Increasing the competitiveness of educational institutions in the conditions of internetization

Incrementar la competitividad de las instituciones educativas en las condiciones de la internetización

Yuliya Zhuravel
jul_zhur@ukr.net
https://orcid.org/0000-0003-4065-540X
Candidate of Economic Sciences, Lecturer, Lviv State College of Food and Processing Industry of the National University of Food Technologies, Lviv, Ukraine.

Yuliia Kuzmenko
yulyachechura@gmail.com
https://orcid.org/0000-0001-5267-3088
Candidate of Pedagogical Science, Institute of Management, Department of Education and Management of Educational Institution, Classic Private University, Zaporizhzhia, Ukraine.

Olesia Fedoruk
silence199023@gmail.com
https://orcid.org/0000-0001-7646-9604
PhD, Senior teacher, Department of Information and Document Communications, National University of Ostroh Academy, Ostroh, Ukraine.

Iryna Tymkiv
irinavasiruk@gmail.com
https://orcid.org/0000-0002-9676-9572
PhD in Philosophy, Teacher, Department of Philosophy and Social Sciences, Faculty of History, Ternopil Volodymyr Hnatiuk National Pedagogical University, Ukraine.

Abstract

Transformational social processes, the development of science and technology, changes in the value systems and orientations of the individual, the active introduction of digital technologies into all spheres of human life and economic systems, determine the need for the formation of new requirements for ensuring the quality of the educational process. At the same time, the development of technologies, foremost, the development of digital technologies determines great opportunities for the development of education, but the effective use of new technologies is possible only if the processes of management of educational systems are rationalized at the global level, the level of the state, and the level of a separate educational institution. Therefore, considering the relevance of the research, the article sets a goal: to develop mechanisms for increasing the efficiency of management of educational institutions through the introduction of digital technologies to ensure their competitiveness in the market for the provision of educational services in accordance with

Yuliya Zhuravel, Yuliia Kuzmenko, Olesia Fedoruk, Iryna Tymkiv

new social requirements and global transformations. The object of research in the article is the management system of educational institutions. Methodology. The study analyzed trends and trends in the development of the education system and educational institutions by using methods of statistical analysis and comparison. To structure educational institutions according to the level of use of digital technologies, the leading international rankings QS World University Rankings, Webometrics, Google Scholar Citations and UniRank were analyzed. Based on the analysis, a structured set of indicators and control maps of ratings of the digital popularity of educational institutions were formed. As a result, the article models the effectiveness of using digital technologies as elements of the management system. The projection of the planned results of the use of digital technologies allows modeling the processes of the development of the education system as an element of managing the competitiveness of educational facilities. The results. As a result of the analysis, it was determined that ensuring the competitiveness of educational institutions in the conditions of social transformations significantly depends on the level of use of digital technologies for the promotion of the educational institution, image formation, popularization of its own scientific research and activity results, as well as journalistic activity. The expediency of using database resources, as well as social network resources as an element of the educational institution's digital promotion strategy to ensure its competitiveness, was determined, which was confirmed by analyzing the results of the leading world ratings. Among the main tasks of the management system, which solve the methods of using digital technologies, as well as the advantages that ensure the competitiveness of educational institutions, there are the following: mobile access to public information, a strategy of openness, positioning and creating a positive image, forming the image of an individual scientist and an educational institution by positioning journalistic activity, ensuring accessibility to information, increasing competitiveness by complying with modern trends in the development of an innovative information society.

Key words: education, digital technology, education management system, educational institutions, competitiveness of educational institutions, educational ratings, modeling of education system development processes.

