

Revival of Ukraine in the Paradigm of the Intellectual Economy: A New Mission of Universities

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ANNOTATION. The article analyzes the impact of universities on the processes of post-war revival of the Ukrainian economy on an innovative and intellectual basis. The author shows two ways of further development – restoration of lost industrial capacities and modernization of infrastructure facilities or revival with a focus on the latest criteria of competitiveness of the post-industrial knowledge economy. Based on international and domestic expert data, the author assesses the educational and scientific potential of Ukraine, as well as the strengths and weaknesses of the national innovation system. With the use of Kohonen's self-organizing maps based on 30 parameters, Ukraine is positioned in the scientific and educational potential of the world, with the forecasting of its global innovation index. The unique integrative role of universities in the development of the intellectual economy through open science, education and innovation and interaction with the state, business and civil society is shown. A universal competitive model of the University is proposed, when its innovation management ensures the concentration of talents, effective R&D, academic quality, integration of research and teaching, diversified financing, entrepreneurial comfort, developed digital infrastructure, creative thinking and culture, relying on internal and international mobility to achieve national and European leadership. The authors identify critical wartime challenges for Ukrainian universities with a focus on their forced displacement, academic emigration, infrastructure destruction, daily security and stress resistance. It is argued that the adequate responses to long-term budgetary financial constraints are strategic partnerships between universities and businesses, their corporatization, systemic digitalization, and the introduction of exponential learning technologies based on artificial intelligence.

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KEYWORDS: post-war economic revival, intellectual economy, global innovation index, Kohonen maps, educational and scientific potential, universities, intellectual capital.

Introduction

Russia's aggression against Ukraine, including almost three years of full-scale war, has a devastating impact not only on our human and material resources, but also on the established system of international relations, world security and global economic balance.

The unprecedented level of global economic challenges and threats in modern history requires new responses and approaches to the development and implementation of post-war recovery programs, which is adequately reflected in the research of Ukrainian scientists. The fundamental principles of post-war innovative development of Ukraine through the prism of contradictions and prospects for economic growth were studied by V. Heyets⁴. Conditions and options for the formation of a model of economic development in the new geopolitical realities are analyzed by Zveriaikov M.⁵, and the strategic principles of post-war recovery of Ukraine, taking into account foreign experience, are substantiated by L. Kistersky⁶. The experience of individual East Asian countries in implementing innovative policies of economic recovery is summarized by S. Sidenko.⁷

There is almost unanimous agreement that the philosophy and design of such a recovery program for Ukraine should not only provide for a quantitative recovery of key macroeconomic indicators, but also for the formation of a national innovation ecosystem for the digital age with the effective use of a new generation of technologies, own resources, and intellectual capital.

For the last decade, universities, like the rest of Ukrainian society, have been living in an extremely unstable, challenging, and stressful landscape as a result of the Russian aggression of 2014 and Covid-19, a full-scale war.

At the same time, realizing that it is in such a difficult period when the state and society are experiencing a tectonic fracture, the scientific and expert community should not bury its head in the sand, but demonstrate the ability to think truly independently, produce new ideas and generate real change.

⁴ Heyets V. M. Contradictions and prospects of economic growth on the basis of innovation in Ukraine. *Economy of Ukraine*. 67. 11(756). p. 03–28. <https://doi.org/10.15407/economyukr.2024.11.003>

⁵ Formation of the model of economic development in the new historical realities. *Economy of Ukraine*. 2022. No 8. p. 03–19. <https://doi.org/10.15407/economyukr.2022.08.003>

⁶ Strategic principles of post-war recovery of Ukraine. *Economy of Ukraine*. 2023. No 2. p. 03–16. <https://doi.org/10.15407/economyukr.2023.02.003>

⁷ Sidenko S. V. Priorities and factors of innovation policy: experience of some East Asian countries and strategic imperatives for post-war reconstruction of Ukraine. *Economy of Ukraine*. 2022. No 11. p. 47–75. <https://doi.org/10.15407/economyukr.2022.11.047>

While losing some positions as a result of a full-scale war, Ukraine as a whole retains its scientific and educational potential, as reflected in the 2023 Scientific and Analytical Report of the UkrINTEI.⁸ At the same time, it is necessary to minimize the loss of human capital as a result of the war as a key threat to the post-war revival of the Ukrainian economy, as emphasized by V. Antoniuk.⁹

The purpose of the article is to substantiate the integrative role of universities in the innovative strategy of Ukraine's economic revival.

