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The Impact of Digitalization on the Sustainable Development of Ukraine: COVID-19 and War Challenges for Higher Education

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ABSTRACT

Higher Education plays an important role in ensuring the Sustainable Development of the countries. The purpose of the article is to systematize scientific approaches to the study of the impact of digitalization on ensuring the Sustainable Development of Ukraine and its regions in the conditions of modern COVID-19 and military challenges. The methodological basis of this study is a systematic approach, as well as general and special scientific research methods, namely: systematic analysis and generalization, grouping, induction and deduction, abstract-logical, scientific abstraction and modeling, graphic methods. The authors verified that Higher Education has a tangible positive impact on the dynamics of Sustainable Development of Ukraine and its regions. First of all, this influence is carried out through the educational and research activities of universities. The article emphasizes that it was digitalization that allowed universities to maintain their competitive positions in the educational services market in the conditions of COVID-19 and war challenges.

KEY WORDS: Higher Education, universities, Sustainable Development, digitalization, information technologies, COVID-19, war challenges.

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El impacto de la digitalización en el Desarrollo Sostenible de Ucrania: COVID-19 y los desafíos de la guerra para la Educación Superior

RESUMEN

La Educación Superior juega un papel importante para garantizar el Desarrollo Sostenible de los países. El propósito del artículo es sistematizar los enfoques científicos para el estudio del impacto de la digitalización en la garantía del Desarrollo Sostenible de Ucrania y sus regiones en las condiciones de la COVID-19 moderno y los desafíos militares. La base metodológica de este estudio es un enfoque sistemático, así como métodos de investigación científicos generales y especiales, a saber: análisis sistemático y generalización, agrupación, inducción y deducción, abstracto-lógico, abstracción científica y modelado, métodos gráficos. Los autores comprobaron que la Educación Superior tiene un impacto positivo tangible en la dinámica del Desarrollo Sostenible de Ucrania y sus regiones. En primer lugar, esta influencia se lleva a cabo a través de las actividades educativas y de investigación de las universidades. El artículo destaca que fue la digitalización la que permitió a las universidades mantener sus posiciones competitivas en el mercado de servicios educativos en las condiciones de la COVID-19 y los desafíos de la guerra.

PALABRAS CLAVE: Educación Superior, universidades, Desarrollo Sostenible, digitalización, tecnologías de la información, COVID-19, desafíos de guerra.

Introduction

One of the priority areas of activity of the governments of a number of leading countries of the world is the provision of sustainable development, the components of which are economic, social and ecological ones. Higher education plays a special role in ensuring the sustainable development of countries and regions. It is the universities that train the new formation of specialists, who are able to think innovatively and generate green ideas, as well as have an ecologically friendly mindness. The entrance of such specialists to the labor market will allow to transform the national economy and its sectors in the direction of ensuring their sustainability. For society, the increase in the number of people (in particular, young people) with a new type of mindness, oriented towards the preservation of the environment and natural ecosystems, means the development of the ecological consciousness of the population as a whole. In addition, it is the higher education institutions and scientific institutes that

conduct research, the results of which are eco-products and environmentally safe technologies.

Today, the governments of countries are looking for new tools and ways to influence the sustainable development of the economy and society. Over the past few years, the attention of scientists, experts, analysts, and practitioners has been focused on the digital transformation of business, states, and civil society. Digital technologies are deeply integrated in the everyday life of the population, in the educational processes in universities, in the social spheres of society, in public administration and business. From a technical point of view, digitalization is the converting of information collected by various devices and gadgets (sensors, cameras, documents, etc.) into understandable to modern computers language.

Digitalization is one of the most powerful modern tools that can be effectively used to activate the processes of sustainable development of the country and regions. The latest digital technologies are capable not only of accumulating and operating huge data sets, but also of producing information. Big Data, Artificial Intelligence, blockchain, Internet of Things can be attributed to promising technologies applicable to achieving the global Sustainable Development Goals. For example, the introduction of new digital solutions and environmentally safe production methods will reduce the amount of CO₂ emissions into the atmosphere, reduce the negative impact on the environment and reduce the level of ecological risk. In other words, digitalization has a positive effect on the ecological component of sustainable development of the country/region. The same applies to the impact on the social component, particularly: digital technologies expand and facilitate the population's access to knowledge (digital educational platforms, distance learning courses, online platforms for the exchange of information resources, etc.) – this contributes to better social integration, reducing the level of inequality in society and increasing the literacy level of the population.

It is important to note that digitalization is 1) an objective process, the positive and negative effects of which on the processes of sustainable development of the country/region cannot be ignored; 2) a dynamic process that determines the need for permanent scientific research in the area of strengthening its positive impact on sustainability; 3) a complex process, the progress of which largely depends on the effectiveness of educational, research and innovation activities of universities. In 2020, higher education in most countries of the

world experienced a shock as a result of the pandemic of the COVID-19 coronavirus infection, which turned the work of universities into a turbulent and low-predictable regime. Higher education institutions, which switched to functioning on the basis of sustainability and digitalization of activities, adapted to new conditions, and not lose their competitiveness. In 2022, along with the challenges of the COVID-19 pandemic, Ukrainian universities faced war challenges, which led to the physical destruction of campuses, laboratories, infrastructure, as well as colossal outflow of intellectual resources.

