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## **DIGITALIZATION AS A DEVELOPMENT FACTOR OF INNOVATIVE-ACTIVE UNIVERSITY**

**Abstract.** A characteristic feature of the XXI century is the emergence of digital society phenomenon, which significantly changes all processes in the high education system. The implementation of innovations into university's activity, the creation of its digital culture and digital environment are the key features of an innovative-active university (IAU) and factors of its development. The aim of the article is to develop a strategy and innovative-indicative measures for digitalization of IAU activities based on the study of society digital maturity. Index, rating, comparative analyzes and decomposition method were used. It's determined that Ukraine has a significant gap in comparison with the developed countries in terms of digital maturity of society and occupies lower than average positions in international informatization indices. To assess the state of digitalization processes in Ukraine, government measures for the development of digital culture were analyzed, the limitations and triggers of society digitalization are identified. It's proved the digitalization of education has a dominant impact on the overall level of digital competitiveness of Ukraine. That is, the introduction of information and communication technologies in the IAU activity is an urgent task of its management. The digitalization strategy of S.Kuznets KhNUE in accordance with its educational, scientific and technical, marketing and international activities was created. The proposed strategy is based on a systemic understanding of digitalization processes, which makes it possible to increase the degree of their controllability. A set of innovative and indicative measures was developed, which constitute the tactical contour of IAU digital process management.

**Keywords:** university's activity, digital culture, digitalization strategy, innovative and indicative measures.

**JEL Classification:** I21; I25; I28

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## **ДІДЖИТАЛІЗАЦІЯ ЯК ФАКТОР РОЗВИТКУ ІННОВАЦІЙНО-АКТИВНОГО УНІВЕРСИТЕТУ**

**Анотація.** Характерною рисою ХХІ століття є виникнення феномену діджиталізації суспільства, що суттєво змінює всі процеси в системі вищої освіти. Впровадження новацій в діяльність університету, створення його діджитал культури та діджитал середовища є ключовими ознаками інноваційно-активного університету (ІАУ) та факторами його розвитку. Метою статті є розробка стратегії та інноваційно-індикативних заходів діджиталізації діяльності ІАУ на підставі дослідження діджитал зрілості суспільства. Використано індексний, рейтинговий, компаративний аналізи та метод декомпозиції. Визначено, що Україна має суттєвий відрив від розвинених країн світу за рівнем діджитал зрілості суспільства та займає нижчі за середні позиції за міжнародними індексами інформатизації. Для оцінювання стану процесів діджиталізації в Україні проаналізовано державні заходи щодо розвитку цифрової культури, визначено обмеження та тригери діджиталізації суспільства. Доведено, що діджиталізація освіти здійснює домінуючий вплив на загальний рівень цифрової конкурентоспроможності України. Тобто, впровадження інформаційно-комунікаційних технологій в практику діяльності ІАУ є актуальним завданням його менеджменту. Сформовано стратегію діджиталізації ХНЕУ ім. С. Кузнеця до його освітньої, науково-технічної, маркетингової та міжнародної діяльності. Запропонована стратегія базується на

системному уявленні щодо процесів діджиталізації, що дозволяє підвищити ступінь їх керованості. Розроблено комплекс інноваційно-індикативних заходів, які складають тактичний контур управління діджитал процесами ІАУ.

**Ключові слова:** діяльність університету, діджитал культура, стратегія діджиталізації, інноваційно-індикативні заходи.

**Introduction.** Contemporary conditions for the development of civilization in the XXI century are characterized by the emergence and intensification of digitalization, i.e. the global digital transformation of society. This process takes place in all spheres of life and involves the transition from offline to online mode. Among the areas of digitalization in modern conditions are especially developing, such as digitalization of the economy and business, education and professions, financial market, labor market and trade, manufacturing, medical, insurance and banking, etc.

As a phenomenon, digitalization has evolved from the automation process, where workflows are algorithmized and transferred to digital format. But the digital transformation has the characteristics that put it on a higher stage of scientific and technological progress, namely: rethinking of the external communication model with partners and customers, which focuses on client`s needs; the emergence of a sharing (from the English "to share") business model of the company, the transition from project management to Agile and Learn-technologies; changing the working model with information from the concept of Big Data to the Deep Machine Learning concept, based on the use of artificial intelligence and decision-making in terms of incomplete and asymmetric information; internal communications transformation and relations - outsourcing and freelancing.

The formation and development process of the digital society began in the late twentieth century, but the situation in 2019-2020, associated with the pandemic "Covid 2019", accelerated this trend. According to forecasts Evergreen (2020), global investment in Digital technologies and services by 2023 should amount to \$ 2.3 trillion. But the coronavirus pandemic has been a trigger to intensify the efforts of business structures to implement digital technologies. More than 4,000 business leaders around the world were surveyed according to InfoCity (2020) data, eight out of ten organizations have accelerated their digital transformation programs in 2020.

Information technology, digital literacy, digitalization business are the main innovative areas of development of society and significantly change the educational process in general. The need for widespread use of modern information technologies and services in various types of university activities, work with Big Data, the creation of a systematic digital environment for university management, the formation of a corporate information and educational system, and the protection of corporate information are becoming the main tasks of university management. In addition, the adaptation of national higher education institutions to the changing needs of key stakeholders, namely consumers of educational services, potential employers and government organizations, requires an innovative search or development of appropriate tools, approaches, strategies to maintain high-quality education in the new environment. All these are the main features of an innovative-active university

(IAU), by which Yevseiev et al. (2020) imply an entrepreneurial organization that has resource readiness to contribute to accelerated socio-economic development through the intensive transfer of knowledge and technologies generated at the university based on partnership with stakeholders.

Thus, digitalization is becoming a driving force for development and a factor in the competitiveness of an innovative-active university in the national and international educational market.

**Literature review.** Nowadays, many scientists in their research focus on the problems and prospects of society and the national economy, taking into account the digitalization potential. Thus, Kolyadenko (2016) analyzed the history of the concept of "digital economy", noted that the founders of this category identified three main components of such an economy: supporting infrastructure, e-business and e-commerce. Based on this, modern research conducted using the digital economy has the ability to quickly adapt to the real economy and enable real sectors of the economy to quickly find ways out of different types of crises. Koch (2019) propose to consider the concept of digital economy on three levels: the sector where information and communication technologies (ICT) are developed, the sector of activities that can not function without the ICT use, the sector of other activities that require digitization. Researchers Dyba and Hernego (2018), Kononova (2015), Kraus and Goloborodko (2018), Liashenko and Vyshnevskiy (2018), Ochs and Riemann (2018) provide trends in the digital economy in the leading countries of the world and argue that modern processes of digital transformation of society are associated with business development models that use digital platforms. In addition, they note that these platforms are being updated and emphasize the blockchain technologies use in education.

