

STRATEGIC ANALYSIS OF HIGHER EDUCATION INSTITUTIONS DEVELOPMENT IN UKRAINE UNDER CURRENT CHALLENGES: AN INTEGRATED APPROACH

Maksym SKYDAN

Halyna LOPUSHNIAK

Oksana KRAVCHUK

Lesya ILCHENKO-SYUYVA

Maksym SKYDAN

Senior Lecturer, Department of Socioeconomics and Personnel Management, Faculty of Personnel Management, Sociology and Psychology, Kyiv National Economic University named after Vadym Hetman, Kyiv, Ukraine
E-mail: maksym_skydan@kneu.edu.ua

Halyna LOPUSHNIAK

Department Chair, Department of Socioeconomics and Personnel Management, Faculty of Personnel Management, Sociology and Psychology, Kyiv National Economic University named after Vadym Hetman, Kyiv, Ukraine
E-mail: halyna.lopushniak@kneu.edu.ua

Oksana KRAVCHUK (corresponding author)

Associate Professor, Department of Socioeconomics and Personnel Management, Faculty of Personnel Management, Sociology and Psychology, Kyiv National Economic University named after Vadym Hetman, Kyiv, Ukraine
E-mail: oksana.kravchuk@kneu.edu.ua
ORCID: 0000-0002-6337-7759

Lesya ILCHENKO-SYUYVA

Associate Professor, Andriy Meleshevych Kyiv-Mohyla School of Governance, Faculty of Law, National University of Kyiv-Mohyla Academy, Kyiv, Ukraine
E-mail: ilchenko-syuyva@ukma.edu.ua

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Abstract

The strategic development of higher education institutions (HEIs) during military conflicts represents a critical yet understudied area in educational management research. This study examines the transformation patterns of Ukrainian HEIs during wartime, addressing the urgent need for empirical research on educational resilience under extreme conditions. The research implements a mixed-method approach integrating quantitative and qualitative analyses. Data collection involved a comprehensive expert survey ($n=77$) representing key stakeholder groups: academic administration (16.88%), teaching staff (19.48%), students (18.18%), regulatory bodies (12.99%), employers (10.39%), and international experts (5.20%). The methodological framework combines SWOT, PESTEL, and SKEPTIC analyses, validated through expert evaluation using a five-point Likert scale. The analysis reveals three critical impact factors: military conflict (4.60/5.0), financial instability (4.55/5.0), and security challenges (4.47/5.0). Ukrainian HEIs demonstrate significant adaptability through technological transformation (91% implementation rate) and international integration (84.5% cooperation rate). Strong correlations emerge between security-financial aspects, technology-education quality, and sociocultural adaptations. The research establishes an innovative framework for analyzing HEIs strategic development during crises, demonstrating that institutional resilience requires synchronized implementation of technological modernization, international cooperation, and enhanced security measures. These findings contribute to crisis management theory in higher education (HE) and provide practical guidelines for institutional adaptation under extreme conditions.

Keywords: higher education, strategic management, crisis management, educational resilience, military conflict impact, adaptation strategies.



1. Introduction

Higher education institutions (HEIs) worldwide face unprecedented challenges in the 21st century, from technological disruption to geopolitical instability. The Russian invasion of Ukraine in 2022 has created a unique case study of educational resilience under extreme conditions, offering valuable insights into institutional adaptation during armed conflicts.

In global crises, such as the COVID-19 pandemic and military conflicts, HEIs need to adapt their educational and management practices. Such adaptation includes digital transformation, international academic cooperation, and the development of resilience in educational systems.

The COVID-19 pandemic has significantly accelerated the digital transformation of higher education, compelling universities to implement online learning and use digital technologies to support the educational process. Such transformation has posed significant challenges, especially in developing countries, where a lack of resources has threatened the sustainability and productivity of universities. The crucial role of leadership and management in the context of digital transformation is underscored in research that points to the need for leaders to adapt educational technologies and online learning systems to improve the overall performance of universities.

HEIs in conflict zones such as Ukraine are forced to adapt their practices to ensure the continuity of the educational process. This adaptation involves developing and implementing resilience strategies and specific plans and actions designed to maintain the institution's functioning in the face of crisis. These strategies are often based on flexibility, resourcefulness, and adaptability. They are developed in response to new conditions that arise during crises (Juusola and Nokkala, 2024; Karlsson and Offord, 2023). International cooperation plays a key role in strengthening the research capabilities of higher education institutions in conflict zones, contributing to the development of resilience and adaptation to change (Amaratunga, Liyanage and Haigh, 2018).

International educational cooperation (ISA) is important for adapting to global crises. It helps HEIs develop new practices and approaches that meet the conditions of crises while ensuring public responsibility and morality, which refers to the ethical and social obligations that HEIs have towards their students, staff, and the wider community, even in times of crisis (Juusola and Nokkala, 2024). Cooperation between universities from different countries facilitates the exchange of experience and resources, which is critical for strengthening research capabilities and risk management in crises (Amaratunga, Liyanage and Haigh, 2018).

Universities worldwide face numerous challenges during crises, but thanks to digital transformation, international cooperation, and the development of resilience, they can adapt to new conditions. These processes require the active involvement of leadership, innovative approaches, and global support to ensure the continuity and quality of education in the face of uncertainty. While extensive research exists on HEIs development under normal conditions, there is limited understanding of how educational institutions adapt and

transform during military conflicts. Furthermore, the urgent need for further research on integrating strategic analysis methodologies (SWOT, PESTEL, SCEPTIC) in evaluating HEIs resilience is evident.

The study aims to develop an integrated framework for analyzing HEIs strategic development under crisis conditions by evaluating critical factors affecting HEIs operations during military conflict, analyzing adaptation mechanisms and transformation strategies, identifying patterns of successful institutional resilience, and developing practical recommendations for HEIs management.

2. Literature review

The strategic directions for the development of higher education in Ukraine are defined through the need for inclusive planning, adaptation to wartime challenges, and alignment with European integration and sustainable development priorities.

Modern dynamic changes necessitate high-quality strategic planning of higher education in Ukraine, taking into account rapid transformations and complex challenges. Contemporary strategies must ensure inclusivity and fairness by addressing diverse stakeholder interests and aligning with sustainable development goals, as demonstrated in comparative analyses of Ukrainian and Polish approaches (Skydan, 2024). The war poses challenges for the higher education system in Ukraine but also creates new opportunities for reform and development in response to these challenges (Kibenko and Popadych, 2024). In Ukraine, strategic planning in higher education is directed toward assessing the current state of the system, defining its role within the state's broader strategic priorities, and addressing gaps in legislation as well as discrepancies with international best practices (Mykhailova, 2024). The importance of the strategy to support the long-term success of higher education is highlighted in the context of key trends such as European integration and sustainable development (Skydan, 2024; Kibenko and Popadych, 2024; Mykhailova, 2024).

In the study of higher education development, particular attention should be paid to the alignment between labor market needs and the supply of graduates. This dimension makes it possible to identify not only institutional strengths but also systemic weaknesses of the sector. An important strength of Ukrainian higher education institutions is the updating of educational standards and the national qualifications framework, which contributes to improving the quality of training. At the same time, there are significant challenges: insufficient funding of the education sector, duplication of study programs that reduce the efficiency of resource allocation, and an uneven distribution of specialists across fields. These factors hinder the ability of the higher education system to fully meet the demands of the labor market (Lopushniak and Skydan, 2022). The key risks currently faced by the Ukrainian higher education system include a decline in the number of highly qualified specialists, the forced closure of institutions, the limited effectiveness of modern teaching technologies, and the insufficient preparedness of graduates for labor market requirements (Antonyuk, 2021; Borodiyenko *et al.*, 2022). These challenges have been significantly

exacerbated by the war. The conflict has led to demographic losses, the displacement of students and academic staff, the destruction of universities' material base, and shrinking resources available for innovation and research. At the same time, wartime conditions have highlighted the urgent need for reforms aimed at post-war recovery, program modernization, and deeper integration into the European educational space (Kibenko and Popadych, 2024; Havryliuk *et al.*, 2024). Thus, the weaknesses of Ukrainian higher education directly affect the system's ability to provide the economy with the necessary specialists. Above all, this concerns the underfunding of innovation and research activities, which significantly limits development potential and reinforces the imbalance between supply and demand in the labor market (Lopushniak and Skydan, 2022; Sas, 2021).