The purpose of the article is to systematize scientific approaches to the study of the impact of digitalization on ensuring the sustainable development of the country and its regions in the conditions of COVID-19 and war challenges.

1. Literature Review

Studies of digitalization processes in the context of sustainable development of countries are becoming more and more relevant. Many scientists consider the issue of higher education for the sustainable development of regions and countries, taking into account digital transformations and challenges caused by COVID-19. The leading countries in terms of publication activity on the mentioned issues are: Germany, China, Malaysia, Poland, Romania, Spain, Ukraine, England, Italy, USA, etc. The scientific articles covered such fields of knowledge as Business Economics, Technology Science, Environmental Sciences, Educational Research, Computer sciences, Social Science etc.

In general, considering the research papers in the field of sustainable development and digitalization of higher education, it should be noted that the first paper was published in 2013. Since 2018, there has been a rapid increase in research on this topic, namely: 2018 - 14 articles, 2019 - 21 articles, 2020 - 18 articles, 2021 - 34 articles and 2022 - 38 articles (Fig. 1). It confirms the relevance and timeliness of research devoted to the correlation between the higher education and sustainable development taking into account modern digitalization trends.

Publications of scientists (Obushna N. et al., 2021; Shaposhnykov K. et al., 2022; Shaposhnykova I. et al. 2022; Shkoda T. et al., 2020; Zatonatska et al., 2019) are devoted to the development of higher education in the conditions of digitalization; analysis of the processes of regulation of the higher education system in the context of ensuring the autonomy of universities; ensuring the competitiveness of higher education in the context of

turnaround in higher education institutions. Scholars highlight the need for renewed efforts to focus on the Sustainable Development Goals, especially given the changing landscape of higher education during COVID-19. The authors believe that the results of the study will help accelerate the achievement of the Goals in higher education during and after the pandemic.

Within the article (Sá M.J. et al., 2021), scientists investigate digitalization processes in education for the formation of a sustainable digital society. The authors explore that digital education has experienced significant growth fueled by COVID-19, shaping a digital presence in all dimensions of life.

The authors (Breaz T.O. et al., 2022) prove that in the European area of higher education there has long been a desire for greater digitalization of teaching (e-learning). The results of the authors' research demonstrate the result of significant efforts in the direction of achieving the goals of a sustainable university.

The purpose of the scientists' article (Kichurchak M., 2021) is to investigate the main factors influencing the development of the educational services market in the EU countries from the standpoint of human capital accumulation, as well as to form scientific and practical approaches to improving its functioning in the economy of Ukraine.

According to scientists (Tishchenkova S. et al., 2021), modern educational discourse is characterized by multifaceted and contradictory points of view on the post-pandemic future of higher education. The authors are convinced that the consequences of COVID-19 turned out to be a destructive factor for the world economy, which requires a new educational paradigm, free from illusions and unjustified expectations.

Article (Pinter E. et al., 2021) reveals the impact and sustainability of the distance and online education systems introduced because of the COVID-19 pandemic. The authors investigated specific aspects of the transition from traditional classroom learning to online education at the university. The scientists analyzed the measures of educational changes, the impact of changes on the results of students, and presented the experience of students and teachers during this period, reflecting on the principles of sustainability.

The result of the study (Marchenko O. et al., 2019) is an analysis of approaches to the management of educational systems and their financing in two dimensions of civilization - Western and Eastern. The authors, using the example of specific countries (tentatively

assigned to groups that were previously considered polarized), substantiated the trends in the development of higher education in the modern globalized world.

Based on the generalization of legislative, explanatory, scientific and reference sources, the authors of article (Stankevych I., 2015) substantiated the essence of the concept of higher education quality. The authors explored that higher education is a complex multidimensional system of formal education aimed at satisfying the interests of individuals and other stakeholders at the highest levels of education relevant for lifelong learning.

According to the authors' study (Azmuk N., 2015), trends in the development of the labor market and educational services market under the influence of information and communication technologies were determined, and it was substantiated that digital technologies are a factor in the convergence of these markets. Scientists are convinced that digital technologies are the tool that affects the reduction of the gap between the labor and educational services markets by creating innovative professionals, solving the problem of youth unemployment, and integrating universities and business.

Scientists (Kondratenko N. et al., 2022; Burinskienė A. et al., 2022) devoted their publications to the research question of the role of digitalization in the sustainable development of the country and its regions. The scientists research the role of digitalization in the regions' development in the context of sustainable development, as well as digitalization as an indicator of sustainability in the European Union.

Within the framework of article (Batareina I. et al., 2022), the peculiarities of the state policy of Ukraine in the field of education are investigated. The authors (Santillán-Espinoza D. I. et al., 2022) investigated approaches to educational policy in the global arena after the COVID-19 pandemic. In a study (Rios-Campos C. et al., 2022), Argentine universities were analyzed, namely their problems in the context of COVID-19 and the role of digital technologies in their functioning. Research (Myronets O.M. et al., 2020) reveals the current problems and prospects of modern higher legal education in the context of COVID-19 pandemic challenges.