Innovative capacity of economic revival

Based on the real geopolitical situation, the actual and expected losses due to military expansion, and the foreign experience of post-war strategies, Ukraine's economic development has two alternatives:

- restoration of the lost industrial capacities and infrastructure with modernization of some facilities. In this case, we give up even our regional leadership ambitions, drifting towards a flatbed raw material economy with low social standards and poverty for the majority of the population;

- revival with a focus on modern criteria of competitiveness in the paradigm of the post-industrial knowledge economy (Fig. 1). Even if it is under tremendous external pressure, we have a unique chance to create a new economic system that will ensure European standards of living.

In the post-industrial paradigm of the knowledge economy, the progressive components of the artificial intelligence economy, digital and smart economy, first of all, raise the question of the intellectual capacity of economic revival. In this context, Ukraine, along with its unique natural resources, has always been distinguished by its globally competitive human capital, which is formed mainly in the field of science and education. Despite significant losses, we have managed to preserve and, in some areas, increase our educational and scientific potential, as evidenced by domestic and international expert assessments. Thus, the latest GII ranking positions Ukraine at the 60th place (Table 1).

⁸ Scientific, Technical and Innovative Activities in Ukraine in 2023: Scientific and Analytical Report / T. V. Pysarenko, T. K. Kuranda et al.

⁹ Antoniuk V .P. Losses of human capital as a result of the war as a threat to the post-war modernization of the Ukrainian economy. *Economy of Ukraine*. 2022. No. 8. p. 20–33. <https://doi.org/10.15407/economyukr.2022.08.020>

