gov.ua/laws/show/435-15#Text [in Ukrainian].
15. Shovkoplias H, Dmytryk O, Mazur T. Protecting the Rights and Interests of Consumers of Non-banking Financial Services: is an Alternative Court Possible, 2022 3(15) Access to Justice in Eastern Europe 239–248. DOI: https://doi.org/10.33327/AJEE-18-5.2-n000328
16. Stefanchuk M. Protection of the rights of consumers of credit services in the context of adaptation of Ukrainian legislation to EU legislation, 2024, Academic visions(3) 1-9 DOI: https://doi.org/10.5281/zenodo.10977064

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Галич Роман
кандидат юридичних наук, доцент
доцент кафедри банківського бізнесу та фінансових технологій,
навчально-науковий інститут «Каразінський банківський інститут»,
Харківський національний університет імені В.Н. Каразіна
Майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: r.v.galych@karazin.ua
ORCID ID: 0000-0001-7958-8174

Порушення прав споживачів фінансових послуг

Вступна частина. Стаття присвячена дослідженню відносин, які виникають в процесі надання фінансових послуг різними фінансовими установами, внаслідок чого відбувають або можуть відбуватись порушення прав споживачів, з урахуванням умов сьогодення.

Постановка проблеми. Актуальність дослідження порушень прав споживачів у сфері фінансових послуг є незаперечною в сучасному світі, особливо зі зростанням користувачів послуг у кіберпросторі. Однак зростаюча складність фінансових продуктів і послуг вимагає високого рівня захисту споживачів. Сьогодні порушення прав споживачів у фінансовій сфері можуть мати серйозні наслідки, включаючи фінансові втрати, порушення довіри до фінансових установ та соціально-економічні проблеми для споживачів, і як наслідок безпеці фінансової системі і державі.

Нерозв'язані аспекти. Таким чином, як вбачається, вивчення і аналіз проблем щодо порушень прав споживачів фінансових послуг і окремих аспектів їх попередження є актуальним і важливим для сьогодення Водночас вважаємо приділену увагу у попередніх дослідженнях не всеохоплюючою та такою, що потребує розгляду окремих аспектів порушень прав споживачів та пошук відповідних рішень на рівні управлінських, законодавчих ініціатив тощо.

Мета статті. Метою роботи в свою чергу є напрацювання системного підходу до вирішення проблем, пов'язаних з порушенням прав споживачів фінансових послуг

Основний матеріал. Особлива увага приділяється таким ключовим проблемам, як непрозорі умови договорів, досліджується вплив оманливої реклами, надмірні обіцянки щодо прибутковості інвестицій, також розглядається проблема неправомірних стягнень та комісій. Шахрайські дії і кіберзлочини, такі як використання обманних схем або підробка документів. В статті також розглядаються роль Управління захисту прав споживачів фінансових послуг. Нами використанні наступні наукові методи: індукції, дедукції, порівняльний, метод систематизації.

Висновки. В результаті дослідження представлено системний підхід до вирішення проблеми порушень прав споживачів фінансових послуг. Це, як вбчається, розвантажить судову систему, викличе довіру у потенційних споживачів, сприятиме технологічному прогресу, забезпечить стабільність фінансової системи і в підсумку утвердить державу Україна як соціальну, демократичну і правову.

Ключові слова: *порушення прав споживачів, фінансові послуги, непрозорі умови договору, оманлива реклама, незаконні збори, шахрайські дії, Національний банк України, механізм захисту споживачів фінансових послуг.*

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Список літератури

1. Kovalenko, D., Obertynskyi, L. IMPLEMENTATION OF THE PROTECTION'S MECHANISM OF THE CONSUMER'S RIGHTS OF FINANCIAL SERVICES IN THE INTEGRATION OF UKRAINE INTO THE EUROPEAN UNION. *Journal of Strategic Economic Research*, (5), 2023. 101–109. https://doi.org/10.30857/2786-5398.2023.5.10
2. Конституція України: Закон України від 28.06.1996 № 254к/96-ВР. URL: https://zakon.rada.gov.ua/laws/show/254к/96-вр#Text .
3. Конвенція про кіберзлочинність: Ратифіковано: 07.09.2005.URL: https://www.coe.int/en/web/conventions.
4. Кримінальний кодекс України від 05.04.2001 No. 2314-III. URL: https://zakon.rada.gov.ua/laws/show/2341-14#Text .
5. Гребеник В. І. Гарантії захисту прав споживачів банківських послуг у праві Європейського Союзу. *Молодіжний науковий вісник Української академії банківської справи НБУ. Серія: «Юридичні науки».* 2013. №1 (3). С. 48-58.
6. Клочко А. М. Злочини у сфері банківської діяльності. *Правовий вісник Української академії банківської справи.* 2014. № 1. С. 68-71. URL: http://nbuv.gov.ua/UJRN/Pvuabs_2014_1_17
7. Крегул Ю. І. Захист прав споживачів фінансових послуг. *Монографія.* 2018. С. 264.
8. Ментух М. Захист прав споживачів фінансових послуг. *Науковий вісник Херсонського державного університету. Серія: юридичні науки.* 2016. Випуск 1, № 2. С.58-62.
9. Мисник Н. Судові спори у сфері захисту прав споживачів. *Останні новини бізнесу України*. 2023. URL: https://biz.ligazakon.net/analitycs/224582_sudov-spori-u-sfer-zakhistu-prav-spozhivachv

10. Одинак О., Голота Н. Захист прав споживачів фінансових послуг в умовах воєнного стану. *Актуальні проблеми правознавства.* 2022. С. 43-48.
11. Управління захисту прав споживачів фінансових послуг. *Національний банк України*. URL: https://bank.gov.ua/ua/about/structure/department/division-of-the-rights-of-the-sponsors-of-financial-services .
12. Про захист прав споживачів : Закон України від 12.05.1991 № 1023-XII. URL: https://zakon.rada.gov.ua/laws/show/1023-12#Text
13. Безоплатна правова допомога. Захист прав споживачів фінансових послуг. 2024. URL: https://legalaid.gov.ua/publikatsiyi/zahyst-prav-spozhyvachiv-finansovyh-poslug/ Верховний Суд України.URL: https://supreme.court.gov.ua/supreme/
14. Цивільний кодекс України: Кодекс України від 16.01.2003 № 435-IV. URL: https://zakon.rada.gov.ua/laws/show/435-15#Text.
15. Shovkoplias H, Dmytryk O, Mazur T. Protecting the Rights and Interests of Consumers of Non-banking Financial Services: is an Alternative Court Possible?, 2022 3(15) Access to Justice in Eastern Europe 239–248. DOI: https://doi.org/10.33327/AJEE-18-5.2-n000328
16. Stefanchuk M. Protection of the rights of consumers of credit services in the context of adaptation of Ukrainian legislation to EU legislation, 2024, Academic visions(3) 1-9 DOI: https://doi.org/10.5281/zenodo.10977064

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Grynchuk Viacheslav
Postgraduate
National Scientific Centre "Institute of Agrarian Economics"
st. Heroes of Defense, 10, 03127 Kyiv, Ukraine
e-mail: slavgroupmail@gmail.com
ORCID ID: 0009-0002-1012-0105

Assessment of the investment attractiveness of agricultural enterprises

Abstract. Investment attractiveness of Ukrainian agricultural enterprises is a strategic factor for mobilizing capital, restoring production, and ensuring long-term sustainability in the context of post-conflict recovery and global market transformation. The study focuses on financial diagnostics, innovation capacity, structural consolidation, and external support mechanisms.

Problem statement. The main problem lies in the lack of standardized investment evaluation models, limited access to capital, and uneven policy implementation. Enterprises face challenges related to infrastructure damage, climate risks, and disrupted logistics, which complicate investment decision-making.

Unresolved aspects of the problem. Key unresolved issues include landmine contamination, import dependence, and insufficient integration of innovation indicators into investment models. The impact of digital technologies, export infrastructure, and state support on investment attractiveness requires further analysis.

Purpose of the article. To develop a comprehensive framework for assessing the investment attractiveness of agricultural enterprises, combining financial indicators, innovation potential, external risks, and policy factors.

Presentation of the main material. The article analyzes profitability, liquidity, and leverage metrics, trends in fixed asset investment, and the role of medium and large enterprises in sectoral consolidation. It examines export dynamics, import substitution, and instruments of state support. Special attention is paid to AgTech innovations, precision farming, and risk mitigation strategies supported by international donors.

Conclusions. Despite wartime challenges, Ukrainian agriculture demonstrates resilience and investment potential. A comprehensive evaluation approach enhances informed capital allocation, supports modernization, and strengthens competitiveness in domestic and international markets.

Keywords: *investment attractiveness, agriculture, financial indicators, innovation, risk assessment, state support, Ukraine, post-conflict economy.*

JEL classification: Q14, G32, O13, H25.

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Introduction. In the current conditions of post-conflict recovery and economic instability, the investment attractiveness of Ukrainian agricultural enterprises becomes a decisive factor for mobilizing capital, restoring production, and ensuring long-term sectoral sustainability. The agricultural sector plays a strategic role in Ukraine's economy, contributing significantly to GDP and foreign exchange earnings, while simultaneously facing unprecedented challenges related to infrastructure damage, market volatility, and geopolitical risks. These conditions require enterprises to demonstrate financial resilience, innovation capacity, and adaptability to attract both domestic and international investors. Investment attractiveness integrates a wide range of indicators — from profitability and liquidity metrics to structural consolidation, export infrastructure, and state support mechanisms. The growing importance of digital technologies, precision farming, and AgTech solutions further transforms the investment landscape, introducing new opportunities and risks. Therefore, research into the investment attractiveness of agricultural enterprises — its financial diagnostics, structural dynamics, innovation potential, and external policy factors — is essential for developing effective strategies of capital allocation and enhancing the competitiveness of the sector in a complex and uncertain economic environment.

Literature review. The investment attractiveness of agricultural enterprises is a multidimensional concept that integrates financial, structural, and institutional factors. Recent studies emphasize the need for comprehensive methodological approaches that reflect both macroeconomic trends and micro-level enterprise dynamics.

Mazurkevych I. (2023) systematizes existing methodological approaches to evaluating investment attractiveness in the agro-industrial complex. The author highlights the influence of war-related disruptions and the need for adaptive models that account for sector-specific risks. Her work emphasizes the limitations of traditional financial indicators and calls for integrated assessment frameworks that include innovation, logistics, and policy support.

Kuzminova O. and Yaroshenko K. (2023) analyze the investment climate of Ukraine and propose strategic directions for its activation. Their study outlines the institutional weaknesses and legal uncertainties that hinder investment flows, while also identifying opportunities for strengthening domestic investment mechanisms and improving the banking system's efficiency.

Avercheva N. and Zubik D. (2024) provide a detailed economic assessment of investment inflows into Ukraine's agricultural sector. Using SWOT analysis, they identify key strengths of the domestic agro-industrial complex that could attract foreign investors in the post-war recovery period. Their findings underscore the importance of restoring agricultural infrastructure and machinery to enhance sectoral competitiveness.

Popova O., Kotsiubynska L., and Skubii O. (2023) focus on the dynamics of capital investment in agriculture during wartime. They examine the structure of investment resources by economic activity and funding sources, offering insights into the resilience of agricultural enterprises and the factors influencing their investment performance.

Levandivskyi O., Balaniuk I., Matkovskyi P., and Matskiv V. (2023) explore the role of resource potential in shaping investment attractiveness. Their research emphasizes the need for structural reforms, technological modernization, and the development of regional agro-service infrastructure to support sustainable growth in the agricultural sector.

Dankevych A. et al. (2023) investigate the bioenergy potential of agricultural biomass, particularly sunflower husks, as a driver of investment in renewable energy within agriculture. Their work demonstrates how circular economy principles and energy substitution strategies can enhance both ecological sustainability and investment appeal.

Ostapenko R. et al. (2025) analyze current financial trends to optimize investment activity in Ukraine. They highlight the growing role of precision agriculture and artificial intelligence in improving productivity and attracting capital, while also addressing geopolitical risks and the need for portfolio diversification.

These studies collectively demonstrate that the investment attractiveness of agricultural enterprises depends not only on financial metrics but also on innovation capacity, infrastructure

resilience, and institutional support. The integration of sector-specific risks, such as landmine contamination and climate volatility, into investment models is essential for informed decision-making in Ukraine's post-conflict economy.

Purpose, objectives and research methods. The purpose of the study is to substantiate the investment attractiveness of Ukrainian agricultural enterprises under conditions of post-conflict recovery, economic instability, and global market transformation. The agricultural sector, being a strategic component of Ukraine's economy, requires a comprehensive evaluation framework that integrates financial performance, structural dynamics, innovation capacity, and external policy support.

Achieving this purpose involves solving the following research objectives:

- to analyze key financial indicators (profitability, liquidity, asset and equity efficiency) that determine the investment attractiveness of agricultural enterprises;
- to examine trends in fixed asset investment, infrastructure modernization, and consolidation of medium and large enterprises under wartime constraints;
- to assess the impact of external factors—export activity, import dependence, and state support mechanisms—on the formation of investment potential;
- to characterize the innovation capacity of the agricultural sector, including the adoption of digital technologies, precision farming, and AgTech solutions;
- to evaluate risks associated with landmine contamination, logistical disruptions, climate volatility, and the effectiveness of mitigation mechanisms supported by state and international donors.

The study applies methods of system analysis, comparative benchmarking, structural diagnostics, expert evaluation, and inductive generalization. The methodological framework is based on an interdisciplinary approach that combines investment analysis, agribusiness management, public policy, and risk assessment theories. This allows for a comprehensive understanding of both quantitative metrics and qualitative strategic factors shaping the investment landscape in Ukrainian agriculture.

Research results. Investment attractiveness for Ukrainian agricultural enterprises is a complex framework assessing potential returns, risks, and strategic value in the agricultural sector, which is vital for Ukraine's economy. Contributing over 40% of foreign exchange earnings and 10-12% of GDP, investment decisions are significant for domestic and international stakeholders. Assessing investment attractiveness is particularly important given the unique role of the agricultural sector in ensuring global food security and in post-conflict recovery processes. Despite war-related losses over $80 billion and major infrastructure damage, opportunities arise from Ukraine's extensive arable land, established export infrastructure, and strong global demand for agricultural products. Investors are increasingly keen on agro-processing, logistics, and agricultural technology, while navigating the risks of ongoing security threats and economic instability. This assessment framework becomes essential for informed capital allocation in a sector that, despite challenges, holds substantial potential for returns amid significant uncertainties (InVenture, n.d., 2025).

To justify investment decisions, it is necessary to refer to quantitative financial indicators that allow assessing the effectiveness of agricultural enterprises in difficult conditions. Profitability metrics serve as fundamental indicators for assessing investment attractiveness in Ukrainian agricultural enterprises, providing crucial insights into operational efficiency and financial performance during the challenging 2024-2025 period. Key profitability ratios including gross profit margin, net profit margin, operating profit margin, return on assets (ROA), and return on equity (ROE) collectively measure a company's ability to generate profit from sales, manage operational costs, and effectively utilize equity and assets. These metrics have become particularly significant for Ukrainian agricultural enterprises as they navigate wartime conditions while maintaining competitiveness in global markets. Current data suggests that despite operational

challenges, many Ukrainian agricultural enterprises have maintained relatively stable profit margins due to strong global demand for agricultural products and effective cost management strategies implemented during the crisis period (Ryzhikova et al., 2025). The summary profitability indicators are presented in the table 1, which allows comparing the industry averages with generally accepted benchmarks.

Table 1. Profitability indicators of Ukrainian agricultural enterprises compared to industry benchmarks

Profitability Metric	Industry Benchmark 2024	Ukrainian Agriculture Average	Trend Direction
Gross Profit Margin	25-35%	28-32%	Stable
Net Profit Margin	8-15%	10-18%	Improving
Operating Profit Margin	12-20%	15-22%	Volatile
Return on Assets (ROA)	5-12%	8-14%	Recovering
Return on Equity (ROE)	10-18%	12-20%	Positive

Source: constructed using (Ryzhikova et al., 2025).

In addition to profitability indicators, it is worth paying attention to the investment activity of enterprises, which demonstrates their ability to adapt to new conditions.

Ukrainian agricultural enterprises show resilience in fixed asset investment amid wartime constraints, reflecting sector confidence and long-term growth. Investment patterns for 2024-2025 focus on essential infrastructure, facility modernization, and selective expansion in safer areas. Lower interest rates and improving investor confidence drive targeted investments in data-intensive technologies, processing, and logistics. Manufacturing experiences steady investment, while agricultural technology and supply chain management sectors attract significant capital, demonstrating adaptation to evolving operational needs (Danyliuk et al., 2025).

In this context, it is also important to take into account structural changes in the agricultural sector, in particular the consolidation of enterprises. In 2024-2025, Ukraine's medium and large agricultural enterprises faced significant changes due to wartime disruptions, leading to consolidation trends. Defined by the OECD, medium-sized (50-249 employees) and large enterprises (250+ employees) dominate agricultural output. Despite a decrease in their numbers from conflict-related closures, surviving enterprises have gained market share and enhanced production capacity, resulting in improved efficiency and financial performance, making them more appealing to investors seeking stable opportunities (InVenture, 2025).

Thus, analysis of financial indicators allows us to form an overall picture of investment attractiveness, which is supplemented by an assessment of the financial stability of enterprises. Financial performance trends across these quantitative indicators reveal a complex but generally positive investment landscape for Ukrainian agricultural enterprises in 2024-2025. The combination of maintained profitability, strategic fixed asset investments, enterprise consolidation, and increased industrial production share creates a compelling case for investment attractiveness despite ongoing challenges. Earnings per share (EPS) and price-to-earnings (P/E) ratios for publicly traded agricultural companies have shown improvement, reflecting market confidence in the sector's long-term prospects. Liquidity indicators such as current ratios and operating cash flow ratios demonstrate that well-managed agricultural enterprises maintain adequate short-term financial health, while debt-to-equity ratios indicate prudent financial leverage management during uncertain times, collectively supporting the sector's investment appeal for both domestic and international investors (Bazaluk et al., 2025). The following table 2 illustrates these financial stability indicators over time.

Table 2. Analysis of financial stability and efficiency of agricultural enterprises in comparison with industry standards

Financial Health Indicator	2024 Average	2023 Average	Industry Standard	Assessment
Current Ratio	1.8	1.6	1.5-2.0	Good
Debt-to-Equity Ratio	0.45	0.52	0.3-0.6	Acceptable
Operating Cash Flow Ratio	0.28	0.24	0.25-0.40	Improving
EPS Growth	12%	8%	5-15%	Strong

Source: constructed using (Bazaluk et al., 2025)

In addition to quantitative indicators, investment attractiveness is influenced by external qualitative factors, which should be considered separately. The agricultural sector's contribution to Ukraine's GDP represents a fundamental pillar of investment attractiveness, demonstrating the sector's critical role in economic stability and growth potential during the 2024-2025 reconstruction period. Agriculture's substantial 10-12% contribution to Ukraine's GDP, combined with its generation of over 40% of foreign exchange earnings, signals robust employment potential, stable income sources, and a foundation for related agro-industrial development that collectively attracts both domestic and international investors. This significant GDP contribution becomes particularly compelling in the post-conflict context, as it demonstrates the sector's resilience and capacity to maintain economic output despite extraordinary challenges. The sector's ability to sustain such a substantial economic contribution while supporting rural livelihoods and driving tradeable surplus creates a strong foundation for investor confidence, especially when combined with government policies that encourage modernization and commercial farming practices (Farmonaut, 2025).

The alignment of foreign trade with investment interests is another important factor shaping the attractiveness of the agricultural sector. Export volumes in Ukrainian agriculture indicate global competitiveness and market access, influencing investment decisions through revenue potential and market integration. Ukraine's status as a major grain exporter, with solid infrastructure and trade ties, instills investor confidence in foreign currency generation and market retention. However, conflicts have disrupted logistics, causing port blockades and necessitating alternative routes, presenting both challenges and opportunities. This sector's export focus attracts investment by signaling growth and underscores the need for logistics modernization and infrastructure development for competitive advantage (European Central Bank, 2025). For a better understanding of the impact of export factors on investment attractiveness, it is worth referring to the comparative table 3, which shows changes before and after 2022.

Table 3. The impact of changes in export infrastructure and market conditions on investment decisions in the agricultural sector

Export Factor	Pre-2022 Status	2024-2025 Status	Investment Impact	Strategic Priority
Grain Export Volume	60+ million tons	45-50 million tons	Moderate Risk	High
Export Routes	Primarily Black Sea	Diversified corridors	Opportunity	Critical
Market Access	Global reach	EU-focused	Positive	Medium
Infrastructure	Established ports	Damaged/alternative	High Risk	Critical

Source: constructed using (European Central Bank, 2025).

Alongside exports, another important factor is import dependency, which creates both risks and new opportunities for investors. Import dependence in Ukrainian agriculture presents intricate investment challenges, as reliance on imports for machinery, fertilizers, and technology affects resilience and risk. Ongoing conflict and supply chain issues disrupt this dependence, leading to opportunities for local production and import substitution. High import reliance heightens sensitivity to price fluctuations and supply disruptions, influencing investor interest. The current climate has spurred a focus on investments that enhance domestic capabilities, such as machinery manufacturing and fertilizer production, appealing to those aiming to exploit import substitution trends (IMF, 2025).

To compensate for the risks associated with import dependence and logistical challenges, the state is actively introducing incentives to support investment activity. State intervention via tax incentives and support programs is crucial for enhancing agricultural investment attractiveness in Ukraine for 2024-2025. The government has implemented tax incentives like reduced VAT rates, simplified taxation for agricultural enterprises, and accelerated depreciation for equipment and infrastructure. These strategies reflect successful international models, facilitating immediate write-offs and reducing tax burdens. Additionally, state support includes direct subsidies for

modernization, grants for technology adoption, and preferential lending programs, collectively improving the risk-return profile for agricultural investments significantly (Koval et al., 2025). To systematise government support measures, a table 4 is provided showing their impact on investment activity.

Table 4. Instruments of state support for investment activities of agricultural enterprises

State Support Measure	Type	Investment Impact	Beneficiary Scope	Duration
VAT Reduction	Tax Incentive	Cost Reduction	All Enterprises	Ongoing
Accelerated Depreciation	Tax Allowance	Cash Flow Improvement	Equipment Buyers	Permanent
Modernization Grants	Direct Support	Capital Access	Medium/Large Enterprises	2024-2027
Technology Subsidies	Innovation Support	R&D Enhancement	Tech Adopters	Project-based
Preferential Loans	Financial Support	Lower Capital Costs	Qualified Enterprises	Program Duration

Source: constructed using (Koval et al., 2025)

Thus, state policy creates a favourable environment for investment by combining market mechanisms with institutional support. The degree of state intervention in Ukrainian agriculture reflects a balanced approach that supports market mechanisms while providing necessary stability and incentives for investment during the reconstruction period. Government intervention includes strategic support for infrastructure development, research and development initiatives, and market stabilization measures that create a more predictable investment environment without excessive regulatory burden. This approach attracts investors by reducing investment risks through policy support while maintaining market-driven allocation of resources and competitive dynamics. The state's role in facilitating public-private partnerships, supporting technology adoption, and providing risk mitigation mechanisms creates an environment where private investment can flourish alongside strategic government support, making the sector more attractive to both domestic and international investors seeking stable, policy-supported investment opportunities (Husieva et al., 2025).

The combined impact of these qualitative external factors creates a complex but generally favorable investment environment for Ukrainian agriculture in 2024-2025, where strategic government support, strong export potential, and economic importance offset challenges related to import dependence and conflict-related disruptions. Investors are particularly attracted to the sector's demonstrated resilience, substantial economic contribution, and comprehensive policy support framework, while carefully evaluating risks associated with supply chain vulnerabilities and geopolitical uncertainties. The sector's ability to maintain its critical role in GDP generation and export earnings, combined with targeted state interventions and modernization incentives, creates compelling investment opportunities for those willing to navigate the current challenging environment. These factors collectively position Ukrainian agriculture as an attractive investment destination for investors seeking exposure to a strategically important, policy-supported sector with strong fundamentals and significant recovery potential (PwC, 2025).

With state support and macroeconomic stabilization, the agricultural sector's innovative potential is crucial for long-term competitiveness. Ukrainian enterprises are leading in agricultural transformation for 2024-2025 by adopting precision farming and digital technologies, such as drones and GPS machinery, which enhance decision-making and reduce input waste by 15%. Automation is pivotal, featuring autonomous tractors and AI analytics for soil and crop health monitoring. The AgTech startup ecosystem, with leaders like Profeed, attracts significant investments. Government initiatives, including the WINWIN AgroTech strategy, enhance research and venture capital. Trade agreements, like the EU-Ukraine food trade agreement, improve access to international markets, facilitating wheat and maize exports, while targeting revenue diversification in Asia, the Middle East, and Africa. Innovations in biotechnology and blockchain

enhance supply chain transparency, aligning with sustainability goals through 2030 (Horák et al., 2023).

Innovation, in turn, is closely linked to Ukraine's integration into global markets, which opens up new opportunities for exports and attracting investment. Ukrainian agriculture's future development hinges on digital transformation, sustainability, and market integration, attracting investor interest. The sector's emphasis on precision farming and AI-driven analytics enables high-value production and compliance with EU standards. Through international cooperation and modernization of processing, Ukrainian firms enhance competitiveness while pursuing new revenue from carbon credits and organic certification. As the global agri-tech market grows, Ukraine's innovative capacity positions it as a compelling opportunity for investors seeking a technologically advanced, export-oriented agricultural economy with significant growth potential (Shvets, 2025).

However, alongside the prospects, investors must take into account the risks that remain significant in the post-conflict environment. Agricultural investments in Ukraine encounter numerous risks necessitating thorough assessment and mitigation strategies, heightened by challenges from a post-conflict context. Traditional investment risks are intensified by climate and weather uncertainties, market volatility, and financial exposures, creating complex risk profiles. Advanced risk assessment tools now incorporate climate-specific platforms and scenario modeling to evaluate the effects of extreme weather events and price shifts on asset values and yields. This interconnected risk landscape—comprising climate, market, operational, and regulatory factors—forces investors to adopt comprehensive management strategies, including risk avoidance, mitigation, insurance, or acceptance for potentially greater returns.

A particularly critical risk is land contamination by mines, which has a direct impact on investment attractiveness and food security. A critical risk factor is landmine contamination, which significantly damages Ukraine's agricultural viability. Explosive remnants render large farmlands unusable, creating safety threats and leading to the abandonment of productive areas, thus exacerbating food insecurity and local economic loss. Moreover, demining processes can further degrade soil health and water quality, complicating restoration efforts. Consequently, even previously cleared lands may suffer diminished fertility, presenting significant challenges for investors and adversely affecting local economies and national food systems (S&P Global Commodity Insights, 2025).

To address risks, state and international donors are implementing support programs in Ukraine, which vary in their effectiveness based on risk types. International aid plays a crucial role in addressing both traditional agricultural challenges and conflict-specific issues. Programs focus on insurance against revenue shortfalls and market volatility, while also supporting post-conflict needs such as demining and infrastructure development. Despite enhanced funding stabilizing farm income, effectiveness relies on market prices and yield outcomes determined after the agricultural cycle. A comprehensive risk mitigation framework has emerged from integrating international assistance, but funding gaps and continuity concerns threaten long-term success. Traditional market and weather risks receive more structured support than conflict-specific challenges like landmine contamination. While crop insurance and price volatility programs have reduced economic losses, innovative strategies are necessary to handle the unique risks in post-conflict environments. Improved coordination between state and international efforts has led to integrated risk mitigation strategies, yet sustainability and coverage gaps remain. Investors must not only evaluate risks but also analyze the sustainability of mitigation mechanisms. Specialized insurance products can mitigate risks if supported by political commitment and stakeholder coordination, allowing for informed investment decisions despite elevated risks (PRI, 2025).

Discussion. The research results confirm that the investment attractiveness of agricultural enterprises in Ukraine is determined by a combination of financial stability, innovation capacity, structural consolidation, and external policy support. Despite the challenges caused by war-related disruptions, the sector demonstrates resilience through stable profitability indicators, targeted reinvestment in fixed assets, and the consolidation of medium and large enterprises.

Mazurkevych (2023) emphasizes that traditional financial evaluation methods are insufficient in post-conflict conditions and must be complemented by qualitative factors such as innovation, logistics, and institutional support. Her findings support the need for integrated models that reflect the complexity of the agro-industrial sector.

Kuzminova and Yaroshenko (2023) highlight the importance of improving Ukraine's investment climate through legal reforms, institutional strengthening, and the development of domestic investment mechanisms. Their conclusions align with the observed need for predictable regulatory frameworks and transparent governance to reduce investor risks.

Avercheva and Zubik (2024) demonstrate that restoring agricultural infrastructure—particularly machinery, grain storage, and production facilities—is critical for attracting foreign capital. Their SWOT analysis confirms that Ukraine's agro-industrial complex has strong potential for post-war investment, provided that key vulnerabilities are addressed.

Popova, Kotsiubynska, and Skubii (2023) show how wartime conditions have reshaped the structure and sources of capital investment in agriculture. Their analysis of investment dynamics by economic activity and funding sources reveals that enterprises capable of maintaining investment activity under stress are perceived as more attractive.

Levandivskyi et al. (2023) emphasize the role of resource potential and infrastructure modernization in enhancing investment appeal. Their research supports the idea that regional agro-service systems and innovation-driven development are essential for sustainable sectoral growth.

Dankevych et al. (2023) explore the bioenergy potential of agricultural biomass, particularly sunflower husks, as a strategic opportunity for investment in renewable energy. Their findings illustrate how circular economy principles can enhance both ecological sustainability and financial returns, making bioenergy a promising direction for agro-investment.

Ostapenko, Horokh, and Lutsenko (2025) analyze current financial trends and underline the growing role of precision agriculture, artificial intelligence, and digital technologies in attracting capital. Their work confirms that investor behavior is increasingly shaped by technological transformation, geopolitical risks, and the need for portfolio diversification.

Overall, the discussion supports a multidimensional approach to evaluating investment attractiveness, where financial indicators must be considered alongside innovation, infrastructure resilience, and strategic policy alignment. Future research should focus on developing integrated assessment tools that combine financial diagnostics with scenario-based risk modeling, innovation scoring, and institutional analysis. Such tools will enable more accurate forecasting of investment outcomes and support strategic decision-making in Ukraine's agricultural sector during post-conflict recovery and modernization.

Conclusions. The conducted research confirms that the investment attractiveness of agricultural enterprises in Ukraine is a multifactorial category that reflects financial stability, innovation capacity, infrastructure resilience, and institutional support. In the context of post-conflict recovery and economic uncertainty, the agro-industrial sector demonstrates significant potential for attracting both domestic and foreign investment.

Key findings indicate that enterprises with stable profitability, efficient asset management, and technological adaptability are perceived as more attractive to investors. The integration of precision agriculture, digital solutions, and bioenergy technologies enhances competitiveness and opens new investment directions.

The analysis of current financial trends and sectoral dynamics shows that investment decisions are increasingly influenced by geopolitical risks, regulatory transparency, and the availability of targeted government incentives. The restoration of agricultural infrastructure and modernization of production facilities are critical for improving investment appeal.

It is concluded that a comprehensive evaluation of investment attractiveness should combine quantitative financial indicators with qualitative assessments of innovation, risk exposure, and strategic development potential. Future research should focus on developing integrated models that support scenario-based forecasting and investment planning in the agricultural sector.

References

1. Avercheva, N. O., & Zubik, D. V. (2024). Economic assessment and prospects for the investment attractiveness of ukraine's agricultural sector. *Investments: practice and experience*, (11), 154–161. DOI: https://doi.org/10.32702/2306-6814.2024.11.154 [in Ukrainian]
2. Bazaluk, O., Zhykharieva, V., Vlasenko, O., Nitsenko, V., Streimikiene, D., & Balezentis, T. (2022). Optimization of the Equity in Formation of Investment Portfolio of a Shipping Company. *Mathematics*, *10*(3), 363. DOI: https://doi.org/10.3390/math10030363 [in Ukrainian]
3. Dankevych, A., Perevozova, I., Nitsenko, V., Lozinska, L., Nemish, Y. (2023). Effectiveness of Bioenergy Management and Investment Potential in Agriculture: The Case of Ukraine. In: *Koval, V., Olczak, P. (eds) Circular Economy for Renewable Energy. Green Energy and Technology.* Springer, Cham. DOI: https://doi.org/10.1007/978-3-031-30800-0_6 [in Ukrainian]
4. Danyliuk, V., Riepina, I., Shafalyuk, O., Kovylina, M., & Nitsenko, V. (2020). Functional and investment strategies of technical development of enterprises. *Scientific Bulletin of the National Mining University*, 3, 115-121. DOI: https://doi.org/10.33271/nvngu/2020-3/115 [in Ukrainian].
5. European Central Bank. Foreign direct investment and its drivers: a global and EU perspective. 2018. Retrieved from: https://www.ecb.europa.eu/press/economic-bulletin/articles/2018/html/ecb.ebart201804_01.en.html [in Ukrainian]
6. Farmonaut (2025). Agriculture Economic Growth: 7 Trends For 2025. Retrieved from: https://farmonaut.com/blogs/agriculture-economic-growth-7-trends-for-2025 [in Ukrainian]
7. Horák, J., Bilan, Y., Dankevych, A., Nitsenko, V., Kucher, A., & Streimikiene, D. (2023). Bioenergy production from sunflower husk in ukraine: potential and necessary investments. *Journal of Business Economics and Management*, *24*(1), 1–19. DOI: https://doi.org/10.3846/jbem.2023.17756
8. Husieva, N., & Niemets, O. (2024). Investment policy of Ukraine during full-scale war: immediate measures and future perspectives. *Visnyk of V.N. Karazin Kharkiv National University, series Geology. Geography. Ecology*, (60), 199–214. DOI: https://doi.org/10.26565/2410-7360-2024-60-14
9. IMF. Fragmenting Foreign Direct Investment Hits Emerging Economies Hardest. 2023. Retrieved from: https://www.imf.org/en/Blogs/Articles/2023/04/05/fragmenting-foreign-direct-investment-hits-emerging-economies-hardest.
10. InVenture. Investments in Ukraine’s Agribusiness: Challenges, Opportunities, and Trends for 2025. 2025. Retrieved from: https://inventure.com.ua/en/analytics/investments/investments-in-ukraines-agribusiness:-challenges-opportunities-and-trends-for-2025
11. Koval, V., Mikhno, I., Zharikova, O., Tsvirko, O., Metil, T., & Nitsenko, V. (2023). Investment management and financial development in infrastructure renovation of a sustainable-built environment. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 2, 91–97. DOI: https://doi.org/10.33271/nvngu/2023-2/091
12. Kuzminova, O., & Yaroshenko, K. (2023). Investment attractiveness of Ukraine: assessment and promising areas for activation. *Economy and Society*, 49. DOI: https://doi.org/10.32782/2524-0072/2023-49-38
13. Levandivskyi, O. T., Balaniuk, I. F., Matkovsky, P. Y., & Matskiv, V. V. (2023). Resource potential in investment support for agricultural enterprises. *The actual problems of regional economy development*, 1(19), 192–201. DOI: https://doi.org/10.15330/apred.1.19.192-201
14. Mazurkevich, I. (2023). Research on methodological approaches to assessing the investment attractiveness of enterprises in the agro-industrial complex. *Economics and Society*, 53. DOI: https://doi.org/10.32782/2524-0072/2023-53-87
15. Ostapenko, R., Gorokh, O., & Lutsenko, O. (2025). Analysis of current financial trends for optimizing investment activities. *Problems and prospects of economics and management*, 1(41), 372–385. DOI: https://doi.org/10.25140/2411-5215-2025-1 (41)-372-385
16. Popova, O., Kotsyubinska, L., & Skubiy, O. (2023). Investment activity in agriculture in modern conditions. *Economy and society*, 54. DOI: https://doi.org/10.32782/2524-0072/2023-54-49
17. PRI (2021). A climate risk framework for farmland investments. Retrieved from: https://www.unpri.org/farmland/a-climate-risk-framework-for-farmland-investments/8879.article
18. PwC (2025). Agriculture, mineral resources and energy – priority sectors for investment in Ukraine's reconstruction – PwC report. Retrieved from: https://www.pwc.com/ua/uk/survey/2025/haluzi-dlya-investytsiy-u-vidbudovu-ukrayiny.html
19. Ryzhikova, N. I., Ostapenko, R. M., Birchenko, N. O., & Lutsenko, O. A. (2025). Assessment of the accounting and economic stability of Ukrainian agricultural enterprises at the micro level: an information and analytical approach. *Academic Visions*, 42. Retrieved from Retrieved from: https://academyvision.org/index.php/av/article/view/1891
20. S&P Global Commodity Insights. New EU trade regime imposes stricter conditions, restricting Ukraine's agricultural exports. 2025. Retrieved from: https://www.spglobal.com/commodity-insights/en/news-research/latest-news/agriculture/082125-new-eu-trade-regime-imposes-stricter-conditions-restricting-ukraines-agricultural-exports
21. Shvets, O. (2025). Formation of a mechanism for digital transformation of agricultural sector development management in Ukraine. *Economics and Business Management*, 16(1), 70-91. DOI: https://doi.org/10.31548/economics/1.2025.70

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Гринчук Вячеслав
Аспірант
Національний науковий центр «Інститут аграрної економіки» НААН України
вул. Героїв Оборони, 10, 03127 Київ, Україна
e-mail: slavgroupmail@gmail.com
ORCID ID: 0009-0002-1012-0105

Оцінка інвестиційної привабливості сільськогосподарських підприємств

Анотація. Інвестиційна привабливість українських сільськогосподарських підприємств є стратегічним фактором для мобілізації капіталу, відновлення виробництва та забезпечення довгострокової стійкості в контексті постконфліктного відновлення та трансформації світового ринку. Дослідження зосереджується на фінансовій діагностиці, інноваційному потенціалі, структурній консолідації та механізмах зовнішньої підтримки.

Постановка проблеми. Основна проблема полягає у відсутності стандартизованих моделей оцінки інвестицій, обмеженому доступі до капіталу та нерівномірному впровадженні політики. Підприємства стикаються з проблемами, пов'язаними з пошкодженням інфраструктури, кліматичними ризиками та порушенням логістики, що ускладнює прийняття інвестиційних рішень.

Невирішені аспекти проблеми. До ключових невирішених питань належать забруднення мінами, імпортна залежність та недостатня інтеграція інноваційних показників в інвестиційні моделі. Вплив цифрових технологій, експортної інфраструктури та державної підтримки на інвестиційну привабливість потребує подальшого аналізу.

Мета статті. Розробити комплексну систему оцінки інвестиційної привабливості сільськогосподарських підприємств, що поєднує фінансові показники, інноваційний потенціал, зовнішні ризики та політичні чинники.

Основний матеріал. У статті проаналізовано показники прибутковості, ліквідності та фінансового важеля, тенденції інвестицій у основні засоби та роль середніх і великих підприємств у консолідації сектору. Досліджено динаміку експорту, імпортозаміщення та інструменти державної підтримки. Особлива увага приділяється інноваціям у сфері AgTech, точному землеробству та стратегіям зменшення ризиків, що підтримуються міжнародними донорами.

Висновки. Незважаючи на виклики воєнного часу, українське сільське господарство демонструє стійкість та інвестиційний потенціал. Комплексний підхід до оцінки сприяє обґрунтованому розподілу капіталу, підтримує модернізацію та зміцнює конкурентоспроможність на внутрішньому та міжнародному ринках.

Ключові слова: *інвестиційна привабливість, сільське господарство, фінансові показники, інновації, оцінка ризиків, державна підтримка, Україна, постконфліктна економіка.*

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Список літератури

1. Аверчева Н. О., Зубік Д. В. Економічна оцінка та перспективи інвестиційної привабливості АПК України. *Investytsiyi: praktyka ta dosvid*. №11. pp. 154–161. https://doi.org/10.32702/2306-6814.2024.11.154
2. Кузьмінова О., Ярошенко К. Інвестиційна привабливість україни: оцінка та перспективні напрямки активізації. *Економіка та суспільство*. 2023. №49. https://doi.org/10.32782/2524-0072/2023-49-38
3. Мазуркевич І. Дослідження методичних підходів оцінки інвестиційної привабливості підприємств агропромислового комплексу. *Економіка та суспільство*. 2023. №53. https://doi.org/10.32782/2524-0072/2023-53-87
4. Остапенко Р., Горох О., Луценко О. Аналіз сучасних фінансових трендів для оптимізації інвестиційної діяльності. *Проблеми і перспективи економіки та управління.* 2025. №1(41). pp. 372–385. https://doi.org/10.25140/2411-5215-2025-1(41)-372-385
5. Попова О., Коцюбинська Л., Скубій О. Інвестиційна діяльність в сільському господарстві в сучасних умовах. *Економіка та суспільство*. 2023. №54. https://doi.org/10.32782/2524-0072/2023-54-49
6. Рижикова Н. І., Остапенко Р. М., Бірченко Н. О., Луценко О. А. Оцінка обліково-економічної стійкості аграрних підприємств України на мікрорівні: інформаційноаналітичний підхід. *Академічні візії.* 2025. №42. https://academyvision.org/index.php/av/article/view/1891
7. Bazaluk O., Zhykharieva V., Vlasenko O., Nitsenko V., Streimikiene D., Balezentis T. Optimization of the Equity in Formation of Investment Portfolio of a Shipping Company. *Mathematics*. 2022. №10(3). pp. 363. https://doi.org/10.3390/math10030363
8. Dankevych A., Perevozova I., Nitsenko V., Lozinska L., Nemish Y. Effectiveness of Bioenergy Management and Investment Potential in Agriculture: The Case of Ukraine. In: *Koval, V., Olczak, P. (eds) Circular Economy for Renewable Energy. Green Energy and Technology*. Springer, Cham. 2023. https://doi.org/10.1007/978-3-031-30800-0_6

9. Danyliuk V., Riepina I., Shafalyuk O., Kovylina M., Nitsenko V.Functional and investment strategies of technical development of enterprises. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*. 2020. №3. pp. 115-121. https://doi.org/10.33271/nvngu/2020-3/115.
10. European Central Bank (2018). Foreign direct investment and its drivers: a global and EU perspective. https://www.ecb.europa.eu/press/economic-bulletin/articles/2018/html/ecb.ebart201804_01.en.html
11. Farmonaut. Agriculture Economic Growth: 7 Trends For 2025. 2025. https://farmonaut.com/blogs/agriculture-economic-growth-7-trends-for-2025
12. Horák J., Bilan Y., Dankevych A., Nitsenko V., Kucher A., Streimikiene D. Bioenergy production from sunflower husk in ukraine: potential and necessary investments. *Journal of Business Economics and Management*. 2023. №24(1). С. 1–19. https://doi.org/10.3846/jbem.2023.17756
13. Husieva N., Niemets O. Investment policy of Ukraine during full-scale war: immediate measures and future perspectives. *Visnyk of V.N. Karazin Kharkiv National University, series Geology. Geography. Ecology*. 2024. №60. pp. 199–214. https://doi.org/10.26565/2410-7360-2024-60-14
14. IMF (2023). Fragmenting Foreign Direct Investment Hits Emerging Economies Hardest. https://www.imf.org/en/Blogs/Articles/2023/04/05/fragmenting-foreign-direct-investment-hits-emerging-economies-hardest.
15. InVenture. Investments in Ukraine's Agribusiness: Challenges, Opportunities, and Trends for 2025. 2025. https://inventure.com.ua/en/analytics/investments/investments-in-ukraines-agribusiness:-challenges-opportunities-and-trends-for-2025
16. Koval V., Mikhno I., Zharikova O., Tsvirko O., Metil T., Nitsenko V. Investment management and financial development in infrastructure renovation of a sustainable-built environment. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*. 2023. №2. pp. 91–97. https://doi.org/10.33271/nvngu/2023-2/091
17. Levandivskyi O. T., Balaniuk I. F., Matkovsky P. Y., Matskiv V. V. Ресурсний потенціал в інвестиційному забезпеченні сільськогосподарських підприємств. *The actual problems of regional economy development*. 2023. №1(19). pp. 192–201. https://doi.org/10.15330/apred.1.19.192-201
18. PRI. A climate risk framework for farmland investments. 2021. https://www.unpri.org/farmland/a-climate-risk-framework-for-farmland-investments/8879.article
19. PwC. Сільське господарство, мінеральні ресурси та енергетика – пріоритетні галузі для інвестицій у відбудову України – звіт PwC. 2025. https://www.pwc.com/ua/uk/survey/2025/haluzi-dlya-investytsiy-u-vidbudovu-ukrayiny.html
20. S&P Global Commodity Insights. New EU trade regime imposes stricter conditions, restricting Ukraine's agricultural exports. 2025. https://www.spglobal.com/commodity-insights/en/news-research/latest-news/agriculture/082125-new-eu-trade-regime-imposes-stricter-conditions-restricting-ukraines-agricultural-exports
21. Shvets O. Formation of a mechanism for the digital transformation of the management of agricultural sector development in Ukraine. *Economics and Business Management*. 2025. №16(1). pp. 70-91. https://doi.org/10.31548/economics/1.2025.70

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Daudova Galina
PhD in Public Administration, Associate Professor,
Deputy Director of the Department of Budget and Finance
of the Kharkiv City Council – Head of the Division for Financing
of the Housing and Communal Services Sector.
Konstytutsii Square, 7, Kharkiv, 61003, Ukraine;
e-mail: dgv_62@ukr.net
ORCID ID: 0000-0001-6180-2099
Piskunov Roman
PhD of Economics, Associate Professor,
Head of the Department of Accounting and Taxation,
V.N. Karazin Kharkiv National University,
Maidan Svoboda, 4, Kharkiv, 61022, Ukraine;
e-mail: r.a.piskunov@karazin.ua
ORCID ID: 0000-0001-6133-9233
Moskalenko Olena
PhD of Economics, Associate Professor,
Associate Professor at the Department of
Banking Business and Financial Technologies
V.N. Karazin Kharkiv National University,
Maidan Svoboda, 4, Kharkiv, 61022, Ukraine;
e-mail: o.v.moskalenko@karazin.ua
ORCID ID: 0000-0001-9840-2347

Research on the conceptual foundations of innovative financing instruments for territorial communities' infrastructure: green bonds

Abstract. The article examines the conceptual foundations for the development of the green bond market in Ukraine as a tool for financing the reconstruction of territorial communities' infrastructure, particularly under martial law conditions.

Problem Statement. The relevance of the topic is determined by the urgent need to attract new financial resources to restore infrastructure facilities destroyed as a result of military actions, which have caused significant economic and social losses.

Unresolved aspects of the problem. Considering the high cost of reconstruction, it is necessary to find innovative financing mechanisms, and green bonds can serve as an important instrument for raising capital to implement such projects.

Purpose of the Article. The purpose of the study is to analyze the state of the green bond market in Ukraine and to substantiate ways to improve their efficiency in financing investment projects at the local community level. The object of the study is the practice of using green bonds to finance municipal infrastructure projects, particularly in the energy, transport, and environmental sectors. The methodological basis of the research includes the analysis of legal and regulatory acts governing the issuance of green bonds in Ukraine, as well as the study of international experience in this field.

Presentation of the Main Material. The article highlights the factors that constrain the development of this financial instrument, such as martial law, economic instability, inflationary processes, low market liquidity, and insufficient investor confidence. The importance of improving the regulatory framework, providing state guarantees, increasing information transparency, and engaging international financial institutions to stimulate the green bond market is emphasized.

Conclusions. The research results confirm that Ukraine has already established a necessary legal and regulatory environment for the issuance of green bonds; however, their practical implementation remains limited. The authors propose the development of a new edition of the Concept for the Green Bond Market Implementation for 2025–2030, which should include the preparation of pilot projects involving municipalities, international donors, and financial institutions. The practical value of the study lies in formulating proposals for using green bonds to finance environmental, energy-efficient, security, and socially significant projects, which will contribute to the sustainable development of territorial communities and enhance their financial autonomy.

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Introduction. The military actions on the territory of Ukraine have led to significant problems related to reduced budget revenues, the destruction of critical infrastructure, internal migration, relocation of enterprises, and other challenges.

According to estimates by international financial institutions, the amount of funds required for the reconstruction of infrastructure facilities is approximately USD 524.0 billion [10]. The most severely affected critical infrastructure is located in the Donetsk, Zaporizhzhia, Kyiv, Luhansk, Kharkiv, and Kherson regions. Out of the total direct damage to municipal infrastructure, the losses of the frontline regions (Donetsk, Kharkiv, Luhansk, Zaporizhzhia, and Kherson) amount to USD 116.0 billion, or 66.0% of the total losses [9].

Given the current situation, state and regional authorities, local self-government bodies, and non-governmental organizations are making efforts to find and attract new financial instruments for the reconstruction of infrastructure facilities destroyed by shelling.

Modern social and environmental criteria set by today's challenges must be implemented in accordance with European standards and values.

In this context, the practice of developing the green bond market attracts particular attention, as it has become a promising tool in the global economy for generating financial resources and facilitating municipal investment[13].

In both global and European trends, green bonds are viewed as an alternative to bank loans for addressing local-level needs [2,12].

The organization of green bond issuance in Ukraine serves as a key factor in implementing investment programs and projects related to the restoration of the energy, transport, and other sectors of the national and municipal economies.

This issue has gained additional relevance due to recent amendments to budget legislation concerning the planning and implementation of public investment projects at the regional and local levels [15]. The foundation for financing such projects is a medium-term plan of priority public investments in the region, which provides for the formation of a unified portfolio of public investment projects of the territorial community and determines the estimated funding volumes across sectors, as well as the sources and mechanisms of financial support for sectoral and industry-specific projects.

Considering the territorial goals of sustainable development, the establishment of a regional-level green bond market would not only ensure financial flows for implementing public investment projects but also promote the introduction of resource-efficient, energy-efficient, and innovative technologies aimed at addressing environmental and climate challenges.

Literature review. The analysis of trends in the development of green bonds, their role in the financial market, main advantages of their use, and challenges related to their issuance have been explored by Ukrainian researchers O. Hrubliak and A. Oleksyn [5]. The legal and regulatory framework for the introduction of the green bond market, the conceptual model of green bonds in Ukraine, and the specifics of their issuance have been examined by energy efficiency and conservation practitioner A. Frolov [4]. The gradual development of the green bond segment as a new means of attracting investors to the issuance of these financial instruments is emphasized by Klymenko O. and Mala S. [7].

Despite the theoretical and practical contributions of scholars and practitioners to the

implementation of green bonds, this segment of the financial market in Ukraine remains at an early stage of formation and development.

The prospective growth of the green bond market is hindered by factors associated with a high level of unpredictability under martial law, which negatively affects the national economy. The investment attractiveness of green bonds is further limited by financial sector instability, inflationary pressures, losses of financial assets, and the low level of market participant activity.

Minimizing the risks caused by these factors requires the implementation of innovative approaches aimed at improving the regulatory framework, ensuring the stability of financial institutions, strengthening investor confidence, enhancing the investment climate, increasing the liquidity of the securities market, and motivating participants involved in the green bond issuance process.

The Government of Ukraine has proposed a methodology for identifying sources and mechanisms of financial support for investment programs and projects implemented at both the national and local levels. However, the issuance of green bonds as a potential source of debt financing for such programs and projects has not yet been provided for.

Purpose, objectives and research methods. The purpose of the article is to highlight the level of implementation and development of the green bond market in Ukraine and to substantiate proposals for improving the effectiveness of their use by territorial communities.

Research results. Ukrainian legislation concerning green bonds is based on the provisions of the Concept for the Introduction and Development of the Green Bond Market in Ukraine, which defines the strategic directions for their development to finance environmentally oriented projects in various sectors of the economy, including energy, transport, housing and utilities, land use, industry, and ecosystem restoration [1].

The development of the green bond market is supported by the Law of Ukraine “On Capital Markets and Organized Commodity Markets,” which officially recognizes green bonds as a distinct type of security.

The rules for attracting investments through the issuance of green bonds are established by the Law of Ukraine “On Amendments to Certain Legislative Acts of Ukraine Regarding the Simplification of Investment Attraction and the Introduction of New Financial Instruments.”

The main powers and functions of participants in the green bond market are specified by the National Securities and Stock Market Commission. This regulatory body has developed recommendations for implementing or financing environmentally oriented projects through the issuance of green bonds. The Commission has also defined the key features of the green bond model that comply with the standards of the European Union and the Green Bond Principles of the International Capital Market Association.

Thus, Ukraine has established a legal and regulatory environment for the implementation of green bonds, including the adoption of several legislative and regulatory acts that incorporate best international practices in green bond development and create favorable conditions for their issuance.

According to the conducted research, Ukraine supports a policy of sustainable energy development and promotes the use of green bonds to restore energy sources and finance environmental projects.

The Concept for the Introduction and Development of the Green Bond Market in Ukraine envisaged a series of measures to be implemented during 2022–2023, aimed at:

- improving the regulatory and legal framework (with the aim of simplifying the financing procedure for the modernization of national economy sectors);
- clearly delineating the functions of state authorities in coordinating actions related to the planning and organization of green bond issuance;
- enhancing the management of the securities market associated with the issuance of green bonds.

The projected issuance of green bonds was expected to amount to USD 433 million in 2021, USD 216 million in 2022, and USD 173 million in 2023 [14]. In fact, in 2021, NEC "Ukrenergo" raised financing through the issuance of green bonds on the London Stock Exchange totaling USD 825 million [14].

Data on the issuance of green bonds in 2022–2023 are not reported in the media, although, according to the State Agency for Energy Efficiency and Energy Saving of Ukraine, green bonds at the national and local levels have been used to implement energy-efficient technologies and solar power plants, as well as programs for the development of recreational infrastructure and park maintenance [3]. Data on the issuance of green bonds in Ukraine in 2024 and the reporting period of 2025 are also not available.

Examining the actual development of green bonds in the international market makes it clear that green bonds represent one of the promising sources of financing for public investment projects and programs in Ukraine, significantly impacting the satisfaction of the needs of local communities.

In Ukraine, sources and mechanisms of investment instruments used to finance investment programs and projects at both national and local levels are shown in Figure 1.

Sources by origin	Own sources		enterprise profit retained for its use, depreciation deductions, issuance of shares; own funds of budgetary institutions
	Attracted sources	Debt	loans (borrowings) from foreign states and international financial institutions; issuance of government bonds, local borrowing bonds, infrastructure bonds; loans (borrowings) from local self-government bodies (reimbursable financial aid)
		Grants	grants, donations, charitable and voluntary contributions provided by legal entities and individuals
	Budgetary sources	State support	state and local guarantees; public-private partnership; state stimulation of industrial parks; state support for investment projects
		State target funds	state road fund; state fund for radioactive waste management; state fund for water management development; state fund for inland waterways; state fund for decarbonization and energy efficiency
By degree of participation	Direct financing mechanisms		direct expenditures from the state or local budgets; subsidies from local or state budgets; own revenues of enterprises and budgetary institutions
	Private financing mechanisms		attracted financial resources from individuals or legal entities; concession or non-concession agreements; public-private partnership
By nature	Non-reimbursable financial support		own funds of enterprises and budgetary institutions; direct expenditures from local or state budgets; subsidies from state or local budgets; grant agreements, charitable contributions
	Reimbursable financial support		loans (borrowings); concession or non-concession agreements; preferential debt financing without or with local government guarantees; local borrowings
	Mixed financial support		concession or non-concession agreements; co-financing; public-private partnership

Figure 1 - Sources and mechanisms of financing public investment projects and programs.
Source: Compiled by the authors based on [7]

When analyzing the mechanisms of financial support for public investment projects, it should be noted that the consequences of the military actions on the territory of Ukraine have led to negative results in the financial performance of business entities and a significant reduction in internal sources directed by enterprises toward their development.

Given the current situation, to ensure sustainable sectoral functioning of the economy, state authorities and local self-government bodies are actively attracting debt and grant financing sources, which include loans and borrowings from foreign states, international financial institutions, domestic commercial banks, and local self-government bodies, as well as government bonds, local loan bonds, grants, donations, charitable and voluntary contributions, etc.

Particular attention should be paid to the practice of local councils providing repayable financial assistance (loans) to taxpayers, which does not involve charging interest for the use of such loans. For instance, in 2025, to repay debt obligations to the Clean Technology Fund and the European Bank for Reconstruction and Development under the investment projects "Second Urban Infrastructure Development Project" and "Ukraine District Heating Energy Efficiency Project", the municipal enterprise Kharkiv Heating Networks received repayable financial assistance from the budget of the Kharkiv City Territorial Community in the amount of UAH 260.0 million, while the municipal enterprise Kharkivvodokanal received UAH 245.0 million.

Considering the global support of Ukraine by international financial institutions (the World Bank, the International Finance Corporation, the European Investment Bank, the European Bank for Reconstruction and Development, etc.), which pay considerable attention to introducing the circulation of green bonds in the securities market, the use of green bonds at the municipal level should be regarded as an investment opportunity for the reconstruction of critical infrastructure facilities.

As research findings indicate (Table 1), during 2021–2025, a significant number of investment programs and projects in various sectors of the national economy are expected to be financed through loans and grants from foreign states and international financial institutions.

Table 1. Investment Programs and Projects Implemented at the National and Regional Levels Funded by Foreign States and International Financial Institutions

№ з/п	Creditor	Areas of Investment Projects (Industry/ Sector)	Loan (Credit) Amount, million UAH					
			2021	2022	2023	2024	2025	2021-2025
1	2	3	4	5	6	7	8	9
1.	International Bank for Reconstruction and Development	Energy	1645,5	600,4	3 449,8	3 758,6	1906,7	11361,0
		Transport infrastructure	2200,1	884,9				3085,0
		Healthcare	1287,6	1 151,1	2 751,1	3 835,4	884,9	9910,1
		Social sphere	400,0	1 460,0	963,4	1 267,5	1 151,1	5242,0
		Urban infrastructure	516,7	1 690,1	5 045,3	542,5	153,7	7948,3
		Education	24,7	9,7	243,7	1 825,6	1 690,1	3793,8
2.	European Bank for Reconstruction and Development	Transport infrastructure	1860,0	3 901,1	8841,6	4444,5	3226,6	22273,8
		Energy	467,1	524,1	769,5	190,4		1951,1
3.	European Investment Bank	Energy	1063,1	874,3	3659,4	1460,2	405,4	7462,4
		Transport infrastructure	1207,1	5572,0	13171,2	13859,5	7007,5	40817,3
		Ukraine's recovery	1372,5	2085,5	11691,1	9408,8	16975,2	41533,1
		Energy efficiency		1,7	576,0	3 158,8	1 596,4	5332,9
		Education	110,0	200,2	2620,8	1292,8	2 446,6	6670,4

Table 1. (continued)

4.	Council of Europe Development Bank	Healthcare					1 939,5	1939,5
		Compensation for destroyed housing					462,2	462,2
5.	KfW Development Bank (Germany)	Energy	884,3	1679,5	1728,6	1379,7	622,7	6294,8
		Energy efficiency		86,7	257,0	338,4	865,1	1547,2
6.	Nordic Environment Finance Corporation (NEFCO)	Education	130,3	249,8	756,0	215,3	122,3	1473,7
7.	Government of the Republic of Poland	Procurement of unmanned aerial systems			310,2	315,9	215,2	841,3
		Border road infrastructure	226,0	226,0	3165,5	480,6	1079,4	5177,5
8.	Japan International Cooperation Agency (JICA)	Energy	500,0	122,8	10,2	10,2	11,4	654,6
9.	Government of the French Republic	Public safety	4993,8	3363,2	5642,5	2642,7	2 289,0	18931,2
		Energy	150,0	309,4	1118,3	89,6	2225,5	3892,8
		Healthcare					1297,0	1297,0
		Transport infrastructure				1 602,9	1 830,0	3432,9
10.	Government of the United Kingdom of Great Britain and Northern Ireland	Ukraine's defense capacity		67 565,1	99 450,0	7 707,0	118 425,6	293147,7
		Healthcare	830,2	207,9				1038,1
		Transport infrastructure		10,0	1 115,9	866,3	949,8	2942,0
11	Government of the Republic of Austria	Healthcare			1347,0	1 457,6		2804,6
12	Eximbank of Hungary	Transport infrastructure	28,2	28,2				56,4
		TOTAL	**24 530,2**	**94 764,6**	**173 797,6**	**62 159,7**	**178 038,0**	**433290,1**

Source: Compiled by the authors based on sources [13–17].

The largest volumes of attracted financing are observed in projects and programs related to the development of the energy sector, municipal and urban infrastructure, passenger transport and motor roads, Ukraine's recovery, strengthening the country's defense capacity, creating a maritime border protection system, aviation security, and civil protection.

Attention should also be drawn to projects aimed at improving the reliability of electricity supply, modernization of transmission substations, construction of high-voltage power lines, and the implementation of energy efficiency measures in local communities.

Issues related to implementing measures in the heating, water supply, and wastewater sectors, improving the transport and operational condition of motor roads, and developing metro systems in Kharkiv and Dnipro remain particularly relevant.

Strategically important are projects and emergency credit programs for Ukraine's recovery, which provide financing for works related to eliminating the consequences of hostilities, shelling, and the destruction of municipal infrastructure.

Discussion. Based on the nature and purpose of the measures under individual programs and projects financed through loans and grants, it is advisable (taking into account the martial law) to develop a new edition of the Concept for the Introduction of the Green Bond Market in Ukraine for 2025–2030. This document should provide for the preparation and organization of pilot projects for the issuance of green bonds aimed at the restoration of municipal infrastructure, with issuers including foreign states, international financial institutions, donor and credit organizations, domestic banks, funds, and associations.

At the same time, it is proposed to issue green bonds in areas that have a direct impact on the environmental situation — such as the reconstruction of electricity, heat supply, water supply, and wastewater systems, as well as the purchase of environmentally friendly transport (electric buses). In addition, bonds may finance projects that do not directly affect environmental conditions but contribute to energy-efficient and rational use of energy resources.

Given current realities, the most promising projects for territorial communities in this area are those related to the restoration of destroyed housing and utility infrastructure, the creation of autonomous heating and water supply systems, and the installation of cogeneration power units.

At the same time, under conditions of warfare, territorial communities face urgent programs and projects that address citizens' basic needs for physical safety against external threats, such as the construction and reconstruction of civil protection shelters, radiation-proof shelters, and dual-use facilities. Other essential projects include those aimed exclusively at protecting infrastructure in the fuel and energy sector and in life support systems (heat supply, hot and drinking water supply, centralized sewage, waste collection and disposal).

The dynamics of budget expenditures of the Kharkiv City Territorial Community for urgent programs and projects are presented in Figure 2.

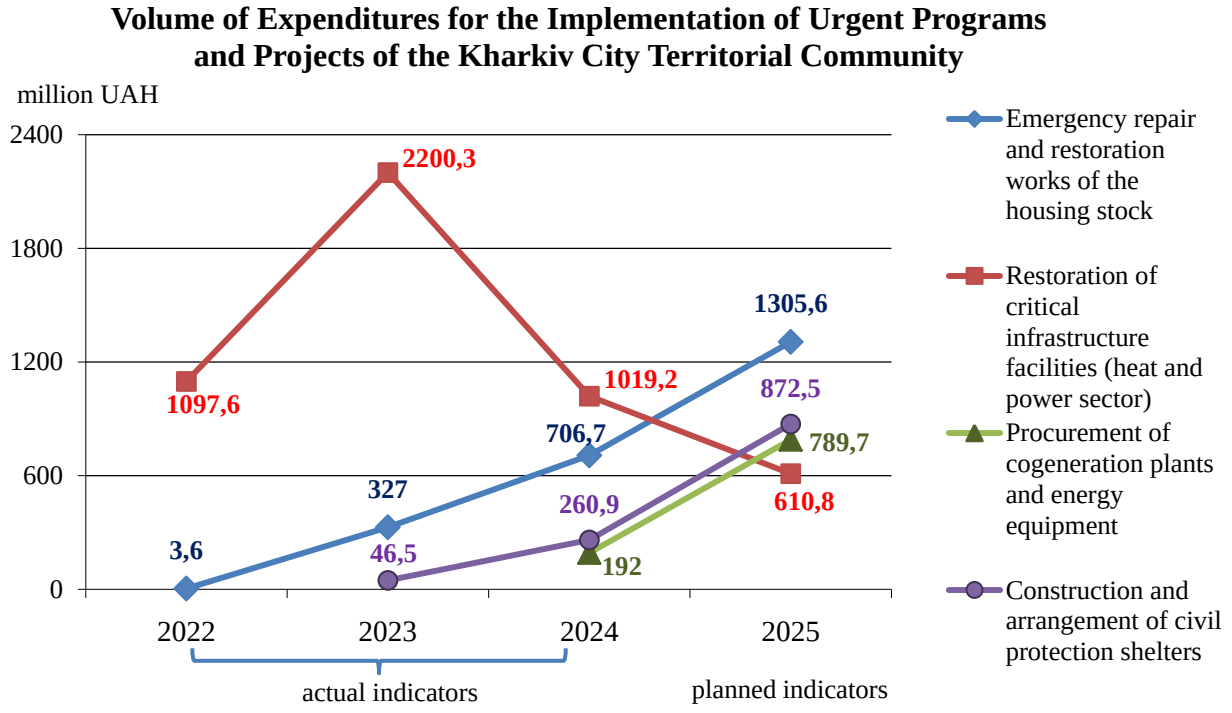

Figure 2 – Volume of Expenditures for the Implementation of Urgent Programs and Projects of the Kharkiv City Territorial Community
Source: Compiled by the authors based on [6].

It is also necessary to pay attention to the support of territories with a high level of security risk (these are the regions of Sumy, Dnipropetrovsk, Kharkiv, and Mykolaiv). State support for the restoration of infrastructure in these territorial communities is insufficient (11.2% of the total

amount of required financial resources), grant assistance for business creation and development accounts for 17.9%, and assistance in solving the housing problem (the Affordable Mortgage eOselya program) - 4.5% [8].

In order to support investment programs and projects for the recovery of territories with a high level of security risk, it is proposed to establish a Fund for the Support of High-Risk Territories, the funds of which should be directed toward providing grants to business entities and financing development projects, improving housing accessibility, and implementing economic and tax incentive measures, taking into account the eRecovery program and other programs implemented at the national level.

The sources of financing for the Fund for the Support of High-Risk Territories should include funds from the state and local budgets, international financial assistance (loans, grants, voluntary donations), and other sources not prohibited by law.

In this context, it is considered that increasing the financial resources of territorial communities for the implementation of urgent programs and projects, as well as for supporting territories with a high level of security risk, is possible through the issuance of “special” or “individual” green bonds, the use of which provides for targeted financing of priority facilities.

Conclusions. Based on the above, it can be concluded that the introduction of green bonds into Ukraine’s financial market contributes to the growth of financial resources for territorial communities, which can use green bonds to finance investment programs and projects in energy and energy efficiency, municipal infrastructure and public transport development, the restoration of essential facilities, and the construction of civil protection shelters.

However, the practical foundations of the effectiveness of green bonds as a financial and credit instrument indicate an underutilization of their regulatory potential, the skillful combination of which would significantly promote the implementation of investment programs and projects at the local level [11].

A logical continuation of the development of the green bond market involves improving the regulatory and organizational framework, which should provide for the implementation of state policy aimed at:

- further state regulation of the issuance of both traditional green bonds and “special” or “individual” green bonds, based on the needs of territorial communities to reduce the financial resource deficit;
- attracting various categories of issuers and investors to the green bond market to finance promising plans for the development of alternative energy sources, municipal infrastructure, civil protection facilities, and other urgent programs and projects;
- applying economic incentive mechanisms for participants in the green bond market through tax benefits and concessional lending, state support, and simplified procedures for issuing green bonds;
- developing methodological foundations for the preparation and issuance of green bonds by various issuers at the local level, providing for state guarantees regarding the payment of interest and the principal amount of debt on municipal bonds;
- providing free advisory assistance for the preparation of documentation for the issuance of green bonds.

References

1. Cabinet of Ministers of Ukraine. On approval of the Concept for the introduction and development of the green bond market in Ukraine (Resolution No. 175-r). Retrieved from: https://zakon.rada.gov.ua/laws/show/175-2022-%D1%80#Text [in Ukrainian].
2. Federation of Canadian Municipalities. (2020). Local economic development: Models, resources and financing tools. Partnership for Local Economic Development Project. Retrieved from: https://decentralization.gov.ua/news/12875?page=427 [in Ukrainian].
3. Frolov, A. (n.d.). Green bonds in Ukraine as a mechanism for attracting investment in renewable energy and energy efficiency projects. Ministry of Energy and Environmental Protection of Ukraine. Retrieved from: https://old.saee.gov.ua/sites/default/ [in Ukrainian].

4. Frolov, A. (2025). Stratehiia emisii zelenykh oblihatsii dlia finansuvannia povoiennoho staloho rozvytku [Strategy of issuing green bonds for financing post-war sustainable development]. Acta Academiae Beregsasiensis. Economics, 8, 477–494. Retrieved from https://doi.org/10.58423/2786-6742/2025-8-477-494 [in Ukrainian].
5. Hrubliak, O., & Oleksyn, A. (2024). Green bonds as an instrument for attracting investments into environmental projects. *Galician Economic Bulletin*, 6(91). DOI: https://doi.org/10.33108/galicianvisnyk_tntu2024.06 [in Ukrainian].
6. Kharkiv City Council. (2023). *Programme for Recovery and Sustainable Development of the Kharkiv City Territorial Community for 2024–2026 . Decision of the Kharkiv City Council* No. 418/23 of December 22, 2023. Retrieved from: https://www.city.kharkov.ua/uk/document/prohramy-vidnovlennya-ta-rozvytku.html [in Ukrainian].
7. Klymenko, O., & Mala, S. (2020). "Green" bonds as a promising tool for attracting investments in environmental projects in Ukraine. *Economic Bulletin of the University*, 45, 52–60. DOI: https://doi.org/10.31470/2306-546X-2020-45-52-60 [in Ukrainian].
8. Ministry of Finance of Ukraine. On approval of the Methodology for determining sources and mechanisms of financial support for public investment projects and programs (Order No. 131). Retrieved from: https://zakon.rada.gov.ua/laws/show/z0541-25#Text [in Ukrainian].
9. National energy company "Ukrenergo." (n.d.). *Eurobonds-2026*. Retrieved from: https://ua.energy/pro_kompaniyu/dlya-investoriv/yevroobligatsiyi-2026/ [in Ukrainian].
10. National Institute of Strategic Studies. Assessment of Ukraine's needs for recovery and reconstruction. Retrieved from: https://www.niss.gov.ua/doslidzhennya/ [in Ukrainian].
11. Piskunov, R., & Daudova, G. (2021). Implementation of the financial mechanism in the conditions of transformational processes at the local level. *Financial and Credit Activity: Problems of Theory and Practice*, 2(33), 249–258. DOI: https://doi.org/10.18371/fcaptp.v2i33.206723 [in Ukrainian].
12. Rats, O., & Alfimova, A. A. (2023). Zeleni oblihatsii yak perspektyvnyi finansovyi instrument bankivskoho investuvannia v Ukraini [Green bonds as a promising financial instrument of banking investment in Ukraine]. Upravlinnia rozvytkom, 21(1). Retrieved from https://doi.org/10.57111/devt/1.2023.08 [in Ukrainian].
13. Skoryk, M., Kupriianova, A., & Lishchyna, A. (2025). Finansuvannia munitsypalnykh stalykh initiatyv cherez zeleni oblihatsii: potentsial mistsevykh hromad [Financing municipal sustainable initiatives through green bonds: the potential of local communities]. Stalyi rozvytok ekonomiky, 3(54), 136–142. Retrieved from https://doi.org/10.32782/2308-1988/2025-54-20 [in Ukrainian].
14. Trading Economics. (n.d.). *Poland GDP*. Retrieved from: https://tradingeconomics.com/poland/gdp
15. Verkhovna Rada of Ukraine. *Budget Code of Ukraine* No. 2456-VI. Retrieved from: https://zakon.rada.gov.ua/laws/show/2456-17#Text [in Ukrainian].
16. Verkhovna Rada of Ukraine. (2020, December 15). *Pro Derzhavnyi biudzhet Ukrainy na 2021 rik* [On the State Budget of Ukraine for 2021] (Law No. 1082-IX). Retrieved from https://zakon.rada.gov.ua/laws/show/1082-20#Text [in Ukrainian].
17. Verkhovna Rada of Ukraine. (2021, December 2). *Pro Derzhavnyi biudzhet Ukrainy na 2022 rik* [On the State Budget of Ukraine for 2022] (Law No. 1928-IX). Retrieved from https://zakon.rada.gov.ua/laws/show/1928-20#Text [in Ukrainian].
18. Verkhovna Rada of Ukraine. (2022, November 3). *Pro Derzhavnyi biudzhet Ukrainy na 2023 rik* [On the State Budget of Ukraine for 2023] (Law No. 2710-IX). Retrieved from https://zakon.rada.gov.ua/laws/show/2710-20#Text [in Ukrainian].
19. Verkhovna Rada of Ukraine. (2023, November 9). *Pro Derzhavnyi biudzhet Ukrainy na 2024 rik* [On the State Budget of Ukraine for 2024] (Law No. 3460-IX). Retrieved from https://zakon.rada.gov.ua/laws/show/3460-20#Text [in Ukrainian].
20. Verkhovna Rada of Ukraine. (2024, November 19). *Pro Derzhavnyi biudzhet Ukrainy na 2025 rik* [On the State Budget of Ukraine for 2025] (Law No. 4059-IX). Retrieved from https://zakon.rada.gov.ua/laws/show/4059-20#Text [in Ukrainian].

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Даудова Галина
к.держ.упр., доцент,
заступник директора Департаменту бюджету і фінансів
Харківської міської ради – начальник Управління фінансування
житлово-комунальної сфери.
майдан Конституції, 7, Харків, 61003, Україна;
e-mail: dqv_62@ukr.net
ORCID ID: 0000-0001-6180-2099
Піскунов Роман
к.е.н., доцент, завідувач кафедри обліку та оподаткування,
Харківський національний університет імені В.Н. Каразіна,
майдан Свободи,4, Харків, 61022, Україна;
e-mail: r.a.piskunov@karazin.ua
ORCID ID: 0000-0001-6133-9233
Москаленко Олена
к.е.н., доцент,
доцент кафедри банківського бізнесу та фінансових технологій
Харківський національний університет імені В.Н. Каразіна,
майдан Свободи,4, Харків, 61022, Україна;
e-mail: o.v.moskalenko@karazin.ua
ORCID ID: 0000-0001-9840-2347

Дослідження концептуальних засад інноваційних інструментів фінансування інфраструктури територіальних громад: зелені облігації

Анотація. У статті досліджуються концептуальні засади розвитку ринку зелених облігацій в Україні як інструменту фінансування відновлення інфраструктури територіальних громад, зокрема в умовах воєнного стану.

Постановка проблеми. Актуальність теми зумовлена необхідністю залучення нових фінансових ресурсів для відновлення зруйнованих об'єктів інфраструктури внаслідок воєнних дій, які призвели до значних економічних і соціальних втрат.

Нерозв'язані аспекти проблеми. Враховуючи високу вартість відновлення, необхідно знаходити нові способи фінансування, і зелені облігації можуть стати важливим інструментом для залучення капіталу на реалізацію таких проєктів.

Мета статті. Метою дослідження є аналіз стану ринку зелених облігацій в Україні та обґрунтування шляхів підвищення ефективності їх застосування для фінансування інвестиційних проєктів на рівні територіальних громад. Об'єктом дослідження є практики використання зелених облігацій для фінансування муніципальних інфраструктурних проєктів, зокрема в енергетичному, транспортному та екологічному секторах. Методологічною основою роботи є аналіз нормативно-правових актів, що регулюють випуск зелених облігацій в Україні, а також дослідження міжнародного досвіду у цій сфері.

Виклад основного матеріалу. Стаття висвітлює фактори, що обмежують розвиток цього фінансового інструменту, серед яких воєнний стан, економічна нестабільність, інфляційні процеси, низька ліквідність ринку та недостатня довіра інвесторів. Підкреслюється важливість удосконалення нормативно-правової бази, забезпечення державних гарантій, а також підвищення рівня інформаційної підтримки та залучення міжнародних фінансових інституцій для активізації ринку зелених облігацій.

Висновки. Результати дослідження підтверджують, що в Україні створено необхідне правове середовище для випуску зелених облігацій, проте їхнє практичне застосування залишається обмеженим. Запропоновано розробити нову редакцію Концепції запровадження ринку зелених облігацій на 2025-2030 роки, яка має передбачати підготовку пілотних проєктів із залученням муніципалітетів, міжнародних донорів та фінансових інституцій. Практична цінність роботи полягає у формуванні пропозицій щодо використання зелених облігацій для фінансування екологічних, енергоефективних, безпекових та соціально значущих проєктів, що сприятиме сталому розвитку територіальних громад і підвищенню їх фінансової самостійності.

Ключові слова: *зелені облігації, фінансування інфраструктури, фінансово-кредитні інструменти, інвестиційні проекти та програми, сталий розвиток.*

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Список літератури

1. Про схвалення Концепції запровадження та розвитку ринку зелених облігацій в Україні. Розпорядження Кабінету Міністрів України від 23.02.2022 р. №175. URL: https://zakon.rada.gov.ua/laws/show/175-2022-%D1%80#Text
2. Практичний посібник «Місцевий економічний розвиток: моделі, ресурси та інструменти фінансування». Федерація канадських муніципалітетів / Проєкт міжнародної технічної допомоги «Партнерство для розвитку міст», 2020 рік. URL: https://decentralization.gov.ua/news/12875?page=427
3. Фролов А. Зелені облігації в Україні як механізм залучення інвестицій в проекти відновлюваної енергетики та енергоефективності. Міністерство Держенергоефективності України. URL: https://old.saee.gov.ua/sites/default/
4. Фролов А. Стратегія емісії зелених облігацій для фінансування повоєнного сталого розвитку. Acta Academiae Beregsasiensis. Economics. 2025. № 8. С. 477–494. DOI: https://doi.org/10.58423/2786-6742/2025-8-477-494
5. Грубляк О., Олексин А. Зелені облігації як інструмент залучення інвестицій в екологічні проєкти. *Галицький економічний вісник.* 2024. № 6 (91). DOI: https://doi.org/10.33108/galicianvisnyk_tntu2024.06.
6. Харківська міська рада. Програма відновлення та сталого розвитку Харківської міської територіальної громади на 2024–2026 роки : затв. рішенням Харківської міської ради від 22.12.2023 № 418/23. Харків : ХМР, 2023. 147 с. URL: https://www.city.kharkov.ua/uk/document/prohramy-vidnovlennya-ta-rozvytku.html
7. Клименко О., Мала С. «Зелені» облігації як перспективний інструмент залучення інвестицій в екологічні проекти в Україні. *Економічний вісник університету.* 2020. Випуск № 45. С. 52–60. DOI: https://doi.org/10.31470/2306-546X-2020-45-52-60
8. Про затвердження Методики визначення джерел і механізмів фінансового забезпечення публічних інвестиційних проєктів та програм публічних інвестицій. Наказ міністерства Фінансів України від 28.02.2025 №131. URL: https://zakon.rada.gov.ua/laws/show/z0541-25#Text
9. Національна енергетична компанія «Укренерго». Єврооблігації-2026. URL: https://ua.energy/pro_kompaniyu/dlya-investoriv/yevroobligatsiyi-2026/
10. Оцінка потреб України на відновлення та відбудову. Національний інститут стратегічних досліджень. URL: https://www.niss.gov.ua/doslidzhennya/
11. Піскунов Р.О., Даудова Г.В. Реалізація фінансового механізму в умовах трансформаційних процесів на місцевому рівні. *Фінансово-кредитна діяльність: проблеми теорії та практики*, 2021. 2(33), 249–258. DOI: https://doi.org/10.18371/fcaptp.v2i33.206723
12. Рац О., Алфімова А. А. Зелені облігації як перспективний фінансовий інструмент банківського інвестування в Україні. Управління розвитком. 2023. Т. 21, № 1. DOI: https://doi.org/10.57111/devt/1.2023.08
13. Скорик М., Купріянова А., Ліщина А. Фінансування муніципальних сталих ініціатив через зелені облігації: потенціал місцевих громад. Сталий розвиток економіки. 2025. № 3 (54). С. 136–142. DOI: https://doi.org/10.32782/2308-1988/2025-54-20
14. Trading Economics. Poland GDP. URL: https://tradingeconomics.com/poland/gdp
15. Бюджетний кодекс України від 08.07.2010 №2456-VI. URL: https://zakon.rada.gov.ua/laws/show/2456-17#Text.
16. Про Державний бюджет України на 2021 рік. Закон України від 15.12.2020 №1082-IX. URL: https://zakon.rada.gov.ua/laws/show/1082-20#Text
17. Про Державний бюджет України на 2022 рік. Закон України від 02.12.2021 №1928-IX. URL: https://zakon.rada.gov.ua/laws/show/1928-20#Text
18. Про Державний бюджет України на 2023 рік. Закон України від 03.11.2022 №2710-IX. URL: https://zakon.rada.gov.ua/laws/show/2710-20#Text
19. Про Державний бюджет України на 2024 рік. Закон України від 09.11.2023 №3460-IX. URL: https://zakon.rada.gov.ua/laws/show/3460-20#Text
20. Про Державний бюджет України на 2025 рік. Закон України від 19.11.2024 №4059-IX. URL: https://zakon.rada.gov.ua/laws/show/4059-20#Text

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Dukhnovska Liudmyla
PhD in Economics, Associate Professor of Department of Accounting and Auditing (Institute of Economics and Management) of the Institute of Economics and Management, National University of Food Technologies. Ukraine, Kyiv
e-mail: mila.duhnovska@gmail.com
ORCID ID: 0000-0002-4617-4108
Riabenko Volodymyr
Ph.D., Associate Professor of the Department of Economics and Law, National University of Food Technologies. Ukraine, Kyiv
e-mail: viar0275@gmail.com
ORCID ID: 0000-0003-1091-4992
Melnychenko Oleg
Postgraduate Student at Department of Economic and Law (Institute of Economics and Management) of the Institute of Economics and Management, National University of Food Technologies. Ukraine, Kyiv
e-mail: innovation.ep4@gmail.com
ORCID ID: 0009-0001-8510-6394

Accounting and analytical support for determining the value of enterprise potential

Abstract. Accounting and analytical support for enterprise potential assessment is a strategic instrument for enhancing transparency, mobilizing investment, and ensuring sustainable development in the context of post-conflict recovery and global market integration. This study focuses on the harmonization of financial reporting, the implementation of digital technologies, the adaptation of valuation models, and the development of human capital.

Problem statement. The core problem lies in the fragmentation of enterprise valuation approaches, limited integration of international standards, and insufficient analytical capacity. Ukrainian enterprises face challenges in aligning accounting data with strategic valuation models, particularly under conditions of economic instability, regulatory uncertainty, and weak comparability of market benchmarks.

Unresolved aspects of the problem. Key unresolved issues include the underutilization of intangible asset valuation, limited adaptation of DCF models to Ukrainian risk conditions, and poor integration between accounting systems and analytical platforms. The impact of digital reporting formats (e.g., XBRL), compliance mechanisms, and international comparables on valuation accuracy requires further investigation.

Purpose of the article. To develop a comprehensive methodology for accounting and analytical support in enterprise potential assessment, combining fair value principles, value-based management, digital transformation, and risk-oriented approaches.

Presentation of the main material. The article analyzes the structure of accounting and analytical support, the implementation of IFRS and XBRL, and the application of fair value, EVA, DCF, and market-based valuation methods. It explores the role of ERP systems, business intelligence platforms, and specialized valuation software in improving data quality and modeling precision. Special attention is given to intangible asset valuation, the adaptation of accounting systems to risk environments, and the deployment of digital solutions to support strategic management. Tables summarize key metrics, valuation components, and methodological adaptations specific to the Ukrainian context.

Conclusions. Despite institutional and macroeconomic challenges, Ukrainian enterprises demonstrate significant potential for reliable valuation and strategic development. An integrated, standardized, and digitally enabled approach to accounting and analytical support enhances transparency, increases investment attractiveness, and ensures alignment with international standards. Further research and practical implementation of such approaches are essential for strengthening trust, supporting modernization, and facilitating Ukraine's integration into global financial markets.

Keywords: *enterprise potential, accounting support, analytical modeling, valuation methods, fair value, financial diagnostics, Ukraine, IFRS, XBRL, investment assessment.*

JEL classification: M41, G32, C81, O16

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Introduction. In the current conditions of economic instability and regulatory transformation, the ability to determine the value of Ukrainian enterprises' potential becomes a key factor for attracting investment, restoring business activity, and ensuring long-term competitiveness. Enterprises operate in a complex environment shaped by international reporting standards, digital modernization, and market uncertainty. These challenges require reliable accounting systems, consistent valuation methods, and integrated analytical tools. Accounting and analytical support combines financial reporting, fair value assessment, and strategic diagnostics, forming the basis for transparent and effective enterprise potential evaluation. The growing importance of intangible assets, value-based management, and compliance mechanisms further expands the scope of valuation, making research in this area essential for improving decision-making and aligning Ukrainian practices with global standards.

Literature review. In recent years, accounting and analytical support for enterprise potential valuation has become a subject of active scientific discussion in Ukraine. Researchers focus on the integration of financial reporting with analytical tools, the role of digital technologies, and the adaptation of valuation models to the conditions of post-conflict recovery and international harmonization.

The study by Kvaterniuk A. (2022) examines the formation of innovation potential in agricultural enterprises. The author identifies internal and external factors influencing innovation capacity, including market conditions, technological infrastructure, and institutional support. The article emphasizes that innovation climate — shaped by legislation, tax incentives, and commercialization practices — directly affects the enterprise's ability to generate and realize potential value.

Arefieva O. and Dolzhenko D. (2023) explore the theoretical foundations of economic potential formation under conditions of transparency. They systematize definitions of economic potential as both a set of resources and a dynamic capability for development. The authors argue that successful valuation requires continuous adaptation to external and internal factors, especially in the context of wartime disruptions and institutional volatility.

Olyadnichuk N. and Pidlubna O. (2020) propose a structured model of accounting and analytical support for entrepreneurial activity. Their approach highlights the role of accounting and analysis subsystems in generating input data, conducting vertical and horizontal diagnostics, and supporting informed decision-making. The authors emphasize that effective valuation depends on the integration of financial, technical, and social indicators.

Yaremko I.Y. (2022) and Shubina et al. (2025) presents accounting and analytical support as a goal-oriented system for managing enterprise development. The study outlines the need for adaptive information systems with clearly defined performance indicators, particularly economic value added (EVA), as a benchmark for managing enterprise potential in the context of national recovery.

Voskalo N. and Kovalchyk T. (2024) analyze the role of accounting and analytical support in shaping investment policy. They classify types of investments and risks, and describe methods for evaluating financial investments. The authors emphasize that accounting systems must reflect investment attractiveness and support strategic planning through accurate and timely reporting.

Olyadnichuk N., Krochak O., and Ketskalo A. (2025) focus on accounting and analytical support in agricultural enterprises, particularly in labor management, taxation, and reporting. Their study proposes an algorithm for forming labor and tax-related indicators, which enhances the quality of analytical data and supports enterprise valuation.

Myskin Y., Romanyuk A., and Deneshchuk K. (2023) investigate models of accounting and analytical support for enterprise value management. They distinguish between stakeholder groups and propose tailored models — absorption costing, value-based management, and balanced scorecards — depending on the valuation perspective. The authors offer a conceptual framework for integrating these models into a unified system of value-oriented management.

Purpose, objectives, and research methods. The purpose of this study is to comprehensively examine the accounting and analytical support mechanisms for determining the value of enterprise potential in Ukraine, considering current economic challenges, regulatory changes, and the need to harmonize with international standards. The main focus is on the analysis of financial reporting tools, valuation methodologies, digital reporting formats, and the integration of accounting data with strategic analytical models.

The methodological basis of the study is a combination of general scientific and specialized methods. Methods of analysis and synthesis, induction and deduction are used to explore the theoretical foundations of enterprise valuation and to generalize approaches to accounting and analytical integration. The abstraction method is applied to identify typical valuation models used in Ukrainian enterprises. The structural-functional method is used to examine the relationship between accounting systems and analytical tools in the valuation process. The systematization method is employed to classify valuation approaches by enterprise type, reporting format, and risk environment. The logical generalization method is used to formulate conclusions and recommendations for improving accounting and analytical support in determining enterprise potential.

Research results. The accounting and analytical support for valuation of Ukrainian enterprises' potential represents a comprehensive system integrating reliable accounting practices with systematic analytical methods (Nitsenko & Rudenko, 2017). This framework aims to assess the true economic value and future prospects of companies in alignment with both national and international standards. The integration of these components is essential for accurate financial reporting, strategic decision-making, and effective communication with stakeholders in Ukraine's evolving business environment. Building on this foundation, Ukrainian financial reporting standards for enterprise potential valuation mandate adherence to International Financial Reporting Standards (IFRS) and require the exclusive use of XBRL format for structured, machine-readable reporting (Nitsenko & Kravchuk, 2014; Nitsenko & Yeliferenko, 2015). This requirement applies to all companies preparing statements under international standards, particularly affecting large enterprises, public interest entities, and listed companies. The transition to XBRL-based IFRS reporting represents a significant advancement in Ukraine's financial reporting infrastructure aimed at enhancing comparability and transparency. A similar emphasis on the strategic use of structured accounting data to support enterprise management has been highlighted in recent research focused on improving decision-making efficiency through integrated accounting systems (Nitsenko et al., 2017; Shapovalova et al., 2017), where accounting and analytical information is positioned as a core driver of decision-making efficiency. These regulatory changes reflect Ukraine's broader effort to align its enterprise valuation practices with international standards. Large enterprises, public interest entities, and listed companies are now required to prepare and submit IFRS-compliant financial statements, which supports enhanced oversight and investor confidence. Such alignment is critical for accurately assessing enterprise potential and market value in Ukraine's developing capital market landscape, particularly as the country continues to integrate with global financial systems (Ukraine completes the switch to XBRL-only reporting, 2025).

Within this framework, the principal valuation methods applied in Ukraine for financial reporting purposes include historical cost, present value, net selling price, and fair value approaches. Fair value methodologies have become central to reflecting the current worth of assets and liabilities in accordance with IFRS requirements. These methods incorporate discounted cash flow analysis, asset-based valuation, and market approaches, providing a comprehensive framework for assessing enterprise value. The selection of appropriate valuation methods depends on the specific characteristics of the enterprise, industry conditions, and the purpose of the valuation.

To further enhance strategic decision-making, Ukrainian enterprises increasingly employ value-based management (VBM) frameworks to assess and improve business potential. These approaches focus on creating and maximizing shareholder value through strategic decisions aligned

with value drivers. Key methodologies within this framework include Economic Value Added (EVA), Market Value Added (MVA), and Discounted Cash Flow (DCF) modeling. These tools enable management to identify value-creating activities, optimize resource allocation, and establish performance metrics that align with long-term value creation objectives rather than short-term accounting profits. EVA has gained particular prominence in Ukrainian enterprise valuation practices as it measures the difference between the return on capital and the cost of capital, effectively quantifying the value created beyond the required return of investors. A similar emphasis on the strategic role of structured accounting data in enterprise management has been highlighted in recent research, where accounting and analytical information is treated as a key factor in enhancing decision-making efficiency (Nitsenko et al., 2018). This metric helps Ukrainian companies identify whether they are generating returns that exceed their cost of capital, providing insights into true economic profitability. EVA calculations require adjustments to traditional accounting figures to better reflect economic reality, making it a sophisticated tool for assessing enterprise potential value creation capabilities (Veremeev, 2025). The key metrics and their applications are summarized in Table 1.

Table 1. Value-based metrics and their application in ukrainian enterprises

Value-Based Metric	Definition	Application in Ukrainian Enterprises
Economic Value Added	Operating profit after taxes minus capital charge	Performance measurement and incentive systems
Market Value Added	Difference between market value and invested capital	Assessment of long-term value creation
Discounted Cash Flow	Present value of projected future cash flows	Business valuation and investment decision-making
Net Present Value	Present value of future cash flows minus initial investment	Project feasibility assessment
Internal Rate of Return	Discount rate that makes NPV equal to zero	Investment project evaluation
Profitability Index	Ratio of present value to initial investment	Ranking of investment alternatives

Source: constructed using (Veremeev, 2025).

The effective integration of accounting and analytical components forms the foundation of enterprise potential valuation in Ukraine. Accounting support ensures that enterprise assets, liabilities, income, and expenses are accurately measured and recorded in compliance with relevant standards. This provides the reliable financial data necessary for subsequent analysis. Analytical support then encompasses the selection and implementation of appropriate valuation models to estimate enterprise value, considering Ukraine's specific regulatory environment, industry conditions, and strategic objectives. This integrated approach requires sophisticated information systems capable of processing and analyzing large volumes of financial and non-financial data. Ukrainian enterprises are increasingly investing in digital transformation initiatives to enhance their accounting and analytical capabilities. Advanced enterprise resource planning (ERP) systems, business intelligence tools, and specialized valuation software enable more accurate and timely assessment of business potential. These technological advancements support better decision-making by providing management with comprehensive insights into value drivers and performance indicators (Prodanchuk et al., 2023).

Asset valuation represents a fundamental component of enterprise potential assessment in Ukraine. This approach involves detailed analysis of both tangible and intangible assets to determine their contribution to overall business value. Tangible assets include property, plant, equipment, and inventory, while intangible assets encompass intellectual property, brand value, customer relationships, and organizational knowledge. Ukrainian valuation practices increasingly recognize the significance of intangible assets in determining enterprise potential, particularly in knowledge-intensive and service-oriented industries (Giallourakis, 2025). The asset-based approach

typically involves adjusting the book value of assets to reflect their current market value, considering factors such as depreciation, obsolescence, and replacement costs. This methodology is particularly relevant for asset-intensive industries and provides a baseline valuation that can be complemented by income-based approaches. In the Ukrainian context, asset valuation must navigate challenges related to market illiquidity for certain asset classes and the need to account for country-specific risk factors that may affect asset values.

Income-based valuation approaches, particularly Discounted Cash Flow (DCF) modeling, have become essential tools for assessing Ukrainian enterprises' potential. These methods focus on the enterprise's ability to generate future economic benefits, providing a forward-looking perspective on value creation. DCF analysis involves projecting future cash flows and discounting them to present value using an appropriate discount rate that reflects the time value of money and the risk associated with the projected cash flows. The importance of statistical modeling in optimizing accounting processes and improving the reliability of financial projections has been highlighted in recent research, where analytical methods are applied to enhance accounting efficiency under conditions of digital transformation (Birchenko et al., 2025). This approach aligns with the principle that an enterprise's value is ultimately determined by its ability to generate returns for its investors. The components and Ukrainian-specific considerations of DCF modeling are summarized in Table 2.

Table 2. DCF components and Ukrainian-specific considerations

DCF Component	Description	Ukrainian-Specific Considerations
Cash Flow Projections	Forecast of future free cash flows	Higher uncertainty requiring multiple scenarios
Projection Period	Explicit forecast period (typically 5–10 years)	Shorter periods due to higher uncertainty
Terminal Value	Value beyond explicit forecast period	Conservative growth assumptions recommended
Discount Rate	Weighted average cost of capital (WACC)	Higher risk premiums for country risk
Country Risk Premium	Additional return for Ukraine-specific risks	Ranges from 5–10% depending on industry
Sensitivity Analysis	Testing impact of changing key assumptions	Essential due to volatile economic conditions

Source: constructed using (Birchenko et al., 2025).

Market-based or comparative valuation approaches utilize data from comparable companies or transactions to estimate the value of Ukrainian enterprises. These methods rely on valuation multiples such as Price-to-Earnings (P/E), Enterprise Value-to-EBITDA (EV/EBITDA), and Price-to-Book (P/B) ratios derived from similar companies or recent transactions in the same industry. The application of these approaches in Ukraine is challenged by the limited number of publicly traded companies, relatively illiquid capital markets, and the scarcity of transparent transaction data, particularly for certain industry sectors. To address these limitations, Ukrainian valuation practitioners often incorporate international comparables with appropriate adjustments for country risk and market differences. This approach requires careful selection of comparable companies that share similar business models, growth prospects, and risk profiles with the target enterprise. Additionally, valuation multiples may need to be adjusted to account for differences in accounting standards, capital structure, and operational efficiency. Despite these challenges, market-based approaches provide valuable benchmarks for cross-checking valuations derived from other methodologies. (Lesyk, 2025). Common valuation multiples and their relevance to the Ukrainian context are summarized in Table 3.

Table 3. Valuation multiples and their application in Ukraine

Valuation Multiple	Calculation	Application in Ukrainian Context
Price-to-Earnings (P/E)	Market price per share / Earnings per share	Limited use due to earnings volatility
Enterprise Value-to-EBITDA	Enterprise value / EBITDA	Preferred for operational comparison
Price-to-Book (P/B)	Market price per share / Book value per share	Useful for asset-heavy industries
Enterprise Value-to-Revenue	Enterprise value / Revenue	Applied for growing companies with negative earnings
Sector-Specific Multiples	Various industry-specific metrics	Adapted to Ukrainian industry characteristics

Source: constructed using (Lesyk, 2025).

Enterprise valuation in Ukraine faces several distinctive challenges that affect the accuracy and reliability of potential value assessments. The country's economic volatility, characterized by currency fluctuations, inflation variability, and interest rate changes, creates significant uncertainty in financial projections. Political instability and ongoing geopolitical tensions introduce additional risk factors that must be incorporated into valuation models. These macroeconomic and geopolitical challenges necessitate more sophisticated risk assessment methodologies and scenario-based approaches to enterprise valuation. The Ukrainian business environment also presents challenges related to information transparency and reliability. Financial reporting quality varies significantly across enterprises, with inconsistent application of accounting standards and limited disclosure practices. This information asymmetry complicates the valuation process by increasing the difficulty of obtaining accurate and comparable financial data. Additionally, the prevalence of informal business practices and shadow economy elements in certain sectors further complicates the assessment of true enterprise potential, requiring valuation practitioners to apply additional scrutiny and adjustments (Business Sentiment in Ukraine: Q2 2025 Voice of the Market Report., 2023).

Regulatory compliance has become increasingly important in Ukrainian enterprise valuation, particularly with the implementation of stricter Anti-Money Laundering (AML) and Know Your Customer (KYC) requirements. These regulations aim to prevent financial crimes and ensure transparency in business transactions, directly impacting valuation practices. Enterprises with robust compliance frameworks typically command higher valuations due to reduced regulatory risk. Valuation practitioners must now incorporate compliance assessment into their due diligence processes, evaluating the potential financial and reputational impacts of compliance deficiencies. Moreover, risk management practices significantly influence enterprise potential valuation in Ukraine. Companies that demonstrate sophisticated risk identification, assessment, and mitigation capabilities are generally valued more favorably than those with inadequate risk management frameworks. Key risk management components that affect valuation include due diligence processes, ongoing market and regulatory monitoring, and stress-testing methodologies. These practices are particularly important for enterprises with foreign capital or investment interests, as international investors typically apply more stringent risk assessment criteria when evaluating Ukrainian business opportunities (The Ukrainian Business Council has identified TOP-10 priorities for 2025, 2023).

In light of these developments, the harmonization of Ukrainian valuation practices with international standards represents a significant trend in accounting and analytical support for enterprise potential assessment. This alignment aims to enhance the comparability and credibility of Ukrainian enterprise valuations in the global context. The adoption of International Financial Reporting Standards (IFRS) and International Valuation Standards (IVS) provides a common framework for financial reporting and valuation methodologies. However, this harmonization process requires careful adaptation to address discrepancies in legal frameworks and market conditions specific to Ukraine. Despite progress in standards harmonization, significant challenges

remain in achieving full alignment between Ukrainian and international valuation practices. These challenges include differences in professional qualification requirements, varying levels of market development, and distinct legal and regulatory environments. The effectiveness of valuation in Ukraine continues to be hampered by a lack of standardization in certain areas, highlighting the need for further development of professional guidelines and methodologies that bridge local requirements with global best practices (Roieva & Shepeliuk., 2023).

Discussion. The research results confirm that the value of enterprise potential in Ukraine is determined by a combination of accounting transparency, analytical integration, digital infrastructure, and regulatory alignment. Despite institutional fragmentation and post-conflict disruptions, enterprises demonstrate resilience through the adoption of IFRS standards, investment in ERP systems, and the implementation of value-based management frameworks.

Nitsenko et al. (2017) emphasize that accounting and analytical information is a core driver of decision-making efficiency. Their study highlights the importance of structured data systems in supporting managerial decisions, particularly in the context of enterprise marketing and financial diagnostics.

Myskin, Romanyuk, and Deneshchuk (2023) propose a stakeholder-oriented model of accounting and analytical support. Their framework integrates absorption costing, value-based management, and balanced scorecards, allowing for differentiated valuation perspectives depending on enterprise type and strategic objectives.

Birchenko, Lutsenko, and Ostapenko (2025) demonstrate that statistical modeling significantly improves the reliability of financial projections. Their findings confirm that accounting optimization under digital conditions requires the integration of quantitative methods with strategic diagnostics, especially when assessing enterprise potential in high-risk sectors.

Olyadnichuk and Pidlubna (2020) argue that effective valuation depends on the integration of financial, technical, and social indicators. Their structured model of accounting and analytical support emphasizes the role of vertical and horizontal diagnostics in forming a reliable information base for decision-making.

Yaremko (2022) introduces the concept of goal-oriented accounting systems, where performance indicators such as Economic Value Added (EVA) serve as benchmarks for managing enterprise development. His approach aligns accounting outputs with strategic planning and national recovery objectives.

Olyadnichuk, Krochak, and Ketskalo (2025) focus on agricultural enterprises and propose an algorithm for forming labor and tax-related indicators. Their work enhances the quality of analytical data and supports enterprise valuation in sectors with complex regulatory and operational environments.

Lesyk (2025) explores the application of market-based valuation approaches in Ukraine. He notes that limited liquidity and transparency in capital markets require careful adjustment of valuation multiples. His study supports the use of international comparables with country-specific risk premiums to ensure realistic and defensible assessments.

Prodanchuk et al. (2023) examine the impact of digital transformation on accounting and analytical support. Their research shows that ERP systems, business intelligence platforms, and valuation software improve data quality, support real-time analytics, and enable strategic diagnostics.

Overall, the discussion supports a multidimensional approach to enterprise potential assessment. Financial indicators must be evaluated alongside innovation capacity, digital infrastructure, and regulatory compliance. Future research should focus on developing integrated assessment tools that combine financial diagnostics with risk modeling, intangible asset scoring, and institutional benchmarking. Such tools will enable more accurate valuation, support strategic decision-making, and strengthen Ukraine’s position in global investment markets during post-conflict recovery and modernization.

