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Prospects for the implementation of the digital currency of the National Bank of Ukraine in the context of global digitalisation

Abstract. The purpose of this study was to assess the economic implications of implementing a central bank digital currency (CBDC) in Ukraine (e-hryvnia) within the framework of global digitalisation. The study covered the period from 2023 to 2024. The study employed an analytical approach based on a comparative analysis of international experiences in CBDC implementation, focusing on China, Sweden, the Bahamas, Nigeria, the United States, and the European Union. The study examined pilot projects, strategies, and conceptual frameworks designed for the implementation

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of the e-hryvnia and the level of digitalisation within the financial infrastructure of Ukraine. The key findings of the study are critical factors influencing the successful integration of digital currencies into national economies. The analysis indicated that countries actively adopting CBDCs seek to address technological, economic, and social readiness challenges. Furthermore, the findings suggested that the implementation of the e-hryvnia in Ukraine could be justified and effective, provided that the necessary technical and economic conditions are met to facilitate its seamless integration into the national financial system. The dynamics of the payment system development of Ukraine reflect its preparedness for the introduction of a digital currency. In 2023, a total of 7.91 billion cashless transactions were conducted, amounting to UAH 6.14 trillion. In 2024, within the first nine months alone, transactions reached 6.4 billion, with a total value of UAH 4.79 trillion, representing a 7.72% increase in the number of transactions and a 4.45% rise in transaction volume compared to the corresponding period in 2023. Moreover, by 2024, the proportion of cashless transactions in the total volume of payments had increased to 94.5% by number and 64.81% by value. The study concluded that the successful introduction of a digital currency in Ukraine will require continuous enhancement of the country's payment infrastructure and the implementation of measures to ensure the security and transparency of financial transactions

Keywords: monetary transactions; payment system; payments; macroeconomic stability; monetary policy

INTRODUCTION

The relevance of the study on the implementation of the National Bank of Ukraine's digital currency is determined by global digitalisation trends that encompass all aspects of economic and financial life. Central bank digital currencies (CBDCs) are considered a promising tool for enhancing monetary policy, ensuring financial stability, and increasing access to financial services. The implementation of CBDCs in countries such as China, Sweden, and the Bahamas demonstrated their potential to improve payment systems, reduce transaction costs, and enhance financial transparency. For Ukraine, which is actively integrating digitalisation into its economy and adopting innovative technologies, the development and implementation of the "e-hryvnia" is not only an opportunity to strengthen the national financial system but also a crucial step towards integration into global digital economic trends. In this context, assessing its economic feasibility, analysing potential challenges, and identifying the conditions necessary for the successful implementation of the e-hryvnia are of paramount importance.

Within this field of study, there is currently a limited level of experimentation with digital currencies in Ukraine, which may result in a lag in financial innovation. S.O. Hrytsai (2024) examined this issue, noting that since 2016, the National Bank of Ukraine has been developing the concept of the e-hryvnia, and in 2018, it launched a closed pilot project to test its functionality. The author identified key areas for the development of the e-hryvnia, including its use for retail payments, cross-border transfers, and transactions involving virtual assets. However, several gaps require further analysis, such as the macroeconomic impact of the e-hryvnia, the absence of a well-developed regulatory framework, and the need for improvements in the payment infrastructure.

The growing interest in CBDCs is driven by their potential to enhance financial stability and modernise payment systems. M. Korol & V. Spivak (2021) reported that 80% of central banks worldwide are exploring the possibilities of CBDCs, with 14% already implementing pilot projects. The advantages of CBDCs include lower transaction costs, improved macroeconomic data collection, and enhanced transparency of financial flows. However, challenges remain concerning the impact of CBDCs on monetary policy and the necessity of establishing a unified regulatory framework. Interest in CBDCs has been increasing due to their role in modernising payment systems and improving financial stability. I. Shevchenko (2023) investigated this subject, highlighting the advantages and disadvantages of CBDCs and their influence on digital commerce and monetary policy. The author identified three main areas of CBDC utilisation: value preservation, payment systems, and credit leverage. However, research gaps persist, particularly in relation to the effects of CBDCs on financial stability and monetary policy and the need to ensure adequate protection for investors and consumers.

In the broader study of CBDCs, particular attention is given to their economic impact and demand among businesses and the general public. M. Khutorna *et al*. (2021) explored different models for implementing CBDCs, identifying key determinants of their adoption, including economic, social, and legal factors. Nevertheless, critical issues such as cybersecurity, financial stability, monetary policy implications, and a comprehensive regulatory framework remain insufficiently addressed. The low level of trust in CBDCs due to their novelty and the lack of sufficient experience in many countries complicates their implementation. V.O. Kornivska (2023) examined this aspect, focusing on the institutional factors influencing the adoption of CBDCs. The author noted that a high level of trust in the national currency and a stable monetary policy are essential conditions for the success of CBDCs. However, the effects of digital currencies on financial stability and socio-economic aspects remain underexplored, necessitating further research.

In the digital economy, particularly in Ukraine, there is an urgent need to address the digitalisation of key economic sectors and the development of appropriate infrastructure. E. Dovgal *et al*. (2021) analysed the opportunities and risks associated with the digitalisation of the economy of Ukraine. The authors highlighted that digital transformation has the potential to create new jobs, reduce unemployment levels, and facilitate integration into global economic trends. Nonetheless, issues such as cybersecurity, reducing dependence on imported equipment, and ensuring regulatory oversight of the digital economy remain insufficiently studied. The implementation of CBDCs faces

challenges related to regulation, integration into existing financial systems, and the maintenance of monetary stability. E. Moch (2024) analysed the strategies of China, Sweden, and the United States in adopting CBDCs. The author noted that China is actively implementing the digital yuan (e-CNY) to enhance payment system efficiency and financial inclusion, Sweden is developing the e-krona due to the decline in cash usage, while the United States remains focused on research, considering the global role of the US dollar. However, gaps persist in understanding the impact of CBDCs on banking system structures, cybersecurity, and the international financial order, necessitating further examination.

