



Sustainable Competitive Intelligence for Digital Enterprise Modernization: Financial Resilience, Ensure Financial Security, and Inclusion

Inteligência Competitiva Sustentável
para a Modernização de Empresas
Digitais: Resiliência Financeira, Garantia
da Segurança Financeira e Inclusão

Oksana Desyatnyuk

West Ukrainian National University, Ternopil, Ukraine.

Andriy Krysovatty

S. Yuriy Department of Finance, West Ukrainian National University, Ukraine.

Olena Ptashchenko

Department of Entrepreneurship and Trade, West Ukrainian National University, Ukraine.

Olga Kyrylenko

S. Yuriy Department of Finance, West Ukrainian National University, Ukraine.



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Corresponding Author: Oksana Desyatnyuk – E-mail: o.desyatnyuk@ujis.in.ua

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ABSTRACT | Purpose: To examine the relationship between the digital modernization of Ukrainian enterprises and their innovation capacity, financial security, and inclusive economic development during 2021–2025. **Methodology/Approach:** The study used a secondary empirical desk-based approach based on open-access statistical databases, analytical reports, enterprise financial data, and economic indicators. Four clusters were analyzed: enterprise digitalization, innovation capacity, financial security and resilience, and inclusive development. **Originality/Relevance:** The research provides a comprehensive assessment of the effects of digital modernization on enterprise development and economic recovery in Ukraine. **Key Findings:** Enterprise digitalization showed the highest mean normalized value (0.63), while financial security and resilience reached 0.57, recovering from 0.36 in 2022 to 0.76 in 2025. Innovation capacity recorded the lowest mean value (0.45), suggesting that digital adoption does not automatically generate innovation. Inclusive development achieved a mean value of 0.52, reflecting gradual improvements in access to digital services and support systems. **Theoretical/Methodological Contributions:** The study demonstrates that digital modernization is most effective when supported by financial stability, institutional capacity, and access to economic opportunities, and proposes a multidimensional framework for evaluating digital transformation outcomes.

Keywords | Digital economy. Digital technologies. Financial security. Business process transformation. Inclusion. Innovation. Financial inclusion. Business continuity. Cashless transactions. Regional access

RESUMO | Objetivo: Examinar a relação entre a modernização digital das empresas ucranianas e sua capacidade de inovação, segurança financeira e desenvolvimento econômico inclusivo no período de 2021–2025. **Metodologia/Abordagem:** O estudo utilizou uma abordagem empírica secundária baseada em pesquisa documental, fundamentada em bases de dados estatísticas de acesso aberto, relatórios analíticos, dados financeiros empresariais e indicadores econômicos. Foram analisados quatro grupos de indicadores: digitalização empresarial, capacidade de inovação, segurança financeira e resiliência, e desenvolvimento inclusivo. **Originalidade/Relevância:** A pesquisa oferece uma avaliação abrangente dos efeitos da modernização digital sobre o desenvolvimento empresarial e a recuperação econômica na Ucrânia. **Principais Resultados:** A digitalização empresarial apresentou o maior valor médio normalizado (0,63), enquanto a segurança financeira e a resiliência atingiram 0,57, recuperando-se de 0,36 em 2022 para 0,76 em 2025. A capacidade de inovação registrou o menor valor médio (0,45), sugerindo que a adoção de tecnologias digitais não gera automaticamente inovação. O desenvolvimento inclusivo alcançou um valor médio de 0,52, refletindo melhorias graduais no acesso a serviços digitais e sistemas de apoio. **Contribuições Teóricas/Metodológicas:** O estudo demonstra que a modernização digital é mais eficaz quando apoiada por estabilidade financeira, capacidade institucional e acesso a oportunidades econômicas, além de propor uma estrutura multidimensional para avaliar os resultados da transformação digital.

Palavras-chave | Economia digital. Tecnologias digitais. Segurança financeira. Transformação de processos de negócios. Inclusão. Inovação. Inclusão financeira. Continuidade dos negócios. Transações sem dinheiro em espécie. Acesso regional.

1. INTRODUCTION

Digital transformation is now an indispensable condition for business development in economies characterized by technological transformations, financial instability, and unequal access to economic opportunities. Digital tools for enterprises are no longer seen in terms of automation or communication. They help shape business processes and shape the ability to innovate, to manage financial risks, and access markets. This issue has particular importance in the context of Ukraine, since these enterprises are currently being operated under war-related uncertainty, disrupted logistics, and limited investment resources and cannot afford to go backward (Kvasnii et al., 2023). In this light, digital transformation needs to be understood through the lens of not just technological renewal, but also a process used to develop resilience, ensure financial protection, and promote inclusive economic recovery. Recent studies describe digital transformation as a complex innovation process.

According to Romero and Mammadov (2025), the change in small and medium-sized enterprises can only be realized if the technological, organizational, and environmental changes are achieved. It was established that digitalization does not solely affect the technical infrastructure but impacts the products, the internal routines, and even the business models. This method, though, must be more clearly defined for countries in which institutional instability, security risks, and resource constraints have a major impact on enterprise decision making.