Problems of assessing the level of development of the digital economy and society in the country are covered in the works of Golovenchyk (2018), Bakumenko and Minina (2020), Varlamova and Demyanova (2020), as well as in studies of international organizations that use various indices. Thus, Golovenchyk (2018) proposes to use rating analysis in the study of the digitalization level of the economy on the basis of international indices. The UN Economic and Social Council (2020) determines digitization as one of the priority areas of the National Accounts Research Program and is working on the Digital Economy and Society Index, developing indicators for measuring digital transformation. Varlamova and Demyanova (2020) analyze the growth rates and the state of the digital economy in the countries of the world and prove that the leading countries demonstrate high rates of digital development and diffusion of innovations in various spheres of society development. For example, the global index of digital competitiveness of a country contains the factor of "knowledge", which includes indicators of talent, training and education, scientific concentration. These components reflect the efforts of national universities to digitize their activities.

The emergence of the concept of a digital university is a phenomenon of the late 20th early 21st century. Thus, Jones and Goodfellow (2012) assess the impact of digital technologies on changes in university activities, McCluskey and Lynn Winter (2012) compare digital and traditional universities and show how the university has

to adapt to the digital age while keeping what is most essential, namely the mission of learning. Lukianenko and Stepanenko (2018) note that the digital transformation of education is the driving force behind the sustainable development of universities around the world. They note that the concept of a digital university implies a radical change in corporate culture and digitalization of all processes at the university. The research of the digital future of universities is the focus of the works of Johnston, McNeill, and Smith (2019). They offer practical tools for the academic and organizational development of a digital university. PwC's online community (2018) research confirm that modern university transformation must go through the development of effective digital strategies.

The main trends of digitalization of education, research on digitalization in higher education are analyzed in the works of many scientists. Thus, Kadyrbayeva (2018) considers new approaches to the organization of learning and new learning solutions based on new formats of full-time and online learning. Areshonkov (2020) believes that the higher education digitalization and the creation of digital universities is a response to today's challenges and defines a list of tasks for public administration and the leadership of a higher education institution (HEI) to spread the domestic university education digitalization. Korotenko (2020) pays attention to the issues of flexibility and mobility of learning, especially in the context of digitalization and the functioning of HEI in force majeure (Covid pandemic 2019). She sees online education as an innovation in education.

The study by Habib et al. (2021) emphasizes the need to create an automated management and learning infrastructure in a modern university, aimed at improving the efficiency of teachers, staff and university administration. It proposes the creation of an integrated digital platform for the university to interact with key stakeholders. Babin (2018) develops recommendations for building an integrated information environment of the university, which is focused on the management of internal business processes, individualization of learning, the use of online courses and network collaboration with consumers of educational services.

Yevseiev et al. (2017) propose to apply an integrated indicator of service quality for users to assess the effectiveness of the corporate scientific and educational network, information protection within the corporate educational network. The practical use of the proposed indicator will allow to more accurately assess the effectiveness of data exchange protocols used in global IP networks, the economic network deployment and maintenance costs, the cost of providing the required indicator of service quality, i.e. the digitization efficiency.

Thus, the formation of a digital university is an urgent task of the modern stage of transformation of the higher education system and is considered as a factor in enhancing the innovative activity of the HEI. All this justifies the need to continue research in this direction, the development of new methodological approaches, strategies and effective means of digitalization of the main types of activities of national HEI.

**The aim** of the article is to develop a strategy and innovative-indicative measures for digitalization of IAU activities based on the study of society digital maturity.

**Research methodology.** The methodological basis of the research is the concept of a digital university, which emerged at the beginning of the 21st century as a response to a radical change in the needs of the digital society.

A key feature of the concept is its focus on transforming all types of university activities, especially the form and content of education. The concept contains the main components:

1. Formation of the university management information system.
2. Creation of online support and implementation of digital technologies in the educational process.
3. Formation of key competencies for the needs of the digital economy.
4. Digital transformation of the university's activities related to the formation of digital culture and the digital environment of the university.

The introduction of this concept in the practice of the university presupposes, first of all, the resource readiness of HEI to digitalize the processes and types of its activities, permanent collaboration with the main stakeholders, which is a characteristic feature of an innovative-active university.

The implementation of the concept of "digital university" primarily depends on effective tools for its implementation in the practice of activities, the main of which is the strategy of digitalization of the types of activities of HEI.

Based on this, a methodological approach to the development of a digitalization strategy for the main types of university activities is proposed, which is based on the following hypotheses:

1. The emergence of the phenomenon of "digitalization of higher education" is the result of new needs of stakeholders in accordance with the requirements of the development of the digital economy and digital society of the 21st century and acts as a trigger for the development of an innovative-active university.
2. The effectiveness of the digitalization process of higher education depends on a synergistic combination of initiatives from the state and the innovative-active behavior of a separate HEI.
3. To maintain the higher education quality under the influence of changing environmental conditions (force majeure, for example, the Covid 2019 pandemic), it is necessary to establish the optimal balance between online and offline learning.
4. The effectiveness of the digital transformation of the university depends on the systemic implementation of digital technologies in all types of its activities.

In Fig. 1 shows a scheme of the methodical approach.