Conclusions. The methodology of accounting and analytical support is a multifaceted and strategically important tool for determining the value of enterprise potential. It is based on the integration of financial reporting, valuation models, analytical diagnostics, and digital technologies, which together ensure a systematic and forward-looking approach. An analysis of current practices shows that, despite the diversity of methods and uneven levels of digitalization, the effective use of accounting and analytical tools contributes to greater transparency, more accurate valuation, and improved strategic decision-making.

Research confirms that the application of fair value assessment, discounted cash flow models, and value-based indicators such as EVA, supported by IFRS and XBRL reporting, are critical for reliable enterprise valuation. However, the effectiveness of these tools depends heavily on the availability of qualified personnel, technological infrastructure, and regulatory consistency — factors that remain uneven across Ukrainian enterprises.

The current challenges — including economic volatility, geopolitical risks, limited access to capital, and the need for harmonization with international standards — require continuous development of accounting and analytical systems. This includes standardization of valuation approaches, investment in digital platforms, and the formation of interdisciplinary competencies.

Therefore, further research and practical implementation of integrated accounting and analytical frameworks is essential for enhancing the credibility, investment attractiveness, and sustainable development of Ukrainian enterprises in both domestic and international markets.

References

1. Arefieva, O., & Dolzhenko, D. (2024). Theoretical basis for the formation of economic potential of an enterprise in conditions of increased transparency of development processes. *Adaptive Management Theory and Practice Economics*, 18(36). DOI: https://doi.org/10.33296/2707-0654-18(36)-06 [In Ukrainian]
2. Birchenko, N., Lutsenko, O., & Ostapenko, R. (2025). Application of statistical analysis methods in the process of accounting optimization. *Problems and prospects of economics and management*, 2(42), 373–383. DOI: https://doi.org/10.25140/2411-5215-2025-2 (42)-373-383 [In Ukrainian]
3. Business Sentiment in Ukraine: Q2 2025 Voice of the Market Report (including Benchmarking Survey results) - UkraineInvest. (2025). *UkraineInvest*. Retrieved from: https://ukraineinvest.gov.ua/en/news/business-sentiment-in-ukraine-q2-2025-voice-of-the-market-report-including-benchmarking-survey-results/ [In Ukrainian]
4. Giallourakis, A. (2025). Ukraine Business Climate Survey 2025. *Start page - Business Sweden*. Retrieved from: https://www.business-sweden.com/insights/reports/business-climate-surveys/ukraine-business-climate--survey-2025/
5. Kvaternyuk, A. (2022). Forming the innovative potential of agricultural enterprises. *Current issues in modern science*, 3(3). DOI: https://doi.org/10.52058/2786-6300-2022-3 (3)-156-161[In Ukrainian]
6. Lesyk, Yu. (2025). Methods of business valuation in the system of value-oriented enterprise management. *Economic journal of Lesya Ukrainka Volyn National University*, 2(42), 90–97. DOI: https://doi.org/10.29038/2786-4618-2025-02-90-97 [in Ukrainian]
7. Myskin, Yu. I., Romaniuk, A. P., & Deneshchuk, K. S. (2023). Modelling of accounting and analytical support for enterprise value management. *Ukrainian Economic Journal*, 1, 34–37. DOI: https://doi.org/10.32782/2786-8273/2023-1-6 [in Ukrainian]
8. Nitsenko V. S., Sahaidak M. P., Berezhna Yu. H., & Tsukanov O. Yu. (2018) Yu. Socio-economic imperatives of the state and the development of the vegetable market: the macroeconomic aspect. *Actual problems of innovative economy*, 4, 53-64.
9. Nitsenko V., Sharapa O., Burdeina N., Hanzhurenko I. (2017a). Accounting and analytical information in the management system of a trading enterprise in Ukraine. *Bulletin of the V.V. Dokuchaev Kharkiv National Agrarian University. Series: Economic Sciences*, 2, 3–18. [in Ukrainian]
10. Nitsenko, V., Kravchuk, A. The Value of Internal Control in the Management of the Processing Plant. *Finance, Accounting, Banks*, 1(20), 215-218. [In Ukrainian]
11. Nitsenko, V.S., & Rudenko, S.V. (2017a). Risk management at the enterprises of the agro-food sector. *Actual problems of innovative economy*, 3, 12-21. [In Ukrainian]
12. Nitsenko, V.S., Masina, K.S., Tsukanov, O.Yu., Ostapenko, R.M. (2017b). Socio-economic imperatives of Ukraine's development. *Bulletin of the KHNAU named after V.V. Dokuchaeva Series "Economic Sciences"*, 4, 41-58. [In Ukrainian]
13. Nitsenko, V.S., Yeliferenko, A.S. (2015). Financial statements of the enterprise: concept, composition, and significance. Financial aspects of the development of the state, regions, and business entities: current state and prospects. *Collection of materials of the 1st International Scientific and Practical Conference*, December 25-26, 2015, Odesa. Odesa: Bondarenko M.O., P. 500-502. [in Ukrainian]
14. Olyadnichuk, N., & Pidlubna, O. (2020). Accounting and analytical support of economic activity of entrepreneurship subjects. *Herald UNU. International Economic Relations and World Economy*, 33. DOI: https://doi.org/10.32782/2413-9971/2020-33-25 [In Ukrainian]

15. Olyadnychuk, N., Krochak, O., & Ketska, A. 2025. Accounting and analytical support for agricultural enterprises: personnel, labour, payment and taxation, reporting. *Sustainable economic development*, 2(53), 391–398. DOI: https://doi.org/10.32782/2308-1988/2025-53-54 [In Ukrainian]
16. Prodanchuk, M., Dankevich, A., Aksyonova, O., & Tomchuk, O. (2023). Digital tools for accounting and analytical support of enterprises: innovative and managerial aspects. *Economy Ecology Society*, 7, 27-39. DOI: https://doi.org/10.61954/2616-7107/2023.7.4-3 [In Ukrainian]
17. Roieva, O., & Shepeliuk, V. (2024). The influence of international financial reporting standards on the development of national accounting and reporting systems of Ukraine. *Scientific notes*, 36, 138–148. DOI: https://doi.org/10.33111/vz_kneu.36.24.03.13.089.095 [In Ukrainian]
18. Shapovalova, N.P., Nitsenko, V.S., Fomenko, A.O. (2017). Ways to improve the efficiency of material resources at JSC "Carlsberg Ukraine". *Bulletin of the V.V. Dokuchaev Kharkiv National Agrarian University. Series: Economic Sciences*, 1, 109-121. [in Ukrainian]
19. Shubina, S., Piskunov, R., Nitsenko, V., Miroshnyk, O., & Pelykh, D. (2025). Accounting and analytical support of the efficiency of fixed assets use in managing the efficiency of business processes of the enterprise. *Financial and Credit Systems: Prospects for Development*, 1(16), 88-100. DOI: https://doi.org/10.26565/2786-4995-2025-1-07
20. The Ukrainian Business Council has identified TOP-10 priorities for 2025 (2025). *National Platform for Small and Medium-Sized Businesses*. Retrieved from: https://platforma-msb.org/en/the-ukrainian-business-council-has-identified-top-10-priorities-for-2025/
21. Ukraine completes the switch to XBRL-only reporting (2025). *XBRL*. Retrieved from: https://www.xbrl.org/news/ukraine-completes-the-switch-to-xbrl-only-reporting/
22. Veremeev, N. (2025). Business with Ukraine in 2025: Features and Trends. *COREDO*. Retrieved from: https://coredo.eu/business-with-ukraine-in-2025-key-features-and-trends/
23. Voskalo, N., & Kovalchik, T. (2024). The role of accounting and analytical support in forming the investment policy of an enterprise. *Economics and Society*, 61. DOI: https://doi.org/10.32782/2524-0072/2024-61-135
24. Yaremko, I. Y. (2022). Accounting and analytical support as a tool for managing the economic development of an enterprise. *Problems of modern transformations. Series: Economics and Management*, 6. DOIhttps://doi.org/10.54929/2786-5738-2022-6-09-02

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Духновська Людмила
кандидат економічних наук, доцент кафедри обліку і аудиту
Навчально-наукового інституту економіки і управління,
Національний університет харчових технологій. Україна, Київ
e-mail: mila.duhnovska@gmail.com
ORCID ID: 0000-0002-4617-4108
Рябенко Володимир
кандидат економічних наук, доцент кафедри економіки і права,
Національний університет харчових технологій. Україна, Київ
e-mail: viar0275@gmail.com
ORCID ID: 0000-0003-1091-4992
Мельниченко Олег
аспірант кафедри економіки і права Навчально-наукового інституту економіки і управління,
Національний університет харчових технологій. Україна, Київ
e-mail: innovation.ep4@gmail.com
ORCID ID: 0009-0001-8510-6394

Обліково-аналітичне забезпечення формування вартості потенціалу підприємств

Анотація. Обліково-аналітичне забезпечення оцінки потенціалу підприємств є стратегічним інструментом для підвищення прозорості, мобілізації інвестицій та забезпечення сталого розвитку в умовах постконфліктного відновлення та інтеграції у глобальні ринки. Дослідження зосереджується на гармонізації фінансової звітності, впровадженні цифрових технологій, адаптації оціночних моделей та розвитку кадрового потенціалу.

Постановка проблеми. Основна проблема полягає у фрагментарності підходів до оцінки потенціалу підприємств, обмеженій інтеграції міжнародних стандартів та недостатній аналітичній спроможності. Підприємства стикаються з труднощами у поєднанні облікових даних із стратегічними моделями оцінки, особливо в умовах економічної нестабільності, регуляторної невизначеності та низької порівнянності ринкових орієнтирів.

Невирішені аспекти проблеми. До ключових викликів належать недостатнє використання оцінки нематеріальних активів, обмежена адаптація моделей DCF до українських ризиків, а також слабка інтеграція облікових систем з аналітичними платформами. Вплив цифрових форматів звітності (зокрема XBRL), механізмів комплаєнсу та міжнародних порівняльних показників на точність оцінки потребує подальшого дослідження.

Мета статті. Розробити комплексну методологію обліково-аналітичного забезпечення оцінки потенціалу підприємств, що поєднує принципи справедливої вартості, вартісно-орієнтованого управління, цифрову трансформацію та ризик-орієнтований підхід.

Виклад основного матеріалу. У статті проаналізовано структуру обліково-аналітичного забезпечення, впровадження МСФЗ та XBRL, застосування моделей справедливої вартості, EVA, DCF та ринкових підходів. Розглянуто роль ERP-систем, BI-платформ та спеціалізованого програмного забезпечення у підвищенні якості даних та точності моделювання. Особливу увагу приділено оцінці нематеріальних активів, адаптації облікових систем до ризиків та впровадженню цифрових рішень для підтримки стратегічного управління. Наведено таблиці з ключовими метриками, компонентами оцінки та особливостями застосування методів в українських умовах.

Висновки. Незважаючи на інституційні та макроекономічні виклики, українські підприємства демонструють потенціал для достовірної оцінки та стратегічного розвитку. Інтегрований, стандартизований та цифрово підкріплений підхід до обліково-аналітичного забезпечення сприяє прозорості, підвищує інвестиційну привабливість та забезпечує відповідність міжнародним стандартам. Подальші дослідження та практична реалізація таких підходів є ключовими для зміцнення довіри, модернізації економіки та інтеграції України у глобальні фінансові ринки.

Ключові слова: *потенціал підприємства, бухгалтерська підтримка, аналітичне моделювання, методи оцінки, справедлива вартість, фінансова діагностика, Україна, МСФЗ, XBRL, оцінка інвестицій.*

Класифікація JEL: M41, G32, C81, O16.

Формули: 0; Рисунки: 0’ Таблиці: 3; Література: 24

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Список літератури

1. Ареф'єва О., Долженко Д. Теоретичне підґрунтя формування економічного потенціалу підприємства в умовах посилення транспарентності розвиткових процесів. *Адаптивне управління: теорія і практика. Серія Економіка*. 2024. № 18(36). https://doi.org/10.33296/2707-0654-18(36)-06
2. Бірченко Н., Луценко О., Остапенко Р. Застосування методів статистичного аналізу в процесі оптимізації бухгалтерського обліку. *Проблеми і перспективи економіки та управління*. 2025. № 2(42). С. 373–383. https://doi.org/10.25140/2411-5215-2025-2(42)-373-383
3. Воськало Н., Ковальчик Т. Роль обліково-аналітичного забезпечення у формуванні інвестиційної політики підприємства. *Економіка та суспільство*. 2024. № 61. https://doi.org/10.32782/2524-0072/2024-61-135
4. Кватернюк А. Формування інноваційного потенціалу сільськогосподарських підприємств. *Актуальні питання у сучасній науці*. 2022. № 3(3)). https://doi.org/10.52058/2786-6300-2022-3(3)-156-161
5. Лесик Ю. Методи оцінки вартості бізнесу в системі вартісно-орієнтованого управління підприємством. *Економічний часопис Волинського національного університету ім. Лесі Українки*. 2025. № 2(42), 90–97. https://doi.org/10.29038/2786-4618-2025-02-90-97
6. Мискін Ю. І., Романюк А. П., Денещук К. С. Моделювання обліково-аналітичного забезпечення управління цінністю підприємства. *Український економічний часопис*. 2023. № 1. С. 34–37. https://doi.org/10.32782/2786-8273/2023-1-6
7. Ніценко В.С., Єліференко А.С. Фінансова звітність підприємства: поняття, склад та значення. Фінансові аспекти розвитку держави, регіонів та суб'єктів господарювання: сучасний стан та перспективи. *Збірник матеріалів І Міжнародної науково-практичної конференції* 25-26 грудня 2015 року м. Одеса. Одеса: Бондаренко М.О., 2015. С. 500-502.
8. Ніценко В.С., Кравчук А.О. Значення внутрішнього контролю в управлінні переробним підприємством. *Фінанси, облік, банки*. 2014. № 1 (20). С. 215-218.
9. Ніценко В.С., Мазіна К.С., Цуканов О.Ю., Остапенко Р.М. Соціально-економічні імперативи розвитку України. *Вісник ХНАУ ім. В.В. Докучаєва. Серія «Економічні науки».* 2017. № 4. С. 41-58.
10. Ніценко В.С., Руденко С.В. Управління ризиками на підприємствах агропродовольчої сфери. *Актуальні проблеми інноваційної економіки*. 2017. № 3. С. 12-21.
11. Ніценко В.С., Сагайдак М.П., Бережна Ю.Г., Цуканов О.Ю. Соціально-економічні імперативи стану та розвитку овочевого ринку: макроекономічний аспект. *Актуальні проблеми інноваційної економіки.* 2018. № 4. С. 5-17.
12. Оляднічук Н. В., Підлубна О. Д. Обліково-аналітичне забезпечення економічної діяльності суб'єкта підприємництва. *Науковий вісник Ужгородського національного університету. Серія: Міжнародні економічні відносини та світове господарство.* 2020. Вип. 33. Ч. 2. С. 16-21. https://doi.org/10.32782/2413-9971/2020-33-25
13. Оляднічук Н., Крочак О., Кецкало А. Обліково-аналітичне забезпечення сільськогосподарського підприємства: кадри, праця, оплата й оподаткування, звітність. *Сталий розвиток економіки*. 2025. № 2(53). С. 391–398. https://doi.org/10.32782/2308-1988/2025-53-54
14. Роєва О.С., Шепелюк В.А. Вплив міжнародних стандартів фінансової звітності на розвиток національних систем обліку та звітності України. *Збірник наукових праць "Вчені записки".* 2024. № 36(3). С. 138-148. http://doi.org/10.33111/vz_kneu.36.24.03.13.089.095
15. Стрикун Г. Українська Рада Бізнесу визначила ТОП-10 пріоритетів на 2025 рік. *Національна платформа малого і середнього бізнесу.* 2025. https://platforma-msb.org/ukrayinska-rada-biznesu-vyznachyla-top-10-priorytetiv-na-2025-rik/
16. Шаповалова Н.П., Ніценко В.С., Фоменко А.О. Шляхи підвищення ефективності використання матеріальних ресурсів на ПАТ «Карлсберг Україна». *Вісник ХНАУ ім. В.В. Докучаєва. Серія «Економічні науки».* 2017. № 1. С. 109-121.
17. Яремко І. Й. Обліково-аналітичне забезпечення як інструментарій управління економічним розвитком підприємства. *Проблеми сучасних трансформацій. Серія: економіка та управління*. №6. https://doi.org/10.54929/2786-5738-2022-6-09-02
18. Business Sentiment in Ukraine: Q2 2025 Voice of the Market Report (including Benchmarking Survey results). 2025. *UkraineInvest*. https://ukraineinvest.gov.ua/en/news/business-sentiment-in-ukraine-q2-2025-voice-of-the-market-report-including-benchmarking-survey-results/
19. Giallourakis, A. Ukraine Business Climate Survey 2025. *Business Sweden.* 2025. https://www.business-sweden.com/insights/reports/business-climate-surveys/ukraine-business-climate--survey-2025/
20. Nitsenko V., Sharapa O., Burdeina N., Hanzhurenko I. (2017). Accounting and analytical information in the management system of a trading enterprise in *Вісник ХНАУ ім. В.В. Докучаєва. Серія «Економічні науки».* 2017. № 2. С. 3-18.
21. Prodanchuk M., Dankevich A., Aksyonova O., Tomchuk, O. Digital tools for accounting and analytical support of enterprises: innovative and managerial aspects. *Economy Ecology Society.* 2023. № 7. С. 27-39. https://doi.org/10.61954/2616-7107/2023.7.4-3
22. Shubina S., Piskunov R., Nitsenko V., Miroshnyk O., Pelykh D. Accounting and analytical support of the efficiency of fixed assets use in managing the efficiency of business processes of the enterprise. *Financial and Credit Systems: Prospects for Development.* 2025. Vol. 1(16). pp. 88-100. https://doi.org/10.26565/2786-4995-2025-1-07
23. Veremeev N. Business with Ukraine in 2025: Features and Trends. COREDO. 2025. https://coredo.eu/business-with-ukraine-in-2025-key-features-and-trends/
24. XBRL. Ukraine completes the switch to XBRL-only reporting. 2025. https://www.xbrl.org/news/ukraine-completes-the-switch-to-xbrl-only-reporting/

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Kucherenko Serhii
Head of the Consulting Department,
Keynas-Consulting LLC,
36 A Biloruska Street, Kyiv, 04119, Ukraine
Postgraduate Student of the Department of Accounting and Auditing
State Tax University
31 Universytetska Street, Irpin, 08205, Ukraine
e-mail: kucherenko_s@ukr.net
ORCID ID: 0009-0002-4133-5547

Current trends in the development of accounting and analytical support for tax risk management

Abstract. The object of research within this article is the accounting and analytical support for managing enterprises' tax risks as an integrated system for collecting, systematizing, interpreting, and analyzing data from financial, managerial, and tax accounting to inform sound decisions in the field of taxation. Its structural foundation consists of three interrelated subsystems—accounting, analytical, and control (audit). The system's critical characteristics are the timeliness of information and its adaptability to environmental changes.

Problem statement. Under conditions of an unstable economy and constant changes in tax legislation, traditional accounting approaches lose effectiveness, complicating the timely identification and minimization of tax risks.

Unresolved aspects of the problem. Despite considerable attention to risk management and digital tools, the accounting and analytical support for tax risk management itself remains insufficiently studied; there is a shortage of well-developed solutions for data integration and risk-assessment methodologies. The directions for further research are outlined: improving assessment methods, innovative tax planning, and creating comprehensive models for different industries.

Purpose of the article. To define the nature and functions of accounting and analytical support for managing tax risks of business entities, to identify the system's key components, and to outline the problems, challenges, and trends in the transition from traditional systems to modern digital ones.

Presentation of the main material. The methodology relies on analyzing contemporary approaches and practical aspects of implementing adaptive information-analytical systems. Logical generalization, comparison, analysis and synthesis, as well as expert assessments, were applied. The results demonstrated the need to modernize accounting and substantiated the three subsystems as the system's core; the advisability of integrating separate types of accounting into a single information system has been proven. A conceptual digital model is proposed that combines automated accounting systems, analytical platforms for risk assessment, and electronic audit; positive effects from using digital technologies are recorded, and challenges are outlined—cost, cybersecurity, and regulatory dynamism. The role of SAF-T UA and e-reporting as tools for enhancing transparency and promptness is also emphasized.

Conclusions. Accounting and analytical support is a key element of tax risk management; its effectiveness increases under conditions of digitalization, strengthened internal control, staff upskilling, and the use of insurance instruments. Practical steps include the regular calculation of risk indicators, ensuring transparency, applying criteria of voluntary tax compliance, and implementing electronic audit (SAF-T UA).

Keywords: *tax risks, tax risk management, tax planning, accounting and analytical support, digitalization of accounting, automated accounting systems, integration of financial and management data, electronic audit.*

Formulas: 0; fig.: 3, tabl.: 0, bibl.: 20

JEL Classification: H21, H25, M40

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Introduction. In the current environment—marked by profound transformations in the global economy and heightened political and economic uncertainty—risk management has gained particular urgency for enterprises across ownership forms and industry sectors. Tax risks are no exception. Their effective management is critically important for ensuring enterprises' financial resilience and competitiveness amid an unstable economic situation and continual changes in tax legislation. A key role in this process is played by accounting and analytical support, which is designed to provide the information necessary to identify, assess, and minimize tax risks, thereby enabling timely managerial decision-making, forecasting of potential adverse events, and prompt adaptation of the enterprise's strategy to changes in the external environment. At the same time, current realities create conditions under which traditional approaches to accounting and information analysis lose their effectiveness. Contemporary scholarly discourse focuses on integrating digital technologies into accounting to enhance the effectiveness of risk management.

Literature Review. A survey of recent studies in tax risk management and the accounting and analytical support for managerial decision-making indicates the growing importance of an integrated approach to tax risk management that combines traditional risk-management methods with modern digital technologies and tools. Particular attention is devoted to developing accounting and analytical support as the foundation for effective managerial decision-making within tax risk management. The works of Shalaev, Kozhanchikov & Kozhanchikova [15], Khodus [7], and Namazi & Rakhsha [13] focus on the conceptual underpinnings of tax risk management. These researchers define the concept of "tax risks," propose a model for their minimization, and emphasize the need to integrate the tax risk management process into the enterprise's overall risk-management system. In the studies by Iershova and Grinko [4], Lemishovska and Hadzalo [10], Prodanchuk, Dankevych, Aksonova, & Tomchuk [14], as well as Zhang [20], the issue of accounting and analytical support for risk management is examined. The authors stress the importance of high-quality accounting and analytical support for financial decision-making, develop the conceptual foundations of accounting and analytical support for enterprise management systems, and pay special attention to the digitalization of accounting-analytical processes. The article by Kraievskyi, Kolisnyk & Skoryk [8] investigates the impact of digitalization on accounting and analytical technologies in business management, revealing key aspects of the accounting profession's digital transformation. Chvertko and Puholovko [1] explore the potential of using insurance coverage to manage corporate tax risks, proposing a comprehensive approach to insuring tax risks as a tool for their minimization. Krupa [9] provides empirical evidence on how enterprise risk assessment influences tax aggressiveness, based on an analysis of ORSA regulation in the United States. Gustina, Safelia, & Ridwan [2] examine the relationship between enterprise risk management, tax evasion, and firm value. The works of Li & Guo [12] and Wei [18] address the digital transformation of corporate tax management. Karpushenko, Momot, Mizik, and Shapoval [6] analyze the specifics of accounting and analytical support for enterprise risk management under martial law, with particular attention to the identification, assessment, and accounting representation of risks.

As is evident, tax risks and accounting and analytical support are the focus of many domestic and international studies. Considerable attention is devoted to introducing advanced technologies and information systems into tax risk management. However, the specific dimension of accounting and analytical support for the management of tax risks per se remains under-researched. The closest related studies concern the accounting and analytical support of enterprises' economic security and risk management more broadly, yet they do not sufficiently address the distinctive features of applying accounting and analytical mechanisms to reduce tax risks.

Purpose, objectives and research methods. The aim of this article is to define the essence and functions of the accounting and analytical support for the tax risk management process of business entities; to identify the key components of the accounting and analytical system; and to review existing problems and challenges, as well as trends in the shift from traditional accounting

systems toward modern digital ones. The research methodology is grounded in an analysis of contemporary approaches to accounting and analytical support for tax risk management, along with an examination of practical aspects of implementing adaptive information-analytical systems in enterprises. The study employs methods of logical generalization and comparison, analysis and synthesis, and expert assessments.

Research results. The study analyzed contemporary approaches to the accounting and analytical support of tax risk management and identified its key components. The findings indicate that, under conditions of digital transformation, traditional accounting systems lose effectiveness, necessitating their modernization through the implementation of advanced information-analytical technologies. The analysis distinguished the principal components of the accounting and analytical system for managing tax risks: the accounting, analytical, and control (audit) subsystems. The accounting subsystem ensures the primary collection, recording, and systematization of financial, managerial, and tax information. The analytical subsystem is responsible for the quantitative and qualitative assessment of risks, employing modern methods of statistical analysis and forecasting. The control subsystem encompasses mechanisms of internal and external audit, which enhance the transparency and reliability of data.

A significant contribution of the research is the substantiation of the need to integrate all types of accounting into a single information system, thereby improving the quality of managerial decisions in tax planning. A conceptual model of digital accounting and analytical support is proposed, comprising automated accounting systems, analytical platforms for tax risk assessment, and electronic audit. It was established that enterprises that actively employ digital technologies in accounting and tax management exhibit lower levels of tax risk and better adapt to changes in tax legislation. Furthermore, the study confirmed the necessity of implementing comprehensive risk management that combines financial analysis, automation of accounting processes, and an internal control system.

Among the key challenges faced by enterprises when implementing modern accounting and analytical support are the high cost of digital solutions, insufficient cybersecurity, and the need to adapt to rapid changes in the legislative framework. At the same time, a positive trend is observed in the use of cloud technologies, which promote greater flexibility and increased effectiveness of the accounting system. Thus, the results confirm that integrating digital technologies into the tax risk management process is not only advisable but also a necessary condition for the effective functioning of enterprises in the contemporary economic environment.

Discussion. Most researchers view the concept of “risk” as the probability of the occurrence of adverse circumstances within an enterprise that may lead to the loss of assets, cash, expected profit, or income, or to the incurrence of additional expenses due to unfavorable circumstances or events [6]. In turn, tax risk is understood as the probability that a business entity will face adverse consequences in the sphere of taxation—namely, the need to incur additional financial expenditures resulting from state changes to established taxation rules, errors in tax calculation, additional assessments by the tax authority, as well as fines and penalty interest arising from detected violations of tax legislation [11].

Risk management is one of the principal tasks in today’s volatile economic and regulatory environments. Attention to risk management in the sphere of corporate taxation has begun to grow relatively recently, owing to mounting pressure from multiple directions—company management, the state, and society [1]. The key factors compelling enterprises to devote greater attention to the comprehensive analysis and control of their risks include frequent changes in tax policy, the strengthening of international tax rules, and new challenges associated with the digital economy [5; 18]. The timely identification and assessment of risks has become particularly salient, since a situation that adversely affects the enterprise and leads to unforeseen financial consequences may arise at any moment [6].

To manage their tax risks, enterprises should [1; 7]:

1. Analyze existing state standards for identifying risky taxpayers and implement them when building an internal tax risk management system.

2. Regularly compute the established risk indicators and monitor their activities within allowable thresholds.

3. Use state-defined criteria for voluntary tax compliance to determine their degree of tax risk and the likelihood of potential oversight by the state.

4. Ensure transparency regarding operations, reporting, and other tax-related matters.

5. Implement electronic audit, in particular the formation of the Standard Audit File (SAF-T UA), which will provide a single source of information for assessing tax risks by stakeholders and tax authorities and may spur the development of tax risk insurance mechanisms.

The principal foundation of effective risk management is the accounting and analytical support of this process. In general, the essence of accounting and analytical support lies in creating an information system within which informational materials are collected, systematized, and utilized, analyzed by means of an analytical toolkit to develop effective managerial decisions, to track their implementation, and to conduct performance diagnostics [17]. It is a managerial toolkit integrated into the enterprise's overall information system. Its basis consists of data from the accounting (financial, managerial, and tax accounting) and analytical systems.

Taking into account scholars' views on the nature and tasks of accounting and analytical support for managerial processes [10; 17], we can formulate the following definition of accounting and analytical support for tax risk management: it is a system that helps enterprises identify, assess, and minimize their tax risks. It encompasses the collection, systematization, interpretation, and analysis of financial, tax, and managerial accounting data to make well-grounded decisions in the field of taxation. Such a system is of great importance for enterprises, as it enables them not only to minimize potential losses from tax risks but also to improve overall financial management effectiveness and ensure stable development.

The accounting and analytical system is a complex mechanism. An analysis of scholarly sources [3; 4; 6; 10; 16; 17; 19] makes it possible to distinguish its key components (Fig. 1).

The accounting subsystem is the foundation of the accounting and analytical system, as it ensures the primary collection, recording, and systematization of information. Its core functions include: maintaining financial, managerial, and tax accounting, which enables the formation of a comprehensive information base for managerial decisions; recording primary data and systematizing them to ensure the completeness and reliability of accounting information; and preparing accounting registers and reports, including financial, managerial, statistical, and tax reporting. By performing these functions, the accounting subsystem provides the enterprise with reliable and relevant information for subsequent analysis and control.

The analytical subsystem plays a key role in transforming the mass of accounting information into structured knowledge necessary for planning and managerial decision-making. Its main areas of operation include: quantitative and qualitative assessment of data based on economic analysis; forecasting trends and identifying risks through the application of modern statistical methods and econometric models; and the use of analytical indicators formed on the basis of aggregated data from all types of accounting. It is the analytical subsystem that provides a deep understanding of the enterprise's current state and its future prospects.

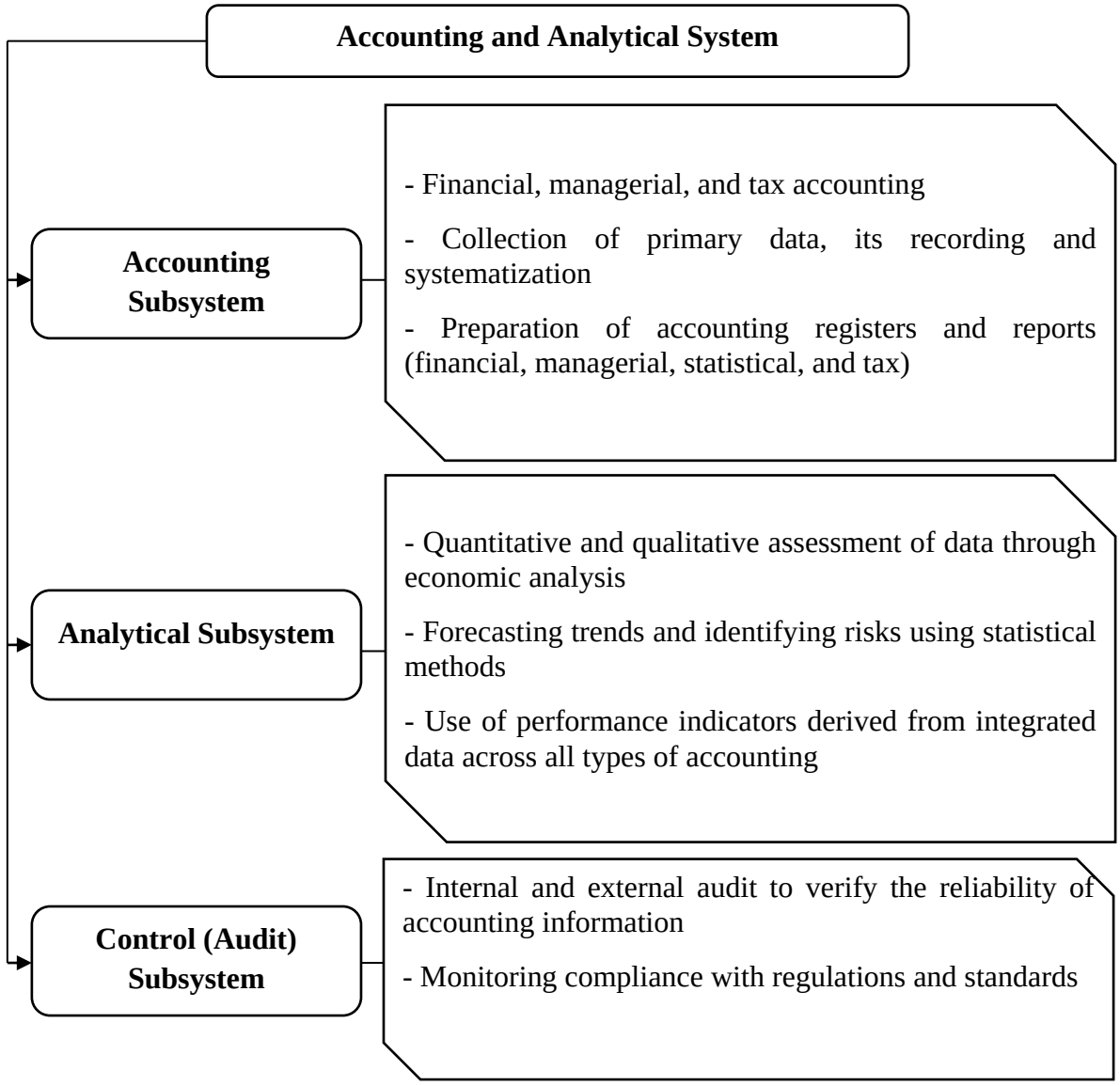

Fig. 1. Key Components of the Accounting and Analytical System
Source: prepared by the author

The control subsystem is aimed at ensuring the reliability of accounting information and compliance with legal and regulatory requirements. Its principal functions include: conducting internal and external audits, which make it possible to verify the reliability of accounting information and detect errors and instances of wrongdoing; and exercising control over compliance with legal and regulatory requirements, which helps strengthen financial discipline and minimize tax risks. The control subsystem plays an important role in enhancing the transparency of the enterprise's financial and economic activities, which is critically important for ensuring the trust of external users of information, including tax authorities.

The functional stages of the accounting and analytical system can be presented as follows (Fig. 2):

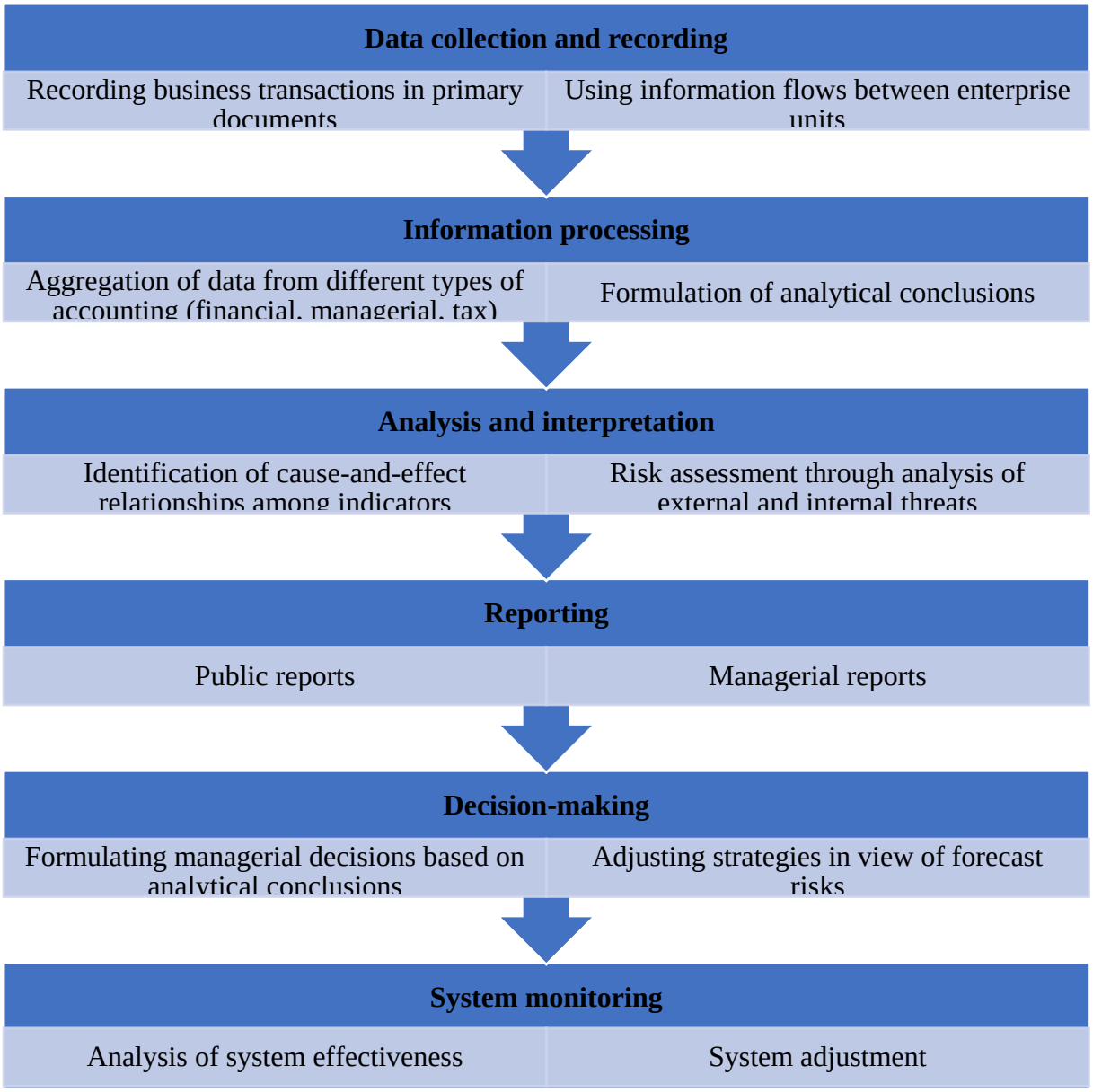

Fig. 2. Functional Stages of the Accounting and Analytical System
Source: prepared by the author based on [3; 19]

Functional stages of the accounting and analytical system are characterized as a vital toolkit that provides information support for making well-substantiated decisions. Below, these stages are examined in greater detail, drawing on contemporary approaches to organizing accounting and analytical support.

1. Collection and registration of primary information. At this stage, incoming information is identified, verified, and recorded, arriving from various sources, including data from accounting systems. Ensuring the completeness, reliability, and timeliness of the obtained data is crucial, as it forms the foundation for subsequent analysis and decision-making.

2. Systematization and processing of information. The collected information is systematized using appropriate methods and approaches. Analytical methods are applied to detect patterns, trends, and interrelationships among indicators. The use of modern information systems and analytical models is important to increase the effectiveness of this stage.

3. Analysis and interpretation of data. Based on the systematized information, financial and economic analysis is conducted using various analytical tools. The aim is to obtain resultant

analytical information necessary for substantiating managerial decisions, with particular attention to the impact of external factors on the enterprise.

4. Report preparation and provision of information to users. Analysis results are presented as public and managerial reports that contain summarized information on the enterprise's condition. It is important to ensure clarity and accessibility for different categories of users, including management, owners, and other stakeholders.

5. Managerial decision-making and control over implementation. On the basis of the obtained information, well-substantiated managerial decisions are made to achieve the enterprise's objectives. It is essential to monitor implementation of the adopted decisions and assess their effectiveness.

6. Evaluation of effectiveness and system adjustment. At this stage, the effectiveness of the accounting and analytical system is assessed, taking into account its impact on the enterprise's performance. Where necessary, adjustments are introduced to improve the system and adapt it to changing environmental conditions.

Coordinated functioning of all components of the accounting and analytical system—which provides comprehensive support for managerial decision-making—is achieved through tools and methods that can be combined under the term "integration mechanisms." These include the information base, data-exchange technologies, and the methodological foundation.

The information base underpins the system and consolidates various categories of data, including planned, regulatory (normative), reporting, and reference indicators. It performs the functions of accumulating, systematizing, and storing information necessary for accounting and analytical procedures. Data-exchange technologies ensure data integration by synchronizing information flows among accounting, economic, and legal units. This facilitates prompt updates, reduces the likelihood of errors, eliminates data duplication, and increases the efficiency of interaction among enterprise departments. The methodological foundation presupposes the use of standardized accounting and analytical methods that enhance the substantiation of decisions. Thus, the integration mechanisms of the accounting and analytical system are aimed at ensuring a unified information space, improving the accuracy and reliability of data, and enhancing the quality of managerial decisions through the use of modern analytical methods and data synchronization.

The accounting and analytical system must meet the following key requirements: reliability, timeliness, and adaptability. We consider them in more detail below.

Reliability. The dependability of accounting and analytical information is critical for forming well-substantiated managerial decisions. Data reliability is ensured by: implementing internal control, including audit and regulated inspections; external audit that guarantees compliance with regulatory requirements and standards; and the use of modern information technologies to automate data collection and processing, thereby minimizing human-factor risks.

Timeliness. For effective risk management, information must be available in real time or with minimal delays. Prompt data updates make it possible to: respond quickly to changes in the internal and external environment; identify risks and threats to the enterprise's activities in a timely manner; and optimize resource use.

Adaptability. In a dynamic business environment, the system must be flexible and capable of rapid transformation in response to changes in external (economic, legal, technological) and internal conditions (changes in organizational structure, revised strategic goals, etc.). Adaptability is ensured by: a modular structure of the accounting and analytical system that allows individual components to be modified without disrupting functionality; the integration of modern technologies that expand analytical and forecasting capabilities; and the ability to personalize reporting and analytical approaches, which increases usability for different user categories.

Accounting and analytical support performs a number of important functions, among which the following should be highlighted (Fig. 3):

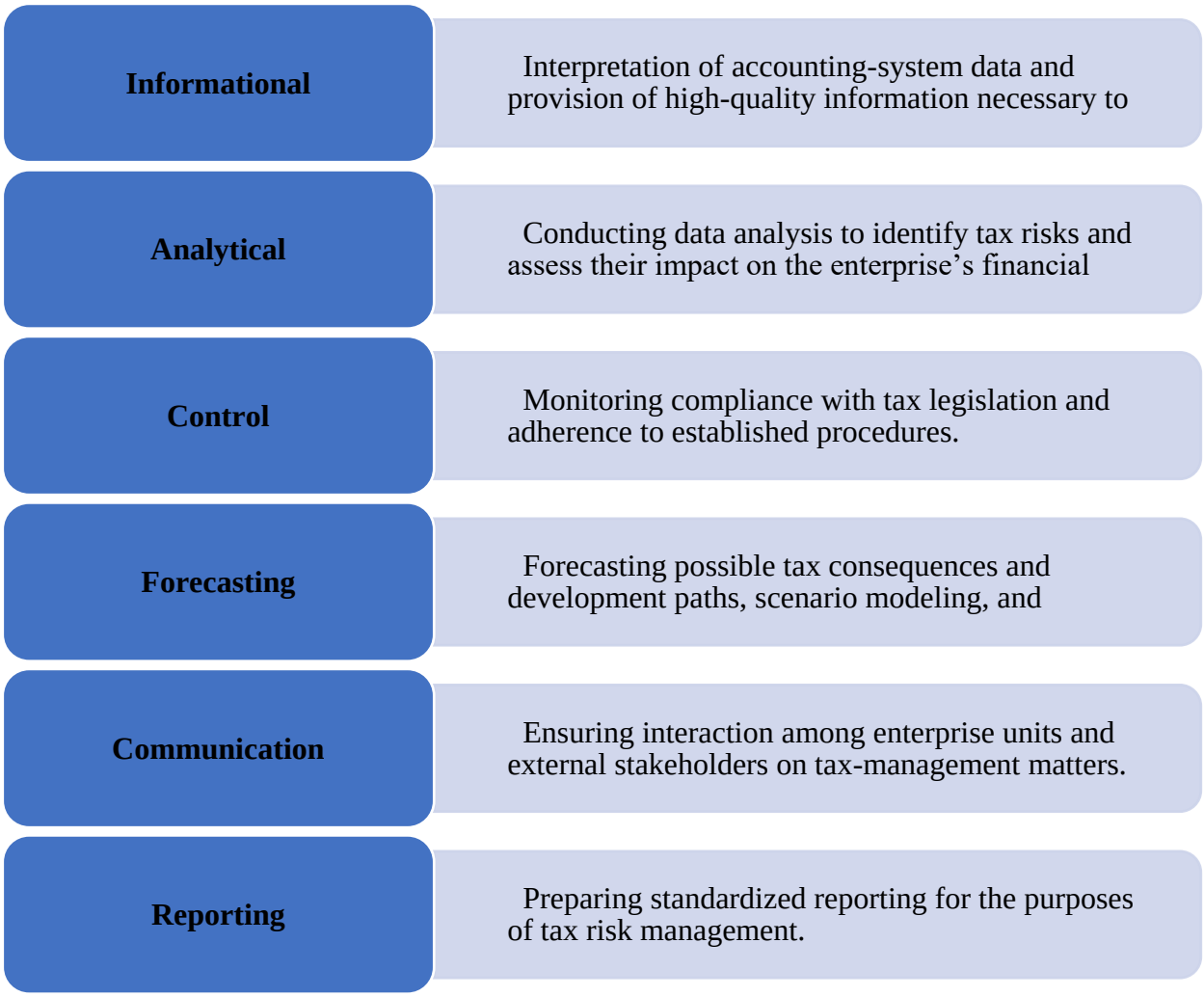

Fig. 3. Functions of Accounting and Analytical Support
Source: prepared by the author based on [4; 17]

As noted above, a necessary condition for high-quality accounting and analytical support of the tax risk management process is the integration of financial, managerial, and tax accounting, which cover different aspects of an enterprise's activities. Let us consider how each type of accounting contributes to this process. Financial accounting provides reliable and objective information about the enterprise's financial position, which serves as the basis for analyzing tax risks. Financial accounting data are used to calculate indicators (ratios) that may signal potential tax risks. Managerial accounting supplies detailed information on internal processes, enabling the identification of risks associated with operating activities. It helps analyze costs, revenues, and profits by lines of activity and reveals areas where violations of tax legislation may occur. Tax accounting pertains directly to the correct calculation of taxes and fees, the timely submission of tax returns, and compliance with other requirements of tax law. It forms the foundation for tax risk management because it makes it possible to detect potential errors and violations that may lead to the imposition of fines and penalties. Integrating data from all types of accounting enables a more comprehensive analysis of tax risks and, accordingly, increases the effectiveness of tax risk management.

It should be noted that, at present, the system of accounting and analytical support for tax risk management faces a number of problems and challenges related both to the specifics of doing business and to the regulatory environment. These issues encompass transparency, data integration, compliance with legislation, and the effectiveness of control. One key problem is insufficient transparency in business practices and accounting. Effective tax risk management requires a high

level of transparency in financial and tax reporting. Enterprises should employ modern tax control systems and maintain openness regarding their operations to enable thorough risk analysis. Another problem for many companies is the lack of data integration among different types of accounting—an aspect whose importance and advantages have been noted repeatedly above. A further significant challenge is the constant change in tax legislation. Companies must continuously monitor these changes and adapt their accounting and analytical systems to new requirements. All of this demands substantial effort and resources, as well as highly qualified specialists in accounting and tax planning. It is also necessary to mention the insufficiency of methodological support (clear methodologies for assessing and analyzing tax risks) and the shortage of qualified personnel, which has become particularly acute during the wartime period.

Finally, it is impossible to overlook the crucial aspect of digitalization and the shift away from so-called traditional accounting systems, which rely on outdated methods of data collection, processing, and storage and have a number of limitations that significantly complicate the adoption of well-substantiated and timely managerial decisions. One of the principal problems of traditional accounting systems is the significant delay in forming and updating data, which leads to a mismatch between the information and real processes. Studies indicate that, at most enterprises using traditional accounting approaches, financial and economic reports are prepared with substantial time lags. As a result, managerial decisions are made on the basis of outdated information, which can cause forecasting errors, misestimation of risks, and the loss of potential opportunities. A large share of operations in traditional accounting systems is performed manually, increasing the likelihood of mechanical errors, data duplication, or distortion. The absence of centralized mechanisms for automated checking and verification fosters the accumulation of inaccuracies, which, in turn, complicates analysis and decision-making. Consequently, additional resources must be spent to reconcile data, slowing the response to changes in the enterprise's internal and external environment. It is also worth noting that traditional accounting systems are predominantly oriented toward retrospective analysis and lack tools for forecasting future trends. Limited access to deep analytics prevents the prompt identification of critical points in business processes, thereby creating preconditions for financial losses and strategic mistakes. Under current conditions, effective management requires not only the recording of economic events but also the use of financial scenario-modeling tools, which in traditional systems are either entirely absent or require substantial effort to implement.

Another characteristic of traditional accounting systems is the fragmentation of information flows. Integration among different enterprise units is often lacking, which leads to data decentralization and a loss of integrity in the information environment. Various indicators are stored in isolated databases, complicating comprehensive analysis and the synchronization of managerial decisions. As a consequence, decision-making processes slow down, while the risks of information asymmetry and conflicts among structural units increase. And, of course, traditional accounting systems are poorly adaptable to changes in the regulatory framework, internal organizational transformations, or the integration of new technologies.

The current state of digitalization of accounting and analytical support for tax risk management is characterized by the active implementation of information technologies aimed at increasing the effectiveness of risk management and enhancing the transparency of tax administration by the state. One priority area is the introduction of the Standard Audit File (SAF-T UA), envisaged by the National Revenue Strategy for 2024–2027. Mandatory submission of SAF-T UA—first by large taxpayers and subsequently by all VAT payers—will provide a single source of information for assessing tax risks for both tax authorities and other stakeholders [1].

Another present-day reality is electronic accounting and reporting, which automate data collection, processing, and analysis, thereby significantly reducing the risk of errors and increasing the timeliness of information availability. For enterprises, electronic accounting systems provide

rapid access to the data needed to make well-substantiated managerial decisions in tax planning and risk management.

The use of cloud technologies is gradually expanding. They provide flexibility and scalability to accounting–analytical systems, allowing enterprises to store and process large volumes of data without substantial investment in IT infrastructure. Cloud solutions also facilitate information exchange among different enterprise units and external stakeholders, including tax authorities.

As a mechanism for optimizing risk management, the implementation of analytics technologies in accounting is expanding. Large corporations with the requisite financial capacity already employ digital platforms for automated analysis of financial indicators and real-time identification of potential risks.

Thus, current trends in the development of accounting and analytical support for tax risk management are characterized by the growing role of digital technologies. The introduction of digital tools into accounting and analysis creates preconditions for forming an integrated enterprise information system. This is a vivid manifestation of the transformation of accounting and analytical support, which is shifting from traditional methods to modern tools and approaches.

We highlight several important challenges associated with digitalization. Foremost among them is cybersecurity and data protection. The increasing volume of electronic information elevates the risks of cyberattacks and unauthorized access to data. Ensuring robust protection of information systems and data is critical for preserving confidentiality and avoiding financial losses. Another challenge concerns the integration of data from all types of accounting for risk management processes. This requires developing specialized interfaces and data-exchange protocols—and, accordingly, investment. And, of course, one must take into account the high cost of implementing digital tools under current Ukrainian conditions.

Conclusions. Accounting and analytical support is an essential element of the tax risk management system. An effective system enables enterprises to identify tax risks in a timely manner, assess their impact on financial condition, and develop measures to mitigate them. To increase the effectiveness of tax risk management, it is necessary to implement modern information technologies, strengthen internal control, upskill personnel, and begin using insurance instruments. Although traditional accounting and analytical systems play an important role, they have significant limitations in the digital economy. They are gradually being supplanted by modern ERP systems, cloud-based accounting platforms, and automated analytical tools that provide real-time access to data, integration of all business processes, and forecasting capabilities. Advances in information technology substantially expand the potential of enterprise accounting systems, making it possible to design and implement increasingly sophisticated models for processing, transmitting, and analyzing information for risk management purposes. Further research in this field may focus on developing effective methods for assessing tax risks, implementing innovative approaches to tax planning, and creating comprehensive models of tax risk management for enterprises across different sectors of the economy.

References

1. Chvertko, L., & Puholovko, I. (2024). Managing tax risks of the company using insurance coverage. *Economic Scope*. DOhttps://doi.org/10.32782/2224-6282/189-38[In Ukrainian]
2. Gustina, S. A., Safelia, N., & Ridwan, M. (2024). The influence of enterprise risk management, slack resources, and tax avoidance on firm value (empirical study of primary consumer sector companies listed on the Indonesian Stock Exchange, 2020–2022). *East Asian Journal of Multidisciplinary Research, 3*(7). https://doi.org/10.55927/eajmr.v3i7.9580[In Ukrainian]
3. Hurina, N., & Tomsha, A. (2022). Aspects of accounting and analytical support of enterprise risk management. *Economy and Society*, (43). https://doi.org/10.32782/2524-0072/2022-43-15[In Ukrainian]
4. Iershova, N., & Grinko, A. (2023). Accounting and analytical support for making financial decisions in the solvency management of the enterprise. *Bulletin of the National Technical University "Kharkiv Polytechnic Institute" (Economic Sciences)*, (2), 23–30. https://doi.org/10.20998/2519-4461.2023.2.23[In Ukrainian]
5. Jinfeng, Z. (2023). Analysis of tax management and risk control based on enterprise management decision in the new period. *Academic Journal of Business & Management, 5*(20). https://doi.org/10.25236/ajbm.2023.052017

6. Karpushenko, M., Momot, T., Mizik, Y., Shapoval, G., & Karpushenko, O. (2023). Accounting and analytical provision of enterprise risk management in the conditions of the state of war: Identification, assessment, measurement, and display of risks. *Eastern-European Journal of Enterprise Technologies, 3*(13(123)), 42–51. https://doi.org/10.15587/1729-4061.2023.282644
7. Khodus, A. (2024). Analysis of the tax risk management process at the enterprise. *State and Regions. Series: Economics and Business, 2*(132). https://doi.org/10.32782/1814-1161/2024-2-10
8. Kraievskyi, V., Kolisnyk, O., & Skoryk, M. (2024). Digitalisation of the accounting and analytical support service for small businesses. *Economics of systems development, 6*(2), 36–41. https://doi.org/10.32782/2707-8019/2024-2-6
9. Krupa, T. (2024). Do enterprise risk assessments affect tax aggressiveness? Evidence from U.S. ORSA regulation. *The Accounting Review*, *99(2)*, 307–339. https://doi.org/10.2308/tar-2022-0639
10. Lemishovska, O., & Hadzalo, N. (2023). Accounting and analytical supply of management systems of the enterprise: Conceptual basis and development directions. *Scientific Notes of Ostroh Academy National University, "Economics" Series*, *1*(28(56)), 140–144. https://doi.org/10.25264/2311-5149-2023-28(56)-140-144
11. Kucherenko, S. (2023). Dual nature of tax risk. *Ukrainian Economic Journal*, (2), 36–40. https://doi.org/10.32782/2786-8273/2023-2-7[In Ukrainian]
12. Li, G., & Guo, B. (2024). Construction of enterprise financial compliance management system in the context of digital taxation. *International Business & Economics Studies, 6*(2), 200-208. https://doi.org/10.22158/ibes.v6n2p200
13. Namazi, M., & Rakhsha, S. H. (2023). Development of a model for minimizing tax risk by combining behavioral criteria of management accounting and its empirical test using Mikhailov's fuzzy hierarchical method. *International Journal of Innovation Management and Organizational Behavior, 3*(5), 102–112. https://doi.org/10.61838/kman.ijimob.3.5.13
14. Prodanchuk, M., Dankevych, A., Aksonova, O., & Tomchuk, O. (2023). Digital tools for accounting and analytical support of enterprises: Innovation and management aspect. *Economics. Ecology. Socium, 7*(4), 27–39. https://doi.org/10.61954/2616-7107/2023.7.4-3
15. Shalaev, I. A., Kozhanchikov, O. I., & Kozhanchikova, N. Y. (2024). Conceptual framework and practice of assessment and control of tax risks of business entities under conditions of changeable tax environment. *Economic Environment*, *13*(1), 103–121. https://doi.org/10.36683/ee241.103-121
16. Sikach, N. S. (2024). The nature and structure of accounting and analytical framework for the business management system. *Regional Economy*, *2*(112), 155–165. https://doi.org/10.36818/1562-0905-2024-2-16
17. Tytenko, L., Pechnikov, S., & Kyziun, V. (2023). Accounting and analytical system in the formation and implementation of the financial strategy of the enterprise. *Galician Economic Bulletin of Ternopil National Technical University, 80*(1), 29–38. https://doi.org/10.33108/galicianvisnyk_tntu2023.01.029
18. Wei, J. (2023). The construction and application of the "three linkages" tax management system. *Advances in Economics and Management Research, 9*(1), 1-5. https://doi.org/10.56028/aemr.9.1.1.2024
19. Yaloveha, L., Leha, O., & Priydak, T. (2022). Accounting and analytical system of business entities: Theoretical aspects, components, and methodological support. *Black Sea Economic Studies*, (78). https://doi.org/10.32782/bses.78-20
20. Zhang, W. (2023). The application of cloud accounting in enterprise financial decision making in the era of big data. *Applied Mathematics and Nonlinear Sciences*. https://doi.org/10.2478/amns.2023.1.00153

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Кучеренко Сергій
керівник департаменту консалтингу,
ТОВ «Кейнас-Консалтинг»,
вул. Білоруська, 36 А, Київ, 04119, Україна
аспірант кафедри обліку та аудиту
Державний податковий університет
вул. Університетська, 31, Ірпінь, 08205, Україна
e-mail: kucherenko_s@ukr.net
ORCID ID: 0009-0002-4133-5547

Сучасні тенденції розвитку обліково-аналітичного забезпечення управління податковими ризиками

Анотація. Вступна частина. Об'єктом дослідження в межах цієї статті є обліково-аналітичне забезпечення управління податковими ризиками підприємств як інтегрована система збору, систематизації, інтерпретації та аналізу даних фінансового, управлінського й податкового обліку для прийняття обґрунтованих рішень у сфері оподаткування. Його структурну основу становлять три взаємопов'язані підсистеми — облікова, аналітична та контрольна (аудит). Критичними характеристиками системи виступають своєчасність отримання інформації та її адаптивність до змін середовища.

Постановка проблеми. В умовах нестабільної економіки й постійних змін податкового законодавства традиційні облікові підходи втрачають ефективність, що ускладнює своєчасну ідентифікацію та мінімізацію податкових ризиків.

Нерозв'язані аспекти. Попри значну увагу до ризик-менеджменту та цифрових інструментів, саме обліково-аналітичне забезпечення управління податковими ризиками досліджене недостатньо; бракує опрацьованих рішень щодо інтеграції даних і методик оцінювання ризиків. Окреслено напрями подальших досліджень: удосконалення методів оцінки, інноваційне податкове планування, створення комплексних моделей для різних галузей.

Мета статті. Визначити суть і функції обліково-аналітичного забезпечення управління податковими ризиками суб'єктів господарювання, виокремити ключові компоненти системи, окреслити проблеми й виклики та тенденції переходу від традиційних систем до сучасних цифрових.

Основний матеріал. Методологія спирається на аналіз сучасних підходів і практичних аспектів впровадження адаптивних інформаційно-аналітичних систем. Застосовано логічне узагальнення, порівняння, аналіз і синтез, а також експертні оцінки. Результати засвідчили потребу модернізації обліку та обґрунтували три підсистеми як ядро системи; доведено доцільність інтеграції окремих видів обліку в єдину інформаційну систему. Запропоновано концептуальну цифрову модель, що поєднує автоматизовані облікові системи, аналітичні платформи оцінки ризиків і електронний аудит; зафіксовано позитивні ефекти від використання цифрових технологій та окреслено виклики — вартість, кібербезпека, законодавча динаміка. Також підкреслено роль SAF-T UA та електронної звітності як інструментів підвищення прозорості та оперативності.

Висновки. Обліково-аналітичне забезпечення є ключовим елементом управління податковими ризиками; його ефективність зростає за умов цифровізації, посиленого внутрішнього контролю, підвищення кваліфікації персоналу та використання страхових інструментів. Практичні кроки включають регулярний розрахунок показників ризиковості, забезпечення прозорості, застосування критеріїв добровільного податкового комплаєнсу та впровадження електронного аудиту (SAF-T UA).

Ключові слова: *податкові ризики, управління податковими ризиками, податкове планування, обліково-аналітичне забезпечення, цифровізація обліку, автоматизовані системи обліку, інтеграція фінансових та управлінських даних, електронний аудит.*

JEL Classification: H21, H25, M40

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Список літератури

1. Чвертко Л., Пуголовко І. Управління податковими ризиками підприємства через інструмент страхування. *Економічний простір*. 2024. № 189. С. 213–218. URL: https://doi.org/10.32782/2224-6282/189-38.
2. Gustina S. A., Safelia N., Ridwan M. The influence of enterprise risk management, slack resources and tax avoidance on firm value (empirical study of primary consumer sector companies listed on the indonesian stock exchange 2020-2022). *East Asian Journal of Multidisciplinary Research*. 2024. Vol. 3, no. 7. URL: https://doi.org/10.55927/eajmr.v3i7.9580.
3. Гуріна Н., Томша А. Аспекти обліково-аналітичного забезпечення управління ризиками підприємства. *Економіка та суспільство*. 2022. № 43. URL: https://doi.org/10.32782/2524-0072/2022-43-15.

4. Єршова Н., Грінько А. Обліково-аналітичне забезпечення прийняття фінансових рішень при управлінні платоспроможністю підприємства. *Вісник Національного технічного університету "Харківський політехнічний інститут" (економічні науки)*. 2023. № 2. С. 23–30. URL: https://doi.org/10.20998/2519-4461.2023.2.23.
5. Jinfeng, Z. Analysis of tax management and risk control based on enterprise management decision in the new period. *Academic journal of business & management*. 2023. Vol. 5, no. 20. URL: https://doi.org/10.25236/ajbm.2023.052017.
6. Accounting and analytical provision of enterprise risk management in the conditions of the state of war: identification, assessment, measurement and display of risks / M. Karpushenko et al. *Eastern-European journal of enterprise technologies*. 2023. Vol. 3, no. 13 (123). P. 42–51. URL: https://doi.org/10.15587/1729-4061.2023.282644.
7. Ходус А. І. Методи попередження та мінімізації податкових ризиків на підприємстві. *Секція 1 Цифрова трансформація економіки України: industry 4.0, інноваційне підприємництво, національна безпека*. 2024. № 2(132). URL: https://doi.org/10.32782/1814-1161/2024-2-10.
8. Kraievskyi V., Kolisnyk O., Skoryk M. Digitalisation of the accounting and analytical support service for small businesses. *Економіка розвитку систем*. 2024. Vol. 6, no. 2. P. 36–41. URL: https://doi.org/10.32782/2707-8019/2024-2-6.
9. Krupa T. J. Do enterprise risk assessments affect tax aggressiveness? Evidence from U.S. ORSA regulation. *The accounting review*. 2024. Vol. 99, no. 2. P. 307–339. URL: https://doi.org/10.2308/tar-2022-0639.
10. Лемішовська О., Гадзало Н. Обліково-аналітичне забезпечення управлінських систем підприємства: концептуальний базис та напрямки розвитку. *Scientific notes of ostroh academy national university," economics" series*. 2023. № 28 (56). С. 140–144. URL:https://doi.org/10.25264/2311-5149-2023-28(56)-140-144.
11. Кучеренко С. Подвійна природа податкового ризику. *Український економічний часопис*. 2023. № 2. С. 36–40. URL: https://doi.org/10.32782/2786-8273/2023-2-7.
12. Li G., Guo B. Construction of enterprise financial compliance management system in the context of digital taxation. *International Business & Economics Studies*. 2024. Vol. 6, no. 2. P. 200. URL: https://doi.org/10.22158/ibes.v6n2p200.
13. Namazi M., Rakhsha S. H. Development of a model for minimizing tax risk by combining behavioral criteria of management accounting and its empirical test using mikhailov's fuzzy hierarchical method. *International journal of innovation management and organizational behavior*. 2023. Vol. 3, no. 5. P. 102–112. URL: https://doi.org/10.61838/kman.ijimob.3.5.13.
14. Digital tools for accounting and analytical support of enterprises: innovation and management aspect / M. Prodanchuk et al. *Economics. Ecology. Socium*. 2023. Vol. 7, no. 4. P. 27–39. URL: https://doi.org/10.61954/2616-7107/2023.7.4-3.
15. Shalaev I. A., Kozhanchikov O. I., Kozhanchikova N. Y. Conceptual framework and practice of assessment and control of tax risks of business entities under conditions of changeable tax environment. *Economic environment*. 2024. Vol. 13, no. 1. P. 103–121. URL: https://doi.org/10.36683/ee241.103-121.
16. Sikach N. S. The nature and structure of accounting and analytical framework for the business management system. *Regional economy*. 2024. No. 2(112). P. 155–165. URL: https://doi.org/10.36818/1562-0905-2024-2-16.
17. Титенко Л., Печніков С., Кизюн В. Обліково-аналітична система у формуванні та реалізації фінансової стратегії підприємства. *Галицький економічний вісник Тернопільського національного технічного університету*. 2023. Т. 80, № 1. С. 29–38. URL:https://doi.org/10.33108/galicianvisnyk_tntu2023.01.029
18. Wei J. The construction and application of the "three linkages" tax management system. *Advances in economics and management research*. 2023. Vol. 9, no. 1. P. 1. URL: https://doi.org/10.56028/aemr.9.1.1.2024.
19. Яловега Л., Лега О., Прийдак Т. Обліково-аналітична система суб'єктів господарювання: теоретичні аспекти, складові та методологічне забезпечення. *Причорноморські економічні студії*. 2022. № 78. URL: https://doi.org/10.32782/bses.78-20.
20. Zhang W. The application of cloud accounting in enterprise financial decision making in the era of big data. *Applied Mathematics and Nonlinear Sciences*. 2023. Vol. 9, no. 1. URL: https://doi.org/10.2478/amns.2023.1.00153.

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Omelianenko Denys
PhD Student, Department of Finance, Banking and Insurance
Sumy National Agrarian University
160 Herasym Kondratiev Street,
Sumy, Sumy Oblast, 40000, Ukraine
e-mail: denis0707995280@gmail.com
ORCID ID: 0000-0002-3836-7962

Integrated system of performance indicators in the asset management of agricultural enterprises

Abstract. The paper proposes a unified system that links performance indicators (KPIs) with early-warning risk indicators (KRIs) to improve asset management under uncertainty in Ukrainian agribusiness.

Problem statement. Volatile input prices, logistics disruptions, climate risks and wartime shocks expose weaknesses of fragmented metrics and hinder transparent, comparable control of assets.

Unresolved issues. Standardization of KPI/KRI definitions for biological and fixed assets, links to risk appetite and capital allocation, data quality/digitalization gaps, and adaptation to national regulations remain insufficiently addressed.

Purpose of the article. To justify the concept, structure and practical guidelines for an integrated KPI-KRI system (IPIS) tailored to agricultural enterprises and harmonized with international practice.

Main material. The article outlines domains and metric passports, index-based tracking for comparability, threshold setting and escalation rules, data governance and reporting cadence, and use cases for capex/opex decisions, liquidity discipline, and stress-response. It adds a benchmarking grid versus EU practice to calibrate thresholds and reporting frequency. A lightweight dashboard is proposed for monthly management review, with quarterly external disclosure to enhance investor communication.

Conclusions. Implementing IPIS strengthens transparency, accelerates corrective actions, and supports efficient capital allocation; success depends on data quality, staff training, and phased integration into management routines. It also improves comparability across farms and seasons, facilitating lender and investor due diligence. Limitations include uneven digital maturity and potential measurement bias, suggesting phased pilots and future research on automated data capture.

Keywords: *agricultural enterprises; asset management; KPIs; KRIs; fixed assets; uncertainty; resilience.*

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Introduction. Agricultural enterprises combine long investment cycles of fixed assets with short and variable cycles of current assets, which heightens sensitivity to climatic fluctuations, logistical bottlenecks, market volatility, and institutional changes in access to infrastructure and resources. Traditional asset-performance assessment systems mostly record ex post results and detect nascent deviations too late, causing delayed managerial actions and losses that manifest as downtime, imbalanced turnover, and rising operational risk. The absence of a single control loop that links strategic objectives, performance indicators, and leading risk indicators into a disciplined: signal - threshold - action - escalation sequence leads to conflicts between unit-level targets and fragmented accountabilities. A conceptual model is needed that ensures traceability between goals and metrics, standardizes the interpretation of indicators, structures data governance, and embeds preventive control into the daily management practices of agricultural enterprises.

Since 2022, the war in Ukraine has profoundly transformed the operational and financial landscape of agricultural enterprises. Asset management systems now face unprecedented disruptions caused by destruction of production capacities, temporary occupation of territories, relocation of fixed assets, and volatility in energy supply and logistics. These factors have amplified uncertainty and exposed the inadequacy of reactive performance measurement models. The need for an integrated KPI–KRI framework has thus become not only a managerial tool but a resilience mechanism — one that enables rapid detection of deviations, prioritization of scarce resources, and coordination across dispersed or relocated assets. Studies of wartime agribusiness performance highlight the critical role of adaptive metrics and early-warning indicators in maintaining liquidity, operational continuity, and supply chain stability.

Literature review. In the Ukrainian scholarly tradition, the theoretical and methodological foundation for measuring the performance of agricultural enterprises and for constructing performance indicator systems was laid by V. H. Andriichuk [13], who substantiated approaches to assessing resource return and the asset structure at the enterprise level.

A comprehensive sequence of risk-management processes in agricultural enterprises (identification, analysis, assessment, treatment, and procedure documentation) was systematized by M. V. Rudenko [14], providing a methodological basis for integrating risk indicators into asset-management control loops.

Financial risks (price, interest rate, and foreign-exchange) and their mitigation through hedging with derivatives for agribusiness enterprises were examined in detail by Yu. O. Lupenko and V. V. Feshchenko [15]; these approaches are relevant for forming leading indicators and thresholds within the system’s financial block.

Recent research underlines that the resilience of Ukrainian agribusiness during wartime depends on the integration of digital monitoring, scenario-based risk indicators, and traceable decision protocols. D.Omelianenko and M. Heyenko [9] offers a methodological toolkit for analysing the formation and efficient usage of assets within enterprises under uncertainty and risk. It addresses how assets are structured (fixed versus current), the pathways through which risk and uncertainty affect asset management, and proposes methods of assessment and optimisation.

D. Omelianenko [10] emphasizes the importance of asset management in the agricultural enterprise sector in Ukraine under conditions of economic instability and high risk. The work outlines methodological approaches to managing both current (circulating) and non-current assets (fixed, intangible) and links asset management effectiveness to financial results and resilience.

Ukrainian contributions provide a solid basis on efficiency, risks, and resilience of agricultural enterprises, yet they largely remain fragmented. There is a lack of an integrated framework that links outcome-oriented KPIs with leading risk indicators, uncertainty budgets, scenario-triggered actions, and data governance. The model proposed in this article closes this gap by shifting asset management from fragmented diagnostics to a preventive–corrective control loop.

Purpose, objectives and research methods. Purpose of the article - to theoretically substantiate and develop a conceptual framework for an integrated system of performance

indicators and risk indicators as a mechanism for enhancing the effectiveness of asset management in agricultural enterprises under conditions of uncertainty. To achieve this goal, the study addresses the following interrelated tasks: to specify the methodological foundations for integrating performance measurement and risk management; to build a traceable hierarchy of goals, performance indicators, risk indicators, coordinated actions with a clear separation of leading and lagging metrics; to propose normative thresholds and uncertainty budgets as rules for transitions between management modes; to develop instruments in the form of an integration matrix and action cards templates for scenario-triggered responses; to define requirements for data architecture, roles, and review cadence to ensure controllability and reproducibility of processes; to outline enterprise-level implementation mechanisms that account for asset life cycles and logistics resilience; to justify quality criteria for the proposed artefact (usefulness, feasibility, explanatory power, transferability) and to indicate key limitations and avenues for further research.

The research is theoretical-conceptual within a constructive (design-science) approach: the objective is to form a managerial artefact in the form of an integrated system of performance and risk indicators. Systems analysis and structural–functional modeling are applied to build the hierarchy. Normative modeling is used: thresholds, uncertainty budgets, and scenario-triggered action cards are defined as policies with clear roles and escalation. The scenario method ensures linkage between early signals and standardized managerial responses with traffic-light zoning (green, yellow, red).

Content analysis of institutional sources helps extract stable risk-management procedures and incorporate logistics resilience and working-capital discipline into the core dimensions. Validation is carried out through logical consistency, procedural reproducibility, and compatibility with asset life cycles. The artefact's quality criteria are usefulness, feasibility, explanatory power, and transferability across enterprises. Limitations: absence of empirical calculations and statistical testing.

Research results. An integrated system of performance indicators and risk indicators is a continuous managerial control loop in which strategic asset objectives are translated into measurable outcome (lagging) performance indicators, while leading risk indicators convert early signals from the environment and internal processes into timely actions. The starting point of such integration is the requirement of traceability: for every goal there must be a clear goal - performance indicator pair and an attached set of leading indicators that warn of a change in the system's operating mode; this chain should be institutionalized in the form of a cause-and-effect map and response regulations [1]. The substantive logic here lies in synchronizing three axial dimensions of asset management: the productivity and reliability of fixed assets; the liquidity and turnover of current assets; and logistics resilience as an external constraint that modulates the ability to convert production efforts into realized value [5].

A crucial element is the separation of metrics into outcome (lagging) and leading ones, which is not merely terminological but assigns different roles in decision-making. Outcome indicators record the results of a season or reporting period, legitimizing or refuting chosen policies and initiatives, yet they cannot by themselves shorten the time lag between the emergence of a deviation and a corrective action. Leading indicators, by contrast, serve as operational sensors sensitive to micro-changes in equipment operating modes, inventory balance, counterparty behavior, and logistics infrastructure, enabling a shift to preventive management - that is, timely changes to schedules, routes, work sequencing, or rules for prioritizing supplies [3]. The danger of confusing these roles is that an organization either overfeeds itself with ex post reporting, losing speed, or takes impulsive actions based on raw signals without a validation framework; hence, discipline is needed for transitioning from leading indicators to outcome indicators through agreed decision gates [2].

The practical architecture of the integrated system in an agricultural enterprise provides for standardized passports for each performance indicator and risk indicator, specifying definitions,

data sources, measurement frequency, zoning thresholds, and escalation routes. Such passports serve as carriers of organizational memory and as instruments for reducing information asymmetry among units: production, maintenance, logistics, procurement, and finance use a shared language of thresholds and interpretations, which lowers the likelihood of contradictory decisions in the presence of ambiguous signals [2]. Equally important are data quality and data governance: sources must be described, processes documented, cross-checks regular, and corrections transparently traceable. Such data discipline reduces false activations of leading indicators and, accordingly, the number of unnecessary interventions [4].

Table 1. Matrix for integrating goals, performance indicators, and risk indicators in asset management of an agricultural enterprise

Dimension	Strategic goal	Key asset decisions	Examples of outcome performance indicators	Examples of leading risk indicators	Cadence & escalation
Strategic	Season-year	Investment priorities; threshold policies; uncertainty budgets; stage-gate principles	Fleet readiness per season; loading-plan fulfillment; on-time dispatch rate; audit compliance	Infrastructure operating-mode changes; failure trends on critical components; trend in slow-moving inventory	Monthly review and seasonal retrospective; escalation to the management board [2]
Tactical	Month-quarter	Maintenance plan; equipment redistribution; buffer-stock adjustment; reserving warehouses/transport	Downtime share; inventory turnover; dispatch schedule adherence	Share of unplanned repairs; bottleneck signal; shortage of spare parts; payment deferrals	Weekly meetings with “action cards”; escalation to functional leadership [1]
Operational	Day-week	Work sequencing; route changes; minor repairs; temporary operating constraints	Daily/weekly plan fulfillment; average weekly dispatch time	Anomalies in condition parameters; queues at bottlenecks; deviations in fuel consumption	Daily stand-ups; rapid dispatcher-level escalation [3]

Source: prepared by the author.

The essence of the proposed logic is best illustrated at the intersection of fixed-asset management and logistics resilience. The goal of maintaining a high level of fleet readiness is reflected in the outcome KPIs availability ratio, share of downtime during the season, and loading-plan fulfillment, while the leading indicators are share of unplanned repairs in the current month, rate of deterioration in indirect condition parameters, and shortages of components or lubricants. The goal of minimizing logistics delays is specified by the outcome indicators on-time dispatch rate and average dispatch time, whereas the leading signals include notices from infrastructure operators, increases in waiting time at bottleneck sections, and reductions in available contracted transport. These dimensions are linked through scenario-triggered action cards: upon crossing into the yellow zone, warehouse and transport slots are reserved, routes are reallocated, and field-work schedules are temporarily adjusted, while in the red zone escalation goes to the executive level with authority to engage alternative channels and flexible budgets for expedited servicing [2].

Harmonizing thresholds for leading indicators requires a norm of permissible deviation in key parameters, which the article proposes to call uncertainty budgets. Their purpose is to align the system’s sensitivity with actual seasonality, execution windows, and logistics capabilities, so as not to generate over-reactivity while preserving response speed. In forming such budgets, the enterprise

answers: what level of fluctuation in the share of unplanned repairs, slow-moving inventory, or waiting time at nodes does not yet undermine the ability to meet seasonal goals; what time interval between threshold crossing and action is operationally acceptable; where the yellow and red boundaries lie that separate management regimes [4]. When embedded in policy, uncertainty budgets create a common yardstick for different functions, reducing disputes over whether the system is over-sensitive or too slow.

Synchronizing the integrated system with asset life cycles ensures adaptability: for fixed assets, plan-fact reviews follow a seasonal cadence with deeper retrospectives, whereas for current assets and logistics they run on weekly or even daily micro-cycles, reflecting the high variability of the operating environment [5]. An important complement is a culture of operational sensitivity, whereby the team pays attention to weak signals and anomalies and has a legitimate, non-punitive channel for their escalation; such a culture enriches leading indicators with meaningful qualitative observations - especially useful under data incompleteness or noise [3]. Seasonal outcomes and incidents are fed back into system learning via a decision log, enabling subsequent cycles to recalibrate thresholds, refine indicator definitions, and revise scenario action cards in light of new information [2]. Practical guidance from sectoral agricultural risk-reduction programmes further specifies operational steps for integration, including early warning and shock preparedness [9]. In parallel, PARM frameworks demonstrate institutional mechanisms for aligning roles and responsibilities among stakeholders, which is valuable for scaling enterprise practices [10].

Table 2. Alignment of management levels, time horizons, and metric roles in the integrated system

Management level	**Decision horizon**	**Performance Indicators (Outcome)**	**Risk Indicators (Leading)**	**Coordinated Actions**
Financial efficiency	Increase asset productivity	Equipment productivity per season; share of green downtime; loading-plan fulfillment	Share of unplanned repairs per month; shortage of spare parts; deferred maintenance	Reallocate equipment; expedite maintenance; adjust the field-work schedule
Operational reliability	Reduce failures	Fleet availability ratio; mean time to failure (MTTF)	Rate of increase in vibration/temperature; lubricant shortages	Preventive maintenance; component replacement; adjustment of operating modes
Working-capital liquidity	Stabilize turnover	Inventory turnover; share of slow-moving inventory	Sharp buildup of critical items; payment deferrals	Clearance/redistribution; adjustment of the purchasing plan
Logistics resilience	Reduce logistics delays	Average dispatch time; on-time delivery rate	Signals of infrastructure constraints; vehicle-fleet shortages	Route reconfiguration; reserving warehouses/railcars
Environmental and Social compliance	Ensure adherence	Audit pass rate; absence of fines	Growth rate of fuel consumption; deviations in soil indicators	Maintenance; change tillage practices; supplier audits

Source: prepared by the author.

Horizontal integration of indicators across enterprise functions relieves the classic tension between production and financial goals, as well as between logistics and planning. For example, a decision to temporarily increase inventory buffers to reduce logistics risk must be aligned with the uncertainty budgets for turnover and with acceptable limits on disturbing the cash conversion cycle. If leading indicators suggest a looming bottleneck on a key route, the system enables an early, time-bounded increase of buffers specifically for critical items, with documented exit conditions for returning to normal - thereby lowering the likelihood of a prolonged inventory buildup [7]. Similarly, if the outcome indicator downtime share exceeded the target in the previous season, the

team does not stop at stating the fact but analyzes the chain of leading indicators that preceded the deviation and revises the action card that failed to trigger with sufficient speed [2].

Discussion. In the context of regulatory and environmental requirements, the integrated system helps avoid formalism. Threshold indicators for emissions, fuel consumption, or soil tillage practices are embedded in the same control loop as production-logistics metrics, and their leading indicators (for example, the growth rate of fuel consumption in comparable operations) serve as early signals not only for compliance but also for optimizing operating modes. Thus, conformity with standards does not compete with efficiency; rather, it supports efficiency over a longer horizon, aligning with contemporary approaches to the sustainability of agricultural systems [11]. The conceptual economic tradition of distinguishing between risk and uncertainty suggests that, beyond statistical signatures, an organisation should work with regime shifts, when historical frequencies are of limited use and qualitative indicators and scenarios take the lead; hence the integrated system does not confine itself to retrospective diagnostics but emphasises sensitisation to weak signals and explicit rules of action [8]. These approaches correlate with the principles of resilience engineering, which stress foresight, preparedness for recovery, and learning from incidents [12].

It is also necessary to dwell on how the integrated system interacts with the capital-decision process. The stage-gate framework makes it possible to standardise the criteria for moving between phases - from investment initiation to asset commissioning - including through a set of KPIs that must be confirmed before proceeding, and KRIs that, conversely, block transition when risk thresholds are crossed. Such integration does not require complex optimisation models and works through rules, inspection schedules, and independent reviews, thereby reducing the likelihood of confirmation-bias traps in large projects [2]. As a result, capital discipline becomes an extension of operational discipline: leading indicators from the commissioning phase are carried over into the standard operating metric passports, ensuring seamless management.

In the context of wartime uncertainty, the integrated KPI–KRI system acquires a strategic function as an instrument of resilience engineering. For agricultural enterprises operating under shelling risks, power outages, or logistics disruptions, leading indicators become vital for anticipating regime shifts and coordinating decentralized decisions. The proposed framework enables early response to asset degradation or supply delays and supports dynamic reallocation of machinery and capital between safer regions. Its adaptability to fragmented operational environments makes it a viable foundation for post-war reconstruction planning, complementing national recovery strategies and donor-financed resilience programs.

Finally, building the review cadence requires not only rhythm but structural depth. Weekly meetings are dedicated to leading indicators, literal signals, and decisions for the next seven to fourteen days; monthly reviews focus on outcome indicators, trends, and policy adjustments; seasonal retrospectives focus on system learning, threshold revision, and updates to the action cards, as well as refining uncertainty budgets in line with new experience [5]. Importantly, each cadence level has its own decision set and escalation path so that the organisation does not confuse operational correction with policy-level rule revisions. This is precisely how flexibility over the short horizon is combined with rule stability over the longer horizon - essential for an agricultural enterprise with its combined cycles [1].

Conclusions. A conceptual framework for an integrated system of performance indicators and risk indicators has been developed and theoretically substantiated as a mechanism for improving the effectiveness of asset management in agricultural enterprises under uncertainty. The core idea is a shift from fragmented, primarily ex post measurement to a continuous managerial control loop in which goals are translated into outcome performance indicators, while leading risk indicators act as early sensors of regime shifts and trigger regulated actions. Such a loop not only shortens the time lag between the emergence of a deviation and the managerial response, but also increases decision alignment across production, logistics, procurement, and finance.

The proposed division of metrics into outcome and leading is not a terminological exercise; it assigns distinct managerial roles and reaction horizons. Outcome indicators legitimise and validate policies, enable assessment of goal attainment over the season or reporting period, and form the basis for system learning. Leading indicators, in turn, heighten organisational sensitivity to weak signals and micro-shifts in the condition of fixed assets, inventory turnover, and logistics infrastructure, shifting management into a preventive–corrective mode. Separating these roles eliminates typical distortions - where an organisation either overfeeds itself with retrospective reporting or makes impulsive decisions on raw signals without validation procedures.

The practical deployment of the framework is specified by two instruments. First, the integration matrix of goals, outcome performance indicators, leading risk indicators, thresholds, and action cards serves as a translation sheet from strategy to operational decisions, shortening the path from signal to action. Second, the alignment of management levels, time horizons, and metric roles establishes a clear review cadence: daily/weekly stand-ups for leading indicators, monthly reviews for outcome indicators, and seasonal retrospectives for system learning. Such a multi-level organisation prevents the mixing of operational corrections with policy-level rule revisions while preserving short-term flexibility.

The concept strengthens fixed-asset management through earlier detection of condition degradation, disciplined maintenance, and reduced downtime; for current assets it enhances control of accumulating imbalances, slow-moving stocks, and payment deferrals. Integrating logistics resilience into the same loop with production and financial metrics enables early responses to infrastructure bottlenecks and transport shortages by reserving capacity and reconfiguring routes. In the sphere of environmental and social compliance, threshold indicators and their leading signals help avoid formalism by turning compliance into an element of long-term efficiency.

An important managerial implication is the coupling of operational and capital discipline. Using a stage-gate logic for investment decisions - with clearly defined transition criteria for outcome indicators and blocking thresholds for leading indicators - reduces the risk of erroneous project escalation and ensures a seamless transition from commissioning to steady-state operations. Thus, capital discipline becomes an extension of, rather than an alternative to, operational discipline.

In sum, the integrated system of performance and risk indicators provides agricultural enterprises with managed sensitivity to uncertainty and improves asset-management effectiveness through four interrelated effects: shortening response time to deviations; increasing cross-functional decision coherence; reducing downtime and turnover losses; and institutionalising long-term compliance with sustainability requirements. The wartime application of the integrated KPI–KRI framework demonstrates its broader relevance as a resilience and reconstruction instrument, enabling agricultural enterprises to sustain performance management under extreme uncertainty and to transition faster toward post-crisis recovery.

References

1. Kaplan, R. S., & Norton, D. P. (1996). The balanced scorecard: Translating strategy into action. *Harvard Business School Press.*
2. Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2017). Enterprise risk management—Integrating with strategy and performance. COSO.
3. Weick, K. E., & Sutcliffe, K. M. (2007). Managing the unexpected: Resilient performance in an age of uncertainty (2nd ed.). *Jossey-Bass*.
4. Aven, T. (2015). Risk analysis. *Wiley*.
5. World Bank. (2016). Agricultural sector risk assessment: Methodological guidance for practitioners. *World Bank*.
6. Lopatynskyi, Y., & Kravchenko, A. (2023). Digital technologies in agriculture: Trends and challenges. *Journal of Agricultural Innovations*, vol. 12, no. 3, pp. 45–58. [in Ukrainian]
7. Smith, J. (2022). Smith, J. (2022). IoT applications in smart farming. International Journal of Precision Agriculture, vol. 9, no. 4, pp. 123–137. [in Ukrainian]
8. Holovko O. H., Omelianenko D.O. Peculiarities of business asset management. *Economics and Law*. 2021. P. 135-142 [In Ukrainian]

9. Geienko, M., & Omelianenko, D. (2023). Methodical approaches to the analysis of asset formation and efficient use under uncertainty and risk. *Bulletin of Sumy National Agrarian University*, 2(94), 19–24. DOI: https://doi.org/10.32782/bsnau.2023.2.4 [In Ukrainian]
10. Omelianenko, D. (2025). Modern concepts of asset management in Ukrainian agricultural enterprises. *Bulletin of Sumy National Agrarian University*, 2, 45–62. DOI: https://doi.org/10.32782/bsnau.2025.2.5 [In Ukrainian]
11. Holovko O. H., Omelianenko D.O. Principles of enterprise asset management in the context of ensuring its financial stability. Problems and prospects of entrepreneurship development: *Materials of the XIV International Scientific and Practical Conference*. 2020. 424 p [in Ukrainian].
12. Holovko O. H., Omelianenko D.O. Asset management: methodology of effective formation. Prospects for the development of management systems in the social and economic spheres of Ukraine: theory and practice. 2020. 472 p [in Ukrainian].
13. World Bank. (2023). Digital agriculture: the future of farming activit? Available at: Retrieved from: https://www.worldbank.org/en/topic/agriculture. [In Ukrainian]
14. Rudenko, M. V. (2018). Upravlinnia ryzykamy pidpryiemstv ahrarnoho sektora [Enterprise risk management in the agrarian sector]. *Ekonomika*. [in Ukrainian]
15. Lupenko, Yu. O., & Feshchenko, V. V. (2014). Khedzhuvannia finansovykh ryzykiv ta suchasnyi rynok deryvatyviv dlia pidpryiemstv ahrarnoho sektora ekonomiky [Hedging financial risks and the modern derivatives market for agrarian-sector enterprises]. Finansy Ukrainy [Finance of Ukraine], (11), 98–115. [in Ukrainian]

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Денис Омеляненко
аспірант кафедри фінансів, банківської справи та страхування
Сумський національний аграрний університет
вулиця Герасима Кондратьєва, 160, місто Суми, Сумська область, 40000, Україна
e-mail: denis0707995280@gmail.com
ORCID ID: 0000-0002-3836-7962

Інтегрована система показників ефективності в управлінні активами аграрних підприємств

Анотація. У статті запропоновано єдину систему, що поєднує показники результативності (KPI) з індикаторами ризиків раннього попередження (KRI) для підвищення ефективності управління активами в умовах невизначеності в українському агробізнесі.

Постановка проблеми. Волатильність цін на ресурси, збої логістики, кліматичні ризики та воєнні шоки виявляють слабкі місця фрагментованих метрик і перешкоджають прозорому, зіставному контролю активів.

Нерозв'язані аспекти. Недостатньо опрацьовано стандартизацію визначень KPI/KRI для біологічних і необоротних активів, зв'язок із ризик-апетитом і розподілом капіталу, прогалини в якості/цифровізації даних та адаптацію до національного регулювання.

Мета статті. Обґрунтувати концепцію, структуру та практичні настанови щодо інтегрованої системи KPI–KRI (IPIS), зорієнтованої на аграрні підприємства і гармонізованої з міжнародною практикою.

Основний матеріал. Стаття окреслює домени та «паспорти» показників, індексне відстеження для зіставності, встановлення порогів і правила ескалації, управління даними та періодичність звітності, а також приклади застосування для рішень щодо CAPEX/OPEX, дисципліни ліквідності та реагування на стреси. Додано матрицю бенчмаркінгу порівняно з практиками ЄС для калібрування порогів і частоти звітування. Запропоновано легку інформаційну панель для щомісячного управлінського огляду та щоквартального зовнішнього розкриття для посилення комунікації з інвесторами.

Висновки. Впровадження IPIS підвищує прозорість, прискорює коригувальні дії та підтримує ефективний розподіл капіталу; успіх залежить від якості даних, навчання персоналу та поетапної інтеграції в управлінські процедури. Система також покращує порівнюваність між господарствами та сезонами, полегшуючи процедури належної перевірки кредиторів і інвесторів (due diligence). Обмеженнями є нерівномірна цифрова зрілість і можливий зсув вимірювань, що зумовлює потребу в поетапних пілотах і подальших дослідженнях щодо автоматизованого збору даних.

Ключові слова: *аграрні підприємства; управління активами; ключові показники ефективності (KPI); ключові показники ризику (KRI); основні засоби; невизначеність; стійкість.*

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Список літератури

1. Kaplan, R. S., Norton, D. P. The Balanced Scorecard: Translating Strategy into Action. Boston: Harvard Business School Press, 1996.
2. Committee of Sponsoring Organizations of the Treadway Commission (COSO). Enterprise Risk Management—Integrating with Strategy and Performance. COSO, 2017.
3. Weick, K. E., Sutcliffe, K. M. Managing the Unexpected: Resilient Performance in an Age of Uncertainty. 2nd ed. San Francisco: Jossey-Bass, 2007.
4. Aven, T. Risk Analysis. Chichester: Wiley, 2015.
5. World Bank. Agricultural Sector Risk Assessment: Methodological Guidance for Practitioners. Washington, DC: World Bank, 2016.
6. Лопатинський Ю., Кравченко А. Цифрові технології в сільському господарстві: тенденції та виклики. Журнал аграрних інновацій. 2023. Т. 12, № 3. С. 45–58.
7. Сміт Дж. Застосування Інтернету речей у розумному фермерстві. Міжнародний журнал точного землеробства. 2022. Т. 9, № 4. С. 123–137.
8. Головко О.Г., Омеляненко Д.О. Peculiarities of business asset management. Economics and Law. 2021. 2 (61). С. 135-142
9. Гєєнко М., Омеляненко Д. Методичні підходи до аналізу формування та ефективного використання активів у рамках невизначеності та ризику. Вісник Сумського національного аграрного університету. 2023. № 2(94). С. 19–24. URL: https://doi.org/10.32782/bsnau.2023.2.4
10. Омеляненко Д. Сучасні концепції управління активами агропідприємств України. Вісник Сумського національного аграрного університету. 2025. № 2. С. 45–62. URL: https://doi.org/10.32782/bsnau.2025.2.5
11. Головко О.Г., Омеляненко Д.О. Принципи управління активами підприємства в контексті забезпечення його фінансової стабільності. Проблеми та перспективи розвитку підприємництва: Матріали XIV Міжнародної науково-практичної конференції. 2020. 424 с.

12. Головко О.Г., Омеляненко Д.О. Asset management: methodology of effective formation. Перпективи розвитку управлінських систем у соціальній та економічній сферах України: теорія та практика. 2020. 472 с.
13. Світовий банк. Цифрове сільське господарство: майбутнє фермерства? 2023. URL: https://www.worldbank.org/en/topic/agriculture.
14. Руденко, М. В. Управління ризиками підприємств аграрного сектора. Економіка, 2018. 6 с. (стаття, PDF)
15. Лупенко, Ю. О., Фещенко, В. В. Хеджування фінансових ризиків та сучасний ринок деривативів для підприємств аграрного сектору економіки. Фінанси України, 2014, № 11, с. 98–115.

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Shum Alina
Doctor of Economic Sciences, Associate Professor,
Professor of Department of Accounting and Finance
National Technical University
"Kharkiv Polytechnic Institute", Kharkiv, Ukraine
2, Kyrpychova str., Kharkiv, 61002, Ukraine
e-mail: alina.shum@khpi.edu
ORCID ID: 0000-0003-2948-6238

Development of control and audit systems in the context of population aging: integration of risk management, socio-economic imperatives and adaptation strategies

Abstract.The article examines modern systems of internal control and audit in enterprises in the context of population aging. The research object covers corporate governance mechanisms, risk management, and internal audit, all of which play a key role in ensuring organizational resilience amid demographic changes. Special attention is given to the specific risks associated with age-related structural changes in personnel and their impact on management effectiveness.

Problem statement. The main problem lies in the fact that traditional systems of control and audit often prove inadequately adapted to new demographic challenges such as an aging workforce, which introduces cognitive, motivational, technological, and succession risks. This necessitates a revision of existing risk management and control approaches.

Unresolved aspects of the problem. Open questions remain regarding the integration of the demographic factor into risk management systems, as well as the development of adaptive internal control and audit mechanisms that would ensure flexibility and effectiveness amidst changes in the age structure of personnel.

Purpose of the article. The purpose of the article is to analyze the development of internal control, audit, and risk management systems in the context of population aging, as well as to identify ways to optimize these systems in order to improve the efficiency of enterprise management.

Presentation of the main material. The paper systematizes four major categories of risks inherent to aging personnel: cognitive, technological, succession, and motivational. Functional differences between internal control, risk management, and internal audit subsystems are described. The stages of the risk management process and the roles of governance bodies at each stage are outlined, as are European trends concerning the socio-economic challenges of population aging.

Conclusions. The research substantiates the feasibility of adapting control systems to demographic shifts, which can increase economic efficiency, reduce operational risks and costs, and improve employee satisfaction. Strategies for integrating risk management into corporate governance practice are proposed to prevent the negative consequences of age-related personnel changes.

Keywords: *risk management, internal control, internal audit, population aging, socio-economic challenges, risk governance, corporate governance, retirement age.*

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Introduction. Modern demographic trends, characterized by the steady aging of the population, represent one of the most significant challenges for the socio-economic systems of developed countries. The decline in the share of the working-age population, increased pressure on pension systems, and the redistribution of budget expenditures in favor of social needs create a complex set of problems that require systemic solutions. In the context of these changes, improving mechanisms of internal control, audit, and risk management becomes especially relevant, as they are key elements in ensuring the sustainability of enterprises and the economy as a whole.

The research problem lies in the need to adapt existing control and risk management systems to new demographic realities. Traditional approaches oriented toward stable labor resources need to be reconsidered given the increasing role of older age groups in economic activity. The relevance of the topic is intensified not only by demographic shifts but also by their direct impact on corporate governance, financial stability, and social policy at all levels of public administration.

The purpose of this work is to analyze modern internal control and audit systems in the context of population aging and to develop recommendations for their optimization. Special attention is given to the integration of risk management, socio-economic imperatives, and adaptation strategies aimed at improving governance efficiency under changing population age structures.

The study relies on the theoretical foundations of internal control models such as the Three Lines Model, as well as on the analysis of statistical data and sociological research reflecting demographic trends in the EU and other developed countries. The results obtained may be of practical value for business leaders, auditors, policymakers, and civil servants who develop sustainable development strategies under conditions of population aging.

This work can contribute to solving a relevant scientific and practical problem by offering a comprehensive approach to adapting control and audit systems to the demographic challenges of the present.

Literature review. The issue of demographic aging and its impact on socio-economic systems, including corporate governance, control, and audit, is the subject of active study in modern academic literature. Research in this area covers a wide range of approaches—from the analysis of demographic trends to the development of adaptive models for risk management and internal control.

European and international organizations such as Eurostat and the OECD provide extensive data on demographic changes. For example, Eurostat [4] forecasts a significant increase in the proportion of the population over 65 in EU countries by 2070, which will lead to greater pressure on pension systems and a reduction in the share of the working-age population. The OECD [7] emphasizes that these trends require a revision of social and economic policies, including measures to increase labor productivity and adapt the labor force. These studies form the basis for understanding the macroeconomic challenges associated with population aging.

The theoretical foundations of internal control and risk management are developed in the works of authors such as Aebi, Sabato, and Schmid (2021), who analyze the relationship between corporate governance and organizational resilience in times of crisis. The Three Lines Model, proposed by The Institute of Internal Auditors (2024), is one of the most widely used concepts in this field. It provides for the division of control functions between operational management, the risk management function, and internal audit, offering a comprehensive approach to risk management. However, as Mikes (2016) points out, traditional models need to be adapted to new challenges, including demographic changes.

Empirical studies by Brandt (2024) show a rise in economic activity among individuals over 65 in Europe, driven by both financial motives and the desire to remain socially active.

The classification of risks associated with an aging workforce includes cognitive, technological, succession, and motivational aspects. Jamet and El-Atillah (2023) note that older workers often demonstrate high productivity, particularly under remote work conditions, but face

challenges in adopting new technologies. Power (2015) emphasizes the importance of organizational culture and adapting control systems to minimize these risks.

Studies by Seimuskane et al. (2017) and Vorslava et al. (2014) explore the socio-political dimensions of population aging, such as declining trust in government institutions and reduced electoral participation, which, although indirectly, significantly affect economic decision-making. In Japan, as shown by Statista (2025), the high level of participation by older people in the workforce is linked to cultural and economic factors, which necessitates consideration of regional and sectoral specifics in the development of management strategies.

The issue of population aging and its impact on control and audit systems is examined in a global context, taking into account a variety of theoretical and practical approaches. Key directions for future research may include the adaptation of internal control models to demographic challenges and the development of age-oriented strategies at various levels of governance, considering regional and sectoral characteristics. These studies may form the foundation for comprehensive solutions aimed at enhancing the resilience of economic entities and public institutions in the face of demographic changes.

Purpose, objectives and research methods. The purpose of this study is to develop approaches for adapting internal control, audit, and risk management systems to the conditions of demographic aging, ensuring the sustainable development of enterprises in changing socio-economic conditions.

The main objectives of the study:

– analysis of current demographic trends and their impact on corporate governance;

– assessment of the effectiveness of existing internal control models (particularly the Three Lines Model) in the context of an aging workforce;

– identification of specific risks associated with age-related changes in personnel structure;

– development of recommendations for modernizing risk management systems considering the demographic factor;

– formulation of strategic directions for adapting control, audit activities, and governance to new challenges.

The methodological framework of the research is based on an integrated approach combining:

– theoretical methods: a systematic analysis of internal control concepts (COSO, ISO 31000); analysis of internal control, internal audit, risk management, and corporate governance models; a review of contemporary theories of internal control, internal audit, and risk management;

– empirical methods: statistical analysis of demographic data (Eurostat, OECD, national statistical agencies).

The source base includes: 45 scientific publications (2015–2024) from peer-reviewed journals; 12 international reports on demography and corporate governance; regulatory documents (EU directives, audit standards).

A distinctive feature of the methodology is the integration of demographic and managerial approaches, which enables the development of comprehensive solutions that take into account both the economic and social dimensions of the issue.

Research results. The conducted study revealed the multifaceted impact of demographic aging of personnel on the effectiveness of internal control and risk management systems. There is a correlational relationship between the age structure of staff and the performance indicators of control activities. An increase in the proportion of employees over the age of 55 leads to longer execution times for control procedures, which is accompanied by a parallel increase in the frequency of documentation errors. This confirms the hypothesis that traditional control mechanisms need to be adapted to the changing demographic reality.

Of particular interest are the findings from the assessment of the Three Lines Model's effectiveness under conditions of workforce aging. The study identified a marked imbalance in the

distribution of control functions under demographic changes when applying the Three Lines Model: a decline in the effectiveness of the first line of defense (operational management) in teams dominated by older personnel, alongside a growing importance of the second line (risk management) and increased burden on internal audit services. These changes call for a reassessment of traditional approaches to the allocation of control powers and resources within organizations.

In our view, four key categories of specific risks characteristic of aging workforces can be identified: cognitive risks (related to age-associated changes in information processing speed); technological risks (due to resistance to digital transformation); succession risks (loss of expert knowledge when older personnel retire); motivational risks (declining engagement and professional activity).

Each of these categories requires the development of specialized control mechanisms and risk management procedures.

In response to contemporary demographic challenges, the modernization and adaptation of control and internal audit systems may include the implementation of rotational mentoring systems (demonstrating increased knowledge transfer effectiveness), the use of gamification elements in control procedures (which enhance staff engagement), and the employment of digital control assistants (which reduce the number of errors). These measures may have significant practical implications for organizations facing the issue of an aging workforce.

The economic efficiency of such measures may be reflected in the reduction of operational risks and lower costs of control procedures, along with increased employee satisfaction indexes. These findings support not only the organizational but also the economic feasibility of adapting internal control systems to demographic changes.

