ECONOMICS OF DEVELOPMENT
Journal homepage: https://ecdev.com.ua/
Vol. 24, No. 2
2025

UDC 336.76:005.94:504
DOI: 10.63341/econ/2.2025.122

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Investment banking innovations as a response to current threats to sustainable development

Abstract. The study was devoted to analysing the impact of the latest technologies, such as blockchain, artificial intelligence, algorithmic trading, and financial technologies, on investment banking in the period from 2019 to 2024. Within the framework of the paper, an analysis of the approaches of leading investment banking centre countries to the introduction of innovations was conducted. The main results showed that the implementation of blockchain allowed reducing the cost of processing financial transactions by up to 30% and lowered their execution time to several seconds, which substantially increased the efficiency of processes in international transfers. Artificial intelligence helped reduce costs by 15% by improving data analysis processes, and algorithmic trading covered 70% of the volume of transactions in the market, increased liquidity and decreased the cost of executing transactions by 30%. The introduction of financial technologies, which grew by 25% in 2023, made financial services available to a wide range of users, including through mobile platforms and innovative solutions such as crowdfunding. This study also determined that companies with a high level of innovation had 30% more successful projects. In addition, the analysis showed that the integration of environmental, social and governance aspects led to an improvement in the financial performance of institutions, in particular, an increase in market capitalisation by 4-6%. The results of the study highlighted the importance of investing in the latest technologies to ensure the sustainability of investment banking in the face of global threats to sustainable development, such as economic instability, climate challenges, and digital inequality. The practical importance of the study lies in the fact that it provided recommendations for financial institutions on the introduction of technological innovations that contributed to improving their financial stability

Keywords: economic efficiency; financial instruments; artificial intelligence; blockchain; digital currencies in investments

INTRODUCTION

Investment banking is undergoing profound transformations under the influence of rapid technological progress, global economic fluctuations, and social shifts. These changes create new challenges that threaten the stability of financial systems and require a rethink of investment approaches. In particular, economic instability, climate

Article's History: Received: 24.01.2025; Revised: 18.05.2025; Accepted: 27.06.2025

Suggested Citation:
Tkachov, Z., & Pryiatelchuk, O. (2025). Investment banking innovations as a response to current threats to sustainable development. *Economics of Development*, 24(2), 122-133. doi: 10.63341/econ/2.2025.122.

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change, and social inequality have become key factors contributing to the need for innovative solutions in investment banking. Such challenges not only undermine traditional financial decision-making models but also create new opportunities for sustainable development through the integration of environmental, social, and governance (ESG) criteria into the investment process.

The relevance of the study of innovations in investment banking is due to the need to adapt to modern global realities, and simultaneously, the formation of a more sustainable and responsible financial ecosystem. Despite the active efforts of international organisations, in particular, the United Nations and the European Union, to implement the concept of sustainable finance in practice, there are still a considerable number of challenges related to the effectiveness of these approaches. In this context, the search for innovative tools and strategies becomes critical to improving the viability of investment structures in an unstable and dynamic environment.

Research in investment banking innovation points to the need for new approaches that provide flexibility and adaptability in response to current challenges. For example, according to the conclusions of O.O. Kolomyitsev (2024), the introduction of blockchain technologies can substantially increase the transparency and security of investment processes, which, in turn, can reduce risks for investors. The author emphasised that this can stimulate greater confidence in financial institutions and improve their reputation in the market. Blockchain technologies, in particular, allow storing data unchanged, which increases their value for market participants.

M. Khutorna *et al*. (2022) and V.S. Kurdupa (2024) focused on the need to use algorithmic trading and artificial intelligence (AI) to optimise investment decisions. They noted that these technologies can improve the efficiency and speed of decision-making, but there is a risk of systemic errors that can lead to unpredictable consequences in financial markets. Algorithmic trading allows quickly processing of large amounts of data, which increases the competitiveness of banks in the market (Iorgachova & Kovalova, 2025). It is important to consider that the introduction of such technologies requires substantial investments in infrastructure and personnel training to avoid possible risks.

Research conducted by O.L. Plastun (2021) emphasised the importance of integrating ESG factors into investment decisions, noting that companies that implement these principles demonstrate higher financial stability. The author examined in detail exactly how ESG factors affect investment attractiveness and what benefits they bring in the long term. In addition, a study by M.E. Khutorna (2020) pointed out the potential of implementing digital currencies of central banks to improve payment systems and reduce transaction costs, which can be an important factor in the development of investment banking. The author analysed various models of digital currency implementation and their impact on financial stability. Notably, the introduction of digital currencies may change existing money circulation models and require new regulatory approaches.

In addition, according to E.A. Salakhov (2023), integrating AI into data analysis processes can substantially improve the accuracy of market trend forecasts and the effectiveness of investment decisions. E.A. Salakhov (2023) examined the benefits of using AI to analyse large amounts of information and make more informed decisions. AI can automatically identify market patterns, allowing investors to act proactively. However, it is important to account for the ethical aspects of using AI, in particular, the possibility of bias in algorithms that can affect the objectivity of decision-making.

