DIGITAL TRANSFORMATION OF ACCOUNTING AND ANALYTICAL PROCESSES IN UKRAINE: TRENDS, CHALLENGES, AND SECURITY IMPERATIVES (2020–2025)

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Abstract. *The study addresses the global digitalization of business processes and its implications for transforming traditional accounting and taxation, emphasizing the rise of ICT, cloud services, and ERP-class systems (notably BAS) alongside heightened risks in information security, data quality, and regulatory compliance under martial law in Ukraine. The article aims to identify the features of digital transformation of accounting and analytical processes in enterprises, assess the impact of cloud technologies, BAS corporate information systems, and IFRS online reporting standards (Inline XBRL) on management efficiency, and develop proposals to strengthen information security amid crisis dynamics and global challenges. A combined systemic–functional approach is applied: the systemic lens situates technologies, institutions, and human capital as interrelated elements, while the functional lens focuses on practical deployment in accounting and taxation. Comparative analysis of international practices and Ukrainian cases (Diia, EDM adoption, fintech) is complemented by statistical indicators and a desk review of scholarly sources; qualitative assessment captures wartime adaptations. From 2020 to 2025, Ukraine expanded e-services and digital documents via Diia, advanced cashless payments and e-commerce, modernized telecom infrastructure, improved digital literacy, and widened business uptake of cloud/ERP/CRM and analytics, enhancing transparency and productivity. Simultaneously, cyber resilience and continuity of critical services strengthened, while convergence with European standards progressed. Persistent challenges include regional disparities, skills shortages, and regulatory harmonization needs. Sustainable digitalization requires integrating systemic, processual, functional, and spatio-temporal perspectives to ensure technological adoption, institutional readiness, legal standards, human capital development, and reinforced cyber resilience. Future work should prioritize inclusive access, interoperability of ERP/BAS and EDM, and governance measures that align security and compliance with innovation during crises.*

Keywords: *digital transformation; accounting; accounting and analytical processes; cloud technologies; ERP/BAS; electronic document management (EDM); online reporting (IFRS, Inline XBRL); information security; cyber resilience; fintech; digital literacy; small and medium-sized enterprises (SMEs); martial law; risk management.*

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Introduction. The modern stage of economic development is characterized by the global digitalization of business processes, which necessitates the transformation of traditional approaches to accounting and taxation. The use of information and communication technologies, cloud services, and enterprise systems of the ERP class, in particular BAS, is gradually becoming the standard for enterprise functioning, allowing operational efficiency, transparency, and automation of accounting and analytical processes. At the same time, the implementation of such technologies is accompanied by increasing risks related to information security, data quality, and regulatory compliance.

Under martial law in Ukraine, these problems acquire particular relevance. Enterprises face not only the challenges of financial instability and resource constraints but also the need to ensure the continuity of accounting processes under conditions of cyber threats, interruptions in energy supply, and telecommunication infrastructure. The need for the use of cloud technologies and online reporting is increasing, as they ensure mobility and data accessibility, but at the same time set new requirements for cyber resilience and risk management.

Thus, there is an objective need to study the features of the digitalization of accounting and analytical activities of enterprises, determine its impact on management efficiency, and develop proposals for strengthening information security in the context of crisis changes and global challenges.

Literature Review. The digitalization of the economy is a key factor in modern economic development, integrating information technologies into all spheres of social life. The digital economy is understood as a set of economic relations that function on the basis of the use of information and communication technologies (ICT), digital platforms, and data as a strategic resource. According to Borblik (2022), it encompasses infrastructure, digital skills, the legal framework, business readiness, and the level of integration into global markets (Borblik, 2022). The OECD (2024) emphasizes that the digitalization of the economy is not only process automation but also a strategic tool for increasing competitiveness, innovativeness, and resilience to crises (OECD, 2024). Modern scholars consider four main approaches to understanding the digital economy: systemic, processual, functional, and spatio-temporal. Each of them has its supporters and critics, forming a broad academic discussion.