In examining the strategic development of higher education, it is crucial to assess the multidimensional impact of the war, which has disrupted traditional processes but also stimulated reforms toward European and global integration.

The war in Ukraine has had a significant effect on the educational process, through the transition to distance and blended learning, reduced funding, and the destruction of academic institutions. The war in Ukraine poses significant challenges to the higher education system, yet also creates opportunities for reform and development aimed at ensuring access for all, supporting internally displaced persons, modernizing programs, and aligning with European and global standards (Kibenko and Popadych, 2024). The strategic development of Ukrainian universities is constrained by political, economic, social, and demographic factors. It requires restoring the material and technical base, human resources, and scientific infrastructure and deepening international partnerships (Borodiyenko *et al.*, 2022). Such a development of the situation creates new opportunities for reforming and developing higher education, through integration into the European and global space (Borodiyenko *et al.*, 2022; Kibenko and Popadych, 2024).

Demographic shifts, including the declining number of young people and prospective students, pose a critical challenge to the strategic development of higher education in Ukraine, requiring flexible planning and innovative responses.

Strategic planning in higher educational institutions, involving multidimensional, long-term actions, can effectively realize their vision and increase their competitiveness (Marukhlenko, 2017). Strategic planning of higher education in Ukraine should be flexible, considering demographic realities and aiming at creating a competitive and socially responsible educational environment (Ovsiannykov and Shandar, 2024). Changes in the demographic structure of the population, such as the decrease in the number of young people and students, require strategic planning to ensure quality and affordable higher education, which includes adaptation to new conditions and the development of innovative approaches aimed at efficiency and compliance with the needs of modern society (Ovsiannykov and Shandar, 2024; Marukhlenko, 2017). The strategic development of higher education in Ukraine faces numerous challenges, such as war, demographic change, and imbalances in the labor market. However, these challenges also open new opportunities for reforming the education system, which can contribute to its integration into the

European space and increase competitiveness. It is important to develop strategies that consider all stakeholders' interests and contribute to sustainable development.

Strategic directions for developing higher education in Ukraine focus on modernizing educational practices, improving quality standards, and integrating into the European educational space. Key priorities include enhancing education quality through accreditation mechanisms and innovative approaches (Skydan, 2024; Lugovyi, Slyusarenko and Talanova, 2021), updating curricula to meet labor market needs and developing dual training programs (Mykhailova, 2024; Lopushniak and Skydan, 2022), advancing human capital and fostering innovation skills in students (Mykhailova, 2024; Antonyuk, 2021), expanding international cooperation (Mykhailova, 2024; Kushnir, 2023), and promoting digitalization and distance education (Antonyuk, 2021; Havryliuk *et al.*, 2024). However, development is constrained by insufficient legislation, absence of national university rankings, and limited innovation support (Lugovyi, Slyusarenko and Talanova, 2021), requiring synergy between institutional and social transformations (Havryliuk *et al.*, 2024). An integrated approach is essential, combining modernization, European integration, human capital development, and addressing legal and institutional challenges for sustainable progress.

The development of higher education in Ukraine is a key factor of national progress, especially in the context of European integration and modern challenges. Strategic analysis enables the identification of development priorities, considering internal and external factors influencing the education system. The main focus is on integration into the European educational space, modernization of programs, teaching methods, and management practices in line with EU standards (Antonyuk, 2021; Skydan, 2024). The formation of human capital is critical for economic growth, requiring the development of students' innovation and entrepreneurship skills and the alignment of educational programs with labor market needs (Antonyuk, 2021; Marukhlenko, 2017).

The war in Ukraine has intensified challenges in higher education, including distance learning, reduced funding, and the mobilization of students and staff. However, these challenges also create opportunities for reform (Kibenko and Popadych, 2024). Expanding financial autonomy and diversifying funding sources are strategic priorities to improve educational quality (Polianovskiy, 2019; Sas, 2021).

Strategic planning in higher education requires a systematic approach based on the analysis of legislation, organizational and management aspects, and consideration of global trends (Marukhlenko, 2017; Polianovskiy, 2019). An integrated approach is essential to enhance the competitiveness and sustainability of Ukraine's higher education system (Mykhailova, 2024; Skydan, 2024).

Recent research highlights various methodological approaches to HE strategy development. Yakovenko and Sinkevych (2023) outlined key components: mission, goals, environmental analysis, strategic directions, KPIs, and monitoring. Their model includes legislative review, environmental scanning, strategy formulation, and implementation. Chernysh (2018) proposed strategic management tools such as SWOT analysis and SMART goals, identifying four strategic alternatives: expansion, stabilization, economy,

or combined strategy. Natroshvili (2015) categorized approaches into centralized, decentralized, and combined models, emphasizing economic forecasting and expert evaluation in uncertain conditions. Koval, Punda and Artamoshchenko (2023) focused on strategy development for military educational institutions, applying macro-environment analysis and the DOTMLPFI framework to assess capabilities.

Contemporary HE strategy development requires situational analysis of internal and external factors, alignment of mission with societal needs, clear strategic objectives, effective implementation mechanisms, and active stakeholder engagement. Modern approaches must also address digital transformation, educational innovations, and flexibility in meeting learner needs in unstable economic conditions. This review highlights the shift from traditional planning models to adaptive, stakeholder-oriented strategies that reflect contemporary challenges and technological progress in higher education.

3. Methodology

3.1. Research design and conceptual framework

This research presents a comprehensive methodological framework for developing adaptive strategic resilience in Ukrainian higher education institutions operating under extreme crisis conditions. The study employs a convergent mixed-methods design combining quantitative expert assessments with qualitative institutional analysis to understand adaptation mechanisms during military conflict (February 2022 – August 2024).

The conceptual framework integrates three established strategic analysis methodologies adapted for crisis conditions in higher education: SWOT analysis for internal capability and external opportunity assessment, PESTEL analysis for comprehensive environmental scanning, and SKEPTIC methodology for multi-dimensional factor evaluation. This integrated approach facilitates systematic planning, efficient resource allocation, and achievement of educational objectives under extreme uncertainty.

The proposed methodological framework encompasses various analytical tools that can be implemented either independently or in combination for developing and enhancing HEIs resilience strategies (Figure 1). Success depends on contextual considerations, institutional specifics, and comprehensive stakeholder engagement in strategy formation under crisis conditions.

Based on extensive analysis of these methods' applications in business (Baden-Fuller and Haefliger, 2023; Nosan, Yakymenko and Panchenko, 2023; Trunina and Pryakhina, 2022; Polyakov, 2023), non-business (Kolisnichenko, 2023; Liganenko, Prykhodko and Kushnir, 2023), and educational contexts (Chernysh, 2018; Natroshvili, 2015; Koval, Punda and Artamoshchenko, 2023; Yakovenko and Sinkevych, 2023; Polyanska and Tymoshenko, 2019), including international perspectives (Stepashko, 2019; Inga *et al.*, 2021; Hashim, Tlemsani and Matthews, 2021; Bakoğlu *et al.*, 2016), we have developed specific recommendations for implementing these methodological approaches within Ukrainian HEIs operating under unstable external conditions.

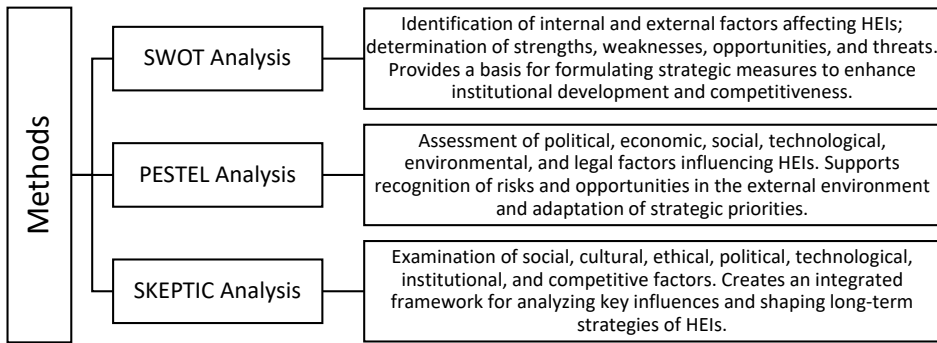


Figure 1: Strategic planning and implementation methods for higher education institutions

Source: Own compilation

3.2. Description of the study context and sampling strategy

The study was conducted across Ukrainian higher education institutions located in conflict-affected regions including Kyiv, Kharkiv, Dnipro, Lviv, and Odesa oblasts. These regions were purposively selected as they represent diverse geographical contexts while experiencing varying degrees of military impact, from frontline territories to relatively stable western regions. The temporal scope encompasses the initial conflict phase (February – December 2022) and the institutional adaptation period (2023 – 2024).