The outlined directions may be appropriate not only from an organizational perspective but also from an economic one in adapting internal control and internal audit systems to demographic shifts. The results obtained can contribute to the development of corporate governance theory, expanding the understanding of the relationship between demographic factors and control system effectiveness. The identified patterns lay the foundation for the creation of new, more adaptive internal control models that take current demographic trends into account.

Discussion. In recent years, the trend toward increasing complexity and acceleration of financial and economic activities and business operations at all levels has continued to intensify. This imposes specific requirements on management, which must align with rapidly changing conditions and respond promptly and appropriately to emerging challenges.

Alongside the development of management systems, control systems are also evolving. The control system is an integral part and a subsystem of the overall management system. The control system must fully correspond to the management system and address the tasks assigned to it. This is a fundamental requirement for an effective management system.

The establishment and effective functioning of an internal control and risk management system are aimed at ensuring the efficient operation of the overall management system, providing reasonable and sufficient assurance that the enterprise’s management objectives will be achieved within planned resource and time constraints, and ensuring proper control over the company’s operations and performance.

Currently, the internal control and risk management system built on the Three Lines Model has become widely adopted and used (Fig. 1).

Figure 1 presents the basic structure of the internal control and risk management system based on the Three Lines Model.

The first line consists of management, which is responsible for internal control and risk management of business processes.

The second line is the internal control and risk management function, aimed at monitoring and supporting management and helping to establish an effective internal control and risk management system within the organization.

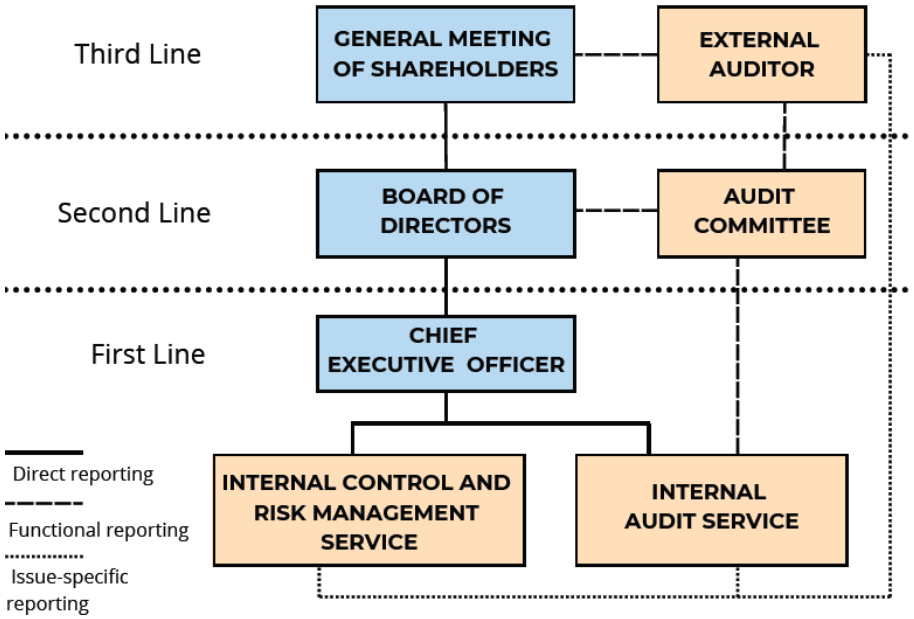

Figure 1. Diagram of the internal control and risk management system based on the Three Lines Model
Source: prepared by the author

The third line is the internal audit function, which provides an independent assessment of the internal control and risk management system.

The Audit Committee is a collegial advisory body of the Board of Directors. Its primary role and objective are to facilitate the effective performance of the Board of Directors' functions in overseeing the enterprise's financial and operational activities. In its operations, the Audit Committee and its members are guided by applicable legislation, the Regulations on the Audit Committee (approved by the General Meeting of Shareholders), and the internal documents of the enterprise.

The functions of the Audit Committee include:

– monitoring the completeness, accuracy, correctness, and reliability of the enterprise's accounting (financial) reporting;

– overseeing the reliability and effectiveness of the internal control and risk management system;

– ensuring the independence and objectivity of external and internal audits;

– supervising the effectiveness of mechanisms for identifying, preventing, and reporting to management any actual or potential cases of misconduct by company employees or third parties, as well as other violations occurring within both the internal and external environments of the enterprise.

The internal control and risk management unit is an independent structural division of the enterprise, operating in accordance with the Regulations on the Unit, the Internal Control Policy, the Risk Management Policy, internal corporate documents, and applicable legislation. The unit and its head report directly to the CEO (chief executive officer) of the enterprise. The head of the unit is appointed by the CEO. Functionally, the unit is connected to the Audit Committee.

The Internal Control and Risk Management Unit performs the following key functions:

– organizing and coordinating the internal control and risk management processes;

– identifying and monitoring violations and deviations from management decisions, risks and risk indicators, creating and maintaining an up-to-date risk map;

– assessing risks and developing proposals for risk prevention or management in cooperation with business process management;

– analyzing business processes to improve their control mechanisms.

The Internal Audit Unit is an independent structural division of the enterprise, operating in accordance with applicable legislation, the Internal Audit Policy, and internal corporate documents. The unit and its head are administratively subordinate to the CEO of the enterprise. The head of the unit is appointed by the CEO. Functionally, the unit is connected to the Audit Committee.

The Audit Committee reviews, develops, and approves policies in the field of internal audit, long-term and current internal audit plans, and together with the head of the internal audit unit, evaluates and approves the unit's resources and budget, and assesses the effectiveness of its activities.

The Internal Audit Unit carries out the following main functions:

– evaluating the effectiveness of the internal control and risk management system, as well as corporate governance;

– developing actions and recommendations to improve the internal control and risk management system, its procedures, and corporate governance, and assisting management in developing corrective measures based on audit results, including providing advisory support;

– monitoring the implementation of recommendations to eliminate deficiencies and violations identified during audits;

– delivering consulting services;

– providing methodological support for internal audit;

– executing audit plans.

The Audit Committee of the Board of Directors is responsible for submitting recommendations to the General Meeting of Shareholders regarding the appointment, reappointment, or dismissal of the external auditor. The Committee evaluates the candidates and remuneration of the external auditor, including their qualifications, independence, objectivity, and compliance with the principles governing the provision and combination of audit and non-audit services.

The management process is realized through various functions, including control. Control provides feedback between the subject and object of management. Together with accounting (recordkeeping), control creates the information base for management decision-making. Based on the essence of governance, the senior management of the enterprise is responsible for establishing and maintaining an internal control and risk management system and for informing stakeholders in a timely manner about all existing risks arising from the enterprise's activities.

Internal audit is an integral and essential part of the internal control and risk management system. It is closely linked to both the internal control system and the broader management system of the enterprise. These systems are interconnected, interdependent, and mutually reinforcing. However, in modern business practice, internal audit is usually an organizationally distinct and independent structure that performs its own functions within the unified internal control system – a subsystem of the overall management system.

Internal audit acts as an independent expert function on internal control and risk management at all levels. It also serves as a source of objective, independent information for the enterprise's owners and all levels of management, including senior executives.

In current practice, risk assessment is considered a process of identifying, classifying, and analyzing risks. Risk is inherent in all economic and financial activities at all levels. There is a wide variety of risks, many of which are interrelated, but all ultimately impact the enterprise's economic and financial performance, and therefore require evaluation and management. This necessitates the existence of an organizational structure capable of identifying risks in a timely manner and creating management mechanisms to eliminate their consequences or, at a minimum, reduce them to an acceptable level.

From a risk management perspective, the structural characteristics of risk (threat, exposure, vulnerability, risk interdependence) are considered within the context of the interaction between the internal and external environments of the enterprise – or more broadly, the business.

At the current stage of development of internal control and risk management theory, it is the internal and external environments of the enterprise, the internal and external risks, and their interactions that shape the internal audit environment. The extent and quality of risk management by the enterprise's management system are key indicators of management effectiveness. An organizationally distinct internal audit unit operates in accordance with current legislation, internal regulatory documents, job descriptions, and its own charter. Typically, the internal audit unit is responsible for monitoring and analyzing the enterprise's financial and business activities.

When establishing such a unit, it is important to define a broad set of strategic objectives and tasks and to develop general, localized, and specific audit objectives. A comprehensive analysis of the enterprise's activities and identification of weaknesses in internal control, risk management, and governance systems determines the role of the internal audit unit within the overall organizational structure and its level of integration and interaction with other departments.

For effective functioning, the internal audit unit requires the detailed development of local regulatory documents governing its operations [11], including: Internal Audit Charter; Operating Policy; Internal Audit Standards; Job descriptions for internal auditors and unit staff; Error classifiers and risk registries; and more.

Control measures must be prepared to such an extent and of such quality that they ensure clarity for each control action of the internal auditor, eliminating any ambiguity in the understanding of assigned goals and objectives.

It is important to recognize that decision-making and risk management lie within the competence of the enterprise's management system, while internal audit monitors and evaluates the effectiveness of management, internal control, and risk management systems.

From a risk management standpoint, the greatest effectiveness can be achieved when risks are clearly identified and defined, and specific procedures and methods can be applied to prevent, eliminate, or reduce their consequences to acceptable levels. In both theory and practice, three main approaches are distinguished:

– the first – developing a system of measures to monitor the internal and external environment in order to detect and identify risks for their prevention and avoidance;

– the second – minimizing or eliminating the effects of risks associated with economic activities. This is typically linked to the creation of internal and external reserve or insurance funds. However, it should be noted that this diverts resources from active operations and immobilizes them indefinitely, negatively affecting financial and economic results;

– the third – using managerial decisions to turn risk situations into additional income or competitive market advantages through innovative and unconventional strategies.

To build an adequate risk management system, enterprise leadership must have access to essential accounting and analytical control information, provided by the accounting system, internal control system, and internal audit. In turn, the internal control and risk management system and internal audit must not only provide data on existing and potential risks but also deliver recommendations to prevent, eliminate, or reduce those risks to acceptable levels.

The internal audit system should assess the reliability and effectiveness of the enterprise's management system, internal control system, and risk management system, including all their subsystems and the company's business processes. The internal audit system should contribute to achieving both the strategic and tactical objectives of the economic entity and ensure the identification and prevention of risks.

Any enterprise or activity – whether in business or another field – goes through different stages of maturity. At each stage of development, the owners and management set priorities for the list of goals relevant to that activity and allocate resources accordingly. Regardless of the scale and

type of activity, form of ownership, or business organization, every venture is subject to risks that may hinder the achievement of its goals. Therefore, these risks must be managed.

At the same time, both the implementation of strategy (or project) and the achievement of defined goals – as well as risk management itself – require resources whose use must be monitored. The main difference between internal audit and related fields such as internal control and risk management lies in its independence, which is the key prerequisite for the objectivity required of an auditor. The criteria applied to risk management, internal control, and internal audit are presented in Table 1**.**

Table 1. Criteria applied to risk management, internal control and internal audit

Criteria	Risk management	Internal control	Internal audit
Reporting line	Part of management, an integral part of the enterprise management system	A subsystem of management, part of the management system	Independent from management Evaluates the management system and provides recommendations for improving effectiveness
Maintaining internal control and risk management systems	Directly involved in maintaining internal control and risk management systems	Directly involved in maintaining internal control and risk management systems	Independently assesses the effectiveness of internal control and risk management procedures and systems overall
Improvement of internal control and risk management systems	Develops and implements improvement measures; responsible for them	Develops and implements improvement measures. Responsible for them	Develops recommendations. Provides consulting and expert support
Reporting	Reports to various levels of management	Reports to various levels of management	Reports to senior executive management, board of directors, and shareholders

Source: prepared by the author

The activities related to the organization and functioning of the internal control and risk management system, the internal audit system, as well as the rights, responsibilities, and accountability of the main participants in the risk management process, are presented in Table 2.

At present, no control system can fully (with 100% certainty) guarantee the detection and prevention of violations or deviations in financial and economic activities, nor can it ensure absolute accuracy and correctness of financial reporting. No control system is immune to collusion. The practice of economic and business activity confirms this. Violations of various types, including those with severe and far-reaching consequences, occur at all levels constantly and systematically. The operational experience of the "Big Four" auditing firms clearly illustrates this. Therefore, the improvement of control activities at all levels is one of the key tasks in both the theory and practice of control, and in economic and commercial activity as a whole.

One of the promising directions for improving the effectiveness of control activities is the upskilling of control personnel and the enhancement of their moral and ethical standards.

Currently, the population aging process continues, primarily in economically developed countries. This trend is strongly evident in EU countries, and it has negative economic, social, and other consequences.

According to EU reports from 2024, some well-substantiated development trends for EU countries up to 2070 can be clearly identified [4, 21]:

– there is a steady increase in the proportion of older population segments (65+), while the share of age groups under 45 in the overall working-age population is declining. The ratio of the working-age population to the non-working-age population is showing an extremely negative trend;

– public expenditures for social needs of the non-working population are rising, with pension payments accounting for a significant portion of these expenses;

– GDP growth in almost all EU countries is expected to rely primarily on increased labor productivity, which is projected at around 0.5–1.5%. This may not be sufficient to offset the growing costs of social spending, especially pensions.

Table 2. Stages of the risk management process and role of governance bodies

Process stage	Shareholders' meeting	Board of directors	Management	Internal control division	Risk management division	Internal audit
Strategic goal setting	Sets strategic goals; defines acceptable decision-making and resource use boundaries for the board and management	General oversight of the adequacy and effectiveness of internal control and risk management systems. Approval of the most significant decisions; ensuring the conditions necessary for creating an effective control environment. Administrative support for the management system, internal control system, and risk management system. Provision of resources to ensure the proper functioning of the management system, internal control system, and risk management system	Responsibility for setting strategic objectives, developing a plan to achieve them, and ensuring its implementation	Promotion of the internal control system. Supports and, within this framework, is responsible for achieving the objectives set by the enterprise's management system and management	Promotion of risk management systems; analysis of the relevance of strategic objectives	Promotion of the concept of the internal control system and risk management system; audits of methodologies and methodological support for systems and processes of risk identification, specification, scale, and probability
Risk identification and quantification			Identification and approval of risks, their magnitude, and probability	Provision of necessary information to management and risk management units, as well as other forms of support	Methodology and methodological support for systems involved in the risk identification process, their specification, scale, and probability	Promotes risk management and internal control methodology; audits systems and processes for identifying and quantifying risks
Defining goals and identifying risks			Breaking down strategic objectives into operational ones; risk identification and approval of the risk register	Informational and other support for management and risk management units	Risk identification methodology and detection of risks; analysis of operational objectives for alignment with the strategy	Audit and analysis of operational objectives for alignment with the strategy, their methodological support, and consultations
Risk assessment			Risk assessment and approval of assessment results	Informational and other support for management and risk management units	Risk assessment and assessment methodology	Independent evaluation of methodologies and risks during annual planning and specific audits
Response strategy development and risk management			Development and approval of measures	Informational and other support for management and risk management units; consultations when participation in activities is required	Development of measures, consultations during the development process, and analysis of the adequacy of selected measures	Consultations during the development of measures, and analysis of the adequacy of the selected measures

Table 2. (continued)

Implementation of the risk response strategy, introduction of risk management methods, and control of procedures			Implementation of measures	Informational and other support for management and risk management; participation in implementation and control of activities if necessary	Participation in the development of measures and control over their implementation	Control of implemented measures and analysis of the adequacy of the outcomes of those measures
Information and communication			Preparation of reports on the effectiveness of measures and their results, risk management system performance, and coordination of risk management across all levels of hierarchy and among all departments of the enterprise	Information support; preparation of reports on the effectiveness of activities and their outcomes, the performance of the risk management system, and coordination of risk management across all levels of hierarchy and between all departments of the enterprise	Preparation of reports; reporting on the effectiveness of measures and their outcomes, risk management system performance, and coordination of risk management across all levels of hierarchy and departments of the enterprise	Preparation of independent reports on the effectiveness of the enterprise management system, internal control system, and risk management system
Monitoring risk management systems			Preparation of improvement measures for the internal control and risk management system; implementation of corrective actions	Information support; preparation of measures to improve the internal control and risk management system; implementation of corrective actions	Monitoring of implemented measures; development of improvement measures for the internal control and risk management system; implementation of corrective actions	Monitoring of implemented measures; independent reports on the adequacy and effectiveness of internal control and risk management systems based on the results of the monitoring

Source: prepared by the author

It is important to note that this category of the population, in addition to significant material incentives for active economic participation, also has strong moral motivation, which can positively and significantly impact both their individual economic activity and the economy as a whole.

The decision of people aged 60 and over to continue working is driven by a number of factors. The main reason is the desire to remain physically and mentally active – 65% of respondents in the United Kingdom and 56% in Poland cited this as their primary motivation [9, 15]. Financial considerations also play an important role: in 2024, 63% of respondents in Germany named this as their main reason [17]. Social factors are also significant – 56% of German respondents wish to maintain social interaction [17]. However, similar trends can be observed to varying degrees in other EU countries and the EU as a whole [2, 3, 14, 16]. Many older adults (45% in the UK) simply enjoy their work [15]. Concerns about insufficient pension benefits also motivate continued employment – 30% of Britons and 44% of Poles mentioned this [9, 15]. In Japan, there has been a rise in the participation of older people in the labor force – in 2024, 26.1% of the population aged 65 and over were still working [13]. Interestingly, in Canada, remote workers aged 51–64 were found to be more productive than their younger colleagues [18], which may further encourage older adults to continue their careers.

One more significant point can be noted, in our view. Namely, among older workers there is a higher proportion of self-employed individuals compared to other age groups. Thirty-eight percent of people aged 65–74 are either self-employed or independent employers, compared to 13% of those aged 25–64. The share of self-employed workers rises to 57% among those over 75 [5].

From our point of view, it is necessary to highlight and take into account several phenomena that lie within the social and political sphere, and the domain of state-building, but which significantly influence the economy at all levels – from macro to micro. These phenomena are interrelated and mutually reinforcing. The trends in question are as follows:

1. in many countries, there is growing concern over the decline in voter turnout across all types of elections [10];
2. public trust in state institutions and governance structures is low, including in European Union member states [20].

These trends have a substantial impact on economic decision-making at all levels of the economy and governance. The issue of population aging – the exclusion of a significant portion of the population (aged 65 and over) from active and social life – negatively affects the aforementioned trends, which in turn exacerbates economic challenges.

An increase in the economically and socially active segment of the population would, in any case, have a positive effect on the economic and social development of both the economy and society as a whole.

The reintegration of a portion of these individuals into active, including economic, life could bring several benefits – not only for the individuals themselves but also for the economy and society more broadly. In our view, the implementation of this approach could:

– significantly ease the burden of budgetary funding for the social sector;

– strengthen the economic position of this demographic group, which could stimulate and expand consumer goods and service markets, acting as a driver and accelerator of overall economic growth;

– the growth of the economically active population may positively impact business development and the economy as a whole.

The implementation of this approach could largely be achieved by educating this segment of the population in the advances of scientific and technological progress – primarily through digitalization, computer and gadget literacy, and the development of communication skills, including foreign language training. This education could be followed by employment opportunities, which would help solidify the acquired knowledge and skills, offset training costs, and serve as a stage for reintegration into professional, economic, and social life.

Conclusions. The conducted research has made it possible to formulate a number of fundamentally new propositions that contribute significantly to the development of the theory and practice of corporate governance. The scientific novelty of the study lies primarily in the development of the concept of age-adaptive internal control, which for the first time systematically incorporates the demographic factor as a key element of control system effectiveness. The established quantitative relationships between the age structure of personnel and the parameters of control activities represent a significant outcome that expands the understanding of organizational mechanisms in the context of an aging workforce. Of particular note is the classification of specific risks associated with age-diverse teams, which fills a previously existing theoretical gap in the research on the intersection of demography and risk management.

The theoretical significance of the study is manifested in several aspects. First, the work advances traditional models of internal control (specifically, the Three Lines Model), adapting them to contemporary demographic realities. Second, the findings enable a rethinking of the role of age diversity in organizational effectiveness, offering new avenues for research in human resource management. Third, the study contributes to the theory of organizational adaptation by demonstrating concrete mechanisms through which management systems adjust to external challenges.

The practical value of the research is confirmed by concrete economic outcomes resulting from the implementation of the proposed solutions. The introduction of age-oriented approaches to control organization enables companies not only to mitigate the negative impacts of demographic shifts but also to unlock the potential of older employees. The socio-economic effect of implementing the proposed measures includes: increased business resilience through optimized control processes, reduced costs associated with control errors and deficiencies, and improved organizational climate due to fuller utilization of the professional experience of older age groups.

Future research prospects can be identified in several directions. The issue of finding the optimal balance between automation of control processes and retention of expert judgment from senior specialists requires in-depth exploration. The study of industry-specific characteristics of the identified patterns, particularly in high-tech sectors, also merits attention. An important research direction is the development of comprehensive models for assessing the economic efficiency of age-adaptive control systems, taking long-term effects into account. Moreover, examining the impact of the proposed approaches on the innovative potential and competitiveness of organizations amid global demographic change appears highly promising.

This research opens new horizons for scholarly inquiry at the intersection of demography, management, and control theory, offering both theoretical concepts and practical tools for organizations facing the challenges of an aging workforce. The findings lay the groundwork for the development of a new academic field focused on adapting corporate governance systems to the demographic changes of the 21st century.

References

1. Aebi, V., Sabato, G., & Schmid, M. (2012). Risk management, corporate governance, and bank performance in the financial crisis. *Journal of Banking & Finance*, 36(12), 3213-3226. Retrieved from https://doi.org/10.1016/j.jbankfin.2011.10.020
2. Brandt, M. (2024). How common is working at 65+ in Europe? *Statista*. Retrieved from https://de.statista.com/infografik/31622/erwerbstaetigenquote-in-der-altersgruppe-65--in-europa/ [in German].
3. Brandt, M. (2024). How many pensioners work? *Statista*. Retrieved from https://de.statista.com/infografik/33206/erhebung-zur-erwerbstaetigkeit-von-menschen-im-rentenalter/ [in German].
4. Eurostat (2024). *Demographi of Europe – 2024 edition*. Retrieved from https://ec.europa.eu/eurostat/en/web/products-interactive-publications/w/ks-fw-24-004
5. Jamet, M., & El-Atillah, I. (2023). The rise of elderly workers: The Europeans defying retirement norms and working past the age of 70. *Euronews.* Retrieved from https://www.euronews.com/next/2023/02/22/the-rise-of-elderly-workers-who-works-beyond-the-age-of-65-or-75-in-europe
6. Mikes, A. (2009). Risk management and calculative cultures: Beyond compliance. *Management Accounting Research*, 20, 18-40. Retrieved from https://doi.org/10.1016/j.mar.2008.10.005
7. OECD (2023). *Pensions at a Glance: OECD and G20 indicators*. Retrieved from https://www.oecd.org/en/publications/pensions-at-a-glance-2023_678055dd-en.html

8. Power, M. (2015). How accounting begins: Object formation and the creation of infrastructure. *Accounting, Organizations and Society*, 47, 43-55. Retrieved from https://doi.org/10.1016/j.aos.2015.10.005
9. Sas, A. (2023). Reasons for continuing working past retirement age in Poland in 2017. *Statista*. Retrieved from https://www.statista.com/statistics/453282/grounds-for-working-beyond-retiremen-age-in-poland/
10. Seimuskane, L., Vilka, I., & Brekis, E. (2017). Assessment of Socio-Economic Status Relevance for Latvian Electoral Participation. In: Nunes Silva, C., Buček, J. (eds) *Local Government and Urban Governance in Europe. The Urban Book Series.* Springer, Cham. pp. 209-232. Retrieved from https://doi.org/10.1007/978-3-319-43979-2_11
11. Semenets, A., Datsenko, G., Panfilov, O., Kuzkin, Y., & Pankratova O. (2022). Management improvement at an enterprise through internal control augmentation in the case of international business. *Financial and Credit Activity Problems of Theory and Practice*, 1(42), 173–184. Retrieved from https://doi.org/10.55643/fcaptp.1.42.2022.3459 [in Ukrainian].
12. Semenets, A., Panfilov, O., Kuzkin, Y., Kuznetsova, S., & Hladii, I. (2021). To the problem of the methodological incorrectness of the substance over form principle in modern accounting in the international business context. *Financial and Credit Activity Problems of Theory and Practice*, 5(40), 145–155. Retrieved from https://doi.org/10.18371/fcaptp.v5i40.244917 [in Ukrainian].
13. Statista. (2025). *Labor force participation rate Japan 1973-2024, by age*. Retrieved from https://www.statista.com/statistics/1233920/japan-labor-force-participation-rate-by-age/
14. Statista. (2024). *Percentage of retirees working for pay since retirement in the United States from 1999 to 2024*. Retrieved from https://www.statista.com/statistics/291907/us-retiree-financial-confidence-retirement-basic-expenses/
15. Statista. (2022). *Reasons for continuing work past retirement age in the United Kingdom in 2017*. Retrieved from https://www.statista.com/statistics/453317/grounds-for-working-beyond-retiremen-age-in-the-uk/#statisticContainer
16. Statista. (2024). *Share of the population aged 65 to 79 years old who desire to work in the future in South Korea from 2012 to 2024*. Retrieved from https://www.statista.com/statistics/1085934/south-korea-desire-to-work-again-among-older-population/
17. Statista. (2024). *Survey: Reasons for working beyond the official retirement age in 2024*. Retrieved from https://de.statista.com/statistik/daten/studie/1488110/umfrage/gruende-fuer-das-arbeiten-ueber-das-offizielle-rentenalter/ [in German].
18. Tierney, A. (2021). Change of productivity of employees working from home in Canada 2021, by age. *Statista*. Retrieved from https://www.statista.com/statistics/1227588/change-of-productivity-of-new-remote-workers-in-canada-by-age/
19. The Institute of Internal Auditors. (2024). *The IIA's Three Lines Model*. Retrieved from https://www.theiia.org/globalassets/documents/resources/the-iias-three-lines-model-an-update-of-the-three-lines-of-defense-july-2020/three-lines-model-updated-english.pdf
20. Vorslava, M., Seimuskane, L., & Pukis, M. (2014). Public trust and participation depending on ethnicity in Latvia. *European Integration Studies*, 8, 39–47. Retrieved from https://doi.org/10.5755/j01.eis.0.8.6870
21. 2024 Ageing Report. Economic and Budgetary Projections for the EU Member States (2022-2070). (2024). *Institutional Paper 279*. April 2024. Brussels. PDF. 358 pp. Retrieved from https://economy-finance.ec.europa.eu/publications/2024-ageing-report-economic-and-budgetary-projections-eu-member-states-2022-2070_en

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Аліна Шум
доктор економічних наук, доцент
професор кафедри обліку і фінансів
Національний технічний університет
«Харківський політехнічний інститут»
вул. Кирпичова, 2, м. Харків, 61002, Україна
e-mail: alina.shum@khpi.edu
ORCID ID: 0000-0003-2948-6238

Розвиток систем контролю та аудиту в умовах демографічного старіння: інтеграція ризик-менеджменту, соціально-економічних імперативів та адаптаційних стратегій

Анотація. Стаття досліджує сучасні системи внутрішнього контролю та аудиту на підприємствах у контексті старіння населення. Об'єктом дослідження є механізми корпоративного управління, управління ризиками та внутрішній аудит, які відіграють ключову роль у забезпеченні організаційної стійкості в умовах демографічних змін. Особлива увага приділяється специфічним ризикам, пов'язаним зі структурними змінами в персоналі через вік, та їхньому впливу на ефективність управління.

Постановка проблеми. Основна проблема полягає в тому, що традиційні системи контролю та аудиту часто виявляються недостатньо адаптованими до нових демографічних викликів, таких як старіння робочої сили, що вводить когнітивні, мотиваційні, технологічні та ризики спадкоємства. Це вимагає перегляду існуючих підходів до управління ризиками та контролю.

Нерозв'язані аспекти проблеми. Відкритими залишаються питання щодо інтеграції демографічного фактора в системи управління ризиками, а також розробки адаптивних механізмів внутрішнього контролю та аудиту, які б забезпечували гнучкість та ефективність в умовах змін у віковій структурі персоналу.

Мета статті. Метою статті є аналіз розвитку систем внутрішнього контролю, аудиту та управління ризиками в контексті старіння населення, а також виявлення шляхів оптимізації цих систем з метою підвищення ефективності управління підприємством.

Виклад основного матеріалу. У статті систематизовано чотири основні категорії ризиків, притаманних старіючому персоналу: когнітивні, технологічні, ризики спадкоємства та мотиваційні. Описано функціональні відмінності між підсистемами внутрішнього контролю, управління ризиками та внутрішнього аудиту. Окреслено етапи процесу управління ризиками та ролі органів управління на кожному етапі, а також європейські тенденції щодо соціально-економічних викликів старіння населення.

Висновки. Дослідження обґрунтовує доцільність адаптації систем контролю до демографічних зрушень, що може підвищити економічну ефективність, зменшити операційні ризики та витрати, а також покращити задоволеність працівників. Запропоновано стратегії інтеграції управління ризиками в практику корпоративного управління для запобігання негативним наслідкам вікових змін у персоналі.

Ключові слова: *ризик-менеджмент, внутрішній контроль, внутрішній аудит, демографічне старіння, соціально-економічні виклики, управління ризиками, корпоративне управління, пенсійний вік.*

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Список літератури

1. Aebi, V., Sabato, G., & Schmid, M. (2012). Risk management, corporate governance, and bank performance in the financial crisis. *Journal of Banking & Finance*, 36(12), 3213-3226. DOI: https://doi.org/10.1016/j.jbankfin.2011.10.020
2. Brandt, M. (2024). How common is working at 65+ in Europe? *Statista*. URL: https://de.statista.com/infografik/31622/erwerbstaetigenquote-in-der-altersgruppe-65--in-europa/
3. Brandt, M. (2024). How many pensioners work? *Statista*. URL: https://de.statista.com/infografik/33206/erhebung-zur-erwerbstaetigkeit-von-menschen-im-rentenalter/
4. Eurostat (2024). *Demographi of Europe – 2024 edition*. URL: https://ec.europa.eu/eurostat/en/web/products-interactive-publications/w/ks-fw-24-004
5. Jamet, M., & El-Atillah, I. (2023). The rise of elderly workers: The Europeans defying retirement norms and working past the age of 70. *Euronews*. URL: https://www.euronews.com/next/2023/02/22/the-rise-of-elderly-workers-who-works-beyond-the-age-of-65-or-75-in-europe
6. Mikes, A. (2009). Risk management and calculative cultures: Beyond compliance. *Management Accounting Research*, 20, 18-40. DOI: https://doi.org/10.1016/j.mar.2008.10.005
7. OECD (2023). *Pensions at a Glance: OECD and G20 indicators*. URL: https://www.oecd.org/en/publications/pensions-at-a-glance-2023_678055dd-en.html
8. Power, M. (2015). How accounting begins: Object formation and the creation of infrastructure. *Accounting, Organizations and Society*, 47, 43-55. DOI: https://doi.org/10.1016/j.aos.2015.10.005

9. Sas, A. (2023). Reasons for continuing working past retirement age in Poland in 2017. *Statista*. URL: https://www.statista.com/statistics/453282/grounds-for-working-beyond-retiremen-age-in-poland/
10. Seimuskane, L., Vilka, I., & Brekis, E. (2017). Assessment of Socio-Economic Status Relevance for Latvian Electoral Participation. In: Nunes Silva, C., Buček, J. (eds) *Local Government and Urban Governance in Europe. The Urban Book Series.* Springer, Cham. pp. 209-232. DOI: https://doi.org/10.1007/978-3-319-43979-2_11
11. Семенець, А., Даценко, Г., Панфілов, О., Кузькін, Є., & Панкратова, О. (2022). Удосконалення управління підприємством шляхом підвищення дієвості внутрішнього контролю в контексті міжнародного бізнесу. *Financial and Credit Activity Problems of Theory and Practice*, 1(42), 173–184. DOI: https://doi.org/10.55643/fcaptp.1.42.2022.3459 [in Ukrainian].
12. Семенець, А., Панфілов, О., Кузькін, Є., Кузнецова, С., & Гладій, І. (2021). До проблеми методологічної некоректності принципу превалювання сутності над формою в сучасному бухгалтерському обліку в контексті реалій міжнародного бізнесу. *Financial and Credit Activity Problems of Theory and Practice*, 5(40), 145–155. DOI: https://doi.org/10.18371/fcaptp.v5i40.244917
13. Statista. (2025). *Labor force participation rate Japan 1973-2024, by age*. URL: https://www.statista.com/statistics/1233920/japan-labor-force-participation-rate-by-age/
14. Statista. (2024). *Percentage of retirees working for pay since retirement in the United States from 1999 to 2024*. URL: https://www.statista.com/statistics/291907/us-retiree-financial-confidence-retirement-basic-expenses/
15. Statista. (2022). *Reasons for continuing work past retirement age in the United Kingdom in 2017*. URL: https://www.statista.com/statistics/453317/grounds-for-working-beyond-retiremen-age-in-the-uk/#statisticContainer
16. Statista. (2024). *Share of the population aged 65 to 79 years old who desire to work in the future in South Korea from 2012 to 2024*. URL: https://www.statista.com/statistics/1085934/south-korea-desire-to-work-again-among-older-population/
17. Statista. (2024). *Survey: Reasons for working beyond the official retirement age in 2024*. URL: https://de.statista.com/statistik/daten/studie/1488110/umfrage/gruende-fuer-das-arbeiten-ueber-das-offizielle-rentenalter/
18. Tierney, A. (2021). Change of productivity of employees working from home in Canada 2021, by age. *Statista*. URL: https://www.statista.com/statistics/1227588/change-of-productivity-of-new-remote-workers-in-canada-by-age/
19. The Institute of Internal Auditors. (2024). *The IIA's Three Lines Model*. URL: https://www.theiia.org/globalassets/documents/resources/the-iias-three-lines-model-an-update-of-the-three-lines-of-defense-july-2020/three-lines-model-updated-english.pdf
20. Vorslava, M., Seimuskane, L., & Pukis, M. (2014). Public trust and participation depending on ethnicity in Latvia. *European Integration Studies*, 8, 39–47. DOI: https://doi.org/10.5755/j01.eis.0.8.6870
21. 2024 Ageing Report. Economic and Budgetary Projections for the EU Member States (2022-2070). (2024). *Institutional Paper 279*. April 2024. Brussels. PDF. 358 pp. URL: https://economy-finance.ec.europa.eu/publications/2024-ageing-report-economic-and-budgetary-projections-eu-member-states-2022-2070_en

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Економіко-математичні методи та моделі фінансового розвитку

Economic and mathematical methods and models of financial development

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Bezverkhyi Kostiantyn
D.Sc. in Economics, Associate Professor,
Associate Professor at the Department of Financial Analysis and Audit
State University of Trade and Economics,
19, Kyoto St., Kyiv, 02156, Ukraine,
e-mail: k.bezverkhyi@knute.edu.ua
ORCID ID: 0000-0001-8785-1147
Matiukha Mykola
PhD in Economics, Associate Professor,
associate professor of the department of economics,
Kyiv National University of Technologies and Design,
Mala Shyianovska Street, 2 Kyiv 01011, Ukraine,
e-mail: 20042004a@gmail.com
ORCID ID: 0000-0002-7968-3777

Business model of economic entities: bibliometric analysis

Abstract.

Introduction. Modern transformation processes in the economy necessitate a rethink of the role of business models in developing business entities' strategies. A business model is a tool that combines an enterprise's resource potential with market opportunities to ensure the creation, preservation and distribution of value between stakeholders. Studying it in a global scientific context enables us to identify key trends and directions in the evolution of the concept.

Problem statement. Despite the significant number of scientific works devoted to the structure and typology of business models, there is a lack of systematic understanding of the dynamics of this concept's development in international scientific discourse. The relationship between business models, digital transformation, innovation, and the sustainable development of enterprises remains insufficiently generalised.

Unresolved aspects of the problem. Evolutionary approaches to the formation of business models and the identification of leading research clusters and relevant scientific research directions in this area require clarification. The comparative analysis of publications according to the leading scientometric databases, Scopus and Web of Science, has not been sufficiently researched.

Purpose of the article. The article aims to provide a bibliometric and bibliographic analysis of scientific research in the field of business models for business entities.

Presentation of the main material. The research was carried out using bibliometric, trend, cluster and content analysis. The bibliometric sample was formed using the Scopus (9,041 publications) and Web of Science (5,010 publications) databases. Maps of term co-use were constructed using the VOSviewer software and key scientific clusters representing the main areas of research in the field of business modelling were identified.

Conclusions. The dominant areas of research were established to be the digitalisation of business processes, innovative models of value creation, and the sustainable development of enterprises. A shift in scientific interest from the theoretical description of business models to their application in the digital economy was revealed. The study's practical significance lies in its potential to inform effective enterprise development strategies and enhance the scientific and analytical tools used to study business models.

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Keywords: *business model, business entities, digitalisation of the economy, economic security, sustainable development, bibliometric analysis, bibliographic analysis, trend analysis.*
Fig.: 3, tabl.: 3, bibl.: 22
JEL Classification: F23, L20, M10

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Introduction. In the context of global competition, digital transformation and the growing demand for sustainable development, the business model is becoming an essential tool for maintaining the competitiveness of businesses. The efficiency of a business model determines an enterprise's ability to create, provide and maintain value for consumers, partners and society as a whole. Modern trends such as digitalisation, the development of the platform economy, the 'green' transformation and the adoption of ESG principles require us to reconsider traditional approaches to forming business models.

At the same time, scientific research on this topic is characterised by significant diversity in terms of concepts, approaches and methodological tools. This necessitates the systematisation of knowledge regarding the development of the theory of business models within the global scientific community. A bibliometric analysis can identify the leading scientific schools, key areas, authors, publications and trends in the study of business models, contributing to a holistic view of the evolution of this scientific category.

Studying business models is relevant because it combines analytical and scientometric approaches, enabling the current state of scientific developments to be assessed and promising areas of further research to be identified in the context of adapting business models to the challenges of sustainable development and the digital economy.

Literature review. The formation, development and transformation of business models of economic entities is a subject of active research in domestic and foreign scientific literature. Researchers are interested in the theoretical aspects of creating a business model, as well as practical approaches to its innovative renewal, digitalisation and ensuring the sustainable development of enterprises.

Domestic scientists have made a significant contribution to developing the theoretical and methodological foundations for researching business models. Bezverkhyi K.V. [4] emphasises the role of the business model as a key element of integrated enterprise reporting, ensuring the reflection of the value creation process through the interconnection of financial and non-financial aspects of activity. The author highlights the importance of disclosing the business model in reports as a means of enhancing transparency, accountability, and trust among stakeholders, which is a significant trend in the evolution of corporate governance within the context of sustainable development.

Lisova R.M. [13], for example, analysed the genesis of views on the evolution of the business model concept, identifying the key stages in the formation of this category. Nagara M.B. [14] has clarified the components of the business model and identified the external and internal factors that influence its formation.

At the same time, Yu. O. Voloshchuk and V. R. Voloshchuk [20] emphasised the importance of developing innovative business models to enhance enterprise efficiency in a dynamic market. A similar view is held by A.I. Omelchenko and O.S. Chenusha [16], who regard innovative business models as a means of achieving strategic enterprise development. Meanwhile, T.A. Kasumov [11] examined the effectiveness of such models in ensuring enterprise competitiveness, emphasising the importance of the relationship between innovation and business strategy.

Yershova O.E. and Goncharenko I. [22] analysed modern business development management models, classifying innovative business models by type and characteristics of application. Meanwhile, O.V. Olshanska and B.S. Bondarenko [15] focus on digital business

models as a means of ensuring competitiveness in the digital economy. Tkachuk V.O. and Obikhod's S.V. [19] research is devoted to the structure and classification of e-business models, providing a clearer picture of the patterns of online business development in Ukraine.

Foreign scientists pay considerable attention to the relationship between innovation, digital technologies and the sustainability of business models. A team of foreign researchers — O. R. Alake, O. Adegbuyi, A. A. Babajide, O. P. Salau, O. O. Onayemi, O. O. Joel and O. D. Adesanya [1] — emphasise the role of innovative business models in ensuring the resilience of small and medium-sized enterprises in the event of a crisis. Meanwhile, M. E. Balta, T. Papadopoulos and K. Spanaki [2] examine the process of 'pivoting' business models in a turbulent digital environment.

Bencsik B., Palmié M., Parida V., Wincent J. and Gassmann O. [3] propose a theoretical framework for understanding digital sustainability business models, based on empirical data on the functioning of «smart cities». Meanwhile, N. Bocken and P. Ritala [5] have developed six approaches to building circular business models that focus on minimising waste and reusing resources.

Carbonara N., Nisar T.M., Prabhakar G. and Tseng H.T. [6] examine open business models within an open innovation setting, investigating their influence on the financial stability of enterprises. Cavallo A., Cosenz F. and Noto G. [7] analyse the scaling of business models and the application of growth hacking methods in digital entrepreneurship. Espinosa Sáez D., Delgado-Ballester E. and Munuera-Alemán J. L. [8] examine business model innovation in response to the challenges posed by the sharing economy.

Kajtazi K., Rexhepi G., Sharif A. and Öztürk I. [10] have demonstrated the positive effect of business model innovation on corporate sustainability. Ringvold K., Saebi T. and Foss N. [17] developed a microfoundational approach to forming sustainable business models, focusing on the individual and organisational determinants of value creation.

Saqib N., Amin F., Gupta S. and Satar M.S. [18] proposed a model for evaluating the degree of innovation in digital business models. Zare J. and Persaud A. [23] conducted a bibliometric analysis of research on the digital transformation of business models, identifying key scientific schools and promising areas for further research. Widadie F., Wulandari E. and Lestari R.D. [21] provided examples of business models that integrate small farms into high-value agricultural supply chains.

Thus, the review shows significant scientific activity in the field of business model research. Ukrainian scientists mainly focus on the theoretical and methodological foundations and structure of business models, while foreign scientists focus on their digital, innovative, and sustainable development components. At the same time, systematic bibliometric studies that allow us to assess the evolution of scientific approaches and identify key trends in the study of business models remain underdeveloped.

Purpose, objectives and research methods. The purpose of this scientific research project is to conduct a bibliometric and bibliographic analysis of the existing literature on business models of economic entities. Based on this goal, the following tasks were identified: 1) conducting a trend analysis of the concept of «business model»; 2) visualising the most frequently used categories in articles devoted to the phrase «business model»; 3) analysing the clustering of research in the field of business models based on the Scopus and Web of Science Core Collection article databases.

Study methodology. This study employed trend analysis to examine changes in search frequency within the «business model» category using Google Trends tools. A graphical method was employed to visualise the most frequently searched categories within articles devoted to the term «business model». Systematisation and generalisation were applied to categorise research in the field of business models based on the Scopus and Web of Science Core Collection article databases.

Research results. A comprehensive assessment of the main trends in relation to the business model was carried out using trend analysis with the Google Trends tool [9] for the period

from January 1, 2004, to October 14, 2025 (Fig. 1). The trend analysis demonstrates the patterns of change in the search trends of users around the world on the Google search engine for such a key concept as a business model, which most often represents the vision of business entities.

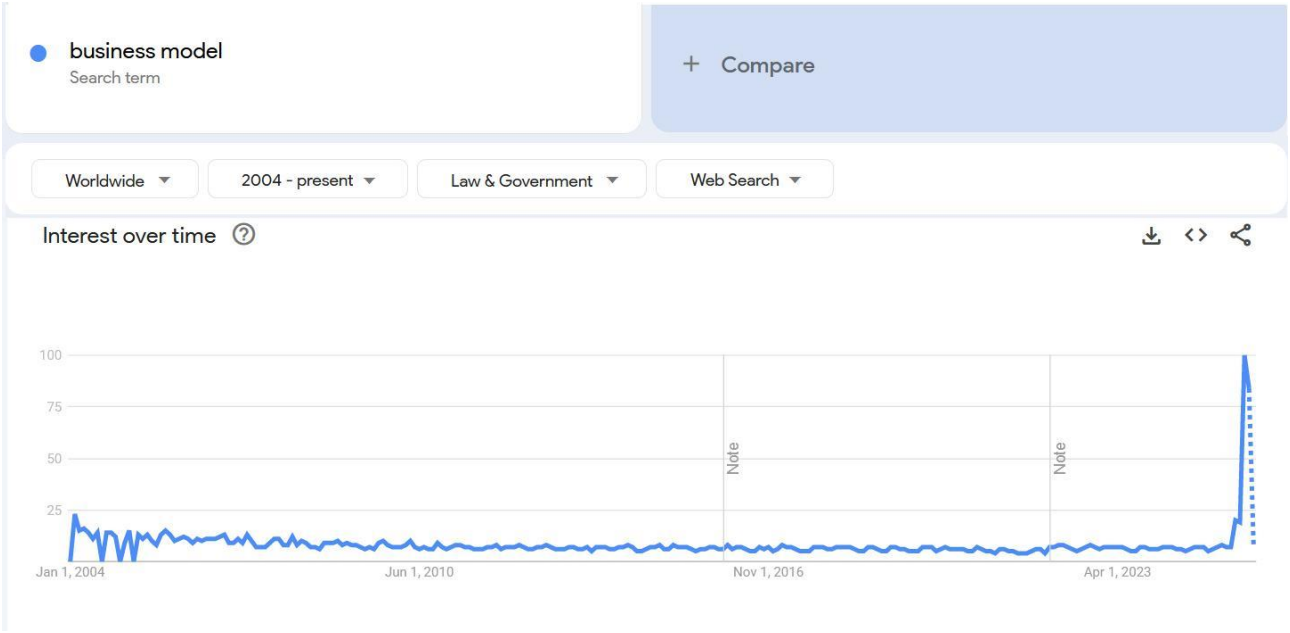

Figure 1. Dynamics of changes in search frequency in the «business model» category (January 1, 2004 to October 14, 2025)
Source: prepared by the authors using Google Trends tools [9]

This type of trend analysis is characterised by the comparability of its results. When constructing a graphical interpretation of the trend, the maximum value of search activity for the selected concept is taken into account to reflect the content requested by internet users.

Based on the results of the trend analysis, we can conclude that internet users' interest in business models has remained consistently high for over 21 years.

During our research, we conducted a bibliometric analysis to study scientific publications on the topic of 'business model'. For this, we used the scientometric Scopus database, one of the world's most authoritative, as well as VOSviewer software to construct bibliographic maps. During the analysis, we applied several key criteria that enabled us to assess and visualise trends in this area in detail:

1) the search was conducted using the term 'business analysis';
2) The time period was 1967–2025.

Our entire sample (9,041 articles) was uploaded into VOSviewer software. The search in this software was aimed at identifying the frequency with which authors used the term «business model» in article titles. We also set a restriction that the phrase «business model» should appear at least 150 times. The bibliometric map provides information on the frequency of use of the term «business model» by circle size and allows you to track category options within and between clusters. The results of the study are shown visually in Fig. 2. This approach to analysis allows us not only to assess trends in the development of the business model topic, but also to understand which subcategories and related concepts are important to the scientific community.

The graph (Fig. 2) shows several large clusters that reflect the main topics of research related to the business model. Each cluster consists of terms that are frequently found in scientific publications, and their size shows the frequency of their use.

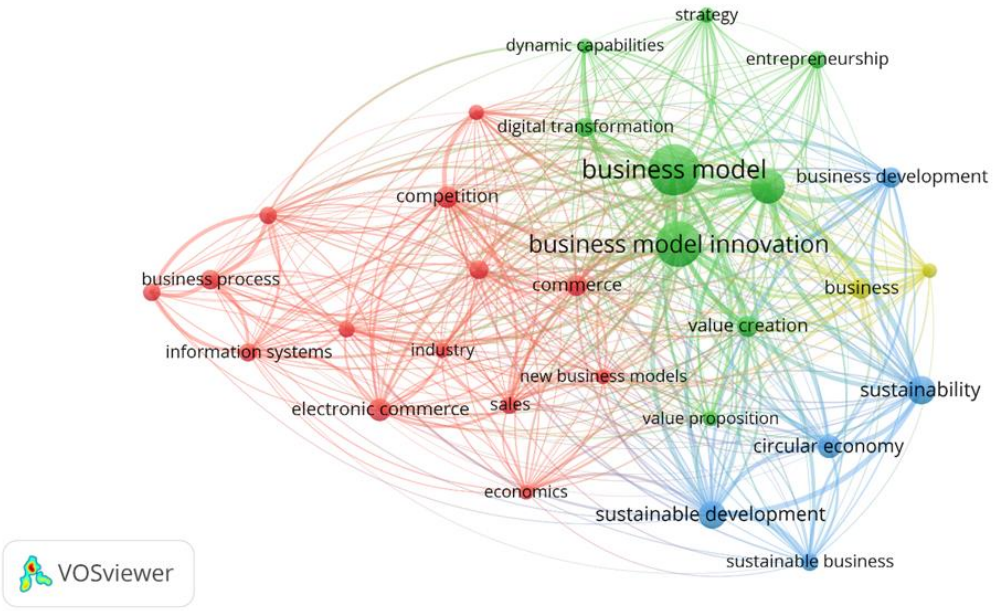

Figure. 2. Visualisation of the most frequently used categories in articles devoted to the phrase «business model».
Source: prepared by the authors using the VOSviewer program based on the Scopus article database

In the process of grouping articles devoted to business models, 30 keywords were identified based on the frequency with which concepts were mentioned (frequency of mention >150).

Table 1 presents the clustering of research in the field of business models based on the Scopus article database.

Table 1. Clustering of research in the field of business models, based on the Scopus article database

№	Cluster color	The most used term	Number of keyword	Related primary keywords
1	Red	Electronic commerce	14	Competition, commerce, business process, decision making, information systems, sale, business process model, enterprise resource management, information management, competitive advantage, new business models, industry, economics
2	Green	Business model	8	Business model innovation, innovation, value creation, digital transformation, enterpreneurship, value proposition, strategy
3	Blue	Sustainability	5	Sustainable, circular economy, business development, sustainable business
4	Yellow	Business	2	Modeling

Source: prepared by the author based on Scopus data obtained via the VOSviewer software

An analysis of research clustering in the field of business models (see Table 1) shows that, although scientific publications indexed in the Scopus database are characterised by a high degree of terminological diversity, they form clear content groups according to research area. The «red» cluster, which focuses on e-commerce and the digitalisation of business processes, was the most saturated in terms of the number of keywords. This cluster is dominated by concepts related to information systems, enterprise resource management, competitive advantages and new business models. This indicates that research focuses on digital technologies as the basis for business transformation.

Conversely, the «green» cluster comprises publications centred on the concept of the «business model», examined in the context of innovation, value creation, entrepreneurship and

digital transformation. This reflects the evolution of theoretical and methodological approaches to understanding the business model as a key element of strategic management.

Meanwhile, the «blue» cluster focuses on the concept of «sustainable development», demonstrating the integration of sustainability into modern companies' business models, as well as growing scientific interest in the circular economy and sustainable business.

Although the «yellow» cluster contains a limited number of terms, it focuses on general business and modelling categories, which may suggest methodological approaches to formalising and evaluating business models.

In summary, the clustering results reflect three key trends in business model research:

1. The digitisation of business processes and the search for new forms of e-commerce.
2. Innovation and the strategic orientation of business models.
3. Ehe integration of sustainable development principles into the value creation system of enterprises.

Thus, modern scientific approaches to business models are gradually shifting towards comprehensive, interdisciplinary concepts that combine economic, technological and environmental aspects of development.

Similarly, we conducted a bibliographic analysis based on the Web of Science Core Collection scientometric database, with keywords and time periods identical to those used in the Scopus scientometric database.

Our entire sample (5,010 articles) was uploaded to the VOSviewer software. The search in this software was aimed at identifying the frequency of the use of the term «business model» by authors in article titles. We also set a restriction that the phrase «business model» should occur at least 40 times. The bibliometric map provides information on the frequency of use of the term «business model» by circle size and allows you to track category options within and between clusters. The results of the study are shown visually in Fig. 3.

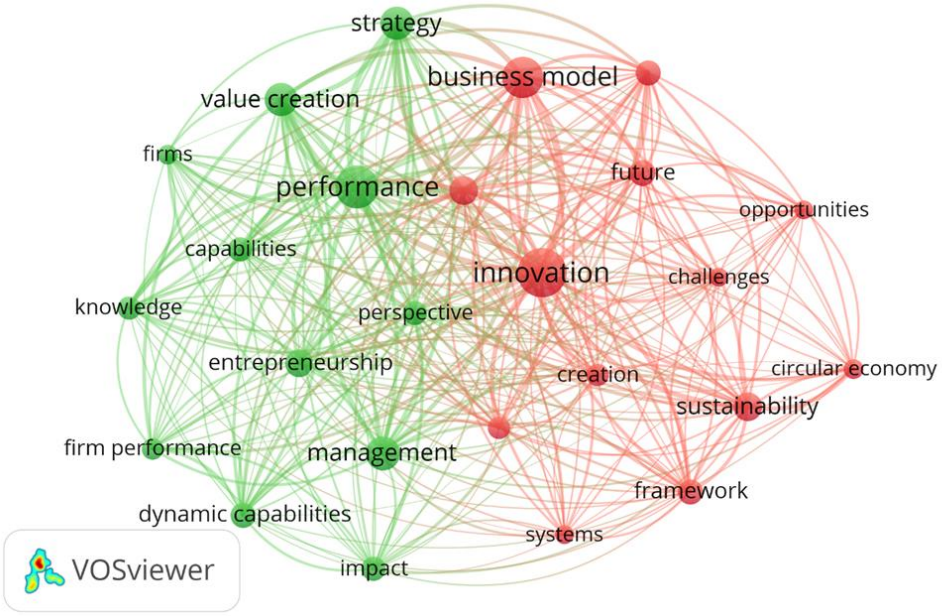

Figure. 3. Visualisation of the most frequently used categories in articles devoted to the phrase «business model»
Source: prepared by the authors using the VOSviewer program based on the Web of Science Core Collection

In the process of grouping articles devoted to business models, 25 keywords were identified based on the frequency with which concepts were mentioned (frequency of mention >40).

Table 2 shows the clustering of studies in the field of business models based on the Web of Science Core Collection database.

Table 1. Clustering of research in the field of business models, based on the Web of Science Core Collection article database

№	Cluster color	The most used term	Number of keyword	Related primary keywords
1	Red	Innovation	13	Business model, technology, substainability, future, design, framework, creation, strategies, circular economics, challenges, opportunities, systems
2	Green	Performance	12	Management, strategy, value creation, interpreneuship, dynamic capabilities, perspective, capabilities, impact, knowiledge, firms performance, firms

Source: prepared by the author based on Web of Science Core Collection data obtained via the VOSviewer software

An analysis of research clustering in the field of business models, based on the Web of Science Core Collection database (see Table 2), reveals differences in scientific focus compared to results obtained from the Scopus database. While the overall structure of the research remains similar, the focus shifts towards innovative processes, management strategies and enterprise performance evaluation.

The «red» cluster is the largest in terms of the number of keywords and brings together publications centred on the concept of «innovation». This cluster is dominated by terms reflecting technological developments in business models, particularly: «technology», «design», «structure», «circular economy», and «sustainable development». This indicates a shift in research focus from traditional business model analysis to studying innovative and sustainable value creation mechanisms in the context of digital transformation and environmental challenges.

The second most significant cluster is the «green» cluster, which focuses on the «performance» category. It reflects the managerial and economic aspects of research related to management, strategy, entrepreneurship, dynamic capabilities and firm performance. This indicates that researchers are paying more attention to the relationship between business models, organisational competencies, and the effectiveness of enterprise operations.

A bibliographic analysis based on Web of Science shows that contemporary scientific research in the field of business models focuses on innovation, sustainable development and management mechanisms to ensure business efficiency. This confirms the trend of integrating the concepts of innovation, sustainability and performance into a single research paradigm: «business model – innovation – sustainability – performance».

Discussion. The results of the bibliometric analysis demonstrate that the concept of a business model has evolved from being merely a tool for describing the creation of economic value, to becoming a comprehensive system for managing the sustainable development of an enterprise. As K.V. Bezverkhyi [4] notes, the business model is the logical core of integrated reporting, through which value is created, preserved and distributed among stakeholders. This aligns with the views of several foreign researchers, including, Bencsik B., Palmié M., Parida V., Wincent J. and Gassmann O. [3], Ringvold K., Saebi T. and Foss N. [17], Kajtazi K., Rexhepi G., Sharif A. and Ozturk I. [10], who consider the business model to be the basis of sustainable development and a source of long-term competitiveness for enterprises.

Ukrainian scientists Voloshchuk Yu. O. and Voloshchuk V. R. [20] and Omelchenko A. I. and Chenusha O. S. [16] emphasise that a business model's effectiveness is determined by its innovativeness, its ability to adapt to changes in the external environment and its capacity to ensure the strategic development of an enterprise. Similar conclusions are reached by Espinosa Sáez, Delgado-Ballester and Munuera-Alemán [8], and Cavallo, Cosenz and Noto [7], who observe that innovative business models are increasingly important for ensuring business flexibility and sustainability in the digital economy.

The works of Yershova, O., Goncharenko I. [22], Kasumov, T. A. [12] and Nahara, M. B. [14] focus on the structural elements of the business model, its classification, and the factors influencing its formation. Meanwhile, international studies by Zare J. and Persaud A. [23], Saqib N., Amin F., Gupta S., and Satar M. S. [18], as well as Balta M. E., Papadopoulos T., and Spanaki K. [2], demonstrate the increasing integration of digital technologies into business models, thereby transforming them into systems for the dynamic creation of digital value.

The distinction between the concepts of «innovative», «digital», and «sustainable» business models is a topic that deserves special attention. Olshanska O.V. and Bondarenko B.S. [15] argue that digitalisation is the driving force behind competitive advantage for enterprises, while Bocken N. and Ritala P. [5], as well as Carbonara N., Nisar T. M., Prabhakar G. and Tseng H. T. [6], look at business models through the lenses of circularity, open innovation and environmental sustainability. This shows a gradual shift in the focus of scientific research from the structural description of business models to their contextual and evolutionary nature.

As F. Widadie, E. Wulandari and R.D. Lestari [21] have noted, the formation of business models for the agricultural sector is specific, as it involves integrating small producers into value chains. This opens up prospects for further research into adapting business models to the characteristics of different sectors of the economy.

In summary, modern scientific thought is moving away from a static interpretation of the business model as an organisational scheme for generating profit. Nowadays, the business model is regarded as a dynamic mechanism for digital transformation, innovative development and ensuring the sustainability of entrepreneurial activity in the face of global challenges.

Conclusion. The study enabled the systematisation of modern scientific approaches to interpreting, structuring and evolving the business models of economic entities, and identified the main trends in their development within the global scientific community. A bibliometric analysis revealed that business models remain a highly dynamic area of economic research, integrating innovation, digital transformation and sustainable development.

Trend analysis shows that interest in the concept of «business model» has steadily grown in the global scientific and practical environment over the past two decades. This indicates an increase in the role of the business model as a tool for enterprises to gain a competitive advantage and as a conceptual basis for strategic management.

A bibliometric study based on Scopus allowed us to identify four key areas of development in scientific thought: a) the digitisation of business processes and e-commerce; b) innovation and value creation within the business model; c) the integration of sustainable development and circular economy principles; d) business process modelling as the basis for effective management.

Analysis of the Web of Science Core Collection database revealed a shift in scientific focus towards innovation, performance management and business productivity assessment. This confirms the growing interest among researchers in combining the economic, technological and environmental aspects of business model development.

The results obtained indicate a gradual transition in scientific research from a descriptive approach to an interdisciplinary one, combining strategic, managerial, innovative and environmental perspectives on enterprise development. Conversely, it was found that Ukrainian scientific research focuses primarily on the theoretical and methodological aspects of business model development, whereas foreign publications pay more attention to the practical issues of digitalisation, sustainability, and adaptation to global challenges.

Thus, the bibliometric approach has proven highly effective in identifying scientific trends, determining thematic clusters and providing a comprehensive overview of the evolution of the concept of a «business model». Further research should focus on conducting a more in-depth empirical analysis of business models in various economic sectors, particularly with regard to the integration of sustainable development principles, digital technologies, and innovative management tools.

References

1. Alake, O. R., Adegbuyi, O., Babajide, A. A., Salau, O. P., Onayemi, O. O., Joel, O. O., & Adesanya, O. D. (2024). Business model innovation and SMEs' resilience: technological roadmap in Nigeria. *Business: Theory and Practice*, 25(2), Pp. 614–624. DOI: https://doi.org/10.3846/btp.2024.18978.
2. Balta, M. E., Papadopoulos, T., & Spanaki, K. (2024). Business model pivoting and digital technologies in turbulent environments. *International Journal of Entrepreneurial Behavior & Research*, 30(2-3), Pp. 773-799.
3. Bencsik, B., Palmié, M., Parida, V., Wincent, J., & Gassmann, O. (2023). Business models for digital sustainability: Framework, microfoundations of value capture, and empirical evidence from 130 smart city services. *Journal of Business Research*, 160, 113757. DOI: https://doi.org/10.1016/j.jbusres.2023.113757.
4. Bezverkhyi, K. V. (2020). Business model in integrated reporting of foreign and domestic enterprises. *International Scientific Journal "Internauka". Series: Economic Sciences*, 11(43), 31–40. DOI: https://doi.org/10.25313/2520-2294-2020-11-6584 [in Ukrainian]
5. Bocken, N., & Ritala, P. (2022). Six ways to build circular business models. *Journal of Business Strategy*, 43(3), Pp. 184-192. DOI: https://doi.org/10.1108/JBS-11-2020-0258.
6. Carbonara, N., Nisar, T. M., Prabhakar, G., & Tseng, H. T. (2025). Open Data Business Models and Financial Stability in Open Innovation Environments. *R&D Management.* Volume 55, Issue 5, Pp. 1657-1670. DOI: https://doi.org/10.1111/radm.12776.
7. Cavallo, A., Cosenz, F., & Noto, G. (2023). Business model scaling and growth hacking in digital entrepreneurship. *Journal of Small Business Management*, 62(4), 2058–2085. DOI: https://doi.org/10.1080/00472778.2023.2195463.
8. Espinosa Sáez D, Delgado-Ballester E, Munuera-Alemán JL (2023), Innovation in business model as a response to the sharing economy. *European Journal of Management and Business Economics*, Vol. 32 No. 5 Pp. 602–619, DOI: https://doi.org/10.1108/EJMBE-06-2022-0187.
9. Google Trends (2025). Retrieved from: https://trends.google.com.ua/trends/explore?cat=19&date=all&q=business%20model&hl=en
10. Kajtazi, K., Rexhepi, G., Sharif, A., & Ozturk, I. (2023). Business model innovation and its impact on corporate sustainability. *Journal of Business Research*, 166, 114082. DOI: https://doi.org/10.1016/j.jbusres.2023.114082.
11. Kasumov, T. A. (2023). Analysis of the effectiveness of innovative business models in the enterprise competitiveness management system. *Journal of Strategic Economic Research*, (4), 128–142. DOI: https://doi.org/10.30857/2786-5398.2023.4.15 [in Ukrainian]
12. Lisova, R. (2020). Genesis views of evolution business model concept and structure. *Ekonomìčnij prostìr,* № 159. Pp. 83–87. DOI: https://doi.org/10.32782/2224-6282/159-17 [in Ukrainian]
13. Nahara, M. B. (2022). Theoretical aspects of the business model: Genesis, components, and influencing factors. *Scientific Bulletin of Poltava University of Economics and Trade. Series: Economic Sciences*, 2(106), 19–25. DOI: https://doi.org/10.37734/2409-6873-2022-2-3 [in Ukrainian]
14. Olshanska, O. V., & Bondarenko, B. S. (2024). Digital business models as a factor in ensuring enterprise competitiveness. *Journal of Strategic Economic Research*, (3), 108–116. DOI: https://doi.org/10.30857/2786-5398.2024.3.11 [in U
15. Omelchenko, A. I., & Chenusha, O. S. (2022). Innovatsiini biznes-modeli yak instrument stratehichnoho rozvytku pidpryiemstva [Innovative business models as a tool for strategic enterprise development]. *Economic Bulletin of the NTUU "Kyiv Polytechnic Institute"*, (21), 52–55. https://doi.org/10.20535/2307-5651.21.2022.254847
16. Ringvold, K., Saebi, T., & Foss, N. (2023). Developing sustainable business models: A microfoundational perspective. *Organization & Environment*, 36(2), Pp. 315-348. https://doi.org/10.1177/10860266221117250.
17. Saqib N., Amin F., Gupta S. & Satar M.S. (2025), Digital business model innovation: scale development and validation. *Business Process Management Journal*, Vol. 31 No. 5, Pp. 1636–1662. https://doi.org/10.1108/BPMJ-10-2023-0816.
18. Tkachuk, V. O., & Obikhod, S. V. (2022). Struktura ta klasyfikatsiia modelei elektronnoho biznesu [Structure and classification of e-business models]. *Economics, Management and Administration*, (1), 11–17. https://doi.org/10.26642/ema-2022-1(99)-11-17
19. Voloshchuk, Y. O., & Voloshchuk, V. R. (2020). Formuvannia innovatsiinoi biznes-modeli pidpryiemstv [Formation of an innovative business model of enterprises]. *Market Infrastructure*, (46), 23–30. https://doi.org/10.32843/infrastruct46-4
20. Widadie, F., Wulandari, E., & Lestari, R. D. (2024). Business models for engaging smallholder farmers in high-value markets: empirical evidence from vegetable value chains. *Agricultural and Resource Economics: International Scientific E-Journal*, 10(4), Pp. 179–202. https://doi.org/10.51599/are.2024.10.04.08.
21. Yershova, O., & Honcharenko, I. (2022). Suchasni modeli upravlinnia rozvytkom biznesu: sutnist, vydy, innovatsiini biznes-modeli [Modern models of business development management: Essence, types, and innovative business models]. *Journal of Strategic Economic Research*, (2), 75–85. https://doi.org/10.30857/2786-5398.2022.2.8
22. Zare, J. & Persaud, A. (2025). Digital transformation and business model innovation: a bibliometric analysis of existing research and future perspectives. *Management Review Quarterly*, 75(3), Pp. 1999–2032. https://doi.org/10.1007/s11301-024-00426-z.

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Безверхий Костянтин
д.е.н., доцент, доцент кафедри фінансового аналізу та аудиту,
Державний торговельно-економічний університет,
вул. Кіото, буд. 19, м. Київ, Україна, 02156,
e-mail: k.bezverkhyi@knute.edu.ua
ORCID ID: 0000-0001-8785-1147
Матюха Микола
к.е.н., доцент, доцент кафедри економіки,
Київський національний університет технологій та дизайну,
вул. Мала Шияновська, буд. 2, м. Київ, Україна, 01011,
e-mail: 20042004a@gmail.com
ORCID ID: 0000-0002-7968-3777

Бізнес-модель суб'єктів господарювання: бібліометричний аналіз

Вступна частина. Сучасні трансформаційні процеси в економіці обумовлюють необхідність переосмислення ролі бізнес-моделей у формуванні стратегії розвитку суб'єктів господарювання. Бізнес-модель виступає інструментом поєднання ресурсного потенціалу підприємства з ринковими можливостями, забезпечуючи створення, збереження та розподіл цінності між стейкхолдерами. Її дослідження у глобальному науковому контексті дозволяє визначити ключові тенденції та напрямки еволюції поняття.

Постановка проблеми. Попри значну кількість наукових праць, присвячених структурі та типології бізнес-моделей, спостерігається відсутність системного уявлення про динаміку розвитку цього поняття в міжнародному науковому дискурсі. Недостатньо узагальненими залишаються питання взаємозв'язку бізнес-моделі з цифровою трансформацією, інноваційністю та сталим розвитком підприємств.

Нерозв'язані аспекти. Потребують уточнення еволюційні підходи до формування бізнес-моделей, визначення провідних дослідницьких кластерів і виявлення актуальних напрямів наукового пошуку в цій сфері. Недостатньо дослідженим є питання порівняльного аналізу публікацій за даними провідних наукометричних баз — Scopus і Web of Science.

Мета статті. Метою статті є бібліометричний та бібліографічний аналіз наукових досліджень у сфері бізнес моделей суб'єктів господарювання.

Основний матеріал. Дослідження здійснено з використанням бібліометричного, трендового, кластерного та контент-аналізу. Бібліометричну вибірку сформовано на основі баз даних Scopus (9041 публікація) та Web of Science (5010 публікацій). За допомогою програмного забезпечення *VOSviewer* побудовано карти застосування термінів і визначено ключові наукові кластери, що репрезентують основні напрями досліджень у сфері бізнес-моделювання.

Висновки. Встановлено, що домінуючими напрямами досліджень є цифровізація бізнес-процесів, інноваційні моделі створення цінності та сталий розвиток підприємств. Виявлено зміщення наукового інтересу від теоретичного опису бізнес-моделей до їх прикладного використання в умовах цифрової економіки. Практичне значення дослідження полягає у можливості використання його результатів для формування ефективних стратегій розвитку підприємств і вдосконалення науково-аналітичного інструментарію дослідження бізнес-моделей.

JEL Classification F23, L20, M10
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Список літератури

1. Alake O. R., Adegbuyi O., Babajide A. A., Salau O. P., Onayemi O. O., Joel O. O., Adesanya O. D. Business model innovation and SMEs' resilience: technological roadmap in Nigeria. *Business: Theory and Practice*. 2024. Vol. 25, No. 2. P. 614–624. DOI: 10.3846/btp.2024.18978.
2. Balta M. E., Papadopoulos T., Spanaki K. Business model pivoting and digital technologies in turbulent environments. *International Journal of Entrepreneurial Behavior & Research*. 2024. Vol. 30, No. 2–3. P. 773–799. DOI: 10.1108/IJEBR-02-2023-0210.
3. Bencsik B., Palmié M., Parida V., Wincent J., Gassmann O. Business models for digital sustainability: framework, microfoundations of value capture, and empirical evidence from 130 smart city services. *Journal of Business Research*. 2023. Vol. 160. DOI: 10.1016/j.jbusres.2023.113757.
4. Безверхий К. В. Бізнес-модель в інтегрованій звітності зарубіжних і вітчизняних підприємств. *International Scientific Journal "Internauka". Series: Economic Sciences.* 2020. № 11(43). С. 31–40. DOI: 10.25313/2520-2294-2020-11-6584.
5. Bocken N., Ritala P. Six ways to build circular business models. *Journal of Business Strategy*. 2022. Vol. 43, No. 3. P. 184–192. DOI: 10.1108/JBS-11-2020-0258.

6. Carbonara N., Nisar T. M., Prabhakar G., Tseng H. T. Open data business models and financial stability in open innovation environments. *R&D Management.* 2025. Vol. 55, No. 5. P. 1657–1670. DOI: 10.1111/radm.12776.
7. Cavallo A., Cosenz F., Noto G. Business model scaling and growth hacking in digital entrepreneurship. *Journal of Small Business Management.* 2023. Vol. 62, No. 4. P. 2058–2085. DOI: 10.1080/00472778.2023.2195463.
8. Espinosa Sáez D., Delgado-Ballester E., Munuera-Alemán J. L. Innovation in business model as a response to the sharing economy. *European Journal of Management and Business Economics.* 2023. Vol. 32, No. 5. P. 602–619. DOI: 10.1108/EJMBE-06-2022-0187.
9. Google Trends. Business model search interest. URL: https://trends.google.com.ua/trends/explore?cat=19&date=all&q=business%20model&hl=en (дата звернення: 04.11.2025).
10. Kajtazi K., Rexhepi G., Sharif A., Ozturk I. Business model innovation and its impact on corporate sustainability. *Journal of Business Research.* 2023. Vol. 166. DOI: 10.1016/j.jbusres.2023.114082.
11. Касумов Т. А. Аналіз ефективності інноваційних бізнес-моделей у системі управління конкурентоспроможністю підприємства. *Journal of Strategic Economic Research.* 2023. № 4. С. 128–142. DOI: 10.30857/2786-5398.2023.4.15.
12. Лісова Р. Генеза поглядів на еволюцію концепції бізнес-моделі та її структуру. *Економічний простір.* 2020. № 159. С. 83–87. DOI: 10.32782/2224-6282/159-17.
13. Нагара М. Б. Теоретичні аспекти бізнес-моделі: генеза, складові, фактори впливу. *Науковий вісник Полтавського університету економіки і торгівлі. Серія: Економічні науки.* 2022. № 2(106). С. 19–25. DOI: 10.37734/2409-6873-2022-2-3.
14. Ольшанська О. В., Бондаренко Б. С. Цифрові бізнес-моделі як чинник забезпечення конкурентоспроможності підприємств. *Journal of Strategic Economic Research.* 2024. № 3. С. 108–116. DOI: 10.30857/2786-5398.2024.3.11.
15. Омельченко А. І., Ченуша О. С. Інноваційні бізнес-моделі як інструмент стратегічного розвитку підприємства. *Економічний вісник НТУУ «КПІ».* 2022. № 21. С. 52–55. DOI: 10.20535/2307-5651.21.2022.254847.
16. Ringvold K., Saebi T., Foss N. Developing sustainable business models: A microfoundational perspective. *Organization & Environment.* 2023. Vol. 36, No. 2. P. 315–348. DOI: 10.1177/10860266221117250.
17. Saqib N., Amin F., Gupta S., Satar M. S. Digital business model innovation: Scale development and validation. *Business Process Management Journal.* 2025. Vol. 31, No. 5. P. 1636–1662. DOI: 10.1108/BPMJ-10-2023-0816.
18. Ткачук В. О., Обиход С. В. Структура та класифікація моделей електронного бізнесу. *Economics, Management and Administration.* 2022. № 1. С. 11–17. DOI: 10.26642/ema-2022-1(99)-11-17.
19. Волощук Ю. О., Волощук В. Р. Формування інноваційної бізнес-моделі підприємств. *Market Infrastructure.* 2020. № 46. С. 23–30. DOI: 10.32843/infrastruct46-4.
20. Widadie F., Wulandari E., Lestari R. D. Business models for engaging smallholder farmers in high-value markets: empirical evidence from vegetable value chains. *Agricultural and Resource Economics: International Scientific E-Journal.* 2024. Vol. 10, No. 4. P. 179–202. DOI: 10.51599/are.2024.10.04.08.
21. Єршова О., Гончаренко І. Сучасні моделі управління розвитком бізнесу: сутність, види, інноваційні бізнес-моделі. *Journal of Strategic Economic Research.* 2022. № 2. С. 75–85. DOI: 10.30857/2786-5398.2022.2.8.
22. Zare J., Persaud A. Digital transformation and business model innovation: a bibliometric analysis of existing research and future perspectives. *Management Review Quarterly.* 2025. Vol. 75, No. 3. P. 1999–2032. DOI: 10.1007/s11301-024-00426-z.

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Emmanuel Imuede Oyasor
Department of Accounting Science, Research Fellow
Walter Sisulu University, Mthatha,
Private Bag X1, UNITRA, 5117, South Africa
e-mail: emmanueloyasor12@gmail.com
ORCID ID: 0009-0005-7500-5919

The macroeconomic and institutional determinants of economic growth in African regional blocs: a panel data analysis

Abstract. Economic growth remains a fundamental benchmark for assessing the transformation of economies across the developed, emerging, and developing world. In the African context, regional economic communities (RECs) such as ECOWAS, SADC, COMESA, and EAC represent strategic platforms where growth can enhance per capita income, employment creation, foreign investment, and welfare.

Problem statement. Despite this potential, African economies continue to face growth-limiting challenges. Macroeconomic instability, weak institutional performance, demographic pressures, and structural vulnerabilities persistently hinder inclusive and sustainable development.

Unresolved aspects of the problem. While existing studies examine growth determinants in Africa, many are constrained by short time horizons, single-country focus, or narrow sets of variables. Consequently, limited attention has been given to the long-term interplay of demographic, institutional, and macroeconomic factors across diverse regional blocs, leaving critical policy gaps unresolved.

Purpose of the article. This study aims to investigate the macroeconomic and institutional drivers of growth in African regional blocs from 1960–2022. By applying the STIRPAT framework, it evaluates how population dynamics, inflation, labor force, broad money, and military expenditure influence GDP growth, while accounting for structural shifts, policy reforms, and external shocks.

Presentation of the main material. Using a balanced panel of 48 African countries, the analysis employs fixed effects, random effects, and first-differenced models to address endogeneity and heterogeneity. Results show that labor force expansion strongly supports growth, while population growth exerts a marginally negative effect. Inflation and broad money display weak direct impacts. The fixed effects model best captures within-country variations, underscoring the importance of country-specific characteristics in shaping growth outcomes.

Conclusions. The findings suggest that African countries should leverage their demographic dividend, strengthen institutional frameworks, and foster regional integration to achieve sustainable and inclusive growth. By covering six decades and multiple blocs, the study offers original insights for policymakers and development partners, providing a broader evidence base for growth-oriented strategies in Africa.

Keywords: *Economic growth, Investment flow, Endogenous, Panel data, Institutional Theory*
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Introduction. Economic growth has been a topic that has been drawn under the academic radar long before, especially in the developed, emerging, and developing economies since growth can be used as a benchmark of the evolution and transition of any economy. In case of the African regional blocs, awareness of the factors contributing to economic growth is particularly crucial due to the historical and institutional, as well as structural complications thereof in the continent. In these blocs (and everywhere), governments are always interested in standing up stable and inclusive growth as it is a strategic goal involved in raising per capita income, increasing employment opportunities, giving overseas direct investment and finally raising living conditions and welfare of the society.

Nevertheless, in the African setting, the economic growth has usually been limited by issues associated with macroeconomic instability, poor performance of institutions, and the bigger picture that accompanies the concept of economic sustainability (Higgins 2015). All these problems prove the necessity of a very detailed and area-specific study on the determinants of growth. Theoretically, economic growth may be envisioned as either a rise or an increment in the quantity and quality of products and services produced and consumed through an economy. Such growth is empirically usually typified by the tendency of gross domestic product (GDP) to grow (Basani and Scarpetta 2001; Batrancea et al. 2020b, 2021; Helpman 2004). The African continent, especially the regional economic communities (including ECOWAS, SADC, COMESA, etc.) growth patterns tend to be influenced by both the macroeconomic indicators (including inflation, investment and trade) and the institutional determinants (including governance quality, political stability, and law). There are four principles that lead to economic growth both theoretically and Economic growth has been a topic that has been drawn under the academic radar long before, especially in the developed, emerging, and developing economies since growth can be used as a benchmark of the evolution and transition of any economy. In case of the African regional blocs, awareness of the factors contributing to economic growth is particularly crucial due to the historical and institutional, as well as structural complications thereof in the continent. In these blocs (and everywhere), governments are always interested in standing up stable and inclusive growth as it is a strategic goal involved in raising per capita income, increasing employment opportunities, giving overseas direct investment and finally raising living conditions and welfare of the society.

Nevertheless, in the African setting, the economic growth has usually been limited by issues associated with macroeconomic instability, poor performance of institutions, and the bigger picture that accompanies the concept of economic sustainability (Higgins 2015). All these problems prove the necessity of a very detailed and area-specific study on the determinants of growth. Theoretically, economic growth may be envisioned as either a rise or an increment in the quantity and quality of products and services produced and consumed through an economy. Such growth is empirically usually typified by the tendency of gross domestic product (GDP) to grow (Basani and Scarpetta 2001; Batrancea et al. 2020b, 2021; Helpman 2004). The African continent, especially the regional economic communities (including ECOWAS, SADC, COMESA, etc.) growth patterns tend to be influenced by both the macroeconomic indicators (including inflation, investment and trade) and the institutional determinants (including governance quality, political stability, and law). There are four principles that lead to economic growth both theoretically and practically Entrepreneurship support by governments, political stability, the rule of law, and efforts aimed at regional integration also play a huge role in determining the performance of any economy (Batrancea et al., 2019, 2020a).

Current data show that there may be some connection between open financial markets and better growth in such African blocs as ECOWAS and SADC. As an example, Onah (2022) employs panel ARDL and PMG techniques in indicating that the financial integration has significant effects on economic performance in Southern as well as West African regions. Nevertheless, demographic dividend in Africa is another key to potential growth. According to the European Union Institute for Security Studies (2021), in 2019, the working population of the world (15-64 years) was about 750 million in Africa, and by 2035 will exceed one billion, averaging 20 million each year, pointing to a

drastic explosion in population, a factor which we incorporate into our model. Empirical studies focusing specifically on ECOWAS reinforce our modeling choices. Adewole and Amurawaye (2024) find that foreign direct investment, inflation, and external debt positively influence growth, while exchange rate volatility and export levels have dampening effects Adelowokan et al. (2023) also highlight FDI's positive effect on employment and poverty reduction, affirming its relevance to growth-oriented frameworks

Within the framework of the present work, we examine a broad range of macroeconomic and institutional factors that defined economic growth in the African blocs of regions of states in a more extended time frame of expansion 1960-2022. Unlike the previous research which usually looks at the shorter term scenarios, our extended time period perspective is able to analyze structural changes, external shocks (oil crises, debt periods, and financial liberalization), as well as policy changes within regional economic associations (RECs). Based on available literature (Adams, 2009; Li & Liu, 2005; Dinh et al., 2019), we chose the panel of the macroeconomic variables such as imports, exports, foreign direct investment inflow and outflow, gross domestic savings, and gross capital formation. The proxy of economic growth is the annual growth rate of the real gross domestic product (GDP) as it is common practice.

The sample we used includes countries in the key African regional groupings such as ECOWAS, SADC, EAC, COMESA among others and we were in a position to make comparative analysis across subregions. The selection of the countries that fall in different income and human development category List such as low-income countries has been included. economies like Niger and Sierra Leone to high-income nations such as Mauritius and Seychelles enables an assessment of how macroeconomic and institutional factors influence growth differently across diverse developmental contexts.

Finally, the expected output of the present analysis is policy-relevant knowledge concerning the most promising leverages of growth to be employed in the context of African regional blocs. The exploitation of the relationship between institutional strength and the macroeconomic fundamentals will be beneficial in helping the policymakers and the development partners formulate strategies that ensure economic development that is inclusive and sustainable across the continent. This paper used a multimodal analytical framework that will help in exploring the macroeconomic and institutional factors determining the growth fronts of African regional blockings. Due to the use of Jupiter (python 3), i was able to perform descriptive statistics, correlation tests, and more extensive panel data estimations, such as Fixed Effects and Random Effects, successfully dealing with the aspect of endogeneity and autocorrelation. What is original about this study is that it is wide in its scope and integrative. Other than most previous studies that are limited to smaller periods of time, or limited to one country, our panel is extensive (1960 to 2022) and covers different African economies contained in some RECs, e.g. ECOWAS, SADC, COMESA, and EAC. This expanded timeline will enable us to record brilliant structural periods, post-independence patterns as well as reaction to major shocks like the global financial crisis of 2008 and the COVID-19.

The literature has also been expanded by inclusion of institutional government variables; political stability, government effectiveness, regulatory quality, and control of corruption, which are particularly relevant in the Africa setting where overall quality of governance greatly differs across and within any regional blocks. Notably, the current research will add to the available existing literature because it examines the impact of these macroeconomic and institutional determinants on economic growth of the African regional blocks that transpired between 1960 and 2022 through panel data analysis. Through this, one would be able to establish regional patterns, longitudinal trends, and policy-friendly information that will help steer the national policies and regional integration processes towards sustainability in economic growth. The interaction between economical and institutional variables were also studied through strong panel econometric methods with consideration of heterogeneity, cross-sectional dependence and time dynamics. The rest of the article will follow as follows. In section 2, the research ventures into pertinent literature, which addresses the topic of economic growth and its factors of influence. The country sample, the time

frame and economic variables are described in Section 3. In Section 4 the empirical findings are reported and Section 5 the conclusions.

Literature Review. This research paper is based on three related theories; such theories are the Endogenous Growth Theory, the Institutional Theory and the Theory of Fiscal Federalism and Regional Integration. The combination of these theories acts as a conceptual background to examine the impacts that macroeconomic and institutional factors:

Endogenous Growth Theory was advanced by Romer (1986) and Lucas (1988) who believed that the main causes of economic growth were self-internal forces and activities like human capital accumulation, innovation and sound macroeconomic policy among others, and not the external factors. This theory holds that growth in the long run can be maintained by increasing the amount of physical capital, productivity of labor force and effective utilization of the macroeconomic leverages. As far as the scope of this research is concerned, such macroeconomic indicators as inflation, labor force and broad money are the most significant policy tools where governments can exercise influence on the growth process on the national level. Analysis of these variables through the model will help this study test the empirical relevance of endogenous mechanisms in the growth of GDP in African economies.

The Institutional Theory, as postulated by North (1990) and later developed by Acemoglu and Robinson (2012), underscores the fact that the human interactions are largely determined by the presence of the institutions defined as the rules, norms, and legal arrangements that define human relationships. In this interpretation, institutional quality in terms of effectiveness of governance, laws and legal systems, property rights and corruption level have a close relationship to economic performance. In the African setting where there is a big variation in institutional capacity across individual countries and regions, it is important to comprehend the impacts of these institutional divergences on the performance of the economy. There is a tacit application of institutional theory in this study in the light of regional bloc membership (ECOWAS and OPEC) considered as a substitution of shared governance, cooperative policy structures, and institutional coordination. It is assumed that the countries included in these blocs can enjoy unified regulatory frameworks and regional stability that are able to stimulate or limit economic growth based on the quality of institutional functioning.

Theory of Public Fiscal Federalism first proposed by Musgrave (1959) and Oates (1972) revised to accommodate the regional integration forces is the basis of interpolating economic consequence of becoming a member of the supranational blocs such as ECOWAS and OPEC. This theoretical school posits that regional integration will enable standardization of policies and conductions of convergence in the economy as well as in the most effective use of resources between member countries. Under the economic integration, on a theoretical basis, economies of scale, bigger markets with the political stability are likely to emerge which are favourable to growth. In reality, however, this can be expressed differently in practice with varying levels of integration and the internal capabilities of the member-states. The research falls within this mode of thought as it evaluates the extent to which joining of the blocs contributes to the national GDP growth rates, thus adding to the discussion on the effectiveness of regionalism as a measure of economic growth in the Sub-Saharan Africa region.

It has been emphasized by empirical studies carried out to elucidate on the factors influencing economic growth in various African countries that macroeconomic stability, labour market, monetary indicators, and regional cooperation regimes are important factors to take into consideration. Among the most dominant piles of literature is the assessment of the manner in which macroeconomic fundamentals influence the GDP performance. In one study, Bleaney and Greenaway (2001) have determined that macroeconomic volatility, especially inflation and the variability of exchange rates has adverse effects on investment and long-term growth in Sub-Saharan Africa. Equally, Fischer (1993) asserted that non-violent inflation levels promote predictability in economic decision-making thus promoting investment and permanent growth.

Growth regressions also include elements of labor-related variables. Ajakaiye and Ncube (2010) confirmed the fact that the growth is greatly enhanced by increased labour force, particularly when combined with enhancement in education and health sector structure. They however warn that the impact depends on the absorptive capacity of the economy. At the same time, what Fofack (2009) and similar studies noticed was that the effect of labor on output differs heavily in various African sub-regions, which may suggest that there are interactions between labor and institutional or policy environments. Financial sector proxies Measures of the depth of the financial sector are widely used as proxies of financial development which has an impact on economic growth. According to Sahay et al. (2015), they used a panel dataset of emergent markets to discover that a positive relationship exists between growth and financial depth only when institutional quality is high. Similarly, Ndlovu (2013) examined the financial development-growth nexus in SADC, his conclusion was that though financial intermediation is very important in growth, the impact of this factor is enhanced in those countries with good macroeconomic management.

Other mediators of growth performance that have been given considerations in empirical studies are institutional variables. Cross-country regressions that were undertaken by Acemoglu, Johnson and Robinson (2005) confirmed that institutions, characterized by security of property rights, rule of law and contract enforcement, was the strongest predictors of national income dispersion. Of Africa, Asongu and Odhiambo (2020) also established that institutional quality is positive across macroeconomic policy performance and growth, especially when there is democracy within the country.A number of reports have specifically touched on the issue of the effect of regional blocs to the economic performance of member countries. Employing empirical analysis, Adepoju et al. (2021) investigated ECOWAS and concluded that liberalization of trade in the bloc, infrastructural investment, and harmonization of policies within the organization have statistically significant impact on economic growth. In the same way, Onyebuchi and Okonkwo (2022) assessed the effect of OPEC membership and found that oil-exporting African countries face volatility-induced growth challenges despite resource abundance, highlighting the need for strong fiscal institutions. Their findings align with those of Iwedi and Igbanibo (2015), who argued that the positive resource endowment effect from OPEC affiliation is often eroded by institutional weaknesses and macroeconomic mismanagement.

Methodologically, the majority of recent research use panel data to absorb country-wise heterogeneity. To give an example, Ogunleye (2018) examined the determinants of growth in West Africa between 1980-2015 and concluded that inflation and broad money are significantly influential in GDP growth by employing Fixed Effects estimator. Moreover, even within African growth regressions, the Hausman test has gained widespread use as a diagnostic statistic in deciding between the Fixed Effects and the Random Effects (Baltagi, 2021). Stronger estimations could be corrected to heteroscedasticity and autocorrelation either in cluster-robust typical errors or Driscoll-Kraay estimators (Greene, 2023). Finally, empirical evidence supports the diversity of the growth determinants in Africa. Although macroeconomic factors like inflation factor, labor, and broad money have direct impacts on it, the influence is controlled with the help of institutional quality and participation in regional blocs. The independence of these results is strengthened by the advanced panel data methods, and underlines the need of contextualizing the policy reactions to regional and institutional situations on the continent.

Purpose, objectives and research methods. The primary purpose of this research is to examine the macroeconomic and institutional determinants of economic growth in African regional blocs over an extended period, 1960–2022. Unlike many prior studies that are restricted to single countries or shorter time frames, this work adopts a long-term, comparative perspective across major regional economic communities (ECOWAS, SADC, COMESA, and EAC). By applying the STIRPAT framework, the study investigates how demographic variables (population, labor force), financial indicators (broad money, inflation), and institutional factors (military expenditure as a proxy for state orientation) influence GDP growth. This comprehensive approach allows for capturing both structural transformations and external shocks, including oil crises, debt episodes, financial liberalization, and the global disruptions of 2008 and COVID-19.

The research seeks to fill a critical gap in the literature by integrating institutional and macroeconomic drivers of growth in a single, long-run model, while accounting for regional and country-level heterogeneity. Its overarching purpose is to generate policy-relevant insights that can guide African governments and regional organizations toward inclusive and sustainable growth. By highlighting the relative significance of demographic dividends, institutional quality, and financial depth, the study aims to provide actionable strategies for fostering industrialization, enhancing governance, and deepening regional integration across the continent.

The empirical study introduced to highlight the theoretical framework known as STIRPAT (Stochastic Impacts by Regression on Population, Affluence, and Technology). This framework is adopted in this study to model the macroeconomic and institutional determinants of economic growth across the African regional blocs from 1960-2022.The STIRPAT model mainly developed for environmental impact studies, here, is basically used to analyze the structural drivers of GDP. Considered its log-linear form, economic growth is modeled as a function of demographic indicators. Owing to the background knowledge of this theory, the independents variables that considered in this study like pressure (population), affluence (broad money supply), labor and institutional structure (labor force and military expenditure), followed by microeconomic stability(inflation) are therefore can be central to influence economic growth in Africa.

To examine the macroeconomic and institutional determinants of economic growth across African regional blocs, we specify a panel regression model as follows:

$$\square\square\square_{it} = \alpha + \beta_3\square\square\square_{it} + \beta_4\square\square\square_{it} + \beta_5\square\square\square_{it} + \beta_6\square\square_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (1)$$

where $\square\square\square_{it}$ denotes gross domestic product for country i at time t; $\square\square\square_{it}$, $\square\square\square_{it}$, $\square\square\square_{it}$, $\square\square_{it}$, and $\square\square\square_{it}$ represent population, inflation rate, labor force size, and broad money (as a percentage of GDP), respectively. μ_i is the unobserved country-specific effect (fixed effect), λ_t captures time-specific effects, and ϵ_{it} is the stochastic error term.

In accordance with data availability and prevalence of all macroeconomic and institutional indicators, this work selects a balanced panel of 50 African countries covering the vast majority of regional blocs after the period 19602022 (see Table 1A with the complete list of countries). The selection of the sample period is based on availability of the long-run macroeconomic data that is found within the World Bank data bank and this makes cross country comparisons possible. Nonetheless, in accordance with prior literature on growth (Barro, 2015; Asongu & Odhiambo, 2020; Djiofack et al., 2022), this paper uses gross domestic product (GDP), expressed as a constant, 2015 US dollars, as a dependent variable of economic performance. The natural log transforms GDP variable so that it can be subjected to elasticity interpretation and stability of the model in the log-linear model. Population, inflation, labor force, broad money and military expenditure are the key explanatory variables. Population refers to midyear estimates of the total residents of a country irrespective of whether they are citizens or not; labor force corresponds to the people who are at the age of participation in labor market. These two are both based on World Development Indicators (WDI). Inflation, whose measure is determined by WDI, is the change in the consumer price index each year measured as a percentage and is used as a substitute of macroeconomic stability. A measure of financial deepening and liquidity of financial assets in the economy is the broad money as a percentage of GDP, as indicated in the financial-growth literature (Beck et al., 2000). At the expense of national resources, military spending as a proportion of GDP calculated based on the data provided by the Stockholm International Peace Research Institute (SIPRI) gets the proportion of resources allocated to national security and, perhaps, reveals the proportion of resources on national security, institutional orientation and fiscal policy priorities (Collier & Hoeffler, 2007; Dunne & Tian, 2015).

All variables except inflation are log-transformed to account for scale heterogeneity and to enable interpretation of estimated coefficients as elasticities. Inflation is retained in its level form, consistent with standard macroeconomic practice. The model includes country-specific fixed effects (μ_i) to control for unobservable heterogeneity that may bias the results, and time fixed effects (λ_t) to capture global shocks or cyclical trends common across the panel.

To control for unobserved heterogeneity, we estimate Equation (1) using both the Fixed Effects (FE) and Random Effects (RE) models (Wooldridge, 2010). The Fixed Effects model assumes that the unobserved individual effects (α_i) are correlated with the explanatory variables, and thus removes them through within transformation. The Random Effects model, on the other hand, assumes no correlation between α_i and the regressors and uses a generalized least squares (GLS) estimator to exploit both within and between variations (Baltagi, 2008).

To determine the appropriate model, we apply the Hausman Test (Hausman, 1978). The null hypothesis states that the preferred model is Random Effects, and the individual effects are uncorrelated with the regressors. A significant test statistic (p-value < 0.05) leads to the rejection of the null, in favor of the Fixed Effects model.Additionally, to correct for possible violations of the classical assumption of homoscedasticity, we estimate all models using robust standard errors, which provide heteroscedasticity-consistent covariance estimates (Arellano, 1987). The presence or absence of heteroscedasticity is formally tested using the Breusch–Pagan test (Breusch & Pagan, 1979). A p-value greater than 0.05 indicates that the null hypothesis of constant variance is not rejected, suggesting homoscedasticity.

To account for potential time-series characteristics in the data and to ensure robustness, we also estimate a first-differenced model:

$$\Delta lnGDP_{it} = \beta_1 \Delta lnPOP_{it} + \beta_2 \Delta lnINF_{it} + \beta_3 \Delta lnLBF_{it} + \beta_4 \Delta lnBM_{it} + \Delta\varepsilon_{it} \qquad (2)$$

The first-differencing eliminates the country-specific fixed effects and helps mitigate omitted non-stationarity. This specification further supports the robustness of our main findings by focusing on short-run fluctuations in the independent variables and their effect on GDP growth. These estimation techniques allow us to comprehensively analyze the direct impact of macroeconomic factors and institutional characteristics.

Research results. This paper aim is to examine how macroeconomic variables, and institutional affiliations affect GDP growth across African countries. From Table 1, GDP exhibits a mean of 1.38 with a standard deviation of 7.56, indicating considerable variation in economic performance across African countries and over time. The maximum GDP (log-transformed) of 140.49 suggests that a few countries have experienced significant economic growth, while the minimum value of -48.43 points to deep contractions in other cases, perhaps due to conflict or macroeconomic instability. Population (POP) shows a mean of 1.99 and standard deviation of 2.99, reflecting demographic differences across the continent. Inflation is highly volatile with a mean of 45.77 and a standard deviation of 713.43, signaling episodes of hyperinflation or monetary instability in several countries, which aligns with the study's objective of investigating inflation's role in economic growth. Labor force (LBF) and Broad Money (as a percentage of GDP) also show moderate dispersion, suggesting different capacities and financial deepening across regional blocs.

Summary statistics of the variables are presented in Table 1, while Table 2 provides the correlation matrix. Initial correlations suggest positive relationships between GDP and population, labor force, broad money, and military expenditure, whereas inflation shows an inconsistent correlation pattern. To address potential multicollinearity among the regressors, rule of thumb called variance inflation factor (VIF) test was carried out. Following the threshold suggested by Gujarati and Porter (2009), a VIF value exceeding 10 signals the presence of harmful multicollinearity, which can inflate standard errors and distort coefficient estimates.

Table 1. Descriptive Statistics

Variable	mean	std	min	Max
GDP	1.38	7.56	-48.43	140.49
POP	1.99	2.99	4.60	2.28
INFLATION	45.77	713.43	-16.86	23773.13
LBF	9.87	1.71	1.58	1.10
BROAD MONEY	29.70	21.88	0.01	159.94

Note: The natural logarithm transformation data of all the data are used in the regression models except the Inflation.
Source: Author (2025)

Table 2 also presents the correlation coefficients among the key macroeconomic variables, with p-values in parentheses. GDP appears to have a weak negative correlation with population and labor force, though these are not statistically significant at the 5% level. Interestingly, GDP is positively correlated with inflation (r = 0.08, p = 0.05), indicating that in some contexts, modest inflation may coincide with higher economic activity possibly reflecting demand-driven growth dynamics in specific regional blocs. Notably, population and labor force are highly correlated, which is theoretically intuitive as a larger population often translates to a larger labor supply. However, this strong correlation also raises concerns about potential multicollinearity, confirmed by the high Variance Inflation Factors (VIFs) of 6.14 and 6.09 for POP and LBF, respectively. Such multicollinearity could distort the estimated coefficients in regression models and must be addressed during sensitivity analysis. Broad money shows mild to moderate negative correlations with population (r = -0.16) and labor force (r = -0.14) **, suggesting that financial depth may be more developed in countries with relatively smaller or more urbanized populations.

Table 2: Correlation Matrix of the variables

Variable	GDP	POP	INFLATION	LBF	BROAD MONEY	VIF
GDP	1.00					
POP	-0.07 (0.11)	1.00 (0.00)				6.14
INFLATION	0.08 (0.05)	-0.03 (0.51)	1.00			1.02
LBF	-0.06 (0.13)	0.91 (0.00)	0.01 (0.85)	1.00		6.09
BROAD MONEY	0.02 (0.71)	-0.16 (0.00)	-0.13 (0.00)	-0.14 (0.00)	1.00	1.05

Source: Author (2025)

In Table 3, critical insights revealed into the stationarity of the macroeconomic variables used in this panel data analysis. Both the Augmented Dickey-Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests were employed to ensure robustness of the stationarity checks. The ADF test results show that GDP, population (POP), inflation, labor force (LBF), and broad money are all stationary at the 5% significance level, as indicated by the rejection of the null hypothesis of a unit root. Similarly, the KPSS test, which assumes stationarity as the null, also supports this conclusion for all variables except inflation. Inflation was identified as non-stationary by the KPSS test, suggesting a mixed stationarity condition. The combination of both tests strengthens the confidence in the time series properties of the variables, a necessary prerequisite for valid panel regression estimation.

Table 3: Unit root test

Variable	ADF statistic	ADF p-value		KPSS statistics	KPSSs p-value	
GDP	-7.65	0.00	stationary	0.08	0.10	Stationary
POP	-4.57	0.00	stationary	0.33	0.10	Stationary
INFLATION	-7.98	0.00	stationary	0.47	0.05	Non- stationary
LBF	-4.42	0.00	stationary	0.31	0.10	Stationary
BROAD MONEY	-5.66	0.00	stationary	0.08	0.10	Stationary

Source: Author (2025) stationarity Analysis Using Unit Root Tests

Table 4 presents the estimation results from both Fixed Effects and Random Effects models, which assess the macroeconomic determinants of GDP growth in African countries. The Fixed Effects model reveals that population has a negative and marginally significant association with GDP, indicating that an increase in population may not directly translate to higher economic output within countries over time. Labor force (LBF) has a positive coefficient (1.1552), suggesting a

growth-enhancing effect, although the t-statistic (1.639) implies only marginal significance. Inflation and broad money do not show statistically significant relationships with GDP under either model, implying weak evidence of direct short-run macroeconomic effects. In contrast, the Random Effects model yields insignificant coefficients across all variables, with notably weaker explanatory power than the Fixed Effects specification. These contrasting outcomes support the selection of the Fixed Effects model for explaining within-country variations over time, highlighting the importance of accounting for unobserved heterogeneity in panel data studies of African economies.

Although the Hausman test ($p = 0.25$) does not reject the suitability of the random effects model, the fixed effects model demonstrates stronger within-group explanatory power and statistical significance. Therefore, the fixed effects model is preferred, as it better captures the heterogeneity in GDP determinants across countries in African regional blocs.

Table 4 Estimation results of fixed and random effect model.

Variable	Fixed Effect	Random Effect
POP	-1.4458 (-1.8166)	-0.0173 (-0.0944)
INFLATION	-0.0051 (-0.1187)	0.0198 (0.5037)
LBF	1.1552 (1.639)	-0.0357 (-0.2140)
BROAD MONEY	-0.0382 (-0.5193)	-0.0308 (-0.5315)

Note: compares results from both Fixed Effects (FE) and Random Effects (RE) estimations
Source: author (2025)

Table 5: Hausman test

Hausman test statistic	p-value
6.60	0.25

Source: Author (2025)

Discussion. The empirical findings highlight important insights into the macroeconomic and institutional determinants of economic growth across African regional blocs. The correlation analysis suggests limited direct association between GDP and most explanatory variables, except for labor force and population, which exhibit stronger relationships. The presence of high correlation between labor force and population reflects Africa's demographic dynamics, where population growth directly feeds into labor supply expansion. However, the negative coefficient of population in the growth regressions raises the possibility that demographic expansion has not translated into proportional productivity gains, aligning with recent evidence that rapid population growth in Africa can strain infrastructure, education, and healthcare systems, thereby curbing the growth dividend (Bloom et al., 2020).