Resumen

Los procesos sociales de transformación, el desarrollo de la ciencia y la tecnología, los cambios en los sistemas de valores y las orientaciones del individuo, la introducción activa de las tecnologías digitales en todas las esferas de la vida humana y los sistemas económicos, determinan la necesidad de la formación de nuevos requisitos para garantizar la calidad del proceso educativo. Al mismo tiempo, el desarrollo de las tecnologías, ante todo, el desarrollo de las tecnologías digitales determina grandes oportunidades para el desarrollo de la educación, pero el uso efectivo de las nuevas tecnologías solo es posible si se racionalizan los procesos de gestión de los sistemas educativos a nivel global, el nivel del estado y el nivel de una institución educativa separada. Por lo tanto, considerando la relevancia de la investigación, el artículo se plantea como objetivo: desarrollar mecanismos para incrementar la eficiencia de la gestión de las instituciones educativas a través de la introducción de tecnologías digitales para asegurar su competitividad en el mercado de la prestación de servicios educativos de acuerdo con las nuevas requerimientos sociales y transformaciones globales. El objeto de investigación en el artículo es el sistema de gestión

de las instituciones educativas. Metodología. El estudio analizó tendencias y tendencias en el desarrollo del sistema educativo y las instituciones educativas mediante el uso de métodos de análisis y comparación estadísticos. Para estructurar las instituciones educativas según el nivel de uso de las tecnologías digitales, se analizaron los principales rankings internacionales QS World University Rankings, Webometrics, Google Scholar Citations y UniRank. Con base en el análisis, se formó un conjunto estructurado de indicadores y mapas de control de calificaciones de la popularidad digital de las instituciones educativas. Como resultado, el artículo modela la efectividad del uso de tecnologías digitales como elementos del sistema de gestión. La proyección de los resultados planificados del uso de las tecnologías digitales permite modelar los procesos de desarrollo del sistema educativo como elemento de gestión de la competitividad de los establecimientos educativos. Los resultados. Como resultado del análisis se determinó que asegurar la competitividad de las instituciones educativas en las condiciones de las transformaciones sociales depende significativamente del nivel de uso de las tecnologías digitales para la promoción de la institución educativa, formación de imagen, divulgación de sus propias investigaciones científicas y resultados de la actividad, así como de la actividad periodística. Se determinó la conveniencia de utilizar los recursos de la base de datos, así como los recursos de las redes sociales como elemento de la estrategia de promoción digital de la institución educativa para asegurar su competitividad, lo cual se confirmó al analizar los resultados de los principales ratings mundiales. Entre las principales tareas del sistema de gestión, que resuelven los métodos de uso de las tecnologías digitales, así como las ventajas que aseguran la competitividad de las instituciones educativas, se encuentran las siguientes: acceso móvil a la información pública, estrategia de apertura, posicionamiento y creación una imagen positiva, formando la imagen de un científico individual y una institución educativa posicionando la actividad periodística, asegurando la accesibilidad a la información, aumentando la competitividad al cumplir con las tendencias modernas en el desarrollo de una sociedad de la información innovadora.

Palabras clave: educación, tecnología digital, sistema de gestión educativa, instituciones educativas, competitividad de las instituciones educativas, calificaciones educativas, modelización de los procesos de desarrollo del sistema educativo.

1. Introduction

In the conditions of changes and transformations of society, the education system should be reformed with the setting of new tasks, the formation of new methods and techniques of imparting knowledge and the formation of skills that would be popular both in the modern labor market and in the conditions of the modern information society. The use of digital technologies allows ensuring the competitiveness of the economic system in the conditions of the expansion of the digital market. Classical methods of work of educational institutions are beginning to lose relevance. In the conditions of humanity's existence in the system of digital technologies, with the transition to remote forms of education due to quarantine restrictions, classical forms of education and image formation are losing their relevance. According to the evidence of statistical analysis "April Global Statshot report" the number of Internet users exceeded 5 billion people in 2022, and the number of

Internet users is growing at a rate of 300 million people per year. This is almost 63 % of the planet's population. It is worth noting that the majority of people who are active users of the Internet are young people, which increases the role of the use of digital technologies in the education system, since young people are the main target audience for the provision of educational services. Thus, an important element of ensuring the competitiveness of educational institutions is the search for effective methods of using digital technologies in the educational process and the process of creating the image of an educational institution.

The purpose of the article is to determine ways to introduce mechanisms for improving management efficiency to ensure the competitiveness of educational institutions using digital technologies in the market for the provision of educational services in accordance with the requirements of society and transformational processes at the global level.