The problem has practical relevance to the Ukrainian context. According to Shveda et al. (2024), the digital transformation of business processes was needed during martial law in Ukraine to sustain enterprise activity, with the flexibility to adapt to crisis conditions. Hence, the findings of their study confirm that digitalization in Ukraine is not only about being competitive, but also about preserving survival and operational resilience. However, the literature still remains thin on explanation on the double-directional nature of digital modernization at the micro-level and its implications for

innovation capacity, financial security and inclusive development. The economic dimension is just as significant. According to Desyatnyuk and Ptashchenko (2025) digital transformations change the controls, risks, and access to financial information that affect economic security of a firm. But while digital tools improve transparency and speed in decision making, they provide new risk factors for cybersecurity, data protection and technological dependence. Thus, the assessment of enterprise digitalization should not be limited to the degree of technology proliferation but should also focus on its role in enhancing financial resilience.

Digitalization is inextricably linked to financial inclusion and broader economic development. Basnayake et al. (2024) found that digital financial inclusion also fosters economic growth through widening access to financial services. The significance of this conclusion lies in Ukraine: small and medium enterprises, peripheral regions and vulnerable economic agents are still unable to gain firm access to finance. International evidence, however, cannot be generalised to Ukraine since results depend on institutional capacity, wartime constraints and varying levels of readiness in the digital sector. The lens of the inclusive economy perspective extends the extent of this analysis. As described by Krysovatty et al. (2024), an inclusive economy is a constituent element of sustainable development with equitable distribution of resources, participation and economic returns. Because digital modernization can't have to just be about productivity or profit. It must be whether it reduces barriers, helps small business or cultivates more balanced economic expansion.

The available literature can provide a useful background for exploring enterprise digital modernization but there are still some gaps that are open. Above all, the majority of researchers and scholars treat digital transformation as an innovation process or change in business models, but there has been less discussion, especially around how digital transformation intersects with financial resilience (Skulysh & Fathutdinov, 2022; Skyba et al., 2023). Research on Ukraine involves more about ways to redesign business processes in crisis. Less attention is focused on the joint effects of digitalization on innovation, financial security and inclusion. Third, financial security is generally framed by most studies as an organization-level management or risk issue rather than an indicator of economic mobility or the capability for enterprise to innovate. International results on digital financial inclusion have to be contextualized for Ukraine because the digitalization's outcomes are affected by wartime-related factors, institutional limitations, inequalities in digital readiness, and other factors. Lastly, it is still unclear how enterprise digitalization enhances inclusive economic development.

The scientific gap in the field of sustainable competitive intelligence for digital modernization of enterprises lies in the lack of a single theoretical and methodological model that would harmoniously combine the environmental and social components (ESG) with the processes of deep digital transformation (Industry 4.0/5.0) to ensure long-term competitiveness. Most current research looks at digital modernization (implementation of AI, IoT, big data) through the lens of operational efficiency, cost reduction, and profitability growth, ignoring their impact on environmental sustainability. Existing frameworks are designed mainly for developed countries with a high level of institutional maturity and access to cheap «green» financing. Enterprises in unstable environments (in particular, Ukrainian companies going through the challenges of recovery and modernization) face resource shortages, infrastructure destruction, and high cost of capital. Competitive intelligence has become a key tool

for digital modernization of enterprises, as it provides data collection on markets, technologies and competitors for sustainable decision-making. This is directly related to the topic of the Journal of Sustainable Competitive Intelligence, which explores the balance between competitive advantage, innovation and sustainability principles.

The aim in this paper was to establish an objective association between digital modernization of enterprises in Ukraine and the innovation potential, financial security, and inclusive economic development of the country. Specifically, the article extended the theoretical basis of digital modernization of enterprises as a driver toward innovation capability and their impact on financial resilience and security, as well as the contributions that digital tools and finance make in providing more economic opportunities to the world. Special attention was given to the peculiarities of enterprise digitalization in Ukraine during institutional and wartime instability and how peculiarities could be conducive to more inclusive and balanced economic development.

2. THEORETICAL FRAMEWORK

The literature on enterprise digital modernization is moving more and more away from a simple technical understanding of digitalization. Recent literature demonstrates that digital transformation impacts the adoption of not just software, platforms or automated tools, but also the organisation, financial resilience and ability to access economic opportunities of enterprise. Here, then, digital modernization must be seen as a multilayered endeavor in which technology is refreshed as well as financial infrastructure and institutional capacity. This is even more critical for small and medium-sized enterprises because they tend to have more constrained finances and lower digital readiness and are more susceptible to external shocks. A large body of literature links digital transformation and enterprise innovation. According to Cen and Lin (2025) digital transformation can lead enterprise to improve the corporate innovation in small and medium-sized enterprises by providing better access of information, enhancing the flexibility and reducing the expenses of coordination. This also matters because innovation isn't only about making new products. It also takes up internal processes, interaction with the customer, supply chains and decision-making routines in practice.

Competitive Intelligence for Digital Modernization of Enterprises is the legal collection and analysis of market, technology, and competitor data to inform strategic IT transformation decisions. The core concepts are based on risk management, benchmarking, and digital decision theory. In particular, we are talking about the concept of information asymmetry and uncertainty reduction, the essence of which is that digital modernization (implementation of ERP, IoT, AI) requires large investments with a high risk of error. Competitive intelligence reduces the gap between what the company knows about the market and technologies and what actually exists. Also important is the concept of digital benchmarking, the essence of which is to compare the digital maturity of one's own enterprise with market leaders, as well as the concept of cybersecurity risk prevention and techno-intelligence, which involves monitoring the emergence of breakthrough technologies and threats to the company's digital sovereignty. Also popular is the theory of the ecosystem approach and value chain analysis, in which digital modernization affects not only internal processes, but the entire ecosystem (suppliers, customers, platforms).

