KAPITEL 4 / CHAPTER 4 [4]
FORMULATING THE CONCEPT OF FINANCIAL SECTOR DIGITALIZATION: A THEORETICAL AND PRACTICAL ANALYSIS OF THE EU AND UKRAINE

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Introduction

The digital transformation of the financial sector is a key trend in the current stage of economic development, both in Ukraine and worldwide. It is driven by the need to increase the efficiency, transparency, speed, and accessibility of financial services, as well as the aspiration for sustainable development in the context of globalization and the digital economy.

The development of fintech, artificial intelligence, blockchain, big data, and other digital technologies is fundamentally changing the traditional business models of financial institutions. These technologies contribute to the automation of lending, insurance, and investment processes; the reduction of transactional costs; the minimization of risks through the use of intelligent systems for client and transaction assessment; and the expansion of access to financial services, especially in remote and sparsely populated regions.

In the context of post-pandemic economic recovery, digital solutions have become a factor of resilience for banks and insurance companies. Moreover, digitalization increases the demands for cybersecurity, the regulation of digital assets, and the formation of new competencies in the financial market.

For Ukraine, the digital transformation of the financial sector is of particular importance. It contributes to the de-shadowing of the economy and strengthens institutional trust in financial organizations.

The digital transformation of finance is not merely the implementation of new technologies, but a strategic transition to a new model of financial services focused on

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client orientation, sustainability, and efficiency.

4.1. Theoretical Foundations of the financial sector digitalization

The digitalization of the financial sector is a multifaceted process that encompasses the transformation of traditional financial services through digital technologies. It is based both on general economic theories of innovation and digital transformation (табл.1) and on specialized concepts that form the methodological foundation for studying digital changes in the financial system.

Table 1 - Theoretical foundations of digital finance theory

Theory, author	Core concept	Application
1	2	3
The Theory of Innovation, (J.Schumpeter) [1]	It emphasizes the role of technological breakthroughs as a driver of economic development.	In the financial sector, such breakthroughs include online banking, mobile payments, cryptocurrencies, and artificial intelligence.
The Theory of the Information Economy *(G. Stigler*[2], *J. Stiglitz* [3])	It views information as a key resource. In digital finance, those who have access to data and are able to process it efficiently gain a competitive advantage.	Digital finance, favored by FinTech, neobanks, blockchain and IT, allows one to overcome the problems of information asymmetry and reduce the cost of searching for information.
The Theory of Transaction Costs *(O. Williamson* [4]*)*	It explains digitalization as a means of reducing the costs of conducting financial operations through automation, online access, and paperless processes.	Digital finance, favored by FinTech, neobanks, blockchain and IT, allows one to overcome the problems of information asymmetry and reduce the cost of searching for information.
The Platform Theory *(G. Parker, M. Van Alstyne* [5]*)*	The platform economy involves the creation of ecosystems where financial services are delivered through digital platforms that connect customers, banks, and fintech companies.	It considers digital platforms (such as Revolut, PayPal, Monobank) as a new form of organizing financial markets that creates network effects. Digital platforms such as *Diia* in Ukraine integrate tax and financial services for citizens.
Theory of Digital Transformation (E. Stolterman, G. Westerman [6])	The digitalization of the financial sector is part of the broader digital transformation, which involves not only the implementation of technology but also the rethinking of business processes, customer experience, and organizational culture. Theory highlight three key aspects: the implementation of personalized financial services through digital	Banks and fintech companies use AI for personalized offerings, blockchain for transparent transactions, and cloud technologies for scalability. Digitalization of tax administration (e.g., the ProZorro platform in Ukraine) and automation of budget planning.