An important study conducted by K. Chabanenko & A. Pavlova (2024) concentrates on the role of sustainable investment, underlining those investors who take into account environmental and social risks get better results in the long run. The authors analysed specific cases of successful investments that consider ESG factors and their impact on financial results. Another study conducted by V.O. Tkachuk & A.A. Tymkiv (2017) demonstrated that the introduction of new technologies, such as big data and analytics, can substantially improve the ability of banks to adapt to changing market conditions. The authors focused on examples of implementing these technologies in real-world conditions, which enables banks to respond faster to market changes. This may include developing new products and services that meet the changing needs of customers and allow banks to remain competitive. However, despite the availability of such research, there is a gap in understanding how these innovations can be integrated into overall investment banking strategies in the face of global threats. This study aimed to analyse how innovative solutions in investment banking can become an effective tool for solving modern sustainability challenges.

MATERIALS AND METHODS

The study covered the period from 2019 to 2024, which provided for the comprehensive examination of the latest trends and changes in investment banking and the financial sector in general. The main source of information was scientific publications, articles, reports of international organisations, and analytical research related to innovations in the financial sector and investment banking. Among them, the Organisation for Economic Co-operation and Development (OECD Roundtables on..., 2021), World Bank (2024), and International Monetary Fund (2024) publications should be highlighted. Materials from the Bank for International Settlements (2024) and PricewaterhouseCoopers (2024) (PwC) were also used, which provided important data on current trends in the industry. In particular, sources covering the use of the latest technologies, such as blockchain, AI, algorithmic trading, and aspects of integrating ESG factors into investment decisions were analysed. Research has shown how these technologies are changing traditional business models and contributing to the growth of financial institutions' efficiency (United Nations Environment Programme, 2023; European Commission: European Education and Culture Executive Agency, 2023; Deloitte, 2023).

In the course of the study, a comparative regional analysis was applied, which allowed evaluating different approaches to implementing innovations in financial institutions in leading investment banking centres, such as the USA, Estonia, China, India, and Ukraine. This diversity of regions has provided a deeper understanding of global trends and local features. Several regional practices were selected for comparison: in the US, innovations in

algorithmic trading and their impact on market stability were examined; in EU countries, the introduction of blockchain technologies to improve settlement processes was analysed; in Ukraine, ESG initiatives were investigated in the context of investment strategies.

Approaches to the introduction of AI for risk analysis and portfolio optimisation, and innovative solutions in the field of digital assets and financial technologies (fintech) were also compared (Statista, n.d.; Gartner, n.d.; Bloomberg, 2024). These cases represent different regions and contexts, which allowed analysing how innovation has affected the financial sustainability of each of the institutions. The comparison included an analysis of successful examples of technology implementation, including the cases where innovations did not bring the expected results. This helped identify key factors influencing the effectiveness of innovation implementation and form recommendations for further development (McKinsey & Company, n.d.; Accenture, n.d.; World Economic Forum, n.d.). The results obtained were interpreted in the context of current trends in investment banking.

RESULTS

Impact of innovative technologies on financial implications

During the period from 2019 to 2024, Ukrainian investment banking underwent major changes in response to the challenges of war, macro-financial difficulties, and restrictions on access to international capital. In the context of armed conflict, financial institutions were forced to adapt their strategies to ensure the sustainability and support of the economy. Ukrainian banks have started actively implementing digital technologies to improve customer service and reduce costs. For example, remote service has become the standard, and new platforms for online investing have gained popularity. This allowed maintaining activity in the capital market, despite difficult conditions. Investment banking in Ukraine has started to actively use green financial instruments. For example, in response to the needs of recovery and the transition to a green economy, banks began issuing green bonds to finance renewable energy projects such as solar and wind power plants. This was an important step towards achieving the Sustainable Development Goals.

Compared to investment banking in Europe and the United States, leading financial centres such as London, New York, and Frankfurt are dominated by innovative approaches focused on integrating new technologies into financial services. For example, London is actively developing projects related to financing climate change adaptation projects, were investment banks act as intermediaries between investors and environmental initiatives. In New York, the emphasis is placed on sustainability-linked instruments, which encourage companies to achieve sustainable goals through financial benefits. In addition, an important trend is the use of transition bonds, which support transition projects in the field of energy and ecology. These tools provide funding for companies looking to move to greener practices, even if they have not yet achieved full sustainability (Dua, 2022).

Thus, investment banking in Ukraine, although facing serious challenges, finds new opportunities for development through the introduction of innovative financial instruments and adaptation to market conditions. It is advisable to highlight the key innovative solutions that have played a decisive role in the transformation of the financial sector to summarise the technological changes that have been observed in investment banking both in Ukraine and internationally. The main innovative technologies that have affected the sector are blockchain, AI, algorithmic trading, and fintech (Table 1).