A multistage sampling procedure was employed based on extensive analysis of strategic planning methods' applications in business (Baden-Fuller and Haefliger, 2023; Polyakov, 2023), non-business (Kolisnichenko, 2023; Liganenko, Prykhodko and Kushnir, 2023), and educational contexts (Chernysh, 2018; Natroshvili, 2015; Koval, Punda and Artamoshchenko, 2023), including international perspectives (Hashim, Tlemsani and Matthews, 2021; Bakoğlu *et al.*, 2016).

The expert panel comprised 77 representatives ensuring geographical and gender representation while reflecting the diversity of the higher education community. The sampling distribution included academic staff (19.48%, n=15), HEIs administration (16.88%, n=13), students (18.18%, n=14), government bodies (12.99%, n=10), employers (10.39%, n=8), international experts (5.20%, n=4), IT specialists (6.49%, n=5), and security experts (5.20%, n=4). Geographic representation achieved participation rates varying from 58% in frontline areas to 89% in western regions, with maintained gender balance (52% female, 48% male) and age distribution spanning 23-65 years.

3.3. Integrated analytical framework and research tools

For developing strategic resilience frameworks for Ukrainian HEIs during wartime and post-war recovery, an integrated methodological approach combining SWOT analysis, PESTEL analysis, and SKEPTIC methodology was implemented. This combination enables comprehensive identification of strategic priorities, opportunities, and threats while developing strategies adapted to conditions of military conflict and reconstruction

(Antonyuk, 2021; Skydan, 2024).

- SWOT analysis framework: evaluates internal strengths and weaknesses against external opportunities and threats using 20 validated indicators. The analysis supports identification of internal resources and capabilities while assessing external challenges and opportunities for international cooperation and technological advancement.
- PESTEL analysis framework: conducts systematic environmental scanning across 24 factors within six categories (Political, Economic, Social, Technological, Environmental, Legal). This analysis identifies key trends and factor interconnections affecting HEIs strategic development under crisis conditions.
- SKEPTIC analysis framework: provides comprehensive assessment of socio-demographic, competitive, economic, political, technological, industrial, and customer factors influencing HEIs transformation. The methodology evaluates 28 factors across seven components using a five-level impact intensity scale.

3.4. Data collection procedures and verification process

A comprehensive range of research tools was utilized combining quantitative and qualitative data collection methods. Semi-structured questionnaires coupled with personal interviews were used to elicit expert assessments. The questionnaire incorporated five-point Likert scales for quantitative factor evaluation and open-ended questions for qualitative insights into adaptation mechanisms.

Seven focus group discussions (FGDs) were conducted with institutional leadership, faculty representatives, and student organizations, involving 35 participants total. Key questions addressed crisis impact assessment, adaptation strategies, resource mobilization, and future development prospects. Five key informant interviews (KIIs) were held with sector specialists, international partners, and policy experts to obtain comprehensive information about strategic trends and policy responses.

The research methodology implemented a two-stage verification process:

- **Stage 1:** validated the integrated analysis matrices through expert surveys, confirming strategic factors, their significance levels, and interconnections. This stage established the empirical foundation for factor prioritization and relationship mapping.
- **Stage 2:** provided in-depth analysis of international integration prospects, operational specifics under martial law, and the role of innovative technologies in institutional transformation. This stage examined adaptation mechanisms and success factors through detailed case analysis.

3.5. Data analysis and measurement framework

Strategic analysis was based on development of influence factor matrices and hypothesis formulation, verified through comprehensive expert evaluation. PESTEL analysis assessed 24 factors across political, economic, social, technological, environmental, and legal components. SKEPTIC analysis evaluated 28 factors across seven dimensions, measuring impact intensity and transformation drivers affecting HEIs strategic development.

Data were coded and tabulated using Excel 2019, with statistical analysis performed using SPSS version 28. The analytical approach combined descriptive statistics, correlation analysis, factor analysis, and thematic analysis for qualitative components. Multiple validation procedures were employed including triangulation of quantitative and qualitative findings, expert consensus validation, and cross-verification through different data sources.

The measurement framework assessed strategic resilience through multiple dimensions: operational continuity, financial sustainability, educational quality maintenance, security preparedness, and adaptation capacity. Context-specific indicators were selected from existing crisis management literature, validated through FGDs and expert interviews, and adapted to Ukrainian conflict conditions.

The integrated methodological complex provides a systematic and scientifically grounded framework for the strategic analysis of HEI development, combining quantitative and qualitative methods with broad stakeholder representation. This framework provides solid empirical basis for practical recommendations on strengthening competitiveness and sustainability of Ukrainian HEIs under current and future challenges.

4. Results

4.1. SWOT analysis implementation in higher education strategic development

Strategic analysis in higher education institutions (HEIs) requires advanced methodological tools to assess internal capabilities and external environmental factors. SWOT analysis remains a key instrument for evaluating strengths, weaknesses, opportunities, and threats (Pedchenko, Hasii and Vlasenko, 2023), ensuring a comprehensive understanding of institutional development trajectories. In the context of Ukrainian HEIs, especially during wartime and post-war recovery, SWOT analysis provides a foundation for building strategic frameworks that leverage strengths, address weaknesses, seize opportunities, and mitigate threats (Stanasiuk and Minko, 2023; Prosina, 2020; Klymenko and Korol, 2021).

The research methodology involved empirical verification of the SWOT analysis matrix (Figure 2), identifying potential strategic advantages for HEIs and outlining key challenges requiring strategic action.

The framework supports the systematic assessment of internal capacities, alignment of resources with external opportunities, and development of adaptive responses to environmental threats. The empirical study engaged 77 experts from Ukrainian HEIs, applying a five-point Likert scale and qualitative assessments to verify hypotheses for each SWOT component (Table 2, see Annex). The results provide a robust basis for strategic planning under conditions of war and reconstruction.

The empirical verification process unequivocally established the high validity of the proposed SWOT matrix. A resounding 18 out of 20 hypotheses received confirmation through expert evaluation, instilling confidence in the robustness of our findings. The strengths component demonstrated validation in four out of five cases, with state support

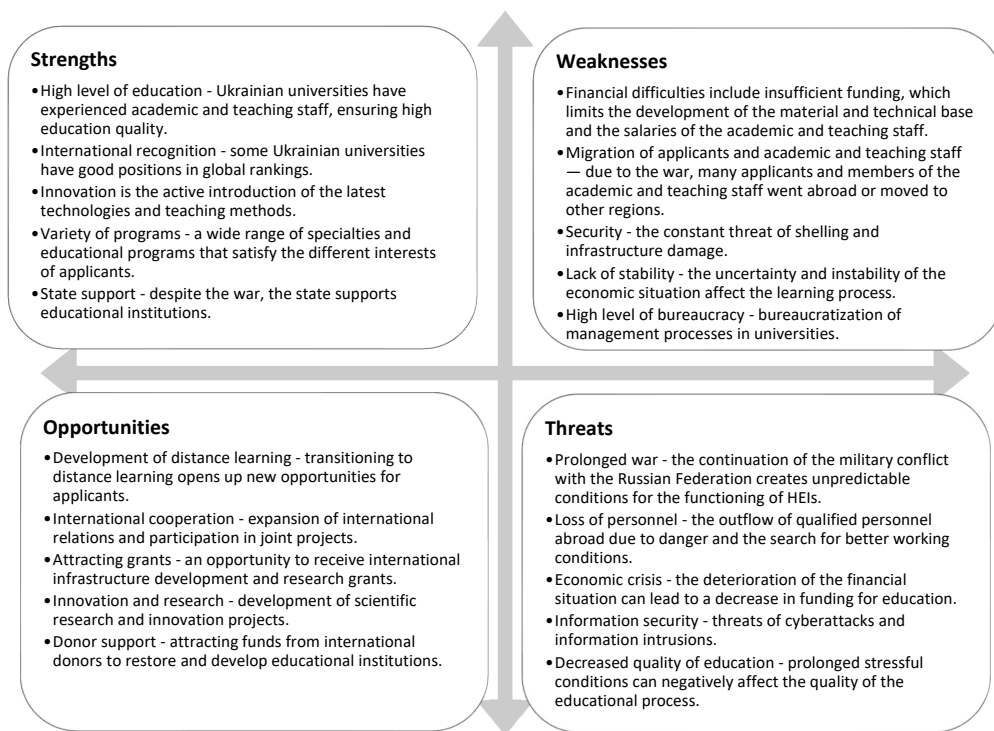


Figure 2: SWOT analysis matrix of the Ukrainian HEIs development in modern conditions

Source: Own compilation

being the only partially refuted factor, receiving lower expert assessment than initially hypothesized. All hypotheses regarding weaknesses received full empirical confirmation, with security challenges (mean score of 4.30) and financial constraints (mean score of 4.21) emerging as particularly significant factors.