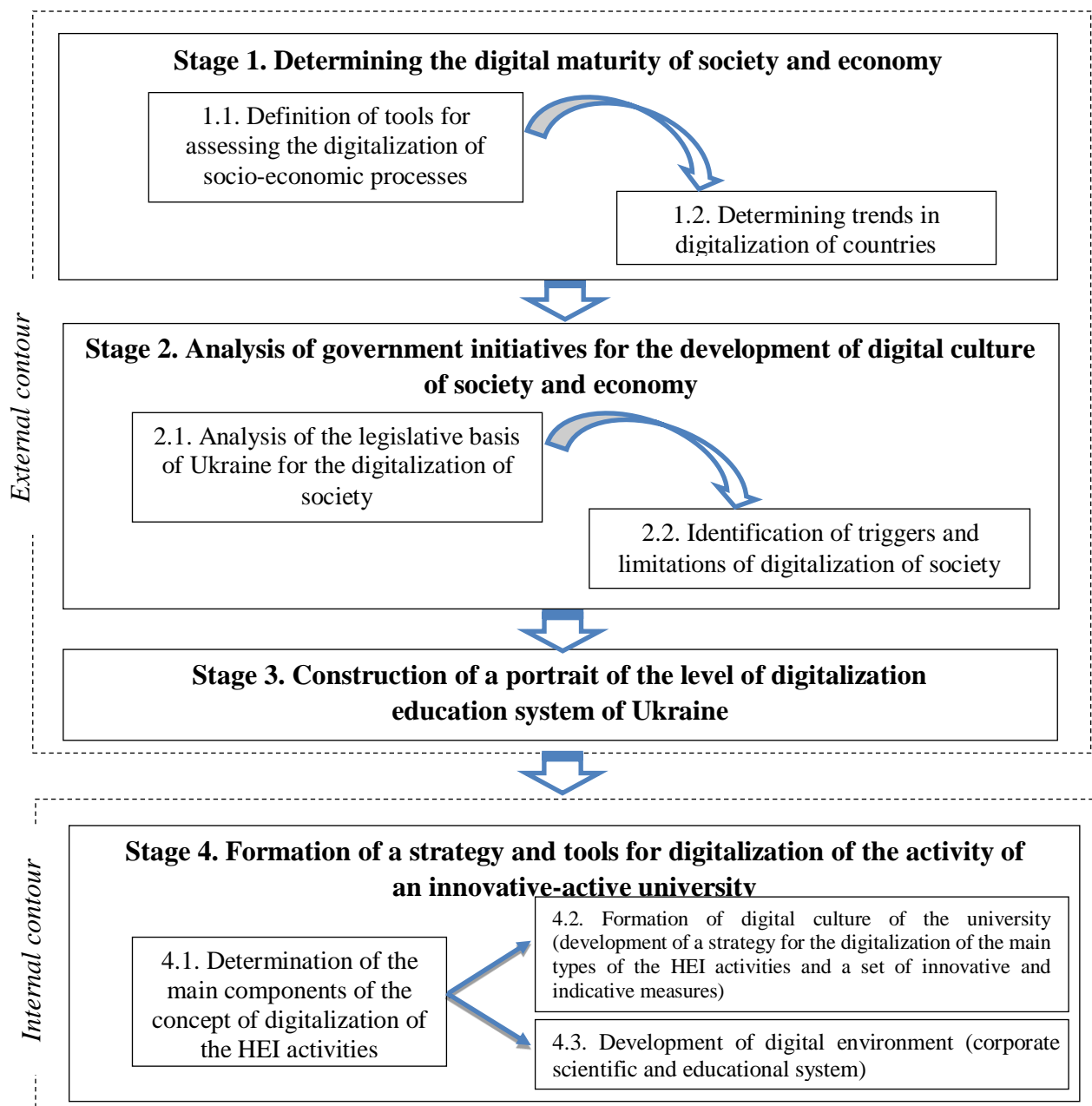


Fig. 1. Scheme of the methodical approach to developing a digitalization strategy for the spheres of university activity

**Results.** Let's consider in more detail the steps of the proposed methodical approach.

*Stage 1.* The formation and development of the digital society are influenced by both the external and internal environment. In this regard, to develop effective measures to implement and disseminate the processes of digitalization of society and educational activities in the HEI, it is necessary to rely on current trends in the digital economy, which can be identified on the basis of rating analysis of digital indexes.

The construction of ratings is a mathematical apparatus of various indicators and indicators convolution in compared values, so the use of rating analysis is in demand when conducting interstate comparisons. To assess the level of development of the digital economy or its individual components, various ratings are used,

calculated on the basis of the following indices: ICT Development Index (IDI), Digital Economy and Society Index (DESI), IMD World Digital Competitiveness Index (WDCI), Digital Evolution Index (DEI), Economy digitalization index Boston Consulting Group (e-Intensity), Networked Readiness Index (NRI), The UN Global E-Government Development Index (EGDI), E-Participation Index (EPART), Global Connectivity Index (GCI, Huawei), The Global Innovation Index (GII), Global Competitiveness Index (WEF).

The level of digitalization of the Ukrainian economy and the ten best economies in the world, determined in the research of Kokh (2019), IMD World Competitiveness Center (2020), International Telecommunication Union (2017), Global connectivity index (2020), Portulans Institute (2020), United Nations (2020), World economic forum (2019), and World Intellectual property organization (2020) are presented in Table 1.

Table 1

Ratings of the digital economy of the world according to various indices

Country	IDI 2017	WDCI 2020	GCI 2020	NRI 2020	EGDI 2020	EPART 2020	GII 2020	WEF 2019	Middle place
USA	16	1	1	8	9	1	3	2	5,13
Singapore	18	2	2	3	11	6	8	1	6,38
Denmark	4	3	5	2	1	9	6	10	5,00
Sweden	11	4	4	1	6	41	2	8	9,63
Hong Kong SAR	6	5	22	22	45	9	14	3	15,75
United Kingdom	5	13	8	10	7	6	4	9	7,75
Finland	22	10	6	6	4	14	7	11	10,00
Germany	12	18	15	9	25	57	9	7	19,00
<b>Ukraine</b>	79	58	52	64	69	46	45	85	62,25

As can be seen from Table 1, Ukraine differs significantly from the highly innovative countries of the world in the level of digitalization and in all indices occupies average and below average ratings.

One of the indices on the basis of which you can get a systematic view of the digitalization of society and the impact of factors on the development of this process is the IMD World Digital Competitiveness Index (WDCI), which is calculated based on a study of capacity and readiness of 63 economies to implement digital technologies as economic transformations in society (IMD World Competitiveness Center, 2020).

The component structure of the rating, built on the basis of WDCI in tuple form is as follows:

$$WDCR = \langle Kn; Tn; Fr \rangle, \quad (1)$$

where WDCR – World Digital Competitiveness Rating, which shows the country's place in the development of digitalization level of society; Kn is a knowledge factor that covers the intangible infrastructure needed to discover, understand and build new technologies. This component includes indicators of talent, learning and education and scientific concentration; Tn is a technology factor that



quantifies the overall basis for the development of digital technologies. This component covers indicators of regulatory and technological base; Fr - future readiness factor, which characterizes the level of readiness of the country to use digital transformation. This component includes indicators of business flexibility, adaptability and IT integration.

Let's analyze the level of development of digitalization of society on the basis of WDCR assessment (Table 2).

Table 2

Changes in the place of countries in the ranking of digital competitiveness

Country	2016	2019	2020	Change in 2020 compared to 2016	Change in 2020 compared to 2019
USA	2	1	1	↑ 1	↔
Singapore	1	2	2	↓ 1	↔
Denmark	8	4	3	↑ 5	↑ 1
Sweden	3	3	4	↓ 1	↓ 1
Hong Kong SAR	11	8	5	↑ 6	↑ 3
...	...	...	...	...	...
Mexico	52	49	54	↓ 2	↓ 5
Peru	58	61	55	↑ 3	↑ 6
Indonesia	60	56	56	↑ 4	↔
Philippines	46	55	57	↓ 11	↓ 2
<b>Ukraine</b>	<b>59</b>	<b>60</b>	<b>58</b>	<b>↓ 1</b>	<b>↑ 2</b>

In the rating of digital competitiveness of countries, Ukraine in 2020 compared to 2019 rose by 2 points and is now in 58th place among the 63 countries that participated in the indexation. As can be seen from Table 2, almost all countries, both those belonging to the cluster group of leaders and those to which the cluster group Ukraine belongs, have raised their positions on the digitalization of society over the past year. The top 5 countries have different approaches to digital competitiveness. Thus, the United States and Sweden aim at a balanced approach to acquiring knowledge, creating favorable conditions for technology development and readiness for innovation. Countries such as Singapore and Denmark give priority to one or two factors that make up the Digital Competitiveness Index.

In the further study of Ukraine's ranking by WDCI values and the formation of a portrait of the level of digitalization of higher education in Ukraine, emphasis will be placed on identifying the components of Knowledge and its subfactors.