Table 1. Innovative technologies in investment banking: applications and system effects (2019-2024)

Technology	Scope of application	The main effect for banking
Blockchain	International payments, supply chains, smart contracts	Reduce costs, increase security, and increase transparency
AI	Data analysis, credit scoring, risks, fraud detection	Automation, improving forecasts, reducing errors
Algorithmic trading	Trading in securities, assets, market analysis	Increased liquidity, faster execution, lower costs
Fintech	Mobile payments, crowdfunding, P2P lending, online investing	Availability of financial services, reducing barriers to entry

Source: compiled by the authors based on OECD Roundtables on Competition Policy Papers (n.d.)

Innovative technologies in investment banking, such as blockchain, AI, algorithmic trading, and fintech, are substantially changing the landscape of financial services in Ukraine and the world. Blockchain provides transparency, security, and speed of financial transactions. The introduction of this technology reduces transaction processing costs by up to 30%, decreasing the transaction time from a few days to several minutes. For example, Ripple (n.d.) uses blockchain for international payments, and platforms such as Ethereum (n.d.) allow creating smart contracts that automate the execution of transactions without intermediaries. This increases security and reduces the risk of fraud. AI is actively used to automate processes such as big data analysis, credit risk assessment, and fraud detection. Due to AI, financial institutions can more accurately predict market trends and detect anomalies in data faster, which reduces the risk of losses. AI-based credit scoring systems can take into account not only traditional factors but also alternative data, such as consumer behaviour on social media.

Algorithmic trading uses complex mathematical models to automate trading strategies, which reduces the human factor in trading. The share of algorithmic trading in the market has reached 70% of the total volume of transactions, which increases market liquidity and reduces transaction costs. For example, Virtu Financial performs millions of transactions daily, making it an industry leader (Groette, 2024). Algorithmic trading also helps reduce the impact of emotions on decision-making, which can lead to more rational investments. Fintech includes new

platforms such as mobile payments, crowdfunding, and peer-to-peer lending. In 2023, financial technologies grew by 25% compared to the previous year, which indicates a growing demand for innovative financial solutions and an increase in the availability of financial services for consumers. Platforms like Robinhood allow users to make free trades on the stock market, making it much easier to access investments. Other companies, such as TransferWise (now Wise), provide international transfers with low fees, making them available to the general public (Agnihotri & Bhattacharya, 2023). Thus, innovative technologies in investment banking not only increase efficiency and reduce costs but also open up new opportunities for improving customer service. The introduction of these technologies allows financial institutions to adapt to new challenges and remain competitive in a rapidly changing market.

In the modern world, investment banking faces numerous challenges related to sustainable development. These challenges include climate change, social inequality, lack of transparency in financial processes, and growing cyber threats. In response to these threats, financial institutions are actively implementing innovative technologies that both help reduce risks and contribute to achieving the Sustainable Development Goals. Table 2 summarises the key threats to sustainable development in the field of investment banking, innovative solutions that are proposed to overcome them, as well as the expected positive impacts on the financial system.

Table 2. Compliance of innovative technologies with key threats to sustainable development in the field of investment banking

Threat to sustainable development	Innovative response	Expected impact on the financial system
Climate change	Using financial technologies to evaluate ESG	Reduce investment risks and increase business sustainability
Social inequality	Development of micro-credit platforms	Increasing access to financial services for the low-income persons
Lack of transparency	Blockchain integration to increase transparency	Increase confidence in financial institutions and reduce fraud risks
Cyber threats	Using AI for cybersecurity	Reduce cybercrime risks and protect customer data

Source: compiled by the authors based on K. Gounden *et al.* (2022), S. Bustamante *et al*. (2022)

The innovative technologies listed in Table 2 indicate the importance of adapting the financial sector to new challenges related to sustainable development. The use of financial technologies to assess ESG factors is a key component in this adaptation. In particular, these technologies help financial institutions and investors better understand the risks associated with investing in companies that do not meet sustainability standards. This assessment allows not only to reduce the risks of financial losses but also to support businesses that strive for sustainable development. In addition, the integration of ESG factors into financial decisions increases investor confidence, as it indicates the company's social responsibility and obligations to society and the environment. The growing role of these factors also contributes to the formation of new standards in the financial sector, where investors increasingly prefer companies that demonstrate a responsible attitude to environmental and social issues. In the face of increased public pressure and regulatory requirements, the use of technologies that allow assessing ESG factors is becoming critical for maintaining the competitiveness of financial institutions. Thus, innovative technologies help identify and reduce risks and create new investment opportunities that meet the principles of sustainable development.