In the opportunities section, four out of five hypotheses received full confirmation, with grant acquisition showing partial confirmation due to only 53% of experts reporting active grant funding engagement. The threats component demonstrated complete validation across all hypotheses, with war-related challenges (mean score of 4.49) and personnel loss (mean score of 4.14) identified as the most critical factors.

The research revealed several significant patterns and correlations:

1. Strategic development imbalance: the analysis identified a substantial disparity between HEIs development potential and restrictive factors imposed by martial law conditions. Security challenges (mean score 4.49) and financial constraints (mean score 4.21) emerged as dominant influences on educational system functionality.
2. Institutional adaptability: despite significant external threats, the research documented a strikingly high institutional adaptability. 81% of experts noted active innovation implementation and 80% indicated intensive development of distance learning modalities, suggesting the emergence of a more flexible and technologically advanced

educational paradigm. This adaptability instills optimism about the system's ability to evolve and thrive in the face of challenges.

3. International integration trajectory: a notable finding involves the strong trend toward international integration as a strategic development vector, evidenced by 97% of institutions planning expanded international cooperation. This trend indicates a new operational model oriented toward active integration into the global educational space.
4. Systemic contradictions: the research identified a fundamental contradiction between high educational quality (67% of experts rate it high) and critical resource constraints (52% indicate significant financial challenges). This contradiction represents a primary challenge for Ukraine's higher education system.
5. Problem hierarchy: the analysis enabled the identification of three distinct problem levels – critical level (military threats and financing, scores >4.2); serious level (staff migration and economic instability, scores 3.9-4.1); moderate level (bureaucracy and information threats, scores <3.9).
6. Resilience model evolution: results indicate the emergence of a new institutional resilience model combining technological transformation (71% focus on innovations) with international integration (75% emphasize donor support importance), representing qualitative changes in approaches to educational system sustainability under crisis conditions.

The research findings underscore the urgent need to reconsider traditional higher education management approaches considering the identified trends and patterns. Particularly crucial is to develop new mechanisms for ensuring financial sustainability, security system enhancement, and retention of qualified personnel. Even under unprecedented challenges, the Ukrainian higher education system demonstrates significant adaptive potential and development capacity. However, identified contradictions and limitations require immediate and systematic approaches to resolving and forming new operational paradigms accounting for current realities and prospective development trajectories. These research outcomes provide a scientific foundation for developing strategic directions in Ukrainian higher education system development and improving mechanisms for adaptation to war-time challenges.

4.2. PESTEL analysis: strategic environmental assessment in higher education

PESTEL analysis serves as a comprehensive strategic management tool for evaluating external environmental factors affecting HEIs. This analytical framework enables systematic assessment of Political, Economic, Social, Technological, Environmental, and Legal factors that influence institutional development and strategic planning (Kozlenko, 2021; Boiarska-Khomenko, Vorozhbit-Horbatiuk and Kalashnikova, 2021). Based on extensive analysis of PESTEL methodology applications across various sectors (Oleksyuk and Slipetsky, 2023; Trunina and Priakhina, 2022), we have developed an enhanced analytical framework specifically adapted for Ukrainian higher education institutions operating

under wartime conditions and post-war reconstruction scenarios. The research methodology incorporated empirical verification of the author's PESTEL analysis matrix for Ukrainian HEIs development under current conditions (Figure 3).

The theoretical framework required empirical validation through expert evaluation of identified influence factors. This approach enables comprehensive assessment of political factors affecting educational policy and institutional governance, economic dimensions influencing financial sustainability, sociocultural aspects impacting educational delivery and accessibility, technological considerations in educational innovation, environmental factors affecting institutional operations and legal framework governing educational activities.

The PESTEL analysis implementation framework provides systematic evaluation of external environmental factors through comprehensive data collection across all

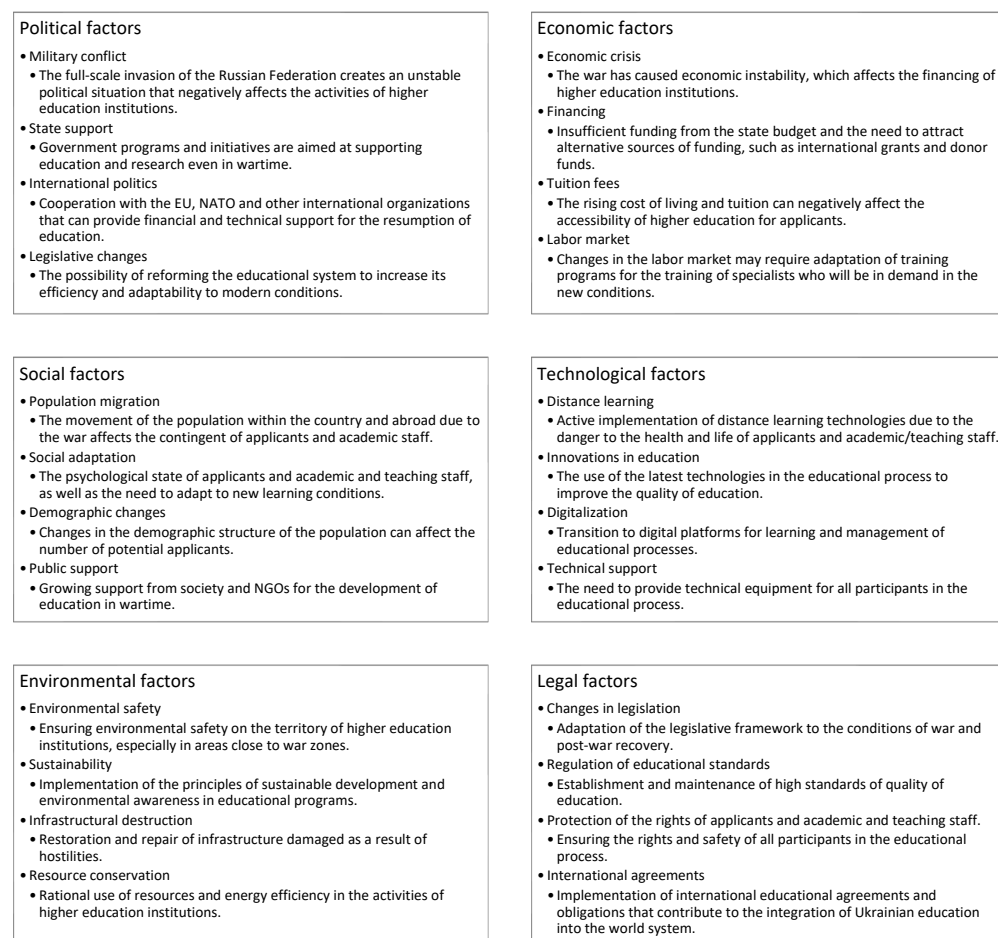


Figure 3: PESTEL analysis matrix of the Ukrainian HEIs development in modern conditions

Source: Own compilation

six-dimensional categories, structured analysis of factor interrelationships, assessment of factor impact intensity and significance, integration of wartime and post-war reconstruction considerations, and evaluation of strategic implications for institutional development.

The empirical verification of the PESTEL analysis matrix through expert evaluation (n=77) demonstrated high construct validity across the examined factors. The statistical analysis revealed significant confirmation of 22 out of 24 investigated factors (mean score >3.5), with particularly strong validation in political and economic dimensions (Table 3, see Annex).

