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ARTÍCULO DE INVESTIGACIÓN

Fundamentos metodológicos para la evaluación de la transformación del ecosistema de la esfera social de Ucrania a partir de la arquitectura de la recuperación global

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Resumen. El artículo examina la arquitectura del ecosistema del sector social en Ucrania con énfasis en las transformaciones glocales en el contexto de la recuperación posterior al conflicto. Está dedicado a los problemas más importantes para comprender la adaptabilidad de un sistema social, la transformación digital y la sostenibilidad institucional en condiciones de guerra. La metodología utiliza el innovador Índice Compuesto de Transformación Glocal (CIGT), que combina dimensiones estructurales, funcionales y adaptativas del análisis de los ecosistemas sociales. Se utilizó un enfoque mixto, combinando métodos de investigación cuantitativos y cualitativos en todas las regiones de Ucrania. Los resultados muestran diferencias regionales significativas en la adaptación institucional y la transformación social. Las regiones occidentales

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demostraron la mayor plasticidad institucional y cohesión social, lo que se explica por el menor impacto directo de los conflictos militares y una infraestructura de sociedad civil desarrollada. La transformación digital ha puesto de manifiesto limitaciones sistémicas caracterizadas por un acceso desigual a los servicios digitales, bajos niveles de alfabetización digital y barreras institucionales para su implementación. Se identificó la transformación digital y los aspectos sociales como factores clave en la sostenibilidad del sistema. Un aspecto único es el fenómeno de la cohesión social como el parámetro más estable de transformación, que es especialmente evidente durante los períodos de conflicto militar, cuando la sociedad ucraniana demuestra un alto potencial de adaptación y capacidad de autoorganización. Se proporciona un marco integral para comprender los conceptos arquitectónicos del ecosistema social, ofreciendo recomendaciones prácticas para la gobernanza social y estrategias de transformación sistemática en situaciones de posconflicto.

Palabras clave: ecosistema social, transformación digital, resiliencia institucional, transformaciones glocales, recuperación posconflicto, cohesión social.

Methodological foundations for assessing the transformation of the ecosystem of the social sphere of Ukraine on the basis of architectonics of global recovery

Abstract. The article examines the architecture of the social sector ecosystem in Ukraine, with emphasis on glocal transformations in the context of post-conflict recovery. It is dedicated to the most important issues for understanding the adaptability of a social system, digital transformation, and institutional sustainability under conditions of war. The methodology employs the innovative Composite Index of Glocal Transformation (CIGT), which combines structural, functional, and adaptive dimensions in the analysis of social ecosystems. A mixed-method approach was used, combining quantitative and qualitative research methods across all regions of Ukraine. The results show significant regional differences in institutional adaptation and social transformation. The western regions demonstrated the highest institutional plasticity and social cohesion, which is explained by the lower direct impact of military conflicts and a well-developed civil society infrastructure. Digital transformation has revealed systemic limitations characterized by unequal access to digital services, low levels of digital literacy, and institutional barriers to implementation. Digital transformation and social aspects were identified as key factors in the sustainability of the system. A unique aspect is the phenomenon of social cohesion as the most stable parameter of transformation, which is especially evident during periods of military conflict, when Ukrainian society demonstrates a high potential for adaptation and self-organization. The study provides a comprehensive framework for understanding the architectural concepts of the social ecosystem, offering practical recommendations for social governance and systematic transformation strategies in post-conflict situations.

Keywords: social ecosystem, digital transformation, institutional resilience, glocal transformations, post-conflict recovery, social cohesion.

INTRODUCTION

The social sphere ecosystem constitutes a complex, multifaceted system that plays a pivotal role in ensuring societal well-being and fostering sustainable development (Kolot et al., 2020; Kolot & Herasymenko, 2022; Martínez Montenegro & Calderón Astete, 2024). In the context of Ukraine, this system confronts unprecedented challenges precipitated by Russian military aggression, necessitating both immediate recovery efforts and long-term transformational changes (Larina et al., 2024; Zavhorodnii et al., 2024). The concept of social sphere architectonics has emerged as a theoretical framework for elucidating these intricate transformational processes.

Recent scholarly endeavors have emphasized the significance of an ecosystem approach to analyzing social transformations. The current trends in the development of the social sphere in the context of digital transformation are explored in the work of Allam et al. (2022). The researchers analyze the impact of virtual technologies on urban development and the formation of new forms of social interaction.

An important area of research is the role of educational institutions in the development of the social sphere, as revealed in the work of Klofsten et al. (2019). The authors substantiate the importance of entrepreneurial universities as drivers of economic growth and social change.

However, a notable lacuna persists in understanding how these theoretical frameworks can be operationalized for practical assessment and management of social sphere transformations, particularly in post-conflict contexts.

Zenkienė et al. (2024) analyze architectonics as a basis for understanding the innovative development of socio-economic systems and their adaptation to global challenges. As noted by Kolot & Herasymenko, 2022; Martínez Montenegro & Calderón Astete, 2024, the architectonics of the social sphere ecosystem is a complex structural organization of interconnected elements, relations, and processes that shape the functioning of key institutional domains of society. Novakovska et al. (2025) emphasize that architectonics includes the basic provisions and specification of methods, tools and levers of system development.

The extant literature predominantly focuses on discrete aspects of social sphere development. While some researchers examine institutional transformations (Vasilyeva et al., 2024; Zerkina et al., 2022) or digital adaptation (Shirish et al., 2025; Pylypenko et al., 2022), few studies offer integrated approaches to assessing the overall architectonics of social ecosystems. This fragmentation in research approaches limits our understanding of the complex interplay between different components of the social sphere and their collective response to glocal challenges.