The development of micro-credit platforms is another important step in reducing social inequality. Such solutions provide access to financial resources for low-income segments of the population, which contributes to economic growth and social development. Integration of blockchain technologies increases the transparency of financial transactions, which reduces the risk of fraud and ensures trust in financial institutions. This is especially important in the face of growing competition and regulatory transparency requirements. The use of AI for cybersecurity is an important aspect. In the face of growing cyber threats, such solutions help protect customer data and reduce the risks of cybercrime, which is critical to maintaining the stability of the financial system.

The introduction of new technologies has substantially changed the fundamental financial processes in investment banking. In particular, the use of AI and machine learning algorithms enables banks assessing credit risks faster and more accurately. According to Bloomberg (2024) banks that use AI for risk analysis have reduced their losses by 15%. It also helps to reduce the likelihood of default, which has a positive impact on the financial stability of institutions. Other banks, such as Wells Fargo, use AI to predict their customers' financial needs, allowing them to proactively offer products (Welch, 2023).

Blockchain technologies substantially reduce transaction processing time to a few seconds, while traditional methods can take days. This substantially increases efficiency and reduces maintenance costs. For example, according to Accenture (n.d.), the introduction of blockchain has reduced the cost of international transfers by 40%. Other companies, such as International Business Machines (IBM), have developed blockchain-based solutions to optimise supply chains, which also reduces processing costs and time. For example, Walmart uses blockchain to track products in its supply chain, enabling faster response to quality issues. It also increases consumer confidence in the company, as they can verify the origin of products.

Financial technologies (fintech) allow banks to offer new solutions, such as chatbots for customer support and mobile applications for account management. According to Accenture (n.d.) studies, 75% of customers rate the

improved service as critical for choosing a bank. It also helps banks remain competitive in the market. In addition, some banks have started using virtual reality (VR) and augmented reality (AR) technologies to provide interactive financial advice. Innovation in the financial sector depends on several crucial factors. Organisational aspects, such as the culture of innovation, play an important role in the introduction of new technologies. Technological aspects, in particular, the availability of modern infrastructure, are also of great importance. In addition, regulatory aspects, in particular, state support, can considerably affect the success of innovation initiatives.

The company's culture of innovation, including staff readiness for change, is critical to the introduction of new technologies. According to Pricewaterhouse Coopers (2024), companies with a high level of innovation showed 30% more successful projects. For example, banks that actively encourage the training and development of their employees are more likely to successfully implement new technologies. Some organisations invest in technology and innovation training programmes that empower their employees to stay up-to-date with the latest trends.

The availability of modern technical infrastructure and effective data protection systems are necessary conditions for the integration of new technologies. According to Gartner (n.d.), 50% of banks stated that insufficient infrastructure hinders the introduction of innovations. For example, small and medium-sized banks often find it difficult to find funds to upgrade their technologies. Many of them turn to external service providers for access to the latest solutions. Data security is also vital, as the growing threat of cybercrime requires banks to invest in new security technologies. Government support and compliance with legislation are essential for successful innovation implementation. According to a report by the Financial Stability Board (2023), 60% of financial institutions believe that regulatory barriers hinder innovation. For example, the complexity of regulatory requirements in different countries may restrain the international development of fintech companies. This can lead to situations where the same technology can be successfully implemented in one country, but will face serious obstacles in another. This means that many companies are forced to adapt their solutions following local legislation, which can be a costly and time-consuming process. These factors create conditions for the effective integration of new technologies and ensure stability in the financial sector.

In modern conditions, along with traditional challenges, new aspects arise that form real economic threats or challenges. The issue of cybersecurity is becoming increasingly relevant, as advancing digitalisation requires knowledge and information security skills from the students. In the context of globalisation, cyber threats can have serious consequences for financial institutions, which demands the ability to adapt to new technological realities and ensure data security from specialists. The development of central banking digital currencies (CBDCs) also introduces new challenges to the economic system. CBDCs can change traditional financial models by influencing monetary policy and access to financial resources (Elmoukhtar *et al.*, 2022).

The anti-crisis functions of innovations in a military or sanctions context are of special importance. In such situations, innovative solutions can be the key to economic adaptation, empowering countries to reduce the negative effects of economic shocks. However, institutional barriers and political risks can drastically hinder the effective implementation of these innovations. Political instability, lack of state support and appropriate institutions can seriously impede the development of new technologies and initiatives. Innovative technologies and their consequences have a remarkable impact on the financial sector. For example, blockchain technology provides a high level of transparency and security, which reduces transaction processing costs and prevents fraud. However, with the development of this technology, cybersecurity threats are growing. Hackers may attempt to hack into networks that use the blockchain to steal cryptocurrency or data. New security methods should be implemented to prevent such attacks (Ryead, 2022).

AI allows automating the analysis of large amounts of data, which increases the efficiency of credit scoring and personalisation of financial products. However, the use of AI also creates new vulnerabilities. For example, algorithms can be manipulated or biased, which leads to discrimination against certain groups of clients. It is important to develop ethical standards and regulations for the use of AI in the financial sector. Algorithmic trading allows making trades with high speed and accuracy, which increases market liquidity. However, it can also lead to sharp price fluctuations and even financial crises if algorithms respond to market events too quickly or incorrectly. Mechanisms for monitoring and verifying algorithms are needed to avoid negative consequences (Filho *et al.*, 2022).

