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DIGITAL TRANSFORMATION OF HIGHER EDUCATIONAL ESTABLISHMENTS OF UKRAINE*

The dynamics of digital transformation of the world economy is described. Current status of innovative activity and factors that reduce digital transformation in Ukraine are considered. The necessity of digital transformation of of Higher Education Establishments (HEEs) for strengthening of innovative development of country is given. Key trends in which digital transformation of higher education of Ukraine must be offered.

Keywords: digital economy, digital transformation, higher education, higher educational establishments, educational process.

Background. The modern world processes of globalization generate the requirement in force digitalization of all spheres of human life and activities. It actively takes place all over the world, and countries, that accumulate enough resources for scientific researches and introduction of innovative developments that stipulates rapid growth of technologies become its leaders. Countries with less financial and research possibilities will search the ways of digitalization by differential principle, realising innovation in separate key trends. It, in its turn, generates disproportions of the development of industries and backlog from the basic players of the digital world. Ukraine is one of such countries, that, though has the considerable intellectual and labour potential, but due to financial instability force to develop the innovative programs and projects of left-over principle. The process of digitalization embraces the wide circle of stakeholders, and its leaders must be research and educational establishments, including Ukrainian

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universities. They must become the key suppliers of new technologies not only for Ukraine but also for the whole world, and realization of this scenario needs effective digital transformation of HEEs and introduction of world trends in their activity.

Now digitalisation of higher education takes place nonsystem, and it is not found only one effective scenario, although its necessity is growing day after day, as well as losses of national economy due to unimproved possibilities. Introduction of world practice and following of trends must take place with the account of position of the country, its cultural and geopolitical features. Creation of methodology and strategy of digital transformation of Ukrainian universities is the challenge and it needs further research and practical study.

Analysis of recent research and publications. Digitalisation is the basic theme of discussions on such global debatable platforms, as: World Economic Forum [1], UNCTAD [2], events and meeting of Organization of Economic Collaboration and Development [3], World Bank [4] and other international organizations during many years. The process of digital transformation of economy is lighted up in the publications of international analytical companies, research institutes and scientists. In Ukraine the problem of passing to the digital epoch is investigated by such scientists, as: S. Koliadenko [5], S. Veretiuk [6], A. Filipenko [7], O. Dzhusov [8], S. Apalkov [8], K. Kraus [9], and other. At the same time, there are problems that remain unsolved, and offered approaches need clarification through permanent development of technologies and change of vectors of the world trends.

The **aim** of the article is the analysis of key tendencies of digital transformation of of higher education establishments and forming of recommendations in relation to efficiency of its realization in Ukraine.

Materials and methods. For the achievement of certain goal the row of scientific and special methods of research: dialectical, scientific abstraction (for generalization and formulation of research conclusions), comparison (comparison of statistical and other data), analysis (exposure the tendencies of global digital transformation process, exposure of progress of higher education establishments of Ukraine trends), graphic (evident presentation of statistical data) is applied. The infobase of research by the analytical and statistical publications of international organizations, data of the State Statistics Service of Ukraine, scientific developments and research and practice publications is presented.

Results. Digitalisation is the integration of digital technologies in all life spheres for the increasing availability, lightness of use and speed of transferrableness of digital data [10]. To digital technologies which are actively got to everyday life, it is possible to take: robotics, internet of things, artificial intelligence, Data science, cloudy services, biometrics and systems of authentication, blockchain, cyberdefense and others like that.

Digitalisation is one of key factors of the economy growth, increasing of productivity and value added of goods manufactured [11; 12]. The results of analysis of the part of digital economy in the world GDP (*Figure*), testify that it grows annually.

Part of digital economy in the structure of world GDP, %

Source: is designed by the author [12].

Thus, the part of digital economy in such highly developed countries, as the USA, is considerably higher from the world's economy (33 % or USD 5.9 trillion) [12]. On the prognoses of experts [13] until 2030 it will grow to 50–60 %. On results of undertaken studies that the row of factors that reduce the process of realization of digital economy model in Ukraine is educed. Among them it is possible to distinguish the key factors: absence of effective national innovative infrastructure [5]; weak mechanism of state-private partnership [6]; relatively low level of providing the research institutes [8].

Analysing the dynamics of charges on innovations and sources of their financing (*Table*), it is possible to see that after reduction in 2017 the volume of charges on innovation grew during the last years, although to attain the highest level in 2016 is not succeeded until now. Although the positive tendency is discemibled for the last few years.