Research Gap: Despite burgeoning scholarly attention to social sphere development, there is a conspicuous absence of comprehensive methodological frameworks that would: (1) integrate structural, functional, and adaptive dimensions of social ecosystem analysis; (2) provide quantitative tools for assessing transformation processes; and (3) account for the specific challenges of post-conflict recovery.

Research Questions: This study addresses the following research questions:

1) How can the architectonics of the social sphere ecosystem be conceptualized and evaluated in the context of glocal transformations?

2) What are the key determinants influencing the development of the social sphere ecosystem in post-conflict conditions?
3) How can the effectiveness of social sphere transformation be measured and evaluated?

Objective: The purpose of this study is to develop and validate an integrated approach to assessing the architectonics of the social sphere ecosystem, with a particular focus on post-war recovery contexts. This includes developing a composite index of glocal transformation and identifying key developmental determinants.

Scientific Novelty: The study introduces several innovative elements: (1) a comprehensive framework for analyzing social sphere architectonics; (2) a novel composite index for assessing glocal transformations; and (3) an integrated approach to evaluating ecosystem development determinants. The findings of this study contribute to both theoretical understanding of social sphere development and practical tools for managing transformation processes in post-conflict settings.

The rest of this paper is structured as follows: Section 2 presents a comprehensive literature review examining theoretical approaches to social sphere architectonics and ecosystem development. Section 3 delineates the research methodology, detailing the development and structure of the Composite Index of Glocal Transformation (CIGT) and the mathematical model for ecosystem analysis. Section 4 presents the analytical results, focusing on the assessment of social sphere ecosystem architectonics, implementation of the CIGT methodology, analysis of key development determinants, and examination of transformation patterns and practices. Section 5 discusses the implications of our findings for both theory and practice, offering specific recommendations for policy makers and stakeholders. Finally, Section 6 concludes by summarizing key findings, acknowledging methodological limitations, and suggesting directions for future research.

LITERATURE REVIEW

The scholarly discourse on social sphere architectonics and ecosystem development has evolved significantly in recent years, particularly in response to global challenges and post-conflict recovery needs. This review synthesizes the extant literature into several key theoretical streams.

Ecosystem approach to social sphere

The ecosystem perspective on social sphere development has garnered considerable attention in recent research. Kolot & Herasymenko (2022) conceptualize the social sphere as a complex adaptive system, emphasizing its capacity for self-organization and transformation. This foundational understanding is further developed by Pope & Lim (2020), who examine the dynamic interactions between different ecosystem components and their collective response to external challenges. Mihr (2021) extends this framework by introducing the concept of institutional resilience within social ecosystems, which is particularly relevant for post-conflict societies. This research highlights how social systems adapt and maintain functionality while undergoing significant transformations.

Glocalization and social transformations

The dialectic between global and local processes in social sphere development has emerged as a critical area of study. Silva et al. (2024) identify key characteristics of glocal processes, including the integration of global standards with local practices, the formation of hybrid institutional structures,

and the evolution of social regulation mechanisms. Suntsova (2024) further elaborate on this theme by examining how local social systems respond to global challenges while maintaining their distinctive characteristics. Their research particularly focuses on adaptation mechanisms in social service delivery, cultural integration processes, and innovation in social governance.

Architectonics and structural organization

The structural aspects of social sphere organization have received significant scholarly attention. Institutional architecture, as one of the fundamental categories, is undergoing significant changes in the context of digital transformation. Shirish et al. (2025) note that digitalization creates new opportunities for the development of social institutions and the formation of innovative models of interaction. LopezDeAsiain et al. (2024) extend this understanding by considering architectonics as a method of building complex socio- economic systems that determines their internal organization and management mechanisms.

The stakeholder dimension of the social ecosystem architecture is becoming of particular importance. According to the research of Bravaglieri et al. (2025), its analysis should include the identification and characterization of key stakeholder groups, analysis of their interests and needs, assessment of the impact on the formation and development of social architectonics, as well as the study of mechanisms of interaction between different groups of stakeholders (Dmytrenko et al. 2021).

Digital transformation and social innovation

Recent literature increasingly focuses on the role of digital technologies in reshaping social sphere architectonics. Ng et al. (2024) emphasize that the emergence of new digital platforms and communication technologies has created new forms of social organization and interaction that require a rethinking of traditional social architectural frameworks. At the same time, Kosheleva et al. (2024) emphasize the importance of forming more resilient and adaptive social structures that are consistent with the principles of sustainable development. Holubchak et al. (2020) explore the architectural and urban planning aspects of the formation of innovation hubs in the context of creative urban regeneration, emphasizing that such spaces provide unique opportunities to accelerate the generation and diffusion of innovations.

Mahbub (2021) focuses on the role of blockchain technologies in ensuring the security of IoT infrastructure in the social sphere, proposing to consider architectonics as a way to build a decentralized, reliable and secure environment for the development of social ecosystems in the context of digitalization.

Shirish et al. (2025) examine how digitalization creates new opportunities for social service delivery innovation, community engagement enhancement, and administrative efficiency improvement.

Resilience and post-conflict recovery

A growing body of literature addresses the specific challenges of social sphere development in post-conflict contexts. Bar-ner & Marom (2024), Robazza et al. (2024) analyze how local social systems adapt to post-conflict challenges through participatory practices development, innovative governance models, and community cohesion strengthening.

Assessment and measurement frameworks

The literature reveals various approaches to measuring social sphere transformation. Howard et al. (2024) demonstrate the complex interconnections between socio-economic factors and system development, while Martínez et al. (2023) propose frameworks for assessing system resilience.

Research gaps

Despite the rich theoretical foundation, several gaps in the literature remain:

1) Limited integration of different theoretical approaches.
2) Lack of comprehensive assessment methodologies.
3) Insufficient attention to post-conflict transformation specifics.
4) Need for more empirical validation of theoretical frameworks.