According to studies (Abramova A. et al., 2021; Bazhenkov I. et al., 2021; Djakona A. et al., 2021), information and communication technologies were analyzed as a strategy tool for ensuring the adaptation of higher education to the challenges of the digital economy, and the educational dominant in the development of the information economy. The mentioned studies

outlines the possibilities of implementing the successful Latvian experience of digital transformation of higher education in Ukraine.

The authors (Kosach I. et al., 2022; Kraus K. et al., 2021; Lavrov R. et al., 2021) analyze the regulatory policy in the context of effective state management; research the informatization and digitalization of higher education in the conditions of the innovative development of Ukrainian economy; determine the role of digital technologies in the competitiveness in the educational services market.

Despite the significant number of papers on the mentioned topic, the issue of the impact of digitalization on the development of higher education in the context of sustainable development of the country, taking into account the COVID-19 and war challenges, requires further study and analysis.

2. Methodology

The methodological basis of this study is a systematic approach, as well as general scientific and special research methods. Within the research the authors used such methods:

- methods of system analysis and generalization - for the systematization of scientific approaches to the study of the impact of digitalization on the development of higher education and ensuring the sustainable development of the country/regions;

- methods of grouping, induction and deduction - for identification the role of educational, socially educational, and research activities of universities in the implementation of the Sustainable Development Goals;

- abstract-logical method - for analyzing the impact of digitalization and information and communication technologies on the higher education development;

- methods of scientific abstraction and modeling - for identification the peculiarities of the recovery of educational, research and innovation activities of universities in the conditions of war and COVID-19 pandemic;

- graphic method - for visualization the impact of educational activities of universities on the sustainable development of the country in the conditions of COVID-19 and war challenges;

- special tools of the VOSviewer program - for visual representation of the previous research results through the construction of a map of keywords of the scientific articles.

3. Results

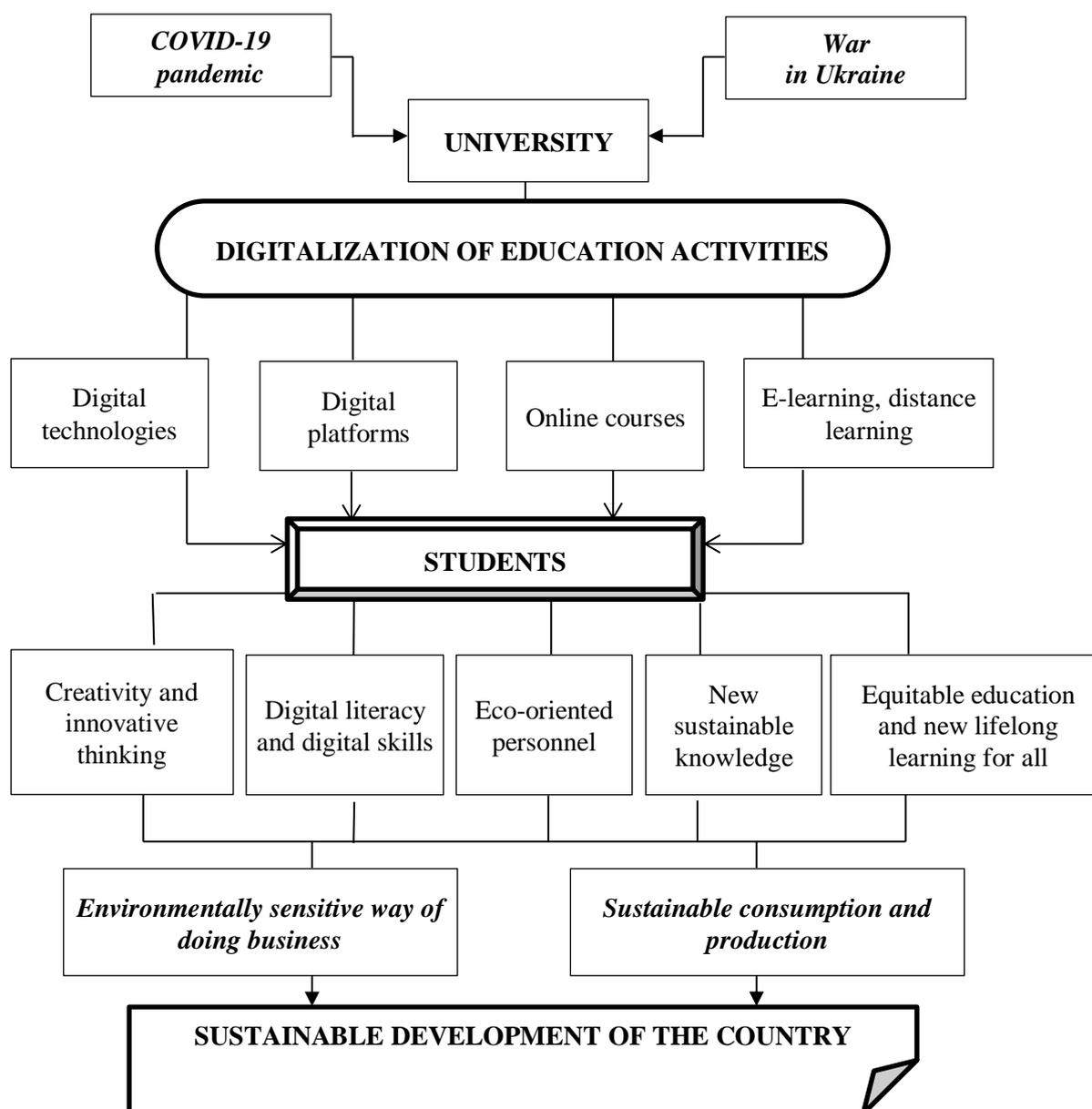
Modern higher education institutions have a significant impact on the pace of achieving the Sustainable Development Goals and ensuring the sustainable development of regions and the country as a whole. Moreover, within the framework of the implementation of educational, scientific and innovative activities, universities make a significant contribution to the dynamics of social, economic, and ecological components of the country's sustainable development. Even despite the challenges caused by the COVID-19 pandemic, higher education institutions continued to move towards achieving the Sustainable Development Goals. It became possible primarily because of the capabilities of innovative digital technologies. The implementation of such technologies into the educational process made it possible to improve educational content, expand the practice of distance learning, update communication channels with students and, most importantly, to continue providing educational services even in conditions of strict social distancing requirements. In addition, in the conditions of a full-scale Russian war in Ukraine, there were digital technologies that ensured the functioning of Ukrainian universities and created conditions for establishing new communication channels between teachers and students. Without access to the Internet and digital technologies in the conditions of a pandemic and war, students would remain disconnected from the usual society, without the opportunity to study, with a decreasing level of competitiveness in the labor market.