*Stage 2.* The issue of the need to build a digital society has been appearing in Ukraine's strategic plans since the late 1990s, when the world began to intensively introduce information technologies. In 1998, Ukraine adopted the Law «On the National Informatization Program» (1998), which defined the strategy of state policy to create a modern information infrastructure of Ukraine and defined the conditions for Ukraine's integration into the world information space in accordance with information geopolitics trends. Despite the measures taken, the process of digitalization in the country has progressed rather slowly. The problems of digital economy development in Ukraine are insufficient coverage of the territory by high-quality Internet and weak development of digital services. According to experts

Pyshchulina (2020), all this indicates that Ukraine is not ready to implement the technologies of Industry 4.0, as the country has not yet completed the process of implementing Industry 3.0. As Makedon (2019) points out the level of automation in Ukrainian industry is lower than average - in metallurgy it is about 50%.

In Fig. 2 shows the dynamics of some indicators of the use of information and communication technologies at enterprises and organizations of the country for 2017-2019 (State Statistics Service of Ukraine, 2020).

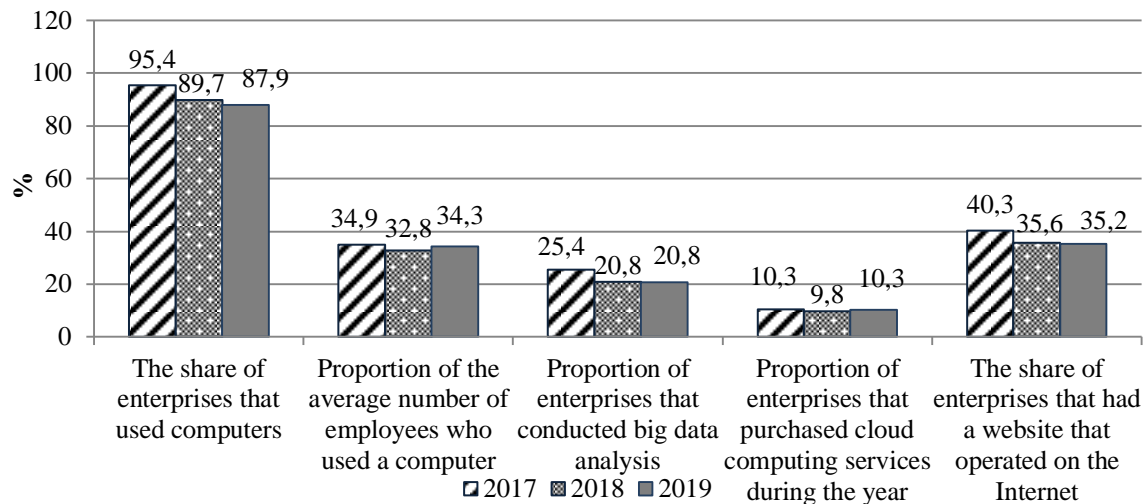


Fig. 2. Dynamics of indicators of informatization of enterprises and organizations of Ukraine

As can be seen from Fig. 2, the digitalization level of Ukraine's economy has not significantly improved in 2017-2019. It even decreased in 2019 compared to 2017 by almost 8% in such a position as the use of computers by enterprises, by 18% - in terms of the share of enterprises that used Big Data Analysis, by 12.7% - in terms of the share of companies that have a functioning website.

Recently, the Government of Ukraine has taken various measures to implement and increase the intensity of digitalization of society. Thus, in order to form and implement state policy in the field of digitalization, digital economy, digital innovation and information society development, the Ministry and Committee for Digital Transformation of Ukraine (2021) was established, the goals of which by 2024 are to ensure: 100% accessibility of public services to citizens and businesses online; 95% of the population, social facilities and major highways with high-speed Internet; involvement of 6 million Ukrainians in the digital skills development program; the share of IT in the country's GDP at 10%.

In 2020 changes approved in the Concept of Development of the Digital Economy and Society of Ukraine for 2018-2020 and noted that trends in increasing the digitalization of society are: bridging the digital divide through the development of digital infrastructures; development of digital competencies; introduction of the concept of digital workplaces; digitalization of the real sector of the economy; implementation of digital transformation projects; ensuring the necessary level of general security of citizens; reforming the education system; digitalization of health care; digital transformation of tourist activity; introduction of e-democracy;

introduction of digital technologies to improve the environmental situation; introduction of the concept of smart city ("smart" cities); development of non-cash economy; harmonization with European and world scientific initiatives; digitalization of public administration.

According to Pyshchulina (2020) the factors that affect the process of digital transformation of society and limit its intensity are divided into external barriers, resource constraints and human potential, Table 3.

Table 3

Characteristics of factors that hinder the development of digitalization of society in Ukraine

The name of the factor	Characteristics of the factor
External barriers	shortage of digital solutions that take into account the specifics of the company's business; availability of unstructured, contradictory data; underdeveloped information infrastructure and digital trust infrastructure; lack of standards for the use of digital technologies; insufficiency of legal regulation of relations in the digital economy; insufficient security of data confidentiality and protection against cybercrime
Resource constraints	lack investment resources for the development and implementation of innovations; high cost of digital technology projects; high operating costs of systems using digital technologies; lack of opportunities for cooperation with other enterprises and scientific organizations
Human capital	shortage of qualified personnel; low information technology competence and digital culture of users of Internet technologies and Internet services; reluctance of staff and / or management to change the usual forms of work

*Stage 3.* The analysis showed that all countries-leaders in the field of digitalization consider education and innovation as the main driving forces of digitalization of society and are increasingly introducing digital technologies in the field of education.

To study the trends of digitalization in education, it is proposed to use the method of decomposition of WDCR and analyze the dynamics of the digital competitiveness level of Ukraine by components of WDCR (Fig.3), (IMD World Competitiveness Center, 2020).

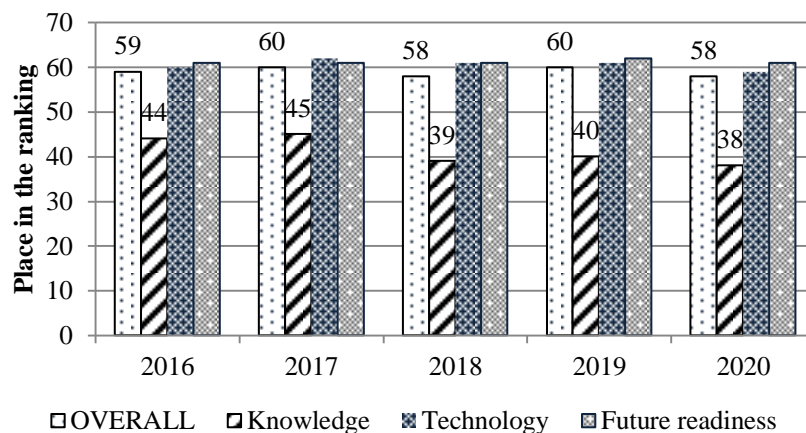


Fig. 3. Dynamics of places of digital competitiveness rating components of Ukraine

Thus, according to the Knowledge component, Ukraine's place among the countries of the world will increase in 2020 by 2 points compared to the previous year, and by 6 points compared to 2016. In addition, Ukraine occupies the highest ranking positions for this component, so it is the Knowledge component that largely forms the WDCR.