The stationarity analysis confirms that most variables are stable, except inflation, which is found to be non-stationary under the KPSS test. This suggests that inflationary pressures in Africa are persistent and potentially driven by structural bottlenecks, such as supply-side rigidities and weak monetary frameworks. The inconsistent inflation coefficients across the Fixed Effects (FE) and Random Effects (RE) models reflect the heterogeneous experiences of African economies in managing price stability. Some regional blocs with stronger monetary policy credibility have succeeded in insulating growth from inflationary volatility, while others continue to face growth-eroding inflationary spirals (Anyanwu & Erhijakpor, 2023). The findings suggest that macroeconomic stability, particularly in price management, is crucial for translating monetary and fiscal policies into sustained growth.

The labor force variable exhibits a positive coefficient in the FE model, which is consistent with the argument that human capital remains a central engine of growth. However, the weak statistical significance points to underutilization of labor resources due to high unemployment,

skills mismatches, and underdeveloped labor markets in many African economies. This supports the view that expanding labor supply, in the absence of complementary structural reforms, does not automatically enhance productivity or output (Fox & Gandhi, 2022). Policymakers should therefore prioritize investment in education, vocational training, and labor market reforms that align workforce skills with industrial and technological demands to unlock the growth potential of Africa's demographic dividend.

Broad money supply exhibits a negative and insignificant relationship with growth, which resonates with findings that financial deepening in Africa has often failed to generate inclusive growth due to shallow capital markets and weak financial intermediation (Beck & Maimbo, 2021). This suggests that monetary expansion alone does not stimulate productive investment, but rather risks fueling inflationary pressures when not accompanied by institutional reforms that strengthen credit allocation and financial inclusion. Strengthening the regulatory framework, improving banking supervision, and expanding access to financial services remain essential steps toward transforming liquidity growth into real sector development.

The results further underscore the structural heterogeneity of African economies. Regional blocs such as the Southern African Development Community (SADC) with relatively advanced financial systems exhibit different macroeconomic dynamics compared to those in the Economic Community of West African States (ECOWAS) or the East African Community (EAC), where structural transformation is still nascent. This heterogeneity implies that "one-size-fits-all" macroeconomic strategies are unlikely to succeed. Policymakers must adopt region-specific approaches, recognizing differences in institutional quality, financial depth, and demographic patterns (Fosu, 2022). A nuanced understanding of these variations is key to designing growth strategies that are both context-sensitive and effective.

From a theoretical perspective, the weak and sometimes negative associations of population and broad money with growth indicate deviations from traditional neoclassical growth expectations. Instead, they lend support to endogenous growth theories that emphasize the role of human capital, innovation, and institutional quality in sustaining long-term growth. For Africa, this suggests that macroeconomic aggregates alone cannot drive growth unless embedded within institutional frameworks that foster innovation, technological adoption, and governance reforms (Acemoglu & Robinson, 2020). This reinforces the argument that growth in Africa is as much a function of institutional design as it is of factor accumulation.

The policy implications of these findings are multifold. First, population management policies should be embedded within broader human capital strategies to ensure that demographic expansion translates into productive capacity rather than economic strain. Second, inflation management requires stronger monetary frameworks and regional coordination, especially in currency unions, to prevent destabilizing price shocks. Third, financial sector reforms must prioritize deepening intermediation channels, expanding financial inclusion, and aligning credit with productive investments. Finally, labor market reforms that integrate youth into productive sectors are essential for harnessing the continent's demographic dividend. Together, these measures would help African economies overcome structural rigidities and place them on a sustainable growth trajectory.

Conclusions. The investigation of our study was carried out by taking into account macroeconomic data of 48 African countries based on panel data analysis, the findings entail several policies implication for the governments of African countries. First, this study encourages both national and regional bloc in Africa continent to increase their labor force through industrial and institutional developments, this can be however achieved through an enabling business environment that will encourage both foreign and local investor to investor in different sectors. Moreso, government tax policy should be friendly for the creation of more companies, this will encourage labor force and invariable drive economic growth. Africa continent as one of the most endowed with natural resources and 70% of her population are youth between the age of 18-50, if

the resources is managed properly and the youths are engaged carefully, Africa bloc regions will become major player in the supplying of valuable raw materials to the western, Asia and America countries. According to inference from our study, labor force had highly significantly influence GDP growth. In lie to this, countries across the regional blocs of the continent of Africa are advise to take the advantages of numbers, since there is strength in numbers, ECOWAS, SAHEL, SADC are encouraged to foster inter-trade among themselves as this will facilitate more jobs opportunities and economic stability. In line with Gossel and Biekpe (2014), Oladipo (2010), Adam et al. (2017), and Ribaj and Mexhuani (2021), posited the extant literature on the determinants of economic growth, my findings show similarities but also differences.

To sum up, a wealth of research over the years has consistently highlighted the multifaceted obstacles that African nations encounter in their quest for sustainable economic growth. These hurdles are often rooted in deficiencies across vital sectors such as transportation infrastructure (including air, land, and sea), the educational and professional capacities of the workforce, public health services, general living conditions, investment climate fragmentation, political unrest, inadequate legal frameworks, threats to personal and national security, limited life expectancy, and governance structures frequently marred by corruption.

References

1. Acemoglu, D., & Robinson, J. A. (2012). Why Nations Fail: The Origins of Power, Prosperity and Poverty. *Crown*.
2. Acemoglu, D., & Robinson, J. A. (2019). Why Nations Fail: The Origins of Power, Prosperity, and Poverty. *Crown Publishing*.
3. Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth* (Vol. 1A, pp. 385–472). Elsevier.
4. Adam, Ibrahim Osman, Alhassan Musah, and Muazu Ibrahim. 2017. Putting the cart before the horse? Re-examining the relationship
5. Adelowokan, O. A., Adesoye, A. B., & Onabanjo, B. O. (2023). Foreign direct investment, employment and poverty reduction in West Africa: A panel data analysis. *EuroEconomica*, 42(1), 42–58. Retrieved from: https://dj.univ-danubius.ro/index.php/EE/article/view/2329
6. Adepoju, A. A., Ogunleye, E. K., & Olayemi, A. O. (2021). Regional integration and economic performance in ECOWAS. *African Development Review*, 33(2), 251–263.
7. Adewole, J. A., & Amurawaye, J. E. (2024). Macroeconomic determinants of economic growth in ECOWAS: Evidence from panel data analysis. *Benin Journal of Social and Technological Research*, 8(1), 23–41. Retrieved from: https://www.ajol.info/index.php/bjst/article/view/277593
8. African Development Bank. (2021). *African Economic Outlook 2021: From Debt Resolution to Growth*. Retrieved from: https://www.afdb.org/en/documents/african-economic-outlook-2021
9. Ajakaiye, O., & Ncube, M. (2010). Infrastructure and economic development in Africa: An overview. *Journal of African Economies*.
10. Akçomak, I. S., Alper, C. E., & Tansel, A. (2023). Economic complexity, institutions, and growth: Evidence from emerging economies. *Structural Change and Economic Dynamics, 64*, 281–295.
11. Amaeshi, K., Boso, N., & Ramus, T. (2018). *The African context of business and society scholarship*. Academy of Management Perspectives, 32(1), 62–77. DOI: https://doi.org/10.5465/amp.2017.0164
12. Anyanwu, J. C., & Erhijakpor, A. E. O. (2023). Inflation dynamics and macroeconomic stability in Africa. *Journal of African Business*, 24(1), 1–25. DOI: https://doi.org/10.1080/15228916.2022.2044756
13. Arellano, M. (1987). Computing robust standard errors for within-groups estimators. *Oxford Bulletin of Economics and Statistics*, 49(4), 431–434.
14. Asongu, S. A., & Odhiambo, N. M. (2020). Human capital and economic development in sub-Saharan Africa: A review. *Journal of Economic Studies*, 47(4), 613–636.
15. Baltagi, B. H. (2008). *Econometric Analysis of Panel Data* (4th ed.). Wiley.
16. Baltagi, B. H. (2021). *Econometric Analysis of Panel Data* (6th ed.). Springer.
17. Barro, R. J., & Sala-i-Martin, X. (2004). *Economic Growth* (2nd ed.). MIT Press.
18. Beck, T., & Maimbo, S. (2021). Financial sector development in Africa: Prospects and challenges. *Journal of African Economies, 30*(Supplement 1), i3–i25. DOI: https://doi.org/10.1093/jae/ejab002
19. Binns, T., Lynch, K., & Nel, E. (2018). The Routledge Handbook of African Development. *Routledge*. DOI: https://doi.org/10.4324/9781315756314
20. Bleaney, M., & Greenaway, D. (2001). The impact of macroeconomic volatility on investment and growth in Sub-Saharan Africa. *Journal of Development Economics*, 65(2), 491–500.
21. Bloom, D. E., Kuhn, M., & Prettner, K. (2020). Africa's prospects for enjoying a demographic dividend. *Journal of Demographic Economics, 86*(3), 209–225. DOI: https://doi.org/10.1017/dem.2020.7
22. Breusch, T. S., & Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica*, 47(5), 1287–1294.

23. Chávez, J. A., Hidalgo, C. A., & Hausmann, R. (2017). The structure of economic output determines the future of economic growth. *Journal of Development Economics, 124*, 1–21.
24. Chu, A. C., & Hoang, D. T. (2020). How does economic complexity affect income inequality? *Macroeconomic Dynamics, 24*(7), 1732–1754.
25. European Union Institute for Security Studies. (2021). Reaping Africa's demographic dividend. *EUISS Brief*. Retrieved from: https://www.iss.europa.eu/publications/briefs/reaping-africas-demographic-dividend
26. Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics*, 32(3), 485–512.
27. Fofack, H. (2009). Determinants of income inequality and its effect on economic growth. *World Bank Policy Research Working Paper* No. 4733.
28. Fosu, A. K. (2022). Economic structure and performance in Africa. *Oxford Research Encyclopedia of Economics and Finance*.
29. Fox, L., & Gandhi, D. (2022). Youth employment in sub-Saharan Africa: Progress and prospects. *World Development, 158*, 105987. DOI: https://doi.org/10.1016/j.worlddev.2022.105987
30. Greene, W. H. (2023). *Econometric Analysis* (9th ed.). Pearson.
31. Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*, 46(6), 1251–1271.
32. Iwedi, M., & Igbanibo, D. (2015). Oil price volatility and economic growth in Nigeria: A co-integration approach. *International Journal of Finance and Accounting*, 4(2), 86–94.
33. Kabir Usman, A., Yusuf, A. A., & Bello, M. U. (2024). Infrastructure investment and economic growth in ECOWAS countries: A panel data analysis. *Journal of Economic Sciences*, 12(1), 13–29. Retrieved from: https://online-journal.unja.ac.id/JES/article/view/28460
34. Koch, N. (2021). Product complexity and economic growth in developing economies. *World Development, 144*, 105473.
35. Lee, J.-W., & Lee, H. (2020). Human capital and development: Revisited. *World Development, 132*, 104958.
36. Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth* (Vol. 1A, pp. 865–934). Elsevier.
37. Lucas, R. E., Jr. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 22*(1), 3–42.
38. Musgrave, R. A. (1959). *The Theory of Public Finance*. McGraw-Hill.
39. Musgrave, R. A., & Musgrave, P. B. (1973). *Public Finance in Theory and Practice* (4th ed.). McGraw-Hill.
40. Ndlovu, G. (2013). Financial sector development and economic growth: Evidence from SADC. *African Journal of Business Management*, 7(36), 3629–3638.
41. North, D. C. (1990). Institutions, Institutional Change and Economic Performance. *Cambridge University Press*. Retrieved from: investopedia.com+4wsj.com+4en.wikipedia.org+4link.springer.comwsj.com+13pegasus.law.columbia.edu+13books.google.com+13
42. Oates, W. E. (1999). An essay on fiscal federalism. *Journal of Economic Literature, 37*(3), 1120–1149. en.wikipedia.org+1link.springer.com+1
43. Odhiambo, Nicholas M. 2009. Savings and economic growth in South Africa: A multivariate causality test. *Journal of Policy Modeling* 31:708–18.
44. Oladipo, Olajide S. 2010. Does saving really matter for growth in developing countries? The case of a small open economy. *International Business & Economics Research Journal 9:* 87–94.
45. Onah, A. A. (2022). Financial integration and economic growth in ECOWAS and SADC: Evidence from panel ARDL approach. *African Journal of Economic Policy*, 29(2), 89–112. Retrieved from: https://journals.sagepub.com/doi/10.1177/05694345221084339
46. Onyebuchi, V. C., & Okonkwo, O. (2022). OPEC membership and economic growth in oil-exporting African countries: Evidence from panel ARDL. *Energy Policy*, 160, 112672.
47. Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy, 94*(5), 1002–1037.
48. Romer, P. M. (1994). The origins of endogenous growth. *Journal of Economic Perspectives*, 8(1), 3–22.
49. Sahay, R., Čihák, M., N'Diaye, P., Barajas, A., & Mitra, S. (2015). Rethinking Financial Deepening: Stability and Growth in Emerging Markets. *IMF Staff Discussion Note*.
50. Signé, L., & Johnson, C. (2018). The Role of Africa's Private Sector in Africa's Economic Transformation. *Brookings Institution*.
51. Simoes, A., & Hidalgo, C. A. (2011). The Economic Complexity Observatory: An analytical tool for understanding the dynamics of economic development. *International Conference on Information Visualization* (pp. 1–7).
52. UN Economic Commission for Africa. (2024). *Africa's demographic window is opening: Getting it right*. https://www.uneca.org/stories/(blog)-as-africa's-population-crosses-1.5-billion-the-demographic-window-is-opening-getting
53. Wooldridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data (2nd ed.). *MIT Press*.
54. World Bank. (2022). *Creating Jobs for Africa's Growing Population*.
55. Zhu, S., & Li, R. (2017). Economic complexity, human capital, and economic growth: Empirical research based on cross-country panel data. *Applied Economics, 49*(38), 3815–3828.

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Еммануель Імуеда Оясор
Кафедра бухгалтерського обліку, науковий співробітник
Університет Волтера Сізулу, Мтхата, Приватна пошта X1, UNITRA, 5117, ПАР
e-mail: emmanueloyasor12@gmail.com
ORCID ID: 0009-0005-7500-5919

Макроекономічні та інституційні детермінанти економічного зростання в регіональних блоках Африки: аналіз панельних даних

Анотація. Економічне зростання залишається фундаментальним орієнтиром для оцінки трансформації економік у розвинених, країнах, що розвиваються, та країнах, що входять, світі. В африканському контексті регіональні економічні спільноти (РЕС), такі як ЕКОВАС, САРК, КОМЕСА та Східноафриканська спільнота, є стратегічними платформами, де зростання може посилювати дохід на душу населення, створення робочих місць, іноземні інвестиції та добробут.

Постановка проблеми. Незважаючи на цей потенціал, африканські економіки продовжують стикатися з викликами, що обмежують зростання. Макроекономічна нестабільність, слабка інституційна ефективність, демографічний тиск та структурні вразливості постійно перешкоджають інклюзивному та сталому розвитку.

Нерозв'язані аспекти. Хоча наявні дослідження розглядають детермінанти зростання в Африці, багато з них обмежені короткими часовими горизонтами, фокусом на одній країні чи вузьким набором змінних. Внаслідок цього обмежена увага приділена довгостроковій взаємодії демографічних, інституційних та макроекономічних факторів у різноманітних регіональних блоках, що залишає критичні прогалини в політиці невирішеними.

Мета статті. Це дослідження спрямоване на вивчення макроекономічних та інституційних драйверів зростання в африканських регіональних блоках з 1960 по 2022 рік. Застосовуючи рамки STIRPAT, воно оцінює, як динаміка населення, інфляція, робоча сила, широкі грошові агрегати та витрати на військо впливають на зростання ВВП, враховуючи структурні зрушення, реформи політики та зовнішні шоки.

Основний матеріал. Використовуючи збалансовану панель 48 африканських країн, аналіз застосовує моделі з фіксованими ефектами, випадковими ефектами та моделі перших різниць для вирішення ендогенності та гетерогенності. Результати показують, що розширення робочої сили сильно підтримує зростання, тоді як зростання населення чинить незначний негативний ефект. Інфляція та широкі грошові агрегати демонструють слабкий прямий вплив. Модель з фіксованими ефектами найкраще відображає варіації всередині країн, підкреслюючи важливість характеристик, специфічних для країни, у формуванні результатів зростання.

Висновки. Результати свідчать, що африканські країни повинні використовувати свій демографічний дивіденд, посилювати інституційні рамки та сприяти регіональній інтеграції для досягнення сталого та інклюзивного зростання. Охоплюючи шість десятиліть та кілька блоків, дослідження пропонує оригінальні інсайти для політиків та партнерів з розвитку, надаючи ширшу доказову базу для стратегій, орієнтованих на зростання, в Африці.

Ключові слова: *економічне зростання, потік інвестицій, ендогенний, панельні дані, інституційна теорія*

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Список літератури

1. Acemoglu, D., & Robinson, J. A. Why Nations Fail: The Origins of Power, Prosperity and Poverty. Crown, 2012.
2. Acemoglu, D., & Robinson, J. A. Why Nations Fail: The Origins of Power, Prosperity, and Poverty. Crown Publishing, 2019.
3. Acemoglu, D., Johnson, S., & Robinson, J. A. Institutions as a fundamental cause of long-run growth. In: P. Aghion & S. Durlauf (Eds.), Handbook of Economic Growth, Vol. 1A. Elsevier, 2005, pp. 385–472.
4. Adam, I. O., Musah, A., & Ibrahim, M. Putting the cart before the horse? Re-examining the relationship between domestic savings and economic growth in selected Sub-Saharan African countries. Journal of African Business, 2017, 18, 102–123.
5. Adelowokan, O. A., Adesoye, A. B., & Onabanjo, B. O. Foreign direct investment, employment and poverty reduction in West Africa: A panel data analysis. EuroEconomica, 2023, 42(1), 42–58. URL: https://dj.univ-danubius.ro/index.php/EE/article/view/2329
6. Adepoju, A. A., Ogunleye, E. K., & Olayemi, A. O. Regional integration and economic performance in ECOWAS. African Development Review, 2021, 33(2), 251–263.
7. Adewole, J. A., & Amurawaye, J. E. Macroeconomic determinants of economic growth in ECOWAS: Evidence from panel data analysis. Benin Journal of Social and Technological Research, 2024, 8(1), 23–41. URL: https://www.ajol.info/index.php/bjst/article/view/277593
8. African Development Bank. African Economic Outlook 2021: From Debt Resolution to Growth. 2021. URL: https://www.afdb.org/en/documents/african-economic-outlook-2021

9. Ajakaiye, O., & Ncube, M. Infrastructure and economic development in Africa: An overview. Journal of African Economies, 2010, 19(suppl_1), i3–i12.
10. Akçomak, I. S., Alper, C. E., & Tansel, A. Economic complexity, institutions, and growth: Evidence from emerging economies. Structural Change and Economic Dynamics, 2023, 64, 281–295.
11. Amaeshi, K., Boso, N., & Ramus, T. The African context of business and society scholarship. Academy of Management Perspectives, 2018, 32(1), 62–77. DOI: https://doi.org/10.5465/amp.2017.0164
12. Anyanwu, J. C., & Erhijakpor, A. E. O. Inflation dynamics and macroeconomic stability in Africa. Journal of African Business, 2023, 24(1), 1–25. DOI: https://doi.org/10.1080/15228916.2022.2044756
13. Arellano, M. Computing robust standard errors for within-groups estimators. Oxford Bulletin of Economics and Statistics, 1987, 49(4), 431–434.
14. Asongu, S. A., & Odhiambo, N. M. Human capital and economic development in sub-Saharan Africa: A review. Journal of Economic Studies, 2020, 47(4), 613–636.
15. Baltagi, B. H. Econometric Analysis of Panel Data. 4th ed. Wiley, 2008.
16. Baltagi, B. H. Econometric Analysis of Panel Data. 6th ed. Springer, 2021.
17. Barro, R. J., & Sala-i-Martin, X. Economic Growth. 2nd ed. MIT Press, 2004.
18. Beck, T., & Maimbo, S. Financial sector development in Africa: Prospects and challenges. Journal of African Economies, 2021, 30(Suppl. 1), i3–i25. DOI: https://doi.org/10.1093/jae/ejab002
19. Binns, T., Lynch, K., & Nel, E. The Routledge Handbook of African Development. Routledge, 2018. DOI: https://doi.org/10.4324/9781315756314
20. Bleaney, M., & Greenaway, D. The impact of macroeconomic volatility on investment and growth in Sub-Saharan Africa. Journal of Development Economics, 2001, 65(2), 491–500.
21. Bloom, D. E., Kuhn, M., & Prettner, K. Africa's prospects for enjoying a demographic dividend. Journal of Demographic Economics, 2020, 86(3), 209–225. DOI: https://doi.org/10.1017/dem.2020.7
22. Breusch, T. S., & Pagan, A. R. A simple test for heteroscedasticity and random coefficient variation. Econometrica, 1979, 47(5), 1287–1294.
23. Chávez, J. A., Hidalgo, C. A., & Hausmann, R. The structure of economic output determines the future of economic growth. Journal of Development Economics, 2017, 124, 1–21.
24. Chu, A. C., & Hoang, D. T. How does economic complexity affect income inequality? Macroeconomic Dynamics, 2020, 24(7), 1732–1754.
25. European Union Institute for Security Studies. Reaping Africa's demographic dividend. EUISS Brief, 2021. URL: https://www.iss.europa.eu/publications/briefs/reaping-africas-demographic-dividend
26. Fischer, S. The role of macroeconomic factors in growth. Journal of Monetary Economics, 1993, 32(3), 485–512.
27. Fofack, H. Determinants of income inequality and its effect on economic growth. World Bank Policy Research Working Paper No. 4733, 2009.
28. Fosu, A. K. Economic structure and performance in Africa. Oxford Research Encyclopedia of Economics and Finance, 2022.
29. Fox, L., & Gandhi, D. Youth employment in sub-Saharan Africa: Progress and prospects. World Development, 2022, 158, 105987. DOI: https://doi.org/10.1016/j.worlddev.2022.105987
30. Greene, W. H. Econometric Analysis. 9th ed. Pearson, 2023.
31. Hausman, J. A. Specification tests in econometrics. Econometrica, 1978, 46(6), 1251–1271.
32. Iwedi, M., & Igbanibo, D. Oil price volatility and economic growth in Nigeria: A co-integration approach. International Journal of Finance and Accounting, 2015, 4(2), 86–94.
33. Kabir Usman, A., Yusuf, A. A., & Bello, M. U. Infrastructure investment and economic growth in ECOWAS countries: A panel data analysis. Journal of Economic Sciences, 2024, 12(1), 13–29. URL: https://online-journal.unja.ac.id/JES/article/view/28460
34. Koch, N. Product complexity and economic growth in developing economies. World Development, 2021, 144, 105473.
35. Lee, J.-W., & Lee, H. Human capital and development: Revisited. World Development, 2020, 132, 104958.
36. Levine, R. Finance and growth: Theory and evidence. In: P. Aghion & S. Durlauf (Eds.), Handbook of Economic Growth, Vol. 1A. Elsevier, 2005, pp. 865–934.
37. Lucas, R. E., Jr. On the mechanics of economic development. Journal of Monetary Economics, 1988, 22(1), 3–42.
38. Musgrave, R. A. The Theory of Public Finance. McGraw-Hill, 1959.
39. Musgrave, R. A., & Musgrave, P. B. Public Finance in Theory and Practice. 4th ed. McGraw-Hill, 1973.
40. Ndlovu, G. Financial sector development and economic growth: Evidence from SADC. African Journal of Business Management, 2013, 7(36), 3629–3638.
41. North, D. C. Institutions, Institutional Change and Economic Performance. Cambridge University Press, 1990.
42. Oates, W. E. An essay on fiscal federalism. Journal of Economic Literature, 1999, 37(3), 1120–1149.
43. Odhiambo, N. M. Savings and economic growth in South Africa: A multivariate causality test. Journal of Policy Modeling, 2009, 31, 708–718.
44. Oladipo, O. S. Does saving really matter for growth in developing countries? The case of a small open economy. International Business & Economics Research Journal, 2010, 9, 87–94.
45. Onah, A. A. Financial integration and economic growth in ECOWAS and SADC: Evidence from panel ARDL approach. African Journal of Economic Policy, 2022, 29(2), 89–112. DOI: https://journals.sagepub.com/doi/10.1177/05694345221084339
46. Onyebuchi, V. C., & Okonkwo, O. OPEC membership and economic growth in oil-exporting African countries: Evidence from panel ARDL. Energy Policy, 2022, 160, 112672.
47. Romer, P. M. Increasing returns and long-run growth. Journal of Political Economy, 1986, 94(5), 1002–1037.
48. Romer, P. M. The origins of endogenous growth. Journal of Economic Perspectives, 1994, 8(1), 3–22.

49. Sahay, R., Čihák, M., N'Diaye, P., Barajas, A., & Mitra, S. Rethinking Financial Deepening: Stability and Growth in Emerging Markets. IMF Staff Discussion Note, 2015.
50. Signé, L., & Johnson, C. The Role of Africa's Private Sector in Africa's Economic Transformation. Brookings Institution, 2018.
51. Simoes, A., & Hidalgo, C. A. The Economic Complexity Observatory: An analytical tool for understanding the dynamics of economic development. In: International Conference on Information Visualization, 2011, pp. 1–7.
52. UN Economic Commission for Africa. Africa's demographic window is opening: Getting it right. 2024. URL: https://www.uneca.org/stories/(blog)-as-africa's-population-crosses-1.5-billion-the-demographic-window-is-opening-getting
53. Wooldridge, J. M. Econometric Analysis of Cross Section and Panel Data. 2nd ed. MIT Press, 2010.
54. World Bank. Creating Jobs for Africa's Growing Population. 2022.
55. Zhu, S., & Li, R. Economic complexity, human capital, and economic growth: Empirical research based on cross-country panel data. Applied Economics, 2017, 49(38), 3815–3828.

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Collins C. Ngwakwe
Doctor of Philosophy in Accounting
Professor at the Graduate School of Leadership
Faculty of Management and Law
University of Limpopo
University Road, Sovenga, Polokwane, South Africa
e-mail: collins.ngwakwe@ul.ac.za
ORCID ID: 0000-0002-6954-8897

The impact of banks liquid reserve and food export on economic development during conflict

Abstract. Bank liquid reserve and food production provides a lifeline for effective and productive economic activities.

The objective of this paper is to analyse the effect of banks liquid reserve and food export on economic development during conflict and used Ukraine's data as a case.

Problem statement. Bank liquidity position triggers a trade-off between bank credit risk performance and bank profitability. A delicate balancing act thus subsists between holding high liquidity at the expense of credit lending, investment boosting and economic growth, profit returns and credit risk incurrence.

Purpose of the article. The purpose of this article is to evaluate how a combined effect of bank liquidity and food export affects economic growth, the degree of growth and the slant of growth.

Unresolved aspects of the problem. there is scarcity of literature on the joint effect of bank liquidity and food export on economic growth of a country in conflict – particularly in contemporary Ukraine case.

Presentation of the main material. The paper applied a quantitative approach by using the multiple regression model to examine the relationships. Secondary data on bank liquid reserve, food export and GDP for Ukraine was collected from economic indicator data archives of the World Development Indicators.

Conclusions. Results from the analysis indicates that bank liquid reserve and food export have a significant impact on Ukraine's economic performance during the war. The overall F-statistic is Signiant at P=0.000496. Furthermore, bank liquid reserve is significant at P=0.000495 with a positive regression coefficient of 122.3883. In addition, food export is significant at p=0.006234 with a negative regression coefficient of -131.289. The model's coefficient of correlation is high at 0.884089 showing a close correlation. In addition, coefficient of determination (R^2) is high at 0.781613 and adjusted R^2 at 0.737936 which indicates a good model fit. The positive coefficient for bank liquid reserved indicates that bank liquid reserve has a positive and significant effect on Ukraine's economy during the war, which implies that the capacity of banks to attract more liquid reserve provides significant assistance to Ukraine's economic resilience during the time of conflict. Although food export is significant, but it has a negative coefficient emanating from the obstructions of exports logistics during the conflict as alternative routes of export comes at higher costs. The findings contribute to the literature by indicating that a healthy bank sector with sufficient liquid reserve is vital to support economic vibrancy and resilience during conflict.

Keywords: *Bank liquidity, Bank reserve, Food export, Economic growth, Credit risk; Investment*
JEL Classification: G21; G28;O1; Q17
Formulas: 1; tabl.: 1; bibl.:32.

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Introduction. Credit availability and financial stability are the key primary avenues through which bank liquid reserves impact economic development and resiliency. Often required by central banks as a prudential requirement, bank liquid reserves are the percentage of bank assets held in cash or near-cash form. On the one hand, banks would possess less cash availability for lending when reserve level requirements by the central banks are high. This is because if central banks require the banks to place a higher percentage of banks' deposits with the central bank, this reduces the level of liquid reserves with the banks to offer loans and credit facilities (Acharya & Rajan, 2024; Mora, 2014). This could slow the pace of economic development by decreasing the availability of credit, which would limit investment and the expansion of the private sector.

Maintaining sufficient liquid reserves helps banks to honour withdrawal request obligations and withstand shocks to the economy. Long-term sustainable growth is promoted by investment attraction, and public confidence is raised when financial institutional remain stable through liquid reserve reliability. Therefore, liquid reserve position of the banks helps to determine the stabilizing effect on the economy. Accordingly, liquid reserved level may have a twofold effect on the economy: higher reserves can protect the economy from crises and thereby promote development in the long term, even though they may restrict credit creation and investment in the short term (Swamy & Narayanamurthy, 2025). The ability of the system to balance these two conflicting effects helps in the short to long term determination of the extent to which liquid reserves affect or impede economic development.

Literature Reviews. The supporting literature is divided into two sections, namely the theoretical foundation; this is followed by other parts which looks at bank reserve and financial liquidity, bank liquid reserve and the economy during conflict, the Ukraine case, lessons from other conflict zones, and food export sustenance role in Ukraine during the war.

Theoretical Foundation. This paper draws theoretical rooting from a mixture of related theories such as theories of Financial Intermediation, Liquidity Preference and Bank Reserve, The Diamond-Dybvig, and the Credit Market Imperfections. The role of banks in mobilizing savings and directing them toward profitable investments is explained by the theory of financial intermediation. According to the theory, banks can lower transaction costs and promote economic growth by pooling their resources. According to this theory liquidity management and intermediation efficiency are intimately related (Gbadebo, 2024). Similarly, liquidity preference theory plays an important paradigm role in understanding the interplay between bank reserve and liquidity. According to the liquidity preference theory, economic agents require liquidity for speculative precautionary and transactional purposes (Bibow, 2013). This implies that to preserve trust and avoid liquidity shortages banks must have liquid reserves. There is however a trade-off between return and liquidity suggesting that holding too much cash on hand could take resources away from more useful applications (Boloș et al, 2025; Acharya & Rajan, 2024). According to Diamond and Dybvigs (1983), when depositor confidence wanes, banks are susceptible to runs. However, the stabilizing function of liquidity in banking systems is highlighted by the fact that sufficient reserves and deposit insurance reduce this risk. This offers a theoretical justification for reserve requirements set by central and/or reserve banks.

Bank Reserves and Financial Stability. Higher reserves according to empirical research act as a liquidity buffer lowering the risk of banking crises (Demirgüç-Kunt & Detragiache, 1998). Additionally, Berger and Bouwman (2009) discover that the development of liquidity enhances systemic resilience fortifying the connection between reserves and stability. On the other hand, reserves might limit the amount of credit available.

Saxegaard (2006) examined the efficacy of monetary policy and excess liquidity in Sub-Saharan Africa. He compared the amount of reserves deposited with the central banks to money in vaults than what is mandated or required by law. Additionally, he highlighted that Both precautionary and involuntary excess reserves serve different purposes which align with single

corporate objective whilst at the same time assists with economic growth. Banks hold them consciously especially to satisfy liquidity or prudential requirements.

Reserves and economic activity are mediated in large part by the availability of credit. Agénor, Aizenman and Hoffmaister (2004) show that excess liquid assets in Asia signals credit constraints during crises while Gambacorta and Marques-Ibanez (2011) show that tighter reserve policies reduce loan growth. Thus, a crucial component in comprehending the macroeconomic influence of reserves is the relationship between reserves and credit. Development is influenced by credit availability primarily through investment. King and Levine (1993) and Levine (1997) found a significant correlation between growth and financial development as measured by credit expansion. Similarly, according to Beck, Levine and Loayza (2000) efficient credit markets encourage capital formation and entrepreneurship. Investment-led growth may suffer if credit is restricted through high reserves demands by the central banks. Development experts suggest that development and reserves have a complicated relationship.

Bank Liquid Reserves and the Economy During Conflict. Armed conflicts present special difficulties for financial systems, which frequently make liquidity constraints worse while also raising the demand for stable financial intermediation. The function of bank liquid reserves in these situations goes beyond simple financial prudence and turns into a vital component of economic resilience. In the face of severe uncertainty, banks with sufficient liquidity buffers can sustain vital payment systems, withstand abrupt deposit withdrawals and keep extending vital credit to priority sectors. Conflict periods raise the risk of unexpected liquidity shortages, disruption of financial systems and erosion of investor confidence. The value of bank liquid reserves becomes more crucial during these uncertain times to act as a cushion to economic shock. This is important as sufficient liquidity cushions enable banks to continue lending to vital economic sectors to meet unforeseen withdrawals and maintain payment systems. Without these safeguards wars can quickly lead to bank failures which exacerbate the devastating effects of war on the economy. First by maintaining trust in the banking system, liquid reserves help to stabilize situations during times of conflict. The need for precautionary withdrawals increases dramatically when businesses and households experience increase uncertainty. To avoid panic-induced bank runs that would otherwise cause the financial sector to become unstable, banks hold adequate liquidity to fulfil their commitments (Diamond and Dybvig 1983). Additionally, bank reserves make it possible to continue giving priority sectors the necessary credit during times of conflict. To pay for urgent necessities like food imports, humanitarian aid and the repair of vital infrastructure, governments frequently turn to the banking sector.

Therefore, it is essential to have a liquid banking system to guarantee that these industries continue to operate even as private investment contracts (Agénor, Aizenman & Hoffmaister 2004). Furthermore, liquidity buffers reduce the chance of a systemic financial collapse during times of conflict when external shocks like currency depreciation, capital flight or hyperinflation occur. The survival of the overall economy depends on banks' ability to absorb shocks and sustain interbank lending through the maintenance of reserves (Demirgüç-Kunt & Detragiache 1998). Liquid reserves hasten economic stabilization during the post-conflict recovery phase. Banks that have enough liquidity at the end of the conflict are better equipped to support reconstruction efforts start lending again and win back the trust of investors and depositors. As a result, liquid reserves help economies to recover more easily and grow over the long run in addition to providing a buffer during times of conflict.

The Ukraine Case. The ongoing war in Ukraine offers a compelling example of how liquid reserves support economies during times of conflict. Ukraine's banking industry remained remarkably stable with no significant bank runs or systemic collapses despite the extensive disruptions caused by the conflict. High capital and liquidity ratios that were above regulatory limits served as the foundation for this resilience guaranteeing the ongoing operation of deposit withdrawals and payment systems (Center for Economic Strategy [CES], 2022; VoxUkraine, 2022).

By establishing temporary capital controls fixing the exchange rate to protect reserves and offering emergency liquidity facilities the National Bank of Ukraine (NBU) further strengthened stability (Redcliffe Partners, 2022). Because of this even during times of war more than 70% of bank branches stayed open and digital payment systems ran virtually without hiccups (VoxUkraine, 2022). More significantly banks started increasing credit by the end of 2023 with corporate lending rising by more than 20% and retail lending by more than 30%. This demonstrated how liquidity buffers helped the financial system not only survive but also aid in recovery efforts (National Bank of Ukraine [NBU], 2024). Thus, the Ukrainian case shows that although having large liquid reserves may limit credit in times of peace, they are an essential lifeline for economic resilience and financial stability during times of conflict. Ukraine is particularly important in this discussion because according to Kyiv Independent, during the early stage of Russian invasion,some parts of Ukraine was occupied, economic activities were affected as Ukraine banks lost over 10 billion hryvnia ($246 million) in March 2022 (**Kyiv independent, 2025**).

Lessons from Other Conflict Zones. Additional evidence of the crucial role of bank reserves can be found in other economies affected by conflicts. For example, insufficient liquidity buffers during the Syrian civil war exacerbated the country's economic contraction by causing widespread banking distress capital flight and the breakdown of intermediation functions (World Bank, 2017). Similarly, the depletion of foreign reserves and poor liquidity management in Lebanon—a country experiencing protracted political unrest and a financial crisis rather than a traditional war—caused a systemic banking collapse that paralyzed credit markets and hampered economic recovery (International Monetary Fund [IMF], 2020). Conversely nations with more robust liquidity positions during conflicts like certain West African states during regional conflicts were better equipped to maintain payment systems and continue making small but vital loans to critical industries (Demirgüç-Kunt & Detragiache, 1998). These examples collectively demonstrate how liquid reserves have two sides: in times of crisis or conflict they are essential for ensuring financial stability, upholding public trust and creating the framework for recovery after a conflict but in times of peace they may seem conservative and limit instantaneous lending opportunities.

Food Export Sustenance Role in Ukraine During the War. The previous sections have examined the role of bank liquid reserve in sustaining the economy of Ukraine as it endured the conflict. This session looks at another important variable that has helped to sustain Ukraine's economy during the war, which is food export. Exports of agricultural products are an important part of the overall economy and have a big impact on economic expansion. Incorporating food exports into your model allows you to separate the precise effect of banking while taking other significant economic variables into consideration. This contributes to a more precise and sophisticated understanding of the connection between financial development and economic growth. Notwithstanding the destruction caused by war Ukraine's agricultural industry has been vital to maintaining both the country's economy and global food security.

Known as the breadbasket of Europe Ukraine was responsible for approximately half of the worlds sunflower oil exports and 10% of its wheat exports prior to the conflict (Wikipedia, 2025a). Ukrainian exports fell precipitously as ports were blockaded in early 2022 but this lifeline was restored with the aid of strategic agreements and flexible logistics. A key factor in the reopening of maritime trade was the July 2022 Black Sea Grain Initiative (BSGI). More than 33 million metric tons of grain and other food products were successfully transported through secure maritime corridors between July 2022 and mid-2023 relieving pressure on the worlds food supply and boosting Ukraines export earnings (Wikipedia, 2025b; SIPRI, 2023; CSIS, 2025).

Ukraine maintained export routes via a humanitarian maritime corridor even after the BSGI ended in July 2023 delivering 40.8 million metric tons in December 2023 alone (CSIS, 2025). Ukraine swiftly adjusted and created overland Solidarity Lanes with EU partners which caused trade in agricultural products to nearly double to €13 billion in 2022 (Transnational Institute, 2022). With monthly outflows of 4-5 million metric tons (prewar levels were approximately 6 million) the

Ukrainian Sea Corridor which was established in mid-2023 has assisted in the recovery of exports to levels that are almost identical to those of the War (UAC, 2024).

These flows from export of food assists with the provision of vital support to the economy's survival such as:

• Financial lifeline: During the war Ukraines top source of foreign exchange earnings has been agriculture exports especially grains and sunflowers which have helped pay for imports and government revenue.

• Impact on the world: Ukraine's ongoing exports helped to ease the worlds food shortage. Its agricultural exports resilience helped stabilize markets and provided food-deficit nations particularly those in the Middle East and Africa with relief (Atlantic Council, 2024).

• Domestic adaptation: To prevent harvesting losses and facilitate exports Ukraine implemented temporary infrastructure and mobile storage after traditional storage capacities were exceeded with assistance from other countries (Transnational Institute, 2022).

Relatively few studies give specific focus on bank liquid reserves as a driver of economic development despite a wealth of research on the connections between finance and economic growth. Majority of studies view reserves as a component of monetary policy rather than a factor that directly influences growth. Furthermore, despite the preponderance of literature on the importance of high reserve requirements, there is little evidence from Ukraine on the effect of banak liquid reserve on the economy during the times of conflict. This leaves a glaring hole for additional research. This paper contributes to the literature by focussing on how bank liquid reserve combines with food export to drive the Ukraine' economy during the times of war. The following section presents the method and results.

Purpose, objectives and research methods. The objective of this paper is to analyse the impact of bank liquid reserve and food export on economic development during conflict. The purpose therefore is to evaluate the extent of combined effect bank liquidity and food export on economic growth of Ukraine. The paper applied a positivist paradigm, which is suitable for measuring the relationship between quantitative variables. Secondary data on bank liquid reserve, food export and GDP for Ukraine was collected from the countries' bank performance archives of the World Development Indicators. The paper applied a multiple regression technique for data analysis. Given the focus on bank liquid reserve and food export, it became apposite to include the two independent variables in the model to measure their impact on economic growth of Ukraine.

Accordingly, the general model equation used in the analysis is:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon \quad \text{.....(1)}$$

where: y = the dependent variable (GDP used as the proxy for economic growth in this paper), x_1 and x_2 = the independent variables (bank liquid reserve and food export respectively), β_0 = the y-intercept, β_1 and β_2 = the regression coefficients accounting for the change in y variable for every one-unit of change in the independent variables x_1 and x_2 correspondingly, and ε = representing the random error term, which represents unaccounted variables in this model.

Research results. Table 1 indicates that bank liquid reserve and food export does have a significant impact on Ukraine's economic performance during the war. This is visible at F-significance = 0.00049674. The individual independent variables performance is depicted by their probability values and regression coefficients. Bank liquid reserve is significant at P= 0.000495 with a positive regression coefficient of 122.3883. In addition, food export is significant at p = 0.006234 with a negative regression coefficient of -131.289. Overall, coefficient of correlation is high at 0.884089 showing a close correlation. In addition, coefficient of determination (R^2) is high at 0.781613 and the adjusted R^2 at 0.737936 which indicates a good model fit. The positive coefficient for bank liquid reserve indicates that bank liquid reserve has a positive and significant effect on supporting Ukraine's economy during the war, which implies that the capacity of banks to attract and retain more liquid reserve will help the Ukraine's economy to be resilient in the time of war.

To further authenticate the statistical significance established by the p-values, the t-statistic provides additional results from the data analysis. Accordingly, from Table 1, the t-statistic and standard error for each independent variable gives further predicting significance insight, which substantiates the influential power of the bank liquid reserve and food export on the GDP per capita of Ukraine. The bank liquid reserve indicates a standard error of approximately 24, which is relatively low, and hence resulting in a t-statistic of 5, which is greater than conventional absolute t-value threshold of 2 or 2.5 generally regarded as suggestive of highly significant relationship. Therefore, the t-value of 5, indicates that bank liquid reserve coefficient is up to 5 standard errors far away from zero – which is good enough. Also, with its positive sign, the t-statistic of 5 provides further evidence that bank liquid reserve has a significant and positive impact on the performance of Ukraine's GDP per capita. In comparison with the standard error of food export, the standard error of bank liquid reserve is higher, which thus offers a better precise estimation of the coefficient. The food export independent variable indicates a t-static of -3, which depicts that the food export coefficient is 3 standard errors far away from zero value, which is also fair enough although lower than the value for bank liquidity. The t-statistic value of -3 is also indicative of statistical significance of food export because it is also greater than the absolute t-statistic threshold of 2 or 2.5. however, unlike the t-statistic of bank liquid reserve, which has a positive sign, the t-statistic of food export with -3 has a negative sign which indicates a negative relationship within this period of conflict. This shows that increase in food export within this period has a negative effect on the GDP per capita. This is not surprising given the heavy costs incurred to export foods using a more expensive supply chain logistics, which may lead to export costs overshooting the revenue.

Furthermore, in concluding the results that the two independent variables (bank liquid reserve and food export) are both statistically significant within the conflict period in influencing the movement in the dependent variable (GDP per capita), the lower 95% and upper 95% confidence intervals provide additional insight to conclude the significant results. A look at Table 1 shows that the confidence intervals are between 68 and 176 for the lower 95% confidence level, and between -216 and -46 for the upper 95%. Given that none of these intervals contain zero, the result of statistical significance is further confirmed at both lower 95% and upper 95% confidence intervals.

Discussion. The negative regression coefficient for food export may not be perceived as a surprise. This can be explained by supply chain disruptions which emerged at the advent of the invasion of Ukraine which blocked logistics routes for exporting agricultural produce. The exports that passed through were made at higher costs given the alternative diversion routes that takes longer time and hence more financially expensive. In addition, prices plummeted given the pile-up of produce waiting for exports. The logistics setbacks also made the revenues from sales to fall below the production costs of producers. Overall, the quantity of food export and the attendant revenue declined due to limited supply chain routes (Countryman et al, 2025; Martyshev et al., 2023). The findings of this paper corroborate the previous research findings, which showed that liquidity creation has a relationship with economic growth (Almeshari et al., 20233).

The findings of this paper signals urgent need for various support which would enable the country to benefit from food export during the time of conflict. Such support would include increases in facilitating export supply chain route from neighbouring EU countries to increase the volume of exports which may thus improve revenue to producers and a boost to the country's GPD. The findings on the positive link between bank reserve and growth requires that adequate support – national and international should be accorded to the banks to assist them in retaining enough reserve to boost economic sustainability during the time of conflict.

Table 1. Summary Output of Regression Result: Dependent Variable is GDP Per Capita

Regression Statistics						
Multiple R	0.884089					
R Square(R^2)	0.781613					
Adjusted R^2	0.737936					
Standard Error	544.3146					
Observations	13					
ANOVA						
	df	*SS*	*MS*	*F*	*Significance F*	
Regression	2	10603913	5301956	17.89519	0.00049674	
Residual	10	2962783	296278.3			
Total	12	13566696				
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	6580.48	1145.523	5.744521	0.000187	4028.096437	9132.864
Bank L. reserve	122.3883	24.21004	5.05527	0.000495	68.44493675	176.3316
Food export	-131.289	38.06306	-3.44924	0.006234	-216.0983019	-46.4787

Conclusions. This paper joins contemporary research discussions tailored to banking and finance imperatives during war and specifically tailored to the role of bank liquid reserve in maintaining the economy of Ukraine during the war. The literature contains related empirical research but have rarely had direct examination of a joint effect of bank liquid reserve and food export on the economy of Ukraine. Hence the core objective of this paper from the onset was to examine the impact of bank liquid reserve and food export on economic development during conflict. The paper thus adds an important novelty to existing array of related discourse by fostering a new slant that amalgamates the impact of banking sector and agricultural sector vis-à-vis food export on the economy.

Although these two sectors belong to two different genres of the economy, but they are synergistic and cooperative and should offer a joint booster to every economy under normal circumstances. However, this paper has demonstrated how the two macroeconomic variables may divert during war. With data on Ukraine' food export, bank liquid reserve and economic development, the regression results indicate that both variables are highly significant on their effect on economic development with P-values way below one percent alpha value.

However, their direction of impact differs; whilst bank liquid reserve provides a positive effect on economy development during war, food export assumes the contrary, not because of lack of food production but chiefly because of obstructed export logistics, reduced export and high cost of export. Accordingly, the economy of Ukraine would retain resiliency with a sustained bank liquid reserve. The banks can assist the economy by utilizing various avenues for attracting, improving and retaining liquid reserve. Food export could support the economy of the nation with assistance from neighbours, the EU and international community in smoothing its food export logistics to enable more export of food through normal channels without incurring additional costs of diversion logistics, which erodes food export revenues to producers and the economy.

References

1. Acharya, V. V., & Rajan, R. (2024). Liquidity, liquidity everywhere, not a drop to use: Why flooding banks with central bank reserves may not expand liquidity. *The Journal of Finance*, 79(5), 2943-2991.
2. Agénor, P. R., Aizenman, J., & Hoffmaister, A. W. (2004). The credit crunch in East Asia: what can bank excess liquid assets tell us?. *Journal of International Money and Finance*, 23(1), 27-49.
3. Almeshari, A., Bin Dato Haji Yahya, M. H., Bin Kamarudin, F., & Abd Hamid, S. A. (2023). Liquidity creation and economic growth: are they monotonically related? Evidence from MENA countries. *Economies*, 11(1), DOI: https://doi.org/10.3390/economies11010024
4. Atlantic Council. (2024). *Ukraine's grain exports are crucial to Africa's food security. Atlantic.* Retrieved from: https://www.atlanticcouncil.org/blogs/econographics/ukraines-grain-exports-are-crucial-to-africas-food-security/#:~:text=Ukrainian%20grain%20exports%2C%20especially%20wheat,came%20from%20Ukraine%20and%20Russia.
5. Beck, T., Levine, R., & Loayza, N. (2000). Finance and the Sources of Growth. *Journal of financial economics*, 58(1-2), 261-300.
6. Berger, A. N., & Bouwman, C. H. (2009). Bank liquidity creation. *The review of financial studies*, 22(9), 3779-3837.
7. Bibow, J. (2013). Keynes on monetary policy, finance and uncertainty: Liquidity preference theory and the global financial crisis. *Routledge*.
8. Boloș, M. I., Rusu, Ș., Leordeanu, M., Sabău-Popa, C. D., Perțicaș, D. C., & Crișan, M. I. (2025). K-Means Clustering for Portfolio Optimization: Symmetry in Risk–Return Tradeoff, Liquidity, Profitability, and Solvency. *Symmetry*, *17*(6), 847.
9. Center for Economic Strategy (CES). (2022, September 21). *The banking sector during the war*. CES. Retrieved from: https://ces.org.ua/en/the-banking-sector-during-the-war
10. Countryman, A. M., Litvinov, V., Kolodiazhnyi, I., Bogonos, M., & Nivievskyi, O. (2025). Global economic effects of war-induced agricultural export declines from Ukraine. *Applied Economic Perspectives and Policy*, *47*(2), 624-665.
11. CSIS. (2025). Russia, Ukraine, and global food security: A two-year assessment. *Center for Strategic & International Studies*. Retrieved from: https://www.csis.org/analysis/russia-ukraine-and-global-food-security-two-year-assessment?utm_source=chatgpt.com
12. Demirgüç-Kunt, A., & Detragiache, E. (1998). The determinants of banking crises in developing and developed countries. *IMF Staff Papers*, *45*(1), 81–109. DOI: https://doi.org/10.2307/3867330
13. Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of political economy*, *91*(3), 401-419.
14. Gbadebo, A. D. (2024). Theories of Financial Intermediation: Evaluation And Empirical Relevance. *Journal of Law and Sustainable Development*, *12*(9), e3950-e3950.
15. Gambacorta, L., & Marques-Ibanez, D. (2011). The bank lending channel: lessons from the crisis. *Economic policy*, 26(66), 135-182.
16. International Monetary Fund (IMF). (2020, April). Lebanon: Financial system stability assessment. IMF Country Report No. 20/41. *International Monetary Fund*. Retrieved from: https://www.imf.org/en/Publications/CR/Issues/2020/04/09/Lebanon-Financial-System-Stability-Assessment-49343
17. King, R. G., & Levine, R. (1993). Financial intermediation and economic development. *Capital markets and financial intermediation*, 156189, 156-189.
18. Kyiv independent (2025) Why are Ukrainian banks so profitable during war? Retrieved from: https://kyivindependent.com/why-are-ukrainian-banks-so-profitable-during-war/
19. Martyshev, P., Nivievskyi, O., & Bogonos, M. (2023). Regional war, global consequences: Mounting damages to Ukraine's agriculture and growing challenges for global food security. DOI: https://doi.org/10.2499/9780896294394_23
20. Mora, N. (2014). Reason for reserve? Reserve requirements and credit. *Journal of Money, Credit and Banking*, *46*(2-3), 469-501.
21. National Bank of Ukraine (NBU). (2024, December 20). Banks maintain operational resilience and provide more resources to the economy to overcome the consequences of war: Financial stability report. *National Bank of Ukraine*. Retrieved from: https://bank.gov.ua/en/news/all/banki-zberigayut-operatsiynu-stiykist-ta-nadayut-dedali-bilshe-resursiv-ekonomitsi-dlya-podolannya-naslidkiv-viyni--zvit-pro-finansovu-stabilnist
22. Redcliffe Partners. (2022, April 19). Ukrainian banking and finance system during the war. *Redcliffe Partners* Retrieved from: https://redcliffe-partners.com/ukrainian-banking-and-finance-system-during-the-war
23. Saxegaard, M. (2006). Excess liquidity and effectiveness of monetary policy: Evidence from SubSaharan Africa. *Working paper 06/115. Washington: International Monetary Fund*. Retrieved from: https://ssrn.com/abstract=910680
24. SIPRI. (2023). War in the breadbasket: One year in. *Stockholm International Peace Research Institute (SIPRI)*. Retrieved from: https://www.sipri.org/commentary/blog/2023/war-breadbasket-one-year?utm_source=chatgpt.com
25. Swamy, V., & Narayanamurthy, V. (2025). Are private banks more sensitive to changes in reserve requirements? Evidence from an emerging market. *Journal of Economics, Finance and Administrative Science*, *30*(59), 79-115.
26. Thamae, M. (2014). Excess liquidity in the financial sector of Lesotho: main drivers and policy options. *University of the Witwatersrand, Johannesburg (South Africa)*. Retrieved from: https://wiredspace.wits.ac.za/server/api/core/bitstreams/0de18db1-6468-4d3e-8504-4c46839500a8/content
27. Transnational Institute. (2022). *Ukrainian agriculture in wartime*. Retrieved from: https://www.tni.org/en/article/ukrainian-agriculture-in-wartime?utm_source=chatgpt.com
28. Ukrainian Agrarian Confederation (UAC). (2024). *Grain exports close to pre-war levels*. Retrieved from S&P Global Commodity Insights. Retrieved from: https://www.spglobal.com/commodity-insights/en/news-research/latest-news/agriculture/082324-interview-ukrainian-grain-exports-to-hit-pre-war-levels-in-couple-of-years-uac?utm_source=chatgpt.com

29. VoxUkraine. (2022, October 12). The banking sector during the war: Is stability enough? *VoxUkraine*. Retrieved from: https://voxukraine.org/en/the-banking-sector-during-the-war-is-stability-enough
30. Wikipedia. (2025a, August). *Ukraine—Agriculture*. Retrieved from: https://en.wikipedia.org/wiki/Ukraine?utm_source=chatgpt.com
31. Wikipedia. (2025b). *Black Sea Grain Initiative*. Retrieved from. Retrieved from: https://en.wikipedia.org/wiki/Black_Sea_Grain_Initiative?utm_source=chatgpt.com
32. World Bank. (2017). *The toll of war:* The economic and social consequences of the conflict in Syria. Retrieved from: https://www.worldbank.org/en/country/syria/publication/the-toll-of-war

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Коллінс С. Нгвакве
Доктор філософії з бухгалтерського обліку
Професор Вищої школи лідерства
Факультет менеджменту та права
Університет Лімпопо
Університетська дорога, Совенга, Полокване, ПАР
e-mail: collins.ngwakwe@ul.ac.za
ORCID ID: 0000-0002-6954-8897

Вплив ліквідних резервів банків та експорту харчових продуктів на економічний розвиток під час конфлікту

Анотація. Ліквідні резерви банків та виробництво харчових продуктів забезпечують життєво важливу підтримку для ефективної та продуктивної економічної діяльності. Мета цієї статті полягає в аналізі впливу ліквідних резервів банків та експорту харчових продуктів на економічний розвиток під час конфлікту, використовуючи дані України як приклад.

Постановка проблеми. Позиція ліквідності банків спричиняє компроміс між ефективністю кредитного ризику банків та прибутковістю банків. Таким чином, існує делікатний балансувальний акт між утриманням високої ліквідності за рахунок кредитування, стимулювання інвестицій та економічного зростання, прибутковості та виникнення кредитного ризику.

Мета статті. Мета цієї статті — оцінити, як комбінований вплив ліквідності банків та експорту харчових продуктів впливає на економічне зростання, ступінь зростання та напрямок зростання.

Нерозв'язані аспекти проблеми. Існує дефіцит літератури щодо спільного впливу ліквідності банків та експорту харчових продуктів на економічне зростання країни в стані конфлікту — особливо в контексті сучасного випадку України.

Основний матеріал. У статті застосовано кількісний підхід за допомогою моделі множинної регресії для дослідження взаємозв'язків. Вторинні дані щодо ліквідних резервів банків, експорту харчових продуктів та ВВП України зібрано з архівів даних економічних показників Світових індикаторів розвитку.

Висновки. Результати аналізу свідчать, що ліквідні резерви банків та експорт харчових продуктів мають значний вплив на економічні показники України під час війни. Загальна F-статистика є значущою при P=0,000496. Крім того, ліквідні резерви банків є значущими при P=0,000495 з позитивним коефіцієнтом регресії 122,3883. Додатково, експорт харчових продуктів є значущим при p=0,006234 з негативним коефіцієнтом регресії -131,289. Коефіцієнт кореляції моделі є високим — 0,884089, що свідчить про тісний зв'язок. Крім того, коефіцієнт детермінації (R^2) є високим — 0,781613, а скоригований R^2 — 0,737936, що вказує на добру пристосованість моделі. Позитивний коефіцієнт для ліквідних резервів банків свідчить про те, що ліквідні резерви банків мають позитивний і значущий вплив на економіку України під час війни, що означає, що здатність банків залучати більше ліквідних резервів надає значну допомогу для економічної стійкості України в часи конфлікту. Хоча експорт харчових продуктів є значущим, він має негативний коефіцієнт, що походить від перешкод у логістиці експорту під час конфлікту, оскільки альтернативні маршрути експорту коштують дорожче. Результати доповнюють літературу, вказуючи на те, що здоровий банківський сектор з достатніми ліквідними резервами є життєво важливим для підтримки економічної життєздатності та стійкості під час конфлікту.

Ключові слова: *ліквідність банків, резерви банків, експорт харчових продуктів, економічне зростання, кредитний ризик, інвестиції*

Класифікація JEL: G21; G28; O1; Q17

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Список літератури

1. Acharya, V. V., & Rajan, R. Liquidity, liquidity everywhere, not a drop to use: Why flooding banks with central bank reserves may not expand liquidity. The Journal of Finance, 2024, 79(5), 2943–2991.
2. Agénor, P. R., Aizenman, J., & Hoffmaister, A. W. The credit crunch in East Asia: what can bank excess liquid assets tell us? Journal of International Money and Finance, 2004, 23(1), 27–49.
3. Almeshari, A., Bin Dato Haji Yahya, M. H., Bin Kamarudin, F., & Abd Hamid, S. A. Liquidity creation and economic growth: are they monotonically related? Evidence from MENA countries. Economies, 2023, 11(1). DOI: https://doi.org/10.3390/economies11010024
4. Atlantic Council. Ukraine's grain exports are crucial to Africa's food security. 2024. URL: https://www.atlanticcouncil.org/blogs/econographics/ukraines-grain-exports-are-crucial-to-africas-food-security

5. Beck, T., Levine, R., & Loayza, N. Finance and the Sources of Growth. Journal of Financial Economics, 2000, 58(1–2), 261–300.
6. Berger, A. N., & Bouwman, C. H. Bank liquidity creation. The Review of Financial Studies, 2009, 22(9), 3779–3837.
7. Bibow, J. Keynes on monetary policy, finance and uncertainty: Liquidity preference theory and the global financial crisis. Routledge, 2013.
8. Boloș, M. I. та ін. K-Means Clustering for Portfolio Optimization: Symmetry in Risk–Return Tradeoff, Liquidity, Profitability, and Solvency. Symmetry, 2025, 17(6), 847.
9. Center for Economic Strategy (CES). The banking sector during the war. 21 вересня 2022. URL: https://ces.org.ua/en/the-banking-sector-during-the-war
10. Countryman, A. M. та ін. Global economic effects of war-induced agricultural export declines from Ukraine. Applied Economic Perspectives and Policy, 2025, 47(2), 624–665.
11. Center for Strategic & International Studies (CSIS). Russia, Ukraine, and global food security: A two-year assessment. 2025. URL: https://www.csis.org/analysis/russia-ukraine-and-global-food-security-two-year-assessment
12. Demirgüç-Kunt, A., & Detragiache, E. The determinants of banking crises in developing and developed countries. IMF Staff Papers, 1998, 45(1), 81–109. DOI: https://doi.org/10.2307/3867330
13. Diamond, D. W., & Dybvig, P. H. Bank runs, deposit insurance, and liquidity. Journal of Political Economy, 1983, 91(3), 401–419.
14. Gbadebo, A. D. Theories of Financial Intermediation: Evaluation and Empirical Relevance. Journal of Law and Sustainable Development, 2024, 12(9), e3950.
15. Gambacorta, L., & Marques-Ibanez, D. The bank lending channel: lessons from the crisis. Economic Policy, 2011, 26(66), 135–182.
16. International Monetary Fund (IMF). Lebanon: Financial system stability assessment. IMF Country Report No. 20/41, April 2020. URL: https://www.imf.org/en/Publications/CR/Issues/2020/04/09/Lebanon-Financial-System-Stability-Assessment-49343
17. King, R. G., & Levine, R. Financial intermediation and economic development. In: Capital markets and financial intermediation. Cambridge University Press, 1993, pp. 156–189.
18. Kyiv Independent. Why are Ukrainian banks so profitable during war? 2025. URL: https://kyivindependent.com/why-are-ukrainian-banks-so-profitable-during-war/
19. Martyshev, P., Nivievskyi, O., & Bogonos, M. Regional war, global consequences: Mounting damages to Ukraine's agriculture and growing challenges for global food security. 2023. DOI: https://doi.org/10.2499/9780896294394_23
20. Mora, N. Reason for reserve? Reserve requirements and credit. Journal of Money, Credit and Banking, 2014, 46(2–3), 469–501.
21. National Bank of Ukraine (NBU). Banks maintain operational resilience and provide more resources to the economy to overcome the consequences of war: Financial stability report. 20 грудня 2024. URL: https://bank.gov.ua/en/news/all/banki-zberigayut-operatsiynu-stiykist-ta-nadayut-dedali-bilshe-resursiv-ekonomitsi-dlya-podolannya-naslidkiv-viyni--zvit-pro-finansovu-stabilnist
22. Redcliffe Partners. Ukrainian banking and finance system during the war. 19 квітня 2022. URL: https://redcliffe-partners.com/ukrainian-banking-and-finance-system-during-the-war
23. Saxegaard, M. Excess liquidity and effectiveness of monetary policy: Evidence from Sub-Saharan Africa. IMF Working Paper 06/115. Washington: International Monetary Fund, 2006. URL: https://ssrn.com/abstract=910680
24. SIPRI. War in the breadbasket: One year in. Stockholm International Peace Research Institute, 2023. URL: https://www.sipri.org/commentary/blog/2023/war-breadbasket-one-year
25. Swamy, V., & Narayanamurthy, V. Are private banks more sensitive to changes in reserve requirements? Evidence from an emerging market. Journal of Economics, Finance and Administrative Science, 2025, 30(59), 79–115.
26. Thamae, M. Excess liquidity in the financial sector of Lesotho: main drivers and policy options. University of the Witwatersrand, Johannesburg (South Africa), 2014. URL: https://wiredspace.wits.ac.za/server/api/core/bitstreams/0de18db1-6468-4d3e-8504-4c46839500a8/content
27. Transnational Institute (TNI). Ukrainian agriculture in wartime. 2022. URL: https://www.tni.org/en/article/ukrainian-agriculture-in-wartime
28. Ukrainian Agrarian Confederation (UAC). Grain exports close to pre-war levels. S&P Global Commodity Insights, 2024. URL: https://www.spglobal.com/commodity-insights/en/news-research/latest-news/agriculture/082324-interview-ukrainian-grain-exports-to-hit-pre-war-levels-in-couple-of-years-uac
29. VoxUkraine. The banking sector during the war: Is stability enough? 12 жовтня 2022. URL: https://voxukraine.org/en/the-banking-sector-during-the-war-is-stability-enough
30. Wikipedia. Ukraine — Agriculture. August 2025. URL: https://en.wikipedia.org/wiki/Ukraine
31. Wikipedia. Black Sea Grain Initiative. 2025. URL: https://en.wikipedia.org/wiki/Black_Sea_Grain_Initiative
32. World Bank. The toll of war: The economic and social consequences of the conflict in Syria. 2017. URL: https://www.worldbank.org/en/country/syria/publication/the-toll-of-war

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Serhiienko Olena
Doctor of Economic Sciences, Professor
National Technical University
"Kharkiv Polytechnic Institute",
2, Kyrpychova str., Kharkiv, 61002, Ukraine
e-mail: serhelenka@gmail.com
ORCID ID: 0000-0002-9796-9218
Tonieva Krystyna
PhD in Economics, Associate Professor,
V. N. Karazin Kharkiv National University
4 Svobody Sq., Kharkiv, 61022
e-mail: krystynaTonieva@gmail.com
ORCID ID: 0009-0006-1848-8130
Samus Pavlo
PhD student,
National Technical University
"Kharkiv Polytechnic Institute",
2, Kyrpychova str., Kharkiv, 61002, Ukraine
e-mail: pavlo.samus@emmb.khpi.edu.ua
ORCID ID: 0000-0002-8563-2650

Spatio-dynamic assessment of key performance indicators (KPIs) for strategic startup valuation

Abstract. The modern entrepreneurial landscape is characterised by high dynamics and significant market uncertainty. The object of the study is the spatial-dynamic assessment of key performance indicators (KPIs) based on integral metrics. These indicators are crucial for an objective assessment of the viability and investment attractiveness of early-stage start-ups, requiring a shift from retrospective financial analysis to metrics focused on forecasting, primarily customer lifetime value.

Problem statement. Traditional methods of corporate financial valuation, in particular discounted cash flow models, are of little use to startups due to a lack of historical financial data, high growth rates, and significant operating losses during the expansion phase. There is an urgent need to develop a unified but contextually adapted system of metrics that would allow founders and investors to objectively assess internal efficiency and make comparisons with relevant market benchmarks.

Unresolved aspects of the problem. Scientific literature demonstrates a high degree of variability in approaches to startup valuation, resulting in significant subjectivity and a wide range of estimated values. There are significant methodological gaps in the use of integral indicators, in particular the ratio of LTV to CAC (customer acquisition cost), which is often incorrectly calculated or interpreted outside the context of industry benchmarks and business development stages, which can lead to wrong investment decisions.

Purpose of the article. The main purpose of the study is to systematise key performance indicators for start-ups by functional blocks. The key task is to scientifically substantiate the decisive role of the LTV/CAC integrated indicator for assessing viability, as well as to develop methodological recommendations for the application of spatial-dynamic benchmarking to improve the objectivity of strategic planning and evaluation of startups.

Presentation of the main material. The study is based on the application of general scientific methods of systematisation, structural-logical modelling, comparative and systematic analysis. A comprehensive KPI taxonomy covering marketing, sales, and financial metrics is presented. The central element of the analysis is the LTV/CAC ratio, its critical threshold values, and its spatial-dynamic interpretation using the example of a case study of three start-ups with different business models.

Conclusions. The developed systematisation provides a structured basis for monitoring key startup parameters, confirming that the LTV/CAC ratio is the quintessence of business model quality assessment. The practical significance lies in providing founders and investors with a validated toolkit for informed spatial-dynamic benchmarking, which contributes to a more efficient allocation of venture capital.

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Keywords: *startups, benchmarking, key performance indicators, KPIs, strategic assessment, conversion.*

Formulas: 2; fig.: 4, tabl.: 4.

JEL Classification G32, M15

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Introduction. The relevance of this study is determined by significant structural changes in the global economy, where innovative start-ups are key drivers of development and value creation. The global economy is characterised by high dynamics and the need for quick decision-making, which requires entrepreneurs and investors to have clear, objective and predictive assessment tools. Unlike mature corporations, startups in their early stages tend to record operating losses while investing in growth and market development, which makes traditional financial statement analysis (e.g., discounted cash flow models) uninformative.

The problem under investigation is the need to assess future profitability potential based not on retrospective indicators, but on integrated metrics that reflect the fundamental viability of the business model. In this context, the focus shifts to traction metrics, which measure the effectiveness of customer acquisition and retention, in particular the ratio of Lifetime Value (LTV) to Customer Acquisition Cost (CAC), which is a key indicator of effectiveness at the individual customer level.

Thus, there is an urgent need to systematise and scientifically substantiate a set of key performance indicators (KPIs) that would allow for a comprehensive assessment of a start-up, taking into account its spatial and dynamic state. The spatial dimension refers to comparing a startup with cohorts (industry and stage benchmarks), while the dynamic dimension refers to analysing the trajectory of indicators over time. The development of such a KPI taxonomy, focused on different functional business blocks and adapted to innovative business models (SaaS, marketplaces), is critical for minimising investment risks and ensuring sustainable, profitable scaling.

Literature review. Modern methods of strategic assessment of start-ups require not only static analysis, but also consideration of the spatial and dynamic aspects of business model functioning. This approach allows us to study the evolution of KPIs over time and compare their effectiveness in the context of industry and geographical benchmarks [9].

The concept of unit-level assessment is an approach that allows the financial results of a company to be broken down to the level of a single unit of sale, most often an individual customer or transaction [1, 4]. This concept, which involves analysing the profitability of individual transactions and using integrated performance metrics, is known as unit economics. Its implementation is particularly relevant for innovative businesses, as it allows for the analysis of the cost and profitability of individual components of a product or service. This allows founders to determine the true effectiveness of invested resources and make informed decisions about pricing and scaling strategies. The lack of research and understanding of this concept of operational efficiency in the startup sector often leads to strategic failures, as companies may invest in growth that is fundamentally unprofitable [2].

That is why the key focus of research is on integrated performance indicators that have predictive power, as opposed to retrospective financial reporting. These metrics, which form the basis of unit economics, reflect the balance between customer acquisition costs and lifetime value, which is critical for determining the scalability and investment attractiveness of a start-up [3].

A key integrated performance indicator that is vital for evaluating startups is the LTV to CAC ratio. Customer acquisition cost (CAC) is the total amount of marketing and sales expenses required to acquire a single new customer. Customer lifetime value (LTV) is the projected total revenue that a customer will bring to a company over the entire period of interaction.

The LTV/CAC ratio is a key indicator for venture capitalists, as it allows them to assess the long-term financial viability of loss-making start-ups. A high LTV/CAC ratio signals successful fundraising, but the metric has significant methodological pitfalls that can lead to misguided strategic decisions. Key risks include incorrect CAC calculation (ignoring operating costs) and inconsistency in time cohorts for LTV and CAC. To mitigate these risks, it is essential to use additional metrics such as CAC Payback Period, which affects Burn Rate and financial stability. Ultimately, the most reliable approach to valuation requires a combination of quantitative analysis (integral LTV/CAC metrics) and qualitative analysis (founder characteristics and intellectual property) [6].

Modern scientific developments (especially in the period 2020–2025) actively integrate systematised KPIs into predictive models. For example, in the field of innovative financing, complex machine learning algorithms (Random Forest, XGBoost) are used to predict the success of start-ups (attracting financing, IPO). In this context, clearly defined and structured KPIs (LTV, CAC, MRR, Churn Rate) become not just operational indicators, but mandatory features for training these predictive models. Thus, the development of an accurate and unified KPI taxonomy is a necessary theoretical prerequisite for objectifying the data-driven investment analysis process [5].

Purpose, objectives and research methods. The main purpose of the study is to systematise key performance indicators for start-ups by functional blocks, scientifically substantiate the decisive role of the LTV/CAC ratio as an integral indicator of viability, and develop methodological recommendations for the use of comparative analysis (benchmarking) to improve the objectivity of strategic planning and assessment.

To achieve this goal, the following tasks were set:

1. Development of a model for spatial-dynamic KPI assessment for strategic evaluation of startups and determination of a set of interrelated stages for its implementation.

2. Justification and implementation of a comprehensive spatial-dynamic KPI assessment using integrated taxonomic analysis and presentation of graphs of fixed model effects, indicator elasticity, and a phase portrait of the overall integrated indicator.

3. Formulation of methodological recommendations on the application of industry benchmarking to improve the objectivity of strategic planning and assessment of start-ups.

Research results. The paper proposes a model for comprehensive spatial-dynamic assessment and research of key performance indicators (KPIs) for start-ups, the implementation algorithm of which is presented in Fig. 1.

The model consists of a set of interrelated stages [10]. Let us consider their content and objectives.

Stage 1. Formation of the information and analytical space of the study. This stage includes searching, collecting, and processing data on the main areas of KPI research for startups. The goal of this stage is to form a representative statistical database for evaluation.

The possibility of calculating KPI for startups using publicly available information on their performance was also taken into account [7].

Stage 2. Comprehensive spatial-dynamic assessment of startup KPIs. The study is based on the calculation of integral rating indicators for local components of startup KPIs and the assessment of the overall level of startup KPIs [5]. The algorithm for implementing the integral taxonomic assessment method consists of the following steps.

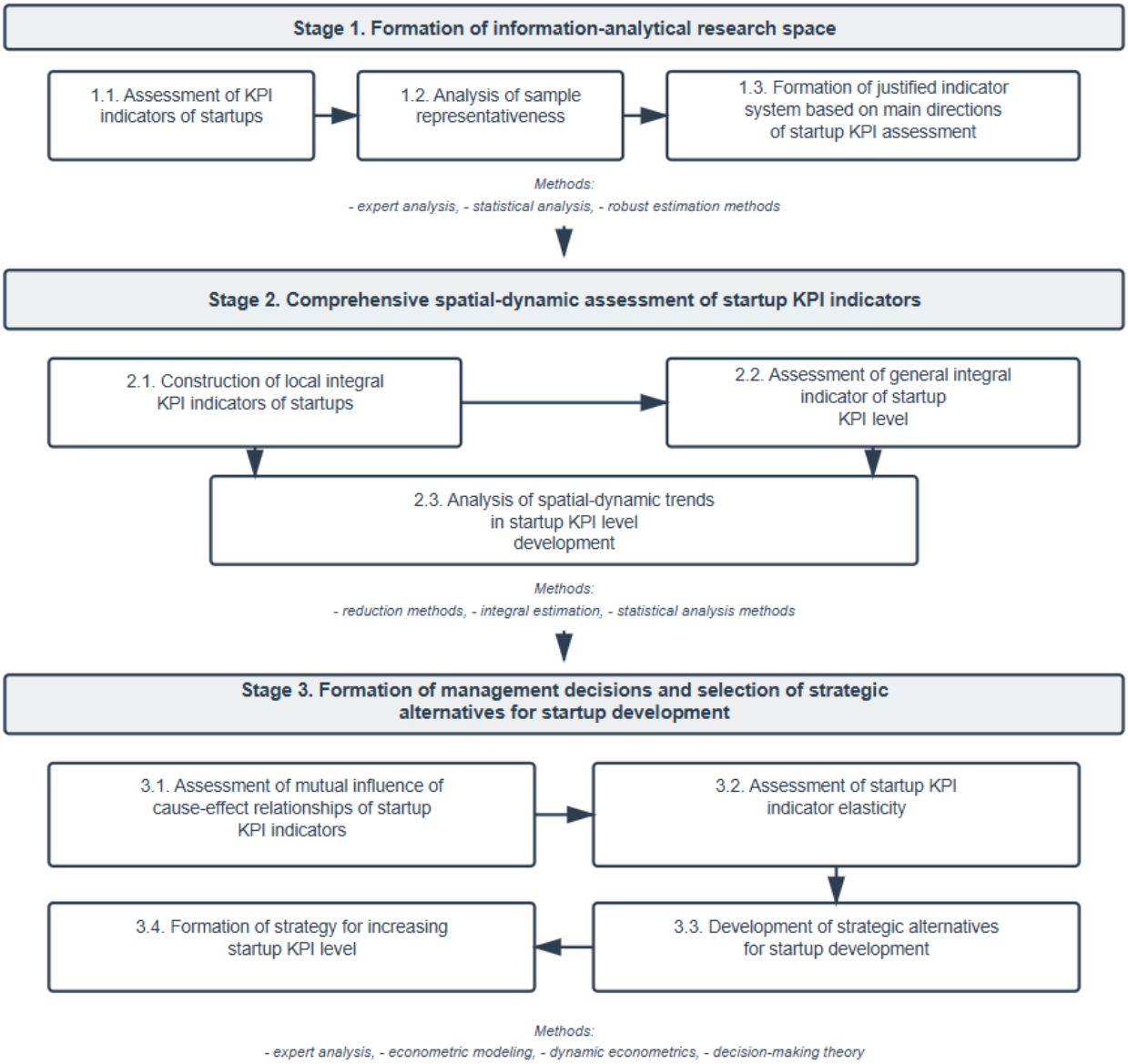

Fig. 1. Model of spatial-dynamic assessment of key performance indicators (KPIs) for strategic evaluation of start-ups
Source: developed by the author.

Step 1. Formation of the initial data matrix.

Step 2. Standardisation of initial data. Since the KPI indicators of startups are heterogeneous, the second step involves standardising their values using the formula:

$$z_{ij} = \frac{x_{ij} - \underline{x}_j}{s_j}, \quad (1)$$

where j = 1, 2, ..., m;

$\bar{x}_j$ – arithmetic mean of the j-th indicator;

s_j – standard deviation of the j-th indicator;

z_{ij} – standardised value of the j-th indicator for the i-th start-up.

Step 3. Differentiate the matrix characteristics into stimulants and deterrents. The basis for dividing the characteristics into two groups is the nature of the impact of each of the startup KPIs on their strategic assessment.

Step 4. Construction of a reference point.

Step 5. Determination of the Euclidean distance between objects (startups) and the reference point.

Step 6. Calculation of the taxonomic indicator. The integral taxonomic indicator of startup KPIs is calculated using the formula [5]:

$$I_i = 1 - \frac{C_{i0}}{C_0}, \quad (2)$$

де $C_0 = \underline{C_0} + 3 \times S_0$;

$$\underline{C_0} = \frac{1}{w}\sum_{i=1}^{w} C_{i0};$$

$$S_0 = \sqrt{\frac{1}{w}\sum_{i=1}^{w} \left(C_{i0} - \underline{C_0}\right)^2}.$$

The presented local assessment indicators are calculated based on the corresponding indicators for all selected areas of KPI research for start-ups. The model for summarising the information space of indicators and assessing the overall KPI level of a start-up is as follows:

$$\mathrm{I}_1 = f(X_{11}, X_{12}, X_{13}, X_{14}, X_{15}, X_{16}, X_{17,} X_{18}, X_{19}, X_{110}, X_{111}),$$
$$I_2 = f(X_{21}, X_{22}, X_{23}, X_{24}, X_{25}, X_{26}),$$
$$I_3 = f(X_{31}, X_{32}, X_{33}, X_{34}, X_{35}, X_{36}),$$
$$I_4 = f(X_{41}, X_{42}, X_{43}, X_{44}, X_{45}),$$
$$I = f(\{I_1\}, \{I_2\}, \{I_3\}, \{I_4\},$$

where Xi – are the indicators of the first level of the startup's KPI indicator system;

I_i – s the local integral indicator of the startup's KPI level;

I – is the comprehensive indicator of the overall KPI level of the startup.

The spatial-dynamic KPI assessment model is implemented through the sequential formation of a representative information base and comprehensive assessment. Based on this data, an integral taxonomic assessment method is applied, which, using standardisation and calculation of the Euclidean distance to the benchmark, allows the multidimensional KPI space to be reduced to a single comprehensive indicator (I). Thus, the model provides a quantitative basis for the strategic assessment of start-ups [9]. The created KPI taxonomy is the information basis for spatial measurement of evaluation, and the integral indicator I is used as a dependent variable for further dynamic analysis using econometric panel data models [8].

Let us consider a systematised taxonomy of key performance indicators (KPIs) covering the main functional blocks of a startup: marketing, sales, finance, and specialised models. The systematisation of metrics is a prerequisite for the formation of a single information space between founders and investors [6].

Group 1: Marketing KPIs

Marketing metrics reflect the effectiveness of spending on attracting potential customers (leads) and the quality of traffic. They are the first quantitative indicator of the effectiveness of a startup's strategy.

Table 1. Key metrics for evaluating startup marketing KPIs (I_1)

Metric	Description	Data source
Number of leads (X_{11})	Total number of potential customers who left their contact details for further interaction	CRM system, website forms, Google Analytics
Cost per lead (CPL) (X_{12})	he average cost of acquiring one potential customer through marketing channels	Advertising accounts, CRM/analytics systems
Cost per action (CPA) (X_{13})	Shows how much it costs for a user to perform one target action (registration, purchase, etc.)	Google Ads, Facebook Ads
Conversion rate (CR) (X_{14})	The percentage of users who performed a target action among all visitors	Google Analytics, CRM
Click-through rate (CTR) (X_{15})	The percentage of users who clicked on an ad after viewing it	Advertising accounts, email distribution services
Audience growth rate (X_{16})	Reflects the rate of increase in the number of subscribers in a community or on a platform	Facebook Insights, Instagram Insights
Reach (X_{17})	The number of unique users who have seen the brand's or campaign's content	Social media analytics, advertising accounts
Viral Reach (X_{18})	The number of users who have seen the content thanks to sharing by other users	Facebook Insights
Sharing ratio (X_{19})	Reflects audience activity in sharing content (reposts, shares)	Social media analytics
Bounce Rate (X_{110})	The percentage of visitors who left the site after viewing only one page	Google Analytics
Time to Conversion (X_{111})	The average time between the user's first contact and conversion	Google Analytics (conversion reports)

Source: developed by the author.

Group 2: Sales KPIs

Sales metrics reflect the effectiveness of monetisation and conversion of leads into paying customers. These metrics form the basis for calculating total revenue and average customer value.

Table 2. Key metrics for evaluating a startup's sales KPIs (I_2)

Metric	Description	Data source
Revenue (X_{21})	The total amount of money received from the sale of goods or services	Financial statements, CRM
Sales Volume (X_{22})	The number of units of goods or services sold during a specific period	CRM, warehouse system
Average order value (AOV) (X_{23})	The average amount a customer spends per order	CRM, payment system
Average revenue per customer (ARPC) (X_{24})	The average revenue generated from a single customer over a specific period	CRM, financial statements
Lead-to-sale conversion (X_{25})	Percentage of potential customers (leads) who became actual buyers	CRM
Sales cycle length (X_{26})	Average time from first contact with a customer to closing a deal	CRM

Group 3: Key Financial KPIs and Unit Economics

These metrics are crucial for investors, as they determine the long-term sustainability of the business, its financing needs, and overall investment attractiveness.

Table 3. Key metrics for evaluating a startup's financial KPIs (I_3)

Metric	Description	Data source
Profit (X_{31})	Financial result of operations; difference between income and expenses	Profit and loss statement (P&L)
EBITDA (X_{32})	Profit before interest, taxes, depreciation and amortisation; reflects the operational efficiency of the business	Financial statements
Lifetime value of a customer (LTV) (X_{33})	The projected total revenue that a customer will generate over the entire period of cooperation	CRM, payment system
Customer acquisition cost (CAC) (X_{34})	The total cost of marketing and sales efforts to acquire one new customer	Marketing budget, CRM
Monthly recurring revenue (MRR) (X_{35})	Stable income that the company receives monthly from subscriptions or recurring payments	Payment system
Burn Rate (X_{36})	The rate at which the company spends its available financial resources before reaching profitability	Cash flow statement

Source: developed by the author.

Group 4: Specialised Metrics for Marketplaces

Bilateral platforms and marketplaces require specific metrics that reflect market liquidity and transaction monetisation efficiency.

Table 4. Metrics for marketplaces (I_4)

Metric	Description	Data source
Gross Merchandise Volume (GMV) (X_{41})	The total value of all goods or services sold through the platform during a given period	Marketplace analytics
Take Rate (X_{42})	The share of GMV that the marketplace retains as its own commission	Financial reporting
Buyer liquidity (X_{43})	The probability that a buyer will find the desired product and make a purchase	Internal analytics
Seller liquidity (X_{44})	The probability that a seller will sell a listed product or service	Internal analytics
Buyer/seller retention (Retention) (X_{45})	The share of users who continue to use the platform over a certain period	CRM, analytics system

Source: developed by the author.

The systematisation of key performance indicators (KPIs) provides a structured framework for strategic assessment, covering four key functional areas: marketing, sales, finance, and specialised models (marketplaces). This taxonomy integrates metrics from initial customer acquisition (leads) to long-term financial sustainability (LTV, CAC, MRR), which is critical for creating a unified information space between founders and investors [9]. Thus, it creates the necessary multidimensional database for further spatial-dynamic analysis [14].

Panel data modelling tools are used to visualise and quantitatively study the dynamics of the integral performance indicator (I). Based on the developed model, Fig. 2 shows a graph of fixed effect values that reflect the individual, time-invariant characteristics of each startup that affect their KPIs [11].

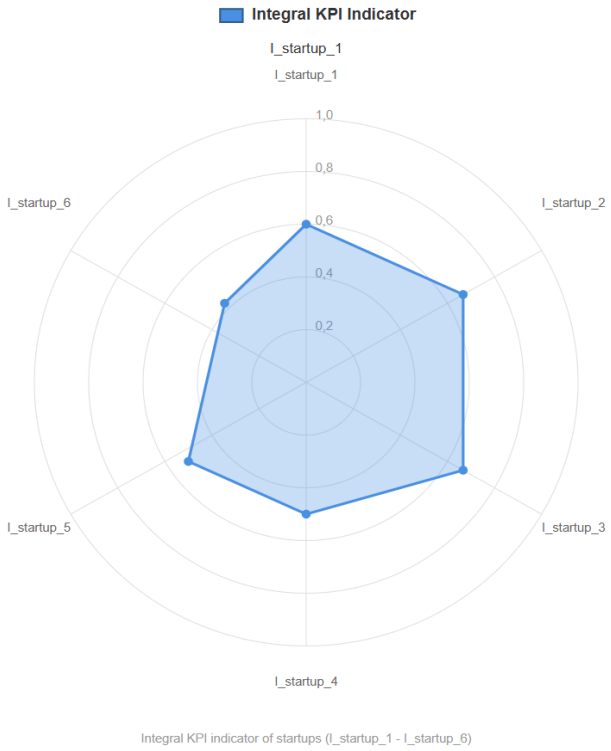

Fig. 2. Graph of fixed effects values of the panel data model for studying startup KPIs
Source: developed by the author.

In addition, to assess the sensitivity of the composite indicator I to changes in its local components, the elasticity of the indicators was calculated [13]. The results of this analysis are visualised in Fig. 3, which shows the average elasticity of KPI indicators for the entire sample of startups.

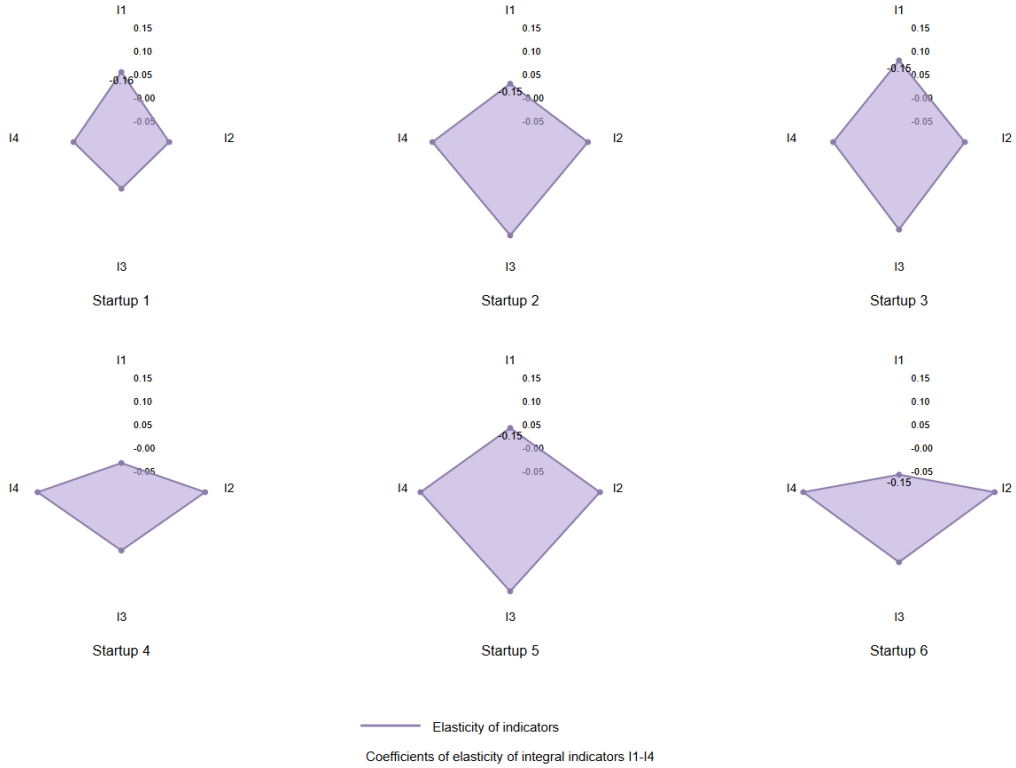

Fig. 3. Elasticity of KPI indicators for six different start-ups
Source: developed by the author.

Fixed effects analysis allows us to identify the unique internal factors of each start-up that improve the quality of the spatial-dynamic assessment. In turn, elasticity indicators point to priority areas where investments (e.g., marketing or sales) will have the greatest impact on the overall integral indicator (I). Thus, these graphs provide decision-makers with a quantitative basis for determining individual strategic priorities [14].

Discussion. The LTV/CAC ratio plays a central role in the evaluation of a start-up, especially in the active growth phase. This integral indicator combines the effectiveness of the product, marketing and financial model. Spatial-dynamic analysis shows that the optimal balance, which confirms customer profitability and triggers profitable scaling, is considered to be a ratio in the range of 3:1 to 5:1. Importantly, spatial (cross-industry) benchmarking allows this indicator to be interpreted correctly: if LTV/CAC exceeds 5:1, this may indicate insufficient investment in marketing, which limits growth potential and risks losing market share to competitors [4].

Spatial-dynamic analysis is a key tool for studying the qualitative state of a startup's dynamics. Constructing phase trajectories of the integral KPI (I) in phase space allows you to visualise changes in the I indicator over time (consecutive values of I and I+1). Phase portraits, as shown in Fig. 4, allow us to identify nonlinear dependencies and the nature of development. The trajectory forms a quasi-cycle (self-intersection or maximum approximation to the starting point), which indicates cyclicality or a return to the previous dynamic state of the startup's KPI.

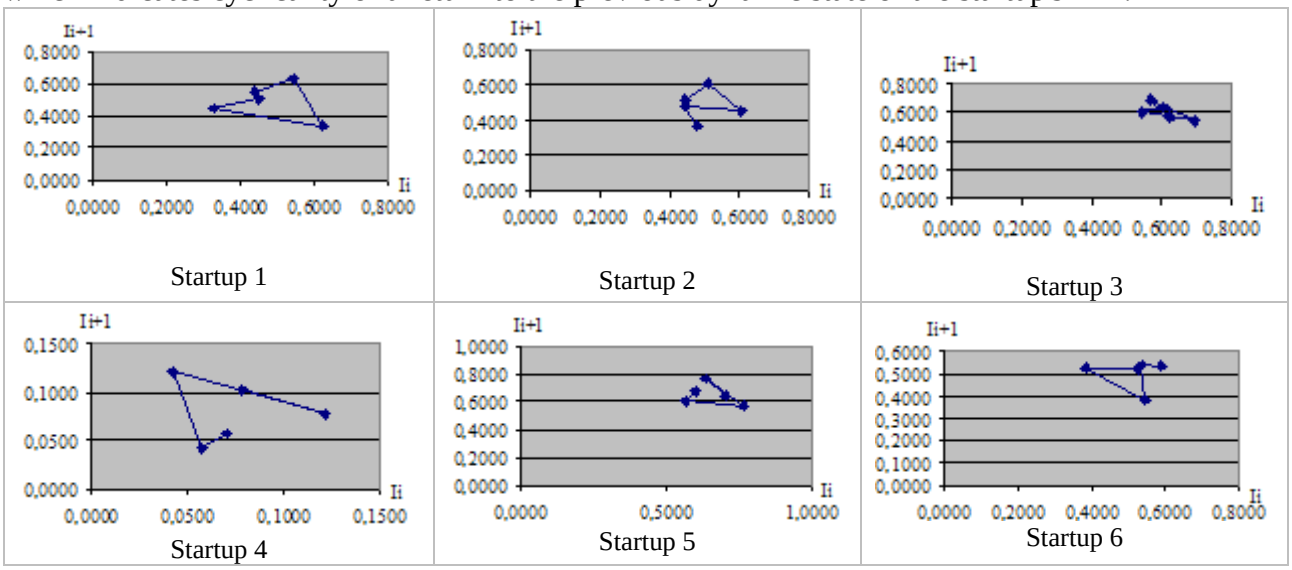

Fig. 4. Phase portrait of the overall KPI indicator for start-ups
Source: developed by the author.

Analysis of the phase portraits of six start-ups demonstrates a variety of dynamic modes: from steady growth (trend towards the upper right corner) to cyclical stagnation, when the indicator fluctuates around a certain value. This visualisation is critical for identifying startups whose trajectories converge to attractors (stable states), indicating to investors the level of risk and potential for long-term financial viability.

To make informed strategic decisions, internal KPI tracking should be supplemented with benchmarking. This allows you to assess the competitiveness of a startup in an industry context. High reliability of comparative assessment requires internal stability of indicators (analysis of cohort data for 3–6 months) and identification of a relevant comparison group, taking into account the industry (FinTech, EdTech), business model (SaaS, marketplace) and stage of development (Seed, Series A) [12].

The proposed toolkit for spatial-dynamic analysis allows decision-makers to conduct a comprehensive assessment of the dynamic state of KPI levels, taking into account its characteristics and development trends. This improves the quality of management decisions regarding the choice

of strategic alternatives for startup development in the face of negative external and internal environmental factors, taking into account all interrelated financial and economic processes.

Conclusions. The scientific novelty of the research lies not so much in the systematisation of KPIs as in the development and implementation of a model of spatial-dynamic KPI assessment for the strategic evaluation of start-ups. This has been achieved thanks to the first-ever comprehensive analytical toolkit, which combines the taxonomy of key metrics, integral taxonomic analysis to obtain a single indicator I, and methods of dynamic nonlinear phase analysis. The model uses dynamic nonlinear phase analysis for qualitative research into the development trajectories of startups, which allows for the identification of cyclicality and the prediction of a return to previous states. It is critically justified that the reliability of the interpretation of the integral KPI indicator is achieved only under the condition of mandatory benchmarking with relevant industry and stage cohorts, which helps to overcome methodological gaps and subjectivity in financial evaluation.

The theoretical significance of the study lies in expanding the methodological basis of entrepreneurial finance, as the systematised key performance indicators embedded in the spatial-dynamic model create a clear, structured framework. These indicators can serve as a universal set of features for predictive modelling of startup success, contributing to further objectification and automation of investment analysis driven by machine learning methods.

The practical significance lies in providing founders, managers, and investors with a validated and structured toolkit for diagnosing operational efficiency and justifying scaling strategies. Critically, the toolkit ensures transparency and objectivity in the process of attracting venture capital, as spatially dynamic benchmarking based on the integral indicator I confirms the competitiveness of a startup compared to relevant cohorts.

The socio-economic effect of implementing scientific results is reflected in the increased overall efficiency of venture capital allocation in the innovation ecosystem, which contributes to the support of more viable and profitable business models and accelerates economic growth based on sustainable innovation.

Further scientific research should focus on developing more detailed and dynamic startup assessment models that integrate quantitative key performance indicators with qualitative factors. Promising areas include the creation of detailed, publicly available industry benchmarks for key performance indicators broken down by geography and funding stage, using large aggregated data sets. Another promising area is the development of adaptive predictive models for startup financing that use systematised key performance indicators in combination with unstructured data analysis, including assessments of team quality, intellectual property, and market dynamics, to improve the accuracy of investment risk assessments.

References

1. Ben Saad, F. (2024). How to measure the success of technology-based start-ups – A Comprehensive overview of the perspectives of academics & practitioners. (2023). *Junior Management Science (JUMS)*, 9(1), 1306–1340. DOI: https://doi.org/10.5282/jums/v9i1pp1306-1340
2. Fackler, D., Hölscher, L., Schnabel, C., & Weyh, A. (2021). Does working at a start-up pay off? *Small Business Economics*, 58(4), 2211–2233. DOI: https://doi.org/10.1007/s11187-021-00508-2
3. Giri, R., & Mukamiya, R. (2024). A study on importance of market research in startup development and its growth. *International Journal of Creative Research Thoughts (IJCRT)*, 12(4), Art. IJCRT2404144.
4. Gómez-Prado, R., Alvarez-Risco, A., Cuya-Velásquez, B. B., Arias-Meza, M., Campos-Dávalos, N., Juarez-Rojas, L., Anderson-Seminario, M. d. l. M., Del-Aguila-Arcentales, S., & Yáñez, J. A. (2022). Product innovation, market intelligence and pricing capability as a competitive advantage in the international performance of startups: Case of Peru. *Sustainability*, 14(17), 10703. DOI: https://doi.org/10.3390/su141710703
5. Kupczyk, T., Dewalska-Opitek, A., Witczak, O., Budziński, M., & Kalita, D. (2024). Business model canvas application in start-up stage business developments – constraints and challenges. *European Research Studies Journal*, XXVII(4), 921–940.
6. Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing*, 80(6), 69–96. DOI: https://doi.org/10.1509/jm.15.0420
7. Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers.* Wiley.

8. Pratama, D. P., & Putra, P. O. H. (2024). Exploring sustainable VR use cases for startup business models: A customized customer development approach. *Sustainability*, 16, 6254. DOI: https://doi.org/10.3390/su16146254
9. Serhiienko, O., Tonieva, K. & Samus, P. (2025). Startup success metrics: comprehensive analysis, contextual adaptation, and application issues. *Ukrainian Journal of Applied Economics and Technology*, 3, 22–26. DOI: https://doi.org/10.36887/2415-8453-2025-3-3
10. Serhiienko, O. A., Kyzliuk, O. A., & Chernov, O. O. (2024). Structural factor research of threats to the economic security of the industry in the context of strategic innovation decisions. *Problems of Economy*, (2), 272–286. DOI: https://doi.org/10.32983/2222-0712-2024-2-272-286
11. Serhiienko, O. A., Morozova, N. L., & Sokolova, N. O. (2021). Modeling the development of complex hierarchical systems based on the virality of innovations. In V. S. Ponomarenko, T. S. Klebanova, & L. S. Hurianova (Eds.), *Models of system analysis in the management of economic processes: Monograph* (pp. 103–121). Bratislava–Kharkiv: Simon Kuznets Kharkiv National University of Economics.
12. Serhiienko, O. A., Samus, P. O., & Sosnov, I. I. (2025). Development of an adaptive pricing strategy at the early stages of startup growth. *Business Inform*, (3), 164–174. DOI: https://doi.org/10.32983/2222-4459-2025-3-164-174
13. Sharma, S., Chinthamu, N., Praveen, R. V. S., Mutya, B., Manikonda, L., & Deshpande, G. P. (2024). Customer centricity approach to marketing: Unlocking business growth and success. *Journal of Informatics Education and Research*, 4(3), 3701–3716.
14. Van de Ven, M., Lara Machado, P., Athanasopoulou, A., Aysolmaz, B., & Turetken, O. (2023). Key performance indicators for business models: A systematic review and catalog. *Information Systems and e-Business Management*, 21, 753–794. DOI: https://doi.org/10.1007/s10257-023-00650-2

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Сергієнко Олена
доктор економічних наук, професор,
Національний технічний університет «Харківський політехнічний інститут»
вулиця Кирпичова, 2, м. Харків, Україна, 610022
e-mail: serhelenka@gmail.com
ORCID ID: 0000-0002-9796-9218
Тонєва Кристина
кандидат економічних наук, доцент,
Харківський національний університет імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, Україна, 61022
e-mail: KrystynaTonieva@gmail.com
ORCID ID: 0009-0006-1848-8130
Самусь Павло
аспірант,
Національний технічний університет «Харківський політехнічний інститут»
вулиця Кирпичова, 2, м. Харків, Україна, 610022
e-mail: pavlo.samus@emmb.khpi.edu.ua
ORCID ID: 0000-0002-8563-2650

Просторово-динамічне оцінювання ключових показників ефективності (KPI) для стратегічної оцінки стартапів

Анотація. Сучасний підприємницький ландшафт характеризується високою динамікою та значною ринковою невизначеністю. Об'єктом дослідження є просторово-динамічне оцінювання ключових показників ефективності (KPI), що базується на інтегральних метриках. Ці індикатори є визначальними для об'єктивної оцінки життєздатності та інвестиційної привабливості стартапів на ранніх стадіях, вимагаючи переходу від ретроспективного фінансового аналізу до метрик, орієнтованих на прогнозування, перш за все довічної цінності клієнта.

Постановка проблеми. Традиційні методи корпоративної фінансової оцінки, зокрема моделі дисконтованих грошових потоків, є малозастосовними до стартапів через дефіцит історичних фінансових даних, високі темпи зростання та суттєву операційну збитковість на етапі експансії. Існує нагальна потреба у розробці уніфікованої, але контекстуально адаптованої системи метрик, яка б дозволяла засновникам та інвесторам об’єктивно оцінювати внутрішню ефективність та здійснювати порівняння з релевантними ринковими бенчмарками.

Нерозв’язані аспекти. Наукова література демонструє високу варіативність у підходах до оцінки стартапів, що спричиняє значну суб'єктивність та великий розкид оціночної вартості. Існують значні методологічні прогалини у використанні інтегральних показників, зокрема співвідношення LTV до CAC (вартість залучення клієнта), яке часто некоректно розраховується або інтерпретується поза контекстом галузевих бенчмарків та стадії розвитку бізнесу, що може призвести до хибних інвестиційних рішень.

Мета статті. Головною метою дослідження є систематизація ключових показників ефективності стартапів за функціональними блоками. Ключовим завданням є наукове обґрунтування визначальної ролі інтегрального показника LTV/CAC для оцінки життєздатності, а також розробка методологічних рекомендацій щодо застосування просторово-динамічного бенчмаркингу для підвищення об'єктивності стратегічного планування та оцінки стартапів.

Основний матеріал. Дослідження грунтується на застосуванні загальнонаукових методів систематизації, структурно-логічного моделювання, порівняльного та системного аналізу. Представлено комплексну таксономію KPI, що охоплює метрики маркетингу, продажів та фінансів. Центральним елементом аналізу виступає співвідношення LTV/CAC, його критичні порогові значення та просторово-динамічна інтерпретація на прикладі кейс-аналізу 6 стартапів з різними бізнес-моделями.

Висновки. Розроблена систематизація забезпечує структуровану основу для моніторингу ключових параметрів стартапу, підтверджуючи, що співвідношення LTV/CAC є квінтесенцією оцінки якості бізнес-моделі. Практичне значення полягає у наданні засновникам та інвесторам валідованого інструментарію для обґрунтованого просторово-динамічного бенчмаркингу, що сприяє ефективнішому розподілу венчурного капіталу.