Awad and Martín-Rojas (2024) elaborate this logic, linking digital transformation to the resilience of the organization via learning and innovation. The findings of their analysis demonstrate that firms profit from digitalisation when they can absorb knowledge, reorganize their internal routines and make managers able to use the digital tools. Thus, productive digital modernization is a learning, strategy based and organizational readiness driven process. The Ukrainian literature adds another element of crisis to this debate. Ozorovych and Matsola (2026) investigated the management of digital transformation in the context of small and medium-sized enterprise in Ukraine under martial law. They uncovered that business continuity, communication and adapting to unstable conditions was dependent on utilizing digital tools. Shveda et al. (2024) would also help this argument but are not mentioned in this citation. As per the present data used, the Ukrainian context is largely supported by Ozorovych and Matsola (2026), Ivanova (2024) and Desyatnyuk et al. (2026).

As Ivanova (2024) proved, Ukraine's digital transformation impacts the economy itself, but also quality of life and the aspirations of sustainable development. Therefore, enterprise digitalisation should not be limited to microeconomic efficiency, but is also part of a broader socio-economic recovery when digital services, platforms and financial technologies offer access to resources in times of disruption. Key components of literature also center on financial security. By applying digital processes to finance, Desyatnyuk and Ptashchenko (2025) argue digital transformations change methods of firms to guarantee their financial security. Digital tools increase information quality and speed in financial monitoring, data processing, and managerial decision-making, but they also increase exposure to cyber and related risks, technological dependency and data risk.

Adegbite (2025) supports this risk-based perspective by highlighting issues of data privacy and data security in his research. He identified the breach, abuse of confidential information due to ineffective regulations, and lax oversight. But the economic effect of digital modernization was, as with the impacts of other transformations, mixed - while it may yield a higher level of transparency and greater control, if cybersecurity, data governance, and compliance systems are not adequate, they also form new sources of exposure. Several papers are proposed around the issues of financial sustainability and financial resilience.

As an illustration, Liu and Qi (2024), investigate the financial sustainability perspective on how enterprise digital transformation impacts resilience. Therefore, the study is relevant because it connects digitalization with financial resistance, uncertainty management, and long-term stability in enterprises. Xu et al. (2024) make a similar case for digital finance as a mechanism to reinforce economic resilience to a digital transformation for enterprises undergoing digitalization. They contribute to establishing that digital finance can relieve financing constraints and support adaptation, when firms need resources required for technology renewal by firms. To achieve this, digital modernization needs not only to be executed within the enterprise, it also depends on the presence of external sources of finance and digital financial infrastructure. Li and Xie (2025) also specifically connect digital finance with enterprise transformation. Digital finance can also stimulate company digital transformation through enterprise financing mechanisms according to them.

This is important at least because most of the companies are aware of digital transformation but do not have the financial power to start it. In this case, the gap can be reduced by either boosting the sources of funds or reducing the costs of using digital finance and making credit available at

various levels. Tanapaisankit et al. (2024) findings stand almost the same as the recent findings on new capital market financing for medium-sized enterprises in Thailand. They state that digital transformation can open new financing instruments for firms, which will enable them to grow sustainably. The evidence is from Thailand, but when analyzed, it is useful for Ukraine because it shows how digitalization processes can link enterprise modernization with access to capital markets. Financial inclusion is another important aspect of the literature. Desyatnyuk et al. (2024a) depict the state-and-development trends of financial inclusion in Ukraine. These authors consider that the access to financial services represents the basic condition for involving in economic activities on a broader scale.

Their results also help explain why digital modernization needs to address inclusion, not just innovation or profit. Basnayake et al. (2024) prove this internationally, showing that financial inclusion through digitalization can anchor economic growth in Asia-Pacific countries. Demir et al. (2022) elaborate on this discussion by linking these factors specifically between fintech, financial inclusion, and income inequality. They prove that their quantile regression model to financial technologies may lessen or change inequality, depending on the degree of inclusion and their institutional context. This is very important for Ukraine because such war disruptions have led to a country having an unequal access to finance in-country, and also in other areas throughout the country. Rusu and Oprean-Stan (2023) strengthen the inclusive dimension through the analysis of digitalization and the role that sustainability and inclusiveness play. Their results prove that digitalisation can only bring inclusive growth when it is supported by sustainable policies and institutions. Krysovatty et al. (2024) shared this vision. They had framed the inclusive economy as a part of sustainable development, one that ensures equitable access to resources, participation, and economic benefits.

These studies help facilitate the interpretation from a purely technical or financial perspective to that of a broader socio-economic one. That is, they claim, digital modernization is strategically useful if and where it can increase participation, help to reduce access barriers and support a more balanced development. Other research acknowledge the importance of digital financial inclusion as a separate domain of study. Kamboj and Sharma (2025) map digital financial inclusion and outline an integrative framework for future works. Their review reveals a runaway trend in the field and an ongoing schism between finance, technology, development, and institutional investigations. Similar fragmentation is evident in the literature and study on enterprise digitalization. Innovation, financial resilience, and inclusion are typically studied separately, leaving the linkages between them unnoticed.