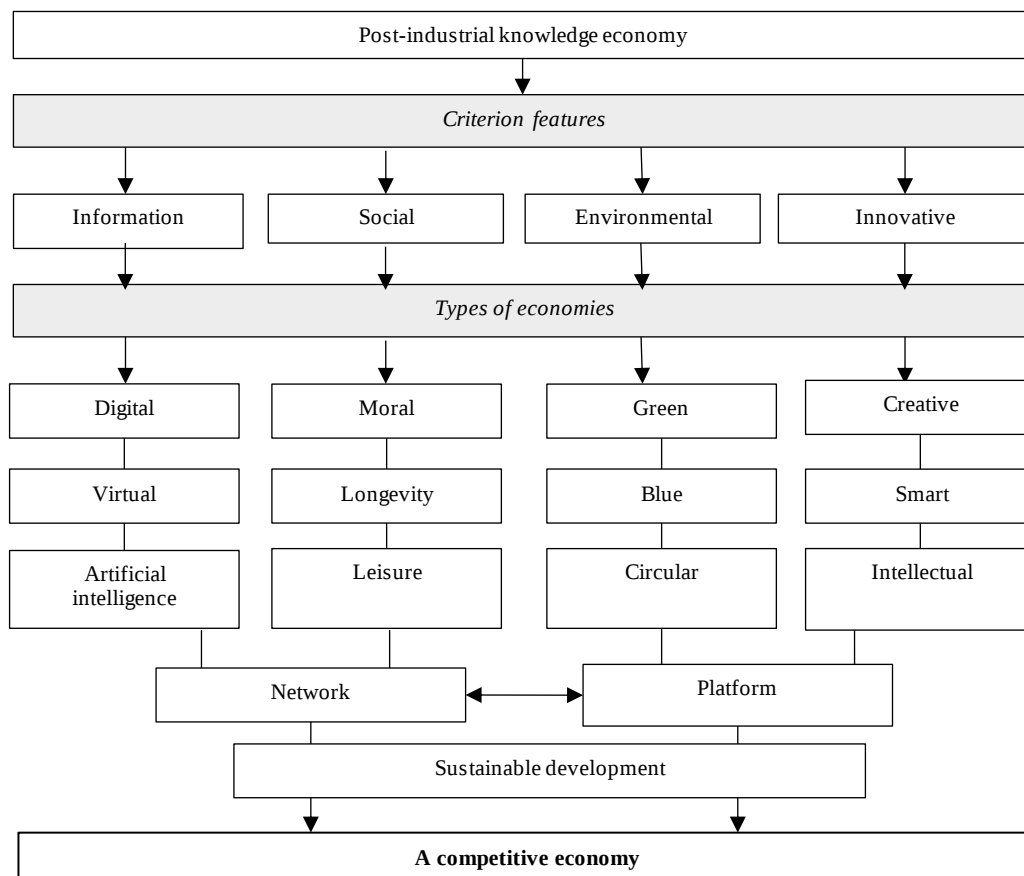


Figure 1. Criteria and types of modern economy

Source: developed by the authors.

Table 1

GII RATING OF UKRAINE (2020–2024)¹⁰

<i>Year</i>	<i>GII positions</i>	<i>Innovative resources</i>	<i>Innovative results</i>
2020	45 th	71 st	37 th
2021	49 th	76 th	37 th
2022	57 th	75 th	48 th
2023	55 th	78 th	42 nd
2024	60th	78th	54th

¹⁰ Global Innovation Index 2024. Ukraine ranking in the Global Innovation Index 2024. WIPO. – p.1

At the same time, it is significant that the output parameters (innovative results) of knowledge exceed the input parameters (innovative resources) as evidence of high innovative productivity.

The GII ranking of Ukraine's innovation strengths and weaknesses has been indicative in recent years (Table 2).

Table 2

STRENGTHS AND WEAKNESSES OF INNOVATION IN UKRAINE¹¹

	<i>Strong</i>		<i>Weak</i>
<i>Rank</i>	<i>Name of the indicator</i>	<i>Rank</i>	<i>Name of the indicator</i>
1	Useful models by origin/billion PPP\$ GDP	130	Labor productivity growth, %
2	Employed women with higher education, %	125	Gross domestic product, % of GDP
4	Software costs, % of GDP	123	Stability of work for business
5	Exports of ICT services, % of total trade	120	Joint venture/strategic alliance agreements/billion GDP at PPP
10	Public funding/pupil, secondary school, % of GDP/person	115	GDP/unit of energy consumption
11	Creation of mobile applications/billion PPP\$ GDP	95	Recipients of venture capital, deals/billion GDP at PPP
16	Expenditures on education, % of GDP	80	Market capitalization, % of GDP
18	Pupil/teacher ratio, average	57	Loans from microfinance organizations, % of GDP
20	Industrial designs by origin/billion PPP\$ GDP	49	Unicorn valuation, % of GDP
29	Joint publications of public research and industry, %	41	Global corporate investors in R&D, top 3, USD million

It should be noted that the strengths primarily reflect Ukraine's potential, while the weaknesses are due to imperfect state regulatory policy, especially in the investment sector.

From the point of view of scientific and technological perspectives and criteria, the national statistics of Ukraine's innovativeness does not look critical either (Fig. 2, Fig. 3).

¹¹ Global Innovation Index 2024. WIPO – p. 239.

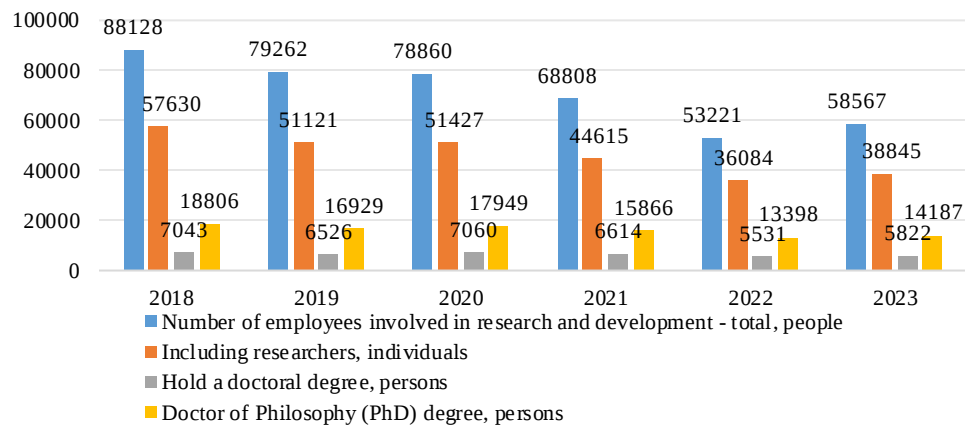


Figure 2. Number of employees involved in research and development in 2018–2023¹²

Source: developed by the authors.