Table

Volumes of charges on innovative activity in Ukraine on financial sourcings, UAH million

Financial sourcing	2015	2016	2017	2018	2019	2020
The state budget	55	179	227	639	556	279
Personal funds of the enterprises	13427	22036	7704	10742	12475	12298
Investors-non-residents	59	23	108	107	43	125
Others	273	991	1078	692	1147	1704

Source: is designed by the author [14].

In the structure of charges on innovation part of the state budget hesitates from 0.4 to 5.2 %. It demonstrates the low level of the state's interest in support of innovative development and weakness of state-private partnership.

Results of analysis of the structure of scientific research-and-development enterprises [14] testifies that 84.3 % scientific and research work come true without the involvement of external contractors. Business objectively expounds mistrust to the research institutes in the direction of innovative activity. Often enough it causes the use of additional funds, unprofitableness of investments, that, in its turn, restrains the development of scientific sector in the country.

Leading players in innovative activity must be scientific and educational establishments. In case of willingness to answer the challengers of digital society, to investigate effectively, to develop and inculcate the innovations of business will be advantageously more actively to involve them to partnership and general commercial projects.

The key element of this process must be HEEs, where the conception of innovative parks and clusters can effectively work due to the synergy of young and progressive ideas, scientific examination and modern logistical support.

According to three basic universally which are recognized by world rating [15–17], what formed on the basis of multivariable analysis and contain innovative performance indicators, in 2020 only one Ukrainian university got these three ranks.

For strengthening the positions of Ukrainian HEEs in the world rating it is necessary to modernize gapproaches to educational activity and management. To approximate their valuable involvment in a global educational environment, digital transformation is a basic task.

In the background of the world pandemic of COVID-19 it is considered that the out-of-date system of education is not ready to the challengers of the digital world and does not have enough mechanisms for rapid transformation. Educational process in universities must test considerable changes in the nearest years. On the prognoses of experts, the traditional form of studies will totally change during 10–15 [9]. The intermediate stage of it is forming of new conceptual approach to higher education.

University 4.0 is ecosystem that consists of physical and digital environment and is a base for innovative activity and commercialization of projects. Within the framework of this conception HEEs must combine such constituents:

- educational center that provides professional and personal development of every participant of educational process;
- scientifically-research part that accumulates fundamental and experimental researches;
- business-accelerator, business-incubator, research cluster;
- space of exchanging opinions and ideas.

Therefore, a new model must be formed according to these three base directions.

The digital co-operating is with the participants of educational process. It envisages the creation of online-platforms and services, providing remote access to the equipment. Greater expanding of exchange information instruments in real-time is becoming more popular. For xample, chatbots are

actively used in communication with students from the first days of studies. It saves time and money, unifying the channels of passed information, allows to get all necessary information about studies, residence in dormitories, leisure by means of smartphone or other device.

Processes optimization. Deep digitalisation gives an opportunity to optimize the charges of time and money. Introduction of artificial intelligence of educational process forming and methodical providing will give an opportunity to work quickly over the large amount of data, find out conformities to law and adapt educational plans and programs to the students' necessities. It will allow to create cross-disciplinary courses that will answer the queries of the young generation, attract new prospective studnts and increase the competitiveness of HEEs at the educational market. Except it, artificial intelligence in combination with the systems of faces recognition and digital personification can form new system of safety on the territory of the universities. Equipage of the territory of educational establishment with touch-controls and software will assist the quality improvement of control and exposure of violations, strengthening the feeling of safety for all participants of educational process. Using the Internet of things is another achievement of digitalization epoch, it is possible to optimize administrative charges. Smart sensors, sensors of the heating systems and illuminations programed after plenty of parameters will allow to determine the rationed volume of necessary resources in real-time, depending on apartments' concentration, character of studies, turned on equipment, weather terms and others like that. It will improve HEEs'infrastructure, energy efficiency and ecofriendlyness.