Therefore, we must state that the digitalization of universities, despite the limitations of COVID-19 and war, formed a reliable foundation for the further sustainable development of country and its regions, as well as the higher education system in particular (Fig. 2). The digital technologies has made possible the high-quality implementation of an educational process aimed at training highly qualified eco-oriented personnel for national enterprises who have the skills to use information and communication technologies, innovative thinking, creativity, and also have new sustainable knowledge. The efforts of higher education institutions also train a new generation of entrepreneurs inclined to implement innovative green technologies and conduct business in an environmentally sensitive way.

In connection with educational activities, universities implement socially education work, which contributes to the achievement of the goals of the social component of sustainable development (Fig. 3). It is worth emphasizing that measures within the

framework of socially education work felt the greatest adverse impact as a result of the COVID-19 pandemic and the full-scale war in Ukraine started by Russia.

Figure 2. Impact of educational activities of universities on country's sustainable development under COVID-19 pandemic and war challenges

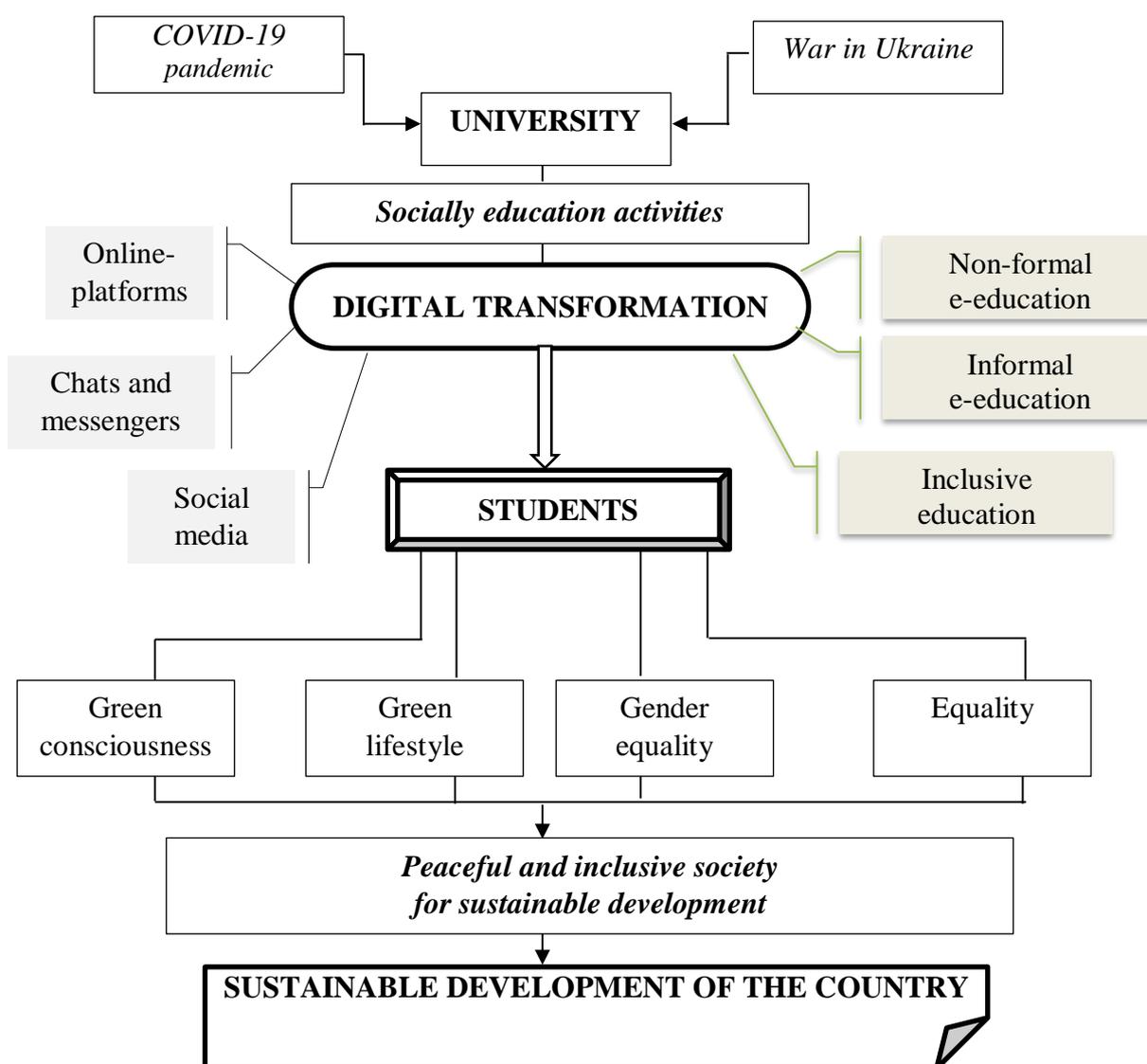


Source: compiled by the authors

This thesis is explained by the fact that such measures were previously effective only when they were conducted in the direct (face-to-face) contact with students.