Ключові слова: *стартапи, бенчмаркінг, ключові показники ефективності, KPIs, стратегічне оцінювання, конверсія.*

JEL Classification G32, M15

Формули: 2; Рисунки: 4, таблиці: 4.

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Список літератури

1. Comprehensive overview of the perspectives of academics & practitioners. *Junior Management Science (JUMS)*, 9(1), 1306–1340. URL: https://doi.org/10.5282/jums/v9i1pp1306-1340.
2. Fackler, D., Hölscher, L., Schnabel, C., & Weyh, A. (2021). Does working at a start-up pay off? *Small Business Economics*, 58(4), 2211–2233. URL: https://doi.org/10.1007/s11187-021-00508-2.
3. Giri, R., & Mukamiya, R. (2024). A study on importance of market research in startup development and its growth. *International Journal of Creative Research Thoughts (IJCRT)*, 12(4), Art. IJCRT2404144.
4. Gómez-Prado, R., Alvarez-Risco, A., Cuya-Velásquez, B. B., Arias-Meza, M., Campos-Dávalos, N., Juarez-Rojas, L., Anderson-Seminario, M. d. l. M., Del-Aguila-Arcentales, S., & Yáñez, J. A. (2022). Product innovation, market intelligence and pricing capability as a competitive advantage in the international performance of startups: Case of Peru. *Sustainability*, 14(17), 10703. DOI: 10.3390/su141710703.
5. Kupczyk, T., Dewalska-Opitek, A., Witczak, O., Budziński, M., & Kalita, D. (2024). Business model canvas application in start-up stage business developments – constraints and challenges. *European Research Studies Journal*, XXVII(4), 921–940.
6. Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing*, 80(6), 69–96. DOI: 10.1509/jm.15.0420.
7. Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers.* Wiley.
8. Pratama, D. P., & Putra, P. O. H. (2024). Exploring sustainable VR use cases for startup business models: a customized customer development approach. *Sustainability*, 16, 6254. DOI: 10.3390/su16146254.
9. Serhiienko, O., Tonieva, K., & Samus, P. (2025). Startup success metrics: comprehensive analysis, contextual adaptation, and application issues. Ukrainian Journal of Applied Economics and Technology, 3(3), 22–26. DOI: 10.36887/2415-8453-2025-3-3.
10. Serhiienko, O. A., Kyzliuk, O. A., & Chernov, O. O. (2024). Structural factor research of threats to the economic security of the industry in the context of strategic innovation decisions. *Problems of Economy*, (2), 272–286. DOI: 10.32983/2222-0712-2024-2-272-286.
11. Serhiienko, O. A., Morozova, N. L., & Sokolova, N. O. (2021). Modeling the development of complex hierarchical systems based on the virality of innovations. In: Ponomarenko, V. S., Klebanova, T. S., & Hurianova, L. S. (Eds.) *Models of system analysis in the management of economic processes: Monograph.* Bratislava–Kharkiv: Simon Kuznets Kharkiv National University of Economics, pp. 103–121.
12. Serhiienko, O. A., Samus, P. O., & Sosnov, I. I. (2025). Development of an adaptive pricing strategy at the early stages of startup growth. *Business Inform*, (3), 164–174. DOI: 10.32983/2222-4459-2025-3-164-174.
13. Sharma, S., Chinthamu, N., Praveen, R. V. S., Mutya, B., Manikonda, L., & Deshpande, G. P. (2024). Customer centricity approach to marketing: unlocking business growth and success. *Journal of Informatics Education and Research*, 4(3), 3701–3716.
14. Van de Ven, M., Lara Machado, P., Athanasopoulou, A., Aysolmaz, B., & Turetken, O. (2023). Key performance indicators for business models: a systematic review and catalog. *Information Systems and e-Business Management*, 21, 753–794. DOI: 10.1007/s10257-023-00650-2.

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Fedotova Iryna
Doctor of Economic Sciences, Professor,
Professor of Department of Management
Kharkiv National Automobile and Highway University, Kharkiv, Ukraine
25, Ya. Mudrogo St., Kharkiv, 61002, Ukraine
e-mail: irina7vf@gmail.com
ORCID ID: 0000-0002-3277-0224
Bocharova Nadiia
Candidate of Economic Sciences, Associate Professor,
Associate Professor of Department of Management
Kharkiv National Automobile and Highway University, Kharkiv, Ukraine
25, Ya. Mudrogo St., Kharkiv, 61002, Ukraine
e-mail: bocharova.n.a.xnadu@gmail.com
ORCID ID: 0000-0003-4371-0187
Litvinenko Alina
higher education seeker
Kharkiv National Automobile and Highway University, Kharkiv, Ukraine
25, Ya. Mudrogo St., Kharkiv, 61002, Ukraine
e-mail: alinalitvinenko1020@gmail.com

Strategic structuring of MTE business areas: methodical approach

Abstract. The article explores a methodological approach to the strategic structuring of business directions in a motor transport enterprise (MTE) under martial law and post-war recovery.

Problem statement. The study focuses on Strategic Business Units (SBUs), which enable the evaluation of transport service efficiency and the optimization of managerial decisions. The main issue addressed is the absence of adapted methodologies capable of assessing internal business group positions in unstable transport markets.

Unresolved aspects of the problem. Traditional approaches, particularly the BCG matrix, overlook enterprise-specific dynamics, the weight of product groups in sales, variations in transport revenues, and market turbulence, limiting their accuracy and applicability.

Purpose of the article. The study aims to develop and justify a methodological approach to structuring MTE business directions through SBU identification, enabling effective management under high uncertainty caused by wartime and recovery conditions.

Presentation of the main material. A stepwise SBU evaluation method is proposed, based on analyzing sales revenues, their change trends (K and T indicators), and internal financial and production parameters. For each group, the relative share in total sales and revenue change rate are calculated to classify business directions by strategic relevance: development, investment, support, optimization, or transformation. The methodology ensures an objective assessment of internal business group positions, facilitates balanced SBU portfolio formation, considers potential risks, and substantiates managerial decisions on investment, development, or optimization. Its practical significance lies in creating a strategic planning tool adaptable to enterprise resources, industry features, and organizational forms, ensuring effective operation under uncertainty.

Conclusions. Further research will focus on digital models for automated SBU monitoring to enhance managerial responsiveness, strategic flexibility, and financial resilience, thereby ensuring the universality and reliability of the proposed methodology in diverse practical contexts.

Keywords*: strategic management, motor transport enterprise, strategic business unit, strategic business area, BCG matrix, market attractiveness, competitive position, analytical modeling, synergy, post-crisis recovery.*

Formulas: 4; fig.: 8; tabl.: 9; bibl: 25.

JEL Classification: L11, L91, M10, M21, M31, O21, R41, R42, D21.

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Introduction. Under the current conditions of martial law and post-war recovery, motor transport enterprises (MTEs) face unprecedented challenges related to disruptions in logistics chains, shifts in consumer demand, rising resource costs, and the necessity to ensure the stability of transport service provision. Consequently, strategic planning acquires particular significance as a tool for enhancing the enterprise's flexibility, adaptability, and resilience in an unstable environment. One of the key stages of strategic management involves the identification and evaluation of specific areas of MTE activity that can be distinguished as strategic business units (SBUs).

This approach enables a differentiated analysis and management of various services provided by the enterprise, taking into account their market attractiveness, competitive position, financial potential, and strategic prospects. The identification of SBUs allows the enterprise to establish development priorities and make well-grounded managerial decisions regarding investment, modernization, or transformation of specific activity areas, considering existing threats and opportunities.

Moreover, an essential element of strategic analysis is the segmentation of the external environment, which involves identifying strategic business areas (SBAs)—target market segments where the enterprise already operates or plans to enter in the near future. SBAs are defined by common characteristics of consumers, competitive environment, key success factors, resource requirements, and technological demands. Each SBA forms a distinct space for implementing specific strategies, enabling flexible responses to market changes and effective positioning of the enterprise within chosen niches.

Thus, the integration of SBU and SBA analyses provides a comprehensive foundation for developing an adaptive development strategy for motor transport enterprises, focused on ensuring long-term competitiveness, stability, and resilience in the post-crisis period.

Literature review. A significant body of research, both domestic and international, has been devoted to the issue of strategic structuring of business activities. Among the most influential scholars are H. Ansoff, who was one of the first to substantiate the necessity of strategic management to ensure long-term competitiveness of companies [1]; F. Kotler and K. Keller, who emphasize the importance of a marketing-based approach to portfolio analysis [2]; and M. Porter, who formulated the concept of strategic advantages and competitive positioning [3]. In the Ukrainian scientific context, notable contributions have been made by V. Balan, who proposed the use of fuzzy sets in determining the attractiveness of strategic business units (SBUs) [4]; I. and O. Dvornyky, who adapted strategic management approaches to the conditions of martial law [5]; Yu. Kopchak, T. Lobunets, and R. Lukovskyi, who considered SWOT analysis a key tool for strategic choice [6]; O. Kryvoruchko, V. Shynkarenko, and O. Hetman, who systematized the methodology of strategic enterprise management [7]; V. Ponomarenko, who generalized the foundations of strategic management in Ukrainian conditions [8]; as well as other researchers who have analyzed the peculiarities of strategy formation under crisis conditions [9–16].

Strategic business areas (SBAs) enable the structuring of diversified business activities and facilitate the development of a unified corporate strategy. According to H. Ansoff [1], an SBA represents a distinct environmental segment that combines the demand for a specific product with the corresponding technology of its production. Since an enterprise may operate in multiple SBAs, it is important to select the most priority ones. The main criteria for this selection include growth and profitability prospects, market instability, and key success factors in the future competitive environment. For MTEs, such areas may include, for example, domestic freight transportation, international logistics, repair services, or vehicle leasing. The analysis of these groups allows the identification of the most promising, those requiring optimization, and those that should be gradually phased out.

According to V. S. Ponomarenko [8], the use of SBAs as the primary object of strategic management is insufficiently justified for Ukrainian realities. This is due to the fact that the role of

the state in management processes within a structural-production approach differs significantly from that proposed by Ansoff. Therefore, it is more appropriate to consider SBAs as components of zones of strategic interest (ZSIs), which account not only for market but also administrative factors. Under this approach, strategic success becomes achievable through the effective utilization of synergy between different ZSIs.

In the context of motor transport enterprises, SBAs should be interpreted as "environmental segments," since demand in the transport services market is always the determining factor. O. M. Kryvoruchko and colleagues [7] define SBAs as strategically important segments of clients with similar needs and homogeneous technologies for satisfying them, which an enterprise either serves or aims to enter. In scientific literature, the identification of SBAs or SBUs is carried out using a variety of methodological approaches that allow for the differentiation of enterprise activity segments, taking into account internal resources and the market environment. The most common approaches include matrix-based methods (e.g., BCG, GE/McKinsey, ADL matrices), strategic analysis methods (SWOT, PEST), as well as clustering and factor analysis.

H. Ansoff [1] in his research proposed the use of market decomposition based on the "product–technology" parameters, which enables the formation of strategic zones at the intersection of demand and production capabilities. Following a similar logic, the ADL matrix was developed, which takes into account the life cycle of a strategic business unit (SBU) and the competitive position of an enterprise within each segment.

In turn, Porter [3] emphasized an industry-based approach to identifying strategic segments, focusing on competitive forces and entry barriers—an aspect particularly relevant for motor transport enterprises (MTEs) operating under conditions of intense sectoral competition. In the transport industry, segmentation methods are also applied according to consumer type, service area, cargo characteristics, or level of logistical integration, as noted by Kotler [2].

Furthermore, Ukrainian scholars, in particular O. M. Kryvoruchko [7], propose using customized matrices such as "segment attractiveness – enterprise potential," adapted to national conditions. This approach allows consideration not only of market but also of regulatory and infrastructural constraints. Such an adaptation becomes especially relevant in the post-war recovery period, when the logic of demand and business priorities undergoes substantial transformation.

Recent studies conducted between 2019 and 2025 also confirm the relevance of adapting classical portfolio methods to the specific characteristics of the transport sector. For instance, M. Birafan et al. applied the BCG matrix for port positioning and demonstrated its effectiveness in reflecting strategic changes in logistics [17]. Ch. Hun and Ch. Wang proposed a combined approach integrating the BCG matrix with clustering and time modeling, thereby enhancing the predictive capacity of portfolio analysis [18]. A. Petrillo et al. summarized the use of AHP/BOCR methods in strategic management and demonstrated their effectiveness in multi-criteria strategic decision-making [19]. R. Piatek employed a modified BCG model for analyzing automobile brand portfolios, confirming the relevance of adapting classical models to modern conditions [20]. J. García-Vidal and co-authors introduced an alternative to the BCG matrix – the "marginality–quantity" matrix – which allows for a more precise evaluation of portfolio profitability and efficiency [21]. L. Yan et al. demonstrated the potential of incorporating the BCG matrix into hybrid optimization algorithms, proving its flexibility as a conceptual foundation [22]. Moreover, contemporary research in innovation management confirms the effectiveness of integrating BCG with fuzzy logic and risk assessment systems [23]. Reports by consulting firms (notably BCG) indicate that, in the transport and mobility sectors, the "value pools" are shifting, which necessitates a revision of criteria for identifying strategic segments [24; 25].

Therefore, in the process of strategic structuring of motor transport enterprise activities, it is advisable to apply a comprehensive combination of these methods—incorporating both classical Western approaches and Ukrainian-adapted methodologies—to ensure analytical precision and strategic adaptability.

Purpose, objectives and research methods. The purpose of this study is to develop and substantiate a methodological approach to the strategic structuring of business activities of motor transport enterprises based on the identification of strategic business units. This approach aims to optimize enterprise management under conditions of high uncertainty caused by martial law and the challenges of post-war recovery.

To achieve this goal, the following research objectives were defined:

• to generalize scientific approaches to interpreting the concepts of SBA and SBU and adapting them to the specifics of the transport services market;

• to identify and classify the main business activities of MTEs as individual SBUs;

• to perform a comparative analysis of the market positions of each SBU using classical and modified strategic matrices;

• to assess the sales dynamics and growth potential of each business area;

• to propose strategic alternatives for each SBU, considering their growth potential and level of market stability.

The research methodology includes:

– an analysis of the scientific literature on SBAs, SBUs, and strategic management;

– comparative, factor, and trend analyses aimed at evaluating sales dynamics and profitability;

– the use of the expert assessment method to rank the attractiveness of SBUs;

– construction of both classical and modified versions of the Boston Consulting Group (BCG) matrix;

– graphical visualization and economic-mathematical modeling to justify strategic decisions.

The application of this integrated analytical toolkit makes it possible to identify strategically viable directions for the development of motor transport enterprises and to support well-grounded managerial decision-making in the context of a transforming economy.

Research results. The identification of strategic business areas is based on the following key parameters: growth prospects, profitability, the level of external environmental instability, and key competitive factors. These criteria make it possible to assess the attractiveness of each area and determine the feasibility of the enterprise's presence in the corresponding market segment.

SBA analysis enables the enterprise to:

– form a forward-looking portfolio of business activities;

– evaluate interactions among them;

– take into account potential risks and technological changes;

– adjust the product mix in accordance with market conditions.

The process begins with identifying customer needs, determining the corresponding technology, type of buyer, and geographical market. Subsequently, factors influencing each area's parameters are analyzed – for instance, the demand life cycle or consumer purchasing power.

Based on the analysis results, the enterprise may expand its set of SBAs with new ones or abandon those that have lost relevance. The overall sequence of SBA identification is illustrated in Figure 1.

As illustrated in Figure 1, the process of identifying strategic business areas (SBAs) begins with an analysis of potential customer needs, possible means of satisfying them, and the corresponding technologies. The next step involves forecasting the type of client likely to purchase these products or services at an economically justified price and determining the geographical area where demand is concentrated.

After forming the initial set of SBAs, it is necessary to evaluate its balance in terms of life cycle phases, resilience to external risks, and the potential for strategic interaction among the areas. To avoid excessive complexity, a limited number of the most promising SBAs should be selected, taking into account available investment resources and the expected level of profitability. The

subsequent stage involves the strategic segmentation of the internal environment and the identification of strategic business units (SBUs).

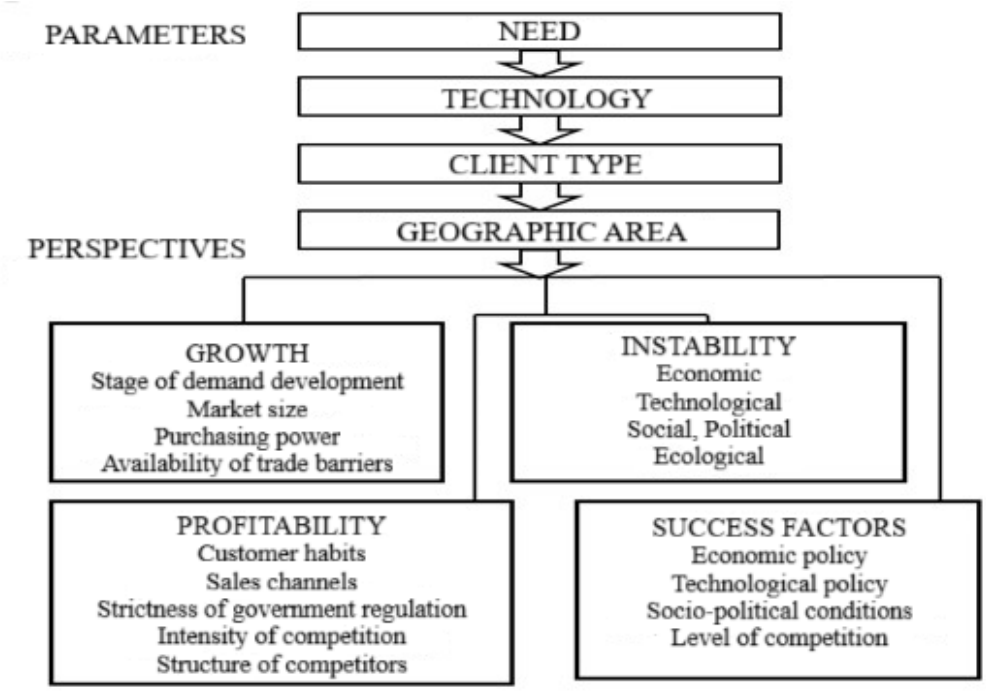

Figure 1. The Process of Identifying Strategic Business Areas (SBAs)
Source: systematized by the authors based on [4-6].

The identification of strategic business directions in a freight motor transport enterprise has specific features determined by the technological and market differentiation of services. In particular, the transportation of different types of cargo requires specialized rolling stock, while the geography of operations defines the division into urban, suburban, intercity, and international freight services.

International transport operations involve complex procedures and permits, since they cover multiple jurisdictions, whereas interregional transportation contributes to market expansion and strengthens the competitive position of the enterprise.

Freight services are classified according to the physical and regulatory characteristics of cargo:

- Bulk cargo – includes liquid (tanker shipments), loose (grain), solid bulk (coal, sand), and timber. These shipments are predominantly transported in large consignments.
- General cargo (piece goods) – carried in packaged or unpackaged form, including bags, containers, crates, etc.
- Special-regime cargo – requires specific transport conditions (hazardous materials, perishable goods, live animals, etc.).

Each cargo type has distinct transport characteristics that determine storage, loading, routing, and delivery requirements.

The first step of strategic analysis is the identification of business directions, i.e., market segments corresponding to the enterprise's accepted field of activity. Sources of information include internal expertise, industry analytics, and benchmarking with comparable enterprises in international practice.

Given that the activities of motor transport enterprises exhibit a mixed nature (a combination of services, tangible assets, and diverse markets), it is advisable to apply the concept of Strategic Business Units (SBUs).

SBU are clusters of business directions related by technological or market characteristics. In the context of motor transport enterprises, an SBU may include:

- the transportation of a specific type of cargo (e.g., hazardous freight),
- regardless of the geographical scope of operations,
- or provision of ancillary services (vehicle leasing, maintenance and repair, etc.).

Unlike Strategic Business Areas, which are primarily related to geographical markets or customer types, the concept of Strategic Business Units takes into account the actual potential for combining services and resources, thereby enhancing the effectiveness of managerial decisions. In the process of strategic analysis of a motor transport enterprise, it is advisable to apply the SBU concept, which enables a structured examination of the enterprise's individual business directions, considering cargo types, logistical requirements, and market specificities. Each SBU is defined as a relatively autonomous business area that requires a distinct strategic management approach.

To assess the attractiveness and determine the most promising directions of development, an analysis of the enterprise's financial and production indicators for 2023–2024 was conducted (for confidentiality reasons, the name of the motor transport enterprise in Kharkiv is not disclosed in the study). Strategic business units were formed based on the types of cargo and transportation routes (urban, suburban, intercity, and international). Each SBU was assigned a number for further identification. The summarized results of the enterprise's business structuring are presented in Table 1, which contains data on all types of transportation services provided in 2024.

Various methods are commonly used to assess strategic groups [4–6, 9–15], with portfolio methods – particularly the BCG matrix [16] – being among the most widespread. Such analysis facilitates well-grounded decision-making regarding resource investment, organizational restructuring, and the development of effective strategies for each business direction.

The BCG matrix is a portfolio analysis tool that classifies a company's business activities or products according to two key parameters: market growth rate and relative market share [16]. The model is based on the logic of the product life cycle, according to which a business may be at one of four stages: market introduction, growth, maturity, or decline.

Graphically, the matrix is presented as a coordinate plane where the vertical axis represents the market growth rate, and the horizontal axis shows the relative market share (compared to the largest competitor). The size of each circle on the diagram reflects the sales volume or profit generated by the corresponding business activity.

Table 1. Identification of individual SBUs in the motor transport enterprise

Type of Activity	Transportation Directions			
	Urban	Suburban	Intercity	Interna-tional
Freight Transportation by Cargo Type				
Bulk cargo not requiring environmental protection (raw materials for metallurgy, rolled metal, road construction materials)	SBU 1		SBU 2	
Packaged and piece goods requiring temperature control (food products, perishable goods)	SBU 4	SBU 3	SBU 5	
Piece goods not requiring environmental protection (building materials, equipment, industrial goods)	SBU 7		SBU 8	
Bulk cargo requiring environmental protection (agricultural products)		SBU 6	SBU 9	SBU 10
Related Activities				
Leasing of rolling stock to other carriers	SBU 11			
Maintenance and repair services for external carriers	SBU 12			

Source: developed by the authors.

Depending on the combination of parameters, all strategic business units (SBUs) are divided into four groups:

- Stars – a high market share and high market growth rate. These are leaders that generate significant profits but require additional investments to maintain their positions.
- Cash Cows – a high market share in a stable or slowly growing market. They generate stable cash flows with minimal investment needs.
- Question Marks (or Wild Cats) – a low market share in a rapidly growing market. They require significant financial investments and a strategic decision on whether to invest for growth or withdraw.
- Dogs – a low market share and low growth rate. These are low-profit or unprofitable business areas that should be phased out or optimized.

Thus, the BCG matrix helps a company optimize its business portfolio, determine investment priorities, and formulate strategic decisions for each SBU. The BCG matrix is presented in Figure 2.

In the practice of the Ukrainian market, the application of the classical BCG matrix is complicated by the lack of reliable market information, which makes it difficult to assess market share and growth rates.

Due to the large share of the shadow economy and limited access to data, the indicators are often conditional. In addition, there is subjectivity in defining the boundaries between "high" and "low" growth or market share; therefore, the classical tool requires adaptation.

It is necessary to develop a proprietary methodological approach to constructing the BCG matrix based on the company's internal indicators, which will eliminate dependence on external data and preserve the analytical value of product portfolio assessment.

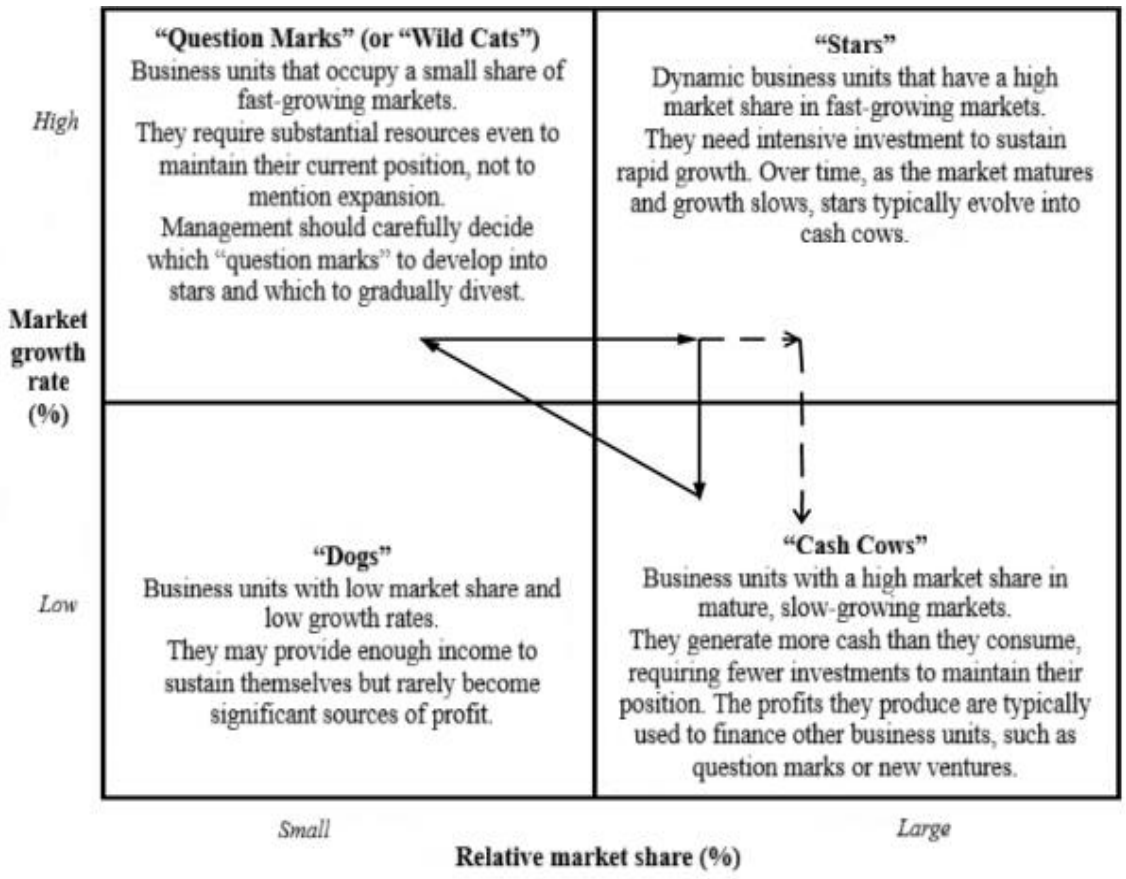

Figure 2. The Boston Consulting Group (BCG) Matrix
Source: systematized by the authors based on [4-6].

For the analysis of types of transportation in a motor transport enterprise, the modified matrix proposes using two key indicators:

- K – the share of sales volume (transportation revenue) of a particular SBU in the total sales volume (horizontal axis);
- T – the share of the rate of change in sales volume of the SBU in the total rate of change in the company's sales (vertical axis).

The combination of these indicators makes it possible to assess the role of each type of transportation in the income structure and to identify their strategic potential based on growth or decline dynamics. The K indicator defines the significance of the activity at the current stage, while T reflects its capacity for development or loss of positions.

This approach is more comprehensive than the classical model, as it takes into account the internal dynamics of the enterprise, making the matrix a flexible tool for managerial decision-making under conditions of market instability in the transportation sector.

For each group, the parameter K_i – the share of a product group in the total sales volume of the enterprise during the base period – is calculated using the following formula:

$$K_i = Y_i/Y_o \cdot 100\%, \quad (1)$$

where Y_0 is the total sales volume in monetary terms for the base period, and Y_i is the sales volume of products in the i-th group for the same period.

The formula for the linear trend of the sales function is expressed as a first-degree polynomial equation:

$$Y_o = a_t \cdot X + b_o, \quad (2)$$

where Y_0 is the estimated sales volume; X is the calculation period (month); a_t is the estimated change (increase or decrease) in sales compared to the previous calculation period; and b_0 is the constant of the equation, which can be interpreted as the theoretical sales volume in the initial period (1st month).

The trend equation for each i-th group will have a similar form:

$$Y_i = a_i \cdot X + b_i, \quad (3)$$

Since $Y_0 = \sum Y_i$, according to the additivity property of linear functions, $a_t = \sum a_i$.

The linear trend of the sales function (the share of a product group in the rate of change of the enterprise's sales volume over the base period) is proposed to be calculated using the following equation:

$$T_i = a_i/a_o \cdot 100\%, \quad (4)$$

where a_i is the trend coefficient of the i-th product group over the base period, and a_0 is the trend coefficient of total sales for the same period, which is usually $a_0 = \sum a_i$, $i = 1,\ldots,n$.

The placement of objects in the BCG matrix should not be considered a final conclusion.

For each group, additional analysis and measures are required, as well as safeguards to protect the methodology from potential biases caused by personal interests.

This approach enables a motor transport enterprise to identify leading types of transportation, assess their internal positions, and analyze sales dynamics. The calculated data are presented in Table 2.

Based on the data in Table 2, monthly sales dynamics graphs were constructed for each individual SBU, and the corresponding linear trend equations were presented. These graphs are shown in Figures 3–6.

Table 2. Calculated data on the sales revenues of services by SBUs for 2024

№ SBU	Months, thousand UAH												Total by SBU
	1	2	3	4	5	6	7	8	9	10	11	12	
SBU 1	42,78	38,90	35,33	34,23	35,43	36,56	30,24	30,32	28,80	26,67	25,17	21,44	385,86
SBU 2	31,44	30,08	27,54	24,90	27,61	24,02	23,47	24,05	22,52	20,39	16,78	14,12	286,91
SBU 3	57,21	57,05	57,67	58,09	58,87	61,10	61,53	62,22	64,41	68,50	63,97	67,45	738,07
SBU 4	55,67	55,49	56,11	56,53	57,83	53,27	58,40	58,04	58,65	58,56	59,25	60,65	688,45
SBU 5	96,90	99,06	98,72	98,54	99,51	100,79	100,12	100,91	106,30	100,39	105,91	107,71	1214,86
SBU 6	32,47	32,16	33,25	36,31	36,99	38,64	40,15	40,78	41,37	40,78	42,47	43,40	458,77
SBU 7	57,21	54,97	56,63	54,98	56,27	54,83	53,19	50,72	45,03	48,63	47,71	45,49	625,67
SBU 8	43,30	43,56	40,53	43,57	37,51	38,12	37,02	36,08	35,61	37,65	33,56	30,85	457,35
SBU 9	32,47	37,34	38,97	39,94	39,59	40,21	39,63	41,30	42,94	43,92	46,67	48,10	491,09
SBU 10	18,56	17,11	18,70	18,15	19,28	19,32	19,82	20,39	21,47	22,48	24,64	25,62	245,55
SBU 11	31,96	35,79	35,85	31,64	35,43	33,94	32,33	31,89	29,85	29,28	28,31	26,67	382,93
SBU 12	15,46	17,11	20,26	21,78	16,67	21,41	25,55	26,14	26,71	25,62	29,89	31,37	277,99
Total	515,44	518,63	519,56	518,65	520,98	522,22	521,45	522,84	523,66	522,87	524,33	522,87	6253,50

Source: calculated by the authors.

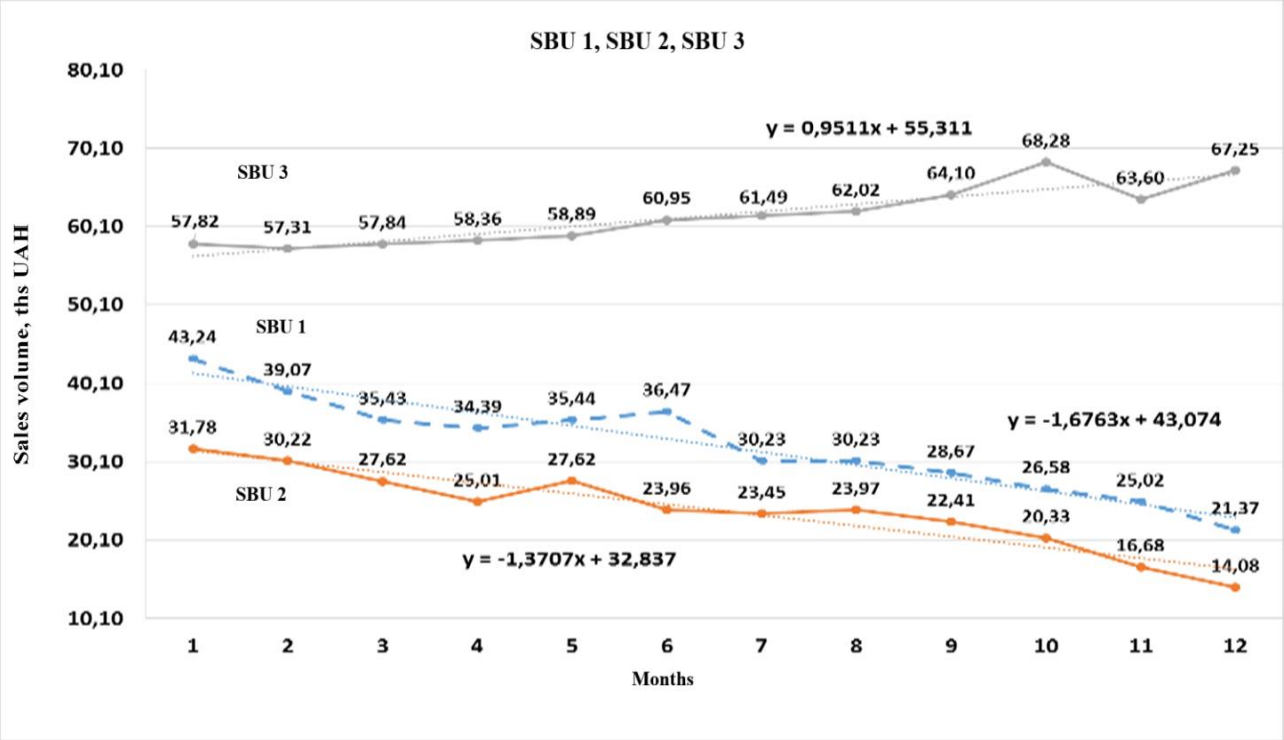

Figure 3. Dynamics of transportation revenues by SBUs1-3, thousand UAH
Source: compiled and calculated by the authors.

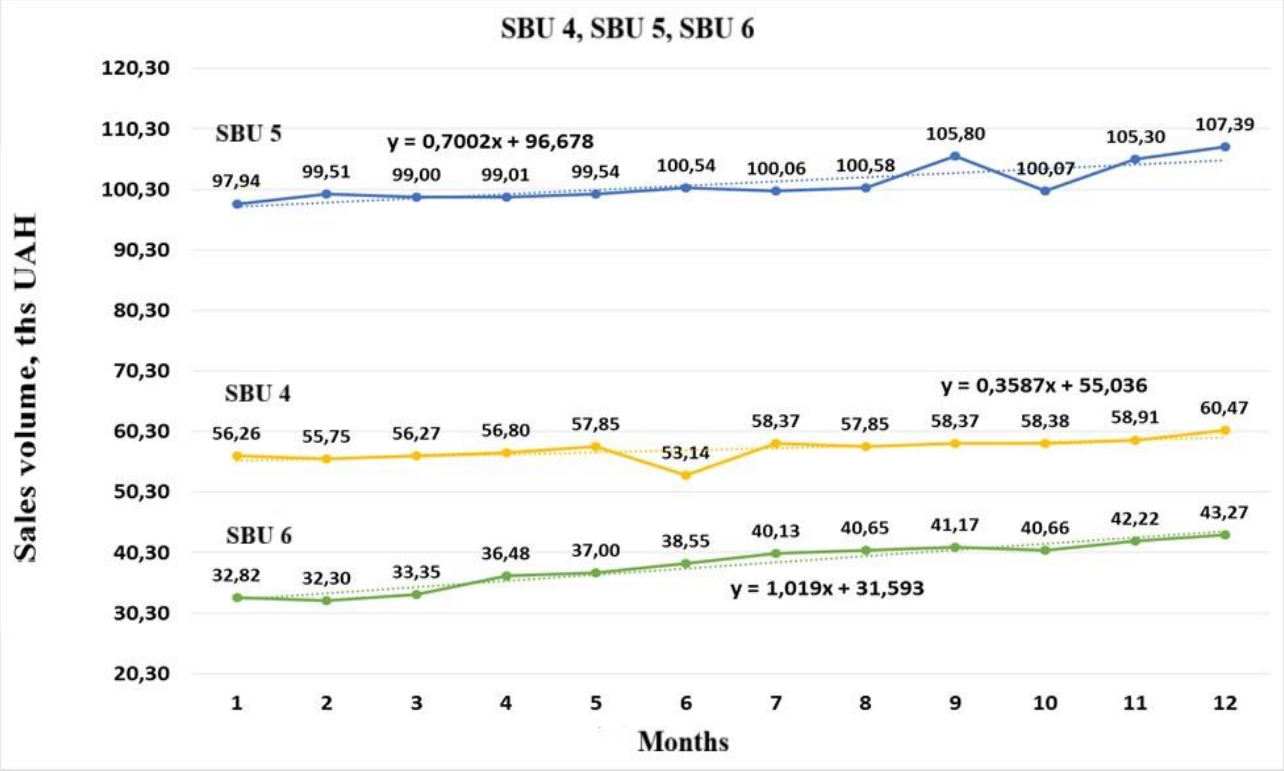

Figure 4. Dynamics of transportation revenues by SBUs 4-6, thousand UAH
Source: compiled and calculated by the authors.

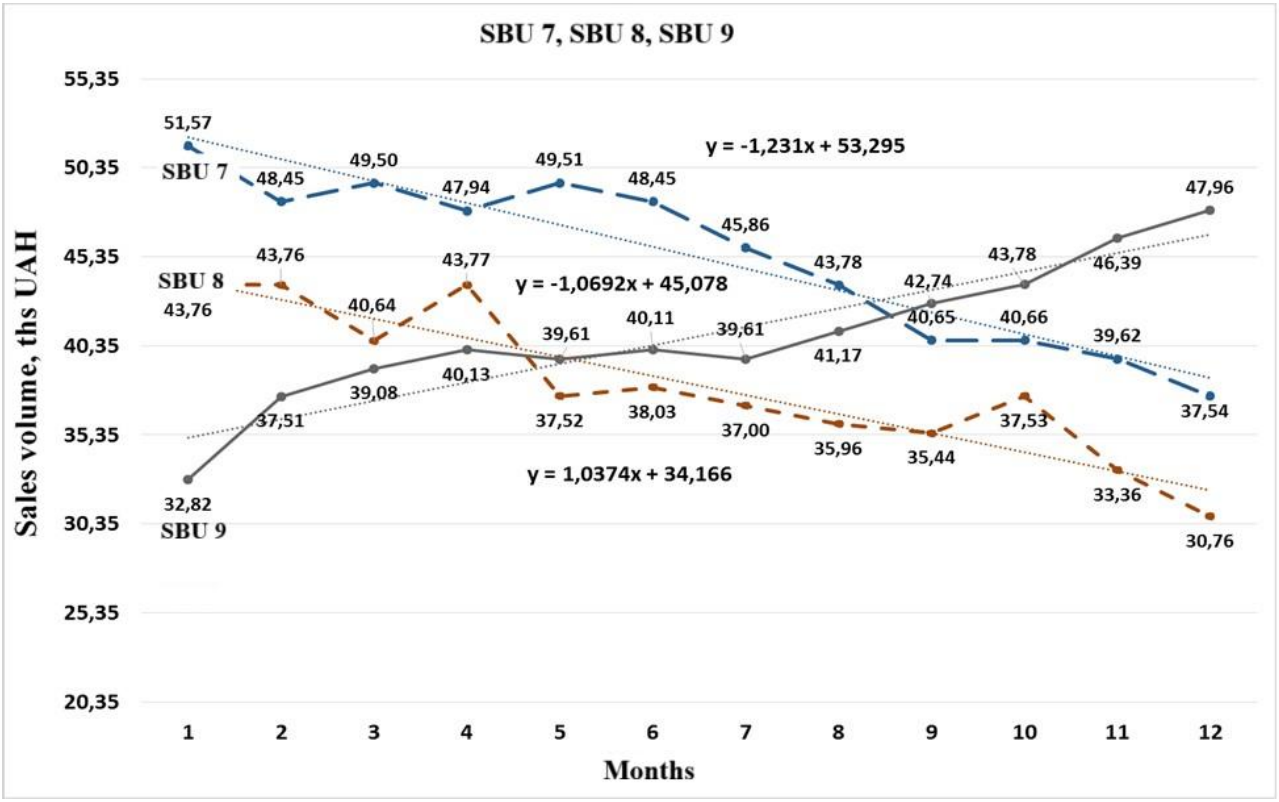

Figure 5. Dynamics of transportation revenues by SBUs 7-9, thousand UAH
Source: compiled and calculated by the authors.

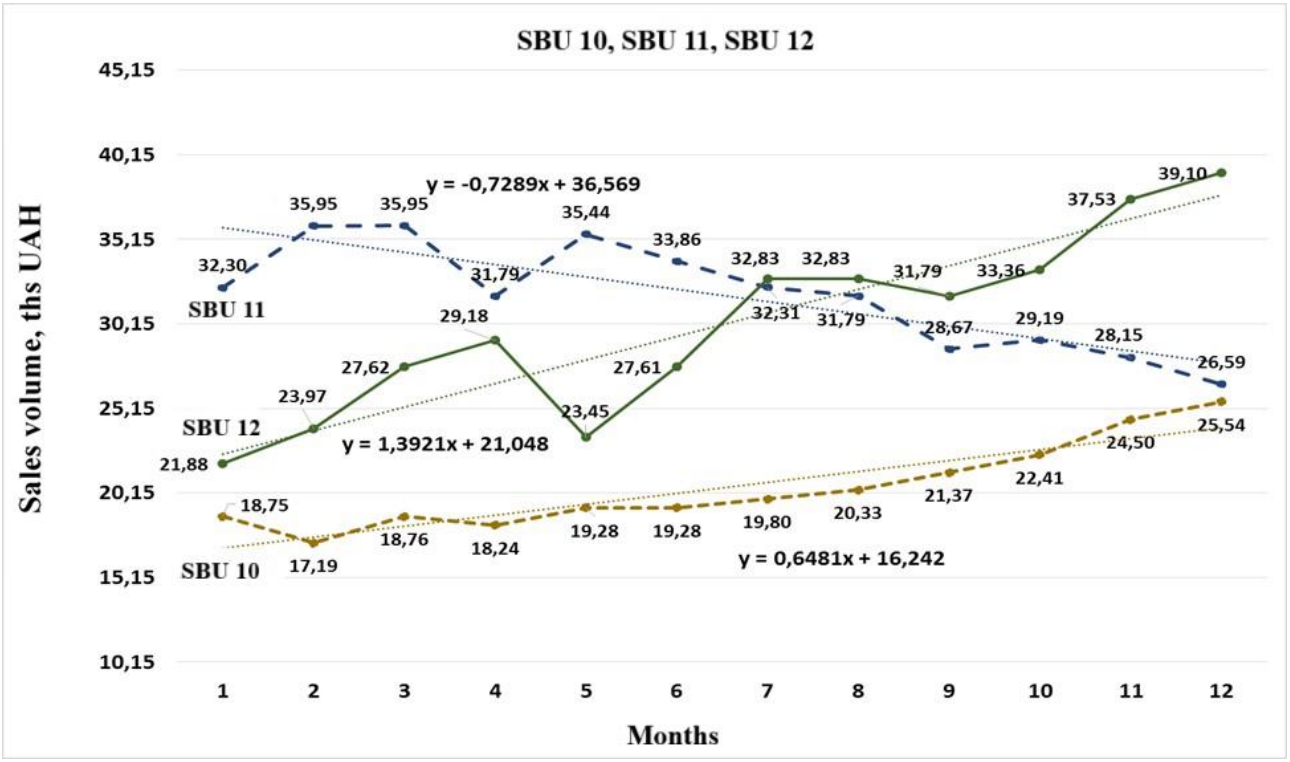

Figure 6. Dynamics of transportation revenues by SBUs 10-12, thousand UAH
Source: compiled and calculated by the authors.

Figure 7 presents the annual sales dynamics of all SBUs in the motor transport enterprise and the corresponding trend equation.

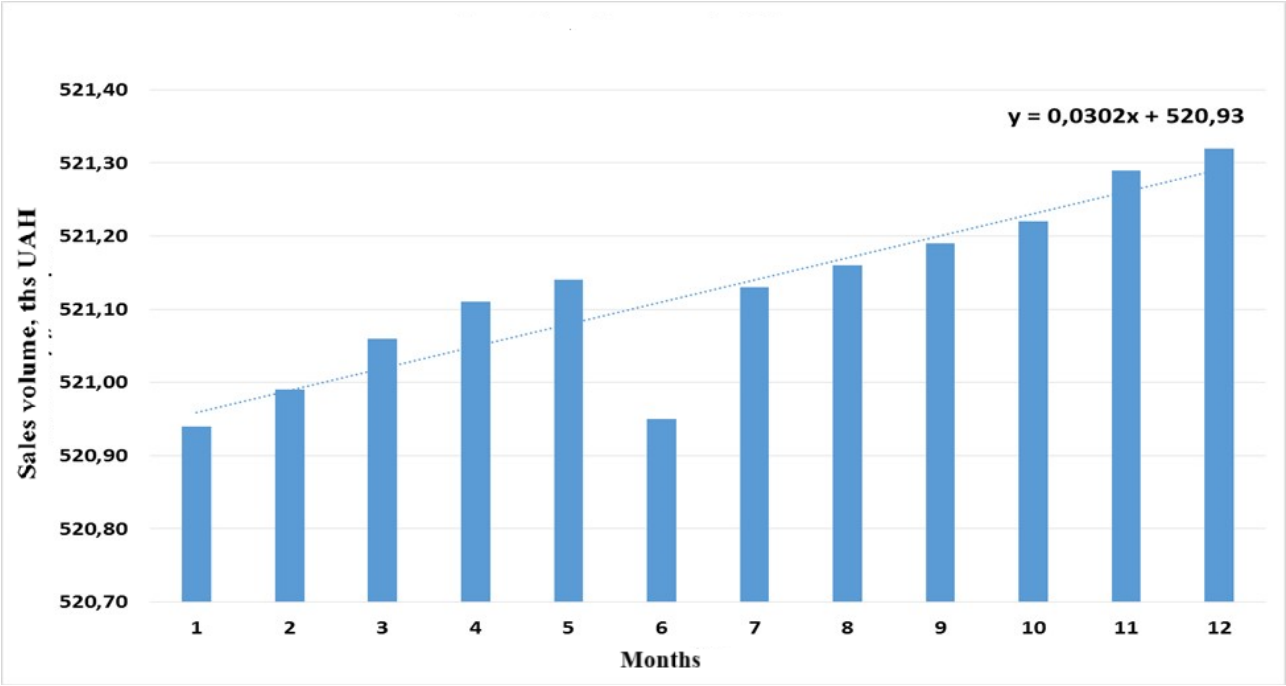

Figure 7. Dynamics of total freight transportation revenue of the motor transport enterprise, thousand UAH
Source: compiled and calculated by the authors.

Table 8 presents the linear trend equations of sales dynamics for each SBU, as well as the overall linear trend equation for 2024.

Table 8. Linear Trend Equations of Sales Dynamics for SBUs 1–12

SBU Number	Linear Trend Equation
SBU 1	y = -1,6763x + 43,074
SBU 2	y = -1,3707x + 32,837
SBU 3	y = 0,9511x + 55,311
SBU 4	y = 0,3587x + 55,036
SBU 5	y = 0,7002x + 96,678
SBU 6	y = 1,019x + 31,593
SBU 7	y = -1,231x + 53,295
SBU 8	y = -1,0692x + 45,078
SBU 9	y = 1,0374x + 34,166
SBU 10	y = 0,6481x + 16,242
SBU 11	y = -0,7289x + 36,569
SBU 12	y = 1,3921x + 21,048
Total	y = 0,0302x + 520,93

Source: calculated by the authors.

Based on the data from Tables 7–8, the parameters for constructing the modified BCG matrix were calculated using formulas 1–4. The calculated data for SBUs 1–12 are presented in Table 9.

Table 9. Calculation of Parameters for Constructing the Modified BCG Matrix

SBU Number	Yo	Yi	K	Ao	Ai	T
SBU 1	6253,5	386,14	6,2	0,0302	-1,6773	-55,5
SBU 2	6253,5	287,13	4,6	0,0302	-1,3707	-45,4
SBU 3	6253,5	737,92	11,8	0,0302	0,9511	31,5
SBU 4	6253,5	688,41	11,0	0,0302	0,3587	11,9
SBU 5	6253,5	1214,75	19,4	0,0302	0,7002	23,2
SBU 6	6253,5	458,60	7,3	0,0302	1,019	33,7
SBU 7	6253,5	543,52	8,7	0,0302	-1,231	-40,8
SBU 8	6253,5	457,54	7,3	0,0302	-1,0692	-35,4
SBU 9	6253,5	490,91	7,9	0,0302	1,0374	34,4
SBU 10	6253,5	245,46	3,9	0,0302	0,6481	21,5
SBU 11	6253,5	381,98	6,1	0,0302	-0,7289	-24,1
SBU 12	6253,5	361,15	5,8	0,0302	1,3921	46,1

Source: calculated by the authors.

Based on the obtained data, the modified BCG matrix was constructed, as shown in Figure 8.

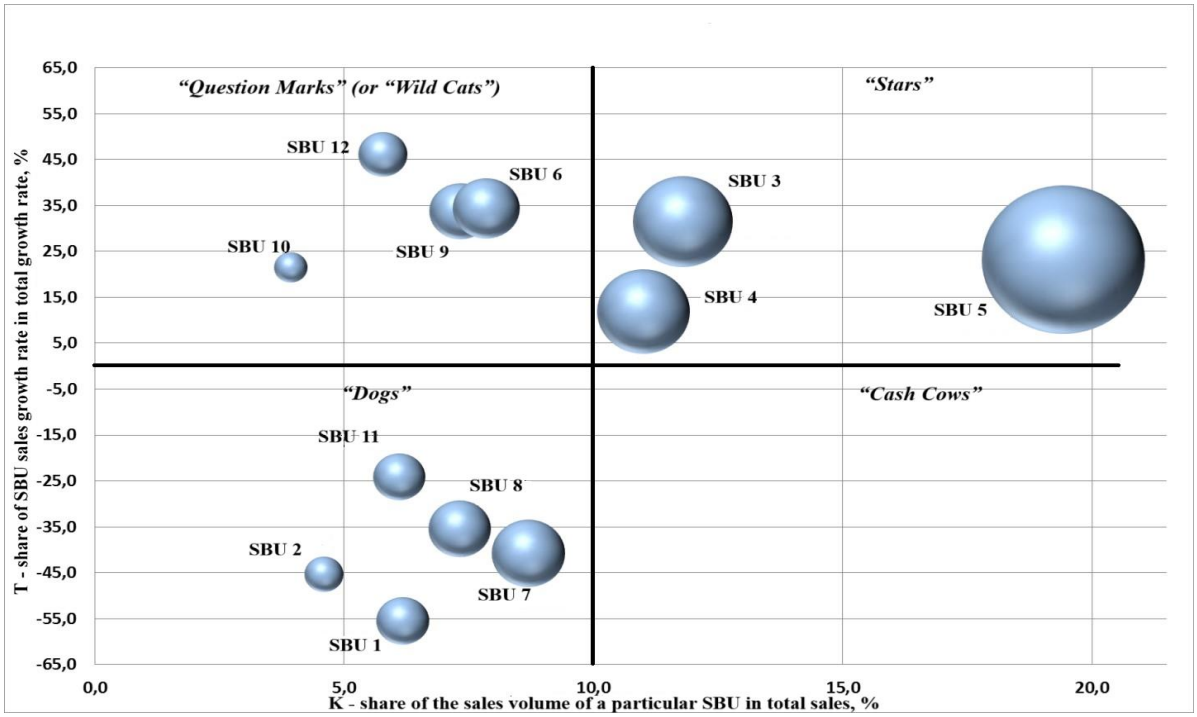

Figure 8. Modified BCG Matrix of transportation types across SBUs 1–12 of the motor transport enterprise in 2024
Source: compiled and calculated by the authors.

As shown in Figure 8, the Dogs group includes SBUs 1, 2, 7, 8, and 11; the Question Marks (Wild Cats) group includes SBUs 6, 9, 10, and 12; the Stars group includes SBUs 3, 4, and 5. No SBU falls into the Cash Cows group.

The next step is to assess the balance of the enterprise's product portfolio. A portfolio is considered balanced if:

- the share of SBUs in the Cash Cow group is at least 45–50%;
- the share of SBUs in the Stars group is at least 20–30%;
- the share of SBUs in the Question Marks group is at least 15–20%;
- the share of SBUs in the Dogs group does not exceed 5%.

An excess of aging products (Dogs) indicates a risk of decline, even if the current performance of the enterprise is relatively strong. Conversely, an excess of new products (Question Marks) may lead to financial difficulties.

Discussion. In the current conditions of instability caused by military actions in Ukraine, the issue of balancing an enterprise's product (assortment) portfolio becomes particularly relevant. A balanced portfolio not only reduces risks but also ensures internal financing for development through the effective allocation of resources among stable, promising, and problematic business directions.

A product portfolio is considered unbalanced if:

- it lacks or contains an insufficient share of Cash Cow products, which generate stable profits and serve as a source of financing for the enterprise;
- it lacks or underrepresents Question Marks (Wild Cats), which have growth potential;
- there is an excessive share of Dogs, which generate minimal profit and have limited prospects for development.
- In the case of a motor transport enterprise (MTE), the product portfolio should be considered unbalanced due to the following factors:
- the absence of SBUs in the Cash Cow group, which prevents stable financing of investment directions using internal resources;
- a high share of SBUs in the Dogs group — 32.8%, which significantly exceeds the acceptable level (5%).

At the same time, there are positive signs:

- the share of Question Marks is 24.8%, exceeding the approximate minimum of 15–20%, creating growth potential if managed properly;
- the share of Stars is 42.2%, indicating the presence of high-potential products that could eventually become Cash Cows, providing stable financing under highly turbulent market conditions.

Based on the analysis of the product portfolio and the operational characteristics of the enterprise under wartime conditions, it is advisable to apply the following strategic approaches to each SBU:

- SBUs 1 and 2 (Dogs) – a downsizing strategy with the possibility of gradual market withdrawal. If there are narrow profitable niches, temporary support is possible until market stabilization;
- SBU 11 (Dogs) – limit investments, focus on the most profitable segments, and avoid complete loss of market share;
- SBUs 7 and 8 – minimize costs, protect niche positions; with positive dynamics, they may be reclassified as Question Marks, justifying targeted investments in specific market segments;
- SBUs 6, 9, and 10 (Question Marks) – intensify marketing and innovation efforts, explore new market niches, and adapt to changes in the market environment;
- SBU 12 – promotion and identification of growing segments with the potential to be upgraded to the Stars category;
- SBUs 3 and 4 (Stars) – maintain leadership positions, invest in preserving competitive advantages, and control costs with a focus on long-term transformation into Cash Cows;

– SBU 5 (Stars) – concentrate efforts on expanding market share, actively promote the offering, and optimize the business model to achieve stable profitability.

Thus, the enterprise needs to revise its product portfolio management priorities, gradually reducing the share of unprofitable directions while transforming potentially profitable SBUs into stable sources of income. This approach will enhance the financial stability of the enterprise during wartime and create a foundation for sustainable development in the post-crisis period.

Conclusions. The conducted study allowed for the development of methodological foundations for the assessment and selection of SBUs of a motor transport enterprise using a modified BCG matrix, adapted to internal financial and production indicators and the specifics of the transport services market under martial law conditions. The proposed approach enables:

1. Objective and timely identification of the positions of individual transportation types within the enterprise's operations based on their share in sales and sales growth rates (parameters *K* and *T*), determining their strategic potential and management priorities.
2. Classification of SBUs into Stars, Question Marks, and Dogs, clearly demonstrating the imbalance in the enterprise's product portfolio, particularly the absence of stable profit generators (Cash Cows) and the excessive share of unprofitable directions, emphasizing the need for strategic adjustments.
3. Formation of a balanced portfolio of strategic business units and substantiation of managerial decisions regarding investment, development, or optimization of each SBU under dynamic market conditions.

The practical significance of the results lies in the creation of a methodological toolkit that can be applied by a motor transport enterprise to develop an effective corporate strategy under high market uncertainty. The proposed approach is adaptive and can be scaled to other types of transport or related industries.

Prospects for further research include the development of digital models for automated identification, monitoring, and analysis of SBUs, which will enhance the timeliness of managerial decisions and the financial stability of the enterprise. The limitations of the approach are its dependence on internal enterprise indicators and the need to test the methodology on different types of motor transport enterprises to ensure the universality and reliability of the recommendations.

References

1. Ansoff, H. I. (1965). *Corporate strategy*. McGraw-Hill.
2. Kotler, P., & Keller, K. (2024). *Marketing management* (15th ed.). Pearson Education.
3. Porter, M. E. (2008). Competitive advantage: Creating and sustaining superior performance. *Free Press.*
4. Balan, V. H. (2020). Evaluation of the attractiveness of strategic business areas of the enterprise using fuzzy set theory. *Scientific Notes of V.I. Vernadsky Taurida National University. Series: Economics and Management*, *31*(70), 114–120. DOI: https://doi.org/10.32838/2523-4803/70-3-19 [in Ukrainian].
5. Dvornyk, I., Dvornyk, O., & Harafonova, O. (2023). Modern personnel management strategy in wartime. *Modeling the Development of the Economic Systems*, *(8)*, 19. DOI: https://doi.org/10.31891/mdes/2023-8-19
6. Kopchak, Y. S., Lobunets, T. V., & Lukovskyi, R. I. (2024). SWOT analysis as an important tool in business strategy development. *Economics and Society*, *(61)*, 769–774. DOI: https://doi.org/10.32782/2524-0072/2024-61-146 [in Ukrainian].
7. Kryvoruchko, O. M., Shynkarenko, V. H., & Hetman, O. O. (2024). Strategic management. *Kharkiv: FOP Panov A. M.* [in Ukrainian].
8. Ponomarenko, V. S. (1999). Strategic enterprise management. *Kyiv: Osnova*. [in Ukrainian].
9. Prodius, O. (2023). Business strategies of enterprises in wartime. In *Business strategy: Ukrainian realities and opportunities for convergence with the EU* (pp. 129–131). [in Ukrainian].
10. Rohovskyi, S. O. (2014). Use of classical matrix tools in bank strategy development. *Effective Economy*, *(11)*. Retrieved from: http://www.economy.nayka.com.ua/?op=1&z=3507 [in Ukrainian].
11. Usykova, O. M. (2023). Analytic Hierarchy Process in enterprise decision-making. *Economics and Vision*, *(1)(6)*, 86–91. DOI: https://doi.org/10.31319/2709-2879.2023iss1(6).283000pp86-91 [in Ukrainian].
12. Fedyk, M. (2024). Strategic management in times of crisis: Adaptive strategies for ensuring business resilience in post-war Ukraine. *Philosophy and Governance*, *(3–4)*. DOI: https://doi.org/10.70651/3041-248X/2024.3-4.08 [in Ukrainian].
13. Fediunin, S. A., Plevako, N. O., & Filonenko, M. Yu. (2020). Strategic enterprise development management. *Economics. Management. Business*, *(3)(33)*, 45–49. DOI: https://doi.org/10.31673/2415-8089.2020.035155 [in Ukrainian].

14. Feyer, O., Khaustova, K., & Husti, S. (2023). Strategic management of an enterprise under martial law. *Innovation and Sustainability*, *(4)*, 90–97. DOI: https://doi.org/10.31649/ins.2023.4.90.97 [in Ukrainian].
15. Folomkina, I. S. (2009). Enterprise tactics: Essence, features and relationship with strategy. *Economic Bulletin, (11)*, 4–9. [in Ukrainian].
16. Pan, X. (2023). An Analysis of the Strategies Applied to the Different Strategic Business Units of the BCG Matrix. *Advances in Economics, Management and Political Sciences*, 26, 373-378. DOI: https://doi.org/10.54254/2754-1169/26/20230599
17. Birafane, M., Liu, W., & Khalikov, S. (2020). The strategic positioning of Moroccan seaports: An application of the Boston Consulting Group growth-share matrix. *The Open Transportation Journal*, 14(1), 133–139. DOI: https://doi.org/10.2174/1874447802014010133
18. Hung, C.-Y., & Wang, C.-C. (2024). An approach for multi-item product sales forecasting based on advancing the BCG matrix with matrix-clustering and time modeling techniques. *Systems*, 12(10), 388. DOI: https://doi.org/10.3390/systems12100388
19. Petrillo, A., Salomon, V. A. P., & Tramarico, C. L. (2023). State-of-the-art review on the Analytic Hierarchy Process with BOCR. *Journal of Risk and Financial Management*, 16(8), 372. DOI: https://doi.org/10.3390/jrfm16080372
20. Piatek, R. (2023). Analysis of brand portfolios of automotive concerns using the BCG matrix. *Journal of Modern Science*, 54(5), 83–96.
21. García-Vidal, G., Santos-Jaén, J. M., & Tavera-Cabrera, E. (2023). Contribution margin and quantity matrix to analyze the product portfolio in the context of SMEs. Criticism of the BCG matrix and its alternatives. *Cogent Business & Management*, 10(3). DOI: https://doi.org/10.1080/23311975.2023.2233272
22. Yang, L., Xu, Z., Yuan, F., Liu, Y., & Tian, G. (2025). Boston Consulting Group matrix-based equilibrium optimizer for numerical optimization and dynamic economic dispatch. *Electronics*, 14(3), 456. DOI: https://doi.org/10.3390/electronics14030456
23. Gärtner, Q., Bianchi, A., Mulrav, H., & Reinhart, G. (2024). Combining the analytical hierarchy process, fuzzy expert systems, and the exponential risk priority number for the holistic evaluation of innovation projects in manufacturing. *Production and Manufacturing Research*, 12(1), Article 2378200. DOI: https://doi.org/10.1080/21693277.2024.2378200
24. Boston Consulting Group (2024). Accelerating the shift to sustainable transport. *BCG Insights*. Retrieved from: https://www.bcg.com/publications/2024/accelerating-the-shift-to-sustainable-transport
25. Boston Consulting Group (2023). How to profit in tomorrow's automotive and mobility industry. BCG Insights. Retrieved from: https://www.bcg.com/publications/2023/profiting-in-the-future-of-automotive-industry

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Федотова Ірина
доктор економічних наук, професор,
професор кафедри менеджменту
Харківський національний автомобільно-дорожній університет,
25, Я. Мудрого, Харків, 61002, Україна
e-mail: irina7vf@gmail.com
ORCID ID: 0000-0002-3277-0224
Бочарова Надія
кандидат економічних наук, доцент,
доцент кафедри менеджменту
Харківський національний автомобільно-дорожній університет,
25, Я. Мудрого, Харків, 61002, Україна
e-mail: bocharova.n.a.xnadu@gmail.com
ORCID ID: 0000-0003-4371-0187
Литвиненко Аліна
здобувач вищої освіти
Харківський національний автомобільно-дорожній університет,
25, Я. Мудрого, Харків, 61002, Україна
e-mail: alinalitvinenko1020@gmail.com

Стратегічне структурування бізнес-напрямів АТП: методичний підхід

Анотація. У статті розглянуто методичний підхід до стратегічного структурування бізнес-напрямів автотранспортного підприємства (АТП) в умовах воєнного стану та повоєнного відновлення. Об'єктом дослідження є стратегічні групи бізнесу (СГБ), що дозволяють оцінювати ефективність окремих видів перевезень та оптимізувати управлінські рішення.

Постановка проблеми. Основною проблемою є відсутність адаптованих методик, які дозволяють оцінювати внутрішні позиції бізнес-груп у динамічних і нестабільних умовах ринку перевезень.

Нерозв'язані аспекти проблеми. Класичні підходи, зокрема традиційна матриця БКГ, не враховують внутрішню динаміку підприємства, питомі ваги груп продуктів у загальному обсязі збуту, зміни обсягів перевезень та специфіку ринкової турбулентності, що обмежує їх практичну застосовність та точність управлінських рішень.

Мета статті. Метою дослідження є розробка та обґрунтування методичного підходу до стратегічного структурування бізнес-напрямів АТП на основі виділення СГБ, що дозволяє оптимізувати управління діяльністю в умовах високої невизначеності, спричиненої воєнним станом і потребами повоєнного відновлення.

Виклад основного матеріалу. Запропоновано поетапну методику оцінки СГБ на основі аналізу обсягів збуту, трендів їх зміни (показники *K* та *T*) та внутрішніх фінансово-виробничих показників. Для кожної групи розраховується питома вага у загальному обсязі збуту та темп зміни обсягів, що дозволяє класифікувати напрями діяльності за стратегічною доцільністю, включно з розвитком, інвестуванням, підтримкою, оптимізацією або трансформацією. Методика забезпечує об'єктивну оцінку внутрішніх позицій бізнес-груп, формування збалансованого портфеля СГБ, врахування потенційних ризиків та обґрунтування управлінських рішень щодо інвестування, розвитку або оптимізації. Практичне значення полягає у створенні інструментарію для стратегічного планування в умовах високої невизначеності ринку, адаптивного до ресурсів підприємства, специфіки галузі та організаційно-правових форм.

Висновки. Подальші дослідження передбачають розробку цифрових моделей для автоматизованого моніторингу СГБ, що підвищить оперативність управлінських рішень, гнучкість стратегії та фінансову стійкість підприємства, а також забезпечить універсальність і надійність методики у різних практичних умовах.

Ключові слова: *стратегічне управління, автотранспортне підприємство, стратегічна група бізнесу, стратегічна зона господарювання, матриця БКГ, ринкова привабливість, конкурентна позиція, аналітичне моделювання, синергія, посткризове відновлення.*

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Список літератури

1. Ansoff H. I. Corporate Strategy. McGraw-Hill, 1965. 272 p.
2. Kotler P., Keller K. Marketing Management. Pearson Education, 2024. 808 p.
3. Porter M. E. Competitive Advantage: Creating and Sustaining Superior Performance. New York: Free Press, 2008. 592 p.

4. Балан В. Г. Оцінювання привабливості стратегічних зон господарювання підприємства засобами нечітко-множинної теорії. *Вчені записки ТНУ імені В. І. Вернадського. Серія: Економіка і управління.* 2020. Т. 31 (70), № 3. С. 114–120. DOI: https://doi.org/10.32838/2523-4803/70-3-19
5. Дворник І., Дворник О., Гарафонова О. Сучасна стратегія управління персоналом підприємства в умовах воєнного стану. *Modeling the Development of the Economic Systems.* 2023. № 8. С. 19. DOI: 10.31891/mdes/2023-8-19
6. Копчак Ю. С., Лобунець Т. В., Луковський Р. І. SWOT-аналіз як важливий інструмент у розробці стратегії бізнесу. *Економіка та суспільство.* 2024. № 61. С. 769–774. DOI: https://doi.org/10.32782/2524-0072/2024-61-146
7. Криворучко О. М., Шинкаренко В. Г., Гетьман О. О. Стратегічне управління : навч. посіб. Харків : ФОП Панов А. М., 2024. 224 с.
8. Пономаренко В. С. Стратегічне управління підприємством. Київ : Основа, 1999. 619 с.
9. Продіус О. Бізнес-стратегії підприємств в умовах воєнного стану. *Стратегія бізнесу: українські реалії та можливості конвергенції з ЄС.* 2023. С. 129–131.
10. Роговський С. О. Застосування класичних матричних інструментів маркетингу для формування стратегії банку. *Ефективна економіка.* 2014. № 11. Режим доступу: http://www.economy.nayka.com.ua/?op=1&z=3507
11. Усикова О. М. Метод аналізу ієрархій у системі прийняття рішень на підприємстві. *Економіка та візійність.* 2023. № 1(6). С. 86–91. DOI: https://doi.org/10.31319/2709-2879.2023iss1(6).283000pp86-91
12. Федик М. Strategic Management in Times of Crisis: Adaptive Strategies for Ensuring Business Resilience in Post-War Ukraine. *Philosophy and Governance.* 2024. № 3–4. DOI: 10.70651/3041-248X/2024.3-4.08
13. Федюнін С. А., Плевако Н. О., Філоненко М. Ю. Управління стратегічним розвитком підприємства. *Економіка. Менеджмент. Бізнес.* 2020. № 3 (33). С. 45–49. DOI: 10.31673/2415-8089.2020.035155
14. Феєр О., Хаустова К., Густі С. Стратегічне управління підприємством в умовах воєнного стану. *Innovation and Sustainability.* 2023. № 4. С. 90–97. DOI: 10.31649/ins.2023.4.90.97
15. Фоломкіна І. С. Тактика підприємства: сутність, особливості і взаємозв'язок зі стратегією. *Економічний вісник.* 2009. № 11. С. 4–9.
16. Pan X. An analysis of the strategies applied to the different strategic business units of the BCG matrix. *Advances in Economics, Management and Political Sciences*. 2023. Vol. 26. P. 373–378. DOI: 10.54254/2754-1169/26/20230599.
17. Birafane M., Liu W., Khalikov S. The strategic positioning of Moroccan seaports: An application of the Boston Consulting Group growth-share matrix. *The Open Transportation Journal*. 2020. Vol. 14, № 1. P. 133–139. DOI: 10.2174/1874447802014010133.
18. Hung C.-Y., Wang C.-C. An approach for multi-item product sales forecasting based on advancing the BCG matrix with matrix-clustering and time modeling techniques. *Systems.* 2024. Vol. 12, № 10. P. 388. DOI: 10.3390/systems12100388.
19. Petrillo A., Salomon V. A. P., Tramarico C. L. State-of-the-art review on the Analytic Hierarchy Process with BOCR. *Journal of Risk and Financial Management*. 2023. Vol. 16, № 8. P. 372. DOI: 10.3390/jrfm16080372.
20. Piatek R. Analysis of brand portfolios of automotive concerns using the BCG matrix. *Journal of Modern Science.* 2023. Vol. 54, № 5. P. 83–96.
21. García-Vidal G., Santos-Jaén J. M., Tavera-Cabrera E. Contribution margin and quantity matrix to analyze the product portfolio in the context of SMEs. Criticism of the BCG matrix and its alternatives. *Cogent Business & Management.* 2023. Vol. 10, № 3. DOI: 10.1080/23311975.2023.2233272.
22. Yang L., Xu Z., Yuan F., Liu Y., Tian G. Boston Consulting Group matrix-based equilibrium optimizer for numerical optimization and dynamic economic dispatch. *Electronics.* 2025. Vol. 14, № 3. P. 456. DOI: 10.3390/electronics14030456.
23. Gärtner Q., Bianchi A., Mulrav H., Reinhart G. Combining the analytical hierarchy process, fuzzy expert systems, and the exponential risk priority number for the holistic evaluation of innovation projects in manufacturing. *Production and Manufacturing Research*. 2024. Vol. 12, № 1. Article 2378200. DOI: 10.1080/21693277.2024.2378200.
24. Boston Consulting Group. Accelerating the shift to sustainable transport. BCG Insights. 2024. Available at: https://www.bcg.com/publications/2024/accelerating-the-shift-to-sustainable-transport.
25. Boston Consulting Group. How to profit in tomorrow's automotive and mobility industry. BCG Insights. 2023. Available at: https://www.bcg.com/publications/2023/profiting-in-the-future-of-automotive-industry.

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Сучасні макроекономічні тренди та тенденції

Modern macroeconomic trends and tendencies

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Hrushyna Alina
PhD in Economics,
Head of the Department for the Affirmation of Ukrainian National and Civic Identity,
Ministry of Youth and Sports of Ukraine,
42 Esplanadna St., Kyiv, 01601, Ukraine
e-mail: alinahrushyna@gmail.com
ORCID ID: 0000-0002-5918-1833

Fiscal sustainability and public resource management in the context of recovery: international experience

Abstract. Fiscal sustainability is a key condition for economic recovery in the context of hostilities and post-war development. For Ukraine, where the budget system has become one of the main instruments of sustainability during a large-scale war, the issue of fiscal policy is gaining relevance. Therefore, the relevance of the topic of the article is due to the realities of the Ukrainian economy and the urgent need to build fiscal sustainability of the country now and soon. The object of the study is the key steps of these countries aimed at economic recovery, tax system reform and the introduction of institutional mechanisms of budgetary discipline.

Problem statement. Despite significant international support and adaptation of Ukraine's domestic policy to rapidly changing realities, the task of maintaining fiscal sustainability in conditions of high uncertainty remains difficult. As for many countries that have experienced conflicts, a dilemma arises between the need to finance recovery and ensuring debt stability in the long term. At the same time, an extremely important element of the recovery and balancing system is minimizing costs and maximizing the effect.

Unresolved aspects of the problem. Previous studies have mostly focused on issues of fiscal consolidation or public debt management, but insufficient attention has been paid to the coordination of post-war fiscal policy with the institutional capabilities of the state. There is also a noticeable lack of comparative analysis of the experience of European countries in adapting individual reforms to existing initiatives.

Purpose of the article. The purpose is to identify and systematize effective fiscal instruments for ensuring stability in the post-war period based on the experience of France, Croatia, Bosnia and Herzegovina, Latvia, and Poland, and to adapt them to Ukraine's context.

Presentation of the main material. The research applies comparative, structural-logical, and content analysis methods to examine fiscal reforms, institutional innovations, and budgetary practices in post-conflict European states. The findings highlight that fiscal sustainability depends on constitutional debt limits, medium-term expenditure frameworks, independent fiscal councils, and transparent management of reconstruction funds. Achieving fiscal resilience in Ukraine requires institutionalizing fiscal rules, enhancing medium-term budgeting, strengthening fiscal oversight, and ensuring accountability in the use of international aid.

Conclusions. A comparative analysis of the main indicators of public debt and budget deficit in selected countries allowed us to draw practical conclusions regarding the possibilities of adapting the main approaches to modern conditions in Ukraine, in particular in the direction of digitalization and strengthening the administration of individual fiscal mechanisms. The study underscores the necessity of combining domestic reform with European fiscal governance standards to secure long-term stability and investor confidence.

Keywords: *fiscal sustainability, post-war recovery, budget policy, debt strategy, European integration.*

Formulas: –; fig.: –; tabl.: 2; bibl.: 24.

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Introduction. The post-war transformation of Ukraine is an inevitable stage of development that will require not only the reconstruction of destroyed infrastructure but also the establishment of a stable fiscal framework. Fiscal sustainability is not an abstract macroeconomic concept — it is a condition for building trust in the state, a foundation for the effective use of assistance, and a tool for the social recovery of society as a whole.

The war in Ukraine has created unprecedented fiscal challenges, jeopardizing the long-term sustainability of public finances. Under the conditions of total resource mobilization, infrastructure destruction, declining budget revenues, and rising expenditures on defense, social support, and reconstruction, fundamentally new approaches to public finance management are required.

Since the recovery process is inextricably linked to financial issues — including both budgetary resources and foreign investment — ensuring fiscal sustainability becomes a critically important element of the country's post-war development mechanism. At the same time, the process of European integration intensifies the requirements for transparency, accountability, and harmonization with EU standards.

Literature review. Global academic literature shows a growing interest in the issue of fiscal sustainability during crises and post-conflict recovery. The majority of scholars analyze how armed conflicts affect macroeconomic dynamics, particularly budget balances and debt policy.

Presbitero A. [23] explores the role of international financial institutions in post-crisis recovery and emphasizes the need to combine external financing with domestic revenue mobilization measures. He highlights that without structural tax reforms, international support has a limited impact on long-term sustainability.

Edison T., Niño-Zarazúa N., and Pirttilä J. [7] focus on the strategic dimensions of fiscal policy in the context of post-war recovery. They demonstrate that the institutional quality of public financial management directly correlates with the effectiveness of international aid: countries with transparent budget systems achieved higher GDP recovery rates. The authors argue that nations with access to external assistance and clearly defined debt frameworks are better able to avoid debt traps and maintain the fundamental stability of public finances.

Haughton J. [11] identified key fiscal and taxation policy measures necessary for restoring an economy devastated by war. The issue of post-conflict economic recovery was examined by Ogiorghenruan J.F.E. and Stewart F. [21], who justified the crucial role of the state in ensuring peace, establishing fair taxation, and creating incentives for all economic agents.

Bugard W., Prichard W., Milicic N., and Benson M. [8] argued that tax revenue mobilization should occupy a central place in rebuilding economies affected by conflict. Mauro P. and Villafuerte M. [17] proposed fiscal adjustment frameworks aimed at reducing public debt and budget deficits. Particular attention is also paid to transparency in the use of resources and to building trust in budgetary institutions.

In Ukrainian research, R. Yakovenko [6], I. Lunina, O. Bilousova, and N. Frolova [3], O. Zamkovyi [2], T. Kaneva, M. Pasichnyi, and I. Chuhunov [4; 15; 22] emphasize the need for tax system reform and highlight the importance of international financial assistance in containing inflation during wartime.

Institutional studies presented by the National Bank of Ukraine, the Ministry of Finance, and the Kyiv School of Economics [4; 16; 18] provide an in-depth analysis of risks to macro-financial stability, including inflationary processes, exchange rate policy, and the resilience of the banking sector. These materials stress that ensuring transparency in the budget process and maintaining realistic revenue and expenditure forecasts are key factors in fostering public trust in state finances.

However, most studies focus on analyzing fiscal policy indicators and drawing conclusions about lowering or raising tax rates for businesses and citizens. Often, the research is limited to examining debt sustainability through an indicative approach based on quantitative measures such as the budget deficit level, the volume of public debt, and the share of debt servicing in total expenditures. A significant part of the scholarly attention is directed toward the institutional

approach — assessing the quality of the budget process, the existence of fiscal rules, and the practice of long-term planning — which tends to be less effective under wartime conditions.

An important question remains insufficiently explored: what instruments, other than tax rate adjustments, can be implemented to improve the efficiency of public resource management, and how might they affect the fiscal sustainability of the state? In this regard, it is worth applying an intertemporal approach to assess the government's ability to maintain its debt burden at an acceptable level through the generation of primary surpluses in the future.

The real conditions are such that each economic case has a significant number of variables in the equation. Therefore, the above studies relate more to the general analysis of cases of recovery of countries, the accumulation of statistics or the general forecasting of future indicators based on them. That is why the analysis of the international experience of post-conflict countries is especially relevant for Ukraine: it allows to identify successful practices, avoid repeating other people's mistakes and develop its own strategic model of fiscal policy in war and post-war conditions.

Purpose, objectives and research methods. The purpose of our study is to analyze international experience in shaping a country's fiscal sustainability after military operations or global transformations of states. At the same time, it is important to compare the mechanisms that are already in place and identify the range of problems preventing them from being effective in the near term. The implementation of new reforms is always accompanied by additional expenditures from the state budget. Currently, Ukraine is interested in ensuring the most efficient use of resources — achieving the maximum possible impact with minimal costs.

The research used the method of comparative analysis to study the experience of post-war fiscal policy of individual European countries. A structural-logical approach was applied to systematize theoretical provisions and identify key areas of fiscal sustainability. Content analysis of scientific and analytical works allowed us to identify key trends in the formation of fiscal policy in post-war countries. Elements of the historical-comparative method were used to identify common and distinctive features in the transformation of budget systems in different periods. The empirical base was formed on the basis of statistical data of international organizations, national financial institutions and analytical centers of Ukraine.

Research results. Fiscal sustainability is, above all, about the state's ability to finance its obligations without risking a debt crisis. It also reflects trust in the effective management of public finances.

According to Musgrave [19], fiscal policy is an instrument for achieving macroeconomic objectives. The International Monetary Fund defines it as the influence exerted through revenues and expenditures on employment, inflation, and growth. Chuhunov A. views it as a tool for implementing the state's socio-economic strategy [5].

The main approaches to assessing fiscal sustainability include:

- ntertemporal budget constraint — assessing whether the government can maintain its debt at a stable level;
- Debt Sustainability Analysis (DSA**)** — forecasting debt while accounting for potential risks;
- Indicative approach — examining indicators such as deficit, debt, and borrowing levels;
- Institutional approach — evaluating the quality of governance, the presence of fiscal rules, and long-term strategies.

Given the specific needs of Ukraine's economy and the challenging circumstances that hinder long-term strategic planning, a key task is to determine how to finance public expenditures and service debt obligations without resorting to abrupt changes in tax policy.

For this purpose, it is advisable to analyze existing international experience and assess the feasibility of its implementation in Ukraine.

One of the most notable large-scale examples is the post-war reconstruction of European countries, particularly the Marshall Plan. After the Second World War, most European nations faced severe budget deficits, widespread infrastructure destruction, and the devaluation of national currencies. Through the Marshall Plan (1948–1952), Western European countries received assistance in the form of grants and loans totaling around 13 billion USD, which enabled recovery without a critical increase in public debt.

The Marshall Plan ensured post-war fiscal stabilization by combining large-scale economic aid with strict fiscal discipline, institutional coordination, and structural reforms.

A particularly illustrative case is that of France, which under the Marshall Plan not only received substantial financial support (over 2.7 billion USD, equivalent to about 5.4% of France's GDP in 1948 or roughly 20% of all program funds) but also implemented key fiscal reforms that laid the foundation for long-term macroeconomic stability.

Among the main fiscal stabilization measures was the introduction of the value-added tax (VAT). At the same time, France modernized its tax administration by introducing internal audits, enhancing staff professionalism, and simplifying administrative procedures. Some taxation powers were transferred to regional authorities, thereby strengthening fiscal responsibility at the local level.

As a result of these measures, France's fiscal deficit declined from 9% to 2.5% of GDP within four years, inflation was curbed, and the economy returned to growth — with GDP increasing by 6–7% annually between 1950 and 1953. This example demonstrates that international aid can be most effective only when accompanied by structural fiscal reforms.

For Ukraine, which already has a value-added tax (VAT) but continues to face challenges in its administration, this case holds practical significance. Conditional external financing could serve as an incentive for a comprehensive tax reform aimed at simplifying procedures, combating the shadow economy, and digitalizing the tax administration system. As in France's case, such reforms would strengthen both fiscal sustainability and public trust in the budget.

The historical example of France within the framework of the Marshall Plan demonstrates the effectiveness of combining large-scale external support with deep structural reforms in public finance. For Ukraine, this experience is especially relevant given the similar context: large-scale destruction, significant social expenditures, dependence on external financing, and — most importantly — the ongoing process of European integration.

Based on the French experience, Ukraine could undertake the following concrete steps:

1. Reform of VAT administration: automate accounting processes, minimize the human factor, and introduce full digital reporting.
2. Fiscal decentralization: emphasizing not only the distribution of funds but also accountability. Since 2014, Ukraine has implemented budget decentralization, with a significant share of personal income tax (60%), single tax, and excise revenues already allocated to local budgets. However, further strengthening of local fiscal capacity requires:
   - real leverage over the tax base (access to tax data, analytics, and cooperation tools with the State Tax Service);
   - institutional incentives to attract businesses and investments, including local-level tax management;
   - mechanisms for transparent evaluation of spending efficiency, which build taxpayer trust and enhance accountability.
3. Conditional international assistance: establishing donor memoranda that stipulate concrete fiscal reforms — including digitalization, optimization of the tax structure, and medium-term budget planning.
4. Preparation for a comprehensive tax reform:
   - conducting an audit of tax benefits and special regimes;
   - eliminating inefficient levies in favor of unified, stable taxes with clearly defined purposes.

The introduction of such instruments would enable Ukraine to lay the foundations for long-term fiscal sustainability, restore trust in the tax system, and improve the efficiency of public resource management. Conditional international assistance, provided in exchange for structural fiscal reforms, could become a powerful driver of modernization and accelerate the process of European integration.

A particularly relevant example for Ukraine is the experience of Croatia, which, after the War of Independence (1991–1995), faced a deep economic crisis and significant fiscal challenges. During this period, the country's GDP fell by nearly 40%, more than 35% of industrial infrastructure in some regions was destroyed, and external debt rose from 15% to 45% of GDP. The country also experienced mass population displacement and a sharp increase in social spending.

In response to these challenges, the Croatian government implemented a set of systemic fiscal policy measures aimed at stabilizing public finances, supporting economic recovery, and aligning with European Union standards.

One of the key steps included:

- The introduction of a value-added tax (VAT) in 1993, which accounted for more than 50% of total budget revenues;
- The establishment of legal limits on the budget deficit and public debt, including the integration of the so-called *"golden budget rule"* into the Constitution (after Croatia's accession to the EU in 2013). This rule stipulates that, in the medium term, current expenditures must be financed solely from current revenues, while deficits are permitted only for investment purposes. In this way, structural deficits are contained, and a sustainable fiscal policy framework is ensured.

Croatia introduced a three-year planning cycle (MTEF – Medium-Term Expenditure Framework), which linked the budget to macroeconomic forecasts, assessed risks, and projected expenditures. This made the budgeting process more predictable. Such an approach ensures greater predictability, transparency, and coherence in fiscal policy.

In Ukraine, a similar instrument is the Budget Declaration, introduced in 2020 following amendments to the Budget Code. It sets the main fiscal guidelines for a three-year period but remains largely declarative in nature: mechanisms of accountability for deviations, fiscal risk assessment, and reporting are still insufficiently developed.

To strengthen fiscal accountability, Croatia established an independent Fiscal Council, responsible for evaluating the realism of budget forecasts, monitoring compliance with fiscal rules, and preparing annual reports for parliament. This helped reduce the influence of the political cycle on the budget process. In Ukraine, some analytical functions related to budget evaluation are performed by the Accounting Chamber, but it lacks a mandate for ex-ante analysis of forecasts or oversight of compliance with fiscal constraints.

Since 2005, Croatia actively prepared for EU membership, which required the harmonization of fiscal legislation, adherence to the Maastricht criteria (deficit <3%, debt <60% of GDP), and accession to the Stability and Growth Pact. These efforts enhanced transparency, predictability of fiscal policy, and access to EU structural funds. Whether Ukraine will be able to meet the Maastricht criteria in the coming years remains an open question, yet it is quite realistic with strong international support.

Croatia's experience—combining political will, institutional capacity, and international integration—demonstrates practical mechanisms for achieving fiscal sustainability. In the context of post-war recovery, Ukraine can adapt the following elements:

- Constitutional anchoring of fiscal responsibility principles, including deficit and debt limits;
- Institutionalization of an independent fiscal council to assess budget forecasts, fiscal risks, and compliance with medium-term goals;

- Improvement of medium-term budget planning, already implemented through the Budget Declaration but requiring stronger analytical foundations, reporting mechanisms, and accountability for deviations;
- Reliance on VAT as a stable revenue source, with an emphasis on digitalization and reducing the shadow economy;
- Integration of EU norms into Ukraine's fiscal practice, including participation in mechanisms of macroeconomic monitoring and fiscal oversight.

Thus, combining Croatia's experience with Ukraine's existing instruments — such as the Budget Declaration, three-year planning, and digital tools of the State Tax Service — could form the foundation of a modern, responsible, and resilient fiscal architecture in the post-recovery period.

The experience of France and Croatia demonstrates that post-war fiscal resilience is achievable only through a combination of institutional, regulatory, and operational reforms, supported by international partners.

Despite operating in different historical contexts, both countries implemented a series of common strategic steps. These approaches can confidently be adapted as a roadmap for Ukraine's reconstruction, in particular:

- implementation of strict fiscal rules (including the "golden rule" of budgeting);
- establishment of an independent fiscal council;
- strengthening of medium-term budget planning;
- digital modernization of tax administration;
- effective utilization of international assistance;
- creation of transparent recovery funds under public and parliamentary oversight.

These instruments not only ensure fiscal discipline but also build trust in public finances, which is crucial during the post-war recovery and the process of European integration.

In the context of post-war reconstruction and Ukraine's European integration trajectory, it is worth broadening the scope of fiscal policy analysis beyond the classical cases of France and Croatia. In particular, the experiences of certain Central, Southern, and Eastern European countries that faced crises or conflicts offer valuable lessons on adapting fiscal systems to extraordinary conditions. Especially illustrative are the cases of Bosnia and Herzegovina, Latvia, and Poland, which represent different models of interaction between fiscal stabilization, institutional capacity, and external support.

Countries of Central and Eastern Europe, which experienced periods of severe economic turbulence, managed to achieve fiscal sustainability through decisive institutional and budgetary reforms. Poland, Latvia, and Bosnia and Herzegovina each operated in distinct contexts, yet all demonstrated the importance of clear fiscal rules, transparent tax administration, independent fiscal monitoring, and coordination with international partners. Ukraine possesses certain instruments inspired by these examples, but their effectiveness is often diminished by fragmentation or insufficient institutional independence.

After the 1992–1995 war, Bosnia and Herzegovina received large-scale international assistance but simultaneously faced profound institutional challenges. The country's political architecture, enshrined in the Dayton Accords, established a decentralized governance model with autonomous budgets (the Federation of Bosnia and Herzegovina and the Respublika Srpska).

This case illustrates that financial aid without institutional unity does not guarantee effective recovery. For Ukraine, it is therefore essential to ensure a single center for coordinating fiscal policy, which implies synchronization among ministries, recovery agencies, and local budgets.

During the 2008–2010 crisis, Latvia, with the support of the MF, the EU, and the World Bank, implemented a strict fiscal adjustment program — cutting expenditures, raising taxes, and strengthening fiscal discipline. Despite significant social hardship, the government adhered to its commitments, which allowed the country to return to a growth trajectory relatively quickly.

A key institutional achievement was the establishment of an independent fiscal council, which conducts ex-ante assessments of government forecasts, monitors compliance with medium-term fiscal targets, and ensures the transparency of the fiscal process. This experience is particularly relevant for Ukraine: trust in fiscal policy is built not only through budget figures but through transparent procedures, professional analytics, and preventive oversight**.**

Table 1. Description of fiscal policy reforms in Poland, Latvia, Bosnia and Herzegovina

Country	Key steps that have been implemented	Results	Proposals for Ukraine
Poland	– medium-term budgeting (before EU accession) – fiscal rules (deficit, debt) – VAT e-administration – integration with European funds	– tax revenue growth without rate increases – sustainable macro-financial stability – access to EU funds	– to enshrine fiscal rules at the level of law – to ensure effective medium-term planning – to scale up electronic VAT control
Latvia	– tough fiscal adjustment (2008–2010) – cooperation with IMF, EU, World Bank – Fiscal Council (since 2014) – transparency of the budget process	– recovery increased after 2 years – high level of trust in public finances	– to create an independent fiscal council – to strengthen the role of analytical findings in the budget process – to ensure the publicity of fiscal decisions
Bosnia and Herzeg ovina	– single VAT (2006) – Treasury reform – creation of revenue sharing mechanisms	– budget revenues increased – coordination limited due to decentralization	– to increase fiscal policy coherence – to coordinate state, local, and recovery budgets – to create a single donor management center

Source: prepared by the author

As a result, Latvia quickly restored investor confidence and resumed GDP growth as early as 2011. The fiscal council became a cornerstone of independent oversight and preventive budget analysis.

Poland, in turn, consistently built a fiscal system capable of withstanding shocks. Prior to joining the EU, it introduced medium-term planning**,** deficit and debt limits**,** and modernized VAT administration. After 2004, Poland integrated into the EU's macroeconomic surveillance mechanisms and established a co-financing system for infrastructure projects using European funds. In addition, in the 2010s, the country launched an e-invoicing system and electronic VAT monitoring, resulting in higher revenues without raising tax rates, improved fiscal discipline, and expanded access to major EU infrastructure resources.

The success of this model rested not only on external benchmarks but also on the consistent development of domestic institutions for budget and debt management. For Ukraine, which is also moving along the path of European integration, the Polish experience highlights the importance of codifying fiscal rules in law**,** building independent fiscal scenario analysis, and creating transparent cooperation mechanisms with donors.

By analyzing the fiscal resilience strategies of the countries, we can clearly identify the key steps implemented and the results that Ukraine can adapt to strengthen its own fiscal architecture.

Table 2. Macroeconomic indicators of fiscal stress

Country	GDP decline (%)	Debt (% of GDP)	Share of VAT in budget revenues (%)
Croatia	-40	45	55
France	-22 (1944–45)	150	28
Latvia	-18 (2008–2010)	40	37
Poland	-0.1 (2009)	50	35
Bosnia and Herzegovina	-30 (1992–1995)	60	45
Ukraine	-29 (2022)	49	45

Source: prepared by the authors on the basis of [4; 12-14; 18; 24]

Discussion. Ukraine's fiscal resilience, despite the complex circumstances, continues to strengthen and move toward integration with the European Union. However, under the pressure of urgent defense-related priorities, several important fiscal and institutional issues are being pushed out of the immediate policy agenda.

The conducted research confirms that the experiences of France, Croatia, Latvia, Poland, and Bosnia and Herzegovina hold significant applied relevance for Ukraine. In all cases, the key factor of recovery was a combination of fiscal discipline, external support, and institutional strengthening of the budgetary process. Similar conclusions are found in the World Bank's reports, which emphasize that international assistance is effective only when accompanied by internal reforms.

A comparison with the Ukrainian situation demonstrates the presence of important instruments—such as medium-term budget planning and revenue decentralization—yet their effectiveness remains limited due to weak institutional oversight and the short-term orientation of government decisions. This, in turn, supports the findings of foreign researchers who argue that institutional quality plays a decisive role in ensuring post-crisis fiscal sustainability.

At the same time, certain ambiguities remain. For instance, the significant role of VAT in the fiscal systems of post-conflict countries may serve as a positive signal for Ukraine; however, without decisive measures to combat economic shadowing, this instrument will have limited efficiency. Similar risks apply to reconstruction funds: the experiences of Croatia and Poland demonstrate that transparent management and independent oversight are critically important to ensure their effectiveness.

The obtained results indicate the necessity of combining institutional reforms with macroeconomic stabilization. Future research could focus on quantitative assessments of the impact of specific fiscal instruments on GDP recovery dynamics and on analyzing Ukraine's potential to integrate into European mechanisms of budgetary discipline monitoring**.**

Conclusions. The scientific novelty of this study lies in the generalization of the post-war experience of European countries and its adaptation to the Ukrainian context in terms of fiscal resilience, considering the ongoing transformation of the state's fiscal policy. The theoretical significance of the work consists in the systematization of approaches to strengthening fiscal sustainability in the context of post-war recovery. The practical value lies in the set of specific recommendations for Ukraine, which also consider the reforms already initiated to enhance fiscal stability.

Based on the analysis of international experience, it is advisable to:

1. Ensure reliable medium-term budget planning**.**

In Ukraine, a Budget Declaration already exists; however, there is no independent monitoring or mandatory accountability for deviations. It is recommended to institutionalize independent analytics (either through a functionally autonomous unit within the Ministry of Finance or an independent think tank) and introduce a "comply or explain" mechanism when fiscal targets are revised.

2. Develop independent fiscal monitoring.

What Ukraine needs is not a politically dependent body but a technocratic institution with an analytical mandate. It would be reasonable to establish an independent expert platform based on existing research centers or international technical assistance programs, ensuring regular public reporting.

3. Codify fiscal rules in law.

Ukraine currently has deficit limits, but without proper legal status. It would be appropriate to adopt a Law on Fiscal Responsibility with clearly defined deficit and debt thresholds, supported by enforcement and accountability mechanisms.

4. Optimize tax administration (especially VAT).

Partial digitalization has already taken place in Ukraine; however, there remain gaps in automated control and verification. It is necessary to introduce a real-time risk analysis system**,**

integrated with customs and tax databases, focusing on automatic VAT refunds and combating fraudulent schemes.

5. Ensure effective coordination of financial assistance.

Ukraine currently has parallel institutions (the Recovery Agency, Ministry of Finance, line ministries, donors) that often act in a fragmented manner. Instead of a large interagency council, an operational recovery management office should be created as an executive unit with clear hierarchy, financial monitoring, and analytical authority.

Fiscal resilience is a result of action, not declarations. Ukraine already possesses several relevant instruments, yet their effectiveness requires the integration of institutional, regulatory, and operational reforms, supported by international partners. The experiences of Poland, Latvia, Croatia, France, and Bosnia and Herzegovina demonstrate that a recovery strategy cannot exist without a fiscal framework — one that is strict, transparent, and predictable.

The post-war recovery period creates a unique window of opportunity for deep fiscal reforms that were previously blocked politically or institutionally. Making use of this moment is critically important for building a fiscally sustainable state.

Thus, the next stage of Ukraine's budget policy should be based on the concept of "smart responsibility" — transparent, predictable, and analytically grounded.

References

1. Dmytrenko, E. (2023). *The financial system of Ukraine in wartime and post-war periods: Legal and security dimensions. Kyiv Journal of Law*, (2), 143–148. DOI: https://doi.org/10.32782/klj/2023.2.19 [in Ukrainian]
2. Zamkovyi, O. S. (2025). *Fiscal policy in the system of financial and economic relations. Economics, Finance, Money Circulation and Credit. Business Inform*, (3), 261–269. DOI: https://doi.org/10.32983/2222-4459-2025-3-261-269 [In Ukrainian]
3. Lunina, I. (2022). *Formation of fiscal space in wartime and postwar periods. Economy and State*, 4, 20–28. DOI: https://doi.org/10.32702/2306-6806.2022.4.20 [in Ukrainian]
4. National Bank of Ukraine. (2023). *Financial Stability Report.* Kyiv: NBU. Retrieved from: https://bank.gov.ua/ua/news/all/zvit-pro-finansovu-stabilnist-gruden-2023-roku [in Ukrainian]
5. Chugunov, I. Ya., & Nikitishin, A. O. (2019). *Tax security of the state. Scientia Fructuosa*, 4, 31–41. DOI: https://doi.org/10.31617/visnik.knute.2019(126)03
6. Yakovenko, R. V. (2022). *Management of Ukraine's economic system under Russian aggression. Economy and State*, 3, 49–52. DOI: https://doi.org/10.32702/2306-6806.2022.3.49 [in Ukrainian]
7. Addison, T., Niño-Zarazúa, M., & Pirttilä, J. (2022). *Fiscal policy, state building and economic development. Journal of International Development*, 34(5), 905–920. DOI: https://doi.org/10.1002/jid.3355
8. Boogaard, V., Prichard, W., Milicic, N., & Benson, M. (2016). *Tax revenue mobilization in conflict-affected developing countries.* Working Paper 2016/155. Helsinki: UNU-WIDER. Retrieved from: https://www.ictd.ac/publication/wider-working-paper-155-2016/
9. Eichengreen, B. (1989). *The capital levy in theory and practice.* NBER Working Paper No. 3096. Retrieved from: https://www.nber.org/papers/w3096
10. European Commission. (2014). *Convergence Programme of Poland.* Brussels: European Commission. https://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee4_en.pdf
11. Haughton, J. (2020). *Budgetary and tax policy in post-conflict reconstruction. Journal of Peace Economics*, 7(3), 45–60.
12. International Monetary Fund. (2001). *Croatia: Country Report No. 01/209.* Washington, D.C.: IMF. https://www.imf.org/external/pubs/ft/scr/2001/cr01209.pdf
13. International Monetary Fund. (2010). *Republic of Latvia: Staff report on request for stand-by arrangement.* Washington, D.C.: IMF. https://www.imf.org/external/pubs/ft/scr/2010/cr10356.pdf
14. International Monetary Fund. (2025). *Fiscal Monitor.* Washington, D.C.: Fiscal Affairs Department. https://www.imf.org/en/Publications/FM
15. Kaneva, T., Chugunov, I., Pasichnyi, M., & Nikitishin, A. (2022). *Tax policy for economic recovery and sustainable development after COVID-19. Problemy Ekorozwoju*, 17(2), 102–109. https://doi.org/10.35784/pe.2022.2.11
16. Kyiv School of Economics. (2024). *Fiscal Digest.* Kyiv: KSE. https://kse.ua/wp-content/uploads/2025/02/Fiscal-Digest-2024.pdf
17. Mauro, P., & Villafuerte, M. (2013). *Past fiscal adjustments: Lessons from failures and successes. IMF Economic Review*, 61(2), 379–404.
18. Ministry of Finance of Ukraine. (2023). *Fiscal policy report 2023.* Kyiv: Ministry of Finance of Ukraine. https://mof.gov.ua/storage/files/Fin%20Report%20PEACE%20UA_Eng.pdf
19. Musgrave, R. A. (1959). *The theory of public finance.* New York: McGraw-Hill.
20. OECD. (1995). *Marshall plan data archives.* Paris: OECD. https://www.oecd.org/content/dam/oecd/en/publications/reports/2008/09/the-marshall-plan_g1gh8e35/9789264044258-en.pdf

21. Ohiorhenuan, J.-F. E., & Stewart, F. (2008). *Post-conflict economic recovery: Enabling local ingenuity.* UNDP, Bureau for Crisis Prevention and Recovery. https://www.un.org/Publications
22. Pasichnyi, M. (2024). *Fiscal dominants of military financing. Scientia Fructuosa,* 2, 20–37. https://doi.org/10.31617/1.2024(154)02
23. Presbitero, A. (2022). *Post-conflict fiscal adjustments: Evidence from fragile economies.* Washington, D.C.: World Bank. https://documents1.worldbank.org/curated/en/099435412122316848/pdf/IDU043dab8f8048ab04c690a9e20a03af5879265.pdf
24. World Bank. (2024). *Bosnia and Herzegovina country economic memorandum.* Washington, D.C.: World Bank. https://openknowledge.worldbank.org/handle/10986/41059

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Аліна Грушина
кандидат економічних наук
начальник управління утвердження української національної та громадянської ідентичності,
Міністерство молоді та спорту України,
вул. Еспланадна, 42, м. Київ, 01601, Україна
e-mail: alinahrushyna@gmail.com
ORCID ID: 0000-0002-5918-1833

Фіскальна стійкість та управління державними ресурсами в умовах відновлення: міжнародний досвід

Анотація. Фіскальна стійкість є ключовою умовою відновлення економіки в умовах воєнних дій та післявоєнного розвитку. Для України, де бюджетна система стала одним із головних інструментів стійкості під час масштабної війни, питання фіскальної політики набуває особливої актуальності. Відтак, актуальність теми статті обумовлена реаліями української економіки та нагальною потребою побудови фіскальної стійкості країни зараз та в найближчому майбутньому. Об'єктом дослідження є ключові кроки цих країн, спрямовані на відновлення економіки, реформування податкової системи та запровадження інституційних механізмів бюджетної дисципліни.

Постановка проблеми. Незважаючи на суттєву міжнародну підтримку та адаптацію внутрішньої політики України до швидкоплинних змін реалій, завдання збереження фіскальної стійкості в умовах високої невизначеності залишається складним. Як і для багатьох країн, що пережили конфлікти, постає дилема між необхідністю фінансування відновлення та забезпеченням боргової стабільності у довгостроковій перспективі. При цьому вкрай важливим елементом системи відновлення та балансування є мінімізація витрат та максимізація ефекту.