This review demonstrates the need for an integrated approach that would combine various theoretical perspectives while addressing the practical challenges of social sphere transformation in post-conflict contexts. Bridging these research gaps requires the development of a comprehensive analytical framework that integrates structural, functional, and adaptive dimensions of social ecosystems, provides quantitative assessment tools, and accounts for the specificities of post-conflict recovery. The following sections of this paper aim to address these challenges by proposing an integrated approach to assessing the architectonics of the social sphere ecosystem in the context of glocal transformations.

Hypothesis of the study:

In the context of glocal transformations and post-conflict recovery, Ukraine's social ecosystem is a complex adaptive network capable of self-organization and evolution through the dynamic interaction of institutional, technological, and social components, in this respect:

1. The integral sustainability of the social ecosystem depends on:

- The level of institutional adaptability.
- The potential of digital transformation.
- The degree of social cohesion.
- Efficiency of intercomponent interactions.

2. There regional differences in the architectonics of the social sphere:

- The differential impact of the military conflict.
- Variability of civil society infrastructure.
- Uneven social and economic development of the territories.

3. A comprehensive assessment of social transformation can be carried out through the development of a Consolidated Index of Glocal Transformation, which combines structural, functional and adaptive dimensions of the social ecosystem. Additional research assumptions:

- Digital transformation is a catalyst for institutional change.
- Social cohesion is a key mechanism for adaptation in the face of hybrid challenges.

METHODS

The methodological framework used in this study combines numerous analytical approaches to assessing the architectonics of the social sector ecosystem and global transformations in Ukraine. The comprehensive methodology includes the following components: development of an integral index, ecosystem analysis, data collection, and statistical analysis. Table 1 provides a systematic overview of the methodological framework with a detailed description of the elements, indicators, and analytical approaches of each component.

TABLE 1. Overview of the methodological framework

Component	Elements	Indicators/Methods	Formula/Approach
1. CIGT development	Social and institutional resilience (SIR)	– New institutional forms (n_1) – Transformation efficiency (n_2) – Institutional adaptability (n_3) – Inter-sectoral interaction (n_4) – Social dialog (n_5) – Connection network (n_6)	CIGT= 0.25× SIR + 0.20 × SDT
	Social digital transformation (SDT)	– Digitalization of services (d_1) – Quality of infrastructure (d_2) – Availability of services (d_3) – Digital interaction (d_4) – Platform efficiency (d_5) – Digital switching (d_6)	X_norm = (X - X_ min)/(X_max - X_ min)
2. Ecosystem analysis	System components	– Digital transformation (D) – Environmental factors (E) – Social aspects (S) – Institutional architecture (I) – Regional development (R)	A = f(D, E, S, I, R)
3. Data collection	Primary data	– A survey by the Razumkov Center: – Sampling: 2016 respondents – Coverage: 25 regions – Accuracy: ±2,3%	Face-to-face interviews; Stratified multistage sampling
	Secondary data	– Decentralization portal – Regional development agencies – Social statistics	Analysis of documents; Statistical collection
	Expert Evaluation	– Interviews with service providers – Focus groups of community leaders – Case studies transformations	Qualitative analysis
4. Statistical analysis	Network analysis	– Shannon diversity index (H') – Freeman's centralization index (C) – Network density	H' = -Σ(pi × ln pi) C= Σ(cmax - ci)/ [(n-1)(n-2)]
	Correlation analysis	– Pearson's coefficients – Significance testing – Factor analysis	p< 0.05; Calculation of r-values

Note: the methodological framework integrates quantitative and qualitative approaches to provide a comprehensive assessment of the architectonics of the social sphere ecosystem in wartime.

Table 1 illustrates the comprehensive methodological approach used in this study.

The Composite Index of Glocal Transformation (CIGT) is an innovative tool for a comprehensive assessment of social transformation processes in the context of glocalization and post-conflict recovery. The CIGT combines two key components: social and institutional resilience (SIR) and social digital transformation (SDT).

The social and institutional resilience (SIR) component includes six indicators:

- New institutional arrangements (n_1): assesses the emergence and development of innovative institutional arrangements adapted to the context of post-conflict recovery.
- Transformation effectiveness (n_2): measures the effectiveness of institutional transformations in terms of achieving social development goals. (Lopushniak et al., 2024)
- Institutional adaptability (n_3): assesses the ability of institutions to adapt to changing conditions and challenges.
- Inter-sectoral cooperation (n_4): analyzes the effectiveness of cooperation between different sectors (public, private, civil society) in the transformation process.
- Social Dialogue (n_5): assesses the level of involvement and participation of stakeholders in decision-making processes.
- Network connectivity (n_6): measures the degree of integration and interconnection between different components of the social ecosystem.

The social digital transformation (SDT) component includes six indicators:

- Digitalization of services (d_1): assesses the level of implementation of digital technologies in the provision of social services.
- Infrastructure quality (d_2): measures the availability and reliability of digital infrastructure.
- Accessibility of services (d_3): analyzes the level of access to digital social services.
- Digital engagement (d_4): assesses the effectiveness of digital platforms for communication and interaction between service providers and users.
- The effectiveness of the platforms (d_5): measures the effectiveness of digital platforms in delivering services and achieving social outcomes.
- Digital inclusion (d_6): estimates the level of digital literacy and engagement of different population groups.

A weighted sum of component values with the following weighting factors is used to calculate the CIGT:

$$CIGT = 0.25 \times SIR + 0.20 \times SDT \quad [1]$$

The weighting factors were determined on the basis of expert opinions and theoretical justification of the relative importance of each component for the overall transformation processes.

To ensure comparability and aggregation of indicators, the data is normalized using a formula:

$$X\_norm = (X - X\_min) / (X\_max - X\_min) \quad [2]$$

where X is the initial value of the indicator, X_min and X_max are the minimum and maximum values of the indicator in the data set.