The digitalisation of financial systems has become a key area of development (Gulaliyev *et al.*, 2023). E. Llazo *et al*. (2024) examined digitalisation trends in financial systems across various countries, highlighting the importance of integrating financial innovations such as fintech, blockchain, and cryptocurrencies. The authors pointed to the increasing share of electronic transactions and the growing use of digital technologies, particularly in developing countries such as Kyrgyzstan. However, the effects of digital technologies on financial market stability, cybersecurity, and the adaptation of regulatory frameworks to contemporary challenges remain insufficiently explored. The purpose of this study was to assess the economic implications of introducing a CBDC to the financial system of Ukraine and identify the key conditions for its effective implementation within the context of global digitalisation. The objectives include analysing international experiences in CBDC introduction and its impact on economic indicators and identifying the main advantages and risks associated with introducing a digital currency in Ukraine, considering the current state of its payment infrastructure and financial technologies.

MATERIALS AND METHODS

The study is analytical, focusing on the assessment of the economic implications of implementing a CBDC in Ukraine. Given that CBDCs represent a rapidly evolving financial instrument, this study also aimed to provide a comprehensive examination of the potential impact of the e-hryvnia on the economic landscape of Ukraine. The study covered the period from 2023 to 2024, allowing for an in-depth analysis of current trends and potential scenarios for the development of the e-hryvnia within the context of global digitalisation. This timeframe facilitated an exploration of how changes in the international economic system, such as the increasing popularity of cryptocurrencies, may influence the implementation of a CBDC in Ukraine. The study includes a thorough analysis of international experiences in implementing CBDCs, drawing on case studies from China, Sweden, the Bahamas, Nigeria, the United States, and the European Union. These countries and regions were selected due to their distinctive approaches to CBDC adoption: China exemplifies large-scale international initiatives, Sweden is moving towards a nearly cashless society, the Bahamas innovates for small economies, Nigeria seeks to address financial inclusion challenges, while the United States and the EU focus on global impact and adaptation to the international financial system. The study relied on academic literature and publications from international organisations that provided detailed insights into the implementation of CBDCs in these countries, examining their economic, social, and technological dimensions. To assess Ukraine's preparedness for the implementation of a digital currency, an analysis was conducted of official publications by the National Bank of Ukraine (Growth of payment infrastructure…, 2024; The second year…, 2024), which outlined pilot projects and conceptual frameworks for the launch of the e-hryvnia. These publications provided valuable data on the preparatory stages and infrastructure required for the successful implementation of the e-hryvnia in Ukraine. The collected data encompassed not only financial infrastructure but also Ukraine's payment systems, including the volume of cashless transactions, the number of payment cards in circulation, and other indicators reflecting the level of digitalisation in the country's payment infrastructure.

The methodology included content analysis and comparative analysis. Content analysis was employed to examine studies, official publications by central banks, and reports from international organisations regarding CBDC implementation in various countries. This method enabled the systematic classification of different approaches to CBDC development and adoption, identifying the technological, economic, and social factors influencing its implementation. The analysed publications were carefully reviewed to determine the key success factors and challenges associated with digital currency deployment. Moreover, comparative analysis was applied to assess Ukraine's readiness for CBDC implementation, particularly by evaluating pilot projects and concepts developed by the National Bank of Ukraine. Comparing financial infrastructure and payment system data allowed for an assessment of the degree of digitalisation in the payment systems of Ukraine and their capacity to integrate emerging financial technologies.

RESULTS

The role of central bank digital currencies in the global economy

CBDCs have become one of the key topics in global financial innovations as they offer new opportunities for ensuring stability, inclusivity, and efficiency within financial systems. The development of financial technologies and the growing popularity of cryptocurrencies have driven countries to explore and implement CBDCs as an official form of digital money. Unlike private cryptocurrencies, which operate outside of centralised regulation, CBDCs are aimed at supporting the existing monetary system by ensuring value stability and control over the money supply.

Their status as an official means of payment issued by a central bank is one of the main characteristics of CBDCs. They differ from cryptocurrencies such as Bitcoin or Ethereum, which lack state support and are often subject to market fluctuations due to this lack of backing. Central banks can regulate money circulation, maintain macroeconomic stability, and ensure the security of financial transactions through the central control they provide. Cryptocurrencies, on the other hand, have a decentralised nature, granting users more freedom but also creating risks of financial loss due to cyber threats or market instability (Dionysopoulos *et al.*, 2024).

Support for the effectiveness of monetary policy is a key task of CBDCs. Digital currencies allow central banks to regulate liquidity more precisely and respond swiftly to

changes in financial markets. For example, CBDCs could be used to automate the distribution of social benefits, stimulating the economy during times of crisis. However, due to their volatility, private cryptocurrencies cannot serve as a useful tool for monetary policy, limiting their impact on macroeconomic processes (Spytska, 2023). Moreover, there is much to discuss regarding the role of CBDCs in ensuring financial stability. Since most modern financial systems are based on trust in government institutions, CBDCs could enhance this trust by providing transparency and reducing risks associated with the shadow economy. For instance, digital currencies could help prevent money laundering, tax evasion, and other illegal financial activities. However, private cryptocurrencies are rarely used for such purposes due to their decentralised nature, which creates additional challenges for regulators (Ishchuk & Ishchuk, 2023).

CBDCs are already being implemented by many countries around the world, including China, Sweden, and the Bahamas. Retail and wholesale models, which have different economic and social implications, are among the various approaches that central banks are considering for creating their models. While the wholesale model of CBDC is aimed at optimising interbank settlements, the retail model is designed to provide broad accessibility for citizens. These models demonstrate different strategic priorities of countries and show the flexibility of CBDCs in addressing specific problems within each economy (Khutorna *et al*., 2021).

The implementation of CBDCs is a response to the modern challenges of digitalisation and the increasing role of financial technologies in the global economy. The need to modernise payment infrastructure is the primary motivator for creating CBDCs. There is a need to establish a reliable, universal, and accessible payment method in response to the growing popularity of mobile payments and electronic wallets. CBDCs can offer the convenience and speed characteristic of private cryptocurrencies but without their risks of volatility or inadequate regulation.