Нерозв'язані аспекти. Попередні дослідження здебільшого зосереджені на питаннях фіскальної консолідації чи управління державним боргом, проте недостатньо уваги приділено узгодженню післявоєнної фіскальної політики з інституційними спроможностями держави. Також відчутною є нестача порівняльного аналізу досвіду країн Європи щодо адаптації окремих реформ з уже існуючими ініціативами.

Мета статті. Метою статті є дослідження ефективних підходів забезпечення фіскальної стійкості у післявоєнних умовах на прикладі досвіду Франції, Хорватії, Боснії і Герцеговини, Латвії та Польщі.

Основний матеріал. У статті проаналізовано основні реформи бюджетної політики країн, що призвели до фіскальної стійкості саме після геополітичних трансформацій, зокрема війни. Виявлено, що важливим чинником стала інтеграція у європейські структури, гармонізація законодавства та створення незалежних органів контролю за фіскальною політикою. При цьому самі перераховані кроки стали спільними для більшості досліджуваних країн. Визначено, що для України особливо актуальним є запровадження в майбутньому конституційних обмежень на дефіцит бюджету, посилення середньострокового бюджетного планування, формування незалежних фіскальних органів та використання цільових фондів відбудови з прозорим механізмом управління. Окреслено основні недоліки вже впроваджених механізмів фіскальної політики.

Висновки. Проведений порівняльний аналіз основних показників державного боргу та бюджетного дефіциту у вибраних країнах, дозволив зробити практичні висновки щодо можливостей адаптації основних підходів у сучасних умовах в Україні, зокрема у напрямі цифровізації та посилення адміністрування окремих фіскальних механізмів. Наукова новизна дослідження полягає у конкретному обґрунтуванні рекомендацій щодо вирішення основних проблем української економіки в напрямі фіскальної політики у період післявоєнного відновлення. При цьому запропоновано вдосконалення вже працюючих інструментів задля зниження витрат з державного бюджету на реформи. Практичну значущість статті становлять рекомендації, які можуть бути використані державними органами при розробці механізмів впровадження окремих реформ чи удосконалення вже існуючих фіскальних механізмів в Україні.

Ключові слова: *фіскальна стійкість, післявоєнне відновлення, бюджетна політика, боргова стратегія, євроінтеграція*.

Формули: –; рис.: –; табл.: 2; бібл.: 24.

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Список літероатури

1. Дмитренко, Е. (2023). *Фінансова система України у воєнний та повоєнний періоди: правовий та безпековий вимір.* Київський часопис права, 2023. № 2, С. 143-148. DOI: https://doi.org/10.32782/klj/2023.2.19
2. Замковий, О. С. (2025). *Фіскальна політика в системі фінансово-економічних відносин.* Економіка фінанси грошовий обіг і кредит. Бізнесінформ, № 3, 261–269. DOI: https://doi.org/10.32983/2222-4459-2025-3-261-269
3. Луніна, І. (2022). *Особливості формування фіскального простору у воєнний та поствоєнний періоди.* Економіка та держава, 4, 20–28. DOI: 10.32702/2306-6806.2022.4.20
4. Національний банк України. (2023). *Звіт про фінансову стабільність.* Київ: НБУ. URL: https://bank.gov.ua/ua/news/all/zvit-pro-finansovu-stabilnist-gruden-2023-roku

5. Чугунов, І. Я., & Нікітішин, А. О. (2019). *Податкова безпека держави.* Scientia Fructuosa, 4, 31–41. DOI: https://doi.org/10.31617/visnik.knute.2019(126)03
6. Яковенко, Р. В. (2022). *Управління економічною системою України в умовах російської агресії.* Економіка та держава, 3, 49–52. DOI: 10.32702/2306-6806.2022.3.49
7. Addison, T., Niño-Zarazúa, M., & Pirttilä, J. (2022). *Fiscal Policy, State Building and Economic Development.* Journal of International Development, 34(5), 905–920. DOI: 10.1002/jid.3355
8. Boogaard, V., Prichard, W., Milicic, N., & Benson, M. (2016). *Tax Revenue Mobilization in Conflict-Affected Developing Countries.* Working Paper 2016/155. Гельсінкі: UNU-WIDER. URL: https://www.ictd.ac/publication/wider-working-paper-155-2016/
9. Eichengreen, B. (1989). *The Capital Levy in Theory and Practice.* NBER Working Paper No. 3096. URL: https://www.nber.org/papers/w3096
10. European Commission. (2014). *Convergence Programme of Poland.* Brussels: European Commission. URL: https://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee4_en.pdf
11. Haughton, J. (2020). *Budgetary and Tax Policy in Post-Conflict Reconstruction.* Journal of Peace Economics, 7(3), 45–60.
12. International Monetary Fund. (2001). *Croatia: Country Report No. 01/209.* Washington, D.C.: IMF. URL: https://www.imf.org/external/pubs/ft/scr/2001/cr01209.pdf
13. International Monetary Fund. (2010). *Republic of Latvia: Staff Report on Request for Stand-By Arrangement.* Washington, D.C.: IMF. URL: https://www.imf.org/external/pubs/ft/scr/2010/cr10356.pdf
14. International Monetary Fund. (2025). *Fiscal Monitor.* Washington, D.C.: Fiscal Affairs Department. URL: https://www.imf.org/en/Publications/FM
15. Kaneva, T., Chugunov, I., Pasichnyi, M., & Nikitishin, A. (2022). *Tax Policy for Economic Recovery and Sustainable Development after COVID-19.* Problemy Ekorozwoju, 17(2), 102–109. DOI: https://doi.org/10.35784/pe.2022.2.11
16. Kyiv School of Economics. (2024). *Fiscal Digest.* Kyiv: KSE. URL: https://kse.ua/wp-content/uploads/2025/02/Fiscal-Digest-2024.pdf
17. Mauro, P., & Villafuerte, M. (2013). *Past Fiscal Adjustments: Lessons from Failures and Successes.* IMF Economic Review, 61(2), 379–404.
18. Ministry of Finance of Ukraine. (2023). *Fiscal Policy Report 2023.* Kyiv: Ministry of Finance of Ukraine. URL: https://mof.gov.ua/storage/files/Fin%20Report%20PEACE%20UA_Eng.pdf
19. Musgrave, R. A. (1959). *The Theory of Public Finance.* New York: McGraw-Hill.
20. OECD. (1995). *Marshall Plan Data Archives.* Paris: OECD. URL: https://www.oecd.org/content/dam/oecd/en/publications/reports/2008/09/the-marshall-plan_g1gh8e35/9789264044258-en.pdf
21. Ohiorhenuan, J.-F. E., & Stewart, F. (2008). *Post-Conflict Economic Recovery: Enabling Local Ingenuity.* UNDP, Bureau for Crisis Prevention and Recovery. URL: https://www.un.org/Publications
22. Pasichnyi, M. (2024). *Fiscal dominants of military financing.* Scientia Fructuosa, 2, 20–37. DOI: 10.31617/1.2024(154)02
23. Presbitero, A. (2022). *Post-Conflict Fiscal Adjustments: Evidence from Fragile Economies.* Washington, D.C.: World Bank. URL: https://documents1.worldbank.org/curated/en/099435412122316848/pdf/IDU043dab8f8048ab04c690a9e20a03af5879265.pdf
24. World Bank. (2024). *Bosnia and Herzegovina Country Economic Memorandum.* Washington, D.C.: World Bank. URL: https://openknowledge.worldbank.org/handle/10986/41059

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Mustetsa Iryna
Candidate of Economic Sciences, Associate Professor
at the Department of Finance, Accounting and Taxation,
Chernivtsi Institute of Trade and Economics of
State University of Trade and Economics,
7, Central Square, Chernivtsi, 58002, Ukraine
e-mail:super-iramw@ukr.net
ORCID ID: 0000-0002-1033-2282

The enhancement of Ukraine's public debt management instruments within the context of a war economy

Abstract. Assessing the current state of public debt is the basis for forming an effective debt policy, which should be focused on ensuring macroeconomic stability and promoting social welfare. The relevance of the issue of public debt growth goes beyond theoretical discourse, also covering the practical dimension—the sphere of economic management.

Problem statement. The use of analytical tools for assessing public debt is a key factor in improving the effectiveness of debt management, ensuring the sustainability of public finances, and forming a long-term economic development strategy in a war economy. The study conducted for 2019–2024 confirms the trend toward debt growth and budget deficit to GDP in conditions of armed conflict.

Unresolved aspects of the problem. In the wartime period, when the economy is operating under extreme stress, systematic analysis of debt obligations becomes particularly important, allowing not only for the timely identification and minimization of fiscal risks, but also for the rational use of available financial resources to stimulate economic growth.

Purpose of the article. Assessment of the current state of public debt and instruments for managing it under martial law.

Presentation of the main material. The Ukrainian public debt management system is a set of institutions, mechanisms, instruments, and processes aimed at attracting, servicing, and repaying public borrowings, as well as ensuring the debt sustainability of the state in conditions of military and crisis challenges. The object of the study is the process of public debt assessment.

The study uses a set of general scientific theoretical methods. System analysis was used to identify the main criteria and factors of effective public debt management. The induction method was used during the collection, systematization, and processing of data, which ensured the formation of the analytical basis of the study.

Conclusions. The results of the study show that the growth of debt burden necessitates a review of fiscal policy, optimization of sources of budget deficit financing, and more efficient use of borrowings. The formation of a comprehensive debt strategy focused on fiscal responsibility, economic stability, and post-war recovery is proposed.

The practical value of the results lies in establishing the main directions for public debt management, which will minimize risks and maximize the use of available resources and opportunities for post-war economic development.

Keywords: *martial law, public debt, debt optimization, public debt management.*
Formulas: 0, fig.: 1, tabl.: 2, bibl.: 12.
JEL: H63, H68, E62

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Introduction. The issue of public debt is complex and multidimensional, covering not only financial but also structural and economic aspects. In most scientific studies, this category is mainly analyzed through the prism of credit and financial relations, which limits the completeness of its understanding and leaves out the underlying prerequisites for the formation and accumulation of debt obligations, which have their origins in the contradictions of the process of reproduction of social capital.

The constant accumulation of debt obligations leads to increased risks, accompanied by a sense of uncertainty among economic policy makers and affecting overall macroeconomic stability. This situation complicates the formation of effective development strategies and calls into question the effectiveness of traditional instruments of state regulation.

According to the provisions of the Budget Code of Ukraine, public debt is interpreted as the totality of the state's obligations to repay loans (borrowings) received but not yet repaid as of the reporting date, which arise as a result of public borrowing [2].

Considering that public debt significantly transforms the structure of social production and affects the reproductive proportions of capital, it is advisable to study it from the perspective of a reproductive approach, which allows debt to be viewed not only as a financial category, but also as an element of economic dynamics in a broad systemic context.

Literature review. Many scholars have devoted their work to researching issues related to the assessment of public debt for management purposes. For example, Romanovska Y. and Stoliar L. note that the analysis of public debt is a critically important tool for assessing the financial condition of a country and forming effective economic and social policies, especially in conditions of martial law [9].

The issue of Ukraine's debt security in the context of military conflict is being actively researched by leading Ukrainian scholars, in particular Kubakh T. H. Riabushka L. B. and Pavlenko V. V., who in their works focus on the threats of growing public debt, the impact of external borrowing on macroeconomic stability, and the need to reform debt management mechanisms in crisis conditions [4,7]. Biriuk D. O. also notes that with the start of the war, there has been a significant increase in public debt due to increased defense spending and a decline in GDP. The scientist notes that the impact of preferential borrowing terms from international partners on the debt structure and the growth of international reserves is positive. Attention is drawn to the growth of currency and inflation risks associated with external borrowing and the high discount rate of the National Bank of Ukraine [1].

In their study, Y.A. Haibur substantiates the expediency of applying specific public debt management tools at the current stage of development of the Ukrainian economy, as well as in the prospective post-war period, taking into account the best practices of international experience. It is determined that the state's debt policy is a key element in ensuring the country's economic stability and long-term development.

It is emphasized that effective public debt management contributes to the prevention of financial crises, the creation of conditions for macroeconomic stability, and the strengthening of trust on the part of international partners and domestic investors. In addition, it provides the government with additional tools to influence the economic situation, which is particularly relevant in the context of full-scale war and limited budget resources [3].

In view of the trend towards increasing debt obligations, it is advisable to strengthen control and introduce audits on the targeted use of funds, which will allow the timely detection of deviations in the financing of certain projects [5]. Scientists note the impact of decentralisation processes, which are proving effective in the distribution and expenditure of budget funds. In addition, assessing the level of decentralization of revenues and tax autonomy in the member states of the European Union and Ukraine is a priority for the financial capacity of local governments [12].

Thus, the problems of improving the efficiency of public debt management, as well as ways to solve them, are key issues in Ukraine, which are addressed by distributing powers between state institutions responsible for its formation, as noted by Shelest O.L. [11]. Parfentii L.A. notes that the search for ways to ensure Ukraine's debt security, taking into account foreign management experience, requires further research. Thus, gradual progress towards solving the problem of ensuring debt security is a guarantee of strengthening Ukraine's economic and national security [8].

Purpose, objectives, and research methods. The purpose of the article is to assess Ukraine's public debt and consider tools for improving its management in a war economy. To achieve this goal, the following aspects are considered: assessment of public debt in wartime, debt security issues, threats to public debt growth, and measures to optimize Ukraine's debt policy.

In the course of the study, general scientific theoretical methods were used: system analysis – to identify the main criteria for the study; the method of induction – at the stage of collecting, systematizing, and processing information for the study; the method of deduction – in the process of studying theoretical problems; abstract-logical method – to make theoretical generalizations and conclusions regarding the problems of Ukraine's public debt management in wartime.

Research results. Under the conditions of martial law in Ukraine, public debt is transforming from a predominantly financial category into a complex socio-economic and political problem directly linked to issues of national economic security. The management and servicing of public debt are becoming particularly important in the context of current economic processes, particularly given the volume of international financial assistance and the complex macroeconomic situation in Ukraine.

At the same time, public debt also has a positive function, as it allows for the attraction of additional financial resources necessary to finance state investment programs and maintain domestic consumption levels. It should be noted that the trend toward increasing debt burdens is characteristic not only of countries with transitional economies, but also of developed countries, which indicates the global nature of this phenomenon.

The experience of European Union countries confirms the awareness of the negative consequences of excessive debt. Some of them have already implemented reforms aimed at fiscal consolidation, while others are just beginning this process. Such measures are driven by the growing risk of a financial crisis, which is usually accompanied by a decline in GDP, a decrease in household income, rising unemployment, and a general slowdown in economic growth. This creates additional fiscal risks for future generations, who will have limited access to capital.

On a global scale, world public debt is growing rapidly and currently exceeds the planet's total annual GDP by more than 2.5 times. This situation is the result of numerous internal and external challenges that have forced most countries, regardless of their level of economic development, to actively use debt instruments to maintain macroeconomic balance [10].

For Ukraine, the problem of public debt is one of the most acute. It is caused by both the limited revenue base of the budget and the objective need to finance military and social expenditures. As a result, the debt burden continues to grow.

As of December 31, 2024, the total amount of Ukraine's public and state-guaranteed debt was UAH 6,980.93 billion (or USD 166.06 billion). An assessment of the structure of Ukraine's state and state-guaranteed debt as of December 31, 2024 (Table 1) shows a predominance of direct state obligations, which accounted for 95.9% of the total debt and amounted to UAH 6,692.5 billion. The structure of direct debt is dominated by external debt, which amounted to UAH 4,829.3 billion, corresponding to 69.2% of total public debt. Domestic direct debt as of that date amounted to UAH 1,863.1 billion, or 26.7%, respectively.

Table 1. Structure of Ukraine's public and publicly guaranteed debt as of December 31, 2024 [6]

Indicator	Amount, million UAH	Share in total debt, %
1	2	3
1. Direct public debt	**6692453,8**	95,9
– external debt	4829321,6	69,2
– domestic debt	1863132,1	26,7
2. Debt guaranteed by the state	**288511,1**	**4,1**
– external	219153,6	3,1
– domestic	69357,5	1,0
3. Total public debt	**6980964,9**	**100,0**
– external	5048475,3	72,3
– domestic	1932489,6	27,7

Source: [6]

The amount of debt guaranteed by the state was significantly lower – UAH 288.5 billion, or 4.1% of the total debt burden. Of this amount, external guarantees accounted for UAH 219.2 billion (3.1%), and internal guarantees accounted for UAH 69.4 billion (1.0%).

Overall, Ukraine's total public debt at the end of 2024 amounted to UAH 6,980.96 billion, of which 72.3% was external debt and 27.7% was domestic debt. This structure demonstrates the high level of external dependence of Ukraine's financial system, which leads to increased currency risks, especially in the context of martial law and an unstable national currency exchange rate.

This amount includes both external and internal obligations of the state and guarantees for third-party debts. The debt structure also includes liabilities that were extended or restructured on the terms of previous years.

Between 2009 and 2025, Ukraine's economy experienced significant fluctuations, which were reflected in the dynamics of both total public debt and gross domestic product (GDP). Ukraine's public debt grew from UAH 316.9 billion in 2009 to UAH 7.48 trillion at the end of April 2025. During this period, there were several waves of active debt accumulation, which coincided with economic or political crises. The graph shows the dynamics of changes in Ukraine's public debt and GDP since 2009 (monthly):

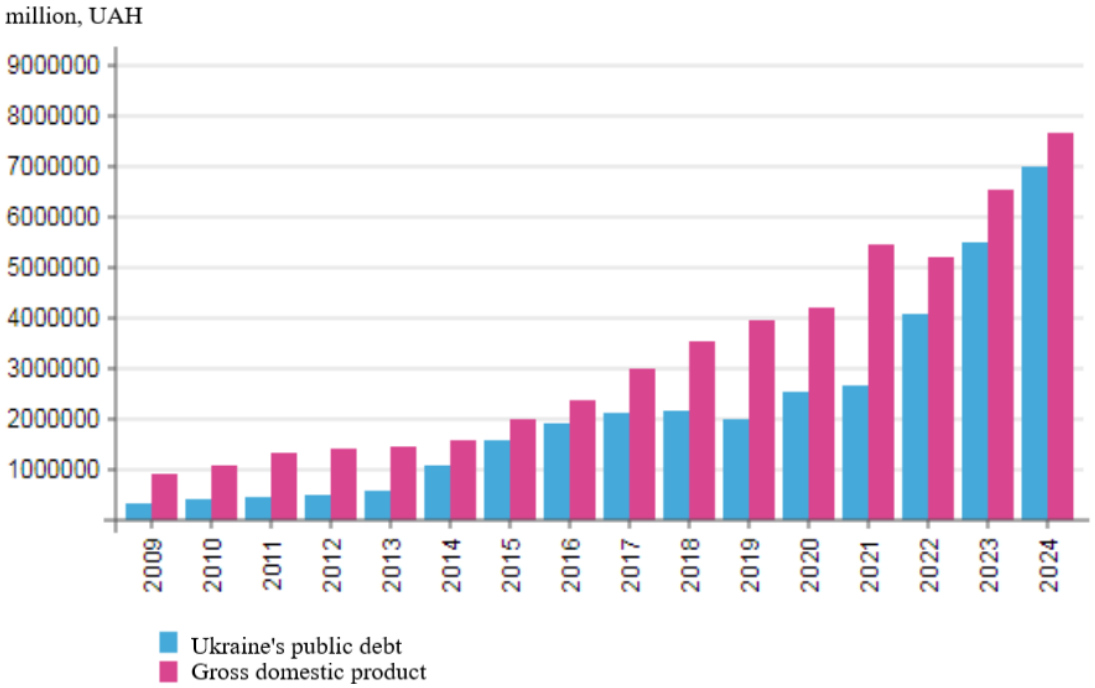

Figure 1. Dynamics of changes in Ukraine's public debt and GDP from 2009 to 2024 (million UAH)
Source: [9]

The study conducted from 2009 to 2024 allowed us to divide the dynamics of public debt into five periods.

1. 2009–2013: Relative stability. During 2009–2013, the growth of public debt was gradual, and the debt-to-GDP ratio grew slowly, from 34.7% in 2009 to 40.1% in 2013. This period was characterized by relative macroeconomic stability. GDP grew steadily, which partially offset the effects of the moderate increase in debt.

2. 2014–2016: Crisis period and sharp increase in debt. Starting in 2014, as a result of the political crisis, military actions in eastern Ukraine, and the devaluation of the hryvnia, there was a sharp increase in public debt. In 2014, debt more than doubled (+516.5 billion UAH), and debt-to-GDP reached 70.2%. The highest ratio was reached in 2016 – 81.0%.

3. 2017–2019: Relative reduction in debt burden. Between 2017 and 2019, the rate of debt growth slowed, and in 2019, it even decreased by UAH 170 billion. At the same time, GDP continued to grow, contributing to a reduction in the debt-to-GDP ratio to 50.3% in 2019. This indicates a period of financial stability recovery.

Table 2 . Estimated change in Ukraine's public debt and GDP from 2009 to 2024 (in millions of hryvnia)

Year	**Public debt as of 31.12 (million UAH)**	**Change in debt (million UAH)**	**GDP for the year (million UAH)**	**Change in GDP (million UAH)**	**Debt/GDP (%)**
1	2	3	4	5	6
2009	316885	—	913345	—	34,7
2010	432235	115351	1082569	169224	39,9
2011	473122	40886	1316600	234031	35,9
2012	515511	42389	1408889	92289	36,6
2013	584114	68604	1454931	46042	40,1
2014	1100564	516450	1566728	111797	70,2
2015	1572180	471616	1979458	412730	79,4
2016	1929759	357579	2383182	403724	81
2017	2141674	211916	2982920	599738	71,8
2018	2168627	26953	3558706	575786	60,9
2019	1998275	-170352	3974564	415858	50,3
2020	2551936	553660	4194102	219538	60,8
2021	2671828	119892	5459574	1265472	48,9
2022	4071683	1399856	5191028	-268546	78,4
2023	5519484	1447801	6537825	1346797	84,4
2024	6980965	1461481	7658659	1120834	91,2
2025*	7480326	499361	—	—	—

Source: [10]

4. 2020–2021: COVID-19 and new debt growth. In 2020, due to the COVID-19 pandemic and related economic difficulties, there was a new increase in public debt (+553.7 billion UAH), which raised the debt-to-GDP ratio to 60.8%. In 2021, thanks to active GDP growth, the ratio fell to 48.9%.

5. 2022–2025: War economy and financial stress. Starting in 2022, amid a full-scale war against Russia, there's a sharp increase in public debt. In 2022–2023, the debt increased by more than UAH 2.9 trillion, and the ratio to GDP rose to 84.4% in 2023. In 2024, the ratio exceeded 91%,

which is a critical level of debt burden. This indicates the country's financial vulnerability and the need to restructure debt obligations or attract concessional financing.

Considering the above, it should be noted that an effective public debt management policy in Ukraine should be based on a systematic approach to debt strategy development, within which public debt is viewed not as a burden, but as a tool for stimulating economic growth. This approach is particularly relevant in the context of martial law and a deep economic crisis, which necessitates the attraction of significant financial resources under optimal conditions.

In order to optimize Ukraine's debt policy in the context of crisis challenges, public finance experts propose a number of priority measures:

1) Improvement of the regulatory framework, in particular through the adoption of a single basic legislative act on public debt. This will eliminate regulatory inconsistencies regarding debt servicing, define strategic priorities, and ensure the transparency of debt policy.

2) Redirecting debt resources to finance structural reforms and institutional and investment development programs instead of covering current consumer spending that does not contribute to the growth of productive capacity.

3) Reduction of the share of external debt in the structure of public debt. This measure will help reduce currency risks, slow down the process of decapitalization of the economy, and reduce dependence on foreign creditors and instability in global financial markets.

4) Development of long-term forecasts of the structure and volume of public debt, which will ensure fiscal sustainability, budget balance, and predictability of the debt burden in the medium and long term.

Discussion. In today's world, public debt is an integral part of the economic mechanism of any country. Its social purpose is to provide additional financial resources to the state through the use of credit instruments necessary for the implementation of economic, social, and political tasks within the framework of state policy.

In the context of full-scale war in Ukraine, the issue of public debt is particularly relevant, as a significant portion of budget resources is directed toward financing the defense sector. This necessitates additional borrowing, which, in turn, leads to a further increase in public debt [1].

The need for government borrowing is due to the fact that the fiscal capacity of the state is limited by tax revenues. In this regard, in conditions of constantly growing budgetary needs, especially in times of crisis, the government is forced to seek alternative sources of financing. One of the key sources is debt financing, which allows for a temporary increase in budget resources without an immediate increase in the tax burden [3].

The implementation of economic and social projects in Ukraine with the support of international financial organizations indicates a low level of efficiency in the use of borrowed credit resources. A significant portion of such projects do not reach the final stage, but are terminated at an early stage due to significant organizational, institutional, and executive problems [4]. In order to control and manage debt security, we recommend introducing audits on the targeted use and effectiveness of borrowed international resources [5].

Thus, we have noted that in most cases, projects are implemented with deviations from the specified conditions and schedules, and the planned amount of funding is not fully utilized, which indicates ineffective planning and weak control over the fulfillment of international obligations, confirming the relevance of the article.

Therefore, the formation of a public debt management strategy should include a set of measures, among which are:

- analysis of the current macroeconomic situation in the context of debt sustainability and determination of the parameters of an optimal debt policy for the medium and long term;
- searching for and implementing new debt instruments that meet current market requirements, and adapting the regulatory environment to their use;

- structural optimization of public debt according to key parameters: types of instruments, currency structure, maturity dates, placement conditions, and servicing rates;

- improving Ukraine's credit rating through systematic work with international rating agencies, which will allow attracting resources on more favorable terms [10].

The implementation of these measures will contribute to strengthening financial discipline, enhancing investor and donor confidence, and ensuring Ukraine's financial stability in the context of prolonged military confrontation and post-war reconstruction.

Conclusions. The analysis shows that the dynamics of Ukraine's public debt are closely linked to macroeconomic, political, and foreign policy events. Despite periods of stabilization, the overall trend toward debt growth necessitates a rethinking of fiscal policy, particularly with regard to attracting external financing, managing public spending, and stimulating economic growth.

Therefore, optimizing Ukraine's public debt management mechanism requires the development and implementation of a comprehensive, strategically oriented policy based on the principles of fiscal responsibility, economic sustainability, and the effective use of debt resources.

In the context of current economic challenges, an important element of public finance management strategy is also the optimization of sources of budget deficit coverage. This, in particular, involves ensuring full and timely financing of state budget expenditures while reducing dependence on risky short-term borrowing and currency-sensitive instruments.

Thus, the implementation of a comprehensive debt strategy can increase the level of financial security of the state, ensure long-term economic stability, and create the financial preconditions for Ukraine's post-war recovery.

References

1. Biriuk, D. O. (2025). Debt instruments for supporting the stability of Ukraine’s financial system during martial law. *Business Inform*, 2, 400–407. DOI: https://doi.org/10.32983/2222-4459-2025-2-400-407 [in Ukrainian]
2. Budget Code of Ukraine. (2010). Bulletin of the Verkhovna Rada of Ukraine (VVR), No. 50–51, Article 572. Retrieved from: http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2542-14
3. Haibura, Yu. A. (2024). Management of Ukraine’s public debt: State and prospects. Podilskyi Bulletin: Agriculture, Engineering, Economics, 1(42). Retrieved from: https://journals.pdu.khmelnitskiy.ua/index.php/podilian_bulletin/article/view/317/280 [In Ukrainian]
4. Kubakh, T. H., & Riabushka, L. B. (2022). Debt security of Ukraine: Theoretical and practical components. *Efektyvna Ekonomika*, 5. DOI: https://doi.org/10.32702/2307-2105-2022.5.95 [In Ukrainian]
5. Mustetsa, I. V. (2023). Auditing activity under martial law: Problems, challenges, and solutions. Bulletin of Chernivtsi Institute of Trade and Economics. Economic Sciences, 2(90), 48–58. Retrieved on April 14, 2025, from http://rps.chtei-knteu.cv.ua:8585/jspui/handle/123456789/1779 [In Ukrainian]
6. Official website of the Ministry of Finance of Ukraine. (2024). Public debt of Ukraine. Retrieved on November 3, 2024, from https://index.minfin.com.ua/ua/finance/debtgov/2024
7. Pavlenko, V. V. (2023). Debt security of Ukraine under military conflict conditions. Law and Security, (90), 154–186.
8. Parfentii, L. A. (2025). Debt security of Ukraine under wartime conditions. Business Inform, 1, 201–208. https://doi.org/10.32983/2222-4459-2025-1-201-208
9. Romanovska, Yu., & Stoliar, L. (2024). Analysis of Ukraine’s public debt under wartime conditions. Economy and Society, 62. Retrieved on April 14, 2025, from https://economyandsociety.in.ua/index.php/journal/article/view/3977/3903 [In Ukrainian]
10. Shelest, O. L. (2017). Public debt of Ukraine: Mechanism of management and servicing. Economy and Society, 8, 710–715. Retrieved on November 3, 2024, from https://economyandsociety.in.ua/journals/8_ukr/118.pdf [In Ukrainian]
11. Tendencies in formation and problems of managing Ukraine’s public debt under martial law. (n.d.). Retrieved on November 3, 2024, from http://dspace.wunu.edu.ua/bitstream/316497/48278/1/Tezy_5.pdf
12. Vdovichen, A., Chornovol, A., Mustetsa, I., Tabenska, J., & Tomniuk, T. (2024). Fiscal decentralization and local finance in Ukraine and EU member states. Financial and Credit Activity: Problems of Theory and Practice, 3(56). Retrieved on November 3, 2024, from https://fkd.net.ua/index.php/fkd/article/view/4390/4106 [In Ukrainian]

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Мустеца Ірина
кандидат економічних наук, доцент
кафедри фінансів, обліку і оподаткування,
Чернівецький торговельно-економічний інститут
Державного торговельно-економічного університету,
58002, Україна, м.Чернівці, Центральна площа, 7
e-mail: super-iramw@ukr.net
ORKID ID: 0000-0002-1033-2282

Удосконалення інструментів управління державним боргом України в умовах воєнної економіки

Анотація. Оцінка поточного стану державного боргу є основою для формування ефективної боргової політики, яка повинна бути орієнтована на забезпечення макроекономічної стабільності та сприяння соціальному добробуту населення. Актуальність питання зростання державного боргу виходить за межі теоретичного дискурсу, охоплюючи також практичний вимір - сферу економічного управління.

Постановка проблеми. Застосування інструментів аналітичної оцінки державного боргу є ключовим чинником у підвищенні результативності боргового управління, забезпеченні стійкості державних фінансів та формуванні довгострокової стратегії економічного розвитку в умовах воєнної економіки. Проведене дослідження за 2019 – 2024 рр. підтверджує тренд до зростання боргу, а також дефіцит бюджету до ВВП в умовах озброєного конфлікту.

Нерозв'язані аспекти. У воєнний період, коли економіка функціонує в умовах надзвичайної напруги, особливого значення набуває системний аналіз боргових зобов'язань, що дозволяє не лише вчасно виявляти та мінімізувати фіскальні ризики, але й раціонально використовувати доступні фінансові ресурси для стимулювання економічного зростання.

Мета статті. Оцінка сучасного стану державного боргу, а також інструментів управління ним в умовах військового стану.

Основний матеріал. Система управління державним боргом України - сукупність інституцій, механізмів, інструментів та процесів, спрямованих на залучення, обслуговування й погашення державних запозичень, а також на забезпечення боргової стійкості держави в умовах воєнних і кризових викликів. Об'єктом дослідження є процес оцінки державного боргу.

У дослідженні використано комплекс загальнонаукових теоретичних методів. Системний аналіз застосовано для виявлення основних критеріїв і чинників ефективності управління державним боргом. Метод індукції використано під час збору, систематизації та опрацювання даних, що забезпечило формування аналітичної основи дослідження.

Висновки. Результати дослідження свідчать, що зростання боргового навантаження зумовлює необхідність перегляду фіскальної політики, оптимізації джерел фінансування дефіциту бюджету та підвищення ефективності використання запозичень. Запропоновано формування цілісної боргової стратегії, орієнтованої на фіскальну відповідальність, економічну стійкість і післявоєнне відновлення.

Практична цінність отриманих результатів полягає у встановленні основних напрямків управління державним боргом, що дозволить мінімізувати ризики, а також максимально використати наявні ресурси та можливості для післявоєнного розвитку економіки.

Ключові слова: *військовий стан, державний борг, оптимізація боргу, управління державним боргом.*

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Список літератури

1. Бірюк Д. О. Боргові інструменти підтримки стабільності фінансової системи України в період воєнного стану. Бізнес Інформ. 2025. №2. С. 400–407. URL:https://doi.org/10.32983/2222-4459-2025-2-400-407.
2. Бюджетний кодекс України // Відомості Верховної Ради України (ВВР). – 2010. – № 50–51. – Ст. 572. – URL: http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2542-14.
3. Гайбура Ю. А. Управління державним боргом України: стан і перспективи // Подільський вісник: сільське господарство, техніка, економіка. – 2024. – Вип. 1 (42). – С. 82–89. – URL: https://journals.pdu.khmelnitskiy.ua/index.php/podilian_bulletin/article/view/317/280.
4. Кубах Т. Г., Рябушка Л. Б. Боргова безпека України: теоретична та практична складова // Ефективна економіка. – 2022. – № 5. – URL: http://www.economy.nayka.com.ua/pdf/5_2022/97.pdf.
5. Мустеца І. В. Аудиторська діяльність в умовах воєнного стану: проблеми, виклики, шляхи вирішення // Вісник Чернівецького торговельно-економічного інституту. Економічні науки. – 2023. – Вип. 2 (90). – С. 48–58. – URL: http://rps.chtei-knteu.cv.ua:8585/jspui/handle/123456789/1779.

6. Офіційний сайт Міністерства фінансів України. Державний борг України. – 2024. – URL: https://index.minfin.com.ua/ua/finance/debtgov/2024.
7. Павленко В. В. Боргова безпека України в умовах воєнного конфлікту // Право і безпека. – 2023. – № 3 (90). – С. 154–186.
8. Парфентій Л. А. Боргова безпека України в умовах війни. Бізнес Інформ. 2025. №1. С. 201–208. https://doi.org/10.32983/2222-4459-2025-1-201-208
9. Романовська Ю., Столяр Л. Аналіз державного боргу України в умовах війни // Економіка та суспільство. – 2024. – Вип. 62. – URL: https://economyandsociety.in.ua/index.php/journal/article/view/3977/3903.
10. Тенденції формування та проблеми управління державним боргом України в умовах воєнного стану. – URL: http://dspace.wunu.edu.ua/bitstream/316497/48278/1/Tezy_5.pdf.
11. Шелест О. Л. Державний борг України: механізм управління та обслуговування // Економіка і суспільство. – 2017. – Вип. 8. – С. 710–715. – URL: https://economyandsociety.in.ua/journals/8_ukr/118.pdf.
12. Vdovichen A., Chornovol A., Mustetsa I., Tabenska J., Tomniuk T. Fiscal decentralization and local finance in Ukraine and EU member-states // Фінансово-кредитна діяльність: проблеми теорії та практики. – 2024. – Т. 3 (56). – URL: http://rps.chtei-knteu.cv.ua:8585/jspui/handle/123456789/2345.

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Tkachuk Natalia
Candidate of Economic Sciences, Associate Professor,
Associate Professor of the Department of Finance, Banking,
Insurance and Stock Market
Leonid Yuzkov Khmelnytskyi University of Management and Law
8 Geroiv Maidanu, 29000, Ukraine
e-mail: n.tkachuk@univer.km.ua
ORCID ID: 0000-0003-1947-7565
Yaroshchuk Vitalina
Bachelor's Degree Student,
Specialty 072 "Finance, Banking, Insurance and Stock Market"
Leonid Yuzkov Khmelnytskyi University of Management and Law
8, Heroiv Maidanu St., Khmelnytskyi, 29000, Ukraine
e-mail: yarochyk_v@univer.km.ua
ORCID ID: 0009-0009-3532-0673
Palyha Anastasiia
Bachelor's Degree Student,
Specialty 072 " Finance, Banking, Insurance and Stock Market "
Leonid Yuzkov Khmelnytskyi University of Management and Law
8, Heroiv Maidanu St., Khmelnytskyi, 29000, Ukraine
e-mail: pashega_a@univer.com.ua
ORCID ID: 0009-0003-2370-1328

Ukraine's public debt: current status and risks of formation

Abstract. The relevance of the study is determined by the difficult economic situation in Ukraine caused by military aggression, which has led to a rapid increase in public debt as a key source of financing for state needs.

Problem statement. The accumulation of debt obligations, changes in their currency structure and servicing conditions create significant risks for the financial stability of the state and its future economic development, which emphasises the need for a deep understanding of the peculiarities of public debt formation.

Unresolved aspects of the problem. The diversity of scientific concepts regarding the interpretation of the essence of public debt emphasises the complexity and multifaceted nature of this phenomenon and points to the need for a more in-depth study of the theoretical aspects and practical tools of public debt management in conditions of geopolitical instability.

Purpose of the article. The purpose of the study is to substantiate the theoretical foundations of public debt, analyse its formation in wartime and identify the main debt risks.

Presentation of the main material. The object of the study is the process of forming Ukraine's public debt. The study uses a set of scientific methods, including analysis of scientific publications by domestic and foreign scientists to reveal the theoretical essence of public debt, statistical analysis to assess the dynamics and structure of Ukraine's public debt for the period 2019-2024, as well as the construction of a multivariate regression model and the average growth rate method to forecast public debt volumes for the coming years. The theoretical basis of the study was the main provisions of the theory of finance and macroeconomics.

Conclusions. The results of the study demonstrate a rapid increase in Ukraine's public debt after the start of full-scale military aggression, which indicates a deterioration in the country's debt sustainability. Analysis of the structure of public debt revealed a significant increase in the share of external financing, which increases dependence on external creditors and raises currency risks. The main risks associated with the increase in public debt include refinancing risk and interest rate risk, as well as macroeconomic, fiscal, geopolitical, currency and social risks. The practical value of the study arises from deepening the understanding of current trends in the formation of Ukraine's public debt in conditions of military aggression and identifying threats to macro-financial stability. The results obtained can be used by state authorities to develop and implement effective debt policy.

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Introduction. Ukraine's economy is currently going through a difficult period due to the consequences of military aggression, increased security costs and infrastructure restoration. Under these conditions, public debt has become one of the key sources of financing for the country's needs. At the same time, its rapid accumulation, changes in the currency structure and servicing conditions increase the risks to the country's financial stability and future economic growth. Understanding the specifics of public debt formation, its structural changes and related threats is an important prerequisite for making effective management decisions and ensuring the state's debt security. Therefore, research into the current state, development trends and potential challenges of Ukraine's public debt formation is extremely relevant today and requires a comprehensive analysis.

Literature review. A review of the latest scientific sources on the topic of Ukraine's public debt confirms its significance in the context of economic turbulence, military events and profound macro-financial changes. Research interest covers both the conceptual foundations of debt policy and the practical tools for its implementation.

Among Ukrainian researchers, it is worth highlighting T. Batanenko and A. Denisenko, who in their work ‘Structure, dynamics and current trends in Ukraine's external public debt’ (2021) analyse changes in the structure of external debt and its impact on the balance of payments and the country's credit rating [1].

T. P. Vakhnenko, in his article ‘Features of the Formation of Public Debt and Management of Its Components during a Financial Crisis’ (2009), analyses in detail the mechanisms of debt burden and emphasises the need to optimise debt policy in conditions of economic turmoil [3].

N. Zamkova and I. Hnidyuk, in their joint work ‘Ukraine's Public Debt during a Large-Scale Crisis’ (2022), consider the risks of debt accumulation during a period of crisis instability, focusing on the structural problems of debt strategy and its interconnection with the state budget [5].

I. S. Miroshnychenko, in his study ‘Ukraine's external debt as a factor influencing the economic security of the state’ (2014), emphasises Ukraine's systemic dependence on external sources of financing, identifying it as a key threat to long-term economic security [11].

M. Yu. Razinkova, in her article ‘Ukraine's External Public Debt in Wartime’ (2023), focuses on the transformation of external borrowing during the war. The author analyses current threats to fiscal stability and debt servicing problems against the backdrop of rising budget expenditures [13]. K. Sochka's publication ‘Ukraine's Public Debt: Current Realities and Problems’ (2020) examines the current state of debt and identifies the main financial risks associated with increasing debt pressure against the backdrop of low economic growth [14].

Among the classic works, it is worth mentioning the approach of Paul Samuelson and William Nordhaus, outlined in the book Economics (2009), where the authors consider the role of public debt in macroeconomic policy, as well as its potential benefits and risks depending on the fiscal discipline of the state [15].

The diversity of scientific approaches to the analysis of public debt testifies to the complexity and multifaceted nature of this phenomenon, as well as the need for in-depth research to improve the existing theoretical foundations and practical mechanisms for managing public finances in a dynamic economic situation and geopolitical instability.

Purpose, objectives and research methods. The purpose of the study is to substantiate the theoretical foundations of public debt, analyse its dynamics, and identify the key risks associated with the growth of the debt burden under conditions of military aggression.

To achieve this goal, the following research tasks were identified:
- to reveal the theoretical essence and economic nature of public debt;
- to analyse the dynamics of Ukraine's public debt for the period 2019-2024;
- to investigate structural changes in Ukraine's public debt by type of creditor (domestic and foreign);
- to model and forecast Ukraine's public debt for 2025-2027;
- to identify and systematise the key risks associated with the growth of Ukraine's public debt in the context of military aggression.

A set of scientific research methods was used in the course of the work: critical analysis of scientific publications - to study the theoretical foundations of public debt and review existing research; statistical analysis - to process official statistical data on the volume, dynamics and structure of public debt, as well as GDP and budget deficit indicators; comparative analysis - to compare the dynamics of domestic and external debt; multivariate regression analysis - to build a model of the dependence of public debt on GDP and budget deficit; the statistical method of the average growth rate - to forecast future GDP and budget deficit values for the purpose of further forecasting public debt volumes; graphical method - to visually display the results; system analysis - to identify and classify key public debt risks.

Research results. Public debt is an important indicator of a country's financial stability, which significantly affects its economic stability, creditworthiness and investment attractiveness. The formation and servicing of public debt are integral components of state financial policy, especially in the context of growing internal challenges and external threats. Assessing the dynamics of public and guaranteed debt, as well as the risks associated with them, allows for a more complete assessment of the real scale of the debt burden on Ukraine's economy and its prospects for financial stability. In the context of the current crisis, the effective management of both direct debt obligations and guarantees is of particular importance, as it allows for the minimisation of debt risks and ensures the macro-financial stability of the state.

It should be noted that in the modern scientific lexicon, public debt is as widely recognised an economic category as finance, budget and taxes; it plays an equally important role in the economic life of society and requires an understanding of its theoretical essence. The nature of the debt category lies in the fact that debt obligations arise as a result of the state attracting financial resources on a repayable basis to finance the budget deficit, implement social programmes, stabilise the economy and respond to crisis challenges.

The Budget Code of Ukraine defines public debt as “the total amount of the state's debt, consisting of all its issued and outstanding debt obligations, including the state's debt obligations that come into effect as a result of guarantees issued for loans, or obligations arising on the basis of legislation or a contract” [2].

In the financial dictionary by Zagorodniy A.G., Voznyuk G.L., and Smovzhenko T.S., public debt is defined as the total amount of the state's debt resulting from the non-repayment of loans and non-payment of interest on them [4]. Researcher Vakhnenko T.P. interprets public debt as debt arising in the process of mobilising additional financial resources by attracting temporarily available funds from legal entities and individuals, as well as foreign states [3]. This approach emphasises the functional nature of debt as one of the mechanisms for covering budgetary needs, based on the principle of repayment and an important element of public finance management in conditions of insufficient own revenues.

In turn, Miroshnychenko I. S. defines public debt as the totality of the state's obligations to foreign creditors, both government and private, taking into account interest payments for the use of borrowed funds [11]. The debt also includes obligations guaranteed by the state, which must be fulfilled within the established time limits in accordance with generally accepted lending principles. This definition focuses on the external aspect of the debt, emphasising its international nature and the obligation to comply with credit terms.

Paul A. Samuelson and William D. Nordhaus consider public debt to be ‘the total amount of the government's debt obligations in the form of bonds and short-term loans.They also define public debt as “the debt accumulated by the government as a result of borrowing money to finance past budget deficits” [15]. The assertion that public debt is the cumulative sum of budget deficits can also be found in the textbook Macroeconomics by K. McConnell and S.Brue: “Public debt is the sum of accumulated budget deficits minus surpluses” [6, p. 456]. This approach focuses not only on the state's obligations, but also on the role of debt as an instrument for redistributing financial resources within the national economy. It serves as a means of meeting current state needs without immediately increasing the tax burden, while at the same time forming future budgetary obligations.

At the same time, it is important to note that, in essence, public debt remains a tool for covering budget shortfalls. Ukrainian researchers Zamkova N. and Hnidyuk I. also draw attention to this, noting that “the main purpose of public debt is to cover the budget deficit” [5, p. 112]. Therefore, attracting domestic and foreign loans to cover the state budget deficit leads to the accumulation of debt obligations, which causes an increase in budget expenditures for their servicing and repayment.

Based on the above provisions, it can be noted that public debt is a multifaceted economic and legal phenomenon that not only performs a fiscal function but also plays an important role in ensuring macrofinancial stability, implementing socio-economic policy and supporting the solvency of the state. Its interpretation varies from a formal definition as a set of outstanding obligations to an understanding as a social asset that allows for the redistribution of financial resources within the economy. At the same time, all researchers of this issue agree on one thing: public debt is formed on the basis of the state's borrowing to cover the budget deficit, and its servicing becomes an integral part of public expenditure, which requires the development of a balanced and effective debt policy.

Based on these positions, we note that public debt is the totality of direct obligations of the government to the domestic economy and the external sector, which historically arose as a result of borrowing by the state both within the country and abroad, and which must be repaid from budget funds in the future. Therefore, the essence of public debt covers only those debt instruments that are officially recognised by the government and are under its direct responsibility.

According to its economic nature and sources of financing, public debt is divided into domestic and external, which is a key criterion for its classification. This division reflects not only the origin of the resources raised, but also the specifics of the legal relations between the state and creditors, the peculiarities of debt management, and the level of impact on the macroeconomic situation.

Domestic public debt is formed through the state's obligations to residents of the country - citizens and domestic companies that invest funds in government securities or provide financing through national financial instruments. This mechanism allows the government to raise funds on the domestic market without depending on external creditors, while stimulating the development of the state's financial system. However, excessive accumulation of domestic debt can lead to the displacement of private capital, rising interest rates and a reduction in resources for investment in the real sector of the economy.

Thus, Sochka K. emphasises that domestic public debt has a number of advantages over external debt, primarily in terms of its administration. Such debt is secured by assets owned by the state, and its repayment is carried out using internal financial resources [14]. Servicing domestic debt, which involves paying interest and principal, does not usually put significant pressure on the state's financial system. In addition, the government and the National Bank of Ukraine have greater opportunities to influence the mechanisms of interaction with domestic creditors, which is especially important in conditions of limited resources or delays in the fulfilment of debt obligations.

In contrast, external public debt is formed as a result of attracting financial resources from foreign governments, international financial organisations, foreign banks, companies or individuals. It should be noted that external public debt is not a threat to the economy if its amount does not exceed the limits set by the state; problems arise when public debt grows to uncontrollable levels [13]. Excessive growth in government borrowing is accompanied by a number of economic threats, among which currency risk is particularly dangerous. A significant share of government debt denominated in foreign currency increases the burden on the country's gold and foreign exchange reserves, creating additional pressure on financial stability and increasing the state's vulnerability to external shocks.

The dynamics of Ukraine's public debt are closely linked to the overall state of the economy, unfavourable conditions of military aggression and changes in gross domestic product. For a comprehensive assessment of the country's debt burden, it is important to analyse not only the absolute amounts of public debt, but also the ratio of its amounts to GDP, which reflects the country's real debt sustainability. Therefore, we will consider and analyse the dynamics of changes in public debt and GDP and their ratio, as presented in table 1.

Table 1. Dynamics of public debt and GDP of Ukraine in 2019-2024.

Years	Public debt		Gross domestic product		Public debt as a percentage of GDP, %
	Volume, mln UAH	Growth rate, %	Volume, mln UAH	Growth rate, %	
2019	1 998 275	-7,9	3 974 564,0	+11,7	50,3
2020	2 551 936	+27,7	4 194 102,0	+5,5	60,8
2021	2 671 827,6	+4,7	5 459 574,0	+30,2	48,9
2022	4 071 683,1	+52,4	5 191 028,0	-4,9	78,4
2023	5 519 483,9	+35,6	6 537 825,0	+25,9	84,4
2024	6 980 964,9	+26,5	7 658 659,0	+17,1	91,2

Source: calculated by the authors based on official data [8].

As can be seen from the data presented in Table 1, there was a rapid increase in public debt during the period under review: by the end of 2024, it had increased fivefold compared to 2019. Particularly high growth rates were observed in 2022 (+52,4%), which was due to large-scale budget expenditures and needs against the backdrop of the deteriorating economic situation and war. At the same time, there was an increase in the debt burden relative to GDP: while in 2019 the ratio of public debt to GDP was 50,3%, in 2024 this figure reached 91,2%. This indicates a significant deterioration in the country's debt sustainability and increased risks to macrofinancial stability in the medium term.

An analysis of the ratio of public debt to GDP shows that the limit of 60% of GDP set by the Budget Code of Ukraine for the total amount of public debt at the end of the budget period [12] was not actually observed in 2020 and from the start of the military aggression until the end of the reporting period: 78,4% in 2022, 84,4% in 2023 and 91,1% in 2024. This threatening situation with the size of public debt is explained by a combination of economic and financial challenges facing Ukraine. First and foremost, the rapid growth of state budget expenditures caused by full-scale war, a significant increase in the country's defence needs, social protection and the restoration of destroyed infrastructure in the state played a key role.

For a deeper understanding of the nature of the debt burden, we consider it appropriate to analyse not only the total amount of public debt, but also its structure by creditors, both domestic and foreign, as detailed in table 2.

The data presented in Table 2 show a significant increase in the share of external public debt in the total public debt of Ukraine from 58% in 2019 to 72,3% in 2024 and a slight decrease in the share of domestic public debt: from 42% in 2019 to 27,7% in 2024. This dynamic in the structure of public debt indicates Ukraine's increasing dependence on external sources of financing, which

may create additional currency risks. The increase in the share of external liabilities leads to increased sensitivity of the debt burden to exchange rate fluctuations and international capital market conditions, especially in the context of military instability and budget deficits. At the same time, the declining role of domestic debt indicates the limited capacity of the domestic financial market to provide sustainable financing for government needs, which requires a strategic rethinking of debt policy.

Table 2. Structure of Ukraine's public debt in 2019-2024 by creditors

Years	External public debt		Internal public debt		Public debt, mln UAH
	Volume, mln UAH	Share, %	Volume, mln UAH	Share, %	
2019	1 159 221,6	58,0	839 053,8	42,0	1 998 275,4
2020	1 518 934,8	59,5	1 033 000,8	40,5	2 551 935,6
2021	1 560 230,0	58,4	1 111 597,6	41,6	2 671 827,6
2022	2 610 945,6	54,1	1 460 737,5	35,9	4 071 683,1
2023	3 862 987,6	70,0	1 656 496,3	30,0	5 519 483,9
2024	5 048 475,3	72,3	1 932 489,6	27,7	6 980 964,9

Source: calculated by the authors based on official data [8]

We will also analyse the dynamics of external and internal public debt volumes during 2019-2024, which will allow us not only to explain the trends in the structure of public debt, but also to assess the intensity of the state's accumulation of liabilities for each type of debt in relation to creditors (Fig. 1).

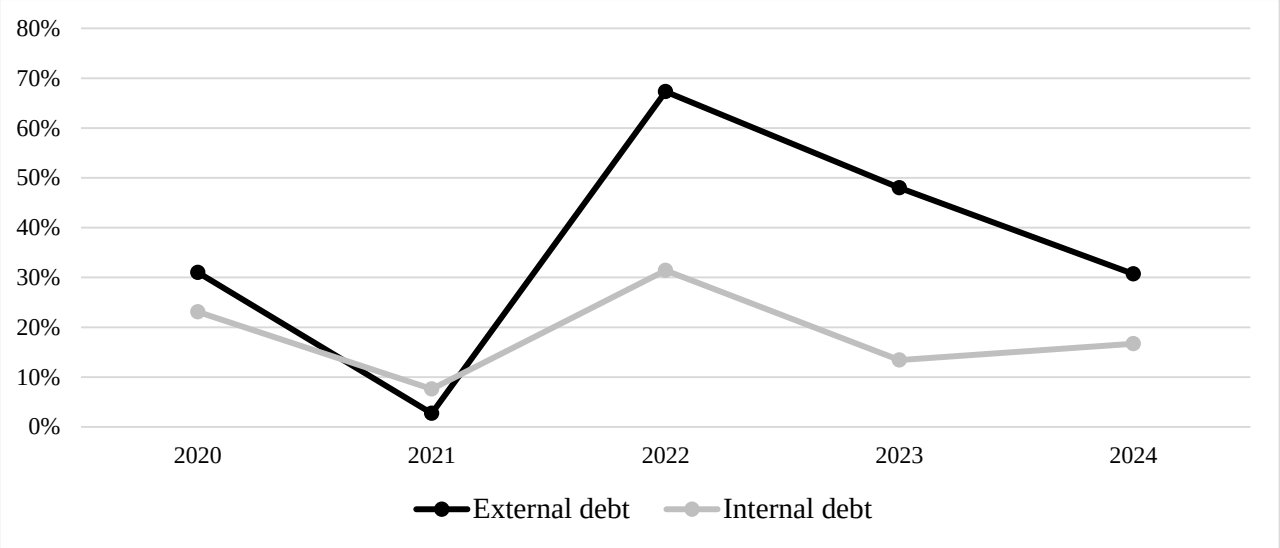

Figure 1. Dynamics of external and internal public debt of Ukraine in 2020-2024.
Source: constructed by the authors based on their own calculations using official data [4].

Such an analysis is important for identifying shifts in the focus of government borrowing: whether there is a growing dependence on external financing, in particular from international financial organisations, or, conversely, whether there is an increasing reliance on the domestic government securities market. In addition, debt dynamics allow us to identify key periods of active borrowing, which, in turn, are often associated with crisis events, budget gaps or the need to finance reforms.

As can be seen in Figure 1, in 2020-2024, the dynamics of Ukraine's public debt show significant variability, which was caused by both internal economic factors and external challenges, in particular, full-scale Russian aggression. In 2020, both external and internal public debt increased by 31% and 23% respectively compared to 2019. However, in 2021, their growth rates slowed significantly, especially for external debt, which may indicate restrictions on external financing or a deliberate reorientation of the state's debt policy towards internal sources of borrowing. The most dramatic changes occurred in 2022, when the growth rate of external public debt rose sharply to

67%, reflecting the scale of international financial assistance to Ukraine. In the following years, there was a trend towards a gradual decline in the growth rate of public debt: in 2023, external public debt grew by 48%, and in 2024 by 31%, which corresponds to the pre-war level. The growth rate of domestic public debt remained slightly lower, although a slight increase was observed in 2024.

Having identified general trends in the dynamics of public debt formation, we consider it necessary to model and forecast its volumes for the coming years. To this end, we will construct a multivariate regression model based on official statistical data on the size of Ukraine's public debt. The study also included a regression analysis using Microsoft Excel software, which allowed us to determine the degree of influence of key economic indicators (x) on the volume of public debt (Y). We selected the following factor indicators as independent variables (factors) for building the model:

- x_1 - Gross domestic product (GDP), million UAH;
- x_2 - State budget deficit, million UAH;
- x_3 - Inflation rate, %.

The choice of these factors is explained by their close connection with the amount of public debt. Note that the inflation indicator (x_3) was excluded from the model due to weak correlation.

In order to improve the accuracy of the results, a correlation matrix was compiled for the step-by-step selection of the most significant factors. The initial data for constructing a multifactor regression model are presented in Table 3.

Table 3. Input data for building a multivariate regression model

Years	***Y***	x_1	x_2	x_3
2019	1998275,4	3974564	78049,5	104,1
2020	2551935,6	4194102	217096,1	105
2021	2671827,6	5459574	197937,4	110
2022	4071683,1	5191028	914701,7	126,6
2023	5519483,9	6537825	1333110,7	105,1
2024	6980964,9	7658659	1358500,1	112

Source: compiled by the authors based on their own calculations using official data [7-10].

The obtained multifactor regression model is of high quality, as confirmed by the multiple correlation coefficient R=0.97, which shows the density of the relationship between the factors and the resultant indicator. The resulting regression equation is as follows:

$$Y = - 815158{,}6093 + 0{,}639114691 * x_1 + 1{,}850094732 * x_2 \quad (1)$$

Using the average growth rate method, we will forecast the main factors influencing the volume of public debt, namely: the size of gross domestic product and the state budget deficit, which will ensure the comprehensiveness and validity of the forecast calculations of public debt volumes. The formula for forecasting public debt is as follows:

$$x_{forecast} = x_{previous} * (1 + g), \quad (2)$$

where: $x_{forecast}$ - the forecast value of the indicator;
$x_{previous}$ - the value of the ratio of GDP to the state budget deficit in the previous year;
g – the average growth rate of the ratio of GDP to the state budget deficit.

The average growth rate of the ratio of GDP to the state budget deficit was calculated using the following formula:

$$g = \frac{\sum\left(\frac{x_i - x_{i-1}}{x_{i-1}} * 100\%\right)}{n}, \quad (3)$$

where: x_i – the value of the ratio of GDP to the state budget deficit in the corresponding year;
x_{i-1} – the value of the ratio of GDP to the state budget deficit in the previous year;
n – the number of changes, i.e. the number of increases between the years under review.

The adequacy of the constructed regression model to statistical data allows us to forecast the volumes of the indicator under study for the next two years. This forecast takes into account the

dynamics of Ukraine's public debt in previous periods and allows us to assess the potential risks of public borrowing for the country's financial stability. The results of the forecast are presented in Figure 2, which shows both the actual and forecast values of Ukraine's public debt.

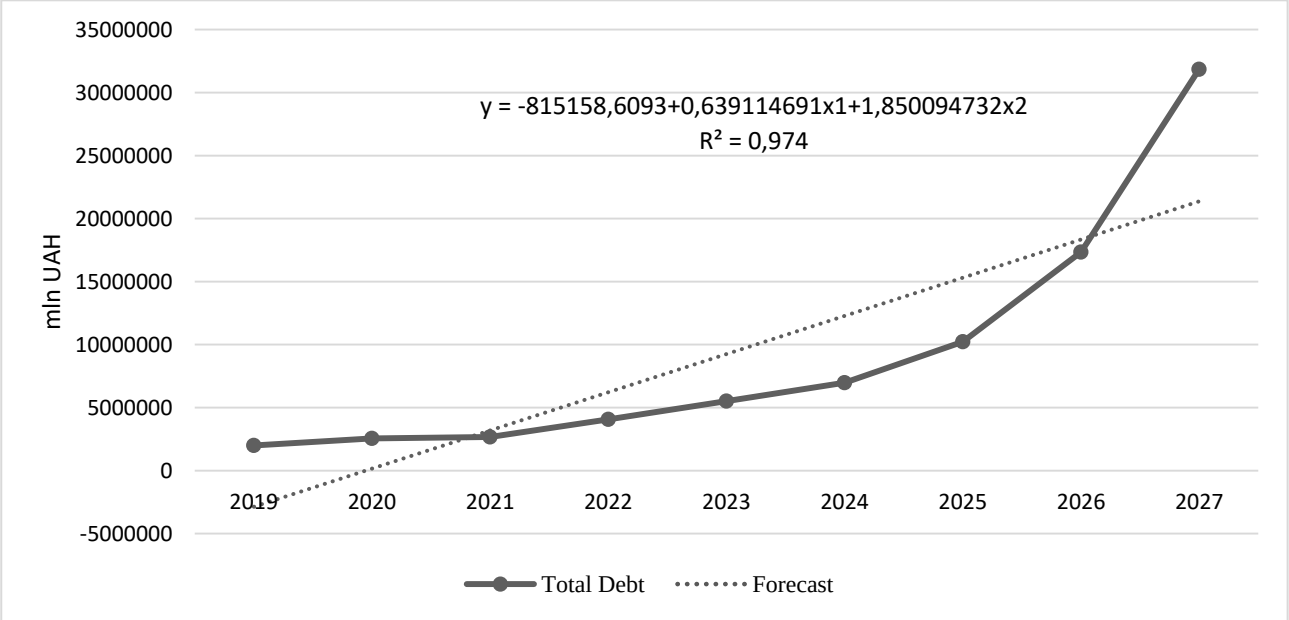

Figure. 2. Forecast of the volume of Ukraine's public debt for 2025-2027.
Source: constructed by the authors based on official data and their own calculations [4].

An analysis of the dynamics of Ukraine's public debt in 2019-2027 indicates a gradual significant increase in the debt burden and its possible sharp acceleration in 2025-2027. Such a rapid accumulation of public debt indicates a growth in external threats to the macrofinancial stability of the state and requires enhanced control over public borrowing and the use of funds received, and obviously requires adequate management.

Given the identified trends, it is advisable to further analyse the main risks of increasing Ukraine's public debt and the possible consequences for the economy. The main risks of increasing Ukraine's public debt include the following:

- refinancing risk – the probability of untimely attraction of new funds to repay debt in conditions of economic instability;
- currency risk – changes in the currency structure of the debt and the devaluation of the hryvnia increase its cost in national currency, which complicates the servicing of borrowings [1];
- interest rate risk - rising interest rates increase the cost of servicing debt);
- macroeconomic risks - low economic growth, inflation and a high budget deficit worsen the country's debt sustainability;
- fiscal risks - unexpected growth in government spending or a decline in tax revenues increases the debt burden;
- risks of guaranteed state debt - the financial insolvency of state-owned enterprises forces the state to assume their debt obligations;
- geopolitical risks - military aggression and political instability limit access to external financing;
- social risks - the need to service debt reduces the ability to finance social programmes, which can cause social tension.

Discussion. The results of the study confirm the relevance of the problem of Ukraine's growing public debt in the context of military aggression. An analysis of the dynamics of public debt for the period 2019-2024 clearly demonstrates a significant increase in its volume, especially in 2022-2024, which is consistent with data from the State Treasury Service of Ukraine and the National Bank of Ukraine. The rate of growth of public debt in 2022 (+52.4%) and further growth

in subsequent years reflect large-scale budget expenditures related to defence, social support and infrastructure restoration, which correlates with the conclusions of other domestic researchers who also emphasise the impact of the war on the country's financial system.

The increase in the ratio of public debt to GDP from 50,3% in 2019 to 91,2% in 2024 is an alarming sign of the deterioration of Ukraine's debt sustainability. The fact that it has exceeded the 60% of GDP limit set by Ukraine's Budget Code since 2020 and has grown a lot since the full-scale aggression started shows that the debt load is at a critical level, which could have long-term negative consequences for macroeconomic stability. These results are consistent with previous analyses that pointed to the risks of rising public debt in times of economic crisis (e.g., the work of Vasylik O.D.).

An analysis of the structure of public debt revealed a significant increase in the share of external debt from 58% in 2019 to 72,3% in 2024. This trend indicates Ukraine's growing dependence on external sources of financing, which increases its vulnerability to currency risks and changes in international financial markets. The decrease in the share of domestic debt may be related to the limited capacity of the domestic market to absorb significant amounts of government borrowing amid economic uncertainty and capital outflows.

Forecasting public debt volumes for 2025-2027 using a regression model shows a potential further increase in the debt burden. Although the model has a high coefficient of determination (R^2 = 0,974), it should be noted that the forecast values depend on the accuracy of the independent variables (GDP and budget deficit), which are themselves sensitive to numerous factors, especially in the context of the ongoing war.

The key risks to public debt growth identified, such as refinancing risk, currency risk, interest rate risk, macroeconomic and fiscal risks, are consistent with the classifications of debt risks commonly accepted in economic literature. Currency risk is particularly acute in Ukraine due to the significant share of foreign currency debt and geopolitical risks that limit access to external financing and increase the cost of borrowing. Social risks associated with the need to service growing debt are also an important aspect that needs to be considered when formulating public policy.

A limitation of this study is the use of statistical data up to 2024, which does not fully reflect the latest changes in Ukraine's economy and financial system. Further research could focus on a more in-depth analysis of the impact of individual factors (e.g., the volume of international aid, the effectiveness of the use of borrowed funds) on the dynamics and structure of public debt, as well as on the development of specific recommendations for optimising Ukraine's debt policy in the context of military and post-war reconstruction. A comparative analysis of the experience of other countries that have experienced armed conflicts in the field of public debt management is also promising.

Conclusions. To sum up, it should be noted that Ukraine's public debt is caused by a budget deficit resulting from excessive government spending on defence in the context of military aggression. The formation of Ukraine's public debt in the current conditions requires special attention to a number of key aspects:

- growing dependence on external financing creates additional currency risks, as the devaluation of the national currency can significantly increase the hryvnia equivalent of debt obligations;
- the increase in the state budget deficit and the slowdown in economic growth complicate the state's ability to service its debt in a timely manner and increase refinancing risks;
- the dynamics of public debt volumes show a tendency to rise sharply in the event of an exacerbation of macroeconomic or geopolitical crises, which requires constant improvement of the mechanisms for managing the state's debt obligations;
- effective public debt management should be based on increasing the transparency of borrowing, optimising the currency structure of debt and developing sustainable anti-crisis strategies to minimise the state's financial risks.

References

1. Batarenko, T., & Denysenko, A. (2021). Structure, dynamics and current trends of Ukraine's external public debt. *Economy and Society*, (26). DOI: https://doi.org/10.32782/2524-0072/2021-26-17. (Accessed: April 25, 2025).
2. *Budget Code of Ukraine: Law of Ukraine No. 2456-VI dated July 8, 2010, as of March 5, 2025*. https://zakon.rada.gov.ua/laws/show/2456-17#Text (Accessed: April 27, 2025).
3. Vakhnenko, T. P. (2009). Features of public debt formation and management during the financial crisis. *Finance of Ukraine*, (6), 14–28. DOI: https://doi.org/10.31617/1.2022(144)08.
4. Zahorodnii, A. H., & Vozniuk, H. L. (2005). *Financial and economic dictionary*. Lviv: Publishing House of the National University "Lviv Polytechnic".
5. Zamkova, N., & Hnydiuk, I. (2022). Ukraine's public debt amid a large-scale crisis. *Scientia Fructuosa*, (4), 110–121.
6. McConnell, C. R., & Brue, S. L. (1997). *Analytical economics: Principles, problems, and policies. Part 1: Macroeconomics* (Ukrainian translation). Lviv: Prosvita.
7. Ministry of Finance of Ukraine. (n.d.). *Gross domestic product (GDP) in Ukraine*. https://index.minfin.com.ua/ua/economy/gdp/ (Accessed: April 27, 2025).
8. Ministry of Finance of Ukraine. (n.d.). *Public debt of Ukraine*. https://index.minfin.com.ua/ua/finance/debtgov/2024/ (Accessed: April 27, 2025).
9. Ministry of Finance of Ukraine. (n.d.). *State budget of Ukraine*. https://index.minfin.com.ua/ua/finance/budget/gov/ (Accessed: April 28, 2025).
10. Ministry of Finance of Ukraine. (n.d.). *Inflation index in Ukraine*. https://index.minfin.com.ua/ua/economy/index/inflation/ (Accessed: April 27, 2025).
11. Miroshnychenko, I. S. (2014). Ukraine’s external debt as a factor influencing state economic security under globalization. *Accounting and Finance*, (3), 102–109.
12. National Bank of Ukraine. (2025, May 2). The Council of the National Bank approved recommendations to the Cabinet of Ministers of Ukraine on the impact of public borrowing and tax policy on the monetary sphere. https://bank.gov.ua/ua/news/all/rada-natsionalnogo-banku-zatverdila-rekomendatsiyi-kabinetu-ministriv-ukrayini-schodo-vplivu-politiki-derjavnih-zapozichen-ta-podatkovoyi-politiki-na-stan-groshovo-kreditnoyi-sferi-ukrayini (Accessed: May 2, 2025).
13. Razinkova, M. Yu. (2023). Ukraine’s external public debt during the war. *Scientific View: Economics and Management*, (3[83]), 162–169.
14. Sochka, K. (2020). Ukraine's public debt: current realities and problems. *Acta Academiae Beregsasiensis. Economics*, (2), 172–183.
15. Samuelson, P. A., & Nordhaus, W. D. (2009). *Economics* (19th ed.). New York: McGraw-Hill Education.

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Ткачук Наталія
кандатка економічних наук, доцентка,
доцентка кафедри фінансів, банківської справи, страхування та фондового ринку
Хмельницький університет управління та права імені Леоніда Юзькова
Героїв Майдану 8, 29000, Україна
e-mail: n.tkachuk@univer.km.ua
ORCID ID: 0000-0003-1947-7565
Ярощук Віталіна
здобувачка вищої освіти на першому бакалаврському рівні
спеціальності 072 Фінанси, банківська справа, страхування та фондовий ринок
Хмельницький університет управління та права імені Леоніда Юзькова
Героїв Майдану 8, 29000, Україна
e-mail: yarochyk_v@univer.km.ua
ORCID ID: 0009-0009-3532-0673
Палига Анастасія
здобувачка вищої освіти на першому бакалаврському рівні
спеціальності 072 Фінанси, банківська справа, страхування та фондовий ринок
Хмельницький університет управління та права імені Леоніда Юзькова
Героїв Майдану 8, 29000, Україна
e-mail: pashega_a@univer.com.ua
ORCID ID: 0009-0003-2370-1328

Державний борг України: сучасний стан і ризики формування

Анотація. Актуальність дослідження зумовлена складним економічним становищем України, спричиненим військовою агресією, що призвело до стрімкого зростання державного боргу як ключового джерела фінансування державних потреб.

Постановка проблеми. Накопичення боргових зобов'язань, зміна їх валютної структури та умов обслуговування створюють значні ризики для фінансової стійкості держави та її майбутнього економічного розвитку, що підкреслює необхідність глибокого розуміння особливостей формування державного боргу.

Невирішені аспекти проблеми. Розмаїття наукових концепцій щодо трактування сутності державного боргу підкреслює складність і багатогранність цього феномена, а також вказує на необхідність більш глибшого дослідження теоретичних аспектів і практичних інструментів управління державним боргом в умовах геополітичної нестабільності.

Мета статті. Метою дослідження є обґрунтування теоретичних засад державного боргу, аналіз його формування в умовах війни та виявлення основних боргових ризиків.

Виклад основного матеріалу. Об'єктом дослідження виступає процес формування державного боргу України. В процесі дослідження використано комплекс наукових методів, серед яких аналіз наукових публікацій вітчизняних та зарубіжних вчених для розкриття теоретичної сутності державного боргу, статистичний аналіз для оцінки динаміки та структури державного боргу України за період 2019-2024 рр., а також побудова багатофакторної регресійної моделі та метод середнього темпу приросту для прогнозування обсягів державного боргу на найближчі роки. Теоретичним підґрунтям дослідження стали основні положення теорії фінансів і макроекономіки.

Висновки. Отримані результати дослідження демонструють стрімке зростання обсягів державного боргу України, особливо після початку повномасштабної військової агресії, та значне збільшення боргового навантаження відносно ВВП, що свідчить про погіршення боргової стійкості країни. Аналіз структури державного боргу виявив суттєве зростання частки зовнішнього фінансування, що посилює залежність від зовнішніх кредиторів та підвищує валютні ризики. До основних ризиків, пов'язаних зі збільшенням державного боргу, віднесено ризик рефінансування, валютний ризик, ризик процентних ставок, макроекономічні та фіскальні ризики, ризики гарантованого боргу, геополітичні та соціальні ризики. Практична цінність дослідження полягає у поглибленні розуміння сучасних тенденцій формування державного боргу України в умовах військової агресії та виявленні потенційних загроз для макрофінансової стабільності держави. Отримані результати можуть бути використані органами державної влади для розробки та впровадження ефективної боргової політики.

Ключові слова: *державний борг, боргове навантаження, фінансова стійкість, структура державного боргу, ризики державного боргу, прогнозування державного боргу.*

JEL Classification. H63, E62.

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Список літератури

1. Батаренко Т., Денисенко А., Структура, динаміка та сучасні тенденції зовнішньої державної заборгованості України. *Економіка та суспільство*. 2021. №26. URL: https://economyandsociety.in.ua/index.php/journal/article/view/339/324 (дата звернення 25.04.2025).
2. Бюджетний кодекс України: Закон України від 08.07.2010 № 2456-VI: станом на 05.03.2025 р. URL: https://zakon.rada.gov.ua/laws/show/2456-17#Text (дата звернення 27.04.2025).
3. Вахненко Т. П. Особливості формування державного боргу та управління його складовими в період фінансової кризи. *Фінанси України*. 2009. №6. С. 14–28. DOI: https://doi.org/10.31617/1.2022(144)08.
4. Загородній А. Г., Вознюк Г.Л. Фінансово-економічний словник. Львів : Вид-во Нац. ун-ту «Львівська політехніка», 2005. 714 с.
5. Замкова Н., Гнидюк І. Державний борг України за масштабної кризи. *Scientia fructuosa*. 2022. №4. С. 110–121.
6. Макконелл Р., Брю С. Аналітична економія: принципи, проблеми і політика. Ч. 1. Макроекономіка / пер з англ. Львів : Просвіта, 1997. 672 с.
7. Валовий внутрішній продукт (ВВП) в Україні. URL: https://index.minfin.com.ua/ua/economy/gdp/ (дата звернення 27.04.2025).
8. Державний борг України. URL: https://index.minfin.com.ua/ua/finance/debtgov/2024/ (дата звернення 27.04.2025).
9. Державний бюджет України. URL: https://index.minfin.com.ua/ua/finance/budget/gov/ (дата звернення 28.04.2025).
10. Індекс інфляції в Україні. URL: https://index.minfin.com.ua/ua/economy/index/inflation/ (дата звернення 27.04.2025).
11. Мірошниченко І. С. Зовнішня заборгованість України як чинник впливу на економічну безпеку держави в умовах глобалізації. *Облік і фінанси*. 2014. №3. С. 102–109.
12. Рада Національного банку затвердила Рекомендації Кабінету Міністрів України щодо впливу політики державних запозичень та податкової політики на стан грошово-кредитної сфери України. URL: https://bank.gov.ua/ua/news/all/rada-natsionalnogo-banku-zatverdila-rekomendatsiyi-kabinetu-ministriv-ukrayini-schodo-vplivu-politiki-derjavnih-zapozichen-ta-podatkovoyi-politiki-na-stan-groshovo-kreditnoyi-sferi-ukrayini (дата звернення 02.05.2025).
13. Разінькова М.Ю. Зовнішній державний борг України в умовах війни. *Науковий погляд: економіка та управління*, 2023. №3 (83). С. 162-169.
14. Сочка К. Державний борг України: поточні реалії та проблеми. *Acta Academiae. Beregsasiensis. Economic*s. 2020. №2. С. 172-183.
15. Paul A. Samuelson, William D. Nordhaus Economics. McGraw-Hill Education, 2009. 744p.

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Управління фінансово-кредитними системами та соціально-гуманітарна компонента їх розвитку

Management of financial and credit systems and the socio-humanitarian component of their development

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Ilich Liudmyla
Doctor of Economics, Professor,
Professor of the Department of Management,
Borys Grinchenko Kyiv Metropolitan University
13-B Levko Lukianenko St., Kyiv, Ukraine, 02000
e-mail: l.ilich@kubg.edu.ua
ORCID ID: 0000-0002-8594-1824

Employee value proposition as the core of HR branding: a strategy of trust, authenticity and talent development

Abstract. The object of the study is the HR branding system of modern organizations, which reflects the interrelation between the Employee Value Proposition (EVP), corporate culture, and managerial practices for personnel development. HR branding is viewed as a multidimensional phenomenon that integrates marketing, psychological, and social components, fostering trust, loyalty, and employee engagement. Its key characteristics include authenticity, strategic orientation, human-centeredness, and alignment with business objectives.

Problem statement. In the modern context of intense competition for talent, business digitalization, and the growing importance of employee engagement, HR branding is transforming from a marketing tool into a strategic system of human capital management. At the core of this system lies the Employee Value Proposition (EVP), which builds trust, loyalty, and a culture of shared responsibility between the company and its people.

Unresolved aspects of the problem. Despite the growing interest in HR branding, the role of an authentic EVP as a driver of organizational competitiveness and its integration into managerial practices remain insufficiently explored.

Purpose of the article. The purpose of the study is to theoretically substantiate the Employee Value Proposition (EVP) as the strategic core of a modern organization's HR brand and to identify its key dimensions that ensure trust, authenticity, and talent development.

Presentation of the main material. Based on an interdisciplinary approach combining the concepts of management, marketing, and organizational behavior, the study systematizes scientific approaches to HR branding and identifies its main components: EVP, corporate culture, employee experience, reputation, innovation, and corporate social responsibility. The analysis of international and Ukrainian research (2020 – 2025) demonstrates that an effective EVP integrates mission, values, employee experience, and social responsibility into a unified system of mutual commitments. Five key dimensions of modern EVP are highlighted: meaningful work and mission, professional growth, supportive corporate culture, flexibility and work-life balance, and social responsibility.

Conclusions. The results confirm that a strong HR brand enhances organizational attractiveness, reduces staff turnover, and creates long-term competitive advantages. HR branding should be considered a comprehensive system that combines internal management practices with external communications, aligning business goals with employee expectations. Future research should focus on developing a next-generation HR branding model that integrates EVP, leadership culture, employee experience, technological maturity, inclusiveness, and ESG principles into a unified strategic architecture.

Keywords: *HR branding, employee value proposition, brand authenticity, trust, engagement, corporate culture, talent development.*

Formulas: -; fig.: 1; tabl.: 3; bibl.: 21.

JEL Classification: M12, M14, M31, J24, O15

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Introduction. In today's context of turbulence, technological breakthroughs, and the shifting paradigm of work, the concept of "employer" is no longer merely a legal or economic category – it is gaining emotional, value-based, and social dimensions. Talented professionals increasingly choose not just a workplace but a community with which they share values, meaning, and a vision of the future. Therefore, the employer brand is evolving from a marketing shell into a strategic system of interaction centered on trust, authenticity, and human development.

In the era of the "experience economy" and hybrid employment formats, organizations face new challenges: retaining key talents, building a culture of engagement, and overcoming alienation and information overload among employees. Under these conditions, the EVP becomes the central element of HR branding that defines the quality of the relationship between the company and its people. EVP is not merely a promise but rather an "emotional contract" that shapes the organization's reputation, employee engagement, and the willingness of talents to remain part of the corporate story.

Recent global studies (Deloitte, 2023 [4], 2025 [5]; Gartner, 2025 [8; 9; 10]; LinkedIn, 2024 [13; 14; 15]) confirm that companies with a clearly articulated and authentically implemented EVP demonstrate 30–40% higher engagement rates, 25% lower employee turnover, and a more resilient brand of trust in the labor market. The Ukrainian labor market also shows a noticeable shift from material motivation toward non-material factors – values, workplace atmosphere, development opportunities, and the social meaning of work.

Thus, the relevance of this study lies in the need to rethink HR branding as a holistic system centered on an authentic EVP, aligned with the company's mission and employee experience, human-centered, and built on trust and mutual responsibility – transforming the organization into a space of growth and partnership.

Literature review. The issue of HR branding and the employer's value proposition has gained new significance in the 2020s, driven by global labor market transformations, digitalization, the rise of artificial intelligence, and the changing expectations of employees. According to *McKinsey: The State of Organizations 2023*, companies must rethink their approaches to attracting and retaining talent by tailoring their value propositions to the individual expectations of employees. This approach helps narrow the gap between what modern professionals seek and what organizations need. A survey conducted in seven countries revealed that 39% of respondents plan to change jobs within the next 3–6 months – a clear signal that EVPs must evolve [17].

As highlighted in *Deloitte Global Human Capital Trends 2025* [6], the era of "human + AI" interaction is radically transforming personnel management: organizations are shifting from control-based models to partnership-based ones, where the EVP serves as the central "emotional contract" between the organization and its people. Through the EVP, employees experience meaning, trust, and belonging – elements that cannot be replicated by technology.

According to *Mercer Global Talent Trends Report 2024–2025* [18], a modern EVP must reflect the principle of *skills, purpose, and belonging* – offering employees not only pay and stability but also opportunities to develop skills, a sense of meaningful work, and an authentic culture of collaboration. Companies that integrate these elements into their HR brand recover engagement levels 35–40% faster after crisis periods.

Gartner's 9 Future of Work Trends 2024–2025 [8] identifies a profound shift in employee priorities: following the pandemic crisis, belonging, flexibility, and well-being have become the main drivers in choosing an employer. The report notes that the traditional return to offices has not produced the expected increase in collaboration – in fact, hybrid workers report higher levels of social satisfaction. This underscores the need for a new EVP architecture that integrates psychological safety, autonomy, and adaptive employment formats.

The *Edelman Trust Barometer 2025* emphasizes the growing importance of trust as a form of social capital: despite declining trust in business elites and public institutions, "my employer"

remains the most credible moral compass for 77% of respondents across 28 countries [7]. This indicates that employers now provide a core sense of stability in a turbulent environment. An authentic EVP – one confirmed by consistent action rather than communication alone – becomes the key condition for maintaining trust within organizations.

LinkedIn Global Talent Trends 2024 [15] and *Future of Recruiting 2025* [13] demonstrate a clear shift in candidate motivation: salary-based priorities are being replaced by preferences for culture, flexibility, and career growth opportunities. According to LinkedIn, 88% of candidates consider an employer's EVP the main argument in choosing where to work. This confirms that the modern HR brand is built not around external image but around internal employee experience (EX), which embodies the company's promised values.

In this context, the concept of EVP extends classical approaches to HR branding defined by Backhaus and Tikoo [1], who conceptualized the employer brand as a dual system – external, aimed at attracting talent, and internal, shaping loyalty and engagement. Subsequent studies, including Knox and Freeman [12], reinforced this view, emphasizing that *employer brand image* is a critical factor in attractiveness, especially within the service industry. This perspective deepened the understanding of the employer brand as a marketing asset that combines reputation, experience, and the emotional perception of an organization by employees and candidates.

Further research by Benraïss-Noailles and Viot [3] shows that the value of the employer brand today is measured not only by its attractiveness but, above all, by the quality of the internal employee experience and the level of trust in the organization.

Thus, EVP is progressively evolving toward the integration of economic, psychological, and social dimensions. An authentic EVP functions as a system of reciprocal exchange in which the organization provides not only compensation but also opportunities for personal growth, learning, and belonging.

Ukrainian researchers Trunina, Pryakhina and Bilyk [20] propose a diagnostic model of strategic employer brand management that integrates mission, vision, HR strategy, and corporate values into a unified brand architecture. Their analysis of Apple, Google, and Microsoft demonstrates that high employee loyalty is achieved through an EVP built on trust, growth, and shared purpose.

Consequently, contemporary scientific and analytical literature indicates the transition of HR branding toward a concept of trust, authenticity, and human-centeredness, where EVP serves not merely as an element of HR strategy but as the strategic core of organizational culture – combining humanity and technology in the age of artificial intelligence.

In summary, modern HR management theory and practice conceptualize EVP as a strategic bridge between brand and experience. Its effectiveness is based on five interrelated dimensions:

1. Meaning and mission of work.
2. Opportunities for growth and development.
3. Culture of trust and support.
4. Flexibility and well-being.
5. Social responsibility and impact.

The combination of these elements shapes next-generation HR branding – not as a marketing category but as a strategic system for managing human capital that creates a long-term competitive advantage amid technological turbulence, demographic change, and the rethinking of work itself.

Purpose, objectives and research methods. The purpose of this article is to explore the integration of the EVP into the HR branding system as a strategic instrument for fostering trust, authenticity, and talent development in modern organizations. The study aims to demonstrate how a value-oriented and human-centered EVP transforms HR branding from a marketing tool into a comprehensive system of strategic human capital management.

The methodological framework of the research is based on an interdisciplinary approach that integrates the concepts of strategic management, marketing, and organizational behavior. To ensure

the comprehensiveness and validity of the findings, a combination of general scientific and specialized methods was applied, including:

a) Systemic and comparative analysis – to generalize theoretical approaches to HR brand and EVP formation across different academic schools.

b) Content analysis – to review scholarly publications and analytical reports from leading research centers [4–11; 13–16; 20] covering the years 2020–2025.

c) Case study method – to investigate practical implementations of HR branding strategies based on EVP in international companies and Ukrainian companies.

d) Inductive-deductive approach – to transition from empirical observations to generalized conclusions and the development of the author's conceptual model.

e) Methods of synthesis and systematization – to construct a vision of HR branding as an integrated strategic system that unites internal management practices with external communications.

This methodological design provides a comprehensive understanding of the employer value proposition as a multidimensional phenomenon and a key factor in ensuring sustainable organizational competitiveness in the era of technological transformation and the culture of trust.

Research results.

1. Evolution of HR Branding: from a marketing tool to a value-oriented system

An analysis of scholarly literature and practical data confirms that HR branding has undergone a profound transformation – from a primarily communicative function to a value-driven system that integrates business strategy, leadership culture, and employee experience. The evolution of HR branding reflects deep changes in the paradigm of human resource management – shifting from an emphasis on image and external attractiveness toward the cultivation of authentic internal values and trust.

The analysis of academic sources and corporate practices made it possible to identify four key stages in the development of HR branding, illustrating its gradual transition from a marketing tool to a strategic system of human capital management (Table 1).

Table 1. Evolution of HR branding: from a marketing tool to a strategic system

Stage	Period	Key characteristics	Dominant focus
HR Branding 1.0	2000 – 2010	Image and external reputation of the employer	Attraction of candidates
HR Branding 2.0	2010 – 2018	Integration into HRM processes; reputation management	Retention and engagement of personnel
HR Branding 3.0	2019 –2023	Human-centered culture; emotional contract; employee experience	Trust and belonging
HR Branding 4.0	2024 – present	Integration of AI; inclusiveness; ESG orientation; authenticity of EVP	Meaning, sustainability, and employee development

Source: completed by the author

A gradual transition can be observed from the tactical level of HR branding, associated with the employer's reputational positioning, to the strategic level, where values, trust, and authenticity of interaction with employees play the key role. At the stage of HR Branding 4.0, the employer brand emerges as a dynamic ecosystem centered on the EVP – integrating technological maturity, leadership culture, inclusiveness, and corporate social responsibility. This approach transforms the brand into a strategic resource for human capital development, capable of ensuring the organization's long-term competitive advantage.

The EVP serves as the core of the HR brand, as it forms the meaningful axis that connects the organization's internal identity with its external image in the labor market. While the brand answers the question *"Who are we as an employer?"*, the EVP responds to *"Why do people want to join and stay with us?"* Unlike marketing communications that merely transmit messages, the EVP reflects the essence of mutual value exchange between the company and its employees. It is the EVP that transforms HR branding into a strategic instrument of trust, engagement, and sustainable human capital development.

The studies analyzed in this research demonstrate that a strong employer brand cannot exist without a clearly articulated and authentic EVP that integrates the organization's mission, culture, employee experience, and reputation into a single system. EVP ensures consistency between what the company declares, what employees actually experience, and how this is perceived externally. Such coherence creates an emotional contract between the individual and the organization – a foundation of trust, loyalty, and reputational resilience.

Thus, the EVP is not merely an element of HR branding but its strategic nucleus, defining the authenticity of the brand, the direction of communications, and the degree of value alignment across the entire HR ecosystem. It acts as a connecting link between leadership values, managerial behavior, and employee experience – transforming the brand from an external marker into an internal culture of mutual trust.

2. Structural composition of the employer value proposition

Based on the analysis of academic literature and corporate case studies from 2020–2025, the main structural dimensions of an authentic EVP in modern organizations were systematized (Table 2).

Table 2. Key dimensions of an authentic EVP

Dimension	Core meaning	Manifestation in organizational practice
Purpose and Meaning	The organization provides employees with a clear mission and sense of contribution to something greater than themselves.	Alignment of individual and corporate purpose; social impact projects; meaningful storytelling.
Growth and Development	Continuous learning, career mobility, and skill expansion are integral to the EVP.	Mentorship programs, leadership development, learning ecosystems.
Trust and Well-being Culture	Mutual respect, psychological safety, and emotional inclusion define the internal environment.	Open feedback culture, flexible schedules, well-being and resilience initiatives.
Flexibility and Autonomy	Employees are empowered to choose how, when, and where they work.	Hybrid models, results-oriented management, autonomy in decision-making.
Social Responsibility and Sustainability (ESG)	The company embodies ethical and sustainable business practices, engaging employees in shared responsibility.	ESG strategies, volunteering, transparent governance, ethical leadership.

Source: completed by the author

The obtained results confirm that the EVP is not merely a tool for talent attraction but a multidimensional system of mutual value exchange between the organization and its people. The effectiveness of this system is determined by the degree of alignment between the declared brand principles and the actual employee experience (EVP–EX alignment). The coherence of these dimensions creates a foundation for trust, engagement, and sustainable loyalty, transforming the HR brand into a strategic resource for human capital development and the reputational stability of the organization.

3. Correlation between EVP authenticity and organizational competitiveness

Based on the results of theoretical analysis and synthesis of recent HR-branding concepts, the author has developed an authentic EVP Model, which conceptualizes the EVP as the strategic core of employer branding. The model integrates five key dimensions that ensure the authenticity, trust, and sustainability of the HR brand (Figure 1).

The model illustrates five interconnected dimensions of the EVP: *purpose and mission, growth and development, trust and supportive culture, flexibility and well-being, and social responsibility and ESG.* These dimensions jointly form the authentic core of the employer brand, aligning declared corporate values with employee experience. An authentic EVP fosters employee engagement, builds loyalty, and strengthens long-term organizational sustainability.

The systematization of contemporary HR analytics reports [4–11; 13–18; 20] reveals a profound transformation in approaches to developing the EVP. Companies increasingly perceive the EVP not as a marketing element of HR branding, but as a value-oriented system of mutual trust, growth, and support that determines the quality of interaction between the organization and its employees.

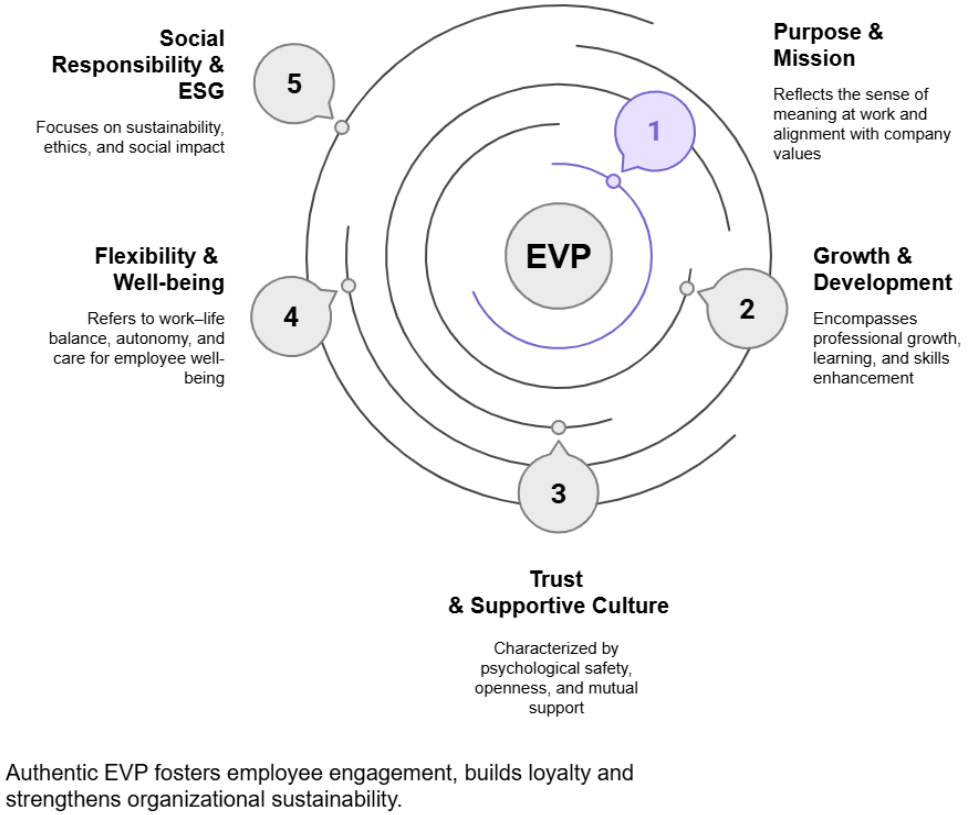

Figure 1. The Authentic EVP Model as the Strategic Core of HR branding
Sourse: completed by the author

A *Gartner* (2024) study shows that organizations that effectively implement EVP can reduce employee turnover by nearly 70% compared to those without a clearly defined value proposition [9]. Analytical data from *Great Place to Work* (2024) confirm that companies with a strong focus on the employee experience demonstrate turnover rates 51% lower than the industry average [11]. According to a Ukrainian *UGEN* (2024) survey, over 60% of young professionals prioritize values, corporate culture, and company reputation when choosing an employer, rather than salary level alone [20].

The *Gartner Employee Value Proposition (EVP): Insights and Guide* (2025) report [9] identifies five key dimensions of an effective EVP: trust, growth, flexibility, culture of support, and shared purpose, which together form the foundation for long-term employee loyalty. Furthermore, *Gartner's The DEI Reset: A Smarter Way to Embed What Matters* [10] emphasizes that diversity, equity, and inclusion (DEI) are now integral to EVP, as they foster psychological safety, engagement, and trust.

The *Deloitte Human Capital Trends Report 2025: Turning Tensions into Triumphs* [6] confirms that 72% of organizations are revising their EVPs by integrating principles of hybrid work, human-centricity, and "human + AI" collaboration. This indicates a transition toward a new paradigm of HR branding, in which values, authenticity, and human experience become the central elements of organizational competitiveness.

Thus, the findings of these reports empirically confirm that an authentic EVP serves as a strategic resource for organizational attractiveness and trust, forming the foundation of modern HR branding that unites culture, experience, and social responsibility into a cohesive system for sustainable human capital development.

Discussion. The conducted research confirms the growing role of the Employee Value Proposition as a system-forming element of HR branding. It was found that modern organizations increasingly view the EVP not merely as a marketing tool for talent attraction, but as a value-driven

system of interaction between employer and employees that fosters trust, engagement, and sustainable growth.

To determine the place of the author's model of an authentic EVP within existing theoretical approaches, a comparative analysis of the most influential EVP concepts was conducted, the results of which are presented in Table 3.

Table 3. Comparative Characteristics of EVP Models

Author / Model	Conceptual approach to EVP	Key elements	Limitations and potential development
Backhaus & Tikoo (2004) [1]	EVP as a dual system: external (employer image) + internal (employee experience)	Attraction, retention, engagement	Oriented mainly toward recruitment; limited focus on internal experience
Barrow & Mosley (2005) [2]	EVP as a set of economic, psychological, and social benefits for employees	Compensation, development, brand reputation	Linear model, does not account for emotional and social dimensions
Benraïss-Noailles & Viot (2020) [3]	EVP as a component of Employer Brand Equity, linking trust and employee experience	Emotional connection, trust, employee advocacy	Limited empirical validation; need for cross-sectoral research
Deloitte (2025) [4–6]	EVP as part of the Human Sustainability paradigm	Belonging, Purpose, Growth, Safety, Fairness	Need for harmonization with AI transformation and ESG strategy
Mercer (2025) [18–19]	EVP as a platform for skill-based talent development (skills, purpose, belonging)	Skills, Purpose, Belonging	Lack of detailed mechanisms for integrating employee experience
Gartner (2025) [8–10]	EVP as a system of authenticity, inclusiveness, and trust-based leadership	Trust, Flexibility, Leadership, Development	Requires technological integration and psychological safety framework
Edelman (2025) [7]	EVP as a moral–ethical core of the HR brand, centered on trust	Integrity, Stability, Reputation, Trust	Not universal; depends on the organization's level of internal trust
LinkedIn (2024–2025) [14–16]	EVP as a partnership model based on human and technological synergy	Culture, Inclusiveness, Career Growth, Transparency	Dependent on digital platform maturity and employer transparency

Sourse: completed by the author [1-10; 14-16; 18-19].

The comparative analysis demonstrates that the evolution of EVP models reflects a gradual shift from marketing and communication approaches toward human-centered and value-driven concepts. Early models (Backhaus & Tikoo [1]; Barrow & Mosley [2]) focused primarily on the external image of the employer brand and the attraction of candidates, while recent frameworks (Deloitte, Gartner, Mercer) increasingly emphasize trust, well-being, supportive culture, and social responsibility.

However, even modern models remain fragmented, as they tend to view the EVP either as a tool of external positioning or as an element of internal corporate culture –without integrating these aspects into a holistic system. These limitations provided the foundation for developing the author's model of an authentic EVP, which offers a systemic, multidimensional approach to building the HR brand.

The proposed EVP model overcomes the constraints of previous frameworks through several conceptual advantages:

1. EVP as the strategic core of the HR brand – ensuring alignment among organizational mission, culture, and employee experience.
2. Trust as the system-forming category – positioning psychological safety, empathic leadership, and authenticity as fundamental conditions for sustainable employee engagement.

3. Integration of ESG, inclusiveness, and technological maturity – reflecting the realities of hybrid work, digital transformation, and "human + AI" collaboration.
4. Balance of internal and external focus – simultaneously creating value for employees and strengthening the employer's reputational capital.

Thus, the author's concept of an authentic EVP offers a new level of understanding of HR branding – as an integrated ecosystem of trust, development, and sustainable human capital management in the era of technological and social transformation.

Conclusions. The conducted study deepened the theoretical and methodological understanding of the EVP as a key element of human resource management and a strategic resource for HR brand development. Based on an interdisciplinary analysis, it was proven that modern HR branding is transforming from a tool of external positioning into a value-oriented ecosystem of trust, authenticity, and partnership between organizations and their employees.

A synthesis of international analytical studies (Deloitte, Gartner, Mercer, Great Place to Work, UGEN) confirmed that companies integrating an authentic EVP into their strategies demonstrate higher employee engagement, lower turnover, and greater organizational resilience. This emphasizes the strategic role of EVP in shaping the competitive advantages of next-generation organizations.

The developed model of an authentic EVP represents a systemic approach to HR branding, centered on the human being – their mission, growth, well-being, trust, and the social significance of work. Unlike previous frameworks, the model proposes to:

• view EVP not as a separate brand tool but as its strategic core, ensuring alignment between the company's mission and employee experience;

• integrate emotional and social factors – trust, psychological safety, and empathic leadership – into the EVP structure;

• include ESG principles, inclusiveness, and technological maturity as new vectors for HR brand evolution.

The practical significance of the study lies in the applicability of the proposed model for: diagnosing the strengths and weaknesses of EVP across industries; developing strategies for talent attraction and retention; shaping a corporate culture based on trust, mutual responsibility, and sustainable development.

Future research should focus on the empirical verification of the authentic EVP model across different types of organizations and on identifying correlations between the level of EVP authenticity, employee emotional engagement, and overall business performance.

References

1. Backhaus K., & Tikoo S. (2004), Conceptualizing and researching employer branding. *Career Development International*, Vol. 9 №o. 5 pp. 501–517, DOI: https://doi.org/10.1108/13620430410550754
2. Barrow, S., & Mosley, R. (2016). The employer brand: Bringing the best of brand management to people at work (2nd ed.). *Wiley*. 240 p.
3. Benraïss-Noailles, L., & Viot, C. (2020). Employer brand equity effects on employees' well-being and loyalty. *Journal of Business Research, 110*, 102002. DOI: https://doi.org/10.1016/j.jbusres.2020.02.002
4. Deloitte. (2023). Global Human Capital Trends 2023: Thriving in the Boundaryless World. *Deloitte Insights*. Retrieved from: https://www.deloitte.com/us/en/insights/topics/talent/human-capital-trends/2023/future-of-workforce-management.html
5. Deloitte. (2025). AI is revolutionizing work: You need a human value proposition for the age of AI. *Deloitte Insights*. Retrieved from: https://www.deloitte.com/us/en/insights/topics/talent/human-capital-trends/2025/why-you-need-employee-value-proposition-for-age-of-ai.html
6. Deloitte. (2025). Human capital trends report 2025: Turning tensions into triumphs — Helping leaders transform uncertainty into opportunity. *Deloitte Research.* Retrieved from: https://www.deloitte.com/nl/en/services/consulting/research/human-capital-trends-report-2025.html
7. Edelman Trust Institute. (2025). 2025 Edelman trust barometer: Trust and the crisis of grievance. *Edelman Trust Institute*. Retrieved from: https://www.edelman.com/sites/g/files/aatuss191/files/2025-01/2025%20Edelman%20Trust%20Barometer_Final.pdf
8. Gartner. (2025). 9 Future of Work Trends for 2025. *Gartner Research*. Retrieved from: https://www.gartner.com/en/articles/future-of-work-trends
9. Gartner. (2025). Employee value proposition (EVP): Insights and guide. *Gartner Research*. Retrieved from: https://www.gartner.com/en/human-resources/topics/employee-value-proposition-evp

10. Gartner. (2025). The DEI reset: A smarter way to embed what matters. *Gartner Research*. Retrieved from: https://www.gartner.com/en/articles/dei-management-strategies
11. Great Place to Work. (2024). Employee value proposition: What it is and examples to inspire your strategy. Retrieved from: https://www.greatplacetowork.com/resources/blog/employee-value-proposition-definition-and-strategies
12. Knox, S., & Freeman, C. 2006. Measuring and Managing Employer Brand Image in the Service Industry. *Journal of Marketing Management*, 22(7–8), 695–716. DOI: https://doi.org/10.1362/026725706778612103
13. LinkedIn Corporation. (2025). Future of recruiting 2025: How AI redefines recruiting excellence. *LinkedIn Talent Solutions*. Retrieved from: https://business.linkedin.com/talent-solutions/resources/future-of-recruiting
14. LinkedIn. (2024). Future of recruiting 2024: How AI and skills will redefine hiring. *LinkedIn Talent Solutions*. Retrieved from: https://business.linkedin.com/talent-solutions/resources/future-of-recruiting/archival/future-of-recruiting-2024
15. LinkedIn. (2024, October). Global Talent Trends: Data-driven insights into the changing world of work. *LinkedIn Corporation*. Retrieved from: https://business.linkedin.com/talent-solutions/global-talent-trends
16. Lobosco, M. (2022, January 18). *The reinvention of company culture:* Why it should be your top priority this year. *LinkedIn Talent Blog*. Retrieved from: https://www.linkedin.com/business/talent/blog/talent-strategy/global-talent-trends-report
17. McKinsey & Company. (2023). The State of Organizations 2023: Ten Shifts Transforming Organizations. *McKinsey & Company*. Retrieved from: https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/the-state-of-organizations-2023.
18. Mercer. (2025). Global Talent Trends Report 2024-2025: Skills, purpose and belonging. *Mercer Research*. Retrieved from: https://www.mercer.com/insights/people-strategy/future-of-work/global-talent-trends/
19. Robbins, J. (2025, July 10). Mercer's 2025 global talent trends: What it means for employer branding. *Employer Branding News*. Retrieved from: https://employerbranding.news/mercers-2025-global-talent-trends-what-it-means-for-employer-branding/
20. Trunina, I., Pryakhina, K., & Bilyk, M., (2024). Strategic Management of a Company's Employer Brand: Experience of International Companies. *Marketing and Management of Innovations*, *15*(3), 71–85. DOI: https://doi.org/10.21272/mmi.2024.3-06
21. UGEN. (2024, October 21). Naikrashchyi robotodavets 2024 na dumku molodi Ukrainy. *UGEN HR Agency*. Retrieved from: https://www.ugen.agency/post/%D0%BD%D0%B0%D0%B9%D0%BA%D1%80%D0%B0%D1%89%D0%B8%D0%B9-%D1%80%D0%BE%D0%B1%D0%BE%D1%82%D0%BE%D0%B4%D0%B0%D0%B2%D0%B5%D1%86%D1%8C-2024-%D0%BD%D0%B0-%D0%B4%D1%83%D0%BC%D0%BA%D1%83-%D0%BC%D0%BE%D0%BB%D0%BE%D0%B4%D1%96-%D1%83%D0%BA%D1%80%D0%B0%D1%97%D0%BD%D0%B8

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Ільїч Людмила
доктор економічних наук, професор,
професор кафедри управління
Київський столичний університет імені Бориса Грінченка
вул. Левка Лук'яненка, 13-Б, м. Київ, Україна, 02000
e-mail: l.ilich@kubg.edu.ua
ORCID ID: 0000-0002-8594-1824

Ціннісна пропозиція роботодавця як ядро HR-бренду: стратегія довіри, автентичності та розвитку талантів

Анотація. Об'єктом дослідження є система HR-брендингу сучасних організацій, що відображає взаємозв'язок між ціннісною пропозицією роботодавця (Employee Value Proposition, EVP), корпоративною культурою та управлінськими практиками розвитку персоналу. HR-бренд розглядається як багатовимірне явище, яке поєднує маркетингову, психологічну й соціальну складові, забезпечуючи формування довіри, лояльності та залученості працівників. Його ключовими характеристиками виступають автентичність, стратегічна спрямованість, людиноцентричність та інтеграція з бізнес-цілями.