Change of model of studies. Digital transformation of educational process stipulates the necessity of combination of traditional studies with the elements of dual education, use of online-instruments, cloudy services, and complemented reality. Introduction of cross-disciplinary and practically oriented on-line courses, bootcamp, certification programs will give an opportunity to extend the circle of possibilities for students. This model can not exist only due to the work of HEEs. There is the necessity of collaboration with the representatives of business, other research organizations and creation of modern innovative infrastructure on the base of establishment. Effective steps in realization of this direction are forming of innovative and research parks, business-clusters, incubators and accelerators. With the reduction of distance between education and business the additional channels for investments are opened, private financing of scientific and research work, strengthening of innovative development of the country.

Educational sphere needs digital transformation already now. It, in its turn, will start the mechanism of active digitalization in other industries, giving effective modern approaches and decisions for the different spheres of a person's activity. Due to forming of "digital view of life" at the young generation and country can provide the human and intellectual potential for the unimpeded and rapid introduction to the global digital world.

Conclusion. The necessity of digital economy development on all links is the challenge of present time. Now Ukraine is not ready to it and needs reformation of different branches of industries, strengthening of innovative activity and rethinking of approaches to forming and realization of innovative politics. Educational sphere is a key instrument of realization of this global aim. Digital transformation of Ukrainian HEEs must be based on providing the full-scale digital co-operating with all participants of educational process, optimization of activity due to the use of modern methods and technologies and valuable rethinking of model of studies taking into account the world tendencies. In the case of purposeful work there is the possibility to find digital trends and be ready to the new "digital world" not during 10-15 years, as experts forecast, and considerably quicker.

REFERENCES

1. Digital Transformation: Powering the Great Reset. The World Digital Transformation: Powering the Great Reset. The World Economic Forum. *www3.weforum.org.* Retrieved from http://www3.weforum.org/docs/WEF_Digital_Transformation_Powering_the_Great_Reset_2020.pdf [in English].
2. Digital Economy Report 2019 – UNCTAD. *unctad.org*. Retrieved from https://unctad.org/system/files/official-document/der2019_en.pdf [in English].
3. OECD (2021), OECD Economic Outlook. Vol. 2021. Issue 1. OECD Publishing, Paris. DOI: 10.1787/edfbca02-en [in English].
4. World Development Report (2020). The World Bank Group. Retrieved from https://www.worldbank.org/en/publication/wdr2020 [in English].
5. Koljadenko, S. V. (2020). Cyfrova ekonomika: suchasni svitovi tendencii' rozvytku [Digital economy: modern world trends of development]. *Tezy dop. Mizhnarod. nauk.-prakt. konf. "Cyfrova ekonomika jak faktor innovacijnogo rozvytku suspil'stva", 11 lystop., Ternopil' – Abstracts of International Scientific-Practical Conference "Digital Economy as Factor of Innovative Development of Society"*, *November 11,* Ternopil, 23-25. Retrieved from http://socrates.vsau.edu.ua/repository/getfile.php/27365.pdf [in Ukrainian].
6. Veretjuk, S. (2016). Vyznachennja priorytetnyh naprjamkiv rozvytku cyfrovoi' ekonomiky v Ukrai'ni [Determination of priority directions of digital economy development in Ukraine]. *Naukovi zapysky Ukrai'ns'kogo naukovo-doslidnogo instytutu zv'jazku – Scientific Proceeding of the State University of Telecommunications, 2*, 51-58. Retrieved from http://nbuv.gov.ua/UJRN/Nzundiz_2016_2_9 [in Ukrainian].
7. Filipenko, A. (2020). Cyfrova ekonomika: teoretyko-prykladnyj aspekt [Digital economy: theoretical and applied aspect]. *Ekonomichna teorija – Economic theory*, *2*, 54-66 [in Ukrainian].
8. Dzhusov, O. A., & Apal'kov, S. S. Cyfrova ekonomika: strukturni zrushennja na mizhnarodnomu rynku kapitalu [Digital economy: structural changes at the international capital market]. *journals.iir.kiev.ua*. Retrieved from http://journals.iir.kiev.ua/index.php/ec_n/article/view/3058/2746 [in Ukrainian].
9. Kraus, N. M. (2018). Cyfrova ekonomika: trendy ta perspektyvy avangardnogo harakteru rozvytku [Digital economy: trends and prospects of vanguard character of development]. *Efektyvna ekonomika – Economic theory*, *1*. Retrieved from http://nbuv.gov.ua/UJRN/efek_2018_1_8 [in Ukrainian].