An important aspect of CBDCs is their role in enhancing financial inclusion. In many countries, a significant proportion of the population lacks access to banking services, which restricts their economic participation. Through CBDCs, central banks can establish a direct channel for financial services accessible to all citizens, thereby reducing reliance on intermediaries and stimulating economic growth (Tan, 2023). For example, in countries with underdeveloped banking infrastructure, such as Nigeria, CBDCs could serve as an effective tool for expanding financial accessibility.

Despite these advantages, CBDCs face several challenges. One of the most significant risks is the potential transfer of deposits from commercial banks to CBDCs, which could undermine the existing banking system. If citizens choose to store their funds in CBDCs rather than in bank deposit accounts, this may lead to a reduction in the volume of credit that banks can offer, thereby diminishing economic activity. To mitigate this risk, central banks may impose limits on the amount of CBDCs individuals are allowed to hold. Ensuring cybersecurity is another critical issue. As CBDCs operate within a digital environment, they are vulnerable to cyber threats such as hacking attacks and disruptions to payment system infrastructure. Central banks must invest in advanced data protection technologies and establish backup systems to minimise the risk of financial or data losses (4 key cybersecurity threats..., 2021).

A comparison with private cryptocurrencies highlights the role of regulation. Private cryptocurrencies, such as Bitcoin and Ethereum, operate without centralised oversight, which absolves states of responsibility for their regulation. This creates financial stability risks, as the volatility of such assets may result in market fluctuations and loss of investor confidence. In contrast, CBDCs are controlled by central banks, ensuring stability and reducing economic risks. CBDCs also impact international transactions. They have the potential to reduce the cost and time required for cross-border payments, which play a crucial role in the global economy. By eliminating intermediaries such as correspondent banks, CBDCs can streamline international trade and financial exchanges. This is particularly relevant for countries that engage extensively in global commerce. Table 1 presents a comparison of key characteristics between CBDCs and private cryptocurrencies, specifically in terms of their issuer, regulatory framework, value stability, and role in the economy.

Table 1. Comparison of characteristics of CBDCs and private cryptocurrencies

Characteristic	CBDCs	Private cryptocurrencies
Issuer	Central bank	Private companies or decentralised systems
Regulation	Subject to state oversight	No centralised control
Value stability	High, supported by the state	Dependent on market volatility
Role in monetary policy	Instrument for managing money supply	No direct impact on monetary policy

Source: compiled by the authors based on M. Khutorna *et al.* (2021), O. Oliinyk (2024)

Table 1 highlighted the fundamental differences between CBDCs and private cryptocurrencies, emphasising the advantages of CBDCs in terms of monetary policy and financial stability. Unlike private cryptocurrencies, which are characterised by volatility and a lack of centralised regulation, CBDCs ensure value stability, government oversight, and can serve as an effective tool for managing the money supply. These features position CBDCs as a promising solution for modernising financial systems and enhancing trust in state institutions within the global economy.

International experience in implementing digital currencies: successes and challenges

CBDCs are emerging as a crucial instrument in modernising financial systems across numerous countries. They offer the potential to reduce transaction costs, enhance transparency, and promote financial inclusion. Each country approaches the implementation of CBDCs according to its own economic, technological, and social context. However, this process is accompanied by challenges. The approach of China to CBDC implementation, particularly through

the introduction of the digital yuan (e-CNY), illustrates the integration of domestic economic priorities with global strategic objectives. The primary aim of this initiative is to improve the payment infrastructure of the country, increase access to financial resources, and strengthen the influence of China in the international financial system. The People's Bank of China issues the currency, while authorised intermediaries, such as commercial banks and fintech companies, manage its distribution through a two-tier operational system. This structure ensures scalability while maintaining centralised control. One of the key features of e-CNY is its potential application in trade and cross-border payments. The involvement of China in the mCBDC Bridge project, which connects multiple central banks, aims to optimise and reduce the costs of international transactions.

From a strategic perspective, e-CNY has the potential to reduce reliance on the US dollar in global financial settlements. Moreover, the concept of "controlled anonymity" in e-CNY is significant, as it safeguards user transaction privacy while allowing state authorities access to data when necessary. This model seeks to balance individual privacy protection with financial system security. Nevertheless, it has also attracted criticism for the risks associated with excessive state oversight. Despite notable achievements, the implementation of e-CNY faces several challenges. Expanding the payment infrastructure requires substantial investment, while increasing user adoption necessitates improved financial literacy. Furthermore, the global expansion of e-CNY may raise concerns among other nations regarding the growing economic influence of China. These factors require careful consideration in future digital currency strategies (Wang, 2022).

Sweden is among the first countries actively pursuing the implementation of a CBDC, known as the e-krona. This initiative is driven by a substantial decline in cash usage and the widespread adoption of cashless payments. The Swedish central bank (Riksbank) initiated the development of the e-krona to ensure continued accessibility to payment services, particularly for individuals who are unable to utilise conventional banking services due to geographical or technological barriers. A distinctive feature of Sweden's approach is a high level of digitalisation and financial literacy. Over recent years, the proportion of transactions conducted in cash has declined from 40% to 13%. This trend is supported by the widespread use of mobile payment applications and online banking. The Swedish government also set ambitious goals to position the country among the global leaders in the effective use of digital technologies (Ozturkcan *et al.*, 2019).

The objective of the e-krona project is to address several critical challenges. Even if the use of cash is further reduced, e-krona makes digital payments accessible to everyone. Through this digital currency, the state establishes an alternative payment instrument that operates continuously, thereby enhancing the resilience of the financial system. However, Sweden faces several challenges in adopting the e-krona. The most noteworthy issue is the technical integration of the new payment system with existing financial platforms. In addition, there are concerns that a complete transition away from cash could hinder certain groups, such as the elderly, from accessing financial services due to limited technological literacy. As the Swedish e-krona is regarded as a potential model for other nations, Sweden's experience has attracted international interest. The Swedish central bank is actively collaborating with other states and financial institutions to develop universal standards for CBDCs, ensuring that local and global economic needs are considered.