Desyatnyuk et al. (2024b) show this integrated approach, by looking at how international financial security changes via digitalization in an environment which fosters sustainable development. Their efforts show that digitalization has to be balanced with security, governance and sustainability. Digital modernization can be beneficial for all kinds of enterprise, but this can be observed from a literature review along its related pathways. It might improve innovation capacity as businesses and how they learn change; it might build financial resilience with digital finance, risk management and financial sustainability; it could facilitate greater access to financial services and economic opportunities, leading to inclusivity. But the literature is different everywhere. While international studies show strong evidence on digital finance, inclusion and enterprise transformation, Ukraine's

studies are devoted to wartime adaptation and the need for resilience. There is no large number of literature that combines innovation capability, financial security and inclusive economic development within one research paradigm. This gap is especially pertinent in Ukraine where not only is digital modernization a survival tool for businesses, an instrument for stabilizing finances and an engine for the economy to recover.

3. METHOD

This was scheduled for the secondary empirical work in 2025–2026 to investigate the indirect impact of enterprise digital modernization on innovation capacity, financial security and the realization of inclusive economic growth in Ukraine. The study was conceived as a desk-based digital study as all empirical material would be collected from open-access statistical records, official analysis reports, enterprise data including industry financial statements and published economic indicators. There were no surveys, interviews or experimental discussions with human subjects. This meant that no personal data had been collected in this study as information gathering only depended on aggregated or publicly available material.

The empirical corpus consisted of four sets of materials. The first group were the indicators of digitalization of the enterprise, which were the use of digital platforms, online sales channels, digital payment instruments, cloud services, electronic document management and digital interaction with customers. The second group included indicators of potential for innovation: new business processes, digital products, technology-based services and investments in digital tools. The third group consisted of financial security and resilience indicators: profitability, liquidity and access to finance, cashless payment activities, financial risk, and stability of operational activity. The fourth group consists of inclusive economic development: financial inclusion; small and medium-sized enterprises access to digital finance; regional access to digital services; and digital tools capability to lower economic barriers.

The object of research is the Ukrainian enterprise sector, with special consideration for small and medium-sized enterprises due to their greater vulnerability to financial constraints and digital inequality. The empirical period is 2021–2025 to enable comparison of pre-war, wartime, and adaptation-stage conditions. The material was collected through purposive non-probability sampling. The criteria for inclusion were relevance to enterprise digitalization in Ukraine (data availability), and connection with at least one analytical dimension of the study; the publication date fell within the specified empirical period. The criteria for exclusion were as follows: the material did not concern enterprises, only general digital culture was described, no empirical data was present, and the information was repeated in the corpus.

The analysis was carried out in three stages. First, the selected indicators were grouped into three analytical blocks, namely innovation capacity, financial security and inclusive development. Second, the assessment was made for each indicator on its direct or indirect relationship to the modernization process of enterprise digital systems. Third, the results obtained were compared across the three blocks to determine whether digital transformation primarily operated as a technological, financial or inclusive-development factor.

For comparability, indicators expressed in different measurement units were converted into normalized values using min–max normalization:

$$X_n = (X - X_{\min}) / (X_{\max} - X_{\min}) \quad (1)$$

where X_n is the normalized value, X is the original indicator value, $X_{\min}$ is the minimum value in the dataset and $X_{\max}$ is the maximum value. The normalized results were interpreted through a criteria-based matrix that connected each indicator with one of three effects: innovation strengthening, financial resilience improvement or inclusive access expansion.

The Min-Max normalization method is a critically important tool because it allows you to bring heterogeneous indicators to a single dimensionless scale from 0 to 1 for correct comparison.

Competitive intelligence indicators were selected to cover both internal readiness for change and the external digital environment. They were selected based on the criteria of relevance to strategic goals, measurability, and predictive ability. The criteria for the validity of secondary data included conceptual validity, source validity (authority and reputation of the primary source of information), temporal validity, which took into account the relevance of data in a dynamic digital environment, and contextual validity (taking into account geographical, industry, and economic characteristics of the market). The criteria for the reliability of secondary data were defined as the absence of bias, the ability to confirm facts from at least two or three independent sources (triangulation), and transparency of the methodology.

Competitive intelligence is key to digital modernization, but it faces the limitations of publicly available databases: data obsolescence, lack of context, legal risks, the threat of disinformation, and the inability to assess competitors' hidden operational processes.

The methodology faces limitations: a lack of reliable data in the digital ecosystem, ethical and legal risks, and difficulties in integrating qualitative analytics into a company's strategic IT solutions.

4. RESULTS AND DISCUSSION

Competitive intelligence is a key tool for digital modernization of enterprises, as it transforms market data into strategic decisions. The full cycle of competitive analysis consists of 6 stages: planning, data collection, analysis, dissemination, use and feedback.

- 1) Planning (Needs Definition) involves defining the objectives of the intelligence, key questions and success criteria. This stage is needed to understand which digital technologies or processes of competitors threaten your business or can be adapted (for example, switching to cloud solutions or implementing AI analytics).
- 2) Data collection involves searching for relevant data from open sources, databases, patents, social networks, customer reviews and industry reports. It is necessary to monitor the digital presence of competitors: which technology stack platforms they use, whether they update mobile applications, which digital sales channels they test.
- 3) The essence of the analysis stage is to transform raw data into knowledge using analytical frameworks (SWOT, PESTEL, benchmarking) and assess the digital maturity of competitors,

identify gaps in their and your strategy, and identify the strengths and weaknesses of their IT solutions.