2. Literature review

With the beginning of the development of the Internet in the 1970s, scientists began to develop conceptual provisions for the individual principles of the use of Internet technologies in various spheres of human life, development of economic and social systems.

The issue of the introduction of digital technologies in education is relevant because these technologies are favorably perceived by students, therefore, they provide an opportunity to obtain better results. Scientists studied the issue of analyzing feedback from students as part of studying online courses. By using inductive analysis, a data model was developed from listeners' open-response tasks via video link and text format. The result of the study showed the negative and positive sides of the work of both formats, however, we note that each format was used remotely by using digital technologies and distance learning methods. The value of the educational process for students due to the use of digital technologies was not reduced, but on the contrary, its advantages were highlighted: mobility and accessibility from anywhere in the world, at any time and under any circumstances. So, this study of feedback from students evaluating the processes of using digital technologies in the distance learning system proved the advantages of digital processes in the educational process (Ari & Arslan-Ari, 2022).

One of the advantages of the educational process using digital technologies was its accessibility. Numerous of authors identified the need for a conceptual change in the paradigm of consideration of the system of access to education. We are talking about the inclusiveness of education for people with disabilities, as well as for those people who temporarily find themselves in conditions of inclusion, for example, with limited access to educational institutions during the pandemic, due to military conflicts and other factors. Therefore, the analysis of focus groups and individual interviews of students who were interviewed for the determine the role of digital technologies in the system of providing inclusive access to education, made it possible to define new views on the educational process using distance technologies (Pacheco, Lips, & Yoong, 2018).

Furthermore, it is advisable to analyze the issue of introducing digital technologies into business processes. Education is a service delivery area with a high degree of social role. Research conducted among representatives of business, non-governmental organizations and IT specialists determined the role of access to information in modern economic systems. An important element of the introduction of digital technologies to improve the efficiency of business processes is training and expanding the capabilities of employees and companies to use digital technologies. Therefore, it is appropriate to say that educational processes should not only use digital technologies directly, but also among the learning outcomes of students, it is appropriate to define the ability to master digital technologies for the development of business and economic systems (Taimur, Busch, Blount & Picoto, 2021, Oymana, Bala & Ozerb, 2022).

Therefore, when analyzing the processes of using digital technologies in the education system, it is appropriate to converse about their strategic role, and the implementation of such technologies must be defined as a strategic task. Among the main strategic advantages of the use of digital technologies in the educational process, the authors identify the impartiality and objectivity of the results of the assessment of students' skills and abilities, the long-term preservation of information, which is especially relevant in the context of Big Date processes. The strategy should consist not only in the use of digital technologies in the educational process. It is important to change the paradigm of the attitude of the educational and scientific community to the possibilities of using digital processes both in the educational process and to promote the results of their scientific research and innovative educational methods (Gupta, Kulkarni & Toksha, 2021).

It is significant to note that with the increase in the number and availability of gadgets, the process of using digital technologies in the educational process has become accessible and necessary. The development of technologies arouses great interest among young people, so even humanitarian blocks of disciplines and humanitarian specialties should be accompanied by digital support. In particular, the results of such a study were confirmed because of the analysis conducted by scientists among respondents studying for a pedagogical specialty. The purpose of the study was to determine the degree of perception of technological innovations by students of humanitarian specialties. Researchers offered students mobile applications and other information systems that help in learning. As a result of the conducted research, there was an increase in the effectiveness of student learning, which proved the effectiveness of the use of digital technologies in the educational process for humanitarian specialties. Separately, a similar study was conducted for students of technical specialties, which also confirmed with quantitative results the effectiveness of using digital technologies (Cabero-Almenara, Fernández-Batanero, & Barroso-Osuna, 2019).