If we look at the decomposition of the Knowledge component into subfactors, we see that the Training and Education subfactor also occupies the highest positions among the other two components in the formation of the WDCR (Fig.4), (IMD World Competitiveness Center, 2020).

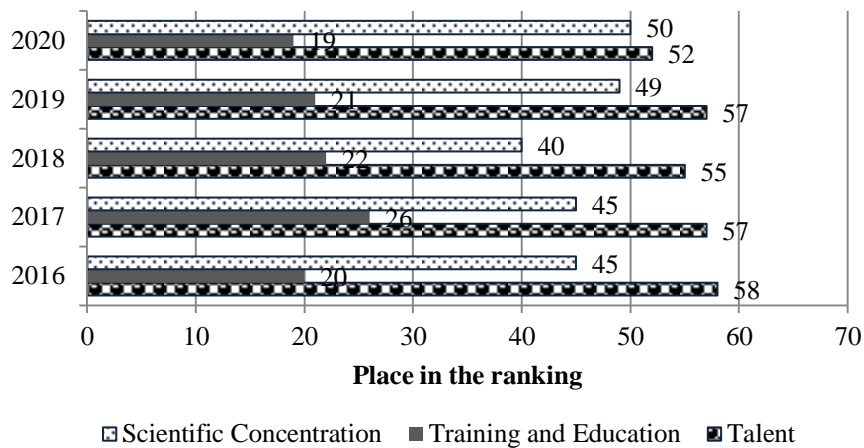


Fig. 4. Dynamics of Ukraine's place by subfactors of the Knowledge component

As can be seen from Fig.4 rating of the subfactor Training and Education is the highest and in 2020 increased by 2 positions compared to 2019. Given the method of constructing WDCR, according to which each component and subfactor has equal value, we have that it is education that supports the level of digitalization of the country and acts as the dominant core in the process of digitalization.

In 2018, within the framework of the Paris Communiqué, European countries formed the values of the European Higher Education Area: academic freedom, integrity, institutional autonomy, participation of students and academic staff in government. They also singled out 10 principles for improving the process of teaching and learning, the essence of which is that education in the HEI forms a personality, is student-centered, based on the requests of interested stakeholders (Community for learning and teaching, 2021).

Based on these values and principles, the main trends of modern education are formed. Among these trends, special attention is paid to the digitalization of education through the creation of computer classes, Wi-Fi distribution, creation of online libraries, online courses, creation of student portals and depositories, introduction of e-portfolio, online exams and tests, etc.

The Government of Ukraine is also working on the implementation of the digital transformation of education and to implement this area, the Ministry of Education and Science of Ukraine decided to approve the Concept of Digital Transformation of Education and Science of Ukraine in 2021(InfoCity, 2020). In

2020, the Strategy for the Development of Higher Education in Ukraine for 2021-2031 was developed, which states that modern education lags behind the processes of digitalization, and more needs to be done to take advantage of the tools and strengths of new technologies while solving problems on possible abuses such as cyber intrusion and privacy issues (Ministry and Committee for Digital Transformation of Ukraine, 2021).

Thus, the main vectors of development of modern education in the direction of digitalization are (Fig.5).

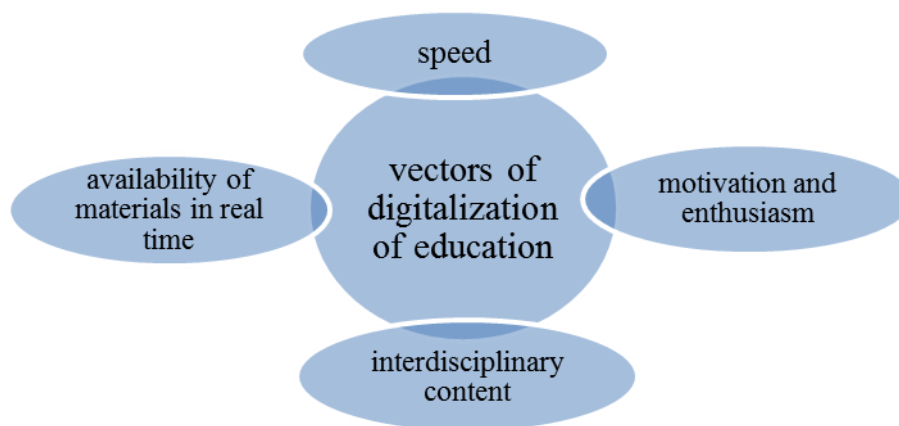


Fig. 5. Vectors of digitalization of Ukrainian education

Speed means that because learning is subject to modern change, the usual accumulation of knowledge loses its relevance. Motivation and enthusiasm show that teachers become coordinators, guiding students both online and offline. The availability of materials in real time is aimed at simplifying the process of acquiring new knowledge. Interdisciplinary content shows that there is a combination of knowledge from different walks of life and the integration of the interests of different groups of stakeholders.

*Stage 4.* The digitalization of higher education depends on the entrepreneurial activity of specific IAU, which should develop concepts of digitalization of all types of their activities.

An effective concept of digitalization of HEI should be formed in order to create a digital environment and digital culture of the university.

The main tasks of the concept are:

1. *Formation of digitalization strategy, tactical action plan, building a system of key performance indicators (KPI).* To do this, it is necessary to determine the real and potential resources of the HEI in accordance with its individual business process / area of activity, the definition of achievable benchmarks (KPI) and means, ways and tools for their implementation.

2. *Continuous training and motivation of staff to acquire the latest digital skills.* This means using employee-driven management and creating an environment that develops the ability and willingness of staff to think creatively, be open to information innovations and implement them in the educational and scientific process;

3. *Abandonment of outdated technologies.* To do this, it is necessary to

abandon, first of all, the old stereotypes of educational, scientific, international and other activities of the HEI, to move from «competition technology» between departments, faculties, etc., to work on the principle of «joint efforts».

According to these tasks, the strategy of digitalization of the activities of Simon Kuznets Kharkiv National University of Economics (S.Kuznets KhNUE) contains the following: a significant improvement in the quality of all processes and activities of the university based on the introduction of information and communication technologies and infrastructure, the formation of a safe digital environment in order to create key conditions for training personnel for the digital economy, the development of innovative activities of the university, increasing its competitiveness in the national and international educational space.

It is proposed to build a digitalization strategy for S.Kuznets KhNUE in accordance with its main activities, namely educational, scientific and technical, marketing, international (Fig. 6).