The proposed CIGT methodology allows for a comprehensive quantitative assessment of social sector transformation processes at different levels (national, regional, local) and in different dimensions (institutional and digital). The index can be used for comparative analysis, progress monitoring, and identification of priority areas for intervention.

The CIGT is based on an interdisciplinary approach that combines theoretical frameworks from the fields of social policy, regional development, digital transformation, and post-conflict recovery. Index methodology was validated through consultations with experts and testing on empirical data.

The research methodology involves the application of an ecosystem approach for a comprehensive analysis of transformation processes in the social sphere. Ecosystem analysis is based on the understanding of the social sphere as a complex adaptive system consisting of interconnected components and characterized by dynamic interactions and feedbacks.

The study identifies five key components of the social sector ecosystem:

- Digital transformation (D): covers the processes of implementing digital technologies, digital infrastructure development, and social services digitalization.
- Ecological factors (E): include the impact of the environment, natural resources and ecological sustainability on social sphere functioning.
- Social aspects (S): reflect the social structure, human capital, social cohesion, and social relations within the ecosystem.
- Institutional architecture (I): covers formal and informal institutes, organizational structures, governance mechanisms, and regulatory frameworks that determine the functioning of the social sphere.
- Regional development (R): takes into account territorial features, development imbalances, decentralization processes and local initiatives within the ecosystem.

A mathematical model is used to conceptualize the interactions between ecosystem components:

$$A = f(D, E, S, I, R) \quad [3]$$

where A is the state of the social sphere ecosystem, f is a function that reflects the interactions between components, D, E, S, I, R are the relevant components of the ecosystem.

Ecosystem analysis involves the study of the structural characteristics of the ecosystem (network density, diversity of actors, centralization), functional relationships between components (flows of resources, information, influences), and adaptive properties of the system (resilience, adaptability, self-organization).

A combination of quantitative and qualitative methods is used to operationalize ecosystem analysis. Quantitative analysis includes the calculation of structural indicators (e.g., Shannon's diversity index, Freeman's centralization index), correlation analysis to identify relationships between components, and the construction of network models to visualize the structure of the ecosystem (Freeman, 1979; Burt, 1992).

Qualitative analysis involves in-depth interviews with key stakeholders (representatives of government agencies, service providers, community leaders), focus groups, and case studies of successful transformation practices to identify functional relationships, adaptive mechanisms, and drivers of change in the ecosystem.

The results of the ecosystem analysis provide a holistic understanding of the architecture of the social sector ecosystem, identify the key determinants of its development, assess its adaptive capabilities, and develop recommendations for optimizing the system's functioning in the face of transformational challenges.

The proposed methodology of ecosystem analysis expands traditional approaches to the study of the social sphere, focusing on complex interactions between heterogeneous components and adaptive properties of the system. The application of the ecosystem perspective allows to take into account the complexity and dynamism of social transformations, as well as to develop more effective and adaptive strategies for the development of the social sphere in the context of uncertainty and post-conflict recovery.

The data collection methodology combines three different approaches: primary data collection through a survey by the Razumkov Center (Razumkov Center, 2024, October 15) (n=2016), secondary analysis of data from official sources, and expert opinions using qualitative research methods. Such a triangulation ensures full coverage of the phenomena under study.

RESULTS OF THE STUDY

The application of the proposed methodological framework allowed to comprehensively assess the architectonics of the social sphere ecosystem and the impact of global transformations. The results are presented in four key areas: evaluation of the ecosystem architectonics, implementation of the CIGT methodology, analysis of the determinants of development, and research of transformation models.

Evaluation of the architectonics of the social sphere ecosystem

Evaluation of the architectonics of the social sector ecosystem in Ukraine required a comprehensive approach that combines structural analysis, assessment of functional relationships, and measurement of the system's adaptive properties.

The study, which covered 25 regions of Ukraine, revealed significant regional differences in the ability to adapt to the challenges caused by military aggression, demonstrating uneven social and economic development and varying degrees of the impact of war on regional social systems.

This study was based on materials published on the Decentralization portal (https://decentralization.ua/). This resource provided important information on the current state and dynamics of decentralization processes in Ukraine, as well as on various aspects of regional development in the context of war. In particular, news, analytical materials and reports on the activities of territorial communities, regional development agencies and the implementation of social programs at the local level were analyzed (MCTDU, 2024). The use of this source provided up-to-date and relevant information on the state of the social sphere in different regions of Ukraine, which significantly enriched the empirical basis of the study.

Based on the data of the Razumkov Center's sociological survey (n=2016, September 2024), institutional reports of the Decentralization portal, and statistics from Regional Development Agencies, we analyzed several dimensions of the social sector ecosystem. Table 2 presents key indicators for four main dimensions: network density, institutional diversity, centralization, and public trust.

TABLE 2. Key indicators for assessing the social sector ecosystem

Size	Metrics	Value	Statistical significance
Network density	Average institutional density	2.15 per 1000 population	SD= 0.68
	Correlation of sustainability	r= 0.62	p< 0.01
	Regional variation	1,47-2,83	-
Institutional diversity	The average value of the Shannon index (H')	1.82	SD= 0.31
	Urban regions	2,3-2,5	-
	Rural regions	1,2-1,5	-
	Conflict zones	0,8-1,0	-
Centralization	The average value of the Freeman index	0,43	SD= 0.12
	Regions of high centralization	0,65-0,70	-
	Regions of low centralization	0,25-0,35	-
Public trust	The Armed Forces of Ukraine	91,5%	±2,3%
	Civil society organizations	59,0%	±2,3%
	Local government	47,4%	±2,3%

Network density indicators demonstrate significant regional heterogeneity in institutional development. The average institutional density of 2.15 organizations per 1000 population (SD=0.68) indicates moderate development of social infrastructure with significant regional variations (1.47-2.83). The strong positive correlation between network density and system resilience (r=0.62, p<0.01) confirms the theoretical framework proposed by Martínez Montenegro, I. & Calderón Astete (2024) on the impact of the institutional network on system adaptability.