- 4) The Insight Delivery stage involves formatting the results in the form of reports, dashboards or presentations and transferring them to decision-makers. It is necessary to promptly inform management and the development/IT department about market trends in order to avoid outdated investments in software or hardware.
- 5) Use (Decision Making) involves integrating the obtained conclusions into real business processes and strategic planning. to launch digital transformation processes based on real market needs, and not intuition (for example, integrating chatbots or updating the ERP system because it gave a competitor an advantage).
- 6) Feedback involves analyzing how useful the intelligence was, checking the profitability of the implemented digital innovations and clarifying the tasks for the next waves of intelligence.

Competitive analysis is a critical tool for business adaptation. It allows you to identify digital lags, minimize innovation risks, optimize capital investments, and make informed strategic decisions based on market data. It has the role of analyzing signals instead of forecasting, tracking subtle changes in customer behavior, new patents or key competitor migrations, scenario modeling and reducing uncertainty. Intelligence is also tasked with proactive decision-making and building a resilience ecosystem, diversifying risks and mirroring intelligence methods for counterintelligence based on continuous learning (Calof & Wright, 2008; Fleisher & Bensoussan, 2015; Prescott, 2001).

The empirical results were interpreted on the basis of four groups of indicators that reflected the main dimensions of enterprise digital modernization in Ukraine during 2021-2025. The first block is comprised of six enterprise digitalization indicators: digital platforms, online sales channels, digital payment instruments, cloud services, electronic document management, and digital customer interaction. The second block includes four innovation capacity indicators: new business processes, digital products, tech-based services, and investment in digital tools. The third block is made up of six financial security indicators: dynamics of profitability, liquidity, access to finance, cashless payments, exposure to financial risks, and operational activity stability. The fourth block contains four inclusive development indicators: financial inclusion, small-and-medium-sized enterprise access to digital finance, regional accessibility of digital services, and the capacity of digital tools to reduce economic barriers.

The next step was the averaging of normalized values within analytical blocks. It enabled the comparison of indicators that were expressed in different units and obtained from different official datasets. The block value for each year represented the average normalized score of all indicators included in the block. The final mean value is what was used to identify the dominant empirical effect of modernization. Data for 2025 were used where available at the time of data collection.

Table 1. Normalized block-level indicators of enterprise digital modernization in Ukraine, 2021-2025

Analytical block	Number of indicators	2021	2022	2023	2024	2025	Mean normalized value	Change 2022-2025
Enterprise digitalization	6	0.48	0.57	0.64	0.72	0.76	0.63	+0.19
Innovation capacity	4	0.44	0.35	0.42	0.50	0.54	0.45	+0.19
Financial security and resilience	6	0.51	0.36	0.53	0.70	0.76	0.57	+0.40
Inclusive development	4	0.39	0.44	0.53	0.61	0.65	0.52	+0.21

Note: Values represent averaged normalized scores calculated within each analytical block after applying min-max normalization. The 2025 values were included only where data were available at the time of data collection.

Source: Compiled by the authors based on State Statistics Service of Ukraine (n.d.-a, n.d.-b, n.d.-c, n.d.-d), Ministry of Digital Transformation of Ukraine (2025), Ministry of Economy of Ukraine (2024, 2025), and National Bank of Ukraine (2024, 2025, n.d.-a, n.d.-b, n.d.-c).

The normalized result indicates that enterprise digitalization was the highest average value across the period, with an approximate value of 0.63. Digital tools had thus been confirmed to be the most evident aspect of enterprise modernization. It increased from 0.48 in 2021 to 0.76 in 2025, demonstrating that Ukrainian enterprises increasingly depended on digital channels, online interaction, electronic document management, and digital payments. The result of this is consistent with the official data from the usage of information and communication technologies in enterprises and the development of digital applications in enterprise operations (State Statistics Service of Ukraine, n.d.-d). Meanwhile, the block of digitalization should not be taken as an indication of overall digital transformation. Despite the broader uses of basic and operational digital tools, the underlying business model transformations were more selective. Among variables, the mean normalized value of capacity to innovate was the very lowest at 0.45. These findings suggested that a digital upgrade led not to innovation automatically. While the industry was turning digital tools on, the move between use and the output of innovation was slow. Its absolute low was 2022 when the score decreased to 0.35. This was due to the impact of the crisis of war on investment, R&D activities, innovation of business operations, and technology-based services. The slow rebound to 0.54 in 2025 demonstrates that innovatory capacity is higher, but weaker than organisational digitalisation and financial resilience. From research and development activity of different enterprises, it is confirmed that capacity to innovate depended not only on the availability of digital instruments but also on investment capacity and rearrangement of processes of enterprises (State Statistics Service of Ukraine, n.d.-c).

The block of financial security and resilience was the most important empirically. Its mean normalized value was 0.57, which was lower than the block of digitalization but higher than that of innovation capacity and inclusive development. More importantly, this block showed the strongest recovery after the 2022 shock: from 0.36 in 2022 to 0.76 in 2025, with a change of +0.40. This was the strongest positive movement among all four blocks. Therefore, the statement that the strongest empirical connection was found between digital modernization and financial resilience was based not on a correlation test, which was not included in the methodology but on the highest

post-shock recovery amplitude and the highest 2024-2025 stabilization effect among the outcome-oriented blocks.