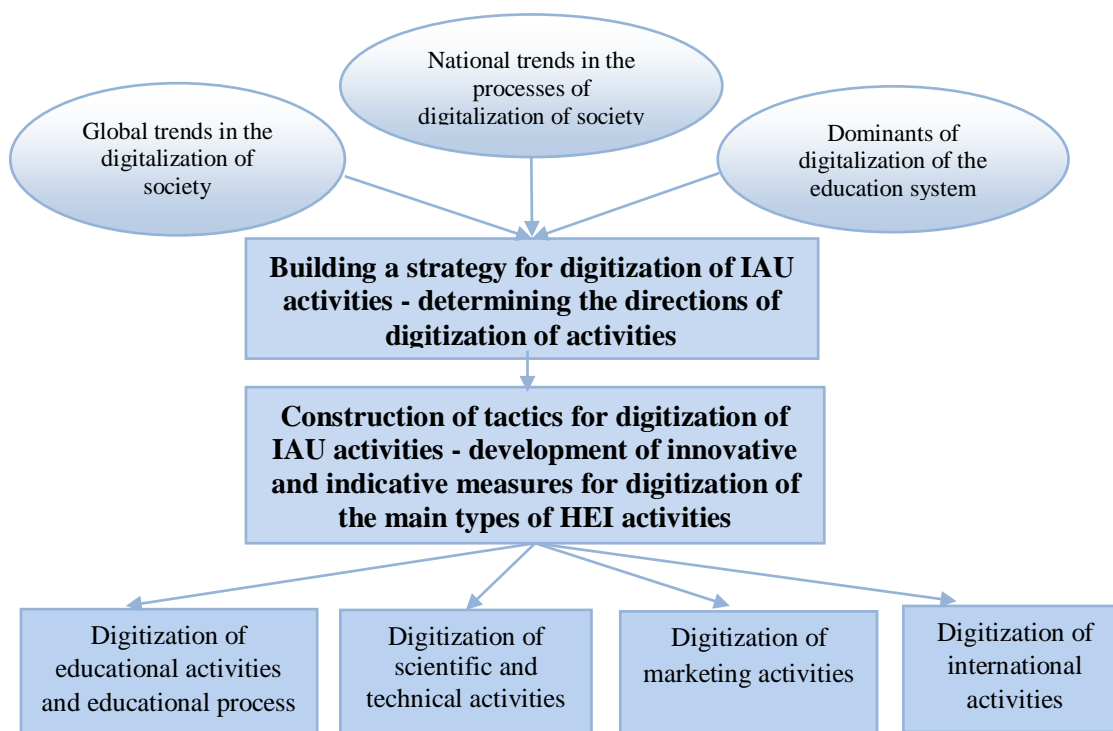


Fig. 6. Components of the digitalization strategy of an innovative-active university – S.Kuznets KhNUE

This approach makes it possible to shape the digital culture of the university as a system of balanced relationships between the main and supporting departments of the university. The latter increases the efficiency of digitalization processes by enhancing the degree of their controllability.

The analysis practice of functioning of innovative-active universities of the world and Ukraine (Etzkowitz & Zhou, 2008, Raievniewa, Azizova & Ostapenko, 2020, Shabanov, 2009, Van Vught, 2000) allowed to form innovative and indicative measures of digitalization of S.Kuznets KhNUE as a set of tactical tasks according to the selected types of activity, namely:

*1. Digitization of educational activities and the educational process is:*

creation of basic information services used in the educational process (video screens for training sessions, cloud technologies for storage and data exchange, etc.);

creation of a digital library (provides student or teacher access to scientific literature from any device, regardless of location and time of day) with tools for scientometric evaluation of scientific performance and publication activity of teachers and staff of the university;

informatization of research project management processes, procurement, interaction with applicants and students, etc.;

creation and application of information and communication technologies and platforms aimed at strengthening the quality of the educational process;

using analytics to identify student learning outcomes and rank them;

creating a system of feedback with students, studying their opinions and suggestions, evaluating teachers, the quality of the curriculum, the need for certain educational and professional programs, etc.

Further development of digitalization is the creation of digital campuses.

Performers: department of e-learning tools, research sector, library, quality assurance and innovative development department.

*2. Digitization of scientific and technical activities is focused on:*

creation of special services for scientists that provide presentation and publication of research results on the Internet;

informatization of publishing processes of magazines, including open access;

analysis of closed databases of publishing houses, open access journals and sources on the Internet;

use of information technologies for monitoring real-time publications;

ensuring the quality of scientific content, in particular the creation of intelligent anti-plagiarism systems;

informatization of the process of determining citation indices of articles, impact factors of publications, etc.

Performers: library, publishing house S.Kuznets KhNUE, quality assurance and innovative development department, research sector, methodical department.

*3. Digitization of marketing activities is:* the use of digital technologies to inform applicants on various issues of the educational process, which is important for both domestic entrants and potential foreign applicants; use of new interaction methods of with employers; constant screening of the university's reputation and formation of a positive image of the HEI in social and professional Internet networks; stimulating the creation of new digital communities and innovations at all stages of the educational cycle, etc.;

Performers: department of marketing and corporate communication, department of student employment and interaction with business structures, department of e-learning tools.

*4. Digitization of international activities is:* integration of IAU to the level of European universities; creation of network universities without borders; increasing the competitiveness level of HEI at the international level; introduction of foreign experience of digital inclusion in the practical activities of HEI;

improving the position of HEI in international rankings.

The prospect is to create a network university without borders.

Performers: quality assurance and innovative development department, department of international relations.

An extensive network of information, digital technologies and services forms the digital environment of the IAU. This presupposes the need to build an effective information corporate scientific and educational system. In S.Kuznets KhNUE, this system is, on the one hand, the basis, and on the other hand, a tool for improving the quality of digitalization processes of all types of activities of the HEI through the creation of: a system of electronic document management and electronic signature; information subsystems of directorates and services of the HEI; information support of the HEI control system; corporate information security system; teacher's personal account; student's personal account; information system for assessing the quality of education; electronic library platforms; individual schedule of classes; electronic management of assessment and monitoring of attendance.

All this makes it possible to significantly enhance the quality of the university's interaction with the main stakeholders, namely, with students, applicants, potential and real employers, representatives of state, regional and local authorities.

That is, the proposed tasks of digital culture and elements of the digital environment are triggers for the innovative development of S.Kuznets KhNUE and contribute to strengthening its competitive advantages in the national and international educational market.

The digitalization of the educational process, as a key activity of the HEI, is a combination of modern digital platforms, new information and educational technologies, and progressive forms of organizing the educational process.

In Fig. 7 shows the transformation of forms of education in accordance with the level of digital culture.