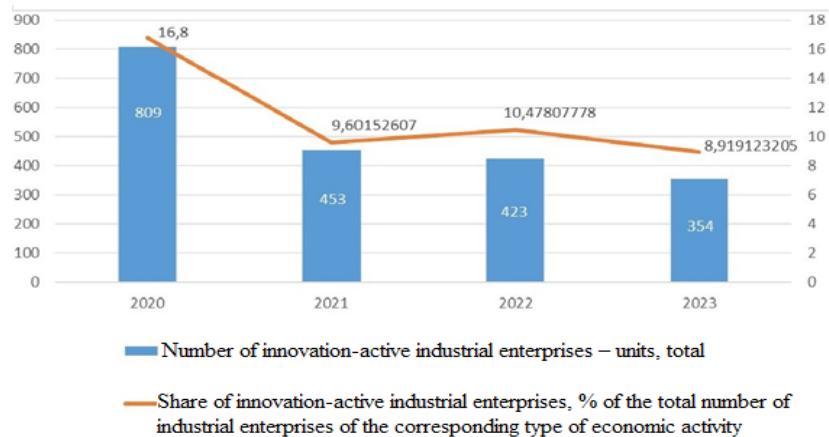


Figure 3. Number and share of innovatively active industrial enterprises, 2020–2023¹²

Source: developed by the authors.

Using Kohonen's self-organizing maps^{13;14} as one of the neural network tools based on more than 30 key parameters, we have positioned Ukraine

¹² State Statistics Committee of Ukraine. <https://ukrstat.gov.ua>

¹³ Dmytro H. Lukianenko, Andriy V. Matviychuk, Liubov I. Lukianenko, Iryna V. Dvornyk. 2022. University competitiveness in the knowledge economy: a Kohonen map approach. The 10th International Conference on Monitoring, Modeling & Management of Emergent Economy, November 17–18, 2022, Virtual, Online. p. 236–250.

¹⁴ Dmytro Lukianenko, Anastasiia Simakhova. 2022. Artificial Intelligence in the Scientific and Technological Paradigm of Global Economy. Problemy Ekorozwoju/ Problems of Sustainable Development, 19(2):55–65 DOI: <https://doi.org/10.35784/preko.6256>

in the world's scientific and educational potential, as illustrated in Figs. 4, 5

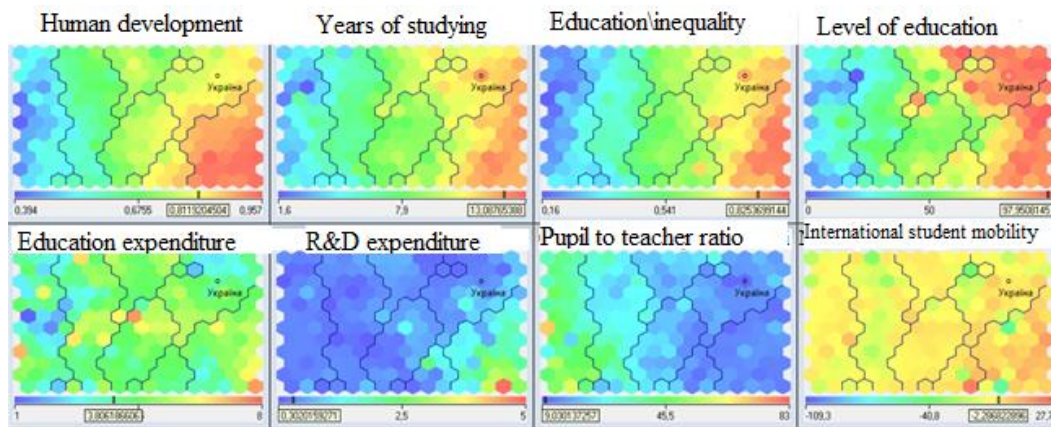


Figure 4. Clustering of countries by indicators of scientific and educational potential, 2018–2023

Source: developed by the authors.