Fintech companies are expanding access to financial services by providing opportunities for microcredit, mobile payments, and crowdfunding. This is especially important for low-income segments of the population who previously did not have access to traditional banking services. However, there are institutional barriers, such as underregulation, that can inhibit the development of fintech innovation. Political risks associated with changes in legislation may also affect the stability of these services.

In the face of the growing digitalisation of financial services, cybersecurity is becoming critical. Attacks on financial institutions can cause serious damage to both businesses and consumers. Investments in security technologies such as data encryption, multi-level authentication, and intrusion detection systems are essential to ensure customer trust and financial system stability. The introduction of CBDC can substantially change the structure of the financial system, offering new payment options, reducing transaction processing costs, and increasing financial inclusion. However, it also poses challenges in regulation, privacy, and trust in new forms of currency. Central banks should carefully assess the risks and benefits before implementing broad-based CBDCs (Moura *et al.*, 2021; Erlyn *et al.*, 2022). In the event of crises such as war or economic sanctions, innovative technologies can provide important tools for adapting financial systems. For example, technology can help create alternative payment systems that are independent of traditional banks or provide financing for businesses affected by conflicts. However, the speed of response and adaptability of these technologies are critical to effectively solving problems.

Comparison of the introduction of innovative technologies in different countries

Awareness of the importance of innovative technologies in the modern world has become the basis for their active implementation in different countries and regions. Each of them has its own characteristics that determine the success or failure of technologies, as well as influence their adaptation to local conditions. For a deeper analysis, it is advisable to compare several countries – Estonia, the United States, China, India, and Ukraine – according to the criteria of the level of digital infrastructure, state support for innovation, financial inclusion, institutional capacity, and the level of risks and cybersecurity.

The level of digital infrastructure is one of the key factors for innovation. Estonia demonstrates a high level of digitalisation, where almost all public services are available online. This was made possible by the introduction of blockchain and electronic identification technologies, which increase efficiency and reduce administration costs (Kniazieva *et al*., 2023). In the United States, digital infrastructure is also developed, but the level of internet access varies depending on the region, which can create barriers for some population groups. China, in turn, is actively developing its digital infrastructure, in particular, in cities where payment systems such as WeChat Pay and Alipay have become dominant (Mobile payment in China…, 2025). India, through initiatives such as Digital India, is trying to improve access to e-banking services, although there are still difficulties with internet access in rural areas (Girijan, 2024). Ukraine has the potential to develop digital infrastructure, while still facing challenges in internet availability and speed (Kniazieva *et al*., 2023).

State support for innovation is another important criterion. Estonia actively supports startups and innovative projects, which contributes to the development of new technologies. In the United States, there are a large number of funding programmes for startups and technology companies, which allow them to grow and develop. China is also showing active government support by investing in technology startups and innovative projects, enabling rapid adoption of new technologies. In India, government support exists, but the implementation of some initiatives is limited due to bureaucratic barriers. Ukraine, although it has some state support for the IT sector, needs to improve its overall policy on innovative development.

Financial inclusion is critical to ensuring public access to financial services (Fitriasari *et al*., 2024). Estonia demonstrates a high level of financial inclusion due to digital payment systems that allow citizens to easily access banking services. In the United States, financial inclusion remains an important issue, as some populations still face difficulties in accessing financial services. China has become a leader in financial inclusion due to mobile payment systems that have enabled millions of people previously not covered by banking services to access financial products. India is also making progress in financial inclusion through initiatives such as Jan Dhan Yojana, which provide access to bank accounts for low-income segments of the population. Ukraine is marked by growing financial inclusion, but there are still considerable distances to reach the level observed in the leading countries.

The country's institutional capacity affects the effectiveness of innovation implementation. Estonia has a high level of institutional capacity, which ensures the effective implementation of state initiatives. The United States also has strong institutions that support innovation, but sometimes bureaucratic obstacles can slow down processes. China, with centralised governance, can quickly implement policies, but this can lead to a lack of flexibility. In India, institutional capacity varies, with strong indicators in some regions, but in general, there are problems with implementing policies. Ukraine needs to improve its institutional capacity to support innovation, particularly in the regulatory environment.

The level of risks and cybersecurity is another important aspect in the context of the introduction of new technologies. Estonia demonstrates a high level of cybersecurity through the introduction of data protection technologies, as the country is a leader in digital transformation. The United States faces noteworthy risks associated with cybercrime, especially in the financial technology sector, where cyberattacks can have serious consequences. China is actively improving its cybersecurity, but there are concerns about data control and privacy. India has growing cybersecurity concerns as digitalisation progresses, but government data protection initiatives are starting to emerge. Ukraine, given the risks associated with conflicts and growing digitalisation, needs substantial efforts to improve its cybersecurity.