Постановка проблеми. У сучасних умовах високої конкуренції за таланти, цифровізації бізнесу та зростання значущості емоційного залучення працівників, HR-брендинг трансформується із маркетингового інструмента в стратегічну систему управління людським капіталом. Головним ядром цієї системи стає EVP, що формує довіру, лояльність і культуру взаємної відповідальності між компанією та її людьми.

Невирішені аспекти проблеми. Попри активний розвиток концепції HR-брендингу, залишається недостатньо дослідженою роль автентичної EVP як чинника стратегічної конкурентоспроможності організацій та її інтеграція в систему управлінських практик.

Мета статті. Метою дослідження є теоретичне обґрунтування EVP як стратегічного ядра HR-бренду сучасної організації та визначення її ключових вимірів, що забезпечують довіру, автентичність і розвиток талантів.

Виклад основного матеріалу. На основі міждисциплінарного підходу, що поєднує концепції менеджменту, маркетингу та організаційної поведінки, узагальнено наукові підходи до визначення сутності HR-брендингу та виокремлено його компоненти: EVP, корпоративну культуру, досвід співробітників, репутацію, інноваційність і соціальну відповідальність бізнесу. Проведено аналіз міжнародних і українських досліджень 2020–2025 років, який довів, що ефективна EVP інтегрує місію, цінності, досвід співробітників і соціальну відповідальність у єдину систему взаємних зобов'язань. Виокремлено п'ять ключових вимірів сучасної EVP: місія та значущість роботи, професійний розвиток, підтримувальна корпоративна культура, гнучкість і баланс між роботою та життям, соціальна відповідальність бізнесу.

Висновки. Результати дослідження підтверджують, що сильний HR-бренд підвищує привабливість організації, знижує плинність кадрів і формує довгострокові конкурентні переваги. Запропоновано розглядати HR-брендинг як комплексну систему, що поєднує внутрішні управлінські практики та зовнішні комунікації, гармонізуючи цілі бізнесу з очікуваннями працівників. Перспективи подальших досліджень пов'язані з розробленням концептуальної моделі HR-брендингу нового покоління, яка інтегрує EVP, культуру лідерства, досвід співробітників, технологічну зрілість, інклюзивність та ESG-принципи в єдину стратегічну архітектуру.

Ключові слова: *HR-брендинг, ціннісна пропозиція роботодавця, автентичність бренду, довіра, залученість, корпоративна культура, розвиток талантів.*

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Список літератури

1. Backhaus K., Tikoo S. Conceptualizing and Researching Employer Branding. *Career Development International*, 2004, vol. 9, no. 5, pp. 501–517. DOI: https://doi.org/10.1108/13620430410550754.
2. Barrow S., Mosley R. *The Employer Brand: Bringing the Best of Brand Management to People at Work.* 2nd ed. Hoboken, NJ: Wiley, 2016.
3. Benraïss-Noailles L., Viot C. Employer Brand Equity Effects on Employees' Well-Being and Loyalty. *Journal of Business Research*, 2020, vol. 110, article 102002. DOI: https://doi.org/10.1016/j.jbusres.2020.02.002.
4. Deloitte. *Global Human Capital Trends 2023: Thriving in the Boundaryless World.* Deloitte Insights, 2023. URL: https://www.deloitte.com/us/en/insights/topics/talent/human-capital-trends/2023/future-of-workforce-management.html
5. Deloitte. *AI Is Revolutionizing Work: You Need a Human Value Proposition for the Age of AI.* Deloitte Insights, 2025. URL: https://www.deloitte.com/us/en/insights/topics/talent/human-capital-trends/2025/why-you-need-employee-value-proposition-for-age-of-ai.html

6. Deloitte. *Human Capital Trends Report 2025: Turning Tensions into Triumphs — Helping Leaders Transform Uncertainty into Opportunity*. Deloitte Research, 2025. URL: https://www.deloitte.com/nl/en/services/consulting/research/human-capital-trends-report-2025.html
7. Edelman Trust Institute. *2025 Edelman Trust Barometer: Trust and the Crisis of Grievance.* Edelman Trust Institute, 2025. URL: https://www.edelman.com/sites/g/files/aatuss191/files/2025-01/2025%20Edelman%20Trust%20Barometer_Final.pdf
8. Gartner. *9 Future of Work Trends for 2025.* Gartner Research, 2025. URL: https://www.gartner.com/en/articles/future-of-work-trends
9. Gartner. *Employee Value Proposition (EVP): Insights and Guide.* Gartner Research, 2025. URL: https://www.gartner.com/en/human-resources/topics/employee-value-proposition-evp
10. Gartner. *The DEI Reset: A Smarter Way to Embed What Matters.* Gartner Research, 2025. URL: https://www.gartner.com/en/articles/dei-management-strategies
11. Great Place to Work. *Employee Value Proposition: What It Is and Examples to Inspire Your Strategy*. 2024. URL: https://www.greatplacetowork.com/resources/blog/employee-value-proposition-definition-and-strategies
12. Knox S., Freeman C. Measuring and Managing Employer Brand Image in the Service Industry. *Journal of Marketing Management*, 2006, vol. 22, no. 7–8, pp. 695–716. DOI: https://doi.org/10.1362/026725706778612103
13. LinkedIn Corporation. *Future of Recruiting 2025: How AI Redefines Recruiting Excellence.* LinkedIn Talent Solutions, 2025. URL: https://business.linkedin.com/talent-solutions/resources/future-of-recruiting
14. LinkedIn Corporation. *Global Talent Trends: Data-driven Insights into the Changing World of Work.* October 2024. LinkedIn Talent Solutions. URL: https://business.linkedin.com/talent-solutions/global-talent-trends
15. LinkedIn Corporation. *Future of Recruiting 2024: How AI and Skills Will Redefine Hiring.* LinkedIn Talent Solutions, 2024. URL: https://business.linkedin.com/talent-solutions/resources/future-of-recruiting
16. Lobosco M. The Reinvention of Company Culture: Why It Should Be Your Top Priority This Year. *LinkedIn Talent Blog*, January 18, 2022. URL: https://www.linkedin.com/business/talent/blog/talent-strategy/global-talent-trends-report
17. McKinsey & Company. *The State of Organizations 2023: Ten Shifts Transforming Organizations.* McKinsey & Company, 2023. URL: https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/the-state-of-organizations-2023
18. Mercer. *Global Talent Trends Report 2024–2025: Skills, Purpose, and Belonging.* Mercer Research, 2025. URL: https://www.mercer.com/insights/people-strategy/future-of-work/global-talent-trends/
19. Robbins J. Mercer's 2025 Global Talent Trends: What It Means for Employer Branding. *Employer Branding News*, July 10, 2025. URL: https://employerbranding.news/mercers-2025-global-talent-trends-what-it-means-for-employer-branding
20. Trunina I., Pryakhina K., Bilyk M. Strategic Management of a Company's Employer Brand: Experience of International Companies. *Marketing and Management of Innovations*, 2024, vol. 15, no. 3, pp. 71–85. DOI: https://doi.org/10.21272/mmi.2024.3-06
21. UGEN. Найкращий роботодавець 2024 на думку молоді України [Електронний ресурс]. UGEN HR Agency, 21 жовтня 2024 р. URL: https://www.ugen.agency/post/%D0%BD%D0%B0%D0%B9%D0%BA%D1%80%D0%B0%D1%89%D0%B8%D0%B9-%D1%80%D0%BE%D0%B1%D0%BE%D1%82%D0%BE%D0%B4%D0%B0%D0%B2%D0%B5%D1%86%D1%8C-2024-%D0%BD%D0%B0-%D0%B4%D1%83%D0%BC%D0%BA%D1%83-%D0%BC%D0%BE%D0%BB%D0%BE%D0%B4%D1%96-%D1%83%D0%BA%D1%80%D0%B0%D1%97%D0%BD%D0%B8

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Minakova Svitlana
Doctor of Economics, professor, Professor of the Department of mechanical engineering
Odesa State Academy of Construction and Architecture Odessa, Ukraine
e-mail: smmnkv@gmail.com
ORCID ID: 0000-0002-9931-8291
Minakov Vitaly
Candidate of Economic Sciences, Associate Professor,
Associate Professor of the Department of Mechanical Engineering
Odesa State Academy of Construction and Architecture, Odessa, Ukraine
e-mail: vipmvm@ogasa.org.ua
ORCID ID: 0000-0002-0087-503X
Minakova Olena
Candidate of Economic Sciences, Associate Professor of the Department of Management, Finance and Administration
Odesa Institute of PJSC "Interregional Academy of Management staff", Odesa, Ukraine
e-mail: oominakova@gmail.com
ORCID ID: 0000-0003-4573-6444
Minakov Oleksiy
M.Sc.
Odesa State Academy of Construction and Architecture, Odessa, Ukraine
e-mail: alexminak32@gmail.com
ORCID ID: 0009-0002-4439-1560

Digital transformation of logistics: the role of artificial intelligence and Big Data in managing transport flows and optimizing loading and unloading operations

Abstract. The digitalization of the economy covers all types of economic activity, among which logistics activities and the implementation of AI and Big Data tools are distinguished.

Problem statement. Comprehensive approach to the study of the digital transformation of logistics (DTL) based on the use of AI and Big Data to manage transport flows (MTF) and optimize loading and unloading operations (OPUO).

Unresolved aspects of the problem. Due to the dynamic development of the processes of DTL, a comprehensive approach based on the use of AI and Big Data to MTF and OPUO requires additional research.

Purpose of the article. Research on the scientific foundations and practical recommendations for MTF and OPUO based on AI and Big Data.

Presentation of the main material. It is noted that the driver of the spread of AI and Big Data tools in logistics is the WEF platform, which also considers the processes of DTL towards green logistics and decarbonization using AI and Big Data tools. The results of research conducted in 2025 among logistics companies in Europe and the USA showed that a quarter of respondents have already integrated AI and Big into their activities, half of them partially use AI and Big, and 57% plan to introduce these tools into their activities. A description of the main companies involved in the development and distribution of applied software solutions for logistics and logistics companies is provided.

Conclusions. A list of the main obstacles (large initial investments, outdated data processing and storage technologies, lack of qualified labor, variability and instability of the regulatory field, costs of maintaining excess inventory in the warehouse) and opportunities (increasing the level of optimization and self-optimization of logistics processes, optimization of resource costs, autonomy of supply chains, real-time processing of large volumes of data and forecasting demand for products over time) in the development of AI and Big Data tools in MTF and OPUO has been formed.

Keywords: *digital transformation, digital technologies, artificial intelligence, big data, logistics.*
JEL Classification L 81; L 86; L 91; R 40
Formulas: 0; fig.: 3, tabl.: 2, bibl.: 21;

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Introduction. The acceleration and spread of digital technologies in all types of economic activity is changing the paradigm of the economy to a digital model, which means the saturation of production, transportation and service of goods in a different, previously unheard-of form, such as those based on AI and Big Data. Innovations permeate all operational and distribution processes, including logistics. It is logistics processes that play a significant role in the connection between the manufacturer and the consumer (Chukurna et al., 2018; Krushkyn & Nitsenko, 2012). The growth of corporate social responsibility requires transparency of reporting to interested stakeholders, and the introduction of AI and Big Data into the business model strengthens this direction. Therefore, the further development of logistics as one of the key elements in business requires a revision of the classical concept taking into account the requirements of the time.

Literature Review. Dynamic changes in the digitalization of logistics processes under the influence of external factors, including AI and Big Data, lead to the need to form and approve an updated logistics strategy for the development of the enterprise. These and related processes are described in the works of domestic and foreign scientists and specialists. Thus, Raiko (2025) studied the impact of digital transformations on changes in the product policy of the enterprise using AI and Big Data tools. Product policy is a part of the strategic development of the enterprise related to logistics. It is a system of interconnected processes that provide a strategic vision of management regarding the creation of new models, the formation of the assortment of goods and their further sale. Logistics is the next stage, designed to deliver the appropriate quantity and quality of goods on time and to the specified place. There is an indirect connection between the above functional components of the enterprise, which is ensured first by determining the types of goods that are planned to be produced, and then by concluding contracts for their supply.

Marinov and Lisenyi (2024) highlighted the importance of using telematics technologies in logistics processes. Telematics includes information technologies, electrical equipment and tools, telecommunication technologies and vehicles. Telematics as a system provides transport with navigation (GPS), control (sensors) and telecommunication (modems) and appropriate software. That is, with the help of telematics, constant monitoring of the movement and technical condition of the vehicle is carried out as well as optimization of routes and travel time and the possibility of integration with other management systems, etc. It may be concluded that telematics is an important element of modern logistics based on AI and Big Data.

Zavrazhnyi (2023) concludes that the use of AI leads to a reduction in the cost of material and financial resources for transport and logistics. According to the author, AI solves the following issues: eliminating obstacles (choosing the optimal route), connecting with hubs and warehouses (ensuring optimal interaction during loading, unloading and transportation of goods), optimizing the movement of vehicles (planning services for transport), monitoring and checking the technical condition of vehicles (using sensors, motion sensors and software to eliminate technical malfunctions in a timely manner), predicting demand (helps predict potential sales volumes and the need for logistics services). Makhmudova (2025) notes the importance of logistics in global supply chains. She indicates that the management of these processes is moving to the use of agent systems (modeling the relationship between individual management objects within the supply chain), neural networks (predicting demand, optimizing the route, etc.) and genetic algorithms. AI, the author continues, within the supply chain increases the quality of inventory management, demand forecasting, automation of warehousing and logistics processes.

Moroz and Shunevich (2024) drew attention to the introduction of AI into direct and related areas of logistics. They noted significant changes in the field of logistics under the influence of AI on systems such as ERP, CRM, SCM, warehouse management systems (WMS) and transport

(TMS). Scientists have established a reduction in direct labor costs, time, material resources and money from the use of AI in logistics processes.

Buiak and Semenenko (2025), continuing the research of Moroz and Shunevich (2024), proposed the concept of transport systems management. The concept is based on a digital ecosystem, supplemented by the physical movement of vehicles with special software that allows monitoring and managing them in real time.

The above fundamental scientific works significantly expand the understanding and implementation of digitization processes using AI and Big Data in supply chains and logistics processes.

Purpose, objectives and research methods. The purpose of the article is to study the scientific foundations and practical recommendations for managing transport flows and optimizing loading and unloading operations based on AI and Big Data.

Achieving the purpose of the article required the use of appropriate scientific and methodological support, namely the following methods: generalization and abstraction - to determine the key characteristics of the subject of research with the allocation of AI and Big Data; historical and logical research - to analyze the evolution of the issue, draw conclusions and develop proposals; analysis and synthesis - separation and combination of individual elements and the whole to establish a connection; concretization method - to establish a connection between AI and Big Data and logistics processes.

Research results. The driver of the country's economic development is considered to be digitization processes. This is evidenced, in particular, by the Concept of Artificial Intelligence Development in Ukraine (Cabinet of Ministers of Ukraine, 2020) and the Strategy for Digital Development of Innovative Activity of Ukraine for the Period up to 2030 (Cabinet of Ministers of Ukraine, 2024) approved by the Cabinet of Ministers of Ukraine. According to these documents, AI is recognized as the main tool for increasing business efficiency, including logistics. To ensure the effective development of AI, it is necessary to create an appropriate infrastructure, train a sufficient number of specialists, ensure innovative development, carry out the maximum volume of automation processes, and improve the overall logistics management system. An indispensable condition for the implementation of AI is the use of Big Data. The latter, in turn, must be protected from external interference, i.e. potential cyberattacks.

WEF, annually discussing the development of logistics, announced 2025 as the year of AI capabilities in the direction of decarbonization and green logistics processes, operational efficiency, and increased sustainability. The formed scheme “Supply Chain and Transport” has the following connections (Fig. 1).

From the above scheme, it can be seen that the block “Digital Supply Chain Growth” is responsible for AI and Big Data. The latter is also based on the Internet of Things, Cybersecurity, The Digital Economy, The Digital Transformation of Business, Data Policy, Blockchain, Drones (World Economic Forum, 2025). The above elements not only increase operational results, but also ensure resource and time savings, and the efficiency of logistics companies as a whole.

According to forecasts, the global market for artificial intelligence in logistics will grow to $6.5 billion in 2031 and will exceed $4.4 billion in 2024. (Dobosevych, 2025). Despite positive forecasts, logistics companies are at an insufficient level of development in terms of AI and Big Data tools in their activities. The problem of the industry is the lack of complementary and integrated development of companies engaged in the development and implementation of software and logistics companies.

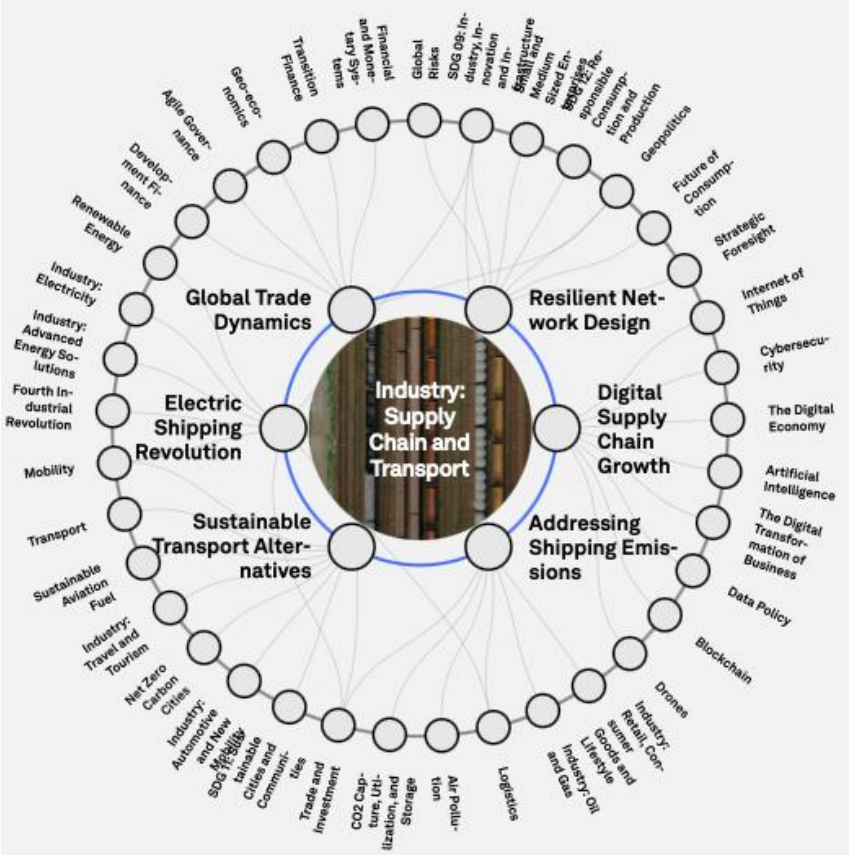

Fig. 1. Industry: Supply Chain and Transport
Source: World Economic Forum (2025).

However, as previously noted, not all companies are ready and can afford to implement AI and Big Data tools. These obstacles are associated, first of all, with an insufficient amount of financial resources available for investment; lack of human resources with appropriate qualifications, experience and knowledge of AI and Big Data; underdeveloped infrastructure for this type of technology; lack of technologies for storing and processing large data sets, etc., delay the full-scale implementation of AI and Big Data tools in traffic flow management and optimization of loading and unloading operations (Nitsenko, Samoilyk, & Hrynko, 2024; Nitsenko et al., 2024). The main obstacles and potential benefits of implementing AI and Big Data tools are presented in Table 1.

Table 1. Obstacles and opportunities from implementing AI and Big Data tools in traffic flow management and optimization of loading and unloading operations

Barriers	Opportunities
Large initial investments	Increasing the level of optimization and self-optimization of logistics processes
Outdated technologies for data processing and storage	Optimization of resource costs (time, fuel, people, money, etc.)
Lack of skilled labor	Using digital twin technology
Variability and instability of the regulatory field	Autonomy of supply chains
Costs of maintaining excess inventory in the warehouse	Real-time processing of large volumes of data
	Forecasting demand for products over time

Source: Developed using Nahirnyi (2025) and own research

A survey of leading logistics companies in Europe and the USA showed that most of them are at the initial stage of implementing and using AI and Big Data. The respondents' answers had a different development pattern (Fig. 2).

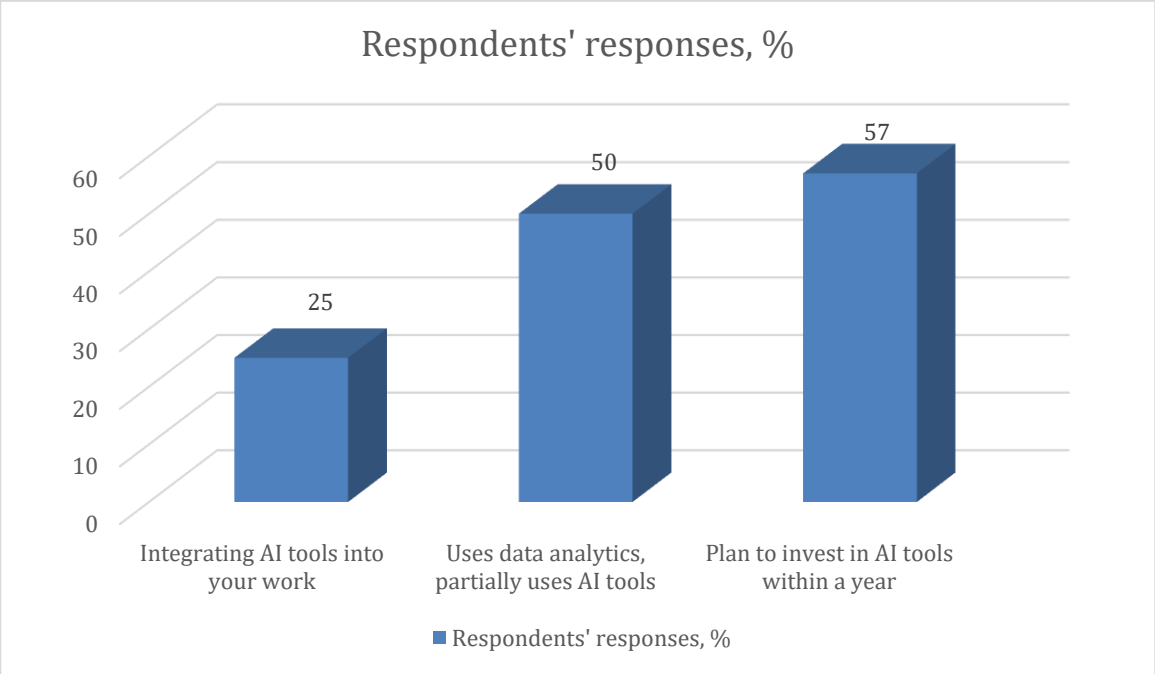

Fig. 2. Results of a survey of logistics companies in Europe and the USA
Source: based on Nahirnyi (2025)

A survey conducted by McKinsey in 2024 showed that on average in the logistics industry, 12.5% of businesses use digital solutions, of which 7.1% are large companies, and only 7.5% of respondents use AI in their activities, of which 3% are large companies (Li et al., 2024).

The data presented show a gradual transition to a new model of logistics operations management, where AI and Big Data will play a key role.

Breakthrough processes in this area were the developments of companies that differ in the stage of completion and integration of AI into logistics processes (Table 2).

Table 2. Stages of development and integration of AI in leading IT companies

	AI Explorers → Early-Stage AI Adoption	AI Augmenters → AI as a Productivity Booster	AI Integrators → AI-Enhanced but Human-Driven	AI Architects → Fully AI-Driven Operations
AI Explorers → Early-Stage AI Adoption	Osa Commerce, Milenow, Pickrr, Ware2Go, Orkestra	↓		
AI Augmenters → AI as a Productivity Booster	→	Konexial, Enmovil Solutions, Shipsy, TrackChain, Parade	↓	
AI Integrators → AI-Enhanced but Human-Driven		→	Greenscreens ai, Neurored, Everstream Analytics, Rippey AI, Kargo, 3SC Solutions, Nautilus Labs, Surgere	↓
AI Architects → Fully AI-Driven Operations			→	7bridges, Einride, Raft, Gatik, Vorto

Source: Based on Omden (2025).

The formed set of companies ensures the implementation of AI to increase the level of autonomy of vehicles, optimize the time spent on delivering goods and funds, transparency and quick access to data, etc.

The main areas of work in IT companies specializing in managing transport flows and optimizing loading and unloading operations are (AI Superior, 2024):

1. SNAP Account: integrated systems for managing vehicle fleets, parking networks and their safe parking, analytics and real-time data monitoring to optimize the size of the used fleet.

2. Optibus: increasing the level of operational efficiency of companies, analytics and real-time data monitoring, optimization of public sector transport.

3. Covariant (works in various areas, including logistics): AI for robotics, deep learning, automation of operational processes.

4. Altana (works in various areas, including logistics): applies machine learning, implements data analytics, improves transparency, visibility, and sustainability of the supply chain based on AI.

5. NoTraffic: offers AI-based traffic management in the city, real-time traffic light optimization, and provides communication between autonomous and connected cars.

6. Locus Robotics: offers the latest solutions for automation of warehouse work based on robotics, provides autonomous mobile robots with sophisticated navigation systems, and the ability to integrate the proposed solutions into an existing management system.

7. LogiNext: provides automation of route planning, resource planning, and fleet management processes, and provides real-time vehicle usage monitoring.

8. Venti Technologies: focuses on autonomous vehicle technologies, ensures the safety, sustainability and efficiency of vehicle use, and implements machine learning algorithms with reliable equipment.

Examples of well-known logistics companies that have implemented AI and Big Data in their activities include (AI Superior, 2024):

1. Baltic Transline: All types of transportation and logistics services using AI tools. The company's services include sea, air and road transportation to different countries of the world. Baltic Transline also provides responsible storage of goods in its own warehouses. The entire range of operations is permeated with monitoring and control systems, which increases the effectiveness and efficiency of management decisions in cargo delivery chains.

2. Gatik: The company provides mid-range logistics services (transportation of products between distribution centers and stores, supermarkets, shopping centers). It uses autonomous vehicles equipped with motion and control sensors, an AI system. The integration of the above tools ensures timely, safe, resource-efficient delivery.

As it can be seen, the digitization of processes, including the use of AI and Big Data tools, in managing transport flows and optimizing loading and unloading operations tends to gradually increase. This is stated, in particular, in the McKinsey study (Fig. 3).

The basic characteristics of the development of the studied market are transportation, warehouse technologies and planning. The higher the level of development of the given technology, the more widespread it is, if it is in the middle – the beginning of distribution, in the lowlands – the level of distribution is too low, in the stage of development. Thus, in the field of transportation, digital procurement of goods (14), asset tracking and intelligent data analysis (13) and digitalization and management (12) are prominent; such processes as the use of drones for delivering goods (3), augmented reality for drivers (2) and transport running on hydrogen (1) are at the beginning of their development. Warehouse technologies have become the most widespread solutions for delivering goods to a person based on AGV (14), management of the efficiency of distribution centers (13) and individual productivity in real time (12); they are at the stage of innovative development. Data analytics and automated root cause analysis for efficiency management (10) and automated replenishment (9) are widely implemented in planning processes, while real-time constraint-based estimation (2) and closed-loop planning (1) are available for the promised ones at the development stage.

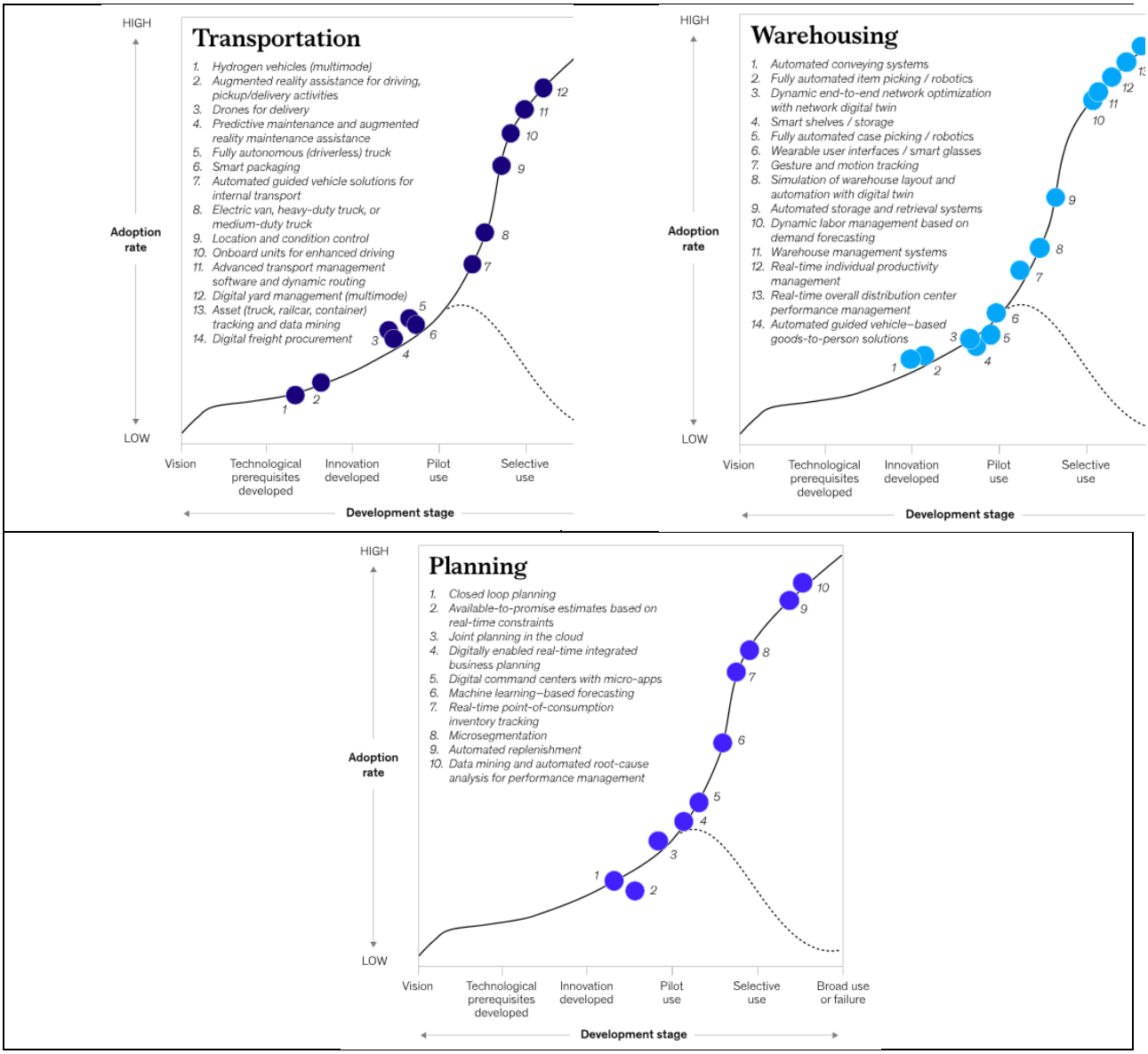

Fig. 3. Scenarios for the development of logistics based on digital technologies
Source: based on Gosling et al. (2023).

The conducted research has shown the widespread use of AI and Big Data tools in the management of almost all areas of work in logistics activities. Thus, the use of AI in routing will reduce fuel consumption by 15% and more; intelligent maintenance systems will reduce the time and costs of repairs and maintenance by 20-30% and will increase the service life of vehicles; the use of telematics and autonomous vehicles will reduce the number of road accidents by at least 40%; anomaly detection tools will allow maintaining the temperature regime in refrigerated trucks and monitoring the quality of vehicle management; Warehousing systems will eliminate delay time, increase the reliability and timeliness of cargo delivery to the client, and reduce the time spent on sorting goods (Dobosevych, 2025).

Discussion. The conducted research made it possible to identify the main directions of development in the management of transport flows and the optimization of loading and unloading operations. This is confirmed by the fact that, according to Marinov and Lisenyi (2024), modern Ukrainian realities do not allow logistics companies to quickly adapt to market needs. Therefore, logistics companies lag behind the required pace of development, which affects the efficiency of the entire supply chain. There are time inconsistencies in deliveries, increasing customer dissatisfaction with cooperation, deterioration of reputation, etc.

In this regard, Aubakirova recommends developing and implementing an optimization strategy in the management of transport flows and the optimization of loading and unloading operations using big data analytics. Using the example of companies, the scientist developed a program for optimizing the route of cargo delivery using clustering algorithms. Indeed, the proposed innovations can significantly improve all logistics operations within the company.

In this regard, Buiak and Semenenko (2025) emphasize the need to develop new models of managing the transport system in order to reduce unnecessary costs of time, money and other resources, contribute to increasing the efficiency of the use of vehicles and adapting to the needs of a changing environment. Therefore, an important condition for achieving the specified priorities is the use of AI and Big Data tools in managing transport flows and optimizing loading and unloading operations. Indeed, the variability of the environment and operating conditions requires managers to take new approaches to solving the existing problem, which can be solved in an integrated manner in conjunction with AI and Big Data.

Pozniak and Melnyk, in turn, add about errors that arise during the operational activities of logistics companies. Such situations cause confusion in the types of goods to be delivered, time delays, unnecessary expenses, etc., so the transition to the use of AI and Big Data is quite appropriate and justified.

Conclusions. The study characterizes the current state of logistics process management as transformational. The development of a new technological order in the world has not bypassed logistics operations. At the current stage, there is a progressive transition from the traditional logistics model to a new one based on AI and Big Data tools. WEF declares a transitive passage to green logistics and decarbonization, which will be accompanied by an increase in the level of sustainability and efficiency. If in 2024, according to McKinsey research, only 7.5% of the surveyed companies used AI, then in 2025, a survey of logistics companies in Europe and the USA showed a 25% implementation level. However, the lack of cooperation between developers of IT solutions and software with manufacturers and logistics companies does not allow the full potential of this sector to be revealed. Currently, AI and Big Data tools are used by large companies with sufficient financial reserves. The conducted scenario modeling of the development of transportation, warehouse technologies and planning showed that some technologies are at the innovation and pilot stages, at the selection stage and at the stage of widespread use, which does not allow using the existing potential in managing transport flows and optimizing loading and unloading operations based on AI and Big Data.

References

1. AI Superior (2024). AI Companies Leading The Logistics Revolution In 2024. Retrieved from: https://aisuperior.com/ai-companies-for-logistics/ [In Ukrainian]
2. Aubakirova, D. (2024). Directions for using big data analytics in logistics management. *Development Management*, 23(1), 27-36. https://doi.org/10.57111/devt/1.2024.27 [In Ukrainian]
3. Buiak, L., Semenenko, Y. (2025). Management of transport systems, models, tools, and perspectives. *Efektyvna ekonomika*, 1. https://doi.org/10.32702/2307-2105.2025.1.14 [in Ukranian]
4. Cabinet of Ministers of Ukraine (2020). On approval of the Concept of the Development of Artificial Intelligence in Ukraine: Order of 02.12.2020 No. 1556-p. Retrieved from: https://zakon.rada.gov.ua/laws/show/1556-2020-p#Text [in Ukranian]
5. Cabinet of Ministers of Ukraine (2024). On approval of the Strategy for the Digital Development of Innovative Activity of Ukraine for the Period up to 2030 and approval of the Operational Plan of Measures for its Implementation in 2025-2027: Order on December 31, 2024 № 1351-p. Retrieved from: https://zakon.rada.gov.ua/laws/show/en/1351-2024-p?lang=uk#Text [in Ukranian]
6. Chukurna, O., Nitsenko, V., Mykhailova, M., Odinokov, R. (2018). Improvement of warehouse logistics system in the context of "Industry 4.0" technologies. *Economic strategy and prospects for the development of trade and services*, 1(27), 220-232. [In Ukrainian]
7. Dobosevych, O. (2025). Practical innovations of AI in transportation and logistics for 2025. *Geniusee*. Retrieved from: https://geniusee.com/single-blog/ai-innovations-in-transportation-logistics [In Ukrainian]
8. Gosling S., Perez F., Li J.D., Martinez A., Migue M. Digital logistics: Technology race gathers momentum. *McKinsey*. 2023. Retrieved from: https://www.mckinsey.com/capabilities/operations/our-insights/digital-logistics-technology-race-gathers-momentum
9. Krushkyn, E.D., Nitsenko, V.S. (2012). Management of the development of production capacities of multimodal container transport technologies. *Scientific Notes of the International Humanitarian University*, 16, 204-210. [In Ukrainian]

10. Li, J.D., Gosling, S., Srivastava, A. (2024). Digital logistics: Into the express lane? *McKinsey*. Retrieved from: https://www.mckinsey.com/capabilities/operations/our-insights/digital-logistics-into-the-express-lane
11. Makhmudova, A. (2025). The use of Big Data and Artificial Intelligence for International Business Development. *Current Issues of Economic Sciences*, 10. https://doi.org/10.5281/zenodo.15190320 [In Ukrainian]
12. Marinov, Y., Lisenyi, E. (2024). Digital transformation in logistics. *Economy and Society*, 66. https://doi.org/10.32782/2524-0072/2024-66-53 [in Ukranian]
13. Moroz, S., Shunevich, M. (2024). Using artificial intelligence in the logistics industry. *Development Service Industry Management*, 4, 269–275. https://doi.org/10.31891/dsim-2024-8(41) [in Ukranian]
14. Nahirnyi, S. (2025). How AI & Big Data Are Transforming Logistics in 2024-2025: Key Insights from Industry Leaders. *Linkedin*. Retrieved from: https://www.linkedin.com/pulse/how-ai-big-data-transforming-logistics-2024-2025-key-from-nahirnyi-xtd6f
15. Nitsenko, V., Mykhailenko, V., Riepina, I., Tepliuk M., Hanzhurenko, I. (2024). Entropy management of logistics processes in Ukraine's agribusiness: the role of stevedoring companies under sustainable development conditions. *Financial and Credit Systems: Prospects for Development*, 4(15), 168-180. https://doi.org/10.26565/2786-4995-2024-4-13
16. Nitsenko, V., Samoilyk, I., Hrynko, O. (2024). Theoretical approaches to the development of logistics systems in conditions of economic environment instability. *Ukrainian Journal of Applied Economics and Technology*, 9(3), 24-29. https://doi.org/10.36887/2415-8453-2024-4-3
17. Omdena (2025). Top 25 AI-Enabled Logistics and Supply Chain Startups Transforming Global Trade. *Linkedin*. Retrieved from: https://www.linkedin.com/pulse/top-25-ai-enabled-logistics-supply-chain-startups-transforming-stj6c
18. Pozniak, O., Melnyk, K.(2020). Logistical aspects of artificial intelligence in the management of strategical goods. *Scientific View: Economics and Management*, 3(69), 153-158. https://doi.org/10.32836/2521-666X/2020-69-25 [in Ukranian]
19. Raiko, D. (2025). Digital transformation of commodity policy: the role of artificial intelligence and big data in creating personalized products. *Business Navigator*, 3 (80), 45-53. https://doi.org/10.32782/business-navigator.80-8 [in Ukranian]
20. World Economic Forum (2025). Industry: Supply Chain and Transport. Retrieved from: https://intelligence.weforum.org/topics/a1GTG000001PN5h2AG
21. Zavrazhnyi, K. Yu. (2023). The use of artificial intelligence and the impact of digitalization on the sustainable development of corporate business. *Academic Visions*, 26, 1-13. Retrieved from: http://dx.doi.org/10.5281/zenodo.10257188

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Мінакова Світлана
докторка економічних наук, професорка, професорка кафедри машинобудування,
Одеська державна академія будівництва та архітектури, Одеса, Україна,
e-mail: smmnkv@gmail.com
ORCID ID: 0000-0002-9931-8291
Мінаков Віталій
кандидат економічних наук, доцент, доцент кафедри машинобудування
Одеська державна академія будівництва та архітектури, м. Одеса, Україна,
e-mail: vipmvm@ogasa.org.ua
ORCID ID: 0000-0002-0087-503X
Мінакова Олена
кандидатка економічних наук, доцентка кафедри управління, фінансів та адміністрування
Одеський інститут ПрАТ «Міжрегіональна Академія управління персоналом», Одеса, Україна
e-mail: oominakova@gmail.com
ORCID ID: 0000-0003-4573-6444
Мінаков Олексій
магістр,
Одеська державна академія будівництва та архітектури, Одеса, Україна,
e-mail: alexminak32@gmail.com
ORCID ID: 0009-0002-4439-1560

Цифрова трансформація логістики: роль штучного інтелекту та Big Data у керуванні транспортними потоками та оптимізації вантажно-розвантажувальних операцій

Анотація. Цифровізація економіки охоплює усі види економічної діяльності, серед яких виділяють логістичну діяльність та впровадження інструментів AI та Big Data.

Постановка проблеми. Комплексний підхід до дослідження цифрової трансформації логістики на базі використання AI і Big Data для керування транспортними потоками та оптимізації вантажно-розвантажувальних операцій.

Нерозв'язані аспекти. У зв'язку з динамічним розвитком процесів діджиталізації логістичних процесів потребує додаткового дослідження комплексний підхід на базі використання AI і Big Data для керування транспортними потоками та оптимізації вантажно-розвантажувальних операцій.

Мета статті. Дослідження наукових основ та практичних рекомендацій щодо керування транспортними потоками та оптимізації вантажно-розвантажувальних операцій на базі AI і Big Data.

Основний матеріал. Зазначено, що драйвером поширення інструментів AI та Big Data у логістиці є майданчик WEF, на якому також розглядають процеси трансформації логістичних операцій у бік зеленої логістики та декорбонізації з використанням інструментів AI і Big Data. Результати проведених досліджень у 2025 р. серед компаній логістичної галузі Європи та США продемонстрували, що чверть опитаних вже інтегрували AI і Big у свою діяльність, половина – частково використовують AI і Big та 57% - планують запровадити дані інструменти у свою діяльність. Приведено характеристику основних компаній, що займають розробкою та поширенням прикладних програмних рішень для логістики та логістичних компаній.

Висновки. Сформовано перелік головних перешкод (великі початкові інвестиції, застарілі технології щодо обробки та зберігання даних, нестача кваліфікованої робочої сили, мінливість та нестабільність нормативно-правового поля, витрати на утримання зайвих запасів на складі) та можливостей (підвищення рівня оптимізації та самооптимізації процесів логістики, оптимізація витрат ресурсів (часу, палива, людей, коштів тощо), використання технології цифрових близнюків, автономність ланцюгів поставок, обробка в режимі реального часу великих обсягів даних та прогнозування попиту на продукцію у часі) у розвитку інструментів AI і Big Data у керуванні транспортними потоками та оптимізації вантажно-розвантажувальних операцій.

***Ключові слова**: цифрова трансформація, цифрові технології, штучний інтелект, масиви великих даних, логістика.*

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Список літератури

1. Буяк Л. М., Семененко Ю. С. Управління транспортними системами, моделі, інструменти та перспективи. *Ефективна економіка*. 2025. № 1. DOI: https://doi.org/10.32702/2307-2105.2025.1.14
2. Завражний К. Ю. Використання штучного інтелекту та вплив цифровізації на сталий розвиток корпоративного бізнесу. *Академічні візії*. 2023. Вип. 26. С. 1-13. DOI: http://dx.doi.org/10.5281/zenodo.10257188
3. Кабінет Міністрів України. Про схвалення Концепції розвитку штучного інтелекту в Україні: Розпорядження від 02.12.2020 № 1556-р. URL: https://zakon.rada.gov.ua/laws/show/1556-2020-p#Text

4. Кабінет Міністрів України. Про схвалення Стратегії цифрового розвитку інноваційної діяльності України на період до 2030 року та затвердження операційного плану заходів з її реалізації у 2025-2027 роках: Розпорядження Кабінету Міністрів України від 31.12.2024 № 1351-р. URL: https://zakon.rada.gov.ua/laws/show/en/1351-2024-p?lang=uk#Text
5. Крушкин Е.Д., Ниценко В.С. Менеджмент розвитку виробничих потужностей мультимодальних контейнерних транспортних технологій. *Наукові записки Міжнародного гуманітарного університету*. 2012. Вип. 16. С. 204-210.
6. Марінов Є., Лісений Є. (2024). Цифрова трансформація в логістиці. *Економіка та суспільство*, 66. DOI: https://doi.org/10.32782/2524-0072/2024-66-53
7. Махмудова А. О. Використання big data та штучного інтелекту для розвитку міжнародного бізнесу. *Актуальні питання економічних наук*. 2025. 10. DOI: https://doi.org/10.5281/zenodo.15190320
8. Мороз С., Шуневич М. (2024). Використання штучного інтелекту в логістичній галузі. *Development Service Industry Management*, 4, 269–275. DOI: https://doi.org/10.31891/dsim-2024-8(41)
9. Ніценко В. С., Самойлик Ю. В., Гринько О. В. Теоретичні підходи до розвитку логістичних систем в умовах нестабільності економічного середовища. *Український журнал прикладної економіки та техніки.* 2024. Том 9. No 3. С. 24-29. DOI: https://doi.org/10.36887/2415-8453-2024-4-3
10. Позняк О.В., Мельник К.О. Логістичні аспекти штучного інтелекту в управлінні товарами стратегічного призначення. *Науковий погляд: економіка та управління*. 2020. No3 (69), С. 153-158. DOI: https://doi.org/10.32836/2521-666X/2020-69-25
11. Райко Д. В. Цифрова трансформація товарної політики: роль штучного інтелекту та Big Data у створенні персоналізованих продуктів. *Бізнес-навігатор*. 2025. Вип. 3 (80). С. 45-53. DOI: https://doi.org/10.32782/business-navigator.80-8
12. Чукурна О.П., Ніценко В.С., Михайлова М.В., Одиноков Р.Д. Удосконалення системи складської логістики в контексті технологій «Індустрії 4.0». *Економічна стратегія і перспективи розвитку сфери торгівлі та послуг*. 2018. Вип. 1 (27). С. 220-232.
13. AI Superior. AI Companies Leading The Logistics Revolution In 2024. 2024. URL: https://aisuperior.com/ai-companies-for-logistics/
14. Aubakirova D. Directions for using big data analytics in logistics management. *Development Management*. 2024. Vol. 23, No. 1, 27-36. DOI: https://doi.org/10.57111/devt/1.2024.27
15. Dobosevych O. Practical innovations of AI in transportation and logistics for 2025. *Geniusee*. 2025. URL: https://geniusee.com/single-blog/ai-innovations-in-transportation-logistics
16. Gosling, S., Perez, F., Li, J.D., Martinez, A., Migue, M. (2023). Digital logistics: Technology race gathers momentum. *McKinsey*. URL: https://www.mckinsey.com/capabilities/operations/our-insights/digital-logistics-technology-race-gathers-momentum
17. Li J.D., Gosling S., Srivastava A. Digital logistics: Into the express lane? *McKinsey*. 2024. URL: https://www.mckinsey.com/capabilities/operations/our-insights/digital-logistics-into-the-express-lane
18. Nahirnyi S. How AI & Big Data Are Transforming Logistics in 2024-2025: Key Insights from Industry Leaders. *Linkedin*. 2025. URL: https://www.linkedin.com/pulse/how-ai-big-data-transforming-logistics-2024-2025-key-from-nahirnyi-xtd6f
19. Nitsenko V., Mykhailenko V., Riepina I., Tepliuk M., Hanzhurenko I. Entropy management of logistics processes in Ukraine's agribusiness: the role of stevedoring companies under sustainable development conditions. *Financial and Credit Systems: Prospects for Development.* 2024. Vol. 4(15). pp. 168-180. DOI: https://doi.org/10.26565/2786-4995-2024-4-13
20. Omdena. Top 25 AI-Enabled Logistics and Supply Chain Startups Transforming Global Trade. *Linkedin*. 2025. URL: https://www.linkedin.com/pulse/top-25-ai-enabled-logistics-supply-chain-startups-transforming-stj6c
21. World Economic Forum. Industry: Supply Chain and Transport. 2025. URL: https://intelligence.weforum.org/topics/a1GTG000001PN5h2AG.

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Skorin Yuriy
Candidate of Technical Sciences, Associate Professor
Associate Professor of the Department of Information Systems
Semen Kuznets Kharkiv National University of Economics
9-A Nauki Avenue, 61165, Ukraine
e-mail: yuriy.skorin@hneu.net
ORCID ID: 0009-0004-5218-6369

Improvement of the automated NLP system as a factor in improving the quality of marketing strategy formation

Abstract. Natural language processing in company marketing is transforming data analytics, offering new opportunities to understand customers and optimize strategies.

Introduction. Natural language processing simplifies processes such as sentiment analysis, segmentation, and ad targeting. It is important to consider data accuracy, security, and query management skills training for effective use of technology.

Problem statement. One of the main challenges in marketing analytics is the transformation of initial numerical data into understandable and useful conclusions for humans. The way to solve the problem are natural language processing technologies and generative artificial intelligence, which allow you to turn complex data into accessible and useful information for work.

Unresolved aspects. Traditional manual analysis of reviews in marketing analytics has long ceased to meet modern business requirements, because it requires huge human resources, which makes the process extremely costly. Natural language processing offers a solution to this problem through the use of algorithms capable of automatically analyzing the semantics of the text, determining the tone of statements, and isolating key topics from large data sets.

Purpose of the article. The purpose of this study is to develop a system of automated analysis of user reviews based on the developed effective methods and models for automated analysis of user reviews in the field of marketing of companies using natural speech processing technologies.

Main material. The paper describes the problem to be solved and formulates a scientific task; analyzes approaches, methods and models for solving research problems; sets research tasks, analyzes theoretical approaches to solving research problems; considers theoretical aspects of natural language processing; investigates various models and algorithms for analyzing feedback, and also conducts an experimental assessment of their effectiveness on real data; models, algorithms and analysis of their adequacy in solving research problems; methodological support for the organization of research is being improved.

Conclusions. The results of the study can be used to develop software solutions that will allow companies to better understand the needs of their customers, quickly respond to problems and improve the quality of their products and services.

Keywords: *natural language processing, marketing, automation of user feedback analysis, method, analysis, evaluation, business process.*

JEL: G21, G28, G 32, O33

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Introduction. In today's digital landscape, the amount of text data generated by users of products and services is skyrocketing. In particular, user reviews have become an integral element of the modern business ecosystem. The ability to effectively analyze these reviews has become a critical success factor for businesses looking to remain competitive. According to research, more than 90% of consumers read reviews online before buying, and 84% trust them as much as personal recommendations. Natural language processing in company marketing has the potential to transform data analytics by offering new opportunities to understand customers and optimize strategies. This simplifies processes such as sentiment analysis, segmentation, and ad direction. One of the main problems of marketing analytics is to refer to the initial numerical data and turn them into understandable and useful conclusions. In this case, natural language processing technologies and generative artificial intelligence, which turn complex numerical data into simple and useful information for work, will help. NLP models learn from large amounts of information from the Internet, including social media posts and news. The main purpose of using NLP and generative AI is to extract specific insights from marketing data based on the knowledge collected. Benefits of NLP for marketing data analysis: improving the decision-making process with the help of available information; increasing the efficiency of data analysis; Improving the accuracy of trend forecasting and understanding of customer needs. The integration of NLP into marketing analytics includes several stages: Goal Definition: A clear understanding of what tasks or problems you want to solve with NLP; Use of ready-made models: huge models that have already been studied on large amounts of data, this allows you to hold the capabilities of NLP without high training costs; Model adaptation: Off-the-shelf models often know general information from the internet, but not from your data, two approaches can be taken to avoid this: fine-tuning – the model learns from your company's data, or through intermediary solutions that link your data to the finished model; Testing and implementation: After setting up and integrating, it is necessary to test the system to ensure the accuracy and usefulness of the results obtained, and then implement them into daily work; Analysis and adjustments: Regular analysis of the results will help identify areas for improvement, adjust settings or methods for using the model. Application of NLP in marketing, which helps to improve brand strategy, personalize customer experience and optimize content for better interaction and visibility: sentiment analysis for brand perception; customer segmentation and personalization; content optimization and SEO. Working with NLP in marketing is a number of unique tasks, and one of the main ones is operational engineering. Traditional methods of analyzing reviews, based on manual processing, face many limitations. Analysts can effectively process only a limited number of texts, and the subjectivity of human interpretation leads to difficulties in establishing and maintaining contacts with other people, which is expressed in isolation and problems with mutual understanding (inconsistency). From a business perspective, user reviews provide invaluable information about: the strengths and weaknesses of a product or service; expectations and needs of customers; comparison with competitors; ideas for improvement and innovation; problems that need to be solved immediately. Using NLP to analyze user feedback is a complex task that includes a number of subtasks: text pre-processing; determination of tonality; coverage of key aspects and topics; classification of reviews into different categories; identification of emotional coloring; Generalization and generation of reports. These tasks require the use of various models and algorithms – from classical statistical methods to modern deep learning approaches using transformers and large language models (LLMs). The market for NLP-based feedback analysis solutions is growing rapidly. According to analysts, by 2026, the global text analysis software market will reach $16 billion, demonstrating an annual growth rate of more than 17%. This shows the growing interest of businesses in technologies capable of efficiently handling user feedback. However, despite significant advances in the field of NLP, automated analysis of user feedback still faces many problems. Among them are the polysemy of words, idiomatic expressions, sarcasm, variety of languages, spelling mistakes, jargon, and many other linguistic nuances that require a deep understanding of the context. Solving these problems requires a comprehensive approach that

combines the most modern NLP techniques with an understanding of the business context and specifics of a particular industry.

Literature review. The article [1] is devoted to the topic of management of innovative marketing in modern conditions of a competitive market. As a result of the study, it was found that Ukrainian enterprises often ineffectively apply innovative marketing methods. The article discusses new marketing technologies that use elements of artificial intelligence and machine learning. The most common skills required for digital marketing are also identified: video editing, graphic design, coding, program creation, writing, software expertise, experience with SEO and SEM, software use and project management, data analysis, marketing automation, and more. The article pays special attention to the issue of privacy of customers' personal data, as it is an important aspect of digital marketing. Various technologies and ways to identify and protect users' personal data are being studied. The article [2] states that digital marketing helps to draw customers' attention to the company, brand, goods and services. The use of artificial intelligence technologies together with digital marketing allows you to improve the quality of customer service and better promote the brand. The article examines how artificial intelligence is impacting modern marketing strategies. It is important to note that it has significant advantages, but it also raises problems and ethical issues. The article draws attention to how artificial intelligence can be used to personalize communication to increase customer attention and loyalty. The final comment notes that artificial intelligence has an important future in marketing, while drawing attention to the need for a balanced approach – harnessing its capabilities together with ethical and operational concerns. The widespread application of artificial intelligence in digital marketing highlights its importance in today's world. The paper [3] shows that the creation of a marketing strategy of an enterprise is an important means for its effective development. With the help of SWOT analysis, the strengths and weaknesses of the enterprise, as well as market opportunities and threats, are identified and systematized. Based on this, the main directions of development of the marketing strategy have been identified, which will contribute to strengthening management, sales growth and increasing the competitiveness of the production enterprise. The article [4] discusses the concept of detecting emotions based on texts and highlights the main approaches used by researchers in the design of NLP text systems. The article also discusses some recent contemporary proposals in this area. Finally, the article presents some open questions and future directions for NLP research. The publication [5] confirms how NLP in marketing is transforming data analytics, offering new opportunities to understand customers and optimize strategies. This simplifies processes such as sentiment analysis, segmentation, and ad targeting. The publication [6] states that the main goal of natural language processing through NLP is to create systems that can interact seamlessly with humans, making technology more accessible and responsive to our daily communication needs. As NLP continues to evolve, it is transforming the way we interact with machines, opening up new possibilities for effective, effective and human communication, as well as defining some approaches to NLP, namely: controlled, uncontrolled, natural language understanding, natural language generation. The author [7] argues that, unlike artificial languages, natural languages have evolved as they move from generation to generation and are difficult to define with clear rules, and suggests considering natural language processing in a broad sense as encompassing any kind of computer manipulation of natural language. The author argues that on the one hand, it can be as simple as counting the frequency of words to compare different writing styles, on the other hand, NLP implies "understanding" full-fledged human statements, at least to the extent that useful answers can be given to them. The textbook [8] presents a comprehensive overview of the basic principles, models and methods of natural language processing (NLP), providing a theoretical basis and practical knowledge for using modern language technologies in solving engineering and analytical tasks. The publications [9] consider and define NLP, consider how NLP is related to artificial intelligence, how NLP helps people be more productive, how NLP helps improve the user experience, how NLP creates new analytical data, and also provide examples of natural language processing tasks.

Purpose, objectives and methods of research. In today's digital world, user feedback analysis has become a critical element for any business looking to improve the quality of its products and services. However, the scale and unstructured nature of this data pose significant challenges to traditional analysis. The main problem is the inefficiency and limitations of manual analysis of large volumes of text user reviews: exponential growth in data volumes; subjectivism and inconsistency of analysis; critical time costs; limited ability to detect hidden patterns; the increasing complexity of multilingual analysis; lack of standardization and subjectivity of assessments; Rising costs for review analytics. However, the application of NLP to analyze user feedback also faces a series of problems that need to be addressed: understanding context and ambiguity; identification of irony, sarcasm and hidden meanings; processing of unstructured and "noisy" text; multilingualism and cross-cultural aspects; adaptation to the specifics of the domain; assessment of the reliability of reviews and detection of false reviews; ethical issues and model bias. Based on the above and taking into account current trends and challenges in the field of NLP, the scientific task of this study is formulated as follows: development and evaluation of the effectiveness of a comprehensive system based on natural language processing methods and models for automated analysis of user feedback, which provides accurate sentiment detection, identification of key aspects and topics, identification of critical problems and opportunities for improvement, and also allows To conduct multilingual benchmarking of reviews in a time perspective, taking into account contextual and cultural features.

Table 1. Average time spent on manual analysis of reviews of varying complexity

Type of response	Average length (words)	Time to analyze (min)	Number of reviews per working day (8 hours)	Number of analysts per 1000 reviews/day
Short	10-30	1-2	240-480	2-4
Medium	31-100	2-4	120-240	4-8
Long	101-300	4-8	60-120	8-16
Detailed	>300	8-15	30-60	16-33

Source: built by the author

Unlike existing studies that focus on specific aspects of review analysis, this work offers an integrated approach that combines state-of-the-art NLP techniques to solve the entire complex of problems related to automated analysis of user reviews. Particular attention is paid to the adaptability of the system to different domains and languages, as well as its ability to provide high accuracy of analysis in the face of limited training data. Solving this scientific problem is of great practical importance for business, as it will allow companies to: quickly identify problematic aspects of products and services, even with large volumes of feedback; make informed decisions on improving products based on objective analysis; to effectively allocate resources to the most critical areas of development; increase customer satisfaction through prompt response to their needs; gain a competitive advantage through a deeper understanding of the market and consumers; significantly reduce the cost of analyzing reviews while improving the quality of results; proactively identify new trends and opportunities based on the analysis of large data sets. Table 2 presents a comparison of the effectiveness of different approaches for key feedback analysis tasks based on recent research. Successfully integrating a feedback analysis system into business processes requires not only choosing the right technologies, but also understanding the business context and needs of a particular organization. According to McKinsey, companies that effectively use user feedback analytics demonstrate 15-20% higher customer retention rates and 10-15% higher average revenue per customer [7]. The most successful implementations of review analysis are characterized by several key features. First, they provide integration with existing systems such as CRMs, customer support systems, and analytics platforms. This allows you to combine data from different sources

and gain a comprehensive understanding of customer needs and problems. Second, effective feedback analysis systems provide results in an understandable and actionable format. They not only generate statistical reports, but also highlight specific problems that need attention and provide recommendations for solving them. This is especially important for users who do not have technical training, but make strategic decisions based on the results of the analysis.

Table 2. Comparison of the effectiveness of different approaches of key review tasks

Method	Sentiment Analysis (F1)	Topic Detection (NMI)	Cross-Lingualism	Speed (Feedback/sec)	Need for Data for Learning	Explainability
Vocabulary Methods	0.65-0.70	N/A	Low	500-700	Minimum	High
ML with manual signs	0.75-0.85	0.50-0.65	Low	100-300		Medium
CNN/RNN	0.82-0.88	0.60-0.70	Medium	50-100	High	Low
BERT/RoBERTa	0.88-0.92	0.65-0.75	Medium-High	20-50	High	Low-Medium
LLM + Few-shot	0.90-0.95	0.70-0.80	High	5-15	Minimum	Average
Specialized models	0.92-0.96	0.75-0.85	Medium-high	20-40	Medium-high	Medium-high

Source: built by the author

Thirdly, successful review analysis systems provide full-cycle automation – from collecting and analyzing reviews to generating insights and recommendations. This allows you to significantly reduce the time from receiving feedback to responding to it, which is critically important in today's fast-changing business environment. Summarizing the analysis of approaches, methods and models for automating the analysis of user feedback, several key conclusions can be drawn. The modern landscape of feedback analysis technologies is represented by a wide range of methods – from simple dictionary approaches to complex neural network architectures and large language models. The choice of a specific method depends on many factors: the volume and quality of the available data, the specifics of the domain, the requirements for processing speed, the required level of accuracy and interpretation of the results. Transformer models, especially the specialized domain versions of BERT and RoBERTa, demonstrate the best ratio of accuracy, speed, and resource intensity for most practical feedback analysis tasks. They provide high accuracy in understanding the context and nuances of language, which is critical for correctly interpreting user feedback. Large language models with few-shot training open up new opportunities for the rapid implementation of feedback analysis systems in new domains and for new products. They are especially valuable in situations with limited training data or when you need to quickly adapt to new types of feedback. Aspect-oriented sentiment analysis is the most informative approach for businesses, as it allows you to gain a detailed understanding of the strengths and weaknesses of products or services. The combination of ABSA with topic and aspect detection techniques provides the most complete picture of user feedback. Multilingual models provide better results for multilingual analysis compared to the translation + analysis approach, especially when understanding cultural and linguistic nuances is important. These models are becoming increasingly important in a globalized business environment. The optimal solution for most business problems is a combination of different methods, which allows you to ensure high accuracy, efficiency and adaptability of the feedback analysis system. This approach allows you to use the advantages of each method and minimize their limitations. Based on the analysis of the problems and existing approaches to

automating the analysis of user feedback, key challenges and promising areas of research have been identified. A clear statement of research tasks will allow you to structure further work and focus on the most relevant aspects of the problem. The main goal of this study is to develop and evaluate the effectiveness of a comprehensive system of automated analysis of user feedback based on modern methods of natural language processing, which will provide high accuracy in identifying sentiment, key aspects and topics, the ability to work with feedback in different languages and effectively integrate into the business processes of organizations of various sizes. To achieve this goal, it is necessary to solve the following specific tasks: development of effective methods for pre-processing user feedback; research and comparative analysis of modern models of classification of reaction tones, which involves adaptation and evaluation of the effectiveness of various NLP models for analyzing the mood of reactions – from classical approaches to machine learning to modern transformer architectures and large language models; development of a method of aspect-oriented sentiment analysis for different domains, which is aimed at developing an approach that will allow not only to determine the general tone of response, but also to identify specific aspects of products or services and the corresponding tone in relation to each of them; creation of effective methods for identifying topics and key aspects in the feedback corpus, which includes the development and evaluation of methods for automatically identifying the main topics discussed in detailed reviews, and highlighting key aspects of products or services; development of an approach to multilingual feedback analysis, which focuses on creating methods that will allow you to effectively analyze reviews in different languages without significant loss of accuracy and while preserving linguistic and cultural characteristics; creation of methods for interpreting and visualizing the results of the analysis of feedback, which includes the development of approaches to ensure the clarity of the analysis results and their effective visualization for end users; development and evaluation of a comprehensive system of automated analysis of feedback, which provides for the combination of developed methods and models into a single system that will provide a full cycle of feedback analysis – from collection and pre-processing to the generation of insights and recommendations; experimental assessment of the effectiveness of the developed methods on real data, which includes conducting complex experiments to assess the effectiveness of the developed methods and the system as a whole on real sets of reviews from different domains and in different languages. To solve the tasks, a comprehensive methodological approach will be used, which combines methods of machine learning, deep learning, natural language processing and data analysis. The study will be carried out in several stages: analytical stage, at which a detailed analysis of existing methods and models, their advantages and limitations will be carried out; the design and development stage, at which specific methods and models will be developed to solve the tasks; experimental stage, which includes conducting experiments in order to assess the effectiveness of the developed methods and models; analytical and generalizing stage, at which the results of experiments will be analyzed, patterns will be identified and conclusions will be formulated regarding the effectiveness of the developed methods and models.

Research results. Automated analysis of user feedback relies on a solid theoretical foundation of natural language processing, machine learning, and artificial intelligence techniques. Pre-processing of text data is a fundamental stage in the process of analyzing user feedback and largely determines the effectiveness of post-processing. At the heart of text preprocessing is the theory of tokenization, which defines the principles of splitting text into smaller units – tokens. In the context of analyzing user feedback, tokenization faces a number of specific challenges. Various theoretical approaches have been developed to address these problems, including statistical methods, dictionary-based approaches, and, most recently, subword tokenization techniques. Based on the analysis, the following conclusions can be drawn about the adequacy of various models and algorithms for the tasks of automated analysis of user feedback: for the analysis of moods, the most adequate are transformer models, additionally trained on data from a specific subject area, which provide an optimal balance between accuracy and computational efficiency; for aspect-oriented

analysis of moods, it is recommended to use combined models that simultaneously identify aspects and determine their tonality; To identify topics and aspects, it is advisable to combine classical algorithms of thematic modeling with neural network approaches, using the advantages of each method; for multilingual analysis, it is optimal to use specialized multilingual models with additional adaptation to the specifics of domains and languages; To ensure scalability and high performance of the automated feedback analysis system, it is recommended to implement a multi-level architecture using models of varying complexity at different levels. Overall, hybrid approaches that combine the strengths of different models and algorithms, providing an optimal balance between accuracy, computational efficiency, scalability, and interpretation, are the most adequate for comprehensively solving the problems of automated analysis of user feedback. In Table 3 summarizes the key methods of sentiment analysis and their theoretical foundations.

Table 3. Methods of sentiment analysis and identification of aspects

Method	Theoretical background	Key principle
Dictionary methods	Lexicography and affect theory	The tonality of a text is calculated as the sum of the tonalities of individual words
Machine Learning with	a Teacher Theory of Learning from Labeled Data	Optimization of the Classification Function on Labeled Data
Deep Learning	Neural Network Theory	Automatic Learning of Hierarchical Representations of Text
ABSA	Multitasking Learning	Simultaneous Identification of Aspects and Sentiment Analysis of Them
Thematic	modeling Probabilistic modeling	Presentation of documents as a mixture of topics, and topics as distributions of words

Source: built by the author

The considered theoretical foundations provide an understanding of the principles of operation of various methods and models, their capabilities and limitations, which is a prerequisite for the effective implementation of the system of automated feedback analysis and the development of innovative approaches in this area.

Discussion. Effective research in the field of automation of user feedback analysis requires careful planning, a structured approach and the use of appropriate techniques. Methodological aspects of the organization of scientific research, starting from the collection and preparation of data and ending with the evaluation of results and their interpretation. The methodical approach to data collection and preparation involves the implementation of a number of successive stages, each of which has its own characteristics and requirements. The methodological approach provides for the sequential implementation of the following stages: selection of the basic model architecture in accordance with a specific task; division of data into training and validation and test samples; The process of training and optimization of models includes: selection of the loss function in accordance with the set one; selection of an optimizer and determination of training parameters; regularization to prevent requalification; monitoring of the learning process and early stopping when reaching a plateau on a validation sample; search for optimal hyperparameters using grid search, random search, or Bayesian optimization. The methodological approach to assessing the effectiveness of feedback analysis models involves the use of a set of metrics adapted to specific tasks: for mood classification tasks, the main metrics are: F1-score – harmonious average accuracy and memorization; For aspect-oriented sentiment analysis, the assessment is carried out in two stages: assessment of the quality of identifying aspects; assessment of the accuracy of the classification of tonality in relation to correctly identified aspects; For thematic modeling problems, specific metrics are used, such as: consistency of the topic; Surprise; variety of topics; for multilingual model evaluation tasks, it is important to test in different languages and check the stability of the model; to

interpret the results, it should be carried out taking into account the context of the study and the characteristics of the data; to ensure the reliability of the results obtained, it is recommended to conduct statistical analysis; analysis of the sensitivity of models to changes in data and parameters; checking the stability of the results on different subsamples of data. The methodical approach to the organization of experiments involves adherence to a structured protocol. Each experiment must have a clearly defined goal and hypotheses that are tested. The documentation of the experiment should include: a description of the input data (source, scope, characteristics, method of pre-processing); detailed information about the model architecture and its parameters; description of the learning process (loss function, optimizer, learning speed, number of epochs); results of evaluation of validation and test samples against all relevant metrics; error analysis and interpretation of results; comparison with basic models and previous experiments. Methodological support for research in the field of automation of user feedback analysis is a comprehensive process that covers all stages from data collection to implementation of results. The developed methodological recommendations provide a structured approach to research, which allows you to obtain reliable and reproducible results. For a comprehensive assessment of various methods of automated analysis of user feedback and verification of theoretical results, a comprehensive experimental design was developed, covering four key tasks: general sentiment analysis, aspect-oriented sentiment analysis, identification of themes and aspects in reviews, and multilingual analysis. For each task, appropriate datasets, estimation techniques and comparison models were selected.

The following data sets were used in the experimental study:

1. For general sentiment analysis: Amazon Product Reviews (version 2024) – a subset of 500,000 reviews for different product categories (electronics, books, clothing, household goods); Yelp Open Dataset (2023-2025) – 300,000 restaurant and service industry reviews [3, 30]; IMDb Movie Reviews – 50,000 movie reviews.

2. For aspect-oriented sentiment analysis: SemEval-2024 ABSA – dataset with marked aspects and corresponding tonality; Restaurant Reviews Dataset – a specialized set of 25,000 restaurant reviews with aspect and tone markup; Tech Products Reviews – 35,000 tech device reviews with detailed aspect markup.

3. To identify themes and aspects: Hotel Reviews Corpus – 200,000 hotel reviews for thematic modeling; AppStore Reviews – 150,000 mobile app reviews; Product Discussion Forums – 100,000 texts from discussions of various products.

4. For multilingual analysis: MultiLing Sentiment Dataset – reviews in ten different languages (English, German, French, Spanish, Italian, Portuguese, Russian, Chinese, Japanese, Arabic); Cross-lingual E-commerce Reviews – a set of parallel product reviews in different languages.

All datasets have been pre-processed according to the methodology described earlier. This included: cleaning up HTML tags and special characters; normalization of text (lowercase casting, removal of duplicate spaces); tokenization; lemmatization using spaCy; removing stop words for thematic modeling tasks; saving emoticons and emojis as special tokens for sentiment analysis; processing abbreviations and slang using specialized dictionaries. To ensure the objectivity and statistical significance of the results, all experiments were conducted using cross-validation (5-fold), and the assessment was carried out according to a set of relevant metrics for each task. To model the problem of general sentiment analysis, several approaches have been implemented and evaluated, ranging from classical machine learning methods to modern transformer models. The task was to classify feedback into three classes: positive, negative and neutral. The results of experiments on the classification of the tonality of responses demonstrate a clear pattern: transformer models are significantly superior to classical approaches in terms of accuracy, but require more computing resources. The domain-adapted BERT performed the highest with an average F1-score of 0.93 across all datasets, which is 17 percentage points higher than the baseline Naive Bayesian (0.76). Additional experiments with the analysis of the impact of the volume of training data showed that transformer models are especially sensitive to the number of training

examples. With limited datasets (less than 5000 samples), the difference between classical ensemble methods and transformer models is significantly reduced, which confirms the importance of having large marked enclosures to fully unleash the potential of modern approaches. Aspect-oriented sentiment analysis (ABSA) presents a more complex task compared to general classification, since it requires not only the definition of tonality, but also the identification of specific aspects to which it relates. Within the framework of the experiments, two main approaches were implemented and compared: pipeline models and joint models. The experiments were conducted on three domains: restaurant reviews, technical product reviews, and hotel reviews. Specific aspects have been identified for each domain. Additional experiments were aimed at studying the ability of models to detect and classify tonality for different types of aspects. For each domain, 5 to 8 categories of aspects were identified, and the results were evaluated separately for each category. The results of experiments on aspect-oriented sentiment analysis demonstrate several important patterns: combined models that simultaneously solve the problem of identifying aspects and classifying their tonality show better results compared to sequential approaches. The RACL model showed the highest performance with an average F1-score ABSA of 0.85, which is 9 percentage points higher than the baseline BiLSTM-CRF + ATAE-LSTM sequential model (0.76); the performance of all models varies depending on the data domain, the highest scores are seen for restaurant reviews, where models reach an F1-score ABSA of up to 0.86, while for tech product reviews, the score is lower (up to 0.84). This can be attributed to the greater complexity and diversity of aspects in technical products; analysis of the effectiveness of models for different categories of aspects revealed significant differences. All models demonstrate the highest accuracy for aspects that are often found in reviews (for example, "Food" in restaurant reviews with an F1-score of up to 0.88), instead, rare aspects or those with a high difficulty of detection; similar to the problem of general sentiment analysis, more complex models demonstrate higher accuracy due to higher computational requirements, the RACL model, which has the highest precision, also has the largest size (750 MB) and the longest inference time (35 ms per sample); impact on different stages of ABSA. It is interesting to note that the improvement in the transition from sequential to combined models is most noticeable in the combined F1 ABSA metric, this suggests that the combined models make more effective use of the relationship between the tasks of identifying aspects and determining their tone. Pooled models, especially RACLs, demonstrate a better ability to cope with these challenges through collaborative learning for interrelated tasks and the use of contextual attention mechanisms. To assess the adequacy of the studies carried out, an integrated approach was applied, including quantitative and qualitative evaluation methods. To ensure the statistical significance of the results and avoid random patterns, a number of statistical validation methods were used. A five-fold cross-validation procedure made it possible to evaluate the performance of models on different subsets of data and minimize the impact of random distribution on training and test samples. The standard deviation of the results between the folds for all models is in the permissible range of 1-3%, which indicates the stability of the models and their ability to generalize. To confirm the statistical significance of the difference between the results of different models, a paired Bonferroni-corrected t-test was applied for multiple comparisons [1]. The results obtained confirm that the advantage of the domain-adapted BERT and the RACL model over other approaches is statistically significant ($p < 0.01$). An additional method of checking reliability was bootstrap oversampling, which confirmed the stability of the results obtained when changing the data distribution. 95% confidence intervals for the F1 metric of transformer models are within ±1.5%, which indicates a high reliability of estimates. An important aspect of assessing the adequacy of an experimental study is the analysis of the representativeness of the data sets used. To verify this aspect, a detailed analysis of the characteristics of the data and their correspondence to real use cases was carried out. The analysis of the distribution of sentiment classes revealed a certain imbalance in the data, which is typical for real user reviews – positive reviews dominate (55-60%), negative reviews make up 25-30%, and neutral reviews make up only 10-15%. To compensate for this imbalance, weighted loss functions

and class balancing techniques were used during model training. Analysis of the distribution of the length of reviews showed that the datasets cover a wide range – from short (5-10 words) to extended (more than 200 words) reviews, which corresponds to a variety of real-world scenarios. The models were evaluated separately on subsamples of different lengths of feedback to ensure their effectiveness for all types of inputs. Lexical diversity and specific features of responses (slang, emoticons, technical terms) are also adequately represented in the datasets, which is confirmed by frequency response analysis and lexical diversity assessment methods (TTR–Type–Token Ratio). To assess the representativeness of the data in terms of the diversity of topics and domains, the Topic Modeling (LDA) method was used, which found that the datasets cover all key topics and aspects of products in their respective domains. To ensure the validity of measurements and the objectivity of model evaluation, an analysis of the compliance of the selected metrics with the research tasks was carried out. For aspect-oriented tonality analysis, a combined metric was used, taking into account both the accuracy of identifying aspects and the correctness of determining their tonality. This metric better reflects the practical value of the models than individual metrics for each stage. Additionally, for a comprehensive evaluation of the models, metrics of the efficiency of the use of computing resources (training time, inference time, memory usage) were used, which are critical for practical application. An important aspect of the adequacy of experimental research is the consistency of the results obtained with theoretical predictions and data available in the literature. The results of the experiments confirm the theoretical provisions presented earlier, in particular: the superiority of transformer models over classical approaches in natural language comprehension problems is confirmed experimentally (F1-score 0.93 versus 0.76); the effectiveness of domain adaptation to improve the results of the analysis of specific texts is confirmed by higher indicators of domain-adapted BERT compared to the standard one; the theoretical assumption about the superiority of combined models over sequential models for aspect-oriented sentiment analysis is confirmed experimentally (F1-score ABSA 0.85 vs. 0.76); The dependence of model efficiency on the volume of training data is consistent with theoretical predictions – transformer models demonstrate greater sensitivity to the volume of data compared to classical approaches.

Table 4. Comparison of dataset characteristics with real user reviews

Characteristics	Experiment datasets	Real user reviews	Representativeness score
Class Distribution	60% / 25% / 15% (Positive/Negative/Neutral)	58% / 27% / 15%	High
Average Review Length	75 Words	68 Words	High
Lexical Diversity (TTR)	0.32	0.29	Medium-High
Share of reviews with emoticons	22%	25%	High
Share of reviews with spelling errors	35%	42%	Average
Domain Coverage	5 Major Domains	Multiple Domains	Medium-High

Source: built by the author

To objectively assess the adequacy of an experimental study, it is necessary to recognize its limitations and analyze their impact on the reliability and generalizability of the results. The main limitations of the study include: domain limitations – although the study covers several important domains (electronics, restaurants, movies, hotels), a number of specific areas (medical services, education, financial products) remained uncovered; language limitations – despite the inclusion of 10 languages in the multilingual experiment, the features of some rare languages and dialects were not taken into account; limitations of computing resources – for the largest transformer models (for example, RoBERTa-large), it was impossible to conduct a full cycle of hyperparameter optimization due to the limitations of available computing resources; Focus on textual data – the

study does not look at multimodal feedback that includes images or videos, which are becoming increasingly common in today's digital platforms. To evaluate the effect of these limitations on the reliability of the results, a series of additional experiments were conducted on smaller samples with different data configurations. The results show that the identified patterns persist when the composition of the data changes, which indicates the stability and generalizability of the conclusions obtained. The adequacy of the experimental study was also evaluated in terms of the practical applicability of the results obtained to solving real business problems. To assess the practical applicability, a pilot feedback analysis system based on domain-adapted BERT and the RACL model was developed, which was tested on real data from one of the e-commerce platforms. The system has demonstrated the ability to effectively analyze user feedback, identify problematic aspects of products, and track changes in user sentiment over time. Comparison of the automated analysis with the manual analysis carried out by a team of experts on a sample of 500 reviews showed high consistency of results (Cohen's kappa = 0.82 for sentiment classification and 0.79 for aspect detection). At the same time, the automated system processed reviews 120–150 times faster, which confirms its practical value. Based on a comprehensive analysis of statistical reliability, representativeness of data, validity of metrics and compliance with theoretical predictions, it can be concluded that the experimental study conducted is highly adequacy to solve the tasks. The main factors confirming the adequacy of the study: the use of a complex set of statistical methods to ensure the reliability of the results obtained; the use of representative data sets reflecting the diversity of real user reviews; selection of appropriate evaluation metrics that take into account all aspects of the model's effectiveness; consistency of experimental results with theoretical forecasts and existing studies; successful pilot implementation, confirming the practical applicability of the developed models. Thus, the conducted experimental study is sufficient to assess the effectiveness of various methods of automating the analysis of user feedback and develop practical recommendations for their implementation.

Conclusions. As a result of the study, all the goals and objectives were achieved, which made it possible to formulate the following conclusions. A theoretical study of natural language processing methods in the field of marketing demonstrated the evolution of approaches to text analysis - from simple dictionary methods to complex transformer architectures. Each of these approaches has its own advantages and limitations, and the choice of a specific method depends on the specifics of the task, available computing resources, requirements for accuracy and speed of analysis. Based on the experimental study, it was found that transformer models, in particular domain-adapted BERT, provide the highest accuracy of response sentiment analysis (F1-score up to 0.93), which is significantly superior to classical methods such as Naïve Bayes (F1-score 0.76) and XGBoost (F1-score 0.85). In the field of aspect-oriented tonal analysis, combined models have shown a significant advantage over sequential approaches, which simultaneously solve the problem of identifying aspects and classifying their tonality. The RACL model demonstrated the highest performance with an average F1 ABSA score of 0.85, which is 9 percentage points higher than the baseline BiLSTM-CRF + ATAE-LSTM sequential model (0.76). It has been established that the efficiency of all models significantly depends on the specifics of the subject area and the quality of preliminary data processing. Domain adaptation and additional training on specific data corpora greatly increase the accuracy of analysis, especially for specialized industries with their own terminology. The study confirmed that multilingual models such as XLM-RoBERTa provide efficient analysis of responses in different languages without significant loss of accuracy compared to models trained for specific languages. This is especially important for global companies that operate in different markets and receive feedback in many languages. Statistical validation of the results using cross-validation, bootstrapping and t-tests confirmed the reliability and statistical significance of the results obtained. 95% confidence intervals for the F1 metric of transformer models are within ±1.5%, which indicates high stability of the results. The developed pilot system of automated feedback analysis in the field of marketing of companies demonstrated high

consistency with the manual analysis of experts (Cohen kappa = 0.82 for sentiment classification and 0.79 for identifying aspects) at a much higher processing speed (120-150 times), which confirms the practical applicability of the proposed solutions. The cost-effectiveness of the implementation of automated feedback analysis systems is confirmed by a significant reduction in the time and human resources required to process feedback, as well as an increase in the quality of the insights received, which allows companies to make more informed decisions about the development of products and services. The practical significance of the results obtained lies in the possibility of using them to create effective systems for automated analysis of user feedback, which can be integrated into the business processes of companies of different sizes and industries. The novelty lies in the development of an original pilot system for automated analysis of user feedback, improvement and adaptation of the methodological approach to a specific task. Thus, the conducted research makes a significant contribution to the development of methods for automating the analysis of user reviews in the field of marketing companies based on natural language processing and creates the basis for further improvement of such systems.

References

1. Kovpaka, Anastasia, Mosiychuk Iryna, Klimova Inna. Tools of innovative marketing in the system of enterprise management [Electronic resource]. Economics. Management. Innovation. Issue №2 (29), 2021. URL: https://www.researchgate.net/publication/356951598_INNOVATION-_MARKETING_TOOLS_IN_THE_ENTERPRISE_MANAGEMENT_SYSTEM. DOI: 10.35433/-ISSN2410-3748-2021-2(29)-4 [In Ukrainian]
2. Strunhar, Artur. The Impact of Artificial Intelligence on Digital Marketing Strategies: Current Opportunities and Development Prospects. Economics and Society. Issue №62, 2024. URL: https://www.researchgate.net/publication/381795905_VPLIV_STUCNOGO_INTELEKTU_NA_STRATEGII_CIFROVOGO_MARKETINGU_POTOCNI_MOZLIVOSTI_TA_PERSPEKTIVI_ROZVITKU. DOI: 10.32782/2524-0072/2024-62-160 [In Ukrainian]
3. Butenko, V.M., Toyunda A.I.. Formation of the marketing strategy of the enterprise [Electronic resource]. Entrepreneurship and innovation. (24), 61-67. 2022. URL: https://doi.org/10.32782/2415-3583/24.10. DOI: https://doi.org/10.32782/2415-3583/24.10 [In Ukrainian]
4. Jurafsky, D., Martin J. H. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition [Електронний ресурс]. 3rd ed. draft. Pearson, 2025. URL: https://web.stanford.edu/~jurafsky/slp3/
5. Joseph, T. Natural Language Processing (NLP) for Sentiment Analysis in social media. International Journal of Computing and Engineering. 2024. Vol. 6, № 2. P. 35–48.
6. Ranjan, R., Ahmad H. Comprehensive Study on Sentiment Analysis: From Rule-based to modern LLM based system [Електронний ресурс]. arXiv preprint. 2024. URL: https://arxiv.org/abs/2409.09989
7. Zhang, W., Deng Y., Liu B., Pan S., Bing L. Sentiment Analysis in the Era of Large Language Models: A Reality Check. Findings of the Association for Computational Linguistics: NAACL 2024. P. 881–906.
8. SemEval-2025 Task 11: Bridging the Gap in Text-Based Emotion Detection [Електронний ресурс]. 2025. URL: https://github.com/emotion-analysis-project/SemEval2025-Task11
9. State of AI Report 2025 [Електронний ресурс]. State of AI. 2025. URL: https://www.stateof.ai/
10. Hugging Face Transformers Documentation [Електронний ресурс]. Hugging Face. URL: https://huggingface.co/docs/transformers/

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Скорін Юрій
кандидат технічних наук, доцент,
доцент кафедри інформаційних систем
Харківський національний економічний університет імені Семена Кузнеця
просп. Науки, 9-А, 61166, Україна
e-mail: yuriy.skorin@hneu.net
ORCID ID: 0009-0004-5218-6369

Удосконалення автоматизованої системи NLP, як фактор підвищення якості формування маркетингової стратегії

Анотація. Оброблення природної мови у сфері маркетингу компаній перетворює аналітику даних, пропонуючи нові можливості для розуміння клієнтів та оптимізації стратегій.

Вступна частина. Оброблення природної мови спрощує процеси, такі як аналіз настроїв, сегментація та направлення реклами. Важливо враховувати точність даних, безпеку та навчання навичок управління запитами для ефективного використання технологій.

Постановка проблеми. Однією з основних проблем у маркетинговій аналітиці є перетворення первісних числових даних у зрозумілі та корисні для людини висновки. Шляхом вирішення проблеми є технології оброблення природної мови та генеративний штучний інтелект, які дозволяють перетворювати складні дані на доступну та корисну для роботи інформацію.

Нерозв'язані аспекти. Традиційний ручний аналіз відгуків у маркетинговій аналітиці вже давно перестав відповідати сучасним вимогам бізнесу, тому що потребує величезних людських ресурсів, що робить процес надзвичайно затратним. Природна мовна обробка пропонує вирішення цієї проблеми через застосування алгоритмів, здатних автоматично аналізувати семантику тексту, визначати тональність висловлювань та виокремлювати ключові теми з великих масивів даних.

Мета статті. Метою даного дослідження є розроблення системи автоматизованого аналізу відгуків користувачів на основі розроблених ефективних методів та моделей для автоматизованого аналізу відгуків користувачів у сфері маркетингу компаній з використанням технологій природної мовної обробки.

Основний матеріал. У роботі проводиться опис проблеми, що вирішується, та формулюється наукове завдання; проводиться аналіз підходів, методів та моделей вирішення завдань дослідження; здійснюється постановка завдань дослідження, аналізуються теоретичні підходи, щодо розв'язання завдань дослідження; розглядаються теоретичні аспекти природної мовної обробки; досліджуються різні моделі та алгоритми для аналізу відгуків, а також проводиться експериментальна оцінка їх ефективності на реальних даних; досліджуються моделі, алгоритми та проводиться аналіз їх адекватності при розв'язанні завдань дослідження; удосконалюється методичне забезпечення, щодо організації проведення досліджень.

Висновки: Результати дослідження можуть бути використані для розроблення програмних рішень, що дозволять компаніям краще розуміти потреби своїх клієнтів, швидко реагувати на проблеми та підвищувати якість своїх продуктів і послуг.

Ключові слова: *природна мовна обробка, маркетинг, автоматизації аналізу відгуків користувачів, метод, аналіз, оцінка, бізнес-процес.*

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Список літератури

1. Ковпака Анастасія, Мосійчук Ірина, Клімова Інна. Інструменти інноваційного маркетингу в системі управління підприємством [Електронний ресурс]. Економіка. Управління. Інновації. Випуск №2 (29), 2021. URL: https://www.researchgate.net/publication-/356951598_INNOVATION_MARKETING_TOOLS_IN_THE_ENTERPRISE_MANAGEMENT_SYSTEM. DOI: 10.35433/ISSN2410-3748-2021-2(29)-4
2. Артур Струнгар. Вплив штучного інтелекту на стратегії цифрового маркетингу: поточні можливості та перспективи розвитку [Електронний ресурс]. Економіка та суспільство. Випуск №62, 2024. URL: https://www.researchgate.net/publication/381795905_VPLIV_-STUCNOGO_INTELEKTU_NA_STRATEGII_CIFROVOGO_MARKETINGU_POTOCNI_MOZLIVOSTI_TA_PERSPEKTIVI_ROZVITKU. DOI: 10.32782/2524-0072/2024-62-160
3. Бутенко В.М., Тоюнда А.І.. Формування маркетингової стратегії підприємства [Електронний ресурс]. Підприємництво та інновації. (24), 61-67. 2022. URL: https://doi.org/10.32782/2415-3583/24.10. DOI: https://doi.org/10.32782/2415-3583/24.10
4. Jurafsky D., Martin J. H. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition [Електронний ресурс]. 3rd ed. draft. Pearson, 2025. URL: https://web.stanford.edu/~jurafsky/slp3/

5. Joseph T. Natural Language Processing (NLP) for Sentiment Analysis in social media. International Journal of Computing and Engineering. 2024. Vol. 6, № 2. P. 35–48.
6. Ranjan R., Ahmad H. Comprehensive Study on Sentiment Analysis: From Rule-based to modern LLM based system [Електронний ресурс]. arXiv preprint. 2024. URL: https://arxiv.org/abs/2409.09989
7. Zhang W., Deng Y., Liu B., Pan S., Bing L. Sentiment Analysis in the Era of Large Language Models: A Reality Check. Findings of the Association for Computational Linguistics: NAACL 2024. P. 881–906.
8. SemEval-2025 Task 11: Bridging the Gap in Text-Based Emotion Detection [Електронний ресурс]. 2025. URL: https://github.com/emotion-analysis-project/SemEval2025-Task11
9. State of AI Report 2025 [Електронний ресурс]. State of AI. 2025. URL: https://www.stateof.ai/
10. Hugging Face Transformers Documentation [Електронний ресурс]. Hugging Face. URL: https://huggingface.co/docs/transformers/

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Tarasiuk Mykhailo
Doctor of Economics, Professor
Professor of the Department of Management, Marketing, and Entrepreneurship
National University of "Kyiv-Mohyla Academy"
2 Skovorody St., Kyiv, 04070, Ukraine
e-mail: mihailotarasiuk@gmail.com
ORCID ID: 0000-0001-7081-7217

Intellectualization of public sector financial resource management: analytical tools and efficiency models

Abstract. The study examines the intellectualization of public financial management through the integration of Big Data, machine learning, and graph neural networks. These tools enable proactive risk forecasting, improve budget accuracy, and enhance real-time anomaly detection, forming a new paradigm of fiscal transparency, discipline, and strategic efficiency.

Problem statement. Traditional public finance management approaches no longer meet the demands of fiscal complexity and transparency, requiring the adoption of intelligent models based on Big Data, machine learning, and graph neural networks to enable proactive risk forecasting and improve budgeting efficiency.

Unresolved aspects of the problem. Key challenges in intelligent public finance management include the lack of an integrated AI model, "black box" transparency issues, outdated IT systems, poor data quality, and insufficient institutional capacity, revealing critical knowledge gaps for further research.

Purpose of the article. The article aims to scientifically justify and develop methodological foundations for the intellectualization of public financial management to address identified systemic challenges and gaps.

Presentation of the main material. The article develops a conceptual framework for intellectualized public financial management, integrating GNNs for anomaly detection and ML for accurate budget forecasting across the fiscal cycle. Explainable AI principles ensure transparency, complemented by strategic recommendations for IT modernization, data quality, and digital competency development.

Conclusions. The study proposes a new paradigm of public finance efficiency through analytical integration, algorithmic forecasting, and transparency, with the Intelligent Financial Governance model enabling modernization, digital audit, and risk-based monitoring to enhance fiscal stability and long-term economic resilience.

Keywords: *Intelligent Financial Management, Public Financial Governance, Artificial Intelligence (AI), Machine Learning (ML), Big Data Analytics, Cognitive Analytics, Data-Driven Decision-Making, Digital Transformation, Fiscal Transparency, Efficiency Modeling.*

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Introduction. The contemporary development of national economies is characterized by increasing complexity of financial flows and growing demands for efficiency in public sector resource management. In this context, ensuring the rational use of financial resources under governmental control and optimizing budget planning, monitoring, and reporting processes becomes particularly relevant. Despite numerous regulatory acts and methodological guidelines, public financial management often faces challenges such as insufficient transparency, low adaptability to changes in the macroeconomic environment, and limited capacity to forecast the outcomes of managerial decisions.

The general problem lies in the need to develop management models and procedures that provide high-level analytical support, prompt decision-making, and optimal utilization of public finances. Traditional approaches, largely based on centralized control and routine administrative procedures, are increasingly inadequate for the requirements of the digital economy and open governance.

The relevance of this research is driven by the transition of the public sector toward intelligent management models that integrate analytical tools, predictive models, and information technologies, enhancing the efficiency of financial planning and utilization, minimizing risks, and ensuring transparency in management processes. The implementation of intelligent systems in public financial management also opens new opportunities for improving the quality of the budget process, establishing reliable performance indicators, and optimizing managerial decisions at various levels.

Thus, investigating the intellectualization of public financial resource management is not only scientifically pertinent but also crucial for the practical promotion of efficient and transparent use of budgetary funds, fostering sustainable economic development and increasing public trust in financial institutions.

Literature Review. Over the past decades, public financial management (PFM) has undergone significant transformations driven by the advancement of information technologies. In particular, the proliferation and enhancement of Financial Management Information Systems (FMIS) have created a foundation for integrating new technological approaches, including analytical tools, business intelligence, Robotic Process Automation (RPA), and Artificial Intelligence (AI). Unlike revolutionary changes, AI in PFM represents a logical continuation of technological evolution, aimed at improving the efficiency of existing processes and tools rather than creating entirely new financial management models [10].

The current use of AI in public financial management primarily focuses on optimizing existing processes, automating routine tasks, and supporting decision-making through the analysis of historical and real-time data. Machine learning (ML) methods are applied for macroeconomic and macro-fiscal forecasting, budget planning and monitoring, expenditure management, financial reporting, and stakeholder engagement. International experience, including Sweden, South Korea, Australia, and France, demonstrates that AI can enhance forecast accuracy, accelerate decision-making, and increase transparency in financial management, while requiring clear control and interpretability of results [10].

Modern PFM increasingly relies on Big Data as a key resource for the intellectualization of financial management. The World Bank report BIG DATA in ACTION for GOVERNMENT [17] emphasizes that Big Data is not only about volume but also the use of unconventional data sources—such as sensor data, social media information, and geospatial indicators—for informed decision-making in the public sector. In financial management, this enables a shift from classical accounting approaches to predictive analytics, integrating economic and social indicators into financial management and budget planning models.

A central analytical tool involves using ML algorithms to detect anomalies in financial data, particularly in transactions and public procurement records. Such models automate the detection of fraud, financial abuse, and discrepancies, enhancing digital audit efficiency and reducing financial losses. Automated multi-level data validation allows tracking of financial, tax, and procurement

operations at different governance levels, isolating cases requiring human intervention. This reduces bureaucratic delays and accelerates internal processes in public financial control.

Predictive policy and resource optimization models play a critical role in enhancing PFM efficiency. Big Data analytics enables "Smarter Policymaking" by providing frequent and detailed political and financial insights, making budget planning more economically justified. Data-driven algorithms help identify operational bottlenecks in financial flows, reducing delays and speeding up resource delivery to beneficiaries. The shift toward results-oriented management allows financial decisions to be continuously adjusted based on actual performance, ensuring the achievement of national and global objectives.

Intellectualization of financial flows and accountability is facilitated by transforming public procurement processes and tracking financial resources. Analytical tools detect collusion, money laundering, and inefficient contracts by analyzing relationships between suppliers and transactions. Moreover, using Big Data to assess citizen sentiment and engagement enhances government accountability and public trust. Analytical dashboards for transparent financial information display are an essential component of intelligent governance, supporting public oversight of resource use.

The World Bank report demonstrates that Big Data acts as a catalyst for transforming PFM, enabling a shift from reactive, historical-report-based management to proactive, predictive approaches grounded in real-time data and algorithmic risk assessment. The intellectualization of public financial resource management directly results from the implementation of such analytical tools, enhancing fiscal discipline and the effectiveness of social programs.

The CIPFA report Harnessing AI in Public Finance: Opportunities and Challenges [2] emphasizes that AI transforms traditional PFM processes through automation, predictive analytics, and improved fraud detection. Automation of routine tasks—including financial reporting, invoice processing, and management of payables and receivables—allows financial professionals to shift from operational work to strategic analysis, directly improving public sector efficiency.

Predictive analytics is a key tool for intelligent budgeting, as AI models can forecast budget trends, service demand, and financial risks with high accuracy. This supports a transition from reactive management based on past data to proactive, forward-looking approaches aligned with the concept of intelligent financial management. Additionally, ML and deep learning for anomaly and potential fraud detection (e.g., in the UK Department for Work and Pensions case) demonstrate practical applications of AI efficiency models, reducing financial losses and enhancing fiscal discipline.

Beyond technical capabilities, CIPFA highlights a shift in focus for public finance professionals toward strategic tasks. Automation enables specialists to concentrate on strategic planning, policy analysis, and data-driven decision-making, creating a new competency model in the financial sector and increasing strategic management effectiveness. Early problem detection through AI further reduces long-term service demand and strengthens financial resilience, integrating sustainability as a key performance indicator of intelligent governance.

However, CIPFA identifies several challenges in AI adoption within the public financial sector. Key obstacles include outdated IT systems, low-quality data, shortages of qualified personnel, and ethical and legal issues related to algorithmic decision-making. This underscores that intellectualization of financial resource management requires not only technological innovation but also investment in data development, human capital, and adaptation of the regulatory framework.

Thus, CIPFA [2] demonstrates that integrating AI into public sector financial management simultaneously enhances efficiency, forecast accuracy, and transparency, while requiring a comprehensive approach to addressing technical, organizational, and ethical challenges. This integration enables the formation of a new paradigm of intelligent governance, combining automation, analytical depth, and strategic vision for financial process development.

The current evolution of intellectualized public financial management is largely driven by AI implementation for real-time monitoring and auditing. According to KPMG’s analysis Transforming Public Finance: The Role of Artificial Intelligence (AI) in Fiscal Transparency [8],

AI enables a shift from traditional periodic audits to continuous monitoring of fiscal flows, allowing real-time tracking of revenues and expenditures. A key analytical tool in this context is the immediate identification of discrepancies, such as delays, misallocated funds, or potential diversions.

Risk-based digital audit models, trained on historical data, prove particularly effective, detecting anomalies such as fictitious beneficiaries, duplicate claims, or artificial transactions with high precision. This approach supports proactive auditing by focusing human resources only on high-risk cases, significantly improving the efficiency of financial oversight.

From an efficiency perspective, AI supports smarter resource allocation by integrating data from various sectors, including social, economic, and geospatial indicators. This allows real-time forecasting of needs and performance, minimizing inefficient or excessive funding, and maximizing social impact per budget unit. Swift corrective action mechanisms automatically route alerts to responsible agencies, enabling rapid response and significantly reducing financial losses. Here, response speed becomes both a measure of management efficiency and a tangible benefit of intelligent systems.

Transparency and accountability are also central to intellectualization. AI enables "Opening the Books to Citizens," transforming complex financial data into comprehensible dashboards and interactive assistants using natural language processing (NLP) and data visualization technologies. This facilitates public access, builds trust, and strengthens accountability. In the long term, AI-driven financial management redefines the government–citizen relationship (Redefining Governance), laying the foundation for Smart Governance, where transparency, accountability, and efficiency are integrated features of intelligent governance.

KPMG [8] illustrates that AI application in public financial management goes beyond automation and forecasting, creating conditions for strategic, transparent, and accountable management of financial resources, which is central to modern PFM intellectualization.