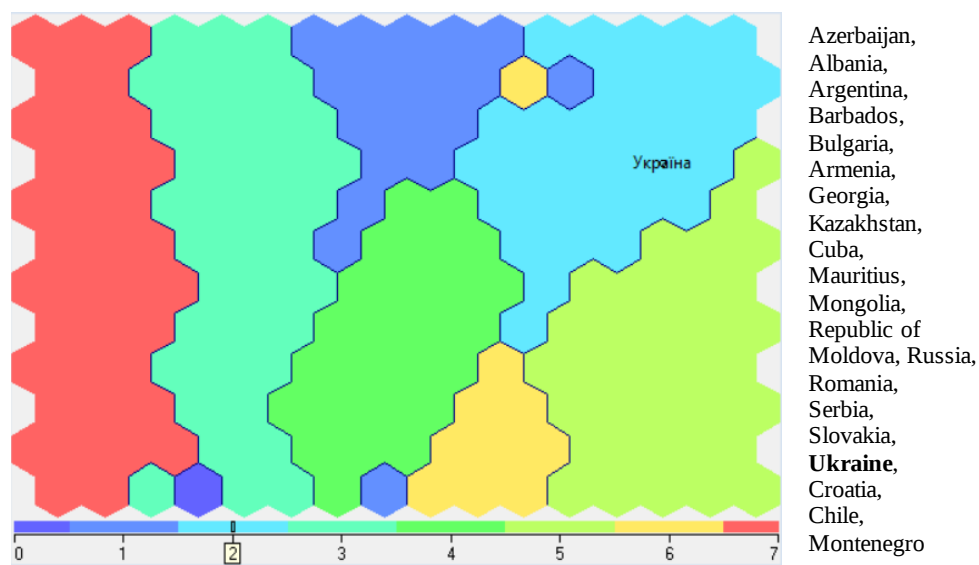


Figure 5. Countries in the same cluster as Ukraine

Source: developed by the authors.

Thus, the cluster to which Ukraine belongs consists of 20 countries, which are divided into 4 groups: post-Soviet republics, new EU member states, Latin American countries, and others. The first two groups make up 65 per cent of the cluster, and the average level of its development is "2" with a maximum of "7".

The integrative mission of universities in the development of the intellectual economy

Based on the practical experience of successful countries, it is obvious that universities are the innovative centers of their economic growth and social progress, and that their ecosystems form the intellectual capital of post-industrial development.

The unique integrative role of universities in the development of the post-industrial knowledge economy is fundamentally important due to their ability of:

- concentration of talent;
- idea generation;
- organization and implementation of R&D;
- ensuring the fundamental stability of knowledge that gives an understanding of the world in the face of dynamic variability of professional competencies;
- innovative diversity through the complementary role of STEM disciplines, humanities and social sciences;
- innovative partnerships and mediation between sectors and territories;
- accumulation and constant updating of the development information resource;
- seeking solutions to global problems and respond to modern challenges.

In general, universities play a unique role in the process of global intellectualization (Fig. 6).

The openness paradigm involves not only the involvement of the public sector, business, and citizens/end users in innovation processes, but also their integration. This, in turn, ensures a constant and dynamic increase in intellectual capital at the micro, macro, local and global levels.

In the inter-university context, openness implies a shift from competition to cooperation and collaboration, where universities share best internal innovation practices for the sake of common progress.