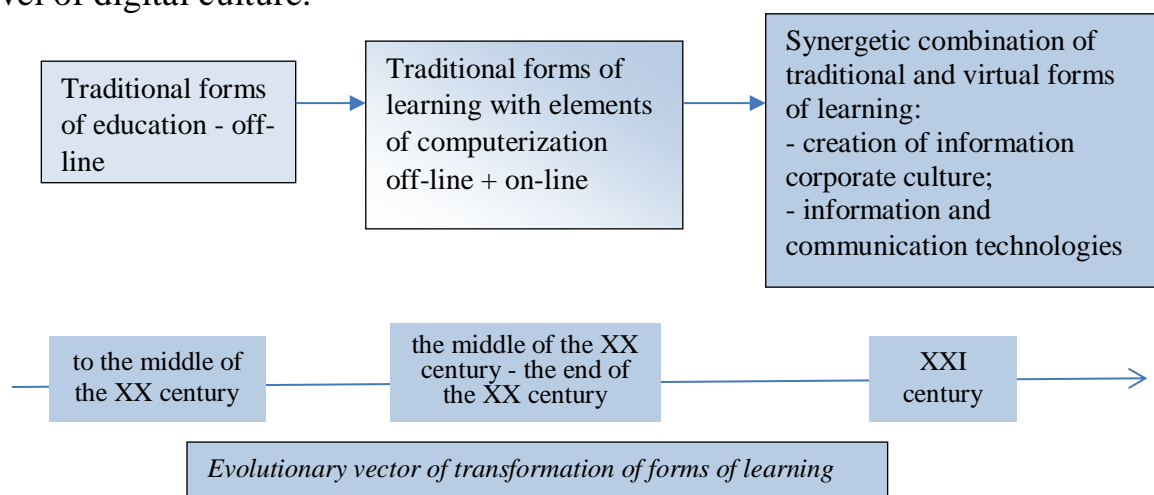


Fig. 7. Transformation of education forms

Today the organization of the educational process is at the stage of combining traditional and virtual forms of education, characterized by the search for new and transformation of traditional forms and methods of teaching that will improve the quality of specialists` training in various specialties based on information and



communication technologies. All this confirms the need to create an information corporate culture, which on the one hand, involves the formation and expansion of information skills of both students and teachers, on the other - information and communication readiness of HEI to effectively support information interaction between them. The latter involves the presence of a set of information, digital on-line technologies that allow to maintain the high quality of the educational process.

Given the spread of the Covid 2019 pandemic, all educational institutions in Ukraine faced unprecedented challenges and the need to find the optimal combination of traditional and virtual forms of learning for HEI (Fig.8).

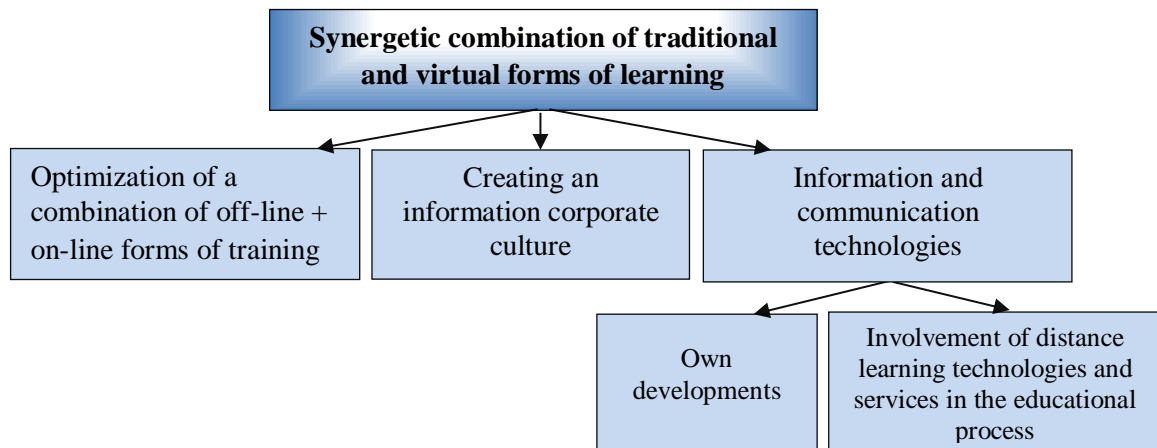


Fig. 8. The scheme of combining traditional and virtual forms of learning

The traditional form of training involves the formation of information and communication system, which, in turn, is the main innovative component in the formation of information and corporate culture of HEI. The introduction of traditional and virtual forms of education is reflected in the combination of offline and online forms of education, which depends on the level of stability of the external environment in which the university operates.

Research in this direction allowed to determine the normal and force majeure modes of operation and the corresponding priorities of forms of education (Fig.9).

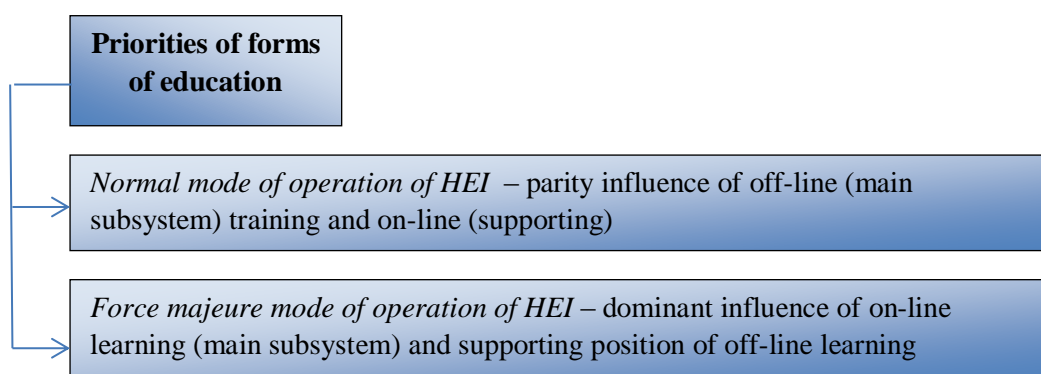


Fig. 9. Directions of priority forms of education

Thus, the challenge of the COVID-19 pandemic in the higher education system in 2020 was the impetus for a radical digitalization of the educational environment. The transition to virtual networks from classrooms, which happened suddenly and on

a massive scale, sharpened the practical implementation of issues that have been the subject of debate among scientists until now.

In the period of combining traditional and virtual forms of education, at S.Kuznets KhNUE, the educational process is implemented through the use of a site of personal educational system (PES). PES S.Kuznets KhNUE is a platform that covers all electronic training courses of university, designed to create and manage a virtual learning environment to share learning materials, conduct classes online and assess students' knowledge.

The site of PES is built on the basis of the Moodle platform. Moodle is a free, open source learning management system. It acts as an effective tool for interaction between the teacher and students, is suitable for the organization of traditional distance learning courses and can serve as a supplement during full-time learning.

Since the functionality of the Moodle software platform is wide enough, for the gradual use of the system tools by teachers at S.Kuznets KhNUE in order to improve the quality of education, three levels of PNS functionality have been introduced (Fig. 10).