Research into the role of technological factors in information and communication processes in the field of education is interesting. In particular, the mediating role of the teacher, the effectiveness of digital technologies in education, in particular artificial intelligence and the Internet of Things, are highlighted. However, the problem of man-

made stress and the overload itself in conditions of access to a large amount of information are being developed separately. Therefore, among the tasks of ensuring the competitiveness of educational institutions is the provision of effective management of methodical selection processes and the use of digital technologies to maximize the result of their use (Khan, Nisar, Sohail, & Shehzadi, 2021).

In addition to the application of digital technologies in the education system, an important aspect of ensuring competitiveness is the positioning of the educational institution in the global digital space. The image component is formed by positioning the institution through the work results of each individual employee. The teacher's portfolio, participation in ratings, positioning of achievements is a significant element of ensuring competitiveness. Most of the international educational ratings are formed by accumulating the results of the activities of the teaching staff. Another significant part of the rating is related to mentions of the educational institution in information sources, and the formation of attitudes towards the institution among employers and graduates and students. Thus, an important element of ensuring competitiveness is positioning among stakeholders, which can only be achieved through the effective use of digital technologies in the corporate communications system (Fong, Lee, Chang, Zhang, Ngai, & Lim, 2014).

The analysis of literary sources made it possible to determine the main directions of using digital technologies in the education system. However, the lack of mobile transformations in classical educational institutions determines the practical value of analyzing ways to increase the competitiveness of educational institutions using digital technologies. And the lack of a comprehensive approach to the definition of strategic vectors of management of digital processes in education among empirical studies requires finding ways to solve the outlined problems.

3. Methodology

The analysis of trends in the development of the education sector was carried out by using the methods of synthesis and analysis of statistical data, because of which problematic aspects of the development of the system were singled out. By analyzing the leading world ratings, which was carried out using the methods of statistical analysis and comparison, the structural and functional set of elements ensuring the competitiveness of educational institutions was determined. The task of the research is to determine the role of digital technologies in the education system, so the rating indicators were selected for analysis, which project the results of the institutions' work based on indicators of digital activity. The accumulation of these indicators and their structuring made it possible to determine the elements of the system for ensuring competitiveness. Such ratings for the analysis were the international QS World University Rankings (general rating of academic activity), Webometrics (conducting a comparative assessment of research work, the results of this work and the rating of official sites of educational institutions), Google Scholar Citations (citation ratings of scientific publications and a certain system reputation of scientists) and UniRank (the quality of the educational institution's representation on the Internet, on various web resources, activity in social networks, etc.). Using the

methods of induction and deduction, as well as by analyzing the indicators of these ratings, a structured set of indicators and a control map of the ratings of the digital popularity of educational institutions, as well as a dependence function of competitiveness, have been developed. Using mathematical modeling methods, a projection of the effectiveness of managerial influences on the use of digital technologies in the education system has been developed.

As a result, the article models the effectiveness of using digital technologies as elements of the management system. The projection of the planned results of the use of digital technologies allows modeling the processes of development of the education system. The results of management activities and the use of digital technologies by the world's leading educational institutions were selected for analysis.

4. Results

The development of the education system is directly proportional to the transformations in society. The development of the information society has determined new priorities for the educational process and ensuring the competitiveness of educational institutions. This is the use of digital technologies in most operational processes, as well as the construction of strategic management systems of the educational institution based on the effective use of current digital technologies and the search or development of new technologies.

Among the main trends in the development of education today, it is expedient to identify the following:

- democratization of educational processes, which determines free access to the choice of education, its forms and methods of acquiring knowledge and skills,
- a change in the leading role of classical education, which allows you to acquire knowledge and specific skills by taking individual courses,
- the development of the "lifelong education" trend, which determines the speed of knowledge obsolescence and the need to update it by finding additional materials, taking separate courses, and finding additional education resources. Such a situation occurs due to the speed of transformational processes in education and the development of science and technology,
- the development of the Internet made education accessible to people anywhere in the world. For example, citizens of Third World countries, who previously did not have access to educational resources, can study remotely, even learn certain materials for free, using the resources of open courses of educational platforms, such as, for example, Coursera,
- there is a trend towards an increase in the demand for educational services among women, which is an element of the democratization of society, especially in countries where the role of patriarchal society is clearly visible,