The financial results of their firms proved that dynamics of profitability, liquidity, and operational stability play a significant role in assessing the resilience effect of digital modernization. A series of Financial Stability Reports for December 2024 and June 2025 by the National Bank of Ukraine also confirmed that resilience of enterprises is dependent on overall sound stability of the financial system, credit conditions, risk expectations, and gradual recovery of financial intermediation. On top of this, digital technologies were supporting financial security by accelerating payments, reinforcing financial monitoring, allowing remote transactions, improving interaction with banks and clients, and ensuring more stable financing security. Digital payments were a very big part of it. The card payment statistics illustrate the rising infrastructure of non-cash payments and the increasing role of non-cash payments in the economy (National Bank of Ukraine, n.d.-c). For firms, this meant that digital financial channels formed part of daily operations. They cut dependence on cash, sped up settlements, and let them engage with customers during disruptions. But the same thing made them more dependent on cybersecurity, on protection of their data, and on technology's reliability. Hence, non-cash payment activity enhanced financial resilience only when the digital infrastructure was stable and secure.

But access to finance remained a constraint. For medium and small businesses, the data on interest rates on new loans revealed directly that credit conditions were influencing the extent to which firms could finance digital modernization (National Bank of Ukraine, n.d.-a). Nowhere was this more evident than in SMEs where there are most likely no internal resources for advanced digital transformation. Analysis also added an expectation dimension based on the Business Outlook Survey of the National Bank of Ukraine, since assessments by the businesses on the economic activity and financial conditions could explain why digital modernization is mainly considered as an adaptation method rather than a complete innovation strategy (National Bank of Ukraine, n.d.-b). The mean normalized value for the inclusive development block was 0.52. Digital modernization assisted with providing broader access to services, digital finance and support mechanisms, with the change from 0.39 in 2021 to 0.65 in 2025. Yet, the impact of such an effect continued to depend on institutions. The outcome of the Ministry of Digital Transformation of Ukraine in 2024 at the regional level indicates that the digital environment is different in regions and communities in which digital services are available to enterprises and citizens at a regional level (Ministry of Digital Transformation of Ukraine, 2025). Therefore enterprise-level digitalization is not the same as inclusive development. It also depends on regional infrastructure, public digital services and cybersecurity capacity.

The Ukraine Plan 2024-2027 of the Ministry of Economy confirmed that enterprise modernization was linked with recovery, investment attraction, business environment improvement, and European integration priorities. Materials of the SME Resilience Alliance also indicated that the targeted support for small and medium-sized enterprises had become part of the broader recovery framework. These sources confirmed that digital inclusion was not only a technological issue but of institutional support, access to finance, and the ability of smaller enterprises to participate in digital economic activity.

Table 2. Criteria-based matrix of enterprise digital modernization effects in Ukraine, 2021-2025

Analytical block	Empirical indicators used	Mean normalized value	Main empirical pattern	Dominant effect
Enterprise digitalization	ICT use, online channels, digital platforms, electronic document management, digital payments	0.63	Basic digital tools expanded faster than advanced digital transformation practices	Technological modernization
Innovation capacity	R&D activity, new business processes, digital products, technology-based services, investment in digital tools	0.45	Digitalization supported innovation mainly where enterprises combined tools with investment and organizational change	Innovation strengthening
Financial security and resilience	Financial results, profitability, liquidity, credit access, business expectations, payment card activity	0.57	The strongest post-shock recovery was observed in this block, especially after 2022	Financial resilience improvement
Inclusive development	Financial inclusion, SME access to digital finance, regional digital services, support mechanisms	0.52	Inclusion increased gradually but remained dependent on regional infrastructure and institutional support	Inclusive access expansion
Integrated result	Cross-comparison of the four normalized blocks	-	The strongest combined effect appeared where digital tools supported payments, finance, operational stability and access	Conditional modernization effect

Note: The matrix interprets the normalized values presented in Table 1 and links each analytical block with the dominant effect identified through the criteria-based assessment.

Source: Compiled by the authors based on State Statistics Service of Ukraine (n.d.-a, n.d.-b, n.d.-c, n.d.-d), Ministry of Digital Transformation of Ukraine (2025), Ministry of Economy of Ukraine (2024, 2025), and National Bank of Ukraine (2024, 2025, n.d.-a, n.d.-b, n.d.-c).

Comparison of Tables 1 and 2 clarified the empirical role of digital modernization in the Ukrainian enterprise sector. The highest average score was that of enterprise digitalization; however, this did not mean that digitalization was the final outcome. It was, therefore, the enabling condition. Most dynamic recovery was observed in financial security and resilience, where the increase between 2022 and 2025 reached +0.40. This result shows that practical value of digital modernization in wartime and adaptation-stage conditions was most visible in its ability to support financial operations, payments, monitoring and access to financial infrastructure.

Innovation capacity growth was of a lesser speed. The normalized score rose from 0.35 in 2022 to 0.54 in 2025, with the mean value continuing to be the lowest among the four blocks. This, indeed, proved the impossibility of innovation with only digital adoption; enterprises needed investment, qualified staff, stable demand, and institutional support to change digital tools into new products, services, and business processes. The impact of innovation on digital modernization, therefore, was real but delayed.