Theory, author	Core concept	Application
1	2	3
	channels; the automation of transactions, auditing, and analytics; and the creation of new models such as the platform economy and fintech services.	
Theory of Big Data and Analytics [7]	Big data enables the analysis of massive volumes of information to support informed decision-making. In the financial sector, it is closely linked to AI, machine learning, and predictive analytics.	Credit scoring, fraud detection, and forecasting market trends. AI is used to forecast tax revenues (e.g., in Canada) and analyze government spending.
Change Management Theory (J. Kotter) [8]	Kotter (1996) developed a change management model that applies to the digitalization of finance. It includes creating urgency, forming coalitions, and locking in change.	Banks and government agencies are training staff and rebuilding processes to implement AI and cloud technologies. Transition to a digital culture in the public sector, as in Estonia (e-Governance).
The Fourth Industrial Revolution (K. Schwab) [9]	Digitalization is viewed as part of a global shift toward an economy driven by artificial intelligence (AI), the Internet of Things (IoT), blockchain, and big data. AI is used for forecasting budget revenues, while blockchain enhances transparency in public procurement (e.g., Harpia in Brazil). In the financial sector, this is reflected in the development of central bank digital currencies (CBDCs), automated management systems, and fintech innovations.	Examples include the pilot project of the digital euro in the EU and the use of blockchain for smart contracts in trade finance. AI is used for forecasting budget revenues, and blockchain is used to ensure transparency in public procurement (e.g., Harpia in Brazil).

Authoring

The main concepts of digital finance are presented in Table 2.

Table 2 - The main concepts of digital finance

Concept	Core concept
FinTech (Financial Technology).	The use of innovative technologies to improve or completely replace traditional financial services. FinTech includes mobile wallets, crowdfunding, robo-advisors, and cryptocurrencies.
Digital Finance	It encompasses not only FinTech but also the digital transformation of traditional financial institutions (e.g., the implementation of AI, big data, and cloud technologies in banks).
Open Banking	Financial institutions grant access to customer data to third-party providers via APIs. This enhances competition and personalization of financial service. Integration of tax data with banking systems to simplify declarations (e.g., automatic data transmission to tax authorities). Based on the PSD2 Directive [10].

Concept	Core concept
Decentralized Finance (DeFi)	A financial services system based on blockchain technology without intermediaries. DeFi involves the use of smart contracts for lending, exchanging, and investing without banks
Digital Financial Inclusion	A concept aimed at providing access to digital financial services for broad segments of the population, including vulnerable groups, through simplified platforms and mobile technologies.

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Analysis of legislative sources and research of International financial organizations showed the presence of two institutional approaches to defining the essence of digitalization. The European approach involves harmonizing the digital financial environment through legal frameworks (e.g., PSD2, MiCA, DORA) and supporting innovative companies through programs such as Digital Europe. International financial organizations (such as the World Bank, IMF, and OECD) view the digitalization of finance as a tool for achieving sustainable development, enhancing transparency, and combating the shadow economy.

Summarizing the research of McKinsey, Gartner and MIT [11, 12, 13], we can formulate the key principles of digitalization of finance:

1. Customer-centricity. Financial services should be focused on customer needs (personalization, availability through mobile applications).

2. Data integration. Creating unified platforms for analyzing financial data (e.g. integrating banking and tax data).

3. Automation. Using RPA and AI to minimize manual processes.

4. Transparency. Technologies such as blockchain ensure accountability of transactions.

5. Cybersecurity. Protecting customer data and public finances from attacks.

6. Flexibility. Using iterative approaches (agile) to quickly implement innovations.

Thus, the digitalization of the financial sector is based on a strong theoretical foundation and modern concepts that explain its dynamics, tools, and implications. The contemporary financial landscape is shaped at the intersection of technological innovations, economic interests, and social challenges, requiring an integrated,

interdisciplinary approach to the analysis and regulation of digital finance.

4.2. The Practical Analysis of Financial Sector Digitalization

The EU is a global leader in the digitalization of the financial sector, driven by advanced infrastructure, strict regulatory frameworks, and a high level of financial inclusion. According to the European Commission (2024), over 90% of EU residents have access to digital financial services, and IT spending in the financial sector amounts to approximately €100 billion annually [14]. Key focus areas include fintech, digital payments, artificial intelligence, and blockchain.

The EU actively develops legal and regulatory frameworks to support digitalization, including the PSD2 Directive (payment services), GDPR (data protection), and the Digital Finance Strategy (2020) [10, 15, 16]. These measures promote the development of open APIs, cybersecurity, and innovation.

Regulation and digital law are guided by MiCA (2023), which governs the crypto-asset market across 27 EU countries. DORA, which came into force in January 2025, has made cyber resilience mandatory for all financial institutions.