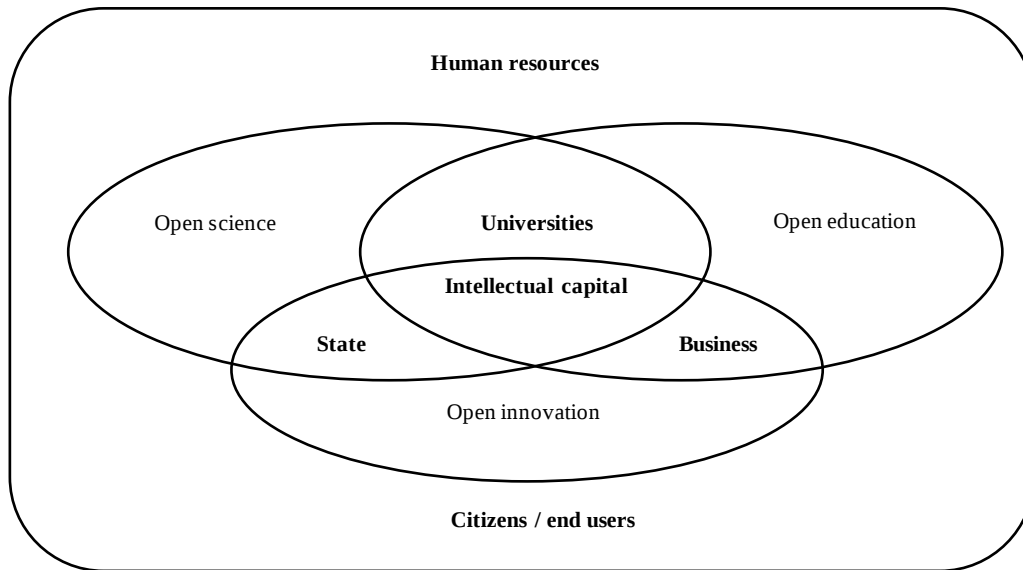


Figure 6. Model of global intellectualization

Source: developed by the authors.

Ukrainian universities are actively engaged in a variety of areas and types of innovation activities, which are often reflected in their cities, and in the related strategies. They are distinguished by:

- development of innovative thinking and competencies;
- innovations based on fundamental research;
- innovation through multidisciplinary approach;
- not only technological but also social innovations;
- innovative entrepreneurship through startups;
- intellectual property management (knowledge security);
- innovation infrastructure (science parks, hubs, incubators, accelerators);
- creation of innovative ecosystems and networks.

After the full-scale invasion of the Russian Federation, participants in the educational process and higher education institutions faced a number of new unprecedented challenges. In addition to the irreversible human losses of scientists, teachers, and students who died as civilians or while defending the country (more than 700 people), other challenges have their own ways of solving or neutralizing them.