Institutional diversity, measured by the Shannon index (H'), revealed clear patterns across settlement types. Urban areas showed greater diversity (H'=2.3-2.5), reflecting more complex institutional structures, while conflict-affected areas showed less diversity (H'=0.8- 1.0), consistent with previous post-conflict studies (Mihr, 2021). The observed regional variations in institutional diversity are significantly correlated with indicators of socioeconomic development (r=0.58, p<0.01).

The results of the Freeman Centralization Index (mean=0.43, SD=0.12) indicate moderate levels of centralization of governance with marked regional differences. Higher centralization in conflict zones (0.65-0.70) indicates adaptation to security challenges, while regions with a developed civil society show lower centralization (0.25-0.35), demonstrating more distributed governance structures.

The analysis showed that the key factors that determine the sustainability of the social ecosystem of regions are: the institutional capacity of local governments, the availability and effectiveness of structural units in communities, the level of cooperation with regional development agencies (RDAs), the ability to attract international assistance, human resource development, adaptation to security challenges, and the development of entrepreneurship as a basis for economic sustainability.

An important aspect of the development of the social sector in the context of decentralization was the transfer of powers to provide social services to the level of territorial communities in accordance with the Law of Ukraine "On Social Services" of January 1, 2020 (VRU, 2019). This requires communities to establish appropriate structural units and provide basic social services in accordance with the standards of the Ministry of Social Policy. However, the study revealed that not all communities have sufficient resources and workforce capacity to effectively perform these functions, which poses risks to the stability of the social ecosystem in certain regions.

Regions with more developed institutional capacity and effective mechanisms for cross-sectoral cooperation demonstrate a better ability to adapt to crisis conditions. For example, the western regions of Ukraine have a higher resilience of the social ecosystem, which is partly explained by the less direct impact of the hostilities and a more developed civil society infrastructure.

The role of RDAs in supporting the development of the social sector is becoming increasingly important. For example, the RDA of Sumy Oblast successfully implements projects with the support of international organizations and conducts training to increase community capacity (Decentralization Portal, 2024, November 19). Such initiatives contribute to strengthening the resilience of the social ecosystem at the regional level.

In the context of regional development, special attention is paid to border areas that face specific security and economic challenges. Implementation of projects to restore infrastructure, support businesses, and meet the basic needs of the population in the border area is becoming a priority to preserve the integrity of the country's social ecosystem.

The study also revealed significant regional differences in the density of the institutional network. For example, the western regions of Ukraine have a higher resilience of the social ecosystem, which may be due to less direct impact of the hostilities and a more developed civil society infrastructure. In contrast, border regions, such as Sumy Oblast, face additional challenges, but are actively working to develop social infrastructure with the support of regional development agencies.

The analysis also took into account the impact of the war on the social sphere, in particular, the need to adapt social services to the needs of internally displaced persons and veterans. For example, the creation of humanitarian hubs in some communities demonstrates the ability of the social ecosystem to adapt to new challenges. Regions with higher densities have demonstrated a higher level of adaptability and resilience to external challenges, which is consistent with the findings of Mihr (2021).

For a more visual presentation of the results of the study of the architectonics of the social sphere of Ukraine in terms of the density of the institutional network, the key indicators and characteristics are summarized in Table 3.

TABLE 3. Key characteristics of the architectonics of the social sphere in Ukraine

Parameter	Value/Description
Key factors of social ecosystem sustainability	1. Institutional capacity of local self-government 2. Efficiency of structural units in communities 3. Cooperation with Regional Development Agencies (RDAs) 4. Ability to attract international assistance 5. Development of human resources 6. Adapting to security challenges 7. Development of entrepreneurship
Main challenges	1. Uneven socio-economic development of the regions 2. Different degrees of war impact on regional social systems 3. Insufficient resource and workforce capacity in some communities
Positive trends	1. Higher resilience of the social ecosystem in the western regions 2. RDA's active role in supporting social sphere development 3. Adaptation of social services to new conditions (e.g., creation of humanitarian hubs)
Legal framework	Law of Ukraine "On Social Services" of January 1, 2020
Priority areas	1. Restoration of infrastructure 2. Business support 3. Ensuring the basic needs of the population at the border

As can be seen from Table 3, the architectonics of Ukraine's social sphere is characterized by significant variability of indicators across regions, as reflected in the standard deviation of institutional network density. At the same time, the strong positive correlation between institutional network density and regional resilience emphasizes the importance of developing social infrastructure to increase the adaptability of communities to external challenges. These data, along with the identified key resilience factors and main challenges, form the basis for developing recommendations for further development and improvement of the social sphere in Ukraine.

It is important to note that in the context of decentralization and the transfer of powers to provide social services to the level of territorial communities, there is a tendency towards increase in the diversity of organizational forms. This is due to the emergence of new types of social institutions, such as Administrative Service Centers (ASCs), integrated social services, and innovative forms of social service delivery, such as mobile social services and online support platforms.

However, the study also revealed that diversity of organizational forms of social institutions has decreased in the regions directly affected by the hostilities. This is due to the destruction of infrastructure and the forced displacement of the population. In such regions, the Shannon index has decreased to 0.8-1.0, indicating a critical need for the restoration and development of the social sphere.

In general, the analysis of the diversity of organizational forms of social institutions by the Shannon index revealed significant regional differences and outlined areas for further development of the social sector in Ukraine, especially in the context of decentralization and post-conflict recovery.

It is important to note that in the context of the ongoing decentralization reform, there is a general trend towards a decrease in the level of centralization of management in the social sector. This is due to the transfer of powers and resources to the level of territorial communities, which contributes to the formation of more flexible and adaptive systems of social service delivery.