The EU's regulation of crypto-assets through MiCA (Markets in Crypto-Assets Regulation, 2023) is encouraging the development of blockchain technologies [17]. Instant payments (SEPA Instant Credit Transfer) and mobile applications such as Revolute and N26 are widely adopted across the EU. The payment infrastructure is based on the Single Euro Payments Area (SEPA), covering 36 countries and processing approximately 43 billion transactions annually. The cost of an average instant SEPA transaction is less than €0.20. The implementation of the European Digital Identity Wallet will allow citizens to use electronic documents for banking operations and identity verification.

According to Eurostat data (2023), 90 % of EU residents have access to digital financial services, and 85 % of banking transactions are conducted online. [18]. The share of cashless transactions in the EU reached 78 % in 2023, and is projected to rise to 82 % by 2025 [19]. The EU fintech market was valued at €150 billion in 2023 and

is expected to grow by 12 % during 2024–2025 [14]. The EU financial sector spends approximately €100 billion annually on IT including cloud services, AI, and cybersecurity [20, 21]. Cybersecurity spending in the finance sector increased by 11 % in 2023 and is projected to reach €15 billion by 2025 [22].

90% of EU banks offer mobile banking and digital wallets. In 2023, Europe had over 200 million digital banking users, with an average annual growth rate of over 8% since 2018 [23]. 74% of Europeans use at least one digital financial service daily. In EU countries, 63.9% of the population aged 16–74 used internet banking in 2023. 60 % of EU banks use AI for credit scoring, fraud detection, and service personalization. Generative AI is used to create financial forecasts and investment strategies, improving forecast accuracy by 10–15 % [22].

According to Deloitte (2023), 60% of EU banks use artificial intelligence (AI) to automate processes [24]. Pilot projects for the digital euro (CBDC) are being tested by the European Central Bank (ECB), with the launch expected by 2027.

EU banks are transitioning to hybrid cloud solutions to enhance security and scalability. A study by AppDynamics (2021) revealed that 70% of IT professionals in the financial sector face challenges in managing mixed infrastructures [25].

The European Central Bank is piloting a digital euro, expected to launch by 2027, with trials in 2024 across five countries (Germany, France, Italy, Spain, the Netherlands). The goal is to enhance transaction transparency and reduce interbank transfer costs .

AI is used in the EU financial sector for credit scoring, fraud detection, and personalized services. For example, the Commonwealth Bank of Australia (although not in the EU, it serves as a relevant example) launched an app for personalized financial planning.

PSD2 drives open API adoption, enabling fintechs to integrate banking data into new products. For example, Revolut and N26 use APIs to combine payments, loans, and investments, serving 30 million and 8 million clients respectively .

By 2025, 80 % of financial organizations are expected to use cloud platforms (AWS, Azure) for transaction processing, amid a 15 % rise in cyberattacks in 2024—

driving investment in "digital immunity" [22]. Organizations investing in cybersecurity are projected to reduce downtime by 80 % by 2025 [26].

Banks are building digital ecosystems that integrate financial and non-financial services (insurance, investments, e-commerce). ING, for example, offers a unified platform for financial and investment management.

Over 10,000 FinTech companies were operating in the EU as of 2024, with Germany, France, and the Netherlands leading among EU countries.

In 2023, the EU financial sector invested €100 billion in IT, allocating 30 % to AI, 25 % to cloud technologies, and 20 % to cybersecurity [22]. Fintech startups raised €12 billion in venture capital in 2023, with projected growth to €15 billion by 2025 (Statista). The EU's Digital Europe program (2021–2027) allocates €7.5 billion for digital technologies, including fintech and cybersecurity [27].

The EU digital transformation market is forecast to reach €1.37 trillion by 2025 (compound annual growth rate), growing 26.5 % by 2037. Investments in AI and blockchain are expected to increase

The countries of Europe, the Middle East, and Africa (EMEA) attracted $24.5 billion in fintech investments in 2023 across 1,514 deals [14].

Ukraine is demonstrating significant progress in the digitalization of its financial sector despite the challenges posed by war and economic instability. According to the National Bank of Ukraine (NBU), in 2024, 80% of banking transactions in the country are conducted online, and the share of cashless payments has reached 73% in 2024 [29]. In 2024, Ukrainians conducted 8,184.8 million cashless card transactions, accounting for 94.6% of all transactions and 64.5% of the total volume of card payments [29].

According to the NBU over 60% of Ukrainians use mobile financial applications. Apple Pay and Google Pay are integrated into more than 80% of Ukrainian banking systems.