Accordingly, in the conditions of war and pandemic restrictions, socially education activities of universities have undergone radical transformations, in particular in the direction of digitalization.

Figure 3. Impact of socially education activities of universities on country's sustainable development under COVID-19 and war challenges



Source: compiled by the authors

The importance of such activities for sustainable development is in the fact that they contribute to the development of green consciousness among young people, loyalty to representatives of different cultures, races, religions, as well as principles of gender equality. It is equally important that universities' socially education activities develop a green lifestyle in the young generation. In the long term, the above will mean the successful achievement of

the Sustainable Development Goals and the formation of a sustainable, environmentally friendly and inclusive society.

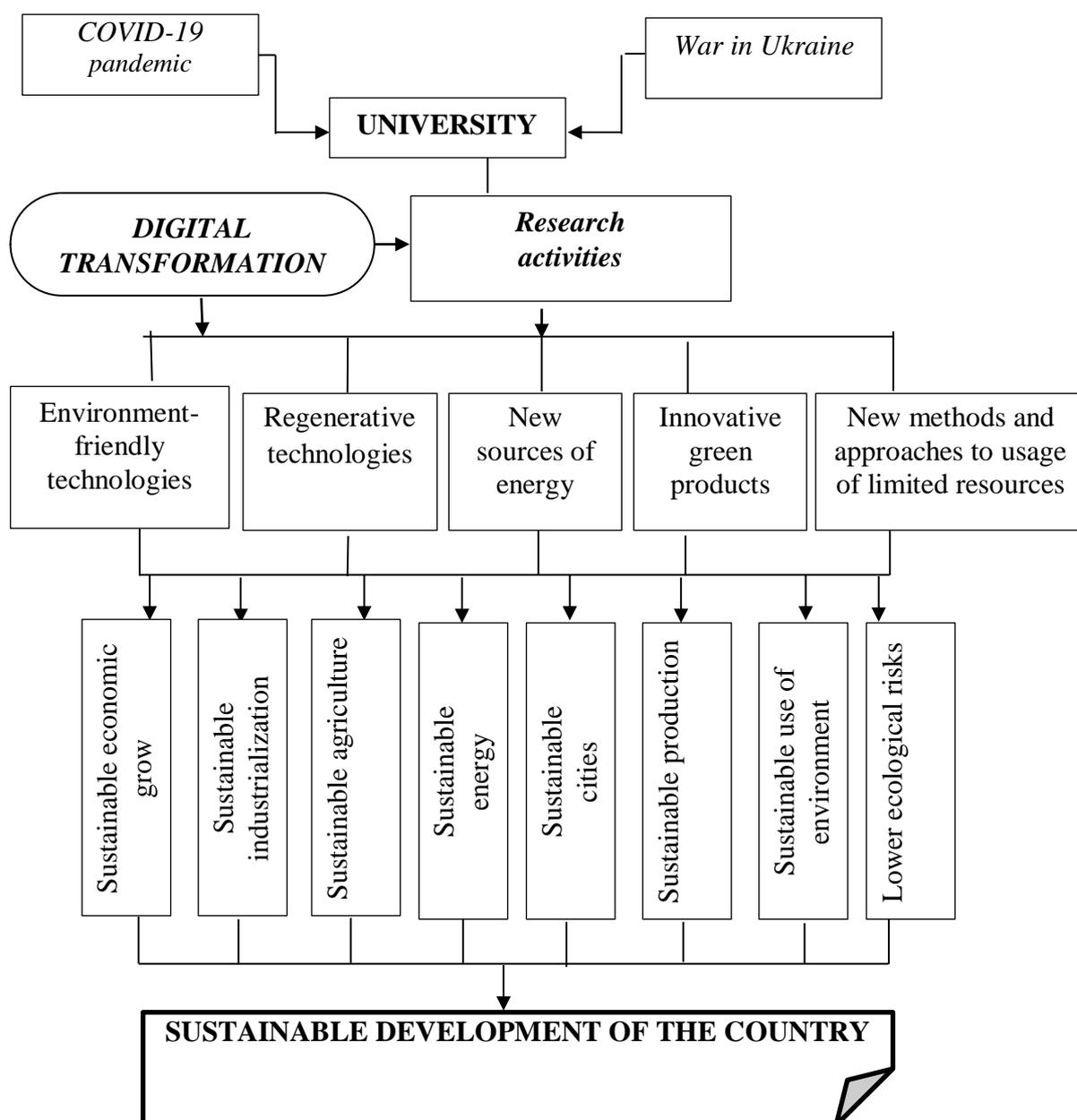
The research activity of higher education institutions has a strong influence on the dynamics of the country's sustainable development (Fig. 4). First of all, this influence is manifested through R&D results, which can be tentatively grouped as follows: technological innovations (environmentally friendly technologies, green technologies, regenerative technologies, etc., which reduce the adverse impact of industry on the environment), new sources of energy that can ensure environmentally safe production, new sustainable knowledge, innovative green products and services, new approaches and methods of using natural resources.