− the formats of school education are changing in accordance with the requests of children of the new generation, who are used to receiving information in larger volumes and have a flickering thinking, which is associated with the use of gadgets in preschool age,
− developed countries increase funding for their own educational systems, since society understands the relationship: a successful economy - modern technologies - an educated society that can work with these technologies and master them, forming a high added value of products.
− the education management system tries to find a balance between classical approaches and the centralization of educational development processes, and the autonomy of educational institutions,
− information resources are developing, digital learning methods are replacing outdated ones,
− the integration of educational institutions into a single global educational space is developing, cooperation between education and business is deepening, which determines additional requirements for educational institutions to ensure the competence of graduates for those innovative production methods offered by the world's leading companies.

Therefore, the leading trends caused by the processes of global integration, customer orientation (focusing on the demands of education seekers and the requirements of the labor market), as well as the introduction of digital technologies into all areas of human life and business processes, are democratization, the expansion of the autonomy of educational institutions, the departure from classical forms and methods of the educational process in favor of digital methods, which are the basis of the formation of the competitiveness of modern educational systems.

The trigger for the development of digital technologies in the education system can be called the following:

− growth in the number of Internet users (more than 5 billion people or 63 % of the world's population),
− expanding the possibilities of using the Internet,
− development of special information products for business and educational needs (platforms for communication, for example, Zoom, Google Meets, MC Teams; distance course platforms, for example, Moodle; applications for smartphones that allow automating most organizational processes in the education system, and offer interactive forms of education),
− the development of the mobile Internet, which makes the education system in the conditions of the use of digital technologies more accessible and operational,
− the development of social networks and the transfer of communications to the Internet space, since communications are one of the basic elements of the educational process in the "teacher-student" interaction system,

− digitization of other operational processes in the education system: bookkeeping, banking settlement system, etc.,
− definition of the Internet as the main source of information search, including educational information,
− the need to use digital technologies in socio-economic processes, which makes it urgent to adapt classical approaches to education to the realities of a digital society.

Having identified the triggers for the development of the education system, the authors selected ratings of educational institutions that most fully describe the level of use of digital technologies by the institution. Among the ratings selected by the authors for analysis: QS World University Rankings, Webometrics, Google Scholar Citations and UniRank.

These ratings reflect the processes of global integration of the education system, and confirm the described higher trends regarding the expansion of the autonomy of educational institutions, their orientation to the demands of consumers (students and businesses as potential employers), as well as requests for the expansion of the use of digital technologies. A brief description of the ratings according to which the study was conducted is presented in the Table 1.

Table 1.
Element-oriented analysis of the structure and a brief description of world ratings of leading educational institutions

The name of the rating	Description	Basic indicators	The number of educational institutions that are evaluated
QS World University Rankings	Generalized academic rating	International Students Ratio, International Faculty Ratio, Citations, Academic Reputation, Employer Reputation	over 1,400 universities from around the world
Webometrics	Quantitative analysis of Internet and web activity of educational and scientific activities	Public knowledge shared, Web contents Impact, Top cited researchers, Top cited papers	over 5000 universities from around the world
Google cholar Citations	Rating of journalistic activity and citations	Citations of authors	over 5000 universities from around the world
UniRank	Rating of the effectiveness of the use of Internet resources and the site	web metrics, the popularity (number of likes or fans count) of their main Facebook page, the popularity (number of followers) of their main Twitter page	13800

The basic indicator of the QS World University Rankings is determined by the academic reputation and the reputation of employees. Academic reputation makes up 40 % of the overall evaluation of the educational institution. This shows the importance of positioning information about the educational institution, its teaching methods, the results of research work, other important information that allows, firstly, to integrate into the global educational space, and secondly, to ensure the confirmation of intellectual property through the publication of research results. So, QS World University Rankings confirms the need to use digital technologies to ensure the most significant indicator for ranking an educational institution – reputation.