The National Bank of Ukraine's Electronic Payment System (SEP) processes about 97% of interbank hryvnia transfers and, as of January 1, 2025, includes 62 banks and two non-bank payment providers [29]. A leading example of a fully mobile bank

in Ukraine is Monobank, with over 8 million users.

The digital platform “Diia” has over 19 million users and integrates financial services such as taxes, subsidies, and banking identification.

Ukraine’s financial sector is currently aligned with 75–77% of EU standards, and the NBU plans to achieve full equivalence by 2027 [29]. The Law of Ukraine "On Payment Services," which came into force in 2022, paved the way for open banking. The NBU is actively implementing EU standards (such as PSD2 and SEPA) and is also advancing national digital initiatives, including the "Diia" platform and the Banking Automation System (BAS). Ukraine ranks fourth in Eastern Europe in terms of the number of fintech startups, with approximately 100 operating in 2023. The country has broad 4G coverage (95% of the territory) and mobile banking access for 70% of the population [29].

Key directions of financial sector digitalization in Ukraine include:

1. Digital Payments. The Diia platform integrates digital documents (passport, ID) for opening bank accounts and accessing services. The National Bank’s Electronic Payment System (EPS) supports instant transfers. Mobile apps such as Privat24 (PrivatBank), serving over 15 million users, are increasingly popular [30].

2. AI and Data Analytics. AI is used in Ukraine’s financial sector for credit scoring and fraud detection. For example, PrivatBank utilizes AI to analyze transactions, preventing approximately $100 million in fraud annually. The ProZorro platform applies AI to monitor public procurement, saving $1 billion for the Ukrainian state budget since 2016 [30].

3. Digital Identification. Diia enables digital identification for 20 million citizens, simplifying access to financial services. Integration with the European Digital Identity Wallet will allow Ukrainians to use their documents within the EU [31].

4. Blockchain and Digital Assets. Pilot projects for the digital hryvnia (e-hryvnia) have been tested by the NBU since 2023. Ukraine adopted the Law “On Virtual Assets” (2022), which regulates cryptocurrencies and fosters fintech innovation [29].

As of 2024, Ukraine has over 200 active FinTech companies, reflecting a 35% growth over the past three years. The most developed areas of financial sector

digitalization in Ukraine include online lending, P2P transfers, digital accounting, and payment solutions.

The investment needs for Ukraine's fintech sector are estimated by experts at $40–75 million USD [32]. According to Dealbook 2024, Ukrainian technology companies (including fintech) attracted $209 million in investments in 2023 [32]. Approximately 14% of this amount, or $29 million, was directed specifically toward fintech startups.

Digital literacy is improving in Ukraine. Over 500,000 Ukrainians have completed online financial literacy courses on platforms such as Prometheus, Diia.Education, and Coursera. In 2024, as part of the National Financial Literacy Strategy, 15,000 educational events were conducted in schools and local communities [29]/.

Ukraine is demonstrating dynamic growth in digital finance, narrowing the gap with the EU. The level of digital service adoption among the population is one of the highest among developing countries. However, cyber risks in Ukraine have increased by 58% over the past two years [33], due to the ongoing war and the digitalization of the public sector. According to NBU forecasts, by 2027, 95% of financial services in Ukraine will be provided in digital format [29].

4.3. The holistic concept of financial sector digitalization

Summary of the theory and practice of digital transformation of finance in the European Union has enabled the development of a holistic concept for the digitalization of the financial sector.

The theory of financial digitalization forms the conceptual foundation for the transformation of financial systems through the integration of modern technologies such as artificial intelligence (AI), blockchain, big data, and cloud computing. This transformation aims to address current economic challenges, including globalization, geopolitical instability, cyber threats, economic inequality, climate change, and rapid technological advancement.

The key propositions of the theory that define its structure and application in

response to these challenges are as follows:

Provision 1. Digitalization as a driver of economic efficiency and resilience. Digital technologies enhance the efficiency of financial systems through process automation, reduced operational costs, and optimized resource allocation. Economic instability (recessions, inflation) requires rapid response, which is enabled by AI-driven forecasting and financial flow management models. Globalization necessitates integrated cross-border payment systems, where blockchain and digital currencies (CBDCs) provide speed and transparency. Example: AI is used to automate tax audits, reducing costs and increasing accuracy.