10. Encyclopedia of Information Science and Technology, Fourth Edition (2017). Vol. 10. IGI Global, June, 8104 [in English].
11. Digital Spillover. Measuring the true impact of the digital economy. *www.huawei.com*. Retrieved from https://www.huawei.com/minisite/gci/en/digitalspillover/files/gci_digital_spillover.pdf [in English].
12. Digital Disruption: The Growth Multiplier – Oxford Economics. *www.anupartha.com*. Retrieved from https://www.anupartha.com/wp-content/uploads/2016/01/Accenture-Strategy-Digital-Disruption-Growth-Multiplier.pdf [in English].
13. Analiz svitovyh trendiv do 2030 p. Ukrai'ns'kyj instytut majbutn'ogo. [Analysis of world trends to 2030 Ukrainian institute of future]. Retrieved from https://strategy.uifuture.org/anal%D1%96z-sv%D1%96tovix-trend%D1%96v do-2030e.html [in Ukrainian].
14. Derzhavna sluzhba statystyky Ukrai'ny [State Statistics Service of Ukraine]. *www.ukrstat.gov.ua.* Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2020/zb/09/zb_nauka_2019.pdf [in Ukrainian].
15. The Times Higher Education World University Rankings (2020). Retrieved from https://www.timeshighereducation.com/worlduniversityrankings/2020/worldranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats [in English].
16. QS World University Rankings. *www.topuniversities.com*. Retrieved from https://www.topuniversities.com/university-rankings/world-university-rankings/2012 [in English].
17. 2021 Best Global Universities Rankings. *www.usnews.com*. Retrieved from https://www.usnews.com/education/best-global-universities/rankings [in English].

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Калініченко О. Цифрова трансформація закладів вищої освіти України.

Постановка проблеми. *Сучасні світові глобалізаційні процеси потребують форсованої цифровізації усіх сфер життєдіяльності людини. Українські університети повинні стати ключовими постачальниками нових технологій не лише для України, а й для світу. Для реалізації цього сценарію необхідно здійснити ефективну цифрову трансформацію самих закладів вищої освіти та впровадити у їх діяльність загальносвітові тренди.*

Аналіз останніх досліджень і публікацій. *Цифровізація є основною темою дискусій вже протягом багатьох років на глобальних дискусійних платформах, у публікаціях міжнародних аналітичних компаній, дослідницьких інституцій та вчених. Водночас, існують проблеми, які залишаються невирішеними, а вже запропоновані підходи потребують уточнення через постійний розвиток технологій та зміну векторів світових трендів.*

Метою *статті є аналіз ключових тенденцій цифрової трансформації закладів вищої освіти та надання пропозицій щодо ефективності її проведення.*

Матеріали та методи. *Для досягнення визначеної мети застосовано низку загальнонаукових та спеціальних методів дослідження: діалектичний, наукової абстракції, аналізу, графічний. Інформаційну базу дослідження становлять аналітичні та статистичні публікації міжнародних організацій, дані Державної служби статистики України, наукові розробки та науково-практичні публікації.*

Результати дослідження. *Провідними гравцями у процесі цифрової трансформації економіки України мають виступати заклади вищої освіти. На тлі світової пандемії COVID-19 виявилось, що застаріла система освіти не готова до викликів цифрового світу та не має достатньо механізмів для швидкої трансформації. Освітній процес в університетах у найближчі роки повинен зазнати вагомих змін.*

Університет 4.0 – екосистема, що складається з фізичного та цифрового середовища і є базою для інноваційної діяльності та комерціалізації розробок. Ця нова модель повинна формуватися за трьома базовими напрямами: цифрова взаємодія з учасниками освітнього процесу; оптимізація процесів; зміна моделі навчання.

Загалом освітня сфера потребує цифрової трансформації вже зараз. Це, в свою чергу, запустить механізм активної цифровізації в інших галузях, надаючи дієві сучасні підходи та рішення для різних сфер діяльності людини.

Висновки. *Необхідність розбудови цифрової економіки на всіх ланках є викликом сьогодення. Цифрова трансформація українських закладів вищої освіти повинна базуватись на забезпеченні повномасштабної цифрової взаємодії з усіма учасниками освітнього процесу, оптимізації діяльності завдяки використанню сучасних методів та технологій, повноцінному переосмисленні моделі навчання з урахуванням світових тенденцій.*

Ключові слова: цифрова економіка, цифрова трансформація, вища освіта, заклади вищої освіти, освітній процес.