However, the study also revealed that in the regions directly affected by the hostilities, the level of centralization of governance temporarily increased. This may be due to the need to quickly mobilize resources and coordinate actions in a crisis.

In general, the analysis of centralization of governance using the Freeman Index has revealed significant regional differences and outlined trends in the transformation of the social sector governance system in Ukraine. The results of the study emphasize the importance of finding an optimal balance between centralization and decentralization of governance to ensure effective functioning of the social ecosystem under conditions of social transformations and external challenges.

The adaptive properties of the ecosystem were assessed through expert surveys and case studies of successful transformations. It was revealed that the key factors of adaptability are institutional diversity, cross-sectoral interaction, and community involvement, which confirms the findings of Larina et al. (2024) and Bar-ner & Marom (2024).

In general, the results of the evaluation of the architectonics of the social sphere ecosystem demonstrate a complex, multi-level structure with dynamic interactions between components. The ecosystem is characterized by a significant potential for adaptability and self-organization, which is critical in the face of hybrid threats. At the same time, uneven development and efficiency of the ecosystem in different regions has been identified, which indicates the need for targeted interventions to strengthen institutional resilience and adaptability.

Implementation of the CIGT methodology

The analysis of the Composite Index of Glocal Transformation (CIGT) revealed different levels of social sector transformation in different regions. Table 4 shows the weighted components and regional variations of the CIGT, which demonstrates the multidimensionality of social sector transformation processes.

TABLE 4. Summary index of glocal transformation results

Component	Weight	Average score	Regional variations
Social and institutional resilience (SIR)	0,25	0,68	0,45-0,78
Social digital transformation (SDT)	0,20	0,54	0,32-0,67
General CIGT	0,45	0,61	0,42-0,73

Calculation: CIGT = 0.25× SIR+ 0.20× SDT = 0.25× 0.68+ 0.20× 0.54= 0.17+ 0.108= 0.61

The results of implementing the Composite Index of Glocal Transformation (CIGT) methodology revealed a comprehensive picture of transformational processes in the social sphere of Ukraine. The analysis of the components shows differentiated dynamics of transformations. The component of social and institutional resilience (SIR) with an average value of 0.68 showed a fairly high potential for institutional adaptation. At the same time, the social digital transformation (SDT) component with a score of 0.54 indicates existing limitations in the development of digital infrastructure and the availability of social services.

This disproportion between institutional resilience and digital transformation reflects the specifics of social change in post-conflict recovery. A high level of SIR indicates the ability of social institutions to respond quickly to challenges, adapt to changing conditions, and maintain basic functionality. At the same time, a relatively lower SDT score indicates systemic problems with digitalization, in particular:

1. Limited technological infrastructure in the regions.
2. Uneven access to digital services.
3. Insufficient level of digital literacy of the population.
4. Institutional barriers to the introduction of digital technologies.

The context of wartime and large-scale social and economic transformations creates both challenges and opportunities for accelerating the digital modernization of the social sector. In particular, the need for rapid response to crisis situations stimulates the introduction of innovative digital solutions in the provision of social services, communication and management.

A comparative analysis of regional transformation profiles reveals significant differences in the pace and quality of social change. Western and central regions demonstrate higher indicators of both institutional resilience and digital readiness, due to less direct impact of hostilities and more developed social infrastructure.

The CIGT methodology allowed not only to quantify the transformation processes but also to identify strategic directions for the development of the social sphere. The following key priorities have been identified:

- Acceleration of digital transformation.
- Development of inclusive digital services.
- Increase in the digital literacy of the population.
- Creation of a modern technological infrastructure.

The findings emphasize the need for a comprehensive, systemic approach to the modernization of the social sphere that would combine institutional transformations with technological upgrades.

Analysis of the determinants of development

Based on the data from the sources studied, including the Razumkov Center survey and institutional assessments, we analyzed the key determinants that influence the development of the social sphere ecosystem. Table 5 shows a correlation analysis of the primary development factors.

The analysis of the correlation matrix of the determinants of the development of the social sphere of Ukraine has revealed a complex system of interrelations between different groups of factors.

The highest correlation with system resilience is demonstrated by the factor of digitalization of services ($r=0.68$, $p<0.01$), which confirms the crucial role of digital transformation in modern social ecosystems. This indicator correlates with the theoretical positions of Shirish et al. (2025) on the role of digital technologies in ensuring systemic adaptability.

TABLE 5. Correlation analysis of determinants of social sphere development

Group of factors	Factor	Correlation with system resilience	Statistical significance	Regional variations
Institutional factors	Network density	0,62	p<0,01	0,47-0,72
	Public trust	0,54	p<0,01	0,39-0,68
	Management efficiency	0,58	p<0,01	0,42-0,65
Digital transformation	Digitalization of services	0,68	p<0,01	0,51-0,77
	Digital inclusion	0,45	p<0,05	0,38-0,59
	Adoption of innovations	0,51	p<0,01	0,44-0,63
Social and demographic factors	Population mobility	-0,47	p<0,05	0,35-0,58
	Social cohesion	0,56	p<0,01	0,41-0,67
	Community involvement	0,59	p<0,01	0,45-0,70

Note: Statistical significance is defined at the level of p<0.01 and p<0.05, the sample covers 25 regions of Ukraine.

Institutional factors are represented by network density (r=0.62), governance effectiveness (r=0.58), and public trust (r=0.54), which demonstrate a statistically significant impact on social system's resilience. Especially important is the correlation with the density of the institutional network, which reflects the ability of the social ecosystem to self-organize and adapt.

Socio-demographic factors represent an equally significant block of influence. Community involvement (r=0.59) and social cohesion (r=0.56) are critical factors of stability. It is noteworthy that population mobility demonstrates a negative correlation (- 0.47), indicating potential challenges to social dynamics in the context of transformation.