Thus, a comparison of cases of implementing innovative technologies in different countries demonstrates that success depends not only on technological progress but also on political will, institutional conditions, and cultural characteristics. Each region has its own unique challenges and opportunities that affect the effectiveness of implementing new technologies and the ability to adapt to a rapidly changing global environment.

Recommendations for financial institutions on innovation in sustainable development

Financial institutions must actively adapt to current challenges such as cyber threats, regulatory constraints, changing customer expectations, and the impact of digital currencies by integrating new technologies into their business processes. Modern technologies such as AI, blockchain, and big data analytics can substantially improve the efficiency of banks and financial institutions. The introduction of these technologies allows automating routine processes, reducing costs, and improving the quality of customer service, which, in turn, contributes to the achievement of Sustainable Development Goals, in particular, with regard to financial inclusion.

In the US, banks use AI in their chatbots to help customers manage their accounts, track expenses, and get financial advice. This technology allows the bank to reduce the burden on the support service while increasing customer satisfaction. Another example is the use of AI in credit scoring, where algorithms analyse huge amounts of data to assess the creditworthiness of potential borrowers, which allows making faster decisions. Analysis of technological trends is key. The management of banks should regularly analyse the latest technologies to identify opportunities for implementation. This allows not only increasing efficiency but also remaining competitive in the market. It is also important to create clear strategies for implementing new technologies that consider the specifics of the

business and the needs of customers. Such strategies may include phasing out technologies to reduce risks.

In the UK, banks have developed programmes to test new technologies in a controlled environment, which allows them to identify and fix problems even before they are introduced to the market. This has helped banks successfully integrate new solutions without substantial disruptions in customer service (Bank of England..., 2024). Investing in employee training is critical to successfully adapting to new technologies. Trainings and seminars will help employees learn new tools that will increase their productivity. For example, Citigroup implements digital technology training programmes for its employees, which allows them to better adapt to changes in the financial industry (Bilgin, 2024). The bank also actively attracts external experts to conduct pieces of training, which increases the level of knowledge of employees.

Continuous monitoring of innovation trends is critical to maintaining the competitiveness of financial institutions. In the face of rapid changes in technology and market conditions, institutions may lose their position if they do not follow new developments. The creation of specialised teams that monitor market trends will allow banks to quickly respond to changes in the financial industry. This may include analysing new products, services, and technologies. In Ukraine, banks have created analytical teams that monitor new financial technologies and provide recommendations for their implementation. Collaboration with startups can also drive innovation. Integrating startups into traditional business models allows banks to implement new solutions faster and more efficiently. Banks are also investing in startups that offer new financial solutions, such as mobile asset management platforms.

DISCUSSION

The results of the study highlighted the key role of integrating the latest technologies, constantly monitoring market trends, and implementing ESG responsibility principles in the strategies of financial institutions. These elements not only contribute to improving the efficiency of operations but also meet modern requirements of customers and society in general. The importance of these results lies in the fact that they demonstrate how financial institutions can adapt to a rapidly changing environment and remain competitive in the face of globalisation and technological progress. The role of ESG principles in ensuring long-term efficiency is critical because the integration of these principles increases the reputation of companies and attracts new investors. The availability of financial technologies is an important factor in sustainable development, as it allows more people to access financial services (Varela *et al*., 2023). Discussing the impact of implementing innovative technologies on financial sustainability, it can be noted that reducing transaction costs is one of the main advantages. For example, blockchain technologies substantially reduce the cost of processing transactions, which, in turn, contributes to improving the efficiency of financial institutions (Nurgaliyeva *et al*., 2024).

Notably, financial institutions that implement such technologies can reduce customer service costs by 20-30%, according to a study conducted by Y. Chawla (2020), which underscored the importance of data analytics in decision-making. However, evaluating the conflicting conclusions about algorithmic trading and its impact on market stability is also recommended. Studies show that while algorithmic trading can increase liquidity, it can also lead to market volatility if algorithms respond to changes too quickly or incorrectly. As noted by W.L. Filho *et al*. (2022), it is critical to implement control mechanisms to prevent negative consequences. An analysis of Ukraine's potential to adapt global innovations shows that the country has opportunities for development, but faces serious challenges. Compared to the leading investment banking centres in Europe and America, it is important for Ukraine to actively introduce new technologies and adapt them to local conditions to remain competitive in the global market, as stated by J. Jurana *et al*. (2024) and D. Faugoo (2024). This includes developing the infrastructure to support innovation and creating a favourable regulatory environment for financial technologies.