In general, the research activities of higher education institutions positively affect the achievement of the following Sustainable Development Goals: No. 6 "Ensure availability and sustainable management of water and sanitation for all", No. 7 "Ensure access to affordable, reliable, sustainable and modern energy for all", No. 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation", No. 11 "Make cities and human settlements inclusive, safe, resilient and sustainable", No. 13 "Take urgent action to combat climate change and its impacts", No. 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development", No. 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss", etc.

With the spread of the COVID-19 coronavirus infection, the conduct of some research became difficult, but it was possible to restore them using the digital tools, by the digitalization of scientific laboratories. The beginning of a full-scale Russian invasion of the sovereign territory of Ukraine had a catastrophic effect on the conduct of research, as universities and their research infrastructure (laboratories, scientific centers, innovation parks, etc.) suffered serious destruction, and scientists were forced to relocate in order to save their lives. In the conditions of simultaneous war and pandemic, Ukrainian universities have to make maximum efforts to implement digital tools to restore scientific, research and innovative activities. In the second half of 2022, most research projects were restarted, a significant share of emigrating scientists returned to Ukraine or at least started conducting research from abroad. This became possible mainly based on modern digital technologies and

the adaptation of the population and the national economy to work in pandemic and wartime. Artificial Intelligence, the Internet of Things, blockchain, cloud computing, deep machine learning and other digital technologies provide wide opportunities for operating huge masses of information, storage, processing, analysis, interpretation and transmission of data, their processing in real time - all this contributes to the successful implementation of research under COVID-19 and war challenges.

Figure 4. Impact of universities' research activities on country's sustainable development under COVID-19 and war challenges



Source: compiled by authors

4. Discussion

Supporting the opinion of the authors (Sun C. et al., 2022), it should be noted that digitalization really provides opportunities for sustainable development. Scientists are convinced that the development of digital skills of students is an important task of higher education. We share the opinion of academics on the importance of digital skills, and we also believe that high-quality online learning processes are of great importance to achieve "quality education" according to the 2030 Agenda for Sustainable Development.

We consider the research (Ahel O. et al., 2023) relevant, which proves that society is facing growing global challenges regarding sustainable development, and a key factor in preparing society for these challenges is education for sustainable development.

We share the opinion of the authors (Giesenbauer B., et al., 2020) regarding the fact that higher education institutions can act as key agents of change for sustainable development. The authors are convinced that the adoption of a multidimensional and networked organizational model as an integrative University 4.0 is suitable for increasing the capacity to cope with complexity, thus addressing the challenge of sustainable development.

In our view, the research (Ciolacu M. I. et al., 2021) is relevant, focusing on Industry 4.0 and the COVID-19 pandemic shaping the future of higher education, industry and organizations, acting as a catalyst for digitalization with huge challenges for mobile connectivity, collaboration and blended teaching and learning.

A noteworthy study by scientists (Lampoltshammer T.J. et al., 2021), in which the authors argue that sustainable development is becoming increasingly important in society, government and the economy, especially in today's rapidly changing environment, thanks to digitalization and digital transformation. We support that awareness, as well as systematic and critical thinking, are crucial to solving the big societal problems postulated within the framework of the Sustainable Development Goals.

We fully agree with the scientists (Fulop M.T. et al., 2022) that in recent years, universities around the world have undergone rapid and very impressive changes under the influence of technological progress and social trends of digitalization. The authors analyzed the peculiarities of the implementation of new technologies by teachers and the impact on their well-being and the stability of the university in the context of sustainable development.

The above proves the relevance, timeliness and necessity of further research in the field of higher education, the impact of digitalization processes on its development and implementation of the concept of sustainable development of the country.

Conclusion

Sustainable development is one of the defining trends of the government policies in the world's leading countries, which correlates with the parameters of their global leadership and competitiveness. In the 2020s, the achievement of the Sustainable Development Goals requires the use of new approaches based on the digitalization process, that is, the use of information and communication technologies by various stakeholders.

Higher education has a tangible positive impact on the dynamics of sustainable development of the country and its regions. First of all, this influence is carried out through the educational and research activities of universities. The COVID-19 pandemic and the Russian war in Ukraine disrupted the overall movement of universities to achieve the Sustainable Development Goals. Higher education institutions were able to provide an adequate response to new exogenous challenges by the implementation of modern digital technologies (machine learning, Big Data, cloud computing, Artificial Intelligent, blockchain, Internet of Things, etc.) in different spheres of their activity. Digitalization has allowed universities to maintain their competitive positions in the educational services market, to set up "teacher-student-administration" communications, as well as to organize quality research.