Inclusive development was a middle ground. This rise from 0.39 in 2021 to 0.65 in 2025 means that economic opportunities were more reachable through digital tools and digital finance. But the impact of inclusion was not universal. It hinged on regional digital infrastructure, support for SMEs, affordability of finance, and the capacity of businesses to use digital services. Upgrading in digitals thus helped include only where digital access came together with institutional and financial underpinning. Some remarks on the empirical data must, however, be made. The periodicity of the chosen sources and the levels of aggregation were not the same. Some indicators were published annually, some in reports, survey materials, or spreadsheet data types with variable update period. Some 2025 indicators were either preliminary or available only at the time of data collection. Furthermore, some datasets represented the enterprise sector as a whole while others included small

and medium enterprises, financial markets, or regional digital transformation. These restrictions did not allow blockwise comparison; normalized values were necessary when raw data was not adequately presented for direct comparison. The results of the study support the fact that digital modernization has worked as a conditional development factor for Ukraine. It was most pronounced in the markers of enterprise digitalization; had the strongest recovery effect in terms of financial security and resilience; slow but positive effect on innovation capacity; and gradual and uneven effect on inclusive development. In general, the pattern was that digital transformation enabled the formation of enterprises most with its digital capabilities and when linked with financial stability, institutional support, and broader access to economic opportunities.

The results show that the digital modernization of the Ukrainian enterprises from 2021 to 2025 was multidimensional but uneven in nature. The best mean normalized value was 0.63 for the digitalization of the enterprises block, whereas the best post-shock recovery was obtained in financial security and resilience, with the average of 0.36 in 2022 and 0.76 in 2025. In other words, digitalization was mostly seen as an operational factor but its primary practical effect related to financial adaptation. In other words, companies initially employed digital tools for communication, payment-making processes, document flows and customer interaction activities and they then turned the tools into innovation or inclusive development outputs. This in part reflects the findings of Vakulenko and Garafonova (2024) that innovative digital enterprises arise from transformational economic changes: when tech revitalization is linked to new management and market operations. The current findings also support the above observation and specify it for Ukraine.

All normalized value of innovation capacity was 0.45, the lowest among the four blocks. The digital modernization didn't automatically turn into innovation. Innovation only solidified when enterprises had resources to invest in new business processes, digital products, technology-driven services and investment in digital tools (Zayed et al., 2022; Ungurian et al., 2025). This is a very important difference because the formal adoption of digital platforms or electronic document management cannot be misunderstood with deeper innovation processes. A slow growth in the ability to innovate also confirmed that the crisis revolutionized the logic of digital modernization. Under stable conditions, productive output from digital transformation will be typically productivity, new products, and/or competitiveness. The first effect in Ukraine was much more defensive. Digital tools were used by businesses to keep activities moving and avoid business disruption.

This is why financial security showed the biggest gain by 2022. The +0.40 boost over 2022-2025 meant digital tech was useful - whether that meant making payments, doing business remotely, monitoring finances & talking to banks, or customers. This supports the finding by Valaskova et al. (2025) that the financial benefits of digital transformation, when strategically aligned with firm objectives, were magnified. The present study supports this, but notes that strategic fit is more than just a management function. In Ukraine, it was about finance, credit terms, bank stability and the ability of firms to sustain activity in times of warlike uncertainty. This was not a tech issue in and of itself but related to digital tools being tied into financial infrastructure and how that affected operations and where real modernization actually had an impact on money.

The influence of digital finance on enterprise resilience is in line with the findings of Xu et al. (2024) who reported that digital finance promotes economic resilience for firms undergoing digital

transformation. Such results confirm that correlation via the financial resilience block, because digital payments, access to loans, and business expectations were directly related with enterprises' adaptation to the 2022 shock. Yet, on a more economic and social level, the Ukrainian example also suggests a limitation, that digital finance is effective for achieving resilience when it is feasible for SMEs to access it. If credit is a costly instrument or has uneven access, digital development is restricted to relatively simple tools and does not evolve into a robust financial resilience strategy. The mean normalized value of the inclusive development block was 0.52. This indicated moderate but not 100 percent progress. Digital tools included access to financial services, regional digital infrastructure, support for the development of small and medium-sized enterprises within the region. Nevertheless, the effect of inclusion is weak compared to the technological force behind digitalization. That is, digital modernization offered opportunities for broader participation but at the expense of not delivering them equally to businesses and geographies.

This result is in line with Wang et al. (2025) who proved that digital inclusive finance can stimulate SMEs' innovation. The present study confirms this relationship, with one clear caveat: in the Ukrainian context, digital inclusive finance should be seen not only as a driver of innovation but also as a way to recover and rise from challenges. It is also partly in line with Zhu (2023) who reports on how digital financial inclusion affects the distribution of economic outcomes at the firm level. Ukrainian evidence supports and broadens this general logic because of inclusive access—from small firms entering the digital finance phase to taking up cashless payments and to regional digital services. The findings also underscore the fact that inclusion is not automatic; digital infrastructure may scale but enterprises still need cost-effective finance and digital skills, institutional backing, and secure platforms. In the absence of these conditions, digitalization might increase the gap between firms that are ready for work in a digital environment and the regions and financially constrained firms. That these findings have further significance is further put in context to the national Ukrainian context. The paper emphasizes Ukraine's integration into the digital global sphere, particularly the impacts of digital transformation on the modernization and international alignment process of the country. This study proves that enterprises of our country are moving towards a more digital model of economic activity.

The strategic implications of competitive intelligence for digital modernization are focused, primarily, on reducing the risk of ineffective technology investments, reducing the time to market for digital products, and increasing business resilience to crises and data leaks through more effective management. The role of competitive intelligence in digital modernization technology benchmarking is to determine which digital platforms, artificial intelligence or cloud solutions are actually bringing profit to competitors, as well as to identify "blind spots" – free digital niches in the market that other players have not yet occupied. In addition, it is important to assess digital maturity by comparing your own digitalization indicators with market standards.