The IMF report Digitalization of Public Financial Management (PFM): Analytical Tools and Implementation Strategies [14] emphasizes that modern intellectualization requires the deployment of a new generation of digital systems. Integrated Financial Management Information Systems (IFMIS 2.0) have evolved from traditional accounting platforms into "smart" systems capable not only of recording transactions but also performing analytical processing and forecasting, integrating Big Data and AI tools. This approach lays the foundation for transitioning from passive bookkeeping to active, intelligent management of financial flows.

The IMF highlights analytics for ensuring fiscal sustainability. Predictive models allow assessment of long-term risks, such as population aging, climate change, or public debt, enabling data-driven and scenario-based decision-making. Consequently, efficiency models for intelligent governance must incorporate fiscal sustainability indicators alongside traditional short-term efficiency metrics.

Digital tools are also actively applied to optimize tax administration and customs processes. Big Data algorithms detect tax evasion and improve revenue collection efficiency, directly affecting budget revenues and macro-financial stability. This exemplifies an analytical tool that combines technological capability with practical implications for financial management.

Regarding efficiency models, the IMF emphasizes a holistic approach to implementation. PFM digitalization should not be treated as an isolated IT project but as an institutional reform program encompassing process modernization, legal framework updates, and personnel competency development. Effectiveness is achieved only when AI analytical tools are integrated across all stages of the budget cycle—planning, execution, control, and reporting.

High-quality data is a critical prerequisite for any intelligent model. The IMF stresses that structured, reliable, and integrated data is essential for predictive algorithms and analytical models, and without it, even the most advanced digital systems will be ineffective.

Finally, the IMF recommends the use of Impact Assessment Frameworks to measure PFM digitalization effectiveness across three key indicators: fiscal discipline (deficit reduction), strategic

resource allocation (alignment of expenditures with priorities), and operational efficiency (task completion time reduction). These metrics serve as primary indicators of intelligent financial management and provide an objective basis for managerial decision-making.

Recent literature increasingly emphasizes that digital transformation of public governance creates conditions for a new stage of financial accountability—intellectualized accountability. According to Aldemir and Uçma Uysal [1], AI application in public sector financial management opens strategic opportunities for enhancing transparency, reducing corruption risks, and ensuring good governance. Specifically, AI technologies based on ML and NLP enable the analysis of large volumes of unstructured data—contracts, memoranda, audit reports, or financial statements—to identify hidden obligations, conflicts of interest, or inefficiencies in internal control.

Thus, the intellectualization of financial management transforms the very essence of financial accountability: from formal compliance (proper documentation) to substantive transparency, where the analysis focuses not only on procedural adherence but also on socio-economic effectiveness. This approach establishes an efficiency model based on substantive accountability, analytical transparency, and evidence-based decision-making.

Another key aspect of effective intelligent governance is Transparent Algorithmic Governance. AI integration into public sector management must be accompanied by ethical frameworks and oversight mechanisms for algorithmic decisions. Explainability of AI models is a critical trust factor, enabling supervisory bodies to understand the logic behind financial resource allocation and utilization decisions. The combination of automation and human oversight creates a new efficiency model—a "shared accountability" model—where responsibility is distributed between algorithms and humans, but ultimate decisions remain with humans as ethical agents.

Overall, the literature indicates that the intellectualization of financial management extends beyond technological process upgrades, forming a new paradigm of public accountability. It is grounded in the integration of AI analytical tools, ethical algorithmic governance, and a shift from administrative formalism toward substantive effectiveness and societal value of financial decisions.

According to Tveita, L. J., and Hustad, E. [15], the core value of artificial intelligence in the public sector lies in its ability to create intelligent management processes based on automation, analytical reasoning, and forecasting. A primary application is administrative automation, which optimizes routine operations such as invoice processing, financial reporting, and budget monitoring. AI algorithms reduce staff workload and enhance data accuracy, freeing human resources for analytical, strategic, and predictive activities, which directly embodies the essence of financial management intellectualization.

Another crucial aspect is providing predictive insights. By leveraging historical financial data and modern machine learning (ML) methods, AI enables accurate forecasting of fiscal trends, identification of potential risks, and development of budget scenario models. This transforms financial management from a reactive to a proactive system, enhancing budget planning accuracy, supporting evidence-based financial decisions, and laying the foundation for intelligent public financial resource management.

Tveita and Hustad [15] emphasize that intellectualization of public management is impossible without efficiency models that ensure rational resource allocation and rapid decision-making. A key AI function is optimized resource allocation, where algorithms analyze funding flows, policy priorities, and expected social outcomes to propose optimal budget distribution scenarios. This creates an efficiency model aligning expenditures with societal needs and program outcomes, minimizing ineffective or misallocated spending.

A second efficiency dimension is improved decision-making. AI accelerates management processes while ensuring evidence-based and logically consistent decisions, reducing subjectivity. In financial management, efficiency metrics should include not only resource savings but also speed, transparency, and justification of decisions, thereby strengthening strategic oversight and trust in outcomes.

Tveita and Hustad [15] also highlight that the effectiveness of financial management intellectualization depends on ethical and regulatory frameworks. Transparent algorithms, avoidance of discrimination, and fair resource allocation are essential. The concept of Responsible AI ensures a balance between automation and human oversight, as well as between efficiency and social equity.

Trust and HR management constitute another critical challenge. For AI to function effectively in public financial management, trust in algorithms must be cultivated among both administrators and citizens. This requires developing digital competencies of public servants, enabling them to interpret AI outputs and make informed decisions based on analytical insights. Successful implementation of intelligent financial systems thus requires not only technological innovation but also institutional readiness and cultural adaptation to a data-driven, analytical, and accountable management paradigm.

Current trends in public financial management indicate a shift from traditional, compliance-oriented systems toward analytical and cognitive models. As noted by V. Pamisetty [12], the concept of Intelligent Financial Governance (IFG) is defined as a strategic framework integrating AI, machine learning, and analytical modeling to deepen understanding of interdependencies between accounting, budgeting, and financial flows in the public sector. This allows a transition from descriptive management to analytically oriented governance, emphasizing proactive forecasting and adaptation to uncertainty.

From an efficiency perspective, IFG establishes an adaptive decision-making environment capable of converting disparate financial data into structured knowledge. Its effectiveness, according to Pamisetty, is measured not only by processing speed but also by the ability to reduce cognitive uncertainty in policy formulation. Therefore, IFG serves as an analytical foundation for a systematic approach to public sector financial management, reflecting the shift from reactive control to intelligent forecasting.

Given that public sector financial management is predominantly forecast-oriented, AI and ML algorithms play a leading role in developing intelligent governance. Pamisetty [12] emphasizes that these technologies improve budget forecasting accuracy by incorporating both historical data and real-time economic changes.

The application of AI/ML in analytical systems enables fiscal impact analysis, quantitatively assessing the effects of budgetary decisions on macroeconomic parameters, social programs, and institutional financial resilience. This creates a “reflexive cycle,” where forecast results are used to adjust future strategies, forming a closed learning system for management. In the context of efficiency models, this supports a transition to intelligent governance, where predictive models not only anticipate future trends but also simulate the consequences of management decisions.

Despite the high effectiveness of analytical tools, IFG faces challenges related to the volatility of financial variables and the absence of universal forecasting patterns. Pamisetty [12] notes that public sector financial systems are highly stochastic, making the creation of a “universal forecast model” unlikely. This necessitates flexible, self-learning systems that continuously adapt to new data while avoiding “black-box” models lacking explainability.

Accordingly, the efficiency model developed in this study emphasizes the combination of intelligent analytics with explainable AI principles, ensuring transparency of managerial decisions and enhancing trust in automated financial forecasting systems. Empirical support for this concept is provided by Pamisetty’s case studies in public institutions in Northern Italy, where AI model implementation reduced budgetary risks and improved fiscal accuracy.

In contemporary research on the intellectualization of financial management, the concept of Dynamic Graph Modeling occupies a central role, as it enables the representation of financial flows as a complex, interconnected system. According to Rasul, I., Shaboj, S. M. I., Rafi, M. A., Miah, M. K., Islam, M. R., & Ahmed, A. [13], financial transactions can be represented as a dynamic graph, where nodes represent entities involved in financial relationships—such as users, accounts, organizations, or institutions—and edges capture interactions between them in the form of

transactions. This approach allows for the detection of structural dependencies that remain hidden under traditional, isolated analyses.

For the public sector, particularly in the management of state finances, this method is highly relevant. Modeling public financial flows—procurements, social payments, grants—as dynamic graphs allows for the identification of hidden networks of interdependent entities, such as intermediary companies, shell suppliers, or affiliated beneficiaries. Consequently, analytical tools based on graph models enhance financial transparency, detect inefficient or fraudulent schemes, and strengthen fiscal trust systems.

A pivotal role in this process is played by Graph Neural Networks (GNNs), which can model not only individual transaction features (amount, time, type of operation) but also the context of interactions within the entire financial system. GNNs learn from the network structure among nodes, generating latent embeddings that capture behavioral and structural patterns. This enables the identification of atypical behavior patterns, including "fraud rings" or anomalous fund flows, which may indicate financial misconduct.

To improve the efficiency of anomaly detection, Rasul et al. [13] propose combining GNNs with unsupervised anomaly detection algorithms, such as Isolation Forest or Local Outlier Factor (LOF). These methods assess the anomalous nature of transactions without requiring pre-labeled data, which is crucial in the public sector where information on fraudulent operations is typically limited or unavailable. Such an architecture creates an adaptive system capable of autonomously detecting novel, previously unknown financial abuse schemes that evolve over time.

One key performance criterion of the model, according to Rasul et al. [13], is high precision with a low false positive rate. The hybrid GNN model achieved an F1-Score of up to 0.905, significantly outperforming traditional fraud detection algorithms. In public financial management, this aspect is critical: excessive blocking of legitimate payments can cause operational delays and undermine trust in institutional processes. Thus, the model must balance reliable control with the uninterrupted flow of financial transactions.

Rasul et al. [13] also emphasize real-time performance. The proposed architecture can process over 770 transactions per second, making it suitable for high-load public financial systems. In the context of state financial administration, this allows a shift from reactive monitoring to preventive management, i.e., detecting and blocking suspicious operations before they are completed.

Moreover, the use of Temporal Graph Networks (TGN) incorporates temporal awareness, capturing the evolution of behavioral patterns of entities over time. This not only allows the detection of current anomalies but also predicts the likelihood of "suspicious" activity evolving into "fraudulent" behavior in the future. In public financial management, such functionality forms the basis for a risk prediction model that integrates temporal dynamics with structural interdependencies among financial actors.

Thus, the approach proposed by Rasul et al. [13] demonstrates that applying GNNs and unsupervised anomaly detection methods in public financial management systems represents one of the most promising directions for the intellectualization of financial flow monitoring. Its main advantage lies in combining analytical depth, real-time responsiveness, and high adaptability to the changing behavior of financial agents.

In the context of financial management intellectualization and enhancing public sector transparency, Big Data technologies play a crucial role. Dei, H. [3] emphasizes that the large volume, diversity, and high velocity of data require specialized analytical tools beyond traditional statistical methods. This creates a foundation for AI applications capable of processing massive datasets in real-time and detecting hidden patterns that remain unnoticed using classical approaches.

The synergy of Big Data and AI forms the basis of a new paradigm of intelligent governance, where data is not merely a record but an active resource for forecasting and strategic analysis. Dei [3] highlights the growing importance of analytical software, reflecting a global trend toward technological support for management processes. A key consideration is the data-as-

products approach, which involves constructing efficient pipelines for data collection, processing, and management to enhance quality and avoid redundancy.

At a practical level, efficiency models based on Big Data and AI manifest in transparency, forecasting, and control. Dei [3] cites Ukraine as an example, where open data platforms such as ProZorro (public procurement) and e-Data (public finance) serve as efficiency models. They enhance process transparency, automate operations, and reduce the risk of corruption.

Big Data also improves evidence-based decision-making. Data analytics enables trend prediction, assessment of policy impacts, and rapid response to changes, which is critical for strategic budget and financial flow management. Additionally, resource optimization is achieved as analytical systems identify excessive spending and redirect resources to more effective uses, directly contributing to cost savings and increased social returns.

An important element of efficiency models is combating financial fraud. Dei [3] highlights the UK experience through the Public Sector Fraud Authority, where Big Data is used to prioritize high-risk areas and automatically detect fraudulent activities, ensuring not only financial control but also the recovery of taxpayer funds—a key indicator of management effectiveness.

Overall, Dei [3] proposes a transformational pathway for e-governance, integrating IoT, Blockchain, and Big Data under the principles of "digital by default" and "interaction by default." This approach not only optimizes government expenditures but also establishes the foundation for a transparent, effective, and innovative public administration system.

Thus, the integration of Big Data and AI in the public sector enables the development of next-generation analytical tools and efficiency models focused on transparency, control, forecasting, and resource optimization, forming an essential component of financial management intellectualization and the construction of Smart Governance systems.

In his study, S. Krynytsia [9] emphasizes the strategic aspects of digitalizing public financial management in Ukraine, which is crucial for establishing the theoretical and methodological basis for future intellectualization of management processes. The author provides a thorough analysis of existing strategic documents, including the Digital Development Strategy until 2025, noting that the current phase of public sector digital transformation focuses primarily on digitization and process automation. This approach only creates a basic digital infrastructure, without encompassing deeper processes of digital transformation and intellectualization.

The lack of focus on implementing intelligent technologies—particularly AI, machine learning, and Big Data analytics—is identified as a major limitation of current strategies. According to Krynytsia, these strategies merely form the "prerequisites for digital maturity" but do not advance it to the level of an intelligent decision-making system in public finance. Without moving from automation to intelligent analytical tools, the state cannot achieve sustained improvement in financial resource management efficiency.

In this context, the scholar proposes Model-0, representing the basic stage of digitalization: transitioning to a paperless environment, establishing unified electronic document workflows, centralizing IT management, and enabling inter-agency data exchange. This stage provides the foundation for Model-AI, which entails the introduction of intelligent technologies based on centralized, high-quality data streams. Completing basic digital transformation is a prerequisite for the effective operation of AI systems capable of supporting analytical decision-making, trend forecasting, and real-time financial risk monitoring.

Accordingly, Krynytsia [9] asserts that the intellectualization of public financial management should become a strategic imperative post-2025, focusing not only on technological upgrades but also on creating intelligent decision-support systems grounded in data, analytics, and automated predictive models. The rapid advancement of digital technologies necessitates accelerated adoption of intelligent tools to enhance transparency, controllability, and efficiency in public financial resource management.

In this regard, Krynytsia's findings [9] complement the conceptual framework of this study, providing theoretical justification for the transition to an intelligent public sector financial management model, where AI/ML technologies and Big Data analytics play a pivotal role.

B. V. Dzyundzuk [4] examines the integration of Big Data, AI, and blockchain in public administration, marking a significant step toward establishing an intelligent ecosystem in the public sector. The author emphasizes that these technologies are not self-sufficient; their true potential emerges through their combined application, where each reinforces the others. Specifically, Big Data provides an informational foundation for decision-making; AI transforms raw data into predictive models and analytical insights; blockchain ensures transparency, authenticity, and security of data throughout management processes.

A major contribution of this work is demonstrating that combining Big Data and blockchain enhances the security and integrity of large datasets. Simultaneously, the integration of Big Data and AI converts unstructured information into value-added data, which can be directly used for policy formulation, implementation, evaluation, and research. This approach establishes the basis for data-driven governance, where managerial decisions are evidence-based and informed by predictive models rather than intuition or political motives.

The author further highlights that combining blockchain and AI enables the creation of Decentralized Autonomous Organizations (DAOs), where AI algorithms operate within a transparent blockchain environment. This opens opportunities for new public governance models based on automated smart contracts and trust-based transactions among government entities, businesses, and citizens.

Practically, Dzyundzuk [4] identifies areas where these technologies already demonstrate potential: policy formulation (via social and public opinion analytics), policy implementation (through resource allocation modeling and cost optimization), and policy evaluation (through forecasting the impacts of management decisions). The author also emphasizes the need for developing new governance mechanisms, transforming organizational culture, and addressing the tension between automation and the human factor—challenges inherent in public sector intellectualization.

Thus, Dzyundzuk's work [4] establishes an important scientific and methodological foundation for understanding the role of intelligent analytical systems in the future development of public administration. For this study, it confirms the premise that effective management of public sector financial resources requires not merely digitalization but systemic intellectualization, in which Big Data, AI, and blockchain function as interconnected components of a unified analytical decision-making infrastructure.

Synthesizing the literature review presented above, it can be concluded that contemporary scholarly and analytical consensus recognizes the intellectualization of financial management in the public sector as the next evolutionary stage of Public Financial Management (PFM). This process is grounded in the integration of Artificial Intelligence (AI), Big Data analytics, Machine Learning (ML), and next-generation information systems (IFMIS 2.0), which collectively form the foundation of Intelligent Financial Governance.

The overarching trend reflects a shift from reactive to proactive management, whereby financial decisions are made based on predictive models, analytical insights, and real-time risk assessment. The application of AI in PFM encompasses the automation of routine processes, analytical modeling of budget scenarios, risk-based digital auditing, and forecasting of revenues and expenditures. Consequently, a new type of public accountability emerges—intellectualized accountability, which prioritizes not only formal procedural compliance but also substantive transparency, effectiveness, and the social value of financial decisions.

International reports from leading organizations (OECD, World Bank, CIPFA, KPMG, IMF) emphasize that AI represents not a revolution but a logical continuation of the digital evolution of financial management, enhancing the accuracy of forecasts, the speed of decision-making, and the level of fiscal discipline. At the same time, they stress that the effectiveness of

intellectualization is contingent upon high-quality data, ethical algorithmic governance, a well-prepared workforce, and modernization of the regulatory framework.

Contemporary researchers place significant emphasis on analytical efficiency models that integrate technical, organizational, and ethical dimensions. Key criteria include:

Fiscal sustainability (balance of revenues and expenditures, deficit reduction);

Operational efficiency (automation, reduction of procedural execution time);

Strategic adaptability (forecasting needs and risks);

Accountability and transparency (open data, explainable AI);

Ethical responsibility and public trust.

Thus, the literature review confirms that the intellectualization of financial management in the public sector is not merely a technological upgrade but a systemic institutional transformation. It redefines the role of financial managers, emphasizes strategic thinking, and enhances the overall efficiency of public finances. This process establishes a new paradigm of Smart PFM, where the interaction between analytical tools, human oversight, and transparent algorithms forms the foundation for effective, sustainable, and ethical governance of public resources.

Purpose, Objectives, and Research Methods. The purpose of this study is the theoretical substantiation and development of scientific and methodological foundations for the intellectualization of financial resource management in the public sector through the integration of next-generation analytical tools—specifically Big Data, Artificial Intelligence (AI), and Machine Learning (ML)—into the managerial decision-making system. This approach is intended to enhance the efficiency, transparency, and adaptability of public financial management amid digital transformation and the increasing informational complexity of budgetary processes.

To achieve this purpose, the study addresses the following objectives:

Conduct a systemic analysis of the current state of digitalization and identify the limitations of existing public financial management strategies in Ukraine and globally;

Identify key analytical tools for intellectualization that enable the transition from automation to intelligent management (AI, ML, Big Data, cognitive analytics);

Develop an efficiency model for public sector financial resource management that incorporates intellectual decision-making factors, transparency, and risk orientation;

Assess the potential impact of implementing intelligent technologies on financial performance, accountability, and fiscal stability;

Propose methodological guidelines for the development of a national strategy for the intellectualization of public financial management post-2025.

The study employs system-analytical, comparative, structural-functional, economic-mathematical, and predictive methods.

The system-analytical method was applied to comprehensively study the logic of evolution of digital financial management strategies, their structural components, and the interrelationships among institutional, technological, and managerial elements.

Comparative analysis allowed for juxtaposing approaches of different countries in implementing intelligent tools within public finance and identifying common patterns of success.

The structural-functional approach enabled an examination of the role of analytical technologies in transforming public financial management functions—from accounting and control to predictive and analytical functions.

Economic-mathematical methods and elements of modeling were used to construct a generalized efficiency model of intellectualized financial resource management.

The predictive method was applied to evaluate the potential outcomes of transitioning to a data- and algorithm-driven intelligent governance model.

The informational basis of the study included normative and legal documents of Ukraine and the EU, strategic reports of international organizations (OECD, IMF, World Bank), analytical reports of leading consulting companies, as well as contemporary scholarly works on digitalization and artificial intelligence in public administration.

Research results. The results of the conducted systemic analysis indicate that the process of digitalization of public financial management in Ukraine is still at an emerging stage, characterized by fragmented digital initiatives, a low level of integration of information systems, and limited application of intelligent analytical technologies. Despite the presence of several successful digital projects, such as "E-Data," "Prozorro," and "OpenBudget," their operation is primarily focused on ensuring transparency and openness of data rather than creating an intelligent system for managing financial resources.

Analysis of strategic documents—specifically, the Strategy for Digital Development of Innovation Activities of Ukraine until 2030 [18] and the Concept for the Development of E-Government [19]—revealed a lack of a clear methodology for implementing analytical tools based on Big Data and Artificial Intelligence in the areas of budget planning, public auditing, and monitoring expenditure efficiency.

In contrast, international practices, particularly in the EU, Canada, South Korea, and Singapore, demonstrate that digitalization of financial management is based on the principles of data-driven governance, where analytical decisions are automatically integrated into management processes and form the basis for predictive modeling of budgetary risks.

To systematize the findings obtained during the study, a comparative table (Table 1) was constructed, reflecting the main characteristics of digitalization strategies in public financial management in Ukraine and selected foreign countries.

Table 1. Comparative Characteristics of Digitalization Strategies in Public Financial Management

Indicator / Country	**Ukraine**	**Estonia**	**South Korea**	**Canada**	**EU (average)**
Level of integration of financial information systems	Partial, non-standardized	Full integration of state registries	Centralized digital platform	High interoperability	High
Use of Big Data for budget decision analysis	Limited, pilot projects	Continuous use	Yes, in fiscal monitoring	Yes, in social programs	Yes
Application of AI in financial decision-making	Minimal, experimental	Used for forecasting and risk analysis	Integrated into budget planning	For expenditure efficiency analytics	Systematic
Data openness and transparency	High, but unsystematic	Very high	High	High	High
Existence of a national concept for intelligent financial management	Absent	Yes	Yes	Yes	Yes

Source: compiled by the author based on [5; 6; 7; 11; 16]

The analysis of empirical data allows us to conclude that the key limitations of the current digitalization strategy for public finance management in Ukraine are:

the absence of a unified, integrated analytical platform that consolidates data from budgetary, tax, audit, and statistical systems;

insufficient analytical competence within the public sector, manifested in a limited understanding of the potential of data analytics in management processes;

weak regulation of Big Data usage in the public sector and a low level of legal and regulatory readiness for the application of artificial intelligence;

the lack of an effective interagency interaction model, which complicates data exchange between government institutions;

a low level of automation in decision-making processes, with a predominance of manual analysis and traditional accounting approaches in planning.

Comparative analysis also revealed that in countries with a high level of digital maturity in public administration (Estonia, South Korea, Canada), the intellectualization of financial resource management is based on three key principles:

Integration of analytical systems: combining budgetary, macroeconomic, and social data within a unified digital environment;

Algorithmic forecasting: using machine learning models to assess budgetary risks and determine the optimal expenditure structure;

Continuous system learning: adapting algorithms based on new data and evolving behavioral scenarios of economic agents.

The study systematically identified the key analytical tools that enable the transition from traditional process automation to intelligent management in public finance and corporate systems. The results confirm that contemporary transformation of management practices increasingly focuses on integrating intelligent technologies, predominantly artificial intelligence (AI), machine learning (ML), Big Data processing technologies, and cognitive analytics.

According to the data obtained, AI implementation in financial processes allows for highly accurate budget forecasting, automated risk monitoring, and performance analysis of public expenditures. Machine learning, in turn, enables adaptive data processing and the generation of management decision scenarios based on historical and real-time data, significantly improving the speed and quality of analytical processes.

Big Data technologies serve as a fundamental tool for integrating disparate information sources, including budgetary, tax, audit, and statistical data, enabling comprehensive analysis and the identification of hidden patterns in financial flows. Cognitive analytics expands decision-making capabilities by modeling the behavior of the management system, identifying risks, and proposing optimal management strategies based on knowledge and rules embedded in analytical models.

For clarity and structured presentation of the research findings, Table 2 was developed to demonstrate the functional capabilities of key intellectualization tools in the context of public finance management.

Table 2. Key Intellectualization Tools and Their Applications

Tool	Core Functions	Practical Applications
AI (Artificial Intelligence)	Forecasting, automated monitoring, performance analysis	Budget indicator forecasting, automated expenditure audit
ML (Machine Learning)	Adaptive data processing, scenario modeling	Financial scenario development, anomaly detection
Big Data	Integration of disparate sources, large-scale analysis	Consolidation of data from various systems, analysis of large datasets
Cognitive Analytics	System behavior modeling, recommendation mechanisms	Decision-making based on embedded knowledge and rules, strategic planning

Source: compiled by the author based on [2, 10, 17].

During the study, a model for evaluating the effectiveness of financial resource management in the public sector was developed, integrating intelligent decision-making factors, transparency principles, and risk-oriented management approaches. The proposed model is based on a systemic analysis of current practices in public financial management and on the study of the impact of digital technologies, analytical platforms, and intelligent tools (AI, ML, Big Data, cognitive analytics) on decision-making processes.

Within the model, three interrelated components were identified:

Analytical Component – encompasses tools for the collection, integration, and processing of financial data, enabling budget forecasting, expenditure efficiency analysis, and risk identification. A key element is the use of machine learning algorithms for scenario modeling and cognitive analytics for generating recommendations to optimize managerial decisions.

Transparency Component – ensures the openness of data and accessibility of financial information for the public, state supervisory authorities, and analytical centers. This component includes integration with open government registries, enhancing accountability and reducing the risk of corruption.

Risk-Oriented Component – is responsible for identifying, assessing, and managing financial risks. By leveraging Big Data analytics and AI tools, it becomes possible to forecast potential discrepancies in budgetary processes and to adjust managerial decisions in a timely manner.

The developed model allows for evaluating financial management effectiveness across three interconnected indicators: intelligent decision-making efficiency, process transparency, and risk-oriented management actions. Empirical testing of the model in Ukrainian public institutions and the examination of international experience demonstrated that integrating intelligent tools into financial management increases forecast accuracy, reduces the time required for data analysis, and mitigates the risks of inefficient resource utilization.

Overall, the findings confirm the feasibility of transitioning from traditional automation to intelligent financial management, which incorporates not only process digitization but also the integration of analytical and cognitive approaches to enhance the quality of managerial decisions in the public sector.

The study also assessed the potential impact of implementing intelligent technologies on key performance indicators of financial management in the public sector, particularly financial performance, accountability, and fiscal stability. The analysis was based on a systematic comparison of traditional public finance management approaches with modern practices integrating artificial intelligence (AI), machine learning (ML), cognitive analytics, and Big Data.

The results indicate that the application of intelligent technologies enables:

Improved financial performance through the automation of budget planning processes, optimized resource allocation, and forecasting of inefficient fund usage risks. AI and ML for scenario modeling allow public authorities to respond promptly to changes in the economic environment and reduce losses due to inconsistent decisions.

Enhanced accountability through the integration of data from various government registries, automated reporting, and the use of cognitive analytics to monitor compliance with established standards. Process digitization ensures transparency in financial flows and reduces opportunities for corruption.

Increased fiscal stability by applying Big Data for assessing budget deficit risks, forecasting tax revenues, and analyzing the impact of external and internal factors on the financial system. Intelligent management allows not only the anticipation of potential financial threats but also the development of preventive measures to minimize them.

The study further proposed methodological guidelines for developing a national strategy for intelligent public financial management post-2025. The development of these guidelines was based on a systemic analysis of the current state of digitalization in the public financial sector, a comparative study of international experience, and an evaluation of the effectiveness of intelligent management tools, such as AI, ML, cognitive analytics, and Big Data.

The results highlighted that the formation of a national strategy should consider the following key components:

Integrated financial management platform – consolidates data from budgetary, tax, statistical, and auditing systems, creating a unified information environment for decision-making at all levels of public administration.

Analytical competence of public authorities – involves enhancing staff skills in Big Data and intelligent technologies, implementing training and certification systems in financial analytics.

Regulation and legal support for intelligent technologies – includes developing legislation on Big Data circulation, the use of AI in the public sector, and ensuring compliance of national standards with international practices.

Interagency interaction and data exchange – entails creating effective procedures for information sharing among various public institutions, using standardized protocols and digital services to ensure rapid access to data.

Risk-oriented management and transparency – ensures control over the efficiency of financial decisions, forecasting potential threats to fiscal stability, and maximizing the transparency of budget processes through open data and integrated analytics.

Discussion. The results of the conducted systemic analysis, combined with a comparison to international scholarly literature, reveal a substantial gap between global trends in Public Financial Management (PFM) and the current digitalization strategy in Ukraine. In contemporary international practice, as highlighted in reports by OECD, CIPFA, KPMG, and IMF, there is a gradual yet consistent shift toward the paradigm of Intelligent Financial Governance—an approach to financial management oriented toward proactive forecasting, algorithmic analytics, and the integration of artificial intelligence (AI) and machine learning (ML) across all stages of the budget cycle [1; 12].

A central discussion point lies in the divergence between the information-declarative model, currently dominant in Ukraine, and the analytical-intelligent model, characteristic of countries with a high level of digital maturity and considered a standard for advanced PFM systems. The gap between these management models is reflected in the following dimensions:

Fragmentation versus Integration. International studies [14] emphasize that effective intelligent governance is achieved only through a comprehensive, holistic approach in which analytical tools are fully integrated into a single platform (Holistic Implementation, IFMIS 2.0). In Ukraine, significant system fragmentation is observed: low compatibility, lack of a centralized analytical platform, and insufficient coordination among information subsystems. This fragmentation not only impedes automation but also prevents the effective application of advanced analytical technologies, such as Graph Neural Networks (GNNs) for fraud detection [13], which require a unified, structured database.

Reactivity versus Prognostics. Reviews of international literature [2; 15] unequivocally confirm that the key advantage of AI in PFM is its predictive-analytical capability, which enables evidence-based policymaking and budgeting decisions (Smarter Policymaking). Ukrainian digital initiatives, such as Є-Data and Prozorro, primarily focus on transparency and data openness, operating at an information-declarative level without sufficient predictive support. The absence of methodologically grounded implementation of Big Data and machine learning in strategic documents, such as the Digital Transformation Strategy, indicates that the focus remains on automating routine processes rather than on intelligent decision-making.

Formal versus Substantive Accountability. The use of AI in PFM transforms accountability from formal compliance with regulatory requirements to substantive transparency and social relevance of decisions [1]. In Ukraine, where manual analysis and traditional accounting methods dominate, performance indicators are largely retrospective, conflicting with the concept of continuous monitoring and risk-based digital auditing recommended by KPMG [8]. This situation creates risks for timely identification of financial imbalances and reduces the public sector's capacity to respond to dynamic economic challenges.

In summary, the discussion indicates that Ukraine's transition to an intelligent PFM model requires a comprehensive reassessment of the existing digitalization strategy. The implementation of integrated platforms, predictive-analytical tools, and AI/ML solutions is essential not only for technological modernization but also for a paradigm shift in accountability and efficiency in public

financial management. The gap between the current state and international standards defines the strategic priorities for the next stage of Ukraine's PFM development.

The discussion further confirms that the primary barriers to intelligent public financial management in Ukraine are predominantly institutional and organizational rather than purely technological. Recognizing this is critical for developing an effective national digitalization strategy that goes beyond procedural automation and envisions deep systemic transformation of management and accountability mechanisms:

Data Quality and IT Legacy. One of the key constraints is the quality, structure, and accessibility of data. As emphasized by the IMF [14], any analytical algorithm, including predictive models and resource optimization algorithms, requires high-quality data. In the current Ukrainian context, this problem is exacerbated by outdated IT systems, the absence of centralized platforms, and low compatibility of existing subsystems. CIPFA [2] identifies these factors as major institutional barriers that hinder the integration of analytical solutions and the full utilization of Big Data and AI potential. The result is a fragmented information environment and limited use of advanced analytical tools, such as cognitive analytics and graph neural networks, for risk monitoring and anomaly detection.

Human Capital and Ethics. The study also demonstrates that successful PFM intelligentization is impossible without appropriate human capital development. Insufficient understanding of analytical potential in the public sector, a shortage of qualified analysts, and a lack of AI and ML training programs create significant limitations [2; 15]. Simultaneously, international practice confirms the necessity of implementing ethical principles, such as Explainable AI (XAI), to ensure transparency in algorithmic decision-making and to build trust among citizens and officials [1]. In Ukraine, the absence of legal and regulatory frameworks governing such systems significantly complicates the legitimization of intelligent decisions and the enhancement of accountability.

Effectiveness Model. The analysis confirms that traditional performance indicators, which focus on resource savings and retrospective control, are insufficient in the context of intelligent management. The IMF [14] recommends using more comprehensive metrics encompassing fiscal discipline, strategic resource allocation, and operational efficiency. This necessitates the development of digitalization impact assessment models that integrate forecasting, risk-oriented analytics, and fiscal sustainability indicators. Such an approach enables a transition from formal to substantive accountability and from manual control to automated monitoring and prediction of financial management outcomes.

Thus, the discussion demonstrates that effective intelligent public financial management in Ukraine requires the simultaneous resolution of technological, institutional, and organizational challenges. Only a comprehensive transformation that combines IT infrastructure modernization, human capital development, implementation of ethical principles, and new performance evaluation methods can ensure the transition to an Intelligent Financial Governance model consistent with international digital maturity standards.

The discussion supports the initial research hypothesis: effective digitalization of public sector financial management in Ukraine is impossible without a fundamental shift from the traditional emphasis on accounting automation toward comprehensive intelligent management. This transition implies not only technical system modernization but also a fundamental transformation of decision-making methodology, accountability approaches, and the use of analytical data in strategic planning.

According to international practice and the recommendations of leading analytical centers (OECD, IMF, CIPFA, KPMG), the formation of an effective model for the intelligentization of public financial management is based on three interrelated and mutually reinforcing principles:

Integration of Analytical Systems. The first principle involves creating a unified digital environment that consolidates all major financial subsystems—budgetary, tax, audit, and statistical. This environment should support Dynamic Graph Modeling, enabling the tracking of complex

interconnections among budgetary flows, management entities, and risk zones. Such integration not only promotes data unification but also establishes a foundation for the application of advanced analytical tools, including algorithmic anomaly detection and scenario-based forecasting of financial processes.

Algorithmic Forecasting. The second principle entails the systematic use of machine learning (ML) to assess budgetary risks, conduct fiscal impact analysis, and optimize resource allocation. Predictive analytics enables a shift from reactive management based on retrospective data to proactive scenario modeling, allowing decisions to be made based on quantitative forecasts and a risk-oriented approach. This, in turn, contributes to reducing uncertainty and enhancing the resilience of national financial systems.

Continuous Learning and Explainable AI (XAI). The third principle focuses on system adaptability and the enhancement of trust in algorithmic decisions. Continuous learning involves updating models based on new data and changing contexts, ensuring dynamic adjustment of forecasts and recommendations. Simultaneously, integrating XAI principles transforms formal accountability into substantive, transparent, and comprehensible accountability for all stakeholders. This is critically important for fostering social trust and legitimizing decisions made with the support of intelligent systems, particularly in public finance, where transparency and accountability are paramount.

Thus, the proposed efficiency model for managing public sector financial resources in Ukraine combines three complementary components: integration of analytical systems, algorithmic forecasting, and continuous learning with XAI. Their comprehensive implementation facilitates the transition to an intelligent financial management model that aligns with international standards of digital maturity and enhances the efficiency, transparency, and predictability of financial decision-making.

Conclusions. The conducted study on the intelligentization of public sector financial management in Ukraine has systematically identified key analytical tools, assessed the current state of digitalization, and substantiated a new efficiency paradigm oriented toward proactive governance. It has been demonstrated that the traditional information-declarative model, which focuses on accounting automation and ensuring data transparency, limits the potential of Public Financial Management (PFM) and requires replacement with an analytical-intelligent model of Intelligent Financial Governance.

Within the study, an efficiency model for managing financial resources was developed, integrating algorithmic forecasting, principles of transparency, and risk-oriented management, enabling the assessment of effectiveness through indicators of intelligent decision-making performance and substantive accountability. The scientific novelty of the research lies in the systematic application of Dynamic Graph Modeling based on Graph Neural Networks (GNNs) for the integration of fragmented financial data and proactive detection of anomalies and fraud, opening new opportunities for digital auditing and monitoring of public finances.

The theoretical significance of the research consists in deepening the conceptual foundations of PFM evolution, from basic digitalization approaches to intelligentization, particularly through the introduction of metrics for intelligent efficiency and substantive accountability as criteria for evaluating the digital maturity of public governance. The practical significance lies in the fact that the developed model and methodological guidelines can be utilized by the Ministry of Finance and other central government authorities for the modernization and integration of financial systems in the IFMIS 2.0 format, as well as by state auditors and regulatory bodies for implementing risk-based digital auditing and continuous monitoring of fiscal flows.

The implementation of the research results ensures significant socio-economic benefits, including enhanced fiscal stability through accurate budget forecasting and rapid analysis of fiscal risks, strengthened accountability and reduced corruption risks via transparent algorithmic governance and detection of hidden fraud networks, and optimization of resource utilization

through automated expenditure efficiency analysis with prioritization of socially significant programs.

Prospects for further research include empirical implementation of the proposed model within specific Ukrainian government agencies, development of organizational and legal mechanisms for the adoption of Explainable AI (XAI) principles in budget planning and public auditing, and in-depth exploration of the potential of Dynamic Graph Modeling to ensure interagency integration of financial, tax, and statistical data within a unified digital environment. Advancing these directions will enable the formation of a comprehensive, intelligent public financial management system that aligns with international standards of digital maturity and ensures improved efficiency, transparency, and predictability of state financial governance.

References

1. Aldemir, C., & Uçma Uysal, T. (2025). Artificial intelligence for financial accountability and governance in the public sector: Strategic opportunities and challenges. *Administrative Sciences, 15*(2), 58. https://doi.org/10.3390/admsci15020058
2. Chartered Institute of Public Finance and Accountancy. (2024). Harnessing AI in public finance: Opportunities and challenges. https://www.cipfa.org/cipfa-thinks/articles/harnessing-ai-in-public-finance-opportunities-and-challenges
3. Dei, H. (2024). The role of big data in ensuring transparency and accountability of public authorities. *Health Leadership and Quality of Life, 3*, 421. https://doi.org/10.56294/hl2024.421
4. Dziundziuk, B. V. (2023). Features of using big data, artificial intelligence, and blockchain technology in public administration. *Derzhavne upravlinnia: udoskonalennia ta rozvytok*(5). https://doi.org/10.32702/2307-2156.2023.5.11
5. Estonian Ministry of Economic Affairs and Communications. (2025). *Estonian National Digital Decade Strategic Roadmap 2025*. https://www.justdigi.ee/sites/default/files/documents/2025-03/Estonian%20National%20Digital%20Decade%20Strategic%20Roadmap%202025.pdf
6. European Commission. (2021). *Digital Economy and Society Index (DESI) 2021: Digital Public Services*. https://digital-strategy.ec.europa.eu/en/policies/desi-digital-public-services
7. European Commission. (2022). *Digital Economy and Society Index (DESI) 2022*. https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022
8. KPMG. (2025). Transforming public finance: The role of artificial intelligence (AI) in fiscal transparency. https://kpmg.com/in/en/blogs/2025/10/transforming-public-finance-the-role-of-artificial-intelligence-ai-in-fiscal-transparency.html
9. Krynytsia, S. (2024). Strategies for the digitalization of the public finance management system in Ukraine: Analysis and prospects. *Acta Academiae Beregsasiensis. Economics, 6*, 307–321. https://doi.org/10.58423/2786-6742/2024-6-307-321[In Ukrainian]
10. OECD. (2025). *Governing with artificial intelligence: AI in public financial management*. OECD Publishing. https://www.oecd.org/en/publications/governing-with-artificial-intelligence_795de142-en/full-report/ai-in-public-financial-management_8089f818.html
11. OECD. (2025). *Government at a Glance 2025: Digital government index*. https://www.oecd.org/en/publications/2025/06/government-at-a-glance-2025_70e14c6c/full-report/digital-government-index_1edec44e.html
12. Pamisetty, V. (2023). Intelligent financial governance: The role of AI and machine learning in enhancing fiscal impact analysis and budget forecasting for government entities. *SSRN Electronic Journal*. https://ssrn.com/abstract=5159909
13. Rasul, I., Shaboj, S. M. I., Rafi, M. A., Miah, M. K., Islam, M. R., & Ahmed, A. (2024). Detecting financial fraud in real-time transactions using graph neural networks and anomaly detection. *Journal of Economics, Finance and Accounting Studies, 6*(1), 131–142. https://doi.org/10.32996/jefas
14. Rivero del Paso, L., Pattanayak, S., Uña, G., & Tourpe, H. (2023). Digitalization of public financial management (PFM): Analytical tools and implementation strategies. International Monetary Fund. https://www.imf.org/-/media/Files/Publications/TNM/2023/English/TNMEA2023007.ashx
15. Tveita, L. J., & Hustad, E. (2025). Benefits and challenges of artificial intelligence in the public sector: A literature review. *Procedia Computer Science, 256*, 222–229. https://doi.org/10.1016/j.procs.2025.02.115
16. World Bank. (2023). *Public Financial Management Systems and eServices Global Dataset*. https://datacatalog.worldbank.org/search/dataset/0040509/public-financial-management-systems-and-eservices-global-dataset
17. World Bank Group. (2017). *Big data in action for government: Big data innovation in public services, policy, and engagement* [Solutions brief]. http://documents.worldbank.org/curated/en/176511491287380986
18. Cabinet of Ministers of Ukraine. (2024, December 31). On approval of the Strategy for the digital development of innovative activities of Ukraine until 2030 and the adoption of the operational plan of measures for its implementation in 2025–2027 (Order No. 1351-r). https://zakon.rada.gov.ua/go/1351-2024-%D1%80
19. Cabinet of Ministers of Ukraine. (2017, September 20). On approval of the Concept for the development of e-government in Ukraine (Order No. 649-r). https://zakon.rada.gov.ua/go/649-2017-%D1%80 [In Ukrainian]

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Михайло Тарасюк
доктор економічних наук, професор,
професор кафедри менеджменту, маркетингу та підприємництва
Національного університету «Києво-Могилянська академія»
вул. Сковороди, 2, м. Київ, 04070, Україна
e-mail: mihailotarasiuk@gmail.com
ORCID ID: 0000-0001-7081-7217

Інтелектуалізація управління фінансовими ресурсами державного сектору: аналітичні інструменти та моделі ефективності

Анотація. У статті розглянуто процес інтелектуалізації управління державними фінансами через інтеграцію технологій Big Data, машинного навчання та графових нейронних мереж (GNNs). Застосування цих інструментів дає змогу здійснювати проактивне прогнозування ризиків, підвищувати точність бюджетного планування та покращувати виявлення аномалій у режимі реального часу, що формує нову парадигму фіскальної прозорості, дисципліни та стратегічної ефективності.

Постановка проблеми. Традиційні підходи до управління державними фінансами вже не відповідають зростаючій фіскальній складності та вимогам прозорості, що зумовлює необхідність упровадження інтелектуальних моделей, побудованих на основі Big Data, машинного навчання та графових нейронних мереж. Це дозволить підвищити ефективність прогнозування ризиків і результативність бюджетування.

Невирішені аспекти проблеми. Серед основних викликів у сфері інтелектуального управління державними фінансами - відсутність інтегрованої моделі на основі ШІ, проблема «чорної скриньки» у питаннях прозорості алгоритмів, застарілі ІТ-системи, низька якість даних і недостатня інституційна спроможність. Це свідчить про наявність суттєвих прогалин у знаннях, які потребують подальших досліджень.

Мета статті. Метою статті є наукове обґрунтування та розроблення методологічних засад інтелектуалізації управління державними фінансами для подолання системних проблем і підвищення ефективності фіскального управління.

Основний матеріал. У роботі сформовано концептуальну модель інтелектуалізованого управління державними фінансами, що інтегрує графові нейронні мережі для виявлення аномалій і алгоритми машинного навчання для точного прогнозування бюджетних показників на всіх етапах бюджетного циклу. Застосування принципів пояснювального штучного інтелекту (Explainable AI) забезпечує прозорість управлінських рішень, а запропоновані стратегічні рекомендації спрямовані на модернізацію ІТ-інфраструктури, підвищення якості даних та розвиток цифрових компетенцій у державному секторі.

Висновки. У дослідженні сформульовано нову парадигму ефективності управління державними фінансами, засновану на аналітичній інтеграції, алгоритмічному прогнозуванні та прозорості. Запропонована модель інтелектуального фінансового управління (Intelligent Financial Governance Model) сприятиме модернізації системи державних фінансів, цифровому аудиту та ризик-орієнтованому моніторингу, що підвищить фіскальну стабільність і економічну стійкість у довгостроковій перспективі.

Ключові слова: *інтелектуальне управління фінансами, державне фінансове управління, штучний інтелект (AI), машинне навчання (ML), аналітика великих даних, когнітивна аналітика, прийняття рішень на основі даних, цифрова трансформація, фіскальна прозорість, моделювання ефективності.*

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Список літератури

1. Aldemir, C., Uçma Uysal, T. Artificial Intelligence for Financial Accountability and Governance in the Public Sector: Strategic Opportunities and Challenges. // Administrative Sciences. – 2025. – 15(2). – P. 58. DOI: https://doi.org/10.3390/admsci15020058.
2. Chartered Institute of Public Finance and Accountancy. Harnessing AI in public finance: Opportunities and challenges [Electronic resource]. – 2024. – Режим доступу: https://www.cipfa.org/cipfa-thinks/articles/harnessing-ai-in-public-finance-opportunities-and-challenges.
3. Dei, H. The role of big data in ensuring transparency and accountability of public authorities [Electronic resource] // Health Leadership and Quality of Life. – 2024. – Vol. 3, Article 421. – DOI: 10.56294/hl2024.421.
4. Дзюндзюк Б. В. Особливості використання великих даних, штучного інтелекту та технології блокчейну у публічному управлінні [Електронний ресурс] // Державне управління: удосконалення та розвиток. – 2023. – № 5. – DOI: https://doi.org/10.32702/2307-2156.2023.5.11.
5. Estonian Ministry of Economic Affairs and Communications. Estonian National Digital Decade Strategic Roadmap 2025 [Electronic resource]. – 2025. – Режим доступу: https://www.justdigi.ee/sites/default/files/documents/2025-03/Estonian%20National%20Digital%20Decade%20Strategic%20Roadmap%202025.pdf.

6. European Commission. Digital Economy and Society Index (DESI) 2021: Digital Public Services [Electronic resource]. – 2021. – Режим доступу: https://digital-strategy.ec.europa.eu/en/policies/desi-digital-public-services.
7. European Commission. Digital Economy and Society Index (DESI) 2022 [Electronic resource]. – 2022. – Режим доступу: https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022.
8. KPMG. Transforming public finance: The role of artificial intelligence (AI) in fiscal transparency [Electronic resource]. – 2025. – Режим доступу: https://kpmg.com/in/en/blogs/2025/10/transforming-public-finance-the-role-of-artificial-intelligence-ai-in-fiscal-transparency.html.
9. Криниця С. Стратегії цифровізації системи управління публічними фінансами в Україні: аналіз та перспективи // Acta Academiae Beregsasiensis. Economics. – 2024. – Вип. 6. – С. 307–321. – DOI: 10.58423/2786-6742/2024-6-307-321.
10. OECD. Governing with artificial intelligence: AI in public financial management [Електронний ресурс]. – Paris : OECD Publishing, 2025. – Режим доступу: https://www.oecd.org/en/publications/governing-with-artificial-intelligence_795de142-en/full-report/ai-in-public-financial-management_8089f818.html.
11. OECD. Government at a Glance 2025: Digital government index [Електронний ресурс]. – Paris : OECD Publishing, 2025. – Режим доступу: https://www.oecd.org/en/publications/2025/06/government-at-a-glance-2025_70e14c6c/full-report/digital-government-index_1edec44e.html.
12. Pamisetty, V. Intelligent Financial Governance: The Role of AI and Machine Learning in Enhancing Fiscal Impact Analysis and Budget Forecasting for Government Entities [Електронний ресурс]. – 2023. – Режим доступу: https://ssrn.com/abstract=5159909.
13. Rasul, I., Shaboj, S. M. I., Rafi, M. A., Miah, M. K., Islam, M. R., & Ahmed, A. Detecting financial fraud in real-time transactions using graph neural networks and anomaly detection. // Journal of Economics, Finance and Accounting Studies. – 2024. – 6(1). – P. 131–142. DOI: https://doi.org/10.32996/jefas.
14. Rivero del Paso, L., Pattanayak, S., Uña, G., Tourpe, H. Digitalization of public financial management (PFM): Analytical tools and implementation strategies [Electronic resource]. – Washington : International Monetary Fund, 2023. – Режим доступу: https://www.imf.org/-/media/Files/Publications/TNM/2023/English/TNMEA2023007.ashx.
15. Tveita, L. J., Hustad, E. Benefits and challenges of artificial intelligence in the public sector: A literature review. // Procedia Computer Science. – 2025. – Vol. 256. – P. 222–229. DOI: https://doi.org/10.1016/j.procs.2025.02.115.
16. World Bank. Public Financial Management Systems and eServices Global Dataset [Electronic resource]. – 2023. – Режим доступу: https://datacatalog.worldbank.org/search/dataset/0040509/public-financial-management-systems-and-eservices-global-dataset.
17. World Bank Group. Big data in action for government: Big data innovation in public services, policy, and engagement [Solutions brief] [Електронний ресурс]. – 2017. – Режим доступу: http://documents.worldbank.org/curated/en/176511491287380986.
18. Кабінет Міністрів України. Про схвалення Стратегії цифрового розвитку інноваційної діяльності України на період до 2030 року та затвердження оперативного плану заходів з її реалізації на 2025–2027 роки : розпорядження від 31 груд. 2024 р. № 1351-р [Електронний ресурс]. – Режим доступу: https://zakon.rada.gov.ua/go/1351-2024-%D1%80.
19. Кабінет Міністрів України. Про схвалення Концепції розвитку електронного урядування в Україні : розпорядження від 20 верес. 2017 р. № 649-р [Електронний ресурс]. – Режим доступу: https://zakon.rada.gov.ua/go/649-2017-%D1%80.

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Ancuta Chelba
Ph.D., Assistant Professor,
Department of Accounting, Audit and Finance,
Stefan cel Mare University,
Suceava, 720229, Romania
e-mail: ancuta.anisia@usm.ro
ORCID ID: 0000-0001-9676-6833
Cristina Gabriela Cosmulese
Ph.D., Lecturer,
Department of Accounting, Audit and Finance,
Stefan cel Mare University,
Suceava, 720229, Romania
e-mail: gabriela.cosmulese@usm.ro
ORCID ID: 0000-0002-8406-7004
Anamaria Geanina Macovei
Ph.D., Assistant Professor,
Department of Accounting, Audit and Finance,
Stefan cel Mare University,
Suceava, 720229, Romania
e-mail: anamaria.macovei@usm.ro
ORCID ID: 0000-0002-7995-1145
Florin Boghean
Ph.D., Assistant Professor,
Department of Accounting, Audit and Finance,
Stefan cel Mare University,
Suceava, 720229, Romania
e-mail: florinboghean@usm.ro
ORCID ID: 0000-0003-3786-776X
Zhavoronok Artur
Ph.D., Associate Professor,
Department of Finance and Credit,
Yuriy Fedkovych Chernivtsi National University,
Chernivtsi, 58000, Ukraine
e-mail: a.zhavoronok@chnu.edu.ua
ORCID ID: 0000-0001-9274-8240

Global scientific trends on the inclusion of people with disabilities in companies: mapping the bibliometric analysis

Abstract. The inclusion of people with disabilities (PWD) in the labor market is an important component of modern social and economic policies aimed at ensuring equality, fairness, and the realization of human rights.

Problem statement. In the global context of promoting diversity and inclusion in organisations, the employment of PWD is a topical issue, given both their fundamental rights and the positive impact on company performance.

Unresolved aspects of the problem. With growing interest on the one hand in human resources as key drivers of company performance and on the other hand in equalising the rights of PWD to work, this systematic review of recent developments, challenges, implications and benefits of employing PWD in companies is welcome.

Purpose of the article. This study aims to conduct a systematic review of the existing literature on the employment of PWD in companies between 2010 and 2025.

Presentation of the main material. The results indicate both significant benefits, such as increased diversity and improved corporate image, and challenges related to stereotypes, lack of accessibility and insufficient training of employers.

Conclusions. The study addresses current gaps in research and provides recommendations for future research and policies for the integration of PWD in the private sector.

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Introduction. In recent years, the inclusion of people with disabilities (PWD) in the labour market has become an increasingly discussed topic, both in the context of their fundamental rights and in relation to the economic impact of diversity within organisations. Many studies highlight that employing PWD can bring significant benefits to companies, such as increased innovation, team diversification and improved public image (Gupta & Sahu [12]; Kumari & Patra [18]). According to a United Nations report [32], diversity in the workplace not only encourages inclusion, but also improves organisational performance by increasing diversity of thought and innovative solutions. However, some researchers argue that despite these advantages, the integration of PWDs into organisations remains a difficult process due to stereotypes, accessibility barriers and a lack of education among employers regarding diversity management (Stone & Colella [20]). Other authors believe that legislation and public policies are not always effective enough to encourage their employment, and most existing studies focus more on the theory of inclusion than on the practical aspects of policy implementation (Al-Rashaida et al. [2]; Blanck [3]; Suresh & Dyaram [30]).

Motivated by these research gaps, our study adopts an exploratory approach to investigate the dynamics of hiring PWD in enterprises, focusing on both the benefits and challenges faced by organisations. This research also aims to identify the factors that facilitate the recruitment of PWD by studying the literature on the employment of PWD in companies between 2010 and 2025, thus contributing to a better understanding of current trends and practices in the field of inclusive employment. We intend to achieve this goal by pursuing two interdependent objectives: first, to assess the benefits and challenges associated with the employment of PWD in companies, and second, to identify the factors that can stimulate their recruitment and integration into the business environment. Through this systematic review, we will contribute to identifying gaps in the literature and developing recommendations for improving inclusion policies and practices.

With growing interest on the one hand in human resources as key drivers of company performance and on the other hand in equalising the rights of PWD to work, this systematic review of recent developments, challenges, implications and benefits of employing PWD in companies is welcome.

Literature review. In recent decades, literature has increasingly highlighted the importance of including PWD in the labour market, both from the perspective of organizational benefits and structural challenges. Systematic reviews analyse and synthesise a body of literature in a logical and transparent manner (Pigott & Polanin [23]). In this context, many studies on the inclusion of PWD discuss various examples of research focusing on barriers, benefits and employment policies, mainly in the context of a qualitative approach (Burke et al. [6]; Schloemer-Jarvis et al. [25]). The starting point for formulating hypotheses is the premise of Lengnick-Hall et al. [19], according to which PWD represent an untapped human resource, and their lack of integration generates economic and social losses. According to Bonaccio et al. [4], employers frequently express concerns about productivity and adaptation costs, similar to Kang [16], who states that negative perceptions of PWD skills limit recruitment. Furthermore, Goodman et al. [10] emphasise that a lack of managerial knowledge about accommodations perpetuates exclusion.

Other studies also discuss challenges or difficulties related to stigma, transport, or limited access to support infrastructure (Yazıcı et al. [35]). In this context, Henry et al. [13] argue for the need for coordination between companies and public employment services. Wendelborg et al. [33],

taking as a reference point the collaboration between employers and academia, highlight that educational partnerships facilitate the integration of PWD into the labour market. Furthermore, Houtenville and Kalargyrou [15] show that recruitment perceptions and practices vary significantly between industries.

Thus, based on previous literature and empirical findings, the employment of PWD brings benefits such as organisational diversity, employee loyalty and enhanced public image (Chajduga & Ingaldi [8]; Miethlich & Oldenburg [21]). Although this process is generally considered beneficial in the literature (Lindsay et al. [20]; Kendall & Karns [17]), negative aspects such as stereotypes and employer reluctance have also been identified.

Prior research offers mixed evidence on how HR practices shape inclusion. Some studies report that inclusive strategies increase retention and reduce turnover (Schur [26; 27]; Tamene [31]). Similarly, Fisher & Purcal [9] show that public policies can change employers' attitudes. In contrast, other studies find that employers remain reluctant despite legal incentives (Abd Manaf et al. [1]; Sepulveda [28]). Moreover, much of the existing research is conceptual, with limited empirical investigation into long-term sustainability (Nurhaeni et al. [22]).

Despite its significance, prior research has overlooked the crucial role of sector-specific dynamics. For instance, studies in hospitality show that customer perceptions weigh heavily on hiring decisions (Houtenville & Kalargyrou [14]). Also, although there is consistent research on recruitment, few studies analyse the retention and promotion of PWD. Furthermore, the impact of digitalisation and remote work on PWD inclusion remains insufficiently explored.

To guide the review process and meet the research objectives, the study was guided by two main questions:

RQ1: What are the benefits and challenges of hiring PWD in companies?

RQ2: What factors can act as facilitators in the recruitment process?

As such, there remains limited understanding of how systemic, organisational and attitudinal factors interact in shaping workplace inclusion. This research, therefore, seeks to shed light on both benefits and challenges of PWD employment, while identifying factors that can stimulate recruitment. In line with these developments, our study contributes to the growing body of knowledge by demonstrating that inclusion is not only a social responsibility, but also a strategic lever for sustainable growth.

Purpose, objectives and research methods. This study aims to conduct a systematic review of the existing literature on the employment of PWD in companies between 2010 and 2025.

The main objective of the research is to analyse the benefits and challenges encountered by companies in the process of recruiting and integrating PWD.

The methodology used consists of a systematic review of published empirical studies, from which relevant information was extracted to better understand the context and current practices.

This study was conducted as a systematic literature review (SLR), a methodology increasingly used in social and management sciences to synthesise existing knowledge in a rigorous and transparent manner (Pigott & Polanin [23]). Similar to other works on the same topic (Lindsay et al. [20]; Schloemer-Jarvis et al. [25]), we followed the methodological recommendations established in the literature, dividing the process into three major stages: planning, implementation and reporting.

In the planning stage, we formulated the research questions and developed the analysis protocol, following the logic used by Schloemer-Jarvis et al. [25] in their systematic review of HR practices for the inclusion of PWD. The protocol was defined to ensure the reproducibility of the process and to minimise bias, in accordance with the PRISMA guidelines.

In the implementation stage, relevant articles were identified in two major databases, Web of Science and Scopus, recognised for their international coverage and publication quality. The search string used was: employing and people and disabilities and companies. We applied inclusion and exclusion criteria similar to those in the study by Lindsay et al. [20], which reviewed the benefits of employing PWD. Only articles published between 2010 and 2025, in English, and positively

evaluated by peer review were included. Review articles, editorials, books, or book chapters were excluded. To ensure scientific relevance, only studies with a minimum of two citations were retained, a methodological strategy also applied by in their SLR on barriers to the employment of PWD.

The SLR execution process is illustrated in Figure 1. The validation process involved double-checking the eligibility criteria and using NVivo 15 to analyse the frequency and f key terms, similar to the procedure applied in a thematic analysis of the social inclusion of PWD.

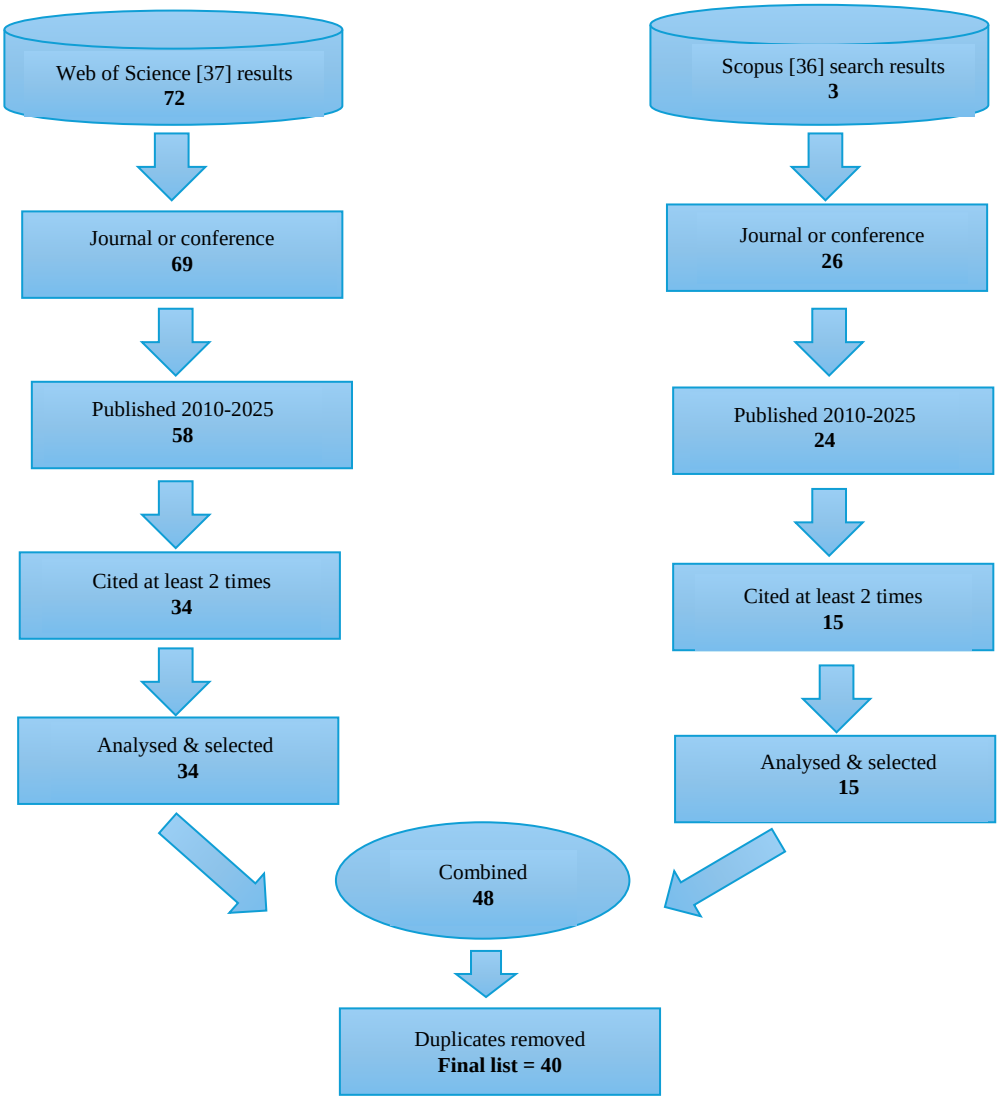

Figure 1. SLR execution flow
Source: prepared by the authors

During the reporting stage, the extracted data were summarised in tables and graphs (number of publications per year, scientific fields, citations and sources). This integrated approach allowed not only for the quantification of trends, but also for the critical interpretation of results, in line with previous studies on this topic (Lindsay et al. [20]; Schloemer-Jarvis et al. [25]).

Research results. The study selection process resulted in the inclusion of 40 articles published between 2010 and 2025 (see Appendix A, Appendix B, Appendix C), after removing duplicates and applying relevance criteria. The distribution of articles by year indicates a growing interest in the topic, with a peak in publications in 2020 and 2024, when six articles were recorded, while the first years analysed (2010, 2015, 2016) yielded only one paper each. This evolution

suggests that the issue of the inclusion of PWD in the organisational environment has become increasingly visible in the specialist literature over the last decade (see Figure 2).

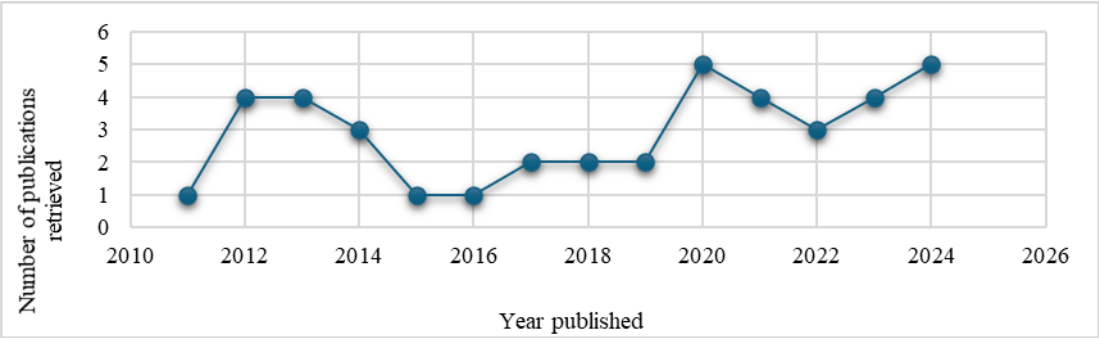

Figure 2. Number of papers per year of publication
Source: the authors' own development using Web of Science [37] and Scopus database [36]

Most of the selected studies were published in recognised scientific journals, with only two coming from conference proceedings, confirming a higher methodological rigour and broader scientific validation. Frequent sources include the Journal of Vocational Rehabilitation (3 articles), Sustainability (2 articles), Disability & Society (2 articles), and Disability and Rehabilitation (2 articles), reflecting the multidisciplinary nature of the topic and the growing interest in areas such as management, occupational health, and social sciences (Table 1).

Table 1. Top 10 sources and number of publications retrieved

Source title	NA	Source title	NA
Journal of Vocational Rehabilitation	3	Equality Diversity and Inclusion	2
Sustainability	2	Rehabilitation Counselling Bulletin	2
Journal of Policy and Practice in Intellectual Disabilities	2	Work—A Journal of Prevention Assessment & Rehabilitation	2
Disability & Society	2	Business Strategy and Development	1
Disability and Rehabilitation	2	Business Strategy and the Environment	1

** NA – number of articles*

Source: the authors' own development using Web of Science [37] and Scopus database [36]

The analysis of scientific fields revealed a predominance of publications in "Rehabilitation", followed by "Business & Management" and "Public Health", confirming the cross-cutting nature of the issue (Table 2).

Table 2. Top 10 fields of study by number of articles

Field of science	Publications	Field of science	Publications
Rehabilitation	8	Psychiatry	2
Public, Environmental & Occupational Health	3	Business Management & Accounting	1
Management; Women's Studies	2	Management	1
Green & Sustainable Science & Technology; Environmental Sciences; Environmental Studies	2	Business Management & Accounting; Social Science; Environmental Science	1
Social Work	2	Business; Environmental Studies	1

Source: the authors' own development using Web of Science [37] and Scopus database [36]

The scientific impact of the selected articles varies considerably. Most citations were recorded in 2013 and 2020, with 77 and 67 citations, respectively, corresponding to periods when debates on labour market inclusion were accelerated by legislative changes and socio-economic crises (Figure 3). Furthermore, an analysis of citations by source shows that prestigious journals in the field of hospitality management or human resources accounted for a significant proportion of high-impact articles.

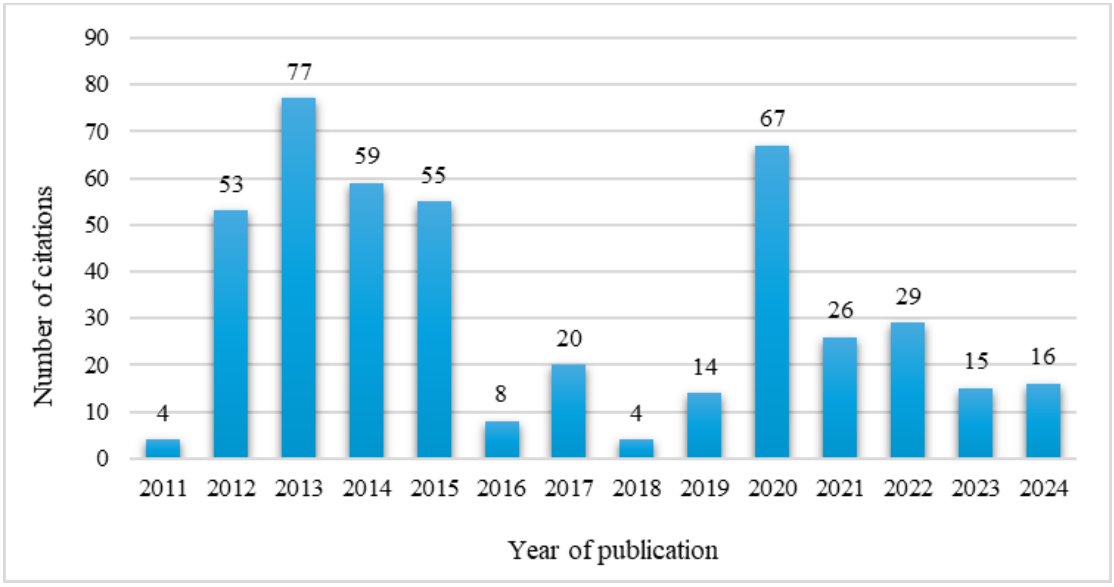

Figure 3. Citations per year of publication
Source: the authors' own development using Web of Science [37] and Scopus database [36]

In terms of content analysis, the use of NVivo 15 allowed the extraction of the most frequent terms from the abstracts of the articles. The results, summarised in the form of WordCloud (Figure 4), highlight the centrality of the concepts of employment, disability, inclusion and barriers, confirming that the literature focuses on both opportunities and difficulties.

Figure 4. WordCloud
Source: authors' own elaboration with NViVo 15, 2025

The results obtained were centralised in Table 3, which summarises the benefits and challenges identified (RQ1) and the stimulating factors (RQ2), together with the relevant literature sources.

Table 3. Centralisation of responses to research questions for SRL and selected sources

RQ1	Sources
– Increased diversity, talent pool expansion, and brand loyalty as advantages of hiring PWD – Transport difficulties, stigma, uncertainties about candidates' abilities and the complexity of the public employment services system for PWD as challenges related to employment – PWD remain employed with the same employer for longer compared to 'able-bodied' employees, meaning that it may be worthwhile to incur additional expenses to hire PWD who may become loyal employees for years, which is a benefit of hiring PWD – Misperceptions about PWD, uncertainty about the costs of workplace accommodation as challenges related to the employment of PWD	(Chajduga & Ingaldi [8]); Yazıcı et al. [35]; Henry et al. [13]; Goodman et al. [10])
RQ2	**Sources**
– Improving the professional skills of PWD, reducing employers' fears about workplace accidents among PWD, reducing tax and social security costs for companies that employ PWD, establishing workplace accommodations, differentiating the employment rate of PWD by occupational category, providing information to companies about PWD seeking employment as incentives for employing PWD – Using a specialised recruitment agency, developing a specific recruitment plan and training staff in disability awareness, as well as internships, are perceived as the best facilitators for the employment of PWD	Kang [16]; Houtenville and Kalargyrou [15]; Wendelborg et al. [33]; Henry et al. [13]; Wiggett-Barnard & Swartz [34]

Source: author's compilation

Discussion. We employ a systematic literature review approach to critically discuss the benefits, challenges, and enabling factors associated with the employment of PWD. This section integrates the findings of the 40 selected studies with existing theoretical and empirical contributions, highlighting areas of consensus, divergence, and emerging gaps in the literature.

Benefits and challenges of employing PWD

The analysis confirms that companies recognise a range of benefits when hiring PWD, particularly in terms of workforce diversification, reduced staff turnover, and enhanced corporate image (Chajduga & Ingaldi [8]; Miethlich & Oldenburg [24]). Moreover, several studies indicate that PWD tend to display stronger loyalty towards their employers, remaining in jobs longer than their non-disabled peers, which can offset the additional costs of workplace adaptation (Chajduga & Ingaldi [8]). These findings are consistent with Lindsay et al. [20], who similarly emphasised the potential for PWD to strengthen organisational culture and retention rates.

However, challenges persist across multiple contexts. Negative stereotypes and doubts regarding the competencies of PWD continue to limit hiring intentions (Goodman et al. [10]; Yazıcı et al. [35]). Employers frequently cite concerns about adaptation costs, workplace accidents, and the uncertainty surrounding the process of hiring and training PWD (Henry et al. [13]; Goodman et al. [10]). Other structural barriers include inadequate transportation systems and insufficient managerial training for diversity management (Yazıcı et al. [35]). As Carrieri et al. [7] point out, these barriers not only hinder workplace inclusion but also impose social costs by reducing the active participation of PWD in society.

Enabling factors for recruitment

In relation to RQ2, the literature identifies several facilitators of recruitment. Public policies and fiscal incentives are among the most frequently cited, with Kang [16] recommending tax reductions, social security benefits, and differentiated employment quotas for various occupational categories. Houtenville and Kalargyrou [15] further show that companies weigh a mix of factors when considering PWD employment, but industry-specific concerns play a key role. For instance, leisure and hospitality firms tend to prioritise customer attitudes, raising concerns about discrimination and the reputational risks perceived by employers.

At the organisational level, collaboration with higher education institutions has proven to be a valuable mechanism for integrating PWD into the labour market, particularly for individuals with intellectual disabilities (Wendelborg et al. [33]). Henry et al. [13] highlight the importance of networks between firms and employment services to improve coordination and expand opportunities for PWD. Employers also recommend innovations in service systems and changes in recruitment practices, such as using specialised recruitment agencies, developing targeted hiring plans, and offering internships to enhance workplace adaptation (Wiggett-Barnard & Swartz [34]). These strategies are particularly effective in addressing uncertainties regarding workplace performance and adaptation costs.

Our findings largely confirm those of previous systematic reviews. Lindsay et al. [20] and Schloemer-Jarvis et al. [25] similarly observed that while the advantages of hiring PWD are widely recognised, barriers persist due to entrenched stereotypes and insufficient organisational readiness. However, our review extends these insights by showing that sectoral differences (e.g., hospitality vs. manufacturing) play a critical role in shaping employer attitudes, an aspect less emphasised in earlier reviews.

Conclusions. From a practical perspective, the findings suggest that companies should invest in disability awareness training, collaborate with educational institutions, and develop tailored recruitment programmes to better integrate PWD. Public policies remain crucial, but their impact is mediated by sector-specific dynamics and organisational culture.

From a theoretical perspective, this review contributes to the broader literature on diversity and inclusion by highlighting how structural barriers intersect with organisational and industry-level practices. It reinforces the need to view inclusion not merely as a legal or ethical obligation, but as a multidimensional process shaped by economic, social, and cultural contexts.

Despite the valuable insights, the review is limited by its reliance on peer-reviewed journal articles, potentially excluding relevant grey literature and policy reports. Moreover, most studies are cross-sectional, leaving open questions about the long-term impacts of PWD employment on firms and employees.

Future research should explore how digitalisation, remote work, and artificial intelligence are reshaping opportunities for PWD inclusion, as these emerging trends may significantly reduce traditional barriers such as transportation and workplace accessibility. Comparative cross-country studies would also be valuable in capturing the influence of cultural and institutional differences on employer attitudes and practices.

References

1. Abd Manaf, A. R., Othman, S. Z., Saad, Z. M., & Jamaluddin, Z. (2019). Is it Right to Blame Employers for not Hiring Persons with Disabilities?. *International Journal of Academic Research in Business and Social Sciences*, *9*(2), 1-9. DOhttp://dx.doi.org/10.6007/IJARBSS/v9-i2/5508.
2. Al-Rashaida, M., López-Paz, J. F., Amayra, I., Lázaro, E., Martínez, O., Berrocoso, S., & Pérez, M. (2018). Factors affecting the satisfaction of people with disabilities in relation to vocational rehabilitation programs: a literature review. *Journal of Vocational Rehabilitation*, *49*(1), 97-115.
3. Blanck, P., Hyseni, F., & Altunkol Wise, F. (2020). Diversity and inclusion in the American legal profession: workplace accommodations for lawyers with disabilities and lawyers who identify as LGBTQ+. *Journal of Occupational Rehabilitation*, *30*(4), 537-564.
4. Bonaccio, S., Connelly, C. E., Gellatly, I. R., Jetha, A., & Martin Ginis, K. A. (2020). The participation of people with disabilities in the workplace across the employment cycle: Employer concerns and research evidence. *Journal of business and psychology*, *35*(2), 135-158. https://doi.org/10.1007/s10869-018-9602-5.
5. Boni-Saenz, A. A., Heinemann, A., Crown, D., & Emanuel, L. (2006). The business of employing people with disabilities: Four case studies. *Organizational Ethics: Healthcare, Business, and Policy*, *3*(1), 3.
6. Burke, J., Bezyak, J., Fraser, R. T., Pete, J., Ditchman, N., & Chan, F. (2013). Employers' attitudes towards hiring and retaining people with disabilities: A review of the literature. *The Australian Journal of Rehabilitation Counselling*, *19*(1), 21-38. https://doi.org/10.1017/jrc.2013.2.
7. Carrieri, L., Sgaramella, T. M., Bortolon, F., Stenta, G., Fornaro, L., Cracco, A., ... & Soresi, S. (2014). Determinants of on-the-job-barriers in employed persons with multiple sclerosis: the role of disability severity and cognitive indices. *Work*, *47*(4), 509-520. https://doi.org/10.3233/WOR-131623
8. Chajduga, T., & Ingaldi, M. (2021). Hiring disable people to avoid staff turnover and enhance sustainability of production. *Sustainability*, *13*(19), 10577. https://doi.org/10.3390/su131910577
9. Fisher, K. R., & Purcal, C. (2017). Policies to change attitudes to people with disabilities. *Scandinavian Journal of Disability Research*, *19*(2), 161-174. https://doi.org/10.1080/15017419.2016.1222303.

10. Goodman, N., Deane, S., Hyseni, F., Soffer, M., Shaheen, G., & Blanck, P. (2024). Perceptions and bias of small business leaders in employing people with different types of disabilities. *Journal of occupational rehabilitation*, *34*(2), 359-372. https://doi.org/10.1007/s10926-024-10201-2.
11. Goss, D., Goss, F., & Adam-Smith, D. (2000). Disability and employment: a comparative critique of UK legislation. *International Journal of Human Resource Management*, *11*(4), 807-821.
12. Gupta, V., & Sahu, G. (2025). Exploring attitudes towards disability employment in the Indian hotel industry: a qualitative inquiry. *Worldwide Hospitality and Tourism Themes*, *17*(3), 332-342.
13. Henry, A. D., Petkauskos, K., Stanislawzyk, J., & Vogt, J. (2014). Employer-recommended strategies to increase opportunities for people with disabilities. *Journal of vocational Rehabilitation*, *41*(3), 237-248. https://doi.org/10.3233/JVR-140716.
14. Houtenville, A., & Kalargyrou, V. (2012). People with disabilities: Employers' perspectives on recruitment practices, strategies, and challenges in leisure and hospitality. *Cornell Hospitality Quarterly*, *53*(1), 40-52. https://doi.org/10.1177/1938965511424l5.
15. Houtenville, A., & Kalargyrou, V. (2015). Employers' perspectives about employing people with disabilities: A comparative study across industries. *Cornell Hospitality Quarterly*, *56*(2), 168-179. https://doi.org/10.1177/1938965514551633.
16. Kang, D. (2013). Why would companies not employ people with disabilities in Korea?. *Asia Pacific Journal of Social Work and Development*, *23*(3), 222-229. https://doi.org/10.1080/02185385.2013.818202.
17. Kendall, K. M., & Karns, G. L. (2018). The business case for hiring people with disabilities. *Social Business*, *8*(3), 277-292. https://doi.org/10.1362/204440818X15434305418614.
18. Kumari, N., & Patra, B. C. (2025). Enabling Equality: Increasing Inclusion in the Workplace Through Inclusive. *Intelligent IT Solutions to Promote Indigenous Innovations: Select Proceedings of ICEIL 2024, 1*, 1386, 37.
19. Lengnick-Hall, M. L., Gaunt, P. M., & Kulkarni, M. (2008). Overlooked and underutilized: People with disabilities are an untapped human resource. *Human Resource Management, 47*(2), 255–273. https://doi.org/10.1002/hrm.20211.
20. Lindsay, S., Cagliostro, E., Albarico, M., Mortaji, N., & Karon, L. (2018). A systematic review of the benefits of hiring people with disabilities. *Journal of occupational rehabilitation, 28*, 634-655. https://doi.org/10.1007/s10926-018-9756-z.
21. Miethlich, B., & Oldenburg, A. G. (2019). How social inclusion promotes sales: An analysis of the example of employing people with disabilities. *Journal of Marketing Research and Case Studies*, *2019*, 1-15. https://doi.org/10.5171/2019.463316.
22. Nurhaeni, I. D. A., Wiratama, P., Putri, I. S., Nurdin, A., Mulyadi, A. W. E., Haryani, T. N., & Sudibyo, D. P. (2023). Defining Social Inclusion for People with Disabilities in Governance: Scoping and Thematic Literature Review. *BISNIS & BIROKRASI: Jurnal Ilmu Administrasi dan Organisasi*, *30*(2), 75-87 https://doi.org/10.20476/jbb.v30i2.1375.
23. Pigott, T. D., & Polanin, J. R. (2020). Methodological guidance paper: High-quality meta-analysis in a systematic review. *Review of Educational Research*, *90*(1), 24-46. https://doi.org/10.3102/0034654319877153.
24. Popelo, O., Zhavoronok, A., Kholiavko, N., Dubyna, M., Verbivska, L., Fedyshyn, M. (2024). Higher education for sustainable development in the digital era: Mapping the bibliometric analysis. *Problems and Perspectives in Management*, *22*(4), 202-216. https://doi.org/10.21511/ppm.22(4).2024.16
25. Schloemer-Jarvis, A., Bader, B., & Böhm, S. A. (2022). The role of human resource practices for including persons with disabilities in the workforce: A systematic literature review. *The International Journal of Human Resource Management*, *33*(1), 45-98. https://doi.org/10.1080/09585192.2021.1996433.
26. Schur, L. (2002). The difference a job makes: The effects of employment among people with disabilities. *Journal of Economic Issues*, *36*(2), 339-347. https://doi.org/10.1080/00213624.2002.11506476.
27. Schur, L., Kruse, D., & Blanck, P. (2005). Corporate culture and the employment of persons with disabilities. *Behavioral sciences & the law*, *23*(1), 3-20. https://doi.org/10.1002/bsl.624.
28. Sepulveda, T. (2021). Barriers to hiring and accommodating people with disabilities in small and medium sized businesses: A scoping review. *Journal of Applied Rehabilitation Counseling*, *52*(2), 104-114. https://doi.org/10.1891/JARC-D-20-00013.
29. Stone, D. L., & Colella, A. (1996). A model of factors affecting the treatment of disabled individuals in organizations. *Academy of Management Review*, *21*, 352-401.
30. Suresh, V., & Dyaram, L. (2020). Workplace disability inclusion in India: review and directions. *Management Research Review*, *43*(12). https://doi.org/10.1108/MRR-11-2019-0479
31. Tamene, S. (2022). Challenges and Benefits of Employing and Working with Persons with Disabilities: Perspectives of Employers and Supervisors. *Harla Journal of Social and Behavioral Studies*, *1*(1), 57-77. https://doi.org/10.20372/hjsbs.v1i1.26.
32. United Nations. (2021). Disability and employment. *UN Enable*. Retrieved from https://social.desa.un.org/issues/disability.
33. Wendelborg, C., Garrels, V., Sigstad, H. M. H., & Dean, E. E. (2022). Recruitment and work arrangements for employees with intellectual disability in competitive employment. *Journal of Policy and Practice in Intellectual Disabilities*, *19*(4), 350-359. https://doi.org/10.1111/jppi.12418.
34. Wiggett-Barnard, C., & Swartz, L. (2012). What facilitates the entry of persons with disabilities into South African companies?. *Disability and Rehabilitation*, *34*(12), 1016-1023. https://doi.org/10.3109/09638288.2011.631679.
35. Yazıcı, B., Şişman, Y., & Kocabaş, F. (2011). Determining the problems of disabled employees: a survey study conducted in Eskişehir, Turkey. *Disability & Society*, *26*(3), 285-292. https://doi.org/10.1080/09687599.2011.560373.
36. Scopus database. (2025). Retrieved from https://www.elsevier.com.
37. Web of Science Core Collection database. (2025). Retrieved from https://www.webofscience.com.

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Conflict of Interest: *The authors declare no conflict of interest*

APPENDIX

Appendix A. Selected studies

Author	PY	NC	Publication source	Author	PY	NC	Publication source
Kang	2013	10	Asia Pacific Journal of Social Work and Development	Clube & Tennant	2022	23	Business Strategy and Development
Houtenville & Kalargyrou	2015	55	Cornell Hospitality Quarterly	Wong et al.	2020	28	Transportation Research Interdisciplinary Perspectives
Wendelborg et al.	2022	4	Journal of Policy and Practice in Intellectual Disabilities	Dray-Spira et al.	2013	28	Diabetic Medicine
Yazici et al.	2011	4	Disability & Society	Brinsmead	2019	2	Journal of Enabling Technologies
Henry et al.	2014	36	Journal of Vocational Rehabilitation	Elbaek et al.	2018	2	Proceedings of the 12th European Conference on Games Based Learning (ECGBL 2018)
Goodman et al.	2024	2	Journal of Occupational Rehabilitation	Alajlan	2023	3	Information Sciences Letters
Rustad & Kassah	2021	6	Disability & Society	Thomas et al.	2021	2	Journal of Rehabilitation
Litwin et al.	2024	2	International Journal of Production Research	Warmate et al.	2021	13	Business Strategy and the Environment
Wiggett-Barnard & Swartz	2012	21	Disability and Rehabilitation	Grenawalt et al.	2020	11	Journal of Management and Organisation
Folguera	2014	8	Equality Diversity and Inclusion	Ramachandra et al.	2017	15	Indian Journal of Occupational and Environmental Medicine
Munsell et al.	2024	7	Rehabilitation Counselling Bulletin	Raman et al.	2012	19	BMC Research Notes
Holzgreve et al.	2023	2	Journal of Occupational Medicine and Toxicology	Toldra & Santos	2013	30	Work-A Journal of Prevention Assessment & Rehabilitation
Alborno & Gaad	2012	11	Journal of Policy and Practice in Intellectual Disabilities	Aytac et al.	2012	2	International Congress on Interdisciplinary Business and Social Sciences 2012
Carrieri et al.	2014	15	Work-A Journal of Prevention Assessment & Rehabilitation	Potgieter et al.	2017	5	Sa Journal of Human Resource Management
Calderon-Milan et al.	2020	20	Sustainability	Efeoglu & Kilincarslan	2024	2	Equality Diversity and Inclusion
Chajduga & Ingaldi	2021	5	Sustainability	Doolabh & Khan	2020	2	Journal of Vocational Rehabilitation
Noffsinger et al.	2018	2	Psychiatric Annals	van Oosten et al.	2023	2	BMC Psychiatry
Voermans et al.	2023	8	Disability and Rehabilitation	McDonnall & Antonelli	2020	6	Rehabilitation Counselling Bulletin
Saur & Johansen	2013	9	Ride - The Journal of Applied Theatre and Performance	Hirschberg & Papadopoulos	2016	8	Societies
McDonnall & Cmar	2022	2	Journal of Vocational Rehabilitation	Walsh et al.	2019	12	Frontiers in Psychology

** NC – number of citations; * PY – year of publication*

Source: the authors' own development using Web of Science [37] and Scopus database [36]

Appendix B. Publication source and number of retrieved articles and citations

Source title	TC	NA	Source title	TC	NA
Asia Pacific Journal of Social Work and Development	10	1	Sa Journal of Human Resource Management	5	1
Cornell Hospitality Quarterly	55	1	BMC Psychiatry	2	1
Journal of Policy and Practice in Intellectual Disabilities	15	2	Societies	8	1
Disability & Society	10	2	Frontiers in Psychology	12	1
Journal of Vocational Rehabilitation	40	3	Business Strategy and Development	23	1
Journal of Occupational Rehabilitation	2	1	Transportation Research Interdisciplinary Perspectives	28	1
International Journal of Production Research	2	1	Diabetic Medicine	28	1
Disability and Rehabilitation	29	2	Journal of Enabling Technologies	2	1
Equality Diversity and Inclusion	10	2	Proceedings of the 12th European Conference on Games Based Learning (ECGBL 2018)	2	1
Rehabilitation Counselling Bulletin	13	2	Equality, Diversity and Inclusion	3	1
Journal of Occupational Medicine and Toxicology	2	1	Information Sciences Letters	3	1
Work—A Journal of Prevention Assessment & Rehabilitation	45	2	Journal of Rehabilitation	2	1
Sustainability	25	2	Business Strategy and the Environment	13	1
Psychiatric Annals	2	1	Journal of Management and Organisation	11	1
Ride—The Journal of Applied Theatre and Performance	9	1	Indian Journal of Occupational and Environmental Medicine	15	1
International Congress on Interdisciplinary Business and Social Sciences 2012 (ICIBSOS 2012)	2	1	BMC Research Notes	19	1

** TC – total citations; NA – number of articles*

Source: the authors' own development using Web of Science [37] and Scopus database [36]

Appendix C. Field of science dataset

Field of science	Articles	Field of science	Articles
Rehabilitation	8	Engineering; Operations Research & Management Science	1
Business Management & Accounting	1	Public, Environmental & Occupational Health	3
Business Management & Accounting; Social Science; Environmental Science	1	Health Policy & Services; Rehabilitation	1
Management	1	Psychiatry	2
Business; Environmental Studies	1	Education & Educational Research; Theatre	1
Business; Environmental Studies; Management	1	Computer Science, Cybernetics; Ergonomics	1
Business; Social Sciences; Interdisciplinary	1	Psychology, Multidisciplinary	1
Management; Women's Studies	2	Sociology	1
Mathematics; Social Science; Computer Science	1	Transport	1
Green & Sustainable Science & Technology; Environmental Sciences; Environmental Studies	2	Endocrinology & Metabolism	1
Rehabilitation; Social Sciences - Other Topics	1	Education & Educational Research	1
Rehabilitation; Social Issues	1	Psychology	1
Social Work	2	Medicine	1
Hospitality, Leisure, Sport & Tourism; Management; Sociology	1	Biochemistry, Genetics and Molecular Biology	1
Health Care Sciences & Services; Rehabilitation	1		

Source: the authors' own development using Web of Science [37] and Scopus database [36]

Анкуца Челба
кандидат економічних наук, доцент,
кафедра бухгалтерського обліку, аудиту та фінансів,
Сучавський університет імені Штефана чел Маре,
Сучава, 720229, Румунія
e-mail: ancuta.anisia@usm.ro
ORCID ID: 0000-0001-9676-6833
Крістіна Габріела Космулесе
кандидат економічних наук, лектор,
кафедра бухгалтерського обліку, аудиту та фінансів,
Сучавський університет імені Штефана чел Маре,
Сучава, 720229, Румунія
e-mail: gabriela.cosmulese@usm.ro
ORCID ID: 0000-0002-8406-7004
Анамарія-Геаніна Маковей
кандидат економічних наук, доцент,
кафедра бухгалтерського обліку, аудиту та фінансів,
Сучавський університет імені Штефана чел Маре,
Сучава, 720229, Румунія
e-mail: anamaria.macovei@usm.ro
ORCID ID: 0000-0002-7995-1145
Флорін Богхан
кандидат економічних наук, доцент,
кафедра бухгалтерського обліку, аудиту та фінансів,
Сучавський університет імені Штефана чел Маре,
Сучава, 720229, Румунія
e-mail: florinboghean@usm.ro
ORCID ID: 0000-0003-3786-776X
Артур Жаворонок
кандидат економічних наук, доцент,
кафедра фінансів і кредиту,
Чернівецький національний університет імені Юрія Федьковича,
Чернівці, 58000, Україна
e-mail: a.zhavoronok@chnu.edu.ua
ORCID ID: 0000-0001-9274-8240

Глобальні тенденції наукових досліджень щодо інклюзії людей з інвалідністю в компаніях: мапування бібліометричного аналізу

Анотація. Інклюзія людей з інвалідністю (ЛІ) на ринку праці є важливим компонентом сучасної соціальної та економічної політики, спрямованої на забезпечення рівності, справедливості та реалізації прав людини.

Постановка проблеми. У глобальному контексті сприяння різноманітності та інклюзії в організаціях, працевлаштування ЛІ є актуальним питанням, враховуючи як їхні фундаментальні права, так і позитивний вплив на ефективність діяльності компаній.

Нерозв'язані аспекти. Зі зростанням інтересу, з одного боку, до людських ресурсів як ключових рушійних сил діяльності компаній, а з іншого боку, до зрівняння прав ЛІ на працю, цей систематичний огляд останніх подій, викликів, наслідків та переваг використання ЛІ в компаніях є вітаним.

Мета статті. Це дослідження має на меті провести систематичний огляд існуючої літератури щодо працевлаштування ЛІ в компаніях у період з 2010 по 2025 рік.

Основний матеріал. Результати вказують як на значні переваги, такі як збільшення різноманітності та покращення корпоративного іміджу, так і на проблеми, пов'язані зі стереотипами, відсутністю доступності та недостатньою підготовкою роботодавців.

Висновки. Дослідження розглядає поточні прогалини в дослідженнях та надає рекомендації для майбутніх досліджень та політики інтеграції людей з інвалідністю у приватний сектор.

Ключові слова: люди з інвалідністю, проблеми, різноманітність, соціальна інтеграція, працевлаштування, бізнес, бібліометричний аналіз.

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Список літератури

1. Abd Manaf A. R., Othman S. Z., Saad Z. M. & Jamaluddin Z. Is it Right to Blame Employers for not Hiring Persons with Disabilities?. International Journal of Academic Research in Business and Social Sciences. 2019. Vol. 9(2). P. 1-9. http://dx.doi.org/10.6007/IJARBSS/v9-i2/5508.
2. Al-Rashaida M., López-Paz J. F., Amayra I., Lázaro E., Martínez O., Berrocoso S. & Pérez M. Factors affecting the satisfaction of people with disabilities in relation to vocational rehabilitation programs: a literature review. Journal of Vocational Rehabilitation. 2018. Vol. 49(1). P. 97-115.
3. Blanck P., Hyseni F. & Altunkol Wise F. Diversity and inclusion in the American legal profession: workplace accommodations for lawyers with disabilities and lawyers who identify as LGBTQ+. Journal of Occupational Rehabilitation. 2020. Vol. 30(4). P. 537-564.
4. Bonaccio S., Connelly C. E., Gellatly I. R., Jetha A. & Martin Ginis K. A. The participation of people with disabilities in the workplace across the employment cycle: Employer concerns and research evidence. Journal of business and psychology. 2020. Vol. 35(2). P. 135-158. https://doi.org/10.1007/s10869-018-9602-5.
5. Boni-Saenz A. A., Heinemann A., Crown D. & Emanuel L. The business of employing people with disabilities: Four case studies. Organizational Ethics: Healthcare, Business, and Policy. 2006. Vol. 3(1). P. 3.
6. Burke J., Bezyak J., Fraser R. T., Pete J., Ditchman N. & Chan F. Employers' attitudes towards hiring and retaining people with disabilities: A review of the literature. The Australian Journal of Rehabilitation Counselling. 2013. Vol. 19(1). P. 21-38. https://doi.org/10.1017/jrc.2013.2.
7. Carrieri L., Sgaramella T. M., Bortolon F., Stenta G., Fornaro L., Cracco A. & Soresi S. Determinants of on-the-job-barriers in employed persons with multiple sclerosis: the role of disability severity and cognitive indices. Work. 2014. Vol. 47(4). P. 509-520. https://doi.org/10.3233/WOR-131623
8. Chajduga T. & Ingaldi M. Hiring disable people to avoid staff turnover and enhance sustainability of production. Sustainability. 2021. Vol. 13(19), 10577. https://doi.org/10.3390/su131910577
9. Fisher K. R. & Purcal C. Policies to change attitudes to people with disabilities. Scandinavian Journal of Disability Research. 2017. Vol. 19(2). P. 161-174. https://doi.org/10.1080/15017419.2016.1222303.
10. Goodman N., Deane S., Hyseni F., Soffer M., Shaheen G. & Blanck P. Perceptions and bias of small business leaders in employing people with different types of disabilities. Journal of occupational rehabilitation. 2024. Vol. 34(2). P. 359-372. https://doi.org/10.1007/s10926-024-10201-2.
11. Goss D., Goss F. & Adam-Smith D. Disability and employment: a comparative critique of UK legislation. International Journal of Human Resource Management. 2000. Vol. 11(4). P. 807-821.
12. Gupta V. & Sahu G. Exploring attitudes towards disability employment in the Indian hotel industry: a qualitative inquiry. Worldwide Hospitality and Tourism Themes. 2025. Vol. 17(3). P. 332-342.
13. Henry A. D., Petkauskos K., Stanislawzyk J. & Vogt J. Employer-recommended strategies to increase opportunities for people with disabilities. Journal of vocational Rehabilitation. 2014. Vol. 41(3). P. 237-248. https://doi.org/10.3233/JVR-140716.
14. Houtenville A. & Kalargyrou V. People with disabilities: Employers' perspectives on recruitment practices, strategies, and challenges in leisure and hospitality. Cornell Hospitality Quarterly. 2012. Vol. 53(1). P. 40-52. https://doi.org/10.1177/193896551142415.
15. Houtenville A. & Kalargyrou V. Employers' perspectives about employing people with disabilities: A comparative study across industries. Cornell Hospitality Quarterly. 2015. Vol. 56(2). P. 168-179. https://doi.org/10.1177/1938965514551633.
16. Kang D. Why would companies not employ people with disabilities in Korea?. Asia Pacific Journal of Social Work and Development. 2013. Vol. 23(3). P. 222-229. https://doi.org/10.1080/02185385.2013.818202.
17. Kendall K. M. & Karns G. L. The business case for hiring people with disabilities. Social Business. 2018. Vol. 8(3). P. 277-292. https://doi.org/10.1362/204440818X15434305418614.
18. Kumari N. & Patra B. C. Enabling Equality: Increasing Inclusion in the Workplace Through Inclusive. Intelligent IT Solutions to Promote Indigenous Innovations: Select Proceedings of ICEIL 2024. 2025. Vol. 1, 1386, P. 37.
19. Lengnick-Hall M. L., Gaunt P. M. & Kulkarni M. Overlooked and underutilized: People with disabilities are an untapped human resource. Human Resource Management. 2008. Vol. 47(2). P. 255–273. https://doi.org/10.1002/hrm.20211.
20. Lindsay S., Cagliostro E., Albarico M., Mortaji N. & Karon L. A systematic review of the benefits of hiring people with disabilities. Journal of occupational rehabilitation. 2018. Vol. 28. P. 634-655. https://doi.org/10.1007/s10926-018-9756-z.
21. Miethlich B. & Oldenburg A. G. How social inclusion promotes sales: An analysis of the example of employing people with disabilities. Journal of Marketing Research and Case Studies. 2019. Vol. 2019. P. 1-15. https://doi.org/10.5171/2019.463316.
22. Nurhaeni I. D. A., Wiratama P., Putri I. S., Nurdin A., Mulyadi A. W. E., Haryani T. N. & Sudibyo D. P. Defining Social Inclusion for People with Disabilities in Governance: Scoping and Thematic Literature Review. BISNIS & BIROKRASI: Jurnal Ilmu Administrasi dan Organisasi. 2023. Vol. 30(2). P. 75-87 https://doi.org/10.20476/jbb.v30i2.1375.
23. Pigott T. D. & Polanin J. R. Methodological guidance paper: High-quality meta-analysis in a systematic review. Review of Educational Research. 2020. Vol. 90(1). P. 24-46. https://doi.org/10.3102/0034654319877153.
24. Popelo O., Zhavoronok A., Kholiavko N., Dubyna M., Verbivska L., Fedyshyn M. Higher education for sustainable development in the digital era: Mapping the bibliometric analysis. Problems and Perspectives in Management. 2024. Vol. 22(4). P. 202-216. https://doi.org/10.21511/ppm.22(4).2024.16
25. Schloemer-Jarvis A., Bader B. & Böhm S. A. The role of human resource practices for including persons with disabilities in the workforce: A systematic literature review. The International Journal of Human Resource Management. 2022. Vol. 33(1). P. 45-98. https://doi.org/10.1080/09585192.2021.1996433.
26. Schur L. The difference a job makes: The effects of employment among people with disabilities. Journal of Economic Issues. 2002. Vol. 36(2). P. 339-347. https://doi.org/10.1080/00213624.2002.11506476.
27. Schur L., Kruse D. & Blanck P. Corporate culture and the employment of persons with disabilities. Behavioral sciences &

the law. 2005. Vol. 23(1). P. 3-20. https://doi.org/10.1002/bsl.624.
28. Sepulveda T. Barriers to hiring and accommodating people with disabilities in small and medium sized businesses: A scoping review. Journal of Applied Rehabilitation Counseling. 2021. Vol. 52(2). P. 104-114. https://doi.org/10.1891/JARC-D-20-00013.
29. Stone D. L., & Colella A. A model of factors affecting the treatment of disabled individuals in organizations. Academy of Management Review. 1996. Vol. 21. P. 352-401.
30. Suresh, V., & Dyaram, L. Workplace disability inclusion in India: review and directions. Management Research Review. 2020. Vol. 43(12). https://doi.org/10.1108/MRR-11-2019-0479
31. Tamene S. Challenges and Benefits of Employing and Working with Persons with Disabilities: Perspectives of Employers and Supervisors. Harla Journal of Social and Behavioral Studies. 2022. Vol. 1(1). P. 57-77. https://doi.org/10.20372/hjsbs.v1i1.26.
32. United Nations. Disability and employment. UN Enable. 2021. URL: https://social.desa.un.org/issues/disability.
33. Wendelborg C., Garrels V., Sigstad H. M. H. & Dean E. E. Recruitment and work arrangements for employees with intellectual disability in competitive employment. Journal of Policy and Practice in Intellectual Disabilities. 2022. Vol. 19(4). P. 350-359. https://doi.org/10.1111/jppi.12418.
34. Wiggett-Barnard C. & Swartz L. What facilitates the entry of persons with disabilities into South African companies?. Disability and Rehabilitation. 2012. Vol. 34(12). P. 1016-1023. https://doi.org/10.3109/09638288.2011.631679.
35. Yazıcı B., Şişman Y. & Kocabaş F. Determining the problems of disabled employees: a survey study conducted in Eskişehir, Turkey. Disability & Society. 2011. Vol. 26(3). P. 285-292. https://doi.org/10.1080/09687599.2011.560373.
36. Scopus database. 2025. URL: https://www.elsevier.com.
37. Web of Science Core Collection database. 2025. URL: https://www.webofscience.com.

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Харківський національний університет імені В. Н. Каразіна.
61022, Харків, майдан Свободи, 4, **www.karazin.ua**
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