Prospects for further research is in the scientific search for ways of post-pandemic and post-war recovery of higher education institutions on the basis of ensuring their digitalization and sustainability.

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References

- Abramova, A., Filyppova, S., Vdovenko, N., Kotelevets, D., Lozychenko, O., Malin, O. (2021). Regulatory Policy Transformation in Conditions of Nonstationary Economy in Eastern European Countries: Practical Approach. *International Journal of Computer Science and Network Security*, 21(10), 39-48. <https://doi.org/10.22937/IJCSNS.2021.21.10.5>.
- Ahel, O., Schirmer, M. (2023). Education for sustainable development through research-based learning in an online environment. *International Journal of Sustainability in Higher Education*, 24(1), 118-140. <https://doi.org/10.1108/IJSHE-07-2021-0305>.
- Azmuk, N. (2015). The interaction of labour markets and higher education in the context of digital technology. *Economic Annals-XXI*, 7-8(1), 98-101. <http://ea21journal.world/index.php/ea-v152-24>.
- Batareina, I., & Korobchenko, A. (2022). State policy of Ukraine in the field of education. *Cuestiones Políticas*, 40(73), 919-936. <https://doi.org/10.46398/cuestpol.4073.53>
- Bazhenkov, I., Kholiavko, N., Popelo, O., Shaposhnykova, I., Sheremet, O. (2021). Information and communication technologies as a tool of strategy for ensuring the higher education adaptation to the digital economy challenge. *International Journal of Computer Science and Network Security*, 21(8), 187-195. <https://doi.org/10.22937/IJCSNS.2021.21.8.25>.
- Breaz, T.O., Fülöp, M.T., Cioca, L.I. (2022). The role of E-Learning generated by the COVID-19 epidemic in higher education. *International Journal of Computers Communications & Control*, 17(5), 4854. <https://doi.org/10.15837/ijccc.2022.5.4854>.
- Burinskienė, A., Seržantė, M. (2022). Digitalisation as the Indicator of the Evidence of Sustainability in the European Union. *Sustainability*, 14, 8371. <https://doi.org/10.3390/sul4148371>.
- Ciolacu, M. I., Marcu, A.-E., Vladescu, M., Stoichescu, D., Svasta, P. (2021). Education 4.0 Lab for Digital Innovation Units – Collaborative Learning in Time of COVID-19 Pandemic. *IEEE 27th International Symposium for Design and Technology in Electronic Packaging (SIITME)*, 268-271. <https://doi.org/10.1109/SIITME53254.2021.9663606>.
- Crawford, J., Cifuentes-Faura, J. (2022). Sustainability in Higher Education during the COVID-19 Pandemic: A Systematic Review. *Sustainability*, 14(3), 1879. <https://doi.org/10.3390/sul4031879>.
- Djakona, A., Kholiavko, N., Dubyna, M., Zhavoronok, A., Fedyshyn, M. (2021). Educational dominant of the information economy development: a case of Latvia for Ukraine. *Economic Annals-XXI*, 192(7-8(2)), 108-124. <https://doi.org/10.21003/ea.V192-09>.
- Fulop, M.T., Breaz, T.O., He, X.F., Ionescu, C.A., Cordos, G.S., Stanescu, S.G. (2022). The role of universities' sustainability, teachers' wellbeing, and attitudes toward e-learning during COVID-19. *Frontiers in Public Health*, 10, 981593. <https://doi.org/10.3389/fpubh.2022.981593>.
- Giesenbauer, B., Müller-Christ, G. (2020). University 4.0: Promoting the Transformation of Higher Education Institutions toward Sustainable Development. *Sustainability*, 12, 3371. <https://doi.org/10.3390/sul2083371>.

Kichurchak, M. (2021). Development of the higher education market in the EU countries as a factor of human capital accumulation: experience for Ukraine. *Economic Annals-XXI*, 192(7-8(2)), 52-62. <https://doi.org/10.21003/ea.V192-05>.

Kondratenko, N., Papp, V., Romaniuk, M., Ivanova, O., & Petrashko, L. (2022). The role of digitalization in the development of regions and the use of their potential in terms of sustainable development. *Amazonia Investiga*, 11(51), 103-112. <https://doi.org/10.34069/AI/2022.51.03.10>.

Kosach, I., Shaposhnykov, K., Chub, A., Yakushko, I., Kotelevets, D., & Lozychenko, O. (2022). Regulatory policy in the context of effective public governance: evidence of Eastern European Countries. *Cuestiones Políticas*, 40(72), 456-473. <https://doi.org/10.46398/cuestpol.4072.26>.

Kraus, K., Kraus, N., Nikiforov, P., Pochenchuk, G., Babukh, I. (2021). Information and Digital Development of Higher Education in the Conditions of Innovatization Economy of Ukraine. *WSEAS Transactions on Environment and Development*, 1, 659-671. <https://doi.org/10.37394/232015.2021.17.64>.

Lampoltshammer, T.J., Albrecht, V., Raith, C. (2021). Teaching Digital Sustainability in Higher Education from a Transdisciplinary Perspective. *Sustainability*, 13, 12039. <https://doi.org/10.3390/sul32112039>.