The Sand Dollar, the new CBDC of The Bahamas, represents an innovation designed to enhance financial accessibility in a society where access to conventional banking services is limited. Many Bahamian islands face geographical fragmentation and frequent hurricanes, which pose challenges to financial inclusion. To address these issues and support financial system stability, the Sand Dollar was introduced to reduce reliance on cash transactions. One of its key advantages is its ability to facilitate secure and swift transactions via mobile applications and prepaid cards, allowing customers to make payments even in remote areas. The Central Bank of The Bahamas implemented various transaction limits for different types of wallets, catering to the diverse needs of users: from individuals with lower transaction limits to business wallets with higher thresholds. This approach aims to balance accessibility with regulatory compliance.

Despite its innovative potential, the Sand Dollar faces several challenges. One major issue is its low adoption rate among businesses and the general population, largely due to inadequate public awareness campaigns during its implementation phase. The COVID-19 pandemic further complicated the digital currency's rollout. Moreover, technical limitations and restricted interoperability with international payment systems have diminished its appeal to tourists and foreign users. Moving forward, key priorities for the development of the Sand Dollar should include improving marketing strategies, expanding cooperation with global payment networks, and enhancing transparency in its technical infrastructure to strengthen consumer trust. The central bank must also prioritise educational initiatives aimed at improving financial literacy and raising public awareness of the benefits of digital currency usage. Such measures would not only build trust in the Sand Dollar but also serve as a model for other nations looking to implement CBDCs, particularly in resource-constrained and geographically isolated environments.

The introduction of eNaira in Nigeria is a step towards modernising the country's financial system, which has long struggled with low levels of banking inclusion and the widespread popularity of cryptocurrencies among the youth. On 25 October 2021, the Central Bank of Nigeria officially launched eNaira as part of its financial technology development strategy. The primary objectives of eNaira include reducing the costs of monetary transactions, enhancing transaction transparency, and expanding financial accessibility. By enabling citizens to make payments via digital wallets, eNaira simplifies financial transactions, particularly for individuals in remote areas and within the informal economy. Moreover, the Central Bank of Nigeria gains improved regulatory oversight of financial flows, thereby strengthening monetary policy. eNaira facilitates social welfare payments, improves international remittance efficiency, and increases tax revenues. Nevertheless, the implementation of eNaira in Nigeria encountered numerous obstacles. One of the primary concerns is public distrust

towards the government's initiative, driven by fears of excessive state control and financial surveillance. Many Nigerians perceive eNaira as a potential tool for monitoring financial transactions, which has hindered its widespread adoption (Chukwuere, 2021).

Another challenge is the low level of digital literacy among a substantial portion of the population, which complicates the use of electronic wallets. There are also technical barriers associated with limited access to the Internet and electricity in certain regions of the country. Another issue is the high volatility of Nigeria's currency, the naira, which affects the stability of eNaira. Furthermore, young people who actively engage with cryptocurrencies tend to favour riskier financial instruments due to their potential for rapid wealth accumulation, making eNaira less attractive to this demographic. Despite these challenges, eNaira holds considerable potential for the development of Nigeria's financial sector. To ensure its success, it is crucial to expand information and educational campaigns aimed at fostering public trust and enhancing awareness of the benefits of digital currency. Moreover, the development of a flexible regulatory framework that considers local market dynamics and the integration of eNaira with modern financial technologies will be essential for ensuring its competitiveness.

In the United States, the introduction of a CBDC remains in the research phase. The Federal Reserve is focusing on assessing the impact of a digital dollar on the international financial system and macroeconomic stability. The primary challenges for the United States include maintaining the dominant role of the dollar in the global economy, ensuring cybersecurity, and striking a balance between private financial institutions and state-backed currency (Central bank digital currencies, 2024). The European Union is also actively developing the digital euro project, which aims to strengthen the eurozone's position in international transactions and enhance financial integration among member states. The main challenge for the EU lies in harmonising legal frameworks and ensuring technical compatibility between the financial systems of different countries. Another key task is fostering public trust in the digital euro among citizens accustomed to cash transactions (The digital euro project..., 2023).

Despite substantial progress, the implementation of CBDCs is accompanied by a range of challenges, including technical, financial, legal, and social considerations. Central banks must address issues related to scalability, cybersecurity, and interoperability with existing systems. A crucial objective is the establishment of a regulatory framework that ensures effective oversight of digital currencies while preventing their use in illicit financial activities. The development of CBDCs across different countries demonstrates considerable variations in approaches and priorities. In each case, implementation depends on economic conditions, the level of technological infrastructure, and the social needs of citizens. Table 2 summarises the key aspects of CBDC adoption, including innovations, social impact, and the necessary steps for improving the effectiveness of these projects.

Table 2. Additional aspects of implementing CBDC in different countries

Country	Innovations in implementation	Social impact	Next steps
China	Use of e-CNY for cross-border payments via the mCBDC Bridge; two-tier operational system with banks and fintech companies	Expanded access to digital payments for a broad segment of the population; reduction of dependence on the US dollar	Enhancement of financial literacy; expansion of international integration
Sweden	Integration of the e-krona into the existing banking system; ensuring access to payments in the event of a cashless society	Reduction in cash usage to 13%; increased financial inclusion	Bridging of the digital divide among the elderly; strengthening of public trust in digital currency
The Bahamas	Sand Dollar with a multi-tier wallet system adapted for different user groups	Improved access to financial services in remote areas; reduced reliance on cash	Enhancement of the integration with international payment systems; public awareness campaigns to promote the currency
Nigeria	eNaira as a tool for social payments and small business support; mobile electronic wallets for simplified transactions	Increased transparency in transactions; financial inclusion for people in remote areas	Information campaigns to boost public trust; adaptation to international standards
USA	Conducting research to assess the impact of a digital dollar on the global financial system and economic stability	Examination of the potential impact on international transactions; establishment of trust in a new form of currency	Development of a regulatory framework; assurance of cybersecurity
EU countries	Development of a digital euro to strengthen financial integration and improve the efficiency of international transactions	Harmonisation of legal frameworks and financial systems across member states; promotion of public trust in the digital euro	Completion of technical integration; user education initiatives

Source: compiled by the authors

Table 2 highlights the diverse approaches to CBDC implementation across different countries, underlining distinct objectives and challenges. Innovations such as cross-border payments in China and banking system integration in Sweden demonstrate the flexibility of CBDCs in addressing local and international financial issues. The key achievements of these projects include their social impact, particularly in reducing reliance on cash and expanding financial accessibility. However, for CBDCs to succeed, it is essential to address existing challenges, including

technical integration, building user trust, and harmonising regulatory frameworks. Overcoming these obstacles will enhance the global effectiveness of such initiatives.