Provision 2. Transparency and accountability as the foundation of trust. Digitalization enhances transparency in financial operations through blockchain, open data, and standards such as open banking. Fighting corruption and fraud in financial systems—especially in countries with low institutional trust—requires transparent mechanisms. Geopolitical crises emphasize the need for secure and open cross-border financial systems. Example: In the EU, the PSD2 directive enables customers to share data with fintech companies, enhancing transparency and competition.

Provision 3. Financial inclusion through digital platforms. Digital technologies enable access to financial services for economically vulnerable groups through mobile banking, microfinance, and digital wallets. Economic and digital inequalities restrict access in rural areas and developing countries. Global migration and economic crises increase demand for affordable financial tools. Example: Mobile platforms such as Revolut are adapted in the EU to support financial inclusion via fintech startups.

Provision 4. Cybersecurity is an integral component of digital finance. Securing financial systems in the digital space requires AI integration, early warning systems, and regulatory standards to combat cyber threats. The increase in cyberattacks (phishing, ransomware) poses threats to financial system stability. Regulations such as GDPR and DORA in the EU set high data protection standards. Example: Real-time transaction monitoring with AI in banks (e.g., HSBC) helps detect fraud.

Provision 5. Adaptability to economic and environmental challenges. Digital financial systems must be flexible to respond to crises, climate change, and geopolitical

shocks using predictive and risk-based management. Green finance development requires AI to assess environmental risks of investments. Geopolitical conflicts (e.g., sanctions) call for alternative payment systems like CBDCs. For example, the European Green Deal supports digital platforms for sustainable development finance.

Provision 6. Interdisciplinary competencies are essential. Successful digitalization depends on professionals with combined expertise in finance, IT, cybersecurity, and ethics. There is a current shortage of specialists with AI and data analysis skills in finance. Ethical issues (algorithmic bias, data privacy) require training professionals with technological ethics understanding. Example: EU universities (e.g., in the Netherlands) offer FinTech programs combining finance, coding, and cybersecurity.

Provision 7. Regulatory harmonization and ethical standards. Digitalization needs balanced regulation that fosters innovation while protecting consumers and ensuring system stability. In developed countries, there is a tension between rapid innovation and strict regulations; international coordination is needed for digital currencies and cross-border operations. Example: The UK's regulatory sandbox allows fintech firms to test innovations under regulatory supervision.

Provision 8. Technological infrastructure is the foundation of digitalization. The development of digital finance depends on modern infrastructure, including 5G, cloud computing, and high-performance systems. Limited access to high-speed internet in developing countries slows digitalization. High costs hinder infrastructure modernization for traditional financial institutions. Example: Singapore invests in 5G and cloud platforms to support its fintech ecosystem.

These provisions underscore the need to integrate technology, regulatory mechanisms, and interdisciplinary skills to build effective, secure, and inclusive financial systems. They address globalization, cyber risks, inequality, and climate change but require significant efforts in infrastructure and education modernization.

Summary and conclusions.

In today's environment, the digital transformation of the financial sector is a key vector of economic development, fundamentally changing approaches to service delivery, risk management, market regulation, and financial inclusion.

Leading EU countries demonstrate various digitalization models shaped by national economic features, institutional frameworks, technological development, and state support.

The research results are practically significant, offering ways to adapt the most effective European practices to other countries, including Ukraine. Conceptual approaches are proposed for forming a national digitalization strategy in finance, balancing innovation and regulatory stability.

Thus, this generalization not only identifies key factors of successful digital transformation in finance but also justifies the feasibility of implementing similar mechanisms in Ukraine, considering its economic, legal, and institutional specifics.

The holistic concept of financial sector digitalization integrates technological, economic, and societal perspectives to create a resilient and inclusive financial ecosystem. It leverages concepts like digital transformation, transaction cost theory, and platform economy to drive efficiency, transparency, and customer-centricity. In the EU, digitalization is advanced, with €100 billion in IT investments and a focus on CBDC and AI. In Ukraine, despite challenges, platforms like Diia and ProZorro showcase progress, supported by $500 million in investments. Addressing data quality, cybersecurity, and digital inequality will be critical for both regions to fully realize the benefits of digitalization by 2030.