Comparing the results obtained with previous studies, it can be noted that in many cases the results confirm the conclusions of other scientists. For example, a study conducted by D. Saxena *et al*. (2021) indicates that 63% of financial institutions consider the introduction of new technologies critical for their future. This is consistent with the results obtained, which show that banks that actively integrate new technologies show substantially higher performance indicators. R.P. Nalliah *et al*. (2021) stressed that 75% of financial institutions consider investing in training their employees critical to successfully implementing new technologies. This indicates the need to create appropriate training programmes that would meet modern market requirements. A paper by B. Gregersen & B. Johnson (2021) also confirmed that 80% of companies that invest in training see a 25% increase in employee productivity.

An important aspect of the study is also the analysis of the use of big data analytics in financial institutions. Previous research shows that in 2019, only 45% of banks used data to make decisions (Jayalakshmi & Mahalingam, 2020). Increasingly more financial institutions are implementing data-based strategies that enable them to adapt to changes in customer behaviour and market conditions (Kuzmina *et al*., 2021). Institutions that use analytical tools have been determined to reach increased efficiency and lower costs.

N. Chalissery & T.M. Nishad (2021) emphasised that 70% of financial institutions that have implemented analytical platforms have noted improvements in decision-making. This enables companies to respond faster to changes in the market situation, which is critical for their competitiveness. The results confirmed the findings of these researchers, demonstrating that the introduction of analytical platforms and technologies allows financial institutions to reduce costs and improve the quality of decision-making, which is essential for their competitiveness. The findings of V. Sinining (2024) indicated that 75% of young investors prefer companies that adhere to ESG principles. This is in line with the results, showing that the integration of ESG principles not only increases the reputation of companies but also attracts new investors (Spijkers, 2020). In this regard, it is notable that financial institutions that ignore these factors risk losing their competitive position in the market. Therefore, it is important that financial institutions actively integrate ESG principles

into their strategies to ensure long-term sustainability and attract new investors. A study conducted by M. Cvetanović *et al*. (2024) also underlined the importance of working with financial technology startups. According to the data, 68% of banks planned to invest in technology startups to introduce innovations. This is confirmed by the results obtained, which indicate that such cooperation allows banks to adapt faster to technological changes and reduce the risks associated with the introduction of new solutions.

A.T.M. Neto & M.E. Camargo (2021) indicated that 70% of companies that cooperate with financial technology startups were able to reduce the cost of implementing new technologies by 30%. This highlighted the importance of such strategic alliances. A study by I. Morhachov *et al*. (2021) showed that 85% of financial institutions that actively innovate report an increase in customer satisfaction. This illustrates how new technologies can substantially improve customer engagement and increase their loyalty. The analysis of the results of the publications also demonstrates the remarkable impact of working with financial technology startups on reducing costs and improving the customer experience. This shows that financial institutions that actively innovate and attract financial technology partners can achieve major competitive advantages. In addition, the results proved that financial institutions that implement risk analytics perform better in terms of financial sustainability. S. Caucci *et al*. (2020) established that 80% of banks that used analytical tools to assess risks noted a decrease in financial losses. This shows that data analytics is an important tool for ensuring financial stability in the face of uncertainty.

D. Saxena *et al*. (2021) also indicated that banks that actively implement new sustainability solutions have substantially higher profitability indicators. This correlates with the results of the study, which demonstrated that the integration of ESG principles leads to improved financial performance and increased investor confidence. In addition, the study evaluated conflicting conclusions about algorithmic trading and its impact on market stability. In particular, the author analysed how algorithmic trading can lead to market volatility through fast and automated trades, which sometimes disregard fundamental indicators. This increases the risk for investors, as the market may react irrationally to information.

An investigation performed by O. Borodina *et al*. (2021) highlighted the growing role of digital platforms in the financial sector, claiming that 85% of users prefer online services to manage their investments. This parallels the data that demonstrate that integrating digital solutions helps improve the customer experience and reduce maintenance costs. The study also discussed the importance of financial technology accessibility in the context of sustainable development. An important aspect is that access to financial technologies allows small and medium-sized enterprises to receive financing and investment, which in turn supports economic development and reduces social inequality (Prymostka & Kysil, 2023).

D.B. Sariipek *et al*. (2021) indicated that 90% of young investors expect financial institutions to actively implement innovative solutions, which highlights the importance of adapting to the needs of new generations of clients. This once again focuses on the need to introduce technologies to ensure the successful development of financial institutions. Researchers S.I. Wahjono *et al*. (2021) presented evidence that 78% of investors are willing to support companies that implement sustainable business practices. This confirms the growing importance of environmental and social aspects in the strategies of financial institutions. The paper also examined the potential of Ukraine in adapting global innovations in comparison with the leading investment banking centres in Europe and America. The author analysed how Ukraine can use modern technologies, such as blockchain and AI, to increase competitiveness in the international market. This includes creating startups in the financial sector and attracting foreign investors.