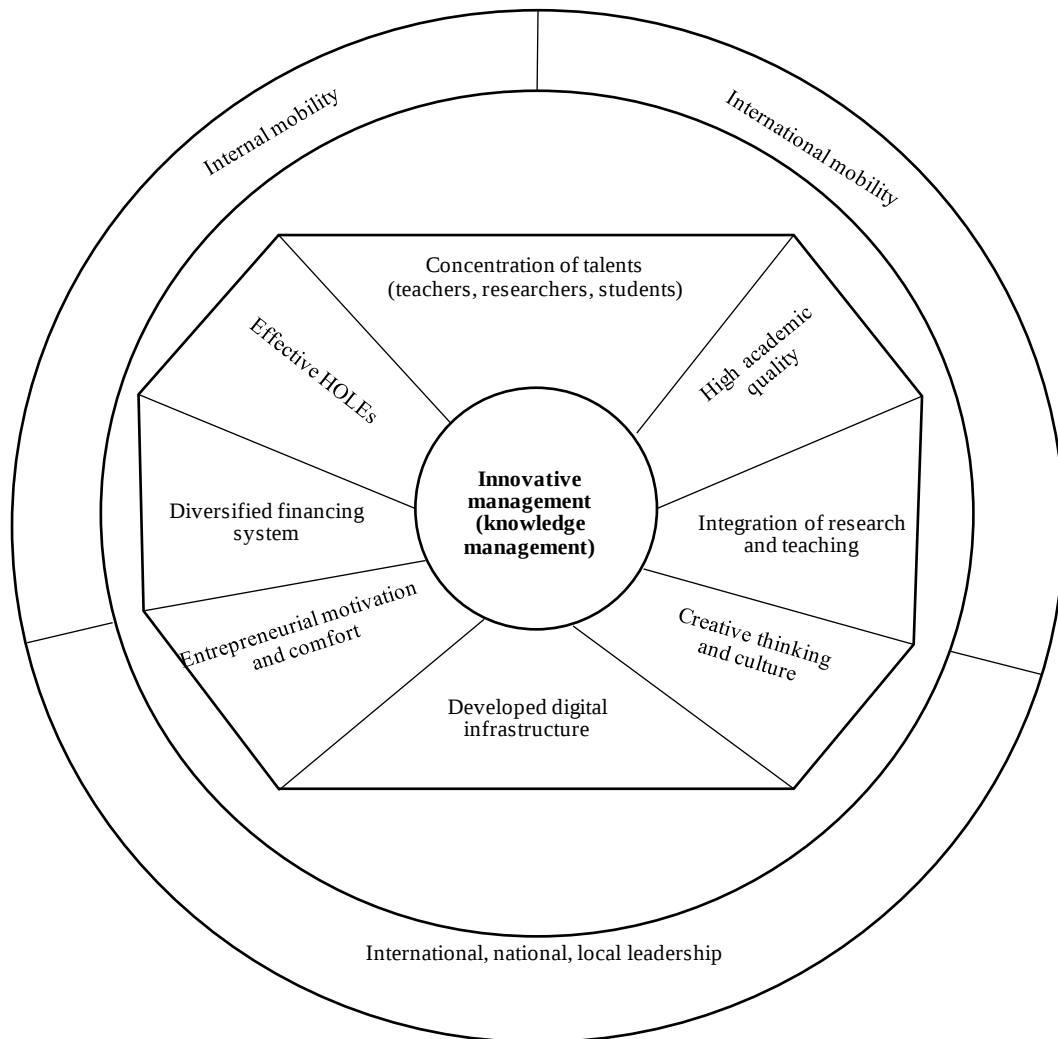


Figure 7. Competitive model of the university

Source: ¹⁵

¹⁵ Dmytro H. Lukianenko, Andriy V. Matviychuk, Liubov I. Lukianenko, Iryna V. Dvornyk. 2022. University competitiveness in the knowledge economy: a Kohonen map approach. The 10th International Conference on Monitoring, Modeling & Management of Emergent Economy, November 17-18, 2022, Virtual, Online. – p. 236–250.

Table 3

WARTIME CHALLENGES AND METHODS OF OVERCOMING THEM

<i>Challenges</i>	<i>Methods of overcoming</i>
Daily threat to the life and health of participants in the educational process	Security flexibility, internal and external mobility
Forced relocation of higher education institutions (more than 30) and participants in the educational process	Network adaptation with a return orientation
Educational emigration of teachers, researchers, students, and future applicants in an unfavorable demographic perspective (more than 1 million young people)	Parallel studies, double and joint diplomas, foreign branches of Ukrainian universities and schools
Destruction and damage to infrastructure (more than 120 higher education institutions)	Selective restoration in new architectural designs with regard to the prospects of optimizing the number of higher education institutions
Long-term budgetary financial constraints and shortage of material resources	Strategic partnership with business, corporatization, privatization, digital university, exponential learning technologies based on artificial intelligence

As the table shows, Ukraine has developed adequate responses/methods to overcome critical wartime challenges in order to preserve the national research and education potential.

Conclusions

Despite the enormous material and intangible losses, Ukraine has retained significant intellectual potential, competitive enterprises in advanced IT business systems, and the motivations and ambitions of post-industrialism, which gives it a unique chance for post-war economic revival in the modern scientific and technological paradigm.

In the context of ultra-dynamic scientific and technological changes, universities play a crucial role in the functioning of competitive innovation economies due to their ability not only to generate new ideas and accumulate knowledge, but also to quickly transfer and scale it in the process of training highly qualified specialists.

In the context of a constant military threat to the very existence of sovereign Ukraine, it is important not so much to admire even attractive from the point of view of very diverse foreign practices of university education management as to enable us to realize our natural function. Today, we need not only expert assessments, advice, and mediation, but also the direct involvement of the university sector in the formation of the

philosophy, programs, and projects of Ukraine's economic revival. To do this, we must first restore the trust of society, the state, and business in Ukrainian universities, which should become laboratories for the formation of a new economy and the future of Ukrainian society.

* This article was translated from its original in Ukrainian

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Received: November 01, 2024.

Accepted: November 20, 2024.

Released: December 31, 2024.