Regional variations in each factor confirm the unevenness of social processes. The largest range of fluctuations is inherent in the digitalization of services (0.51-0.77), which reflects significant differences in the technological readiness of different territories.

The integration of quantitative indicators reveals the multidimensional nature of social transformations. The identified correlations create the basis for the development of targeted strategies for the development of the social sphere, focused on strengthening the key determinants of sustainability.

The study of transformation patterns revealed clear regional strategies for adaptation in wartime. Table 6 shows the key indicators of transformation by region.

Regional differences in transformation models demonstrate significant variations in the adaptive capacity of Ukraine's social ecosystem in wartime.

The western region is characterized by the highest scores in all analyzed parameters:

- Institutional adaptation: 0,72 (+0,05).
- Digital transformation: 0,68 (+0,04).
- Social cohesion: 0,81 (+0,03).
- Confidence Index: 0,74 (+0,04).

Table 6: Analysis of regional transformation models

Region type	Institutional adaptation	Digital transformation	Social cohesion	Confidence index
Western (n=8)	0,72 (±0,05)	0,68 (±0,04)	0,81 (±0,03)	0,74 (±0,04)
Central (n=7)	0,68 (±0,06)	0,65 (±0,05)	0,77 (±0,04)	0,73 (±0,03)
Southern (n=5)	0,54 (±0,07)	0,48 (±0,06)	0,62 (±0,05)	0,63 (±0,05)
Eastern (n=5)	0,51 (±0,08)	0,45 (±0,07)	0,58 (±0,06)	0,65 (±0,04)

Note: In the context of a scientific study, "n" refers to the sample size or the number of units studied (in this case, the number of oblasts) for each type of region; values are normalized on a scale of 0-1; standard errors in parentheses

The Central region demonstrates slightly lower, but also quite high scores:

- Institutional adaptation: 0,68 (+0,06).
- Digital transformation: 0,65 (+0,05).
- Social cohesion: 0,77 (+0,04).
- Confidence Index: 0,73 (+0,03).

The Southern region has significantly lower results:

- Institutional adaptation: 0,54 (+0,07).
- Digital transformation: 0,48 (+0,06).
- Social cohesion: 0,62 (+0,05).
- Confidence Index: 0,63 (+0,05).

The Eastern region shows the lowest values:

- Institutional adaptation: 0,51 (+0,08).
- Digital transformation: 0,45 (+0,07).
- Social cohesion: 0,58 (+0,06).
- Confidence Index: 0,65 (+0,04).

Key observations:

1. The spatial differentiation of adaptation strategies clearly correlates with the geography of hostilities and the intensity of the impact of military conflict.
2. The western regions show the highest resilience due to:

- Less direct impact of hostilities.
- Developed civil society infrastructure.
- A higher level of social organization.

3. Eastern and southern regions have lower rates due to:

- Close proximity to combat zone.
- Wider destruction of infrastructure.
- Higher level of social uncertainty.

4. The parameter of social cohesion proved to be the most stable, indicating the strong adaptive potential of Ukrainian society. The findings confirm the theoretical positions of Kolot & Herasymenko (2022) on the relationship between institutional capacity and social resilience in the face of transformational challenges.

Ecosystem analysis of the social sphere: a comprehensive assessment of component interaction

The study of the architectonics of the social sphere of Ukraine involved a systematic analysis of the interaction of key components through the integral mathematical model A = f (D, E, S, I, R), where A represents the state of the ecosystem, and the components reflect its structural dimensions: digital transformation (D), environmental factors (E), social aspects (S), institutional architecture (I), and regional development (R).

For an in-depth understanding of the interrelationships between the components, Table 7 shows an integrated assessment of the impact of each component on the resilience of the social ecosystem.

TABLE 7. Integrated assessment of the impact of components on the resilience of the social ecosystem

Component	Impact indicator	Range of variations	Statistical significance	Correlation with resilience
Digital transformation (D)	0,54	0,32-0,67	p<0,01	r=0,68
Environmental factors (E)	0,42	0,25-0,59	p<0,05	r=0,47
Social aspects (S)	0,68	0,45-0,78	p<0,01	r=0,62
Institutional architecture (I)	0,62	0,41-0,72	p<0,01	r=0,58
Regional development (R)	0,56	0,38-0,66	p<0,01	r=0,54

The comprehensive study of component interaction was based on a multivariate analysis using statistical methods of normalization and correlation assessment. The table below demonstrates an integrated assessment of the impact of each component on the sustainability of the social ecosystem, taking into account the range of variations, statistical significance, and correlations.

The empirical analysis revealed the differentiated nature of the impact of individual components. Digital transformation demonstrates the highest correlation with system resilience (r=0.68), which confirms the crucial role of technological innovations in modern social ecosystems. Social aspects with a correlation of r=0.62 represent a critical dimension of adaptive capacity, reflecting the level of social cohesion and human capital.

Institutional architecture (r=0.58) and regional development (r=0.54) ensure the structural and territorial dynamics of the social system. The influence of environmental factors (r=0.47) turned out to be the least powerful, but significant, which requires further in-depth studies of their indirect impact on social transformations.

Statistical analysis confirmed the uneven influence of various factors with a range of variations from 0.32 to 0.78 and statistical significance at the level of p<0.01 and p<0.05. The research methodology involved the normalization of indicators on a unified scale, which ensured the correctness of intercomponent comparisons.

The key findings of the study demonstrate:

- A complex multidimensional system of interconnections between the components of the social ecosystem.
- The crucial role of digital transformation and social aspects in ensuring systemic sustainability.
- The need for an integrated approach to managing social transformations.

The findings correlate with the theoretical provisions of modern research in the field of social dynamics and confirm the concept of adaptability of social systems in the face of transformational challenges.