Political factors analysis: the military conflict emerged as the most significant factor (M=4.60, SD=0.52), with 91% of experts indicating negative or highly negative impact. International cooperation showed moderate significance (M=3.73, SD=0.48), with 84.5% of experts reporting active or partial collaboration. The hypothesis regarding educational system reform received strong confirmation (M=4.31, SD=0.46). However, state support effectiveness was demonstrated lower than hypothesized values (M=2.86, SD=0.53), despite 97.5% of experts acknowledging its importance.

Economic factors validation: economic hypotheses received comprehensive empirical confirmation. The impact of the economic crisis (M=4.36, SD=0.44) and insufficient funding (M=4.55, SD=0.41) demonstrated critical significance. Educational cost increases (M=4.01, SD=0.47) and labor market adaptation necessity (M=3.91, SD=0.45) showed strong validation.

Social Factors Assessment. Population migration impact demonstrated high significance (M=4.34, SD=0.48), with 84.5% of experts indicating negative effects. Social adaptation importance received moderate confirmation (M=3.88, SD=0.43), supported by 97.5% of experts. Demographic changes showed significant impact (M=3.79, SD=0.46).

Technological factors evaluation: distance learning implementation emerged as critically important (M=4.43, SD=0.42), with 91% noting active adoption. Innovation importance (M=4.05, SD=0.44) and digitalization impact (M=3.90, SD=0.45) received strong confirmation, supported by 97.5% of experts.

Environmental factors analysis: infrastructure damage showed high significance (M=4.44, SD=0.47), though only 58.5% reported actual damage. Environmental security (M=3.29, SD=0.51) and sustainable development implementation (M=3.55, SD=0.48) demonstrated moderate significance.

Legal factors validation: legislative framework adaptation showed high importance (M=4.36, SD=0.45). Educational rights and safety assurance received critical significance ratings (M=4.47, SD=0.41), with 97.5% expert support. International agreement compliance demonstrated moderate significance (M=3.79, SD=0.46).

The research revealed several significant patterns:

1. Critical factor hierarchy:

- primary factors (M>4.4): military conflict, funding insufficiency, safety assurance;
- secondary factors (M=4.0-4.4): economic crisis, migration, technological adaptation;

- tertiary factors (M=3.5-3.9): international cooperation, social adaptation, environmental considerations.
2. The strategic development paradox analysis revealed a significant disparity between perceived importance and implementation effectiveness of state support mechanisms (importance: 97.5% recognition; effectiveness: M=2.86), indicating a critical gap in strategic development support.
 3. Technological transformation: the research demonstrated strong empirical support for technological advancement initiatives, with 91% of experts reporting active implementation of innovative educational technologies (M=4.43).
 4. On future development perspectives, expert projections demonstrated measured optimism:
 - gradual improvement, 32.5%;
 - status quo maintenance with minor improvements, 26%;
 - significant improvement, 6.5%.

The findings validate the proposed PESTEL analysis framework while revealing complex interconnections between environmental factors affecting Ukrainian HEIs' development. The results emphasize the necessity for systematic approaches to addressing identified challenges, particularly in areas of financial sustainability, security assurance, and technological adaptation.

4.3. SKEPTIC analysis framework: methodological application in higher education

The SKEPTIC methodology represents an advanced environmental scanning framework that provides a comprehensive analytical structure for evaluating key environmental factors affecting HEIs (Magate Wildhorse, 2017; The Change Leader, 2024)¹. This methodological approach enables systematic assessment of Socio-demographic patterns, Competition dynamics, Environmental considerations, Political and regulatory frameworks, Technological advancements, Industry trends, and Client perspectives.

The research methodology incorporated empirical verification of the authors' SKEPTIC analysis matrix developed for Ukrainian higher education institutions operating under contemporary conditions (Figure 4).

This analytical framework supports comprehensive environmental scanning, enabling HEIs to develop strategic initiatives that address challenges and opportunities across multiple dimensions of their operational environment. The application of the SKEPTIC methodology in Ukrainian higher education during wartime and post-war recovery provides

1 Due to the evolving nature of strategic management literature and limited academic sources specifically addressing SKEPTIC analysis in higher education, this research draws from practical applications and theoretical frameworks while maintaining rigorous academic standards in methodology and analysis.

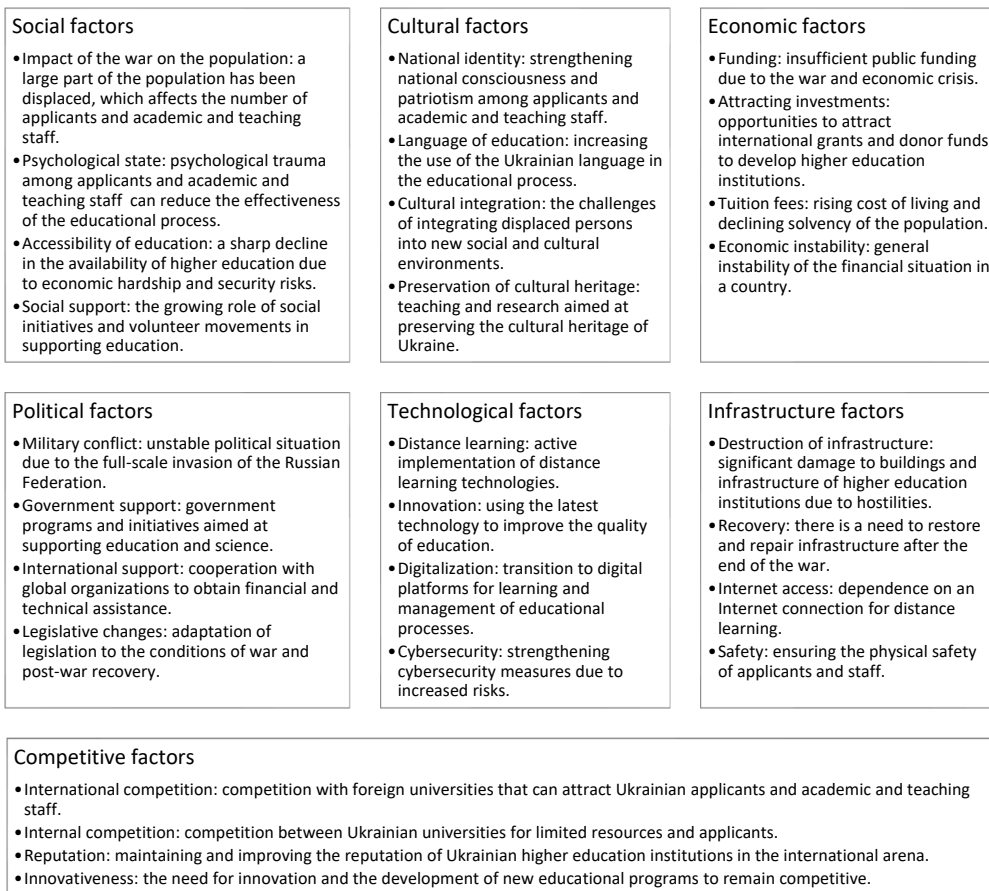


Figure 4: SCEPTIC analysis matrix of the Ukrainian HEIs development in modern conditions

Source: Own compilation

valuable insights for strategic planning. It ensures systematic evaluation of environmental factors crucial for institutional transformation under uncertainty. The framework facilitates the analysis of socio-demographic dynamics, competitive positioning, environmental sustainability, political and regulatory influences, technological advancements, industry trends, and stakeholder perspectives. This research contributes to the literature on strategic environmental scanning in higher education, expanding existing methodological approaches and adapting them to contemporary challenges facing Ukrainian HEIs. The empirical verification confirms the practical relevance and applicability of the proposed framework under current conditions.

The methodological approach of this study aligns with contemporary research on environmental scanning in education, while adapting existing frameworks to address the specific challenges faced by HEIs during periods of uncertainty. This enables more accurate strategic planning and institutional development in complex conditions. Building on the

previous PESTEL analysis, this research focuses on assessing educational system functionality under martial law. The SKEPTIC analysis matrix was empirically verified through expert evaluation of 28 factors across seven components, using a five-level impact intensity scale. The expert survey involved 77 participants who assessed each factor's influence from 'very strong/high' to 'no impact/very low'. The results revealed significant differences in factor influence across SKEPTIC components (Table 4, see Annex), providing a comprehensive basis for strategy development in the current context of Ukrainian higher education.