Supporters of the systemic approach view digitalization as a set of interconnected elements: technologies, institutions, human capital, and the legal environment. For example, Vasyltsiv (2022), in the article “Factors of the Development of Ukraine’s Digital Economy”, identifies six components, including strategy, expertise, readiness, and involvement, which make up the index of Ukraine’s digital economy. Borblik, in “Digitalization of the Ukrainian Economy” (2022), also uses the systemic approach, comparing international rankings of digital infrastructure readiness, the population’s digital literacy, and the legal environment in Ukraine with other countries. However, Dyachenko (2022) criticizes the systemic approach in strategic documents, considering it too general and detached from real economic relations. Moreover, in Ukraine, indicators of "readiness" and "infrastructure" may be high, while in practice there are

noticeable disparities across regions or IT competence levels; the systemic approach sometimes fails to account for these internal asymmetries (Vasyltsiv, 2022).

The processual approach emphasizes that digitalization is not a one-time phenomenon but a gradual transformation of organizational and business processes, management practices, and employee roles. For instance, the article "A processual approach to skill changes in digital automation: The case of the platform economy in the service sector" (Xing & Sharif, 2025) explores how automation and digitalization change the competencies of workers in the service and platform economy, i.e., how skills evolve over time and at different stages of digitalization. Yet, among scholars, there arises the question of whether the processual approach provides clear evaluation methods, progress indicators, or merely a description of changes. Without quantitative metrics, comparisons or measurements are difficult. Many organizations get "stuck" at a certain stage of the process, where digitalization is partial and not linked to a culture of change; the processual approach may fail to consider delays or regressions if resources or motivation decline. Therefore, it is necessary to expand workers' skills in digitalization to improve the assessment of business processes.

The functional approach highlights specific digital functions or tools as key elements: e-services, online payments, automated analytics systems, cloud technologies, etc. For example, in "Analysis of digital technologies in Ukraine: problems and prospects" (Yurchyshyn, Stepanets & Skorobogatova, 2024), it is noted that process automation, market forecasting, and asset monitoring are functional capabilities already being implemented in business, bringing tangible results. Likewise, "European Integration and Globalisation of Ukraine's Digital Transformation" (Shashyna, 2024) emphasizes that access to digital functions of public services, regulatory platforms, and business tools is crucial for EU integration. Thus, we see that the functional approach is very practical, but there is a risk that focusing on tools (functions) may distract from broader structural or institutional changes. Some authors, like Dyachenko (2022), point out that strategy documents in Ukraine often describe functions without paying sufficient attention to production or social relations, changes in labor relations, law, or the institutional framework.

The spatio-temporal approach views digitalization not only as a technological or business change but also as changes depending on space (regions, cities vs. villages, risk zones) and time (crises, wars, pandemics). For example, Verbivska (2023) in "Digitalization of the Ukrainian economy during a state of war is a necessity of the time" analyzes how digital services in rural regions face specific challenges of access and digital literacy, and how their development lags behind urban centers. Also, Shcherban et al. (2025) in the study "Assessment of the Digital Transformation of Ukraine's Economy" pay attention to regional differences in access to digital infrastructure, business readiness, and cybersecurity. However, among scholars, there are disputes about how strongly spatial conditions (region, urban-rural) matter, or whether it is more a question of resources than geography. Researchers also point out that the temporal factor (especially crises such as war or a pandemic) often shifts digitalization priorities: attention turns to accessibility, security, and resilience. Yet, strategic plans often fail to account for such temporary aspects.

Below, in Table 1, the advantages and disadvantages of each approach to interpreting the concept of the digital economy are presented.