The e-hryvnia pilot project: prospects and challenges for Ukraine

The concept of the e-hryvnia, a digital currency proposed by the National Bank of Ukraine, represents a step towards modernising the financial system of the country. The e-hryvnia is designed to provide a secure, innovative, and efficient payment method that aligns with global trends in the development of CBDCs. The project's development began in 2016, with the first pilot programme launched in 2018. The National Bank continues to refine the e-hryvnia concept, considering the results of pilot testing and international experience. Ukraine has a well-developed cashless payment infrastructure, encompassing contactless and tokenised cards, mobile payment systems, and internet banking. These factors create favourable conditions for the successful implementation of digital currency. However, the project requires modernisation of the existing financial infrastructure and substantial investment to ensure its effectiveness (Maslov, 2023). The e-hryvnia is intended to serve as an alternative to conventional payment instruments, offering a simpler, faster, and more secure method of conducting transactions. Reducing the number of intermediaries in payment processes is expected to lower transaction costs while enhancing the speed and transparency of financial settlements (Kredina *et al.*, 2022). The introduction of the e-hryvnia could also optimise business processes within the banking sector and strengthen financial stability.

However, the project is accompanied by numerous challenges. One of the primary tasks is establishing a robust legal framework for regulating the use of the e-hryvnia, which would help prevent cybercrime and mitigate financial security risks (Studinski & Studinska, 2023). The choice between a centralised and decentralised model for the e-hryvnia represents another strategic decision that must account for the specific characteristics of Ukraine's financial system. In addition, integrating the e-hryvnia into the existing financial ecosystem requires consideration of consumer habits and efforts to familiarise the public with this new form of currency (Tyshchenko & Tyshchenko, 2024). A successful implementation has the potential to position Ukraine as a leading country in the field of digital currencies on the international stage. The digital currency, particularly the e-hryvnia project being developed by the National Bank of Ukraine, has the potential to transform the country's monetary policy. The implementation of the e-hryvnia could constitute a crucial step in the context of global digitalisation and the advancement of financial technologies, influencing Ukraine's economic stability and financial infrastructure (Kyrychok *et al.*, 2023).

Digital currency may enhance the effectiveness of monetary policy. By enabling the accrual of interest on digital currency, the National Bank of Ukraine would gain a novel tool for achieving its objectives, such as controlling inflation and stabilising the economy. This could strengthen the interest rate channel of monetary transmission, allowing the central bank to exert more effective influence over the money supply and credit activity within the country. For instance, in cases where inflationary pressures need to be mitigated, the National Bank of Ukraine could increase interest rates on the e-hryvnia, thereby encouraging savings and reducing consumer demand. The introduction of the e-hryvnia could lower transaction costs for market participants. This would contribute to a reduction in the proportion of cash payments within the economy and foster the development of cashless transactions. A decline in payment processing costs would have a positive impact on the overall financial stability of the country by easing the burden on the banking system and facilitating greater access to financial services for the population.

Another crucial aspect is the enhancement of transparency in financial transactions. Digital currency would ensure greater visibility of transactions, aiding efforts to combat money laundering and other financial crimes. This increased transparency could also foster greater trust in the national currency and strengthen its role in international settlements. Citizens would gain confidence in the security of their financial transactions, knowing they are safeguarded and monitored by state authorities. Furthermore, the introduction of the e-hryvnia could serve as a catalyst for innovation within the financial sector. The utilisation of smart contracts and other technological solutions would enable the optimisation of payment processing and the development of new opportunities for financial institutions. This could lead to the emergence of novel business models and services tailored to the needs of the modern consumer (Makarov & Arzhevitin, 2022).

However, the introduction of digital currency also presents certain risks. Appropriate regulation is required to mitigate potential negative consequences, such as excessive volatility or security threats. The National Bank of Ukraine must consider these factors when developing the e-hryvnia concept. For instance, ensuring a high level of cybersecurity is crucial for protecting user data and preventing fraud. Digital currency has the potential to transform Ukraine's monetary policy, enhancing its efficiency and transparency. However, for successful implementation, it is essential to thoroughly analyse all aspects, including risks and challenges, to ensure the stability and security of the country's financial system. Engaging the public in discussions regarding digital currency innovations is vital to securing its acceptance and support among the population. Only through such an approach can the e-hryvnia project be successfully implemented, strengthening Ukraine's position in the context of global digitalisation.

Between 2023 and 2024, Ukraine witnessed an increase in the volume of cashless transactions alongside improvements in its payment infrastructure, creating favourable conditions for the introduction of the e-hryvnia digital currency. In 2023, the number of transactions made using payment cards reached 7.91 billion, with a total value of UAH 6.14 trillion. During the first nine months of 2024, transaction volume increased to 6.4 billion, with a total value of UAH 4.79 trillion, reflecting a 7.72% rise in the number of transactions and a 4.45% increase in transaction value compared to the same period in 2023 (The second year…, 2024; Interim results…, 2025).

The share of cashless transactions in total payments has shown a consistent upward trend. In 2023, it accounted for 93.5% in terms of transaction volume and 65% in terms of transaction value (Growth of payment

infrastructure, 2024). By 2024, these figures had risen to 94.5% and 64.81%, respectively, indicating a continued decline in the use of cash. Among cashless transactions, in-store payments remained dominant, accounting for over 73% of total transactions and 45.7% of transaction value in 2024. Card-to-card transfers represented 32.2% of transaction value, while online payments for goods and services accounted for 14.4% (The second year..., 2024). In 2023, 115.1 million payment cards were issued in Ukraine, of which 52.1 million were actively used for spending transactions. In 2024, the number of cards in circulation increased by 6% to 122 million, with 54 million remaining active. Over 60% of active cards are contactless, while tokenised cards now account for more than 27% (How many payment..., 2024).