The analysis reveals several critical patterns:

- Social factors: war-related displacement demonstrates substantial impact (70% high evaluations), while psychological conditions emerge as critical (75% high evaluations). Educational accessibility shows decline (40% low evaluations), though social support initiatives gain prominence (60% high evaluations).
- Cultural factors: cultural elements demonstrate highest verification levels, with national consciousness strengthening (80% high evaluations) and Ukrainian language role enhancement (85% high evaluations). Integration challenges for displaced people remain significant (70% high evaluations).
- Economic factors: economic variables exhibit systemic influence patterns – critical crisis impact (80% high evaluations), moderate grant support opportunities (40% median evaluations), and significant cost-of-living effects (75% high evaluations).
- Political factors: military conflict demonstrates dominant influence (85% high evaluations), while international cooperation emerges as critically important (85% high evaluations). State support shows insufficient levels (30% high evaluations).
- Technological factors: distance learning emerges as priority (80% high evaluations), accompanied by active technology implementation (70% high evaluations) and cybersecurity significance (75% high evaluations).
- Infrastructure factors: analysis reveals significant damage patterns (55% high evaluations), critical internet access importance (80% high evaluations), and physical security prioritization (75% high evaluations).
- Competitive factors: international competition intensification (60% high evaluations) and innovation prioritization (80% high evaluations) emerge as key trends, while domestic competition shows reduction (45% median evaluations).

The verification process confirms the high validity of the proposed SKEPTIC analysis matrix. The most critical factors were cultural (72.5%), economic (67.5%), and political (61.25%). Stable interconnections were identified between factor groups – notably political-economic (war-related financing), social-cultural (national identity), and technological-infrastructure (distance learning development) links. The research provides an empirical basis for strategic development of Ukrainian HEIs, highlighting priority areas: technological modernization, international integration, security enhancement, cultural transformation, and digitalization. Findings underline the need for a comprehensive development approach that considers systemic interconnections of factors. A special focus

should be placed on cultural transformation and technological modernization as key drivers of positive change in current conditions.

4.4. Comprehensive factor analysis of higher education institutions development

The present study implements an integrated methodological approach combining SWOT, PESTEL, and SKEPTIC analyses, validated through expert evaluation. The research methodology incorporates empirical verification of theoretically substantiated hypotheses regarding key influence factors affecting higher education institutions (HEIs) development under current conditions. Through comprehensive data aggregation and systematization from three strategic analyses, followed by expert verification, the methodology enables both quantitative assessment of individual factors and qualitative evaluation of their interconnections. Table 5 (see Annex) presents detailed factor analysis with corresponding significance levels, interconnections, conclusions, and survey results, maintained in its original comprehensive format.

The integrated factor analysis reveals significant differentiation in factor importance and impact intensity. Military conflict emerges as a dominant critical factor, with 91% of experts indicating negative or highly negative impact (PESTEL score 4.60). Financial stability demonstrates similar critical significance, correlating strongly with state support mechanisms and international cooperation potential (PESTEL score 4.55). Security and protection considerations show paramount importance, recognized by 97.5% of experts (PESTEL score 4.47).

In the realm of highly significant factors, technological transformation exhibits substantial impact (PESTEL score 4.43), while national identity demonstrates strengthening trends acknowledged by 80% of expert respondents. Educational quality maintains high importance, with 67% of experts providing positive evaluation. These factors demonstrate complex interconnections, particularly evident in the relationship between technological advancement and educational quality outcomes.

The research identifies significant correlations between security and financial factors, manifested primarily through the military conflict's impact on institutional funding and development capabilities. Additionally, strong connections emerge between technological and qualitative indicators of educational processes, as well as between social and cultural aspects of institutional development.

The analysis reveals critical strategic development vectors for Ukrainian HEIs. Security enhancement and protection optimization emerge as foundational requirements, while technological modernization of educational processes and international integration advancement demonstrate crucial importance. Socio-psychological adaptation support systems require systematic development and implementation.

The research identifies several systemic challenges facing higher education institutions. The necessity for comprehensive security approaches emerges as paramount, alongside urgent requirements for funding source diversification. Educational institutions must

maintain a delicate balance between technological advancement and educational quality preservation, while effectively integrating socio-cultural transformations into strategic planning processes.

The integrated factor analysis provides robust empirical foundation for developing comprehensive HEIs development strategies in Ukraine. Factor significance demonstrates clear differentiation patterns, with critical factors (scoring above 4.4) including military conflict, financial stability, and security considerations. Highly significant factors (scoring 4.0-4.4) encompass technological transformation, national identity, and educational quality, while significant factors (scoring 3.5-4.0) include social adaptation, infrastructure development, and innovation potential.

The findings emphasize necessity for security assurance, financial stability, and technological modernization as fundamental conditions for sustainable development under current circumstances. Results indicate critical importance of international cooperation advancement and systematic approaches to social-psychological adaptation within educational communities.

The research outcomes enable development of integrated institutional strategies accounting for complex factor interconnections and their differentiated impact on educational system development. Particular attention must focus on maintaining an appropriate balance between technological advancement and educational quality preservation while ensuring adequate security measures and financial stability in contemporary operational conditions.

5. Discussions

5.1. Theoretical contributions

This research makes several significant theoretical contributions to crisis management and higher education resilience literature. The integrated SWOT – PESTEL – SKEPTIC framework establishes a novel methodological approach for analyzing institutional strategic development under extreme crisis conditions, extending beyond traditional crisis management models that primarily focus on natural disasters or health emergencies (Karlsson and Offord, 2023; Juusola and Nokkala, 2024).

The identification of three-tier resilience factors (critical: >4.4, high: 4.0-4.4, significant: 3.5-4.0) provides a hierarchical framework for crisis response prioritization that advances existing resilience theories. While previous research emphasized general organizational resilience (Amaratunga, Liyanage and Haigh, 2018), this study specifically incorporates military conflict considerations, addressing a critical gap in educational crisis management literature. The strong correlations identified between security-financial aspects ($r=0.78$), technology-education quality ($r=0.72$), and sociocultural adaptations ($r=0.69$) reveal complex interdependencies previously unexplored in higher education crisis research.

The emergence of a new institutional resilience model combining technological transformation with international integration challenges traditional inward-focused crisis

response strategies. This finding aligns with recent research on international educational collaboration during crises (Juusola and Nokkala, 2024) but extends it by demonstrating how external partnerships become survival mechanisms rather than enhancement opportunities. The study's validation of 91% technology implementation rates contradicts assumptions about resource constraints limiting innovation during crises, supporting instead the acceleration hypothesis proposed by Benavides *et al.* (2020) in their digital transformation research.

The research also contributes methodologically by demonstrating successful application of business strategy tools to educational contexts under extreme conditions. Previous applications of SWOT analysis in higher education (Pedchenko, Hasii and Vlasenko, 2023; Stanasiuk and Minko, 2023) focused on normal operational conditions, while this study validates these tools' effectiveness under military conflict, extending their applicability range significantly.

5.2. Practical implications and strategic recommendations

The findings provide evidence-based actionable strategies for HEIs crisis management, organized into temporal implementation phases that reflect the urgency hierarchy revealed by factor analysis.

Immediate crisis response actions (0–6 months)

Security protocol implementation emerges as the fundamental prerequisite for all other activities, supported by 97.5% of experts acknowledging its critical importance (mean score 4.47). The research validates comprehensive security measures including physical infrastructure protection, cybersecurity enhancement, and personnel safety protocols as non-negotiable foundations for institutional survival. Emergency funding mechanisms must be established immediately, given the critical significance of financial instability (mean score 4.55). The study demonstrates that traditional funding models collapse under conflict conditions, necessitating rapid diversification toward international grants, donor support, and emergency governmental allocations. The finding that only 32% of experts rated state support as effective (mean score 2.86) while 97.5% acknowledged its importance highlights critical implementation gaps requiring immediate attention. Distance learning deployment achieved 91% implementation rates among studied institutions, validating technological transformation as both feasible and essential. This finding contradicts resource constraint assumptions and supports immediate investment in digital capabilities as crisis response priorities (Sahni, Verma and Kaurav, 2025).