Table 1. Advantages and disadvantages of interpreting the concept of the digital economy

Approach	Authors / examples	Advantages	Disadvantages	Impact on development
Systemic	Vasyltsiv (2022); Borblik (2022)	Comprehensive, strategic	Excessive abstractness, weak practicality (Dyachenko, 2022)	Forms a holistic vision of the digital economy
Process	Xing & Sharif (2025)	Shows dynamics and adaptability	Lack of clear metrics	Explains the continuity of change, the role of human resources
Functional	Yurchyshyn et al. (2024); Shashyna (2024)	Practical orientation, quick effect	Ignores institutional context	Gives businesses specific tools
Spatiotemporal	Verbivska (2023); Shcherban et al. (2025)	Consider context and crises	Difficult to measure	Explains the digital divide and crisis dynamics

Source: systematized by the author

Thus, none of the approaches (systemic, processual, functional, spatio-temporal) alone provides a complete picture of digitalization. An effective theory and practice of the digital economy must combine elements of each: systemic for strategy and institutions, processual for changes over time, functional for practical applications, and spatio-temporal for taking context into account. Strategies and theories that emphasize the systemic approach often point out that without an adequate legal environment, norms, and standards, the digital economy may become stuck at the stage of functional solutions without producing an effect on institutions or society.

Aims. The main purpose of the study is to identify the features of digital transformation of accounting and analytical processes in enterprises, to assess the impact of cloud technologies, BAS corporate information systems, and IFRS online reporting standards (Inline XBRL) on management efficiency, as well as to develop proposals for strengthening information security under martial law and global challenges.

Methodology. The research methodology is based on a combination of systemic and functional approaches. The systemic approach makes it possible to analyze digitalization as an interrelated set of technologies, institutions, and human capital, while the functional approach highlights the practical implementation of digital tools in accounting and taxation. The study applies comparative analysis of international practices (OECD, EU reports) and Ukrainian case studies (Diia platform, EDM adoption, fintech solutions). Statistical data from the OECD (2024), NBU, and the Ministry of Digital Transformation are used to evaluate the dynamics of ERP/BAS systems adoption, e-document circulation, and digital literacy indicators. A desk review of scientific articles (Verbivska, 2023; Shcherban et al., 2025; Vasyltsiv, 2022) provides a theoretical basis, while qualitative assessment of wartime adaptations supplements the analysis.

Results. From 2020 to 2025, Ukraine has demonstrated significant progress in digital transformation. Large-scale e-services and digital documents were launched in

the "Diia" application, accelerating the interaction between citizens, businesses, and the state. The cashless economy, online payments, and e-commerce have been actively developing, while telecom infrastructure has been modernized and digital literacy has improved. Businesses have widely adopted cloud solutions, ERP/CRM systems, and data analytics, increasing transparency and productivity. Despite the war, the country has strengthened its cyber resilience and ability to ensure the continuity of critical services. At the same time, Ukraine has advanced toward European standards in data management, cybersecurity, and electronic identification. Challenges remain – regional disparities in access, a shortage of skilled personnel, and the need for further regulatory harmonization - but the overall trajectory is clearly positive.

Table 2. State of digitalization of the Ukrainian economy (2020–2025)

Indicator	2020	2022	2025 (forecast)
Share of enterprises using ERP/BAS systems	18%	25%	40%
Share of SMEs using only basic digital tools	62%	55%	45%
Mobile Internet penetration rate (4G/5G)	72%	82%	92%
Number of Diia users (million)	9,0	14,2	20,0+
Number of cyberattacks on the public sector (thousands)	1,2	2,8	3,5+

Sources: OECD (2024), Shcherban et al. (2025), ArXiv (2025).

One of the most important achievements of Ukraine in 2020–2025 is the creation and development of the digital platform Diia. This project of the Ministry of Digital Transformation has become a symbol of integrating public services into the digital space. In 2020, Diia began as a mobile application for access to digital documents (passport, driver's license, student ID).

In 2021–2022, more than 70 government services were added to the ecosystem: business registration, filing declarations, paying taxes, and applying for assistance for internally displaced persons.

In 2023–2025, Diia became not only a platform for public services but also a tool of social support during the war: applying for financial aid, accessing compensation for destroyed housing, obtaining certificates under wartime conditions (Wikipedia, 2023). Scholars (Shcherban et al., 2025) emphasize that Diia is a unique example of rapid digitalization under crisis conditions: whereas most countries spend decades creating e-government, Ukraine managed to build an inclusive and flexible system in just five years.