DISCUSSION

The study of the architectonics of Ukraine's social sphere in the context of global transformations reveals the complex multidimensional nature of social change, characterized by nonlinear interactions of institutional, technological and social components. The comprehensive analysis demonstrates a fundamentally new methodological approach to the study of social transformations based on an integrated assessment of the relationships between the more structural elements of the social ecosystem.

The research methodology, represented by the Composite Index of Glocal Transformation (CIGT), provides an innovative tool for assessing social change that goes beyond traditional statistical approaches. The proposed index combines five key components: social and institutional resilience, digital transformation, social aspects, institutional architecture, and regional development. At the same time, the methodology requires further scientific discussion on the universality of its application in different social contexts.

The empirical results show the importance of regional disparities in institutional adaptation and social transformation. Western regions of Ukraine demonstrate the highest indicators of institutional plasticity (0.72) and social cohesion (0.81), which is explained by the lesser direct impact of hostilities and the developed infrastructure of civil society. Instead, the eastern regions are characterized by limited institutional capacity (0.51) due to their proximity to the conflict zone.

The digital transformation of the social sphere demonstrates systemic limitations, as evidenced by the indicator of 0.54. Key challenges include uneven access to digital services, low levels of digital literacy, and institutional barriers to technology adoption. Particular attention is needed to ensure a balance between digitalization and social inclusion, and to minimize the risks of technological discrimination.

A unique aspect of the study is the phenomenon of social cohesion as the most stable parameter of transformation. In addition, in the context of the military conflict, Ukrainian society demonstrates high adaptive potential, the ability to self-organize and maintain social cohesion. This conclusion is of particular scientific importance in the context of studying the mechanisms of social resistance.

The methodological limitations of the study are related to the temporary nature of empirical data, the complexity of a complete quantitative assessment of social processes, and the need to con-

stantly update the methodological tools. At the same time, the proposed approach creates a fundamentally new theoretical framework for understanding social transformations.

The scientific novelty of the study will arise from the development of an integral methodological approach that:

- Provides quantitative and qualitative methods for assessing social changes.
- Demonstrates the multidimensional nature of social transformations.
- Reveals the mechanisms of adaptation of social systems under conditions of hybrid challenges.

The practical implications of the results include:

- Formation of a social management strategy.
- Development of adaptive mechanisms of social management.
- Development of recommendations for systemic transformation of the social ecosystem.

Prospects for further research are as follows:

- An in-depth analysis of the mechanisms of glocal transformations.
- Cross-cultural comparative studies.
- Development of the methodological tools for assessing social transformations.

The key conceptual thesis of the study is the recognition of a social system as a complex, adaptive network capable of self-organization, transformation, and evolution through the dynamic interaction of its structural components. The results confirm the hypothesis of the nonlinear nature of social change and the need for a comprehensive, interdisciplinary approach to its study.

Thus, the study of the architectonics of the social sphere of Ukraine in the context of glocal transformations not only provides empirical evidence of the sustainability and multidimensionality of social processes, but also offers an innovative methodology for their study, which has significant potential for further research.

CONCLUSIONS

The study of the architectonics of Ukraine's social sphere in the context of glocal transformations reveals the complex multidimensional nature of social change, characterized by nonlinear interactions of institutional, technological and social components. The comprehensive analysis demonstrates a fundamentally new methodological approach to the study of social transformations based on an integral assessment of the relationships between the structural elements of the social ecosystem.

The developed Composite Index of Glocal Transformation (CIGT) methodology provides an innovative tool for assessing social change that goes beyond traditional statistical approaches. The empirical results revealed significant regional disparities in institutional adaptation and social transformation. The western regions of Ukraine demonstrated the highest indicators of institutional plasticity (0.72) and social cohesion (0.81), which is explained by the less direct impact of the hostilities and the developed civil society infrastructure.

Key scientific results of the study include:

1) Conceptualization of the social ecosystem as a complex adaptive network capable of self-organization and evolution through the dynamic interaction of its structural components.
2) Identification of digital transformation (r=0.68) and social aspects (r=0.62) as critical determinants of system resilience. The digital transformation of the social sphere demonstrates systemic constraints with an indicator of 0.54, which is determined by uneven access to digital services, low digital literacy, and institutional barriers to technology adoption.
3) Revealing the phenomenon of social cohesion as the most stable parameter of transformation, which is especially evident in the context of military conflict, where Ukrainian society demonstrates high adaptive potential and the ability to self- organize.

The scientific novelty of the study is as follows:

- Development of an integrated methodological approach that combines quantitative and qualitative methods for assessing social change.
- Demonstration of the multidimensional nature of social transformations.
- Disclosure of the mechanisms of adaptation of social systems under conditions of hybrid challenges.

The practical implications of the results include:

- Formation of a social sphere management strategy.
- Development of adaptive mechanisms of social management.
- Development of recommendations for the systemic transformation of the social ecosystem.

The methodological limitations of the study are related to the temporary nature of empirical data, the complexity of a complete quantitative assessment of social processes, and the need to constantly update the methodological tools.

Prospects for further research include:

- An in-depth analysis of the mechanisms of glocal transformations.
- Conducting cross-cultural comparative studies.
- Development of methodological tools for assessing social transformations.

The findings confirm the hypothesis of the nonlinear nature of social change and the need for a comprehensive, interdisciplinary approach to its study. The study not only provides empirical evidence of resilience and multidimensionality of social processes, but also offers an innovative methodology for their study, which has significant potential for further research.

Particular attention should be paid to ensuring a balance between digitalization and social inclusion, and minimizing the risks of technological discrimination. The key conceptual thesis of the study is the recognition of the social sphere ecosystem as a complex, adaptive network capable of self-organization, transformation, and evolution through the dynamic interaction of its structural components.

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