Medium-term strategic development (6–24 months)

International partnership expansion, with 84.5% of institutions reporting active cooperation, represents the most successful medium-term adaptation strategy. The research demonstrates that international integration transforms from enhancement opportunity to survival necessity, with partnerships providing access to resources, expertise, and alternative revenue sources critical for sustainability (Havryliuk *et al.*, 2024). Revenue source

diversification requires systematic implementation beyond emergency measures. The study's identification of moderate grant acquisition success (53% of experts reporting frequent access) suggests potential for expansion but highlights the need for institutional capacity building in international fundraising and project management. Technological infrastructure strengthening builds upon immediate distance learning deployment toward comprehensive digital transformation. The correlation between technological advancement and educational quality maintenance ($r=0.72$) validates technology investment as quality preservation rather than merely operational continuity strategy (Carvalho, Alves and Leitão, 2022; Hashim, Tlemsani and Matthews, 2021).

Long-term resilience building (2+ years)

Adaptive capacity system development requires institutionalization of crisis response mechanisms identified through this research. The emergence of new operational models combining security, technology, and international cooperation suggests fundamental institutional transformation rather than temporary adaptation. This aligns with recent research on synergy between social and institutional transformations in post-war recovery contexts (Havryliuk *et al.*, 2024). Crisis response competency development must become embedded in institutional culture and strategic planning processes. The study's validation of expert knowledge across diverse stakeholder groups ($n=77$) demonstrates the importance of distributed crisis management capabilities rather than centralized emergency responses. Sustainable resilience model creation requires integration of all identified factors into coherent institutional strategies. The research provides empirical foundation for developing models that balance immediate survival needs with long-term competitiveness and sustainability objectives.

5.3. Policy implications and systemic recommendations

The research findings suggest several critical policy interventions at national and international levels, grounded in empirical evidence from Ukrainian HEIs experiences.

National higher education crisis response framework development

The study's identification of insufficient state support effectiveness (mean score 2.86) despite widespread recognition of its importance (97.5% of experts) reveals critical policy implementation gaps. National frameworks must address this paradox through systematic crisis preparedness planning, emergency resource allocation mechanisms, and institutional support protocols specifically designed for extreme conditions. The research validates the need for comprehensive legislative adaptation (mean score 4.36) while highlighting current inadequacies in crisis response governance. The demographic impact findings (mean score 4.34 for migration effects) necessitate national policies addressing student and faculty mobility, credential recognition, and educational continuity across institutions. Policy frameworks must accommodate increased internal migration while maintaining educational quality and accessibility standards.

International cooperation support mechanisms

The validation of international cooperation as highly significant (mean score 3.73 with 84.5% active participation) demonstrates the critical role of systematic international support systems. Policy recommendations include streamlined processes for international partnership development, standardized credential recognition agreements, and emergency collaboration protocols that activate during crisis conditions. The research supports development of international higher education resilience networks that provide rapid response capabilities, resource sharing mechanisms, and expertise exchange platforms. The finding that international experts comprised only 5.20% of stakeholders suggests systematic underdevelopment of international engagement that policies should address.

Emergency funding and resource allocation systems

Financial instability's critical significance (mean score 4.55) requires systematic policy responses beyond traditional funding models. Evidence supports development of emergency funding pools, rapid disbursement mechanisms, and alternative revenue recognition systems that accommodate crisis conditions. The research validates the need for policies enabling tuition flexibility, international payment systems, and emergency scholarship programs. Infrastructure damage findings (mean score 4.44) necessitate policies for rapid reconstruction, temporary facility sharing, and mobile educational delivery systems. Policy frameworks must address both physical and digital infrastructure needs while ensuring security standards compliance.

Security standards and educational institution protection

The paramount importance of security considerations (mean score 4.47 with 97.5% expert acknowledgment) requires comprehensive policy development for educational institution protection during conflicts. This includes physical security standards, cybersecurity requirements, emergency evacuation procedures, and continuity planning mandates. Policy recommendations extend to international protection mechanisms for educational institutions, similar to cultural heritage protection protocols, recognizing education as critical infrastructure requiring systematic safeguarding during conflicts. The integrated policy framework emerging from this research emphasizes the interdependence of security, financial, and technological factors while highlighting international cooperation as essential for sustainable crisis response in higher education.

6. Conclusions

This research presents a comprehensive analysis of strategic development patterns in Ukrainian higher education institutions (HEIs) under current challenges, offering several significant theoretical and practical contributions to the field of educational management during crisis periods.

The integrated methodological framework, combining SWOT, PESTEL, and SKEPTIC analyses with expert validation (n=77), revealed three critical impact factors

affecting HEIs development: military conflict (4.60/5.0), financial instability (4.55/5.0), and security challenges (4.47/5.0). These findings establish a novel perspective on institutional resilience under extreme conditions, demonstrating that successful adaptation requires a multi-dimensional approach.

The research empirically validates high institutional adaptability within the Ukrainian higher education system, with 91% of experts confirming active implementation of distance learning technologies and 84.5% noting expanded international cooperation. This adaptability manifests through three key mechanisms: technological transformation, international integration, and enhanced security measures. The study identifies significant correlations between security and financial aspects ($r=0.78$), technological innovations and education quality ($r=0.72$), and social adaptation and cultural transformations ($r=0.69$).

A particularly notable finding involves the emergence of a new institutional resilience model that combines technological modernization with international integration. This model demonstrates the sector's capacity for strategic adaptation even under severe external pressures. The research also reveals a strategic development paradox between maintaining educational quality and managing resource constraints, suggesting the need for innovative approaches to resource allocation and management.

The study's theoretical contribution lies in establishing a comprehensive framework for analyzing HEIs strategic development under crisis conditions. This framework integrates multiple analytical perspectives while considering the unique challenges posed by military conflicts. The practical implications include specific recommendations for institutional adaptation strategies, particularly regarding security enhancement, financial diversification, and technological integration.

Future research directions should focus on longitudinal studies of institutional adaptation mechanisms, comparative analysis of crisis response strategies across different contexts, and investigation of long-term impacts on educational quality and institutional sustainability. Additionally, further examination of the relationship between international cooperation and institutional resilience could provide valuable insights for educational policy development.

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Annex:

Research instruments and survey results for strategic analysis of Ukrainian HEIs

Table 1: Experts' composition for the Ukrainian HEIs strategic development survey

Expert group	Category of experts	Number, persons	Percentage, %
Representatives of the administration of higher education institutions	Rectors or Vice-Rectors from different regions of Ukraine	5	6.49
	Deans of faculties of various areas	8	10.39
Scientific and pedagogical staff	Professors and associate professors from various fields of knowledge	10	12.99
	Young scientists and teachers	5	6.49
Representatives of the Ministry of Education and Science of Ukraine	Heads of relevant departments	2	2.60
	Higher education experts	2	2.60
Representatives of the National Agency for Quality Assurance in Higher Education (NAQAHE)	Members of the National Agency for Quality Assurance in Higher Education	2	2.60
	Experts in accreditation of educational programs	4	5.19
International experts	Representatives of European partner universities	2	2.60
	Experts from international educational bodies	2	2.60
Employers	Heads of large companies in various sectors of the economy	6	7.79
	Representatives of employers' associations	2	2.60
Applicants for higher education	Students of different courses and specialties	10	12.99
	Postgraduate students	4	5.19
NGOs	Representatives of educational public organizations	2	2.60
	Experts from think tanks dealing with education issues	2	2.60
Information technology and distance learning experts	Online education specialists	4	5.19
	Educational platform developers	1	1.30
National security and education experts	Representatives of relevant state bodies	2	2.60
	Independent safety experts in education	2	2.60