The second direction of digital transformation was the spread of electronic document management (EDM). In the public sector, since 2020, a mandatory transition to EDM between ministries and agencies has been introduced. This reduced paper document circulation by 80% and accelerated internal processes. In business, EDM implementation is taking place gradually. According to OECD (2024), as of 2023, more than 45% of medium and large enterprises used electronic records for contracts, invoices, and tax documents. For SMEs, the process is more complicated: although affordable cloud solutions exist, low digital literacy and lack of financing remain barriers. Marchuk (2024) stresses that digital document management positively affects enterprise competitiveness: it reduces costs, accelerates capital turnover, and increases the transparency of financial information.

Financial technologies (fintech) have become one of the most dynamic sectors of Ukraine's digital economy. The banking sector is massively implementing mobile applications, online banking, and instant payment systems. According to the NBU, in 2023 more than 70% of retail transactions were conducted in cashless form. Ukrainian companies (Monobank, Privat24) have become examples of successful fintech solutions comparable to Western analogues. The segment of digital signatures and electronic identification integrated with the BankID system is also developing. This is particularly important for accounting, taxation, and auditing, where data authenticity and security are critical. Scholars Saeed et al. (2023) note that fintech, combined with digital governance, creates a new level of transparency and convenience for citizens, while at the same time generating new risks of cybercrime.

A significant achievement was the creation of the platform Diia.Digital Education, which since 2020 has provided free courses in digital literacy. By 2024, more than 1.5 million Ukrainians had completed training, which became an important factor in the development of digital skills in society. Special attention has been paid to training accountants, civil servants, and teachers, who must adapt to new digital tools. In his scholarly work, Vasyltsiv (2022) notes that human resource readiness determines the speed and quality of digital transformation: even the best technologies will not be effective without qualified specialists.

Small and medium-sized businesses (SMEs) are the most vulnerable but also the most promising category in Ukraine's digital economy. According to OECD (2024), only about 40% of small businesses actively use ERP/BAS systems, while the majority rely on basic tools (Excel, email). Barriers include low digital literacy, lack of funds for IT investments, and limited access to quality internet in the regions. At the same time, the experience of 2022–2025 shows that SMEs that managed to transition to digital platforms adapted more quickly to wartime conditions and maintained competitiveness.

The full-scale war in Ukraine since 2022 radically changed the functioning conditions of the digital economy. On the one hand, the war stimulated the development of digital services, as many businesses and government institutions were forced to switch to remote work models. On the other hand, new challenges emerged: cyber threats, destruction of infrastructure, power outages, and disruptions in internet connectivity.

The report The Impact of the Russia-Ukraine Conflict on the Cloud Computing Risk Landscape (2025) emphasizes that the war increased attention to data sovereignty and information security requirements. Ukrainian enterprises are forced to devote more resources to protecting information systems, which raises costs but at the same time builds a culture of cyber resilience (ArXiv, 2025).

The Ukrainian government actively supports digital infrastructure, creating alternative communication channels and backup systems. During wartime, the Diia program became not only a service platform but also a tool for receiving social and financial assistance. This confirms the conclusion of Shcherban et al. (2025) that digitalization is not just an economic but a strategic factor of national security.

Thus, in 2020–2025, Ukraine made significant progress in digital transformation, as evidenced by both government initiatives and business activity. A crucial step was the creation of the Diia ecosystem, which evolved into a platform of e-government and social support for citizens. The introduction of electronic document management in the public and private sectors reduced transaction costs and increased the transparency of business processes. The development of the fintech sector, particularly mobile banking and digital signatures, brought Ukraine among the regional leaders in financial innovation. At the same time, the growing role of digital education was important: the Diia.Digital Education platform contributed to the spread of basic digital skills among the population and to workforce preparation for the digital economy. SMEs began gradually integrating ERP/BAS systems and cloud technologies, enhancing competitiveness in both domestic and foreign markets.

At the same time, the current state of digitalization in Ukraine is not without challenges. Regional disparities, insufficient digital literacy, and limited financial resources remain serious barriers (Table 3). An additional factor has been the war, which simultaneously complicated the functioning of digital systems (through cyberattacks, power supply disruptions) and stimulated the search for innovative solutions (satellite internet, cloud data centers, enhanced cybersecurity).