Lavrov, R., Djakona, A., Anisimova, L., Koval, O., Polkhovska, M., Shumaieva, S. (2021). Digital Technologies and Rankings as Tools of the Competitiveness in the Educational Services Market. *International Journal of Computer Science and Network Security*, 21(11), 49-58. <https://doi.org/10.22937/IJCSNS.2021.21.11.7>.

Marchenko, O., & Sydorenko, N. (2019). Higher education in the globalized world: modern trends in management, funding and quality assurance. *Economic Annals-XXI*, 179(9-10), 53-65. <https://doi.org/10.21003/ea.V179-05>.

Myronets, O. M., Danyiuk, I. V., Dembytska, N. M., Frantsuz-Yakovets, T. A., & Dei, M. O. (2020). Current Issues and Prospects of Modern Higher Legal Education in Conditions of the Fight against COVID-19. *Cuestiones Políticas*, 37(65), 438-456. Retrieved from <https://produccioncientificaluz.org/index.php/cuestiones/article/view/33327>.

Obushna, N., Djakona, A., Iegorov, B., Tkachuk, I., Ostrovska, N., Popova, L. (2021). Development of Competitive Advantages of the National Higher Education System in the Digitalization Conditions. *International Journal of Computer Science and Network Security*, 21(10), 13-20. <https://doi.org/10.22937/IJCSNS.2021.21.10.2>.

Pinter, E., Fenyvesi, E., & Pinter, T. (2021). Sustainability aspects of distance learning in higher education during the COVID-19 epidemic in a Hungarian University. *Economic Annals-XXI*, 190(5-6(2)), 58-74. doi: <https://doi.org/10.21003/ea.V190-06>.

Rios-Campos, C., Gutiérrez Valverde, K., Bustamante Vilchez de Tay, S., Reto Gómez, J., Agreda Cerna, H. W., & Lachos Dávila, A. (2022). Argentine Universities: Problems, COVID-19, ICT & Efforts. *Cuestiones Políticas*, 40(74), 880-894. <https://doi.org/10.46398/cuestpol.4074.49>.

Sá, M.J., Santos, A.I., Serpa, S., Miguel Ferreira, C. (2021). Digitainability-Digital Competences Post-COVID-19 for a Sustainable Society. *Sustainability*, 13, 9564. <https://doi.org/10.3390/su13179564>.

Santillán-Espinoza, D. I., Cevallos-Ramos, C. del R., Inca-Falconí, A. F., & Andino-Peñafiel, Érica E. (2022). Approaches to education policies on the global scene of the post-COVID 19 pandemic. *Cuestiones Políticas*, 40(73), 854-867. <https://doi.org/10.46398/cuestpol.4073.49>.

Shaposhnykov, K., Filyppova, S., Lagodiienko, V., Goletc, V., Krylov, D., & Svinarova, H. (2022). State Regulation of the Higher Education System in the Context of Ensuring the Universities' Autonomy. *Cuestiones Políticas*, 40(75), 550-568. <https://doi.org/10.46398/cuestpol.4075.33>.

Shaposhnykova, I., Shaposhnykov, K., Tanashchuk, K., Filippov, V., Hrytsku, V., Demkiv, Yu. (2022). Competitiveness of the Higher Education in the Context of Ensuring Sustainable Development of the State. *Management Theory and Studies for Rural Business and Infrastructure Development*, 44(3), 280-287. <https://doi.org/10.15544/mts.2022.29>.

Shkoda, T., Tepluk, M., Sahaidak, M. (2020). Intellectual Potential Management in Forming Strategic Partnership of Science-Business-Education. *Baltic Journal of Economic Studies*, 6(5), 221-232. <https://doi.org/10.30525/2256-0742/2020-6-5-221-232>.

Stankevych, I. (2015). Essence of higher education quality concept in modern development conditions. *Economic Annals-XXI*, 9-10, 60-63. <http://ea21journal.world/index.php/ea-v154-14>.

Sun, C., Liu, J., Razmerita, L., Xu, Y., Qi, J. (2022). Higher Education to Support Sustainable Development: The Influence of Information Literacy and Online Learning Process on Chinese Postgraduates' Innovation Performance. *Sustainability*, 14, 7789. <https://doi.org/10.3390/su14137789>.

Tishchenkova, S., Martseniuk, L., Cherniak, N., & Hruzdiev, O. (2021). Higher education in the post-pandemic world: prospects for revival and risks for oblivion. *Economic Annals-XXI*, 191(7-8(1)), 16-29. <https://doi.org/10.21003/ea.V191-02>.

Toader, T., Safta, M., Titirișcă, C., Firtescu, B. (2021). Effects of Digitalisation on Higher Education in a Sustainable Development Framework-Online Learning Challenges during the COVID-19 Pandemic. *Sustainability*, 13, 6444. <https://doi.org/10.3390/su13116444>.

Zatonatska, T.H., Rozhko, O.D., Lyutyty, I.O., Tkachenko, N.V., Anisimova, O.Y. (2019). Global Practices of Higher Education Financing: Approaches and Models. *Khazar Journal of Humanities and Social Sciences*, 22(4), 95-112. <https://doi.org/10.5782/2223-2621.2019.22.4.95>.