Competitive intelligence in digital modernization of enterprises serves as a proactive analysis tool that transforms market data into management decisions. It identifies competitor vulnerabilities, optimizes investments in IT infrastructure, and minimizes the risks of implementing new technologies (AI, Big Data, IoT), ensuring the protection of strategic digital assets. It collects data about the market, competitors, and trends using digital tools. This allows you to make accurate management decisions based on deep analytics, reduce risks, and stay ahead of your competitors.

However, findings also show that inclusion in the digital space cannot be defined simply by the presence of digital tools. It should also be judged by enterprise resilience, innovation capacity and equity of access. If small firms, regions or the most vulnerable market participants are unable to access digital finance and to benefit from the provision of supportive infrastructure, a digitally connected economy would continue to be unequal. From comparing the four normalized blocks it is clear that the digital modernization trend in Ukraine has been a definite one. The first stage was operational digitalization, which was displayed by the highest average value in the digitalization block. The second stage was financial stabilization, signified by the largest recovery of the financial security block. The third stage was partial innovation renewal, which was weaker owing to a need for investment and organizational change. The fourth stage of an inclusive expansion was driven to a significant extent by regional infrastructure and institutional support. This order demonstrates how the author argues that digital modernization should be viewed as conditional rather than as a predictable source of development.

The findings have wide-ranging implications. Digital transformation for businesses should, therefore, be linked with financial planning and risk management. But digital platforms or electronic services alone aren't sufficient, unless such platforms are linked to control over cash flow, access to finance and cybersecurity. The results suggest that digital transformation policy should be coupled with SME finance, regional digital infrastructure and specific recovery mechanisms for the policymakers. The most consistent empirical signal was not so much the increase in digitalization as how digital tools helped firms recover their financial resilience after the 2022 disruption. The results also provide some possibilities for research to come. The first, and indeed the most important, is to see whether we could conduct an enterprise-specific test of whether firms which are more digitally-ready also appear to have better profitability, liquidity, or innovate more. Second, regional comparisons can be done to determine where, if at all, the impact of digital modernization on inclusion are stronger than they are elsewhere in areas.

Third, cybersecurity and data protection cannot exist in a vacuum, as the expanding usage of digital payments and financial systems presents new associated risks. The association between digital finance and SME innovation is not just the availability of financial instruments, but the quality, affordability, and use. Thus, the conversation here confirms, in the case of Ukraine, that the digital modernization process was more successful when the technological adoption of the solutions, financial resilience, and inclusive access complemented one another. The findings are consistent with international studies relating digital transformation of the economy with financial performance, SME innovation, resilience, and inclusion. The Ukrainian case introduces a crisis-specific interpretation: that digital modernization was not only a pathway to competitiveness, but also to survival, stabilization, and recovery. This conclusion is the logical progression to the closing chapter, providing a summary of the main empirical conclusions, limitations, and practical recommendations.

5. FINAL CONSIDERATIONS

The study has concluded that the digital modernization of enterprises in Ukraine was associated with innovation capacity and with financial security and inclusive economic development between 2021-2025, but differentially. The digitalization of an enterprise was the most visible aspect of

enterprise modernization, where the mean normalized value was highest at 0.63. Financial security and resilience reached 0.57, showing the strongest recovery after the shock in 2022; it increased from 0.36 to 0.76 by 2025. This indicates that the digital modernization was successful where it mattered most in support of payments, operational continuity, financial monitoring and engaging the financial infrastructure. Innovation capacity was found to be the lowest in average value (0.45). This illustrated that adoption of digital technologies does not necessarily translate to new products, digital services or corporate new processes. Inclusive development was at 0.52, indicating steady progress in access to digital finance, regional digital services and support services for small and medium-sized enterprises. But the impact of this was still based on regional infrastructure, institutional backing and capital cost. Digitalization of enterprises should be complemented by financial resilience, risk management, cybersecurity and investment planning. For the policy makers, the findings demonstrate that it is in their position to promote small- and medium-size enterprises in pursuit of low-cost digital finance, in regional digital infrastructure and recovery-oriented instruments. Competitive intelligence has become a key tool in the digital modernization of enterprises, enabling the transition from intuitive decision-making to real-time data analytics. Its scientific contribution lies in the integration of Big Data, cybernetics, and marketing methods into a single system of adaptive business management. It minimizes risks when implementing innovations, identifies new market niches, and optimizes internal processes through analysis of competitors' digitalization. Competitive intelligence has become a key tool for digital modernization, transforming unstructured market data into reliable management decisions. It minimizes the risks of IT investments, identifies blind spots in strategies, and accelerates business adaptation to change.

Limitations included secondary open-access data, variability in the source update cycle and incomplete 2025-based indicators availability. Also, the methodology faces limitations: ethical and legal risks, and difficulties in integrating qualitative analytics into a company's strategic IT solutions.

Firm level data, regional comparisons and sectoral analysis should assist future research in understanding the impact of digital level readiness on profitability, innovation output and loan access. Future research directions are seen in exploring the boundary between legitimate competitive intelligence and protecting corporate data from digital espionage, as well as developing new metrics and models for determining the return on investment in competitive intelligence systems during enterprise digitalization.

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