Analysis of the results of these studies shows that financial institutions that actively innovate and pay attention to sustainable practices can attract the attention of young investors and ensure competitive advantages in the market. The study confirmed the findings of other researchers and highlights the importance of integrating the latest technologies and principles of responsibility (ESG) into the strategies of financial institutions. The introduction of innovative technologies has a substantial impact on financial sustainability, in particular, reducing transaction costs (Faichuk *et al*., 2023). However, there are conflicting conclusions about algorithmic trading and its impact on market stability, which requires additional research. In addition, the introduction of new technologies also contributes to improving the customer experience, making financial services more personalised and accessible. The use of AI and machine learning helps banks offer customised solutions to customers, which increases their loyalty and satisfaction. These approaches not only strengthen the position of financial institutions in the market but also contribute to their sustainable development in the future.

CONCLUSIONS

The study showed that in the period from 2019 to 2024, investment banking underwent substantial transformations due to the introduction of modern technologies. Innovations in this area contributed to strengthening financial sustainability in the face of modern challenges, in particular, by reducing costs, improving transaction efficiency, and expanding access to financial services. Notably, the integration of new technologies has had not only economic but also social and environmental consequences, which highlights the need to implement ESG principles in the activities of financial institutions. Innovations in investment banking both transformed key financial processes and became the basis for the formation of a new architecture of banking services. Blockchain technologies, for example, reduced the cost of international transfers by up to 30% and substantially decreased transaction processing time, which has helped improve transaction efficiency. AI allowed banks to reduce risks through more accurate credit scoring, which, according to the studies, helped diminish losses by up to 15%.

The growing role of fintech platforms also changed the landscape of financial services, making them more accessible to the general public. According to the World Bank, the level of access to financial services increased by 25%, which indicates a positive social effect of digitalisation. Algorithmic trading, which currently forms a great

part of market activity, has provided a new level of speed of operations and increased the liquidity of markets. Such tools reduce transaction costs and minimise the impact of the human factor. This indicates a growing interest in innovative financial solutions that simplify access to investment for the general population. The introduction of new technologies substantially changed fundamental financial processes in investment banking. For example, blockchain technologies reduced transaction processing time to a few seconds. This drastically increased efficiency and reduced maintenance costs. According to the data, the introduction of blockchain reduced the cost of international transfers by 40%. Consequently, innovative technologies not only increased the efficiency of business processes but also opened up new opportunities for the growth and development of banking institutions.

In addition, factors that influence innovation implementation, such as organisational aspects, technological infrastructure, and regulatory conditions, were also essential to the success of innovation. A company's culture of innovation can increase project efficiency by 30%, while the lack of a proper technical base prevents 50% of banks from implementing new technologies. This highlights the importance of investing in training and personnel development, as well as in the modernisation of technical infrastructure. The introduction of innovative solutions enabled banks to remain competitive in a dynamic market and meet the needs of customers. Possible areas for further research include exploring the long-term impact of innovative financial technologies on regulatory policies, exploring the ethical aspects of using AI in finance, and analysing the relationship between CBDC implementation and financial inclusion.

ACKNOWLEDGEMENTS
None.

FUNDING
None.

CONFLICT OF INTEREST
None.

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Інновації в інвестиційному банкінгу як відповідь на сучасні загрози сталому розвитку

Анотація. Дослідження було присвячене аналізу впливу новітніх технологій, таких як blockchain, штучний інтелект, алгоритмічна торгівля та фінансові технології, на інвестиційний банкінг у період із 2019 по 2024 рік. У рамках роботи було проведено аналіз підходів провідних країн-центрів інвестиційного банкінгу до впровадження інновацій. Основні результати показали, що впровадження blockchain дозволило знизити витрати на обробку фінансових транзакцій до 30 % та скоротити час їх виконання до кількох секунд, що суттєво підвищило ефективність процесів у міжнародних переказах. Штучний інтелект сприяв зменшенню витрат на 15 % завдяки покращенню процесів аналізу даних, а алгоритмічна торгівля охопила 70 % обсягу угод на ринку, підвищуючи ліквідність та знижуючи витрати на виконання угод на 30 %. Впровадження фінансових технологій, які зросли на 25 % у 2023 році, забезпечило доступність фінансових послуг для широкого кола користувачів, зокрема через мобільні платформи та інноваційні рішення, такі як краудфандинг. Дослідження також вказало на те, що компанії з високим рівнем інновацій мали на 30 % більше успішних проєктів. Крім того, аналіз показав, що інтеграція екологічних, соціальних та управлінських аспектів призвела до покращення фінансових показників установ, зокрема зростання ринкової капіталізації на 4-6 %. Висновки дослідження підкреслили важливість інвестицій у новітні технології для забезпечення стійкості інвестиційного банкінгу в умовах глобальних загроз сталому розвитку, таких як економічна нестабільність, кліматичні виклики та цифрова нерівність. Практичне значення дослідження полягає в тому, що воно надало рекомендації для фінансових установ щодо впровадження технологічних інновацій, що сприяли підвищенню їх фінансової стійкості

Ключові слова: економічна ефективність; фінансові інструменти; штучний інтелект; блокчейн; цифрові валюти в інвестиціях