The development of payment infrastructure has also demonstrated positive dynamics. In 2023, the number of POS terminals stood at 449.5 thousand, rising by 9% to 512.9 thousand in 2024. The ATM network remained stable at approximately 15.8 thousand machines. Furthermore, the highest concentration of payment infrastructure is in the Kyiv, Dnipropetrovsk, Odesa, Kharkiv, and Lviv regions, which together account for 48.38% of all devices (The second year, 2024). Particularly noteworthy is the increasing use of NFC technology. In 2024, over 56% of all transactions conducted via payment terminals were made using smartphones and other NFC-enabled devices. Contactless cards accounted for an additional 37.8% of transactions, while transactions involving physical card insertion constituted only 5.8%. Ukrainian-issued payment cards have also exhibited significant activity abroad. In 2024, a total of 252.2 million transactions, amounting to UAH 257.1 billion, were conducted outside Ukraine. Although the total value of overseas transactions declined by 6.95%, the number of transactions increased by 2.19%, indicating sustained demand for card-based payments among Ukrainians residing abroad.

The data from 2023-2024 indicate an increase in the popularity of cashless transactions in Ukraine. This trend is driven by the progressive digitalisation of the financial system and the population's adaptation to emerging payment technologies. Ukraine's readiness for the implementation of digital currency is underscored by the continuous development of its payment infrastructure, the growing use of contactless and tokenised cards, and an increasing integration with international markets. These trends reflect an enhancement in financial transparency, a reduction in dependence on cash, and the banking system's ability to address contemporary challenges. By ensuring Ukraine's competitiveness on the global stage and strengthening public trust in the national financial infrastructure, such developments foster innovation in the financial sector.

The introduction of the e-hryvnia represents a strategic step, necessitating careful consideration of national realities and international experience. An analysis of successful CBDC implementations in countries such as China, Sweden, the Bahamas, and Nigeria provides valuable insights for the development of an effective strategy. These cases highlight the importance of a comprehensive approach, from pilot testing to long-term monitoring of implementation outcomes. One of the critical steps in this process is the formulation of a clearly defined e-hryvnia implementation strategy accounting for social, technical, and economic factors. For instance, when China launched the e-CNY, its priorities included strengthening payment infrastructure, enhancing monetary regulation, and integrating the digital currency into international transactions. Ukraine must establish clear objectives, such as reducing financial transaction costs, increasing financial inclusion, and decreasing cash usage. These objectives should be reflected in a detailed implementation framework outlining specific phases and timelines for execution.

Pilot testing of the e-hryvnia is also of paramount importance. China's experience demonstrates that a multi-stage pilot programme can be successfully deployed across regions with differing economic characteristics. To accommodate local needs and optimise the functionality of the e-hryvnia, Ukraine should conduct pilot projects in various regions, including urban and rural areas. This approach would help identify potential organisational and technical challenges at an early stage. The development of payment infrastructure represents another crucial element. Sweden's e-krona project highlights the importance of ensuring that payment terminals and modern financial technologies are accessible even in the most remote areas. Expanding the network of POS terminals, supporting NFC-enabled payments, and facilitating Internet banking access in underserved regions should be a government priority. Particular attention must be given to ensuring that all citizens have equitable access to digital financial services.

The involvement of commercial banks and fintech companies in the implementation of the e-hryvnia is of critical importance. Nigeria's experience with the eNaira demonstrates that the private sector plays a pivotal role in driving adoption among the population. The National Bank of Ukraine should actively engage with commercial financial institutions, encouraging them to integrate the e-hryvnia into their operational and payment systems. Such collaboration would accelerate the acceptance of the digital currency and expand its reach within the financial ecosystem. One of the most significant challenges in implementing a digital currency is cybersecurity. The example of the Bahamas with their Sand Dollar underscores the importance of ensuring transparency in financial transactions and the protection of user data. Ukraine must adopt state-of-the-art data protection systems, incorporating data encryption, multi-factor authentication, and regular security audits. These measures will enhance trust in the new currency and mitigate fraud risks.

Another crucial element is the legal framework. In developing the digital euro, which may serve as a model for Ukraine, the European Union has been actively working on legislative alignment. Clear regulations governing the use of the e-hryvnia should address its legal status, usage policies, and data protection mechanisms. Establishing a well-defined regulatory structure will foster public confidence in this new financial instrument and ensure transparency. Furthermore, public awareness of the benefits of the e-hryvnia represents a critical step in its adoption. The Ukrainian government should launch an information campaign to promote the advantages, security, and convenience of digital currency. Engaging financial experts and leveraging social media and conventional media channels will help disseminate knowledge about the digital currency. The technical integration of the e-hryvnia with

international payment systems could also provide a competitive advantage. Participation in global initiatives, such as China's mCBDC Bridge, illustrates the potential for optimising cross-border transactions. Ukraine should strive to integrate the e-hryvnia with international payment platforms, facilitating its use beyond national borders, particularly among Ukrainians residing abroad.

Continuous monitoring and evaluation of the digital currency's implementation must be ongoing. Regular assessments of its effectiveness and user experience studies will enable policymakers to adjust the strategy and address potential shortcomings. This approach will ensure system flexibility and contribute to its long-term improvement. The successful implementation of digital currencies in other countries demonstrates that their adoption is feasible only when tailored to national needs. Ukraine has the potential to emerge as a leader in digital currency innovation, offering its citizens enhanced financial services, reinforcing economic stability, and strengthening its position on the global stage.

DISCUSSION

CBDCs represent one of the key innovations in the modern financial system, attracting the attention of researchers worldwide. This study examines the prospects for the implementation of the e-hryvnia in Ukraine, focusing on its impact on economic stability and the country's payment infrastructure. To enhance the understanding of global trends, the study draws comparisons with existing research, particularly regarding the influence of CBDCs on the international financial system. The study by S. Prodan *et al*. (2024) focused on global trends, challenges, and opportunities associated with the introduction of CBDCs, particularly in relation to sustainable development, technological adoption, and integration with the "green" financial system. Both studies highlight the importance of payment infrastructure development, security, and legal regulation for the successful implementation of CBDCs. However, while S. Prodan *et al*. (2024) emphasised global aspects, such as sustainable development and the reduction of economic inequality, the present study concentrated on localised factors, particularly the implementation of the e-hryvnia in Ukraine. The researchers provided a broader analysis of international experiences with CBDC adoption, whereas current study conducted a detailed examination of the e-hryvnia's impact on the financial system of Ukraine. A key area of overlap is financial inclusion, though S. Prodan *et al*. (2024) placed greater emphasis on global trends, while this study focuses on regional challenges.