Table 3. Key Challenges of Ukraine's Digitalization (2020–2025)

Challenge	Manifestation / Examples	Impact on Economy and Governance	Possible Response Measures
Regional disparities in access	Uneven internet coverage, lag in rural areas	Reduced inclusiveness, "digital divide" for SMEs and citizens	Expansion of broadband coverage, subsidies/vouchers for connectivity
Low digital literacy	Limited skills among SMEs, civil servants, educators	Slow adoption of EDM/ERP, errors, resistance to change	Large-scale upskilling/reskilling programs, certifications, micro-credentials
Lack of IT investment (especially SMEs)	Reliance on basic tools (Excel, e-mail)	Low productivity and transparency, loss of competitiveness	Tax incentives, grants/loans for digitalization, public–private partnerships
Cyber threats and security costs	Increased attacks, need for cyber resilience	Service disruptions, data risks, rising operational costs	SOC solutions, zero-trust, redundancy/failover, security audits
Infrastructure damage and power outages	War consequences: energy and telecom disruptions	Risks to continuity of critical services and data	Decentralized power sources, backup channels, cloud data centers
Regulatory harmonization and standards	Inconsistent practices, need for EU compatibility	Legal uncertainty, barriers to integration	Implementation of standards (eIDAS, XBRL/Inline XBRL), clear compliance roadmaps
Data sovereignty and confidentiality	Cloud data storage/transfer	Legal and reputational risks	Data governance policies, data classification, local storage zones
ERP/BAS and EDM integration	Fragmented solutions, lack of interoperability	Double accounting, errors, delayed analytics	Unified integration buses/APIs, phased migration, master data management (MDM)
Workforce shortage (IT/cyber/analytics)	Talent outflow, competition for specialists	Project failures, high implementation costs	Education tracks with scholarships, retraining, remote work models
Change management and culture	"Stuck" at partial digitalization	Underutilization of technology potential	Change management programs, digital maturity KPIs, communication and motivation

Source: systematized by the author

Therefore, the digitalization of Ukraine's economy is a dual process: on the one hand, an accelerator of innovation and European integration; on the other, a source of new risks and social challenges. Further success depends on the ability of the state and business to integrate international practices, strengthen digital infrastructure, and ensure inclusiveness so that the digital economy becomes a catalyst for sustainable development even under crisis conditions.

Discussion. The findings indicate that Ukraine has made remarkable progress in digital transformation despite the crisis environment of 2020–2025. The Diia ecosystem emerged as a central innovation, integrating state services, social support, and digital identity tools. The adoption of electronic document management has significantly reduced transaction costs and improved transparency, although SMEs remain less engaged due to limited resources and digital skills. Fintech development (e.g., Monobank, Privat24, BankID integration) has placed Ukraine among the regional leaders in cashless payments and e-banking, but also created heightened risks of cybercrime. Digital education initiatives, particularly Diia.Digital Education, contributed to raising the digital literacy of more than 1.5 million citizens, yet disparities between urban and rural regions persist. The war highlighted the dual nature of digitalization: while it catalyzed resilience through cloud migration, backup systems, and satellite internet, it also intensified risks of cyberattacks and infrastructure disruption. Thus, Ukraine's experience shows that digitalization is both an enabler of innovation and a field of new vulnerabilities that require strategic management.

Conclusion. Between 2020 and 2025, Ukraine achieved substantial progress in integrating digital technologies into accounting, taxation, and business processes. The successful implementation of Diia, the spread of electronic document management, and the dynamic growth of fintech solutions strengthened competitiveness and enhanced transparency. However, challenges such as regional disparities, insufficient digital literacy, cyber threats, and regulatory harmonization remain critical barriers. The study concludes that sustainable digital transformation requires combining systemic, processual, functional, and spatio-temporal approaches, ensuring not only technological adoption but also institutional readiness, legal standards, and human capital development. Strengthening cyber resilience and expanding inclusive access to digital tools will be decisive for Ukraine's future integration into the European digital economy and for safeguarding national security in times of crisis.

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