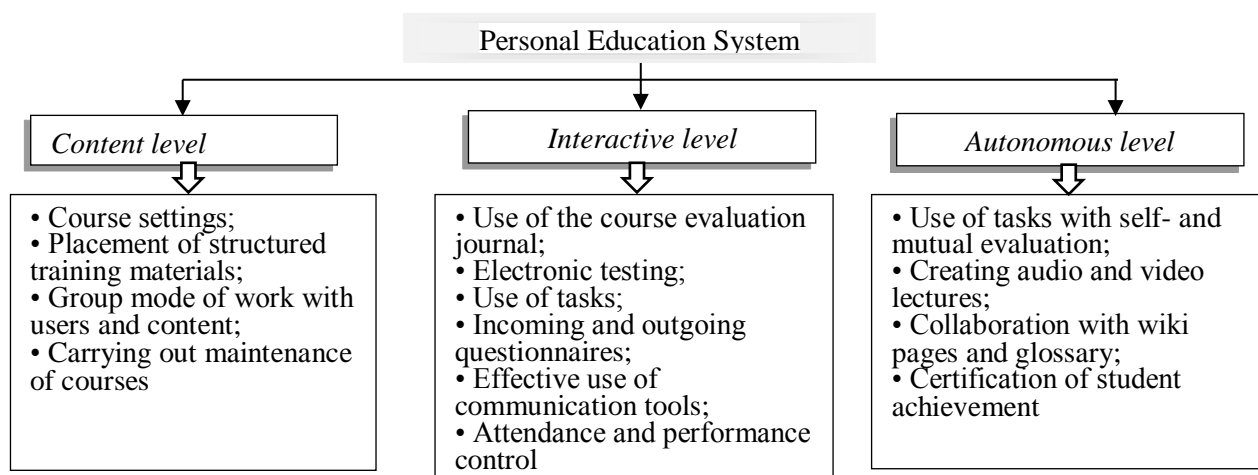


Fig. 10. Three-level model of personal educational system in S.Kuznets KhNUE

The use of the Moodle system during the period of the virtual form of education allowed for the transition to an interactive level, which indicates the strengthening of the digitalization of the educational process.

A high level of quality of education is a factor in the competitiveness of any HEI, therefore, monitoring the quality of the educational process, especially in the context of online learning, is an indicator of the readiness of HEI to function in the new conditions of a digital society.

In S.Kuznets KhNUE the quality assurance and innovative development department constantly evaluates the quality of the educational process for all educational programs. Table 4 shows the results of monitoring for students of 1-2 courses of the specialty "Economics" in different learning conditions.

Table 4

## Monitoring student learning outcomes for 2018-2021

Specialty	Course	Number of applicants for higher education at the beginning of the semester	Applicants with quality performance		Applicants who received satisfactory marks	
			Number	% of the total number on the course	Number	% of the total number on the course
2018-2019 academic year (the main form of teaching is traditional)						
Economy	1	164	43	26.22	121	73.78
	2	163	69	42.33	94	57.67
2019-2020 academic year (the main form of teaching is the combination of traditional and virtual)						
Economy	1	188	49	26.06	139	73.94
	2	152	46	30.26	106	69.74
I semester 2020-2021 academic year (the main form of teaching is virtual)						
Economy	1	229	70	30.57	159	69.43
	2	173	55	31.79	118	68.21

As you can see, the transition from the traditional form of education in 2018-2019 to mixed in 2019-2020 and to online learning in 2020-2021 did not worsen the quality of students' progress, which showed the readiness of S.Kuznets KhNUE to reorganize education in force majeure circumstances. The introduction of digitalization elements has made the educational process mobile, differentiated and individual. The use of information and communication technologies makes educational activities adaptive, interactive and manageable.

**Discussion.** The emergence of the phenomenon of a digital society and economy has significantly changed all spheres of civilization's life, in particular the system of higher education. Today, universities are faced with the need to find effective, innovative ways, means, ways that will allow them to adapt to the new system of social and economic relations and at the same time not lose their key role in teaching and research.

The emergence in the late 20th and early 21st century of the concept of an entrepreneurial university, digital university is the result of such efforts. By supporting the imperatives of these concepts a modern university considers its competitiveness as a result of entrepreneurial activity in the field of science and education, innovative and active efforts to anticipate changes in trends in the development of society and the economy. That is why the systemic digitalization of the processes of functioning of the university, the spheres of its activity, has currently a high level of relevance.

In this context, a significant role is played by the concept of digitalization of the university's activities, the development of which is the work of many scientists. The article proposes to consider the concept of digitalization as the mutual influence of two components - the digital culture of the university and its digital environment. Directed culture is formed by the strategy of digitalization of the main areas of the university's activities, which allows you to look at the digital culture from a systemic standpoint, to form a system of interaction between the main and supporting subsystems of the university. This will increase the manageability of the

digitalization process and form the basis for the development of an effective digital environment. The essence of the latter is formed by an information corporate educational and scientific system, which is considered both an environment and a tool for diffusion of the latest digital technologies and shells into all the areas of the university's activity.

Thus, the transition of the university to the digital level of its activities will ensure its active adaptation to the trends in the transformation of the higher education system of the 21st century. However, such a radical transformation can be carried out only in the conditions of resource and mental readiness of the university which are the characteristics of an innovative-active university. The widespread introduction of digitalization tools in educational, scientific and technical, marketing, international activities presupposes the presence of creative, open to innovations, scientific and pedagogical personnel, the sufficiency of financial support for the implementation and support of the latest digital technologies and information services.

In our opinion, there should be a program of state support for such initiatives on a tender basis for the Ukrainian universities.

**Conclusions.** Digitalization and the formation of a digital society are a source of global transformational transformations that require adaptation of the world higher education system to them and the introduction of modern digital technologies and information services into the practice of universities. It has been proven that the digitalization of university activities depends on the digital maturity of society, the widespread use of digital technologies and skills in the economy. The triggers and limitations of digitalization of the Ukrainian society are highlighted, the ranking place of Ukraine among the countries of the world according to the main indicators of digitalization is determined.

The methodological basis of the study is the concept of a digital university, which substantiates the need for the formation of a digital environment and digital culture of universities. It is proposed that the formation of digital culture involves the development of a digitalization strategy for the types of activities of the university: educational, scientific and technical, marketing and international. This allows you to systematically present the tasks of effective digital transformation of the university and speed up the process of making managerial decisions in this direction. The digital environment is understood as an information corporate scientific and educational system, which, on the one hand, creates an information basis for the effective interaction of structural units of universities, and on the other, acts as a channel for the dissemination of the latest digital technologies in all types of university activities, primarily in educational.

A methodical approach has been developed that makes it possible to form an effective strategy for digitalization of the main areas of activity of the S.Kuznets KhNUE on the basis of determining the possibilities of the external environment - the digital maturity of society and the economy, the resource readiness of the university.

To detail the strategic directions of digitalization of the university's activities, innovative and indicative measures have been developed in the form of a complex of tactical tasks, structural units responsible for their implementation have been identified. The developed tasks allow in the future to form a system of key

performance indicators to increase the level of controllability of digital processes.

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**Acknowledgement.** The following materials were used in writing this article: Development of methodological and model information support for the construction of an innovative type university on the basis of education quality and anti-corruption (state registration number: 0120U102152).

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