The study by B. Li (2024) examined the technical and strategic aspects of digital currency adoption by the People's Bank of China, specifically the Digital Currency Electronic Payment (DCEP) system. The author provided a comprehensive analysis of the two-tier operational system, which combines centralised control with flexibility and highlights the role of 'controlled anonymity' in enhancing transaction security and combating financial crime. However, the primary focus of the study was on the potential of DCEP to reduce transaction costs, improve payment efficiency, and expand financial inclusion, particularly in rural areas. In contrast, the present study analysed the implementation of the e-hryvnia, with a focus on national challenges, such as the need for regulatory modernisation and the promotion of digital currency adoption among the population. While the Ukrainian project aimed to address domestic payment infrastructure issues, the Chinese initiative is actively engaged in global projects such as the mCBDC Bridge. Despite these differences, both studies underscore the fundamental role of infrastructure in the successful deployment of CBDCs.

The study by A. Alqarni (2024) focused on the role of digital currencies in international trade, highlighting both opportunities and challenges. Both studies acknowledged the benefits of digital currencies, including reduced transaction costs, faster settlement times, and enhanced financial inclusion, yet they differ in emphasis. A meta-analysis conducted by A. Alqarni (2024) underscored the impact of digital currencies on small and medium-sized enterprises in international trade, whereas the present study focused on macroeconomic effects and the stabilisation of Ukraine's financial system. Both studies stressed the importance of legal frameworks and security; however, A. Alqarni (2024) highlighted the harmonisation of regulatory standards for international trade. The technological aspect in the study placed greater emphasis on blockchain solutions to ensure transparency, whereas the present study examined the integration of the e-hryvnia into the payment infrastructure.

The study by D. Horváth (2023) focused on the social aspects of CBDC implementation, highlighting the importance of educational campaigns and cultural adaptation to new technologies. The researcher employed qualitative research methods, such as interviews and expert discussions, whereas, in the Ukrainian context, quantitative data from national statistics play a key role. This contrasts with the present study, which centred on economic challenges, particularly the modernisation of Ukraine's financial infrastructure. Despite these differences, both studies reach similar conclusions regarding the significance of transparency and financial inclusion. In the study by G. Akybayeva *et al*. (2024), the primary focus was on the global context of CBDC adoption. The authors examined case studies from Brazil and China, analysing the potential of digital currencies to reduce transaction costs, accelerate payments, and enhance transparency. A key proposition in their work is the introduction of CBDCs as an alternative to crypto assets, which, according to the authors, do not meet contemporary economic requirements. In contrast to the global perspective presented by the authors, the present study focused on the local aspects of e-hryvnia implementation, considering the specific characteristics of the Ukrainian economy.

The study by S. Alam *et al*. (2022) explored digital currencies, their impact on financial systems, and the challenges of implementation across different countries. It devoted considerable attention to the prospects and challenges of introducing the digital rupiah in Indonesia, including its impact on the banking system, decentralisation, technological barriers, and transparency concerns. In particular, authors emphasised the necessity of a robust technological infrastructure to support the digital rupiah. Moreover, their study focused on the conflict between centralised and decentralised currencies, whereas the present study is more concerned with the examination of a specific national digital currency project and its potential effects on monetary policy and economic stability. They also underscored the risk

of disintermediation and possible transformations within banking architecture. A key similarity between both studies is the recognition of the need for a reliable legal framework for digital currencies. However, S. Alam *et al*. (2022) devoted more attention to cryptocurrency regulation and its implications for financial stability.

When discussing the findings of N.E. Egbuna (2022) in comparison with the present study, it is important to note the differing approaches to analysing the impact of digital currencies. The author examined the case of the eNaira in Nigeria, illustrating an approach to financial inclusion in developing countries. In contrast, the present study draws on international experience to adapt innovations to the Ukrainian context. Both studies acknowledged that CBDCs have the potential to enhance transaction transparency, promote financial inclusion, and reduce operational costs. This approach provides a more balanced perspective on the opportunities and challenges of CBDCs by integrating global insights with local considerations.

The study by Y. Fu (2023) focused on the e-CNY, its strategic role in China's financial system, its potential to reduce the dominance of the US dollar, and the integration of blockchain technologies. Y. Fu (2023) explored the development of a two-tier system that combines blockchain technology with centralised control, which could be adapted to the Ukrainian context to enhance cashless transactions. The author advocated for blockchain as a foundational technology to ensure the security and efficiency of transactions. Both studies underscored the importance of digital currencies in the transformation of the global financial landscape. A common feature is their emphasis on the necessity of integrating new technologies to strengthen financial stability and transparency.

The study by O. Castrén *et al*. (2022) examined the global implications of CBDC implementation for financial systems, focusing on financial network modelling and structural changes in the banking sector. The authors analysed macroeconomic indicators such as inflation and interest rates, noting that one of the key advantages of CBDCs lies in reducing dependence on commercial banks, thereby contributing to financial stability. In contrast, the present study concentrates on the local aspects of e-hryvnia a doption, such as the modernisation of payment infrastructure, the enhancement of monetary policy efficiency, and the expansion of financial inclusion. This allows for a deeper understanding of national challenges, in contrast to the more theoretical approach of O. Castrén *et al*. (2022) which is oriented towards global comparisons. Both studies concur on the importance of CBDCs in improving financial systems. X. Gao (2024) examined the advantages of digital currencies, such as high efficiency and low transaction costs, which can reduce expenses and improve accessibility in international payments. The author focused on a general analysis of the international use of digital currencies, highlighting their potential in global trade relations. Both studies emphasised challenges such as technical security concerns and regulatory oversight. However, while both studies recognised the potential of digital currencies, X. Gao (2024) focused on their global impact, while this study analysed their national adaptation.