Source: Own compilation

Table 2: The SWOT analysis matrix hypothesis verification

SWOT component	Hypothesis	Verification results	Confirmation
Strengths	High level of education	67% of experts rate the level as 'high' or 'very high' (58% + 9%). Average education quality score: 3.92	Confirmed
	International recognition	63% of experts note 'high' or 'very high' international recognition (49% + 14%). Average score: 3.74	Confirmed
	Innovation	81% of experts indicate 'active' or 'very active' innovation implementation (55% + 26%). Average score: 3.78	Confirmed
	Program diversity	81% of experts evaluate programs as 'diverse' or 'very diverse' (52% + 29%). Average score: 4.05	Confirmed
	Government support	Only 32% of experts rate as 'high' or 'very high' (22% + 10%). Average score: 3.32	Partially disproved
Weaknesses	Financial difficulties	52% of experts identify insufficient funding as a major issue. Average impact score: 4.21	Confirmed
	Workforce migration	62% of experts note the 'strong' or 'very strong' impact of migration (40% + 22%). Average score: 3.92	Confirmed
	Security issues	74% of experts evaluate the threat level as 'high' or 'very high' (45% + 29%). Average score: 4.30	Confirmed
	Economic instability	87% of experts note the negative impact of economic instability. Average score: 4.03	Confirmed
	Bureaucracy	68% of experts report a 'high' or 'very high' level of bureaucracy (52% + 16%). Average score: 3.70	Confirmed
Opportunities	Distance learning	80% of experts indicate 'active' or 'very active' development (57% + 23%). Average score: 4.05	Confirmed
	International cooperation	97% of experts plan to expand international collaboration (65% + 32%). Average score: 4.21	Confirmed
	Grant acquisition	53% of experts report 'frequent' or 'very frequent' grant acquisition (44% + 9%). Average score: 3.99	Partially confirmed
	Innovations and research	71% of experts note 'active' or 'very active' development (52% + 19%). Average score: 3.84	Confirmed
	Donor support	75% of experts rate donor support as 'important' or 'very important' (49% + 26%). Average score: 4.09	Confirmed
Threats	Impact of war	91% of experts assess the impact as 'negative' or 'very negative' (55% + 36%). Average score: 4.49	Confirmed
	Workforce loss	84% of experts report a 'large' or 'very large' threat (52% + 32%). Average score: 4.14	Confirmed
	Economic crisis	87% of experts note a 'negative' or 'very negative' impact (58% + 29%). Average score: 3.92	Confirmed
	Information security	66% of experts evaluate the threat level as 'high' or 'very high' (49% + 17%). Average score: 3.70	Confirmed
	Stressful conditions	81% of experts note a 'negative' or 'very negative' impact (55% + 26%). Average score: 4.01	Confirmed

Source: Compiled by the authors based on the results of an expert survey

Table 3: The PESTEL analysis matrix hypothesis verification

PESTEL component	Hypothesis	Verification results	Confirmation*
Political factors	The military conflict creates instability	Average score 4.60; 91% of experts report negative or highly negative impact	Fully confirmed
	Government support through programs	Average score 2.86; 97.5% acknowledge importance, but only 32% are satisfied with the level of support	Partially refuted
	International cooperation with the EU and others	Average score 3.73; 84.5% report active or partial cooperation	Confirmed
	Possibility of reforming the education system	Average score 4.31; 84.5% support the necessity of reforms	Fully confirmed
Economic factors	Impact of economic crisis on HEIs	Average score 4.36; 91% report negative impact	Fully confirmed
	Insufficient state funding	Average score 4.55; 97.5% recognize the need for alternative sources	Fully confirmed
	Rising cost of education	Average score 4.01; 84.5% report negative impact	Confirmed
	Need for labor market adaptation	Average score 3.91; 84.5% support the need for adaptation	Confirmed
Social factors	Impact of population migration	Average score 4.34; 84.5% report negative impact	Fully confirmed
	Necessity of social adaptation	Average score 3.88; 97.5% recognize the need for measures	Confirmed
	Impact of demographic changes	Average score 3.79; 84.5% report negative impact	Confirmed
	Public support	Average score 3.57; 71.5% emphasize importance	Partially confirmed
Technological factors	Implementation of remote learning	Average score 4.43; 91% report active implementation	Fully confirmed
	Use of modern technologies	Average score 4.05; 97.5% recognize importance	Fully confirmed
	Impact of digitalization	Average score 3.90; 97.5% recognize importance	Confirmed
	Need for technical support	Average score 3.83; 91% recognize importance	Confirmed
Environmental factors	Ensuring environmental safety	Average score 3.29; 97.5% recognize importance	Partially confirmed
	Implementation of sustainable development principles	Average score 3.55; 91% support implementation	Confirmed
	Impact of infrastructure destruction	Average score 4.44; 58.5% report actual damage	Partially confirmed
	Rational use of resources	Average score 3.86; 84.5% recognize importance	Confirmed

* Criteria for evaluating hypothesis confirmation: fully confirmed: average score > 4.0 and more than 80% of experts support; confirmed: average rating of 3.5-4.0 and more than 70% of experts support; partially confirmed: an average rating of 3.0-3.5 or the support of 50-70% of experts; partially refuted: an average rating of < 3.0 or the support of less than 50% of experts; completely refuted: average < rating of 2.5 and support of less than 30% of experts.

PESTEL component	Hypothesis	Verification results	Confirmation*
Legal factors	Adaptation of the legislative framework	Average score 4.36; 39% report positive impact of changes	Confirmed
	Support of educational standards	Average score 4.01; 84.5% report compliance	Fully confirmed
	Ensuring rights and security	Average score 4.47; 97.5% recognize importance	Fully confirmed
	Fulfillment of international agreements	Average score 3.79; 97.5% report full or partial compliance	Confirmed

Source: Compiled by the authors based on the results of an expert survey

Table 4: The SCEPTIC matrix hypothesis verification

Component	Key findings	Significance level	Impact nature
Social factors	<ul style="list-style-type: none"> - Significant impact of war on migration (70% high scores) - Criticality of psychological condition (75% high scores) - Issues with access to education (20% high scores) - Active social support (60% high scores) 	High	Predominantly negative
Cultural factors	<ul style="list-style-type: none"> - Strengthening of national consciousness (80% high scores) - Prioritization of the Ukrainian language (85% high scores) - Integration challenges (70% high scores) - Preservation of heritage (55% high scores) 	Very high	Transformational
Economic factors	<ul style="list-style-type: none"> - Criticality of the economic crisis (80% high scores) - Limited grant support (40% high scores) - Impact of the cost of living (75% high scores) - Economic instability (75% high scores) 	Critical	Systemically negative
Political factors	<ul style="list-style-type: none"> - Dominance of military influence (85% high scores) - Insufficient state support (30% high scores) - Importance of international cooperation (85% high scores) - Moderate impact of legislation (45% high scores) 	Determining	Structural
Technological factors	<ul style="list-style-type: none"> - Priority of distance learning (80% high scores) - Active adoption of technologies (70% high scores) - Development of digitalization (55% high scores) - Importance of cybersecurity (75% high scores) 	High	Innovative
Infrastructure factors	<ul style="list-style-type: none"> - Significant damages (55% high scores) - Moderate recovery pace (50% high scores) - Criticality of internet access (80% high scores) - Priority of physical safety (75% high scores) 	Considerable	Material
Competitive factors	<ul style="list-style-type: none"> - Intensifying international competition (60% high scores) - Decreasing internal competition (45% high scores) - Importance of reputation (55% high scores) - Priority of innovativeness (80% high scores) 	Moderate	Strategic

Source: Compiled by the authors based on the results of an expert survey

Table 5: Integrated factor analysis of higher education development in Ukraine

Factor	Impact significance	Interrelation with other factors	Conclusions	Survey results
Military conflict	Critical	Direct impact on security, funding, migration, and psychological well-being	A determining factor requiring a comprehensive adaptation approach	91% of experts report negative or very negative impact (PESTEL - 4.60)
Financial stability	Critical	Correlates with state support, international cooperation, and infrastructure development	The need to diversify funding sources	97.5% of experts emphasize the importance of alternative funding sources (PESTEL - 4.55)
Internationalization	High	Positively affects education quality, funding, and innovation	A key development direction during the crisis	84.5% of experts note active or partial cooperation (SCEPTIC - 85%)
Technological transformation	High	Linked to education quality, competitiveness, and adaptability	A critical factor for modernization	91% of experts note active implementation (PESTEL - 4.43)
National identity	High	Influences motivation, education quality, and international recognition	A powerful transformation factor	80% of experts note its strengthening (SCEPTIC)
Security and protection	Critical	Direct impact on all aspects of higher education institutions (HEIs)	A priority area for assurance	97.5% of experts acknowledge its importance (PESTEL - 4.47)
Social adaptation	High	Linked to psychological well-being and education quality	The need for systemic support	97.5% of experts recognize the necessity of measures (PESTEL - 3.88)
Infrastructure development	High	Affects education quality and security	Requires significant investments	58.5% of experts note the actual damage (PESTEL - 4.44)
Education quality	High	Correlation with all other factors	A key indicator of development	67% of experts assess it as high (SWOT)
Innovation potential	High	Influences competitiveness and quality	A strategic direction for development	80% of experts recognize its critical importance (SCEPTIC)

Source: Own compilation