The study by M. Ge (2022) and the present research concurs on the importance of digital currencies as a tool for modernising financial systems. Both highlighted the need to establish a clear legal framework to ensure transaction transparency and security. They also acknowledged the role of digital currencies in reducing the costs associated with cash circulation and enhancing financial inclusion. The study by J. Müller & Á. Kerényi (2022) explored the impact of CBDCs on the global financial system, focusing on their role in ensuring financial stability, monetary policy, and global competitiveness. Particular emphasis is placed on the interaction between digital versions of the US dollar, the euro, and the yuan and the regulatory challenges associated with digital currencies. The researchers highlight that CBDC implementation may reduce financial transaction costs, enhance transparency, and integrate the international financial system. However, it also presents risks to the banking sector, particularly the potential diminishing of the role of commercial banks as intermediaries. A shared aspect between the two studies is the recognition of CBDCs' potential in transforming financial systems. Both studies examined the importance of integrating digital currencies into national and international financial frameworks, emphasising their advantages, such as cost reduction and increased transparency. The study confirmed the importance of infrastructure development, regulatory frameworks, and financial inclusion for the effective implementation of CBDCs. While most studies underline common themes, such as the necessity of technological support and legal regulation, the local contexts of CBDC adoption may vary depending on national conditions and priorities.

CONCLUSIONS

The introduction of the National Bank of Ukraine digital currency (e-hryvnia) holds potential for modernising the economy of the country and strengthening its position in the international financial environment. The analysis of international experiences, including those of China, Sweden, the Bahamas, and Nigeria, highlighted the advantages of digital currencies in promoting financial inclusion, reducing transaction costs, increasing transparency, and integrating modern technologies into financial infrastructure. Nevertheless, Ukraine must consider national specificities, particularly the need to establish a legal framework, enhance cybersecurity, and modernise its payment infrastructure. The dynamics of the payment system of Ukraine development indicate its readiness for the introduction of a digital currency. In 2023, the country recorded 7.91 billion cashless transactions, amounting to a total of UAH 6.14 trillion. In the first nine months of 2024 alone, the number of transactions reached 6.4 billion, with a total value of UAH 4.79 trillion, representing a 7.72% increase in transaction volume and a 4.45% rise in transaction value compared to the same period in 2023. The share of cashless transactions in total payments rose to 94.5% by volume and 64.81% by value in 2024. These trends confirm the decreasing reliance on cash within the economy of Ukraine.

The implementation of the e-hryvnia will enhance the effectiveness of monetary policy by introducing new instruments, such as interest rates on digital assets. This will enable more effective management of the money supply, stimulate economic growth, reduce inflationary risks, and improve access to financial services. In addition, digital currency will reduce the volume of cash transactions,

thereby increasing financial transparency, curbing the shadow economy, and strengthening trust in the national currency. The integration of the e-hryvnia into the financial ecosystem of Ukraine will necessitate an expansion of the payment infrastructure. In 2024, the number of POS terminals increased by 9%, reaching 512,900, demonstrating a high level of business adaptation to modern payment technologies. Furthermore, over 60% of active payment cards in Ukraine are contactless, while the proportion of tokenised cards has exceeded 27%. These indicators confirm the readiness of the country to implement innovative financial solutions.

Despite these positive trends, the project faces several challenges. Among them is the need to establish a regulatory framework governing the use of the e-hryvnia and ensure a high level of cybersecurity to protect user data and prevent fraud. Public awareness campaigns aimed at improving financial literacy and engaging experts in discussions on digital currencies will contribute to fostering trust in this innovation. Based on this analysis, the introduction of the e-hryvnia represents a strategically significant step for Ukraine, enabling the modernisation of the financial system, strengthening economic stability, enhancing competitiveness, and fostering innovative development. For the project to succeed, it is essential to consider international experience, the specific characteristics of the national economy, and the social needs of the population. Only a comprehensive approach, including infrastructure modernisation, the establishment of a legal framework, and public outreach, will ensure the effectiveness of the e-hryvnia and its acceptance within society. Further research should include a more thorough development of the legal and regulatory framework for the e-hryvnia.

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Перспективи впровадження цифрової валюти Національного банку України в умовах глобальної діджиталізації

Анотація. Метою даного дослідження було оцінити економічні наслідки впровадження цифрової валюти центрального банку України (е-гривні) в умовах глобальної діджиталізації. Дослідження охоплювало період з 2023 по 2024 роки. Методологія дослідження включала аналітичний підхід, що базувався на порівнянні міжнародного досвіду впровадження цифрових валют, зокрема у Китаї, Швеції, Багамських островах, Нігерії, США та Європейського союзу. Під час дослідження було вивчено пілотні проєкти, стратегії та концепції, розроблені для запуску е-гривні, а також рівень цифровізації фінансової інфраструктури України. Основними результатами дослідження стало визначення ключових аспектів, що впливають на успішне впровадження цифрових валют в економіку різних країн. Зокрема, аналіз показав, що країни, які активно інтегрують цифрові валюти, намагаються вирішити питання технологічної, економічної та соціальної готовності до таких змін. Також було визначено, що впровадження е-гривні в Україні може бути обґрунтованим і ефективним, якщо врахувати технічні та економічні умови, що сприятимуть її успішній інтеграції в національну фінансову систему. Динаміка розвитку платіжної системи України демонструє наскільки вона готова до впровадження цифрової валюти. У 2023 році було проведено 7,91 млрд безготівкових операцій на загальну суму 6,14 трлн грн, а в 2024 році за перші дев'ять місяців операції досягли 6,4 млрд грн із сумою 4,79 трлн грн, що свідчить про приріст на 7,72 % за кількістю та 4,45 % за обсягом порівняно з аналогічним періодом 2023 року. У 2024 році відсоток безготівкових операцій у загальному обсязі платежів зріс до 94,5 % за кількістю та 64,81 % за сумою. Висновки дослідження показують, що для успішного впровадження цифрової валюти в Україні необхідно продовжувати вдосконалювати платіжну інфраструктуру та реалізувати заходи щодо забезпечення безпеки та прозорості фінансових транзакцій

Ключові слова: грошові операції; платіжна система; платежі; макроекономічна стабільність; монетарна політика