The Webometrics world university ranking is the result of data analysis by the Cybermetrics Lab research group, a resource of the Consejo Superior de Investigaciones Sientíficas (CSIC). The rating uses web indicators, quantitative results of journalistic activity, society's access to information about education and scientific activity, indicators of visualization of the presence of an educational institution in social networks, analysis of organic issuance of domains of educational institutions' sites, cyber network analysis. One of the additional rankings that analyzes journalistic activity from the Cybermetrics Lab group is Google Scholar Citations. It is appropriate to highlight the activity rating of sites and social networks separately. The results of the rating are presented in the Table 2.

Table 2.
The results of the rating are presented

№		Academic Reputation	Overall Score	Impact Rank*	Openness Rank*	Excellence Rank*	Google Scholar Citations	Web metrics	Facebook University Ranking	Twitter UR
1	Massachusetts Institute of Technology	1	1	1	4	15	1,017	1	1,307	1,137
2	Cambridge, United States	1	0,988	21	5	14	0,917	17	2,33	0,592
3	Stanford University	1	0,985	3	2	4	1,496	1	1,411	0,729
4	University of Oxford	1	0,984				0,911	12	4,267	0,832
5	Harvard University	1	0,976	1	1	1	1,812	1	6,148	1,224
6	California Institute of Technology (Caltech)	0,97	0,965	23	21	81	1,029	9	0,483	0,168
7	Yale University	0,97	0,997	10	13	29	0,747	10	1,366	0,565
8	UCL	0,95	0,986	43	10	6	0,853	45	0,541	0.120
9	University of Michigan	0,936	0,913	8	12	8	0,813	7	0,495	0,249
10	Imperial College London	0,932	0,922	6	69	10	0,621	81	0,401	0,137

* Webometrics

Analyzing the rating indicators of the leading educational institutions in the world, a function of directly proportional dependence of the university's competitiveness on the indicators selected for the formation of world ratings in the block of application of digital technologies was developed. At the same time, for the formation of dependence, the indicators were grouped into blocks, among which the following were selected: Academic Reputation, Web-metrics, Social media metrics. As a result of these indicators, the authors developed a structured control map of ratings of digital popularity of educational institutions, based on the structural and functional scheme of indicators of competitiveness – Figure 1.

In accordance with the developed structural and functional scheme of digital indicators of the competitiveness of educational institutions, it is proposed to apply the function of the dependence of competitiveness on indicators of the use of digital technologies, which was developed by the authors, formula 1

$$\sum_{n}^{i} \quad GSC_i; \; SP_i; \; WOSP_i; \; HI_i; \; GAR_i; \; SNV_i; \; SV_i; \; SVi_i; \; LFb_i; \; FFb_i; FT_i \quad (1)$$

Where, GSC – Google Scholar Citations,
SP – Scopus publications,
WOSP – WOS publications,
HI – H-index,
GAR – The number of requests to Google Adds,
SNV – Number of site new visitors,
SV – Number of site visitors,
SVi – The number of site views,
LFb – Number of likes in Facebook page,
FFb – Number of fans count in Facebook page,
FT – Number of followers of their main Twitter page,
i – number of the analysis object,
n – total number of sample objects.

Table 1 shows the accumulated results according to the indicators of the proposed indicators of the best educational institutions. Based on the statistical data of the leading world ratings of educational institutions, it is proposed to develop a control map of ratings of the digital popularity of educational institutions. For this, it is necessary to reduce the rating indicators to a single dimension. Some of the rating indicators that are publicly available on the official sites of the rating organizations are presented in natural numbers, for example, Academic Reputation (QS World University Rankings), Facebook University Ranking (UniRank), Twitter UR (UniRank), Google Scholar Citations. Another part of the indicators is represented by the places of educational institutions in the ratings: Impact Rank, Openness Rank, Excellence Rank (Webometrix). To unify the evaluation indicators, the authors propose to define an indicator of 1.00 places in the rating per unit. Accordingly, each subsequent position in the rating will be lower by 0.01. Thus, for the

formation of control maps of ratings of digital popularity of educational institutions, a table of initial data was unified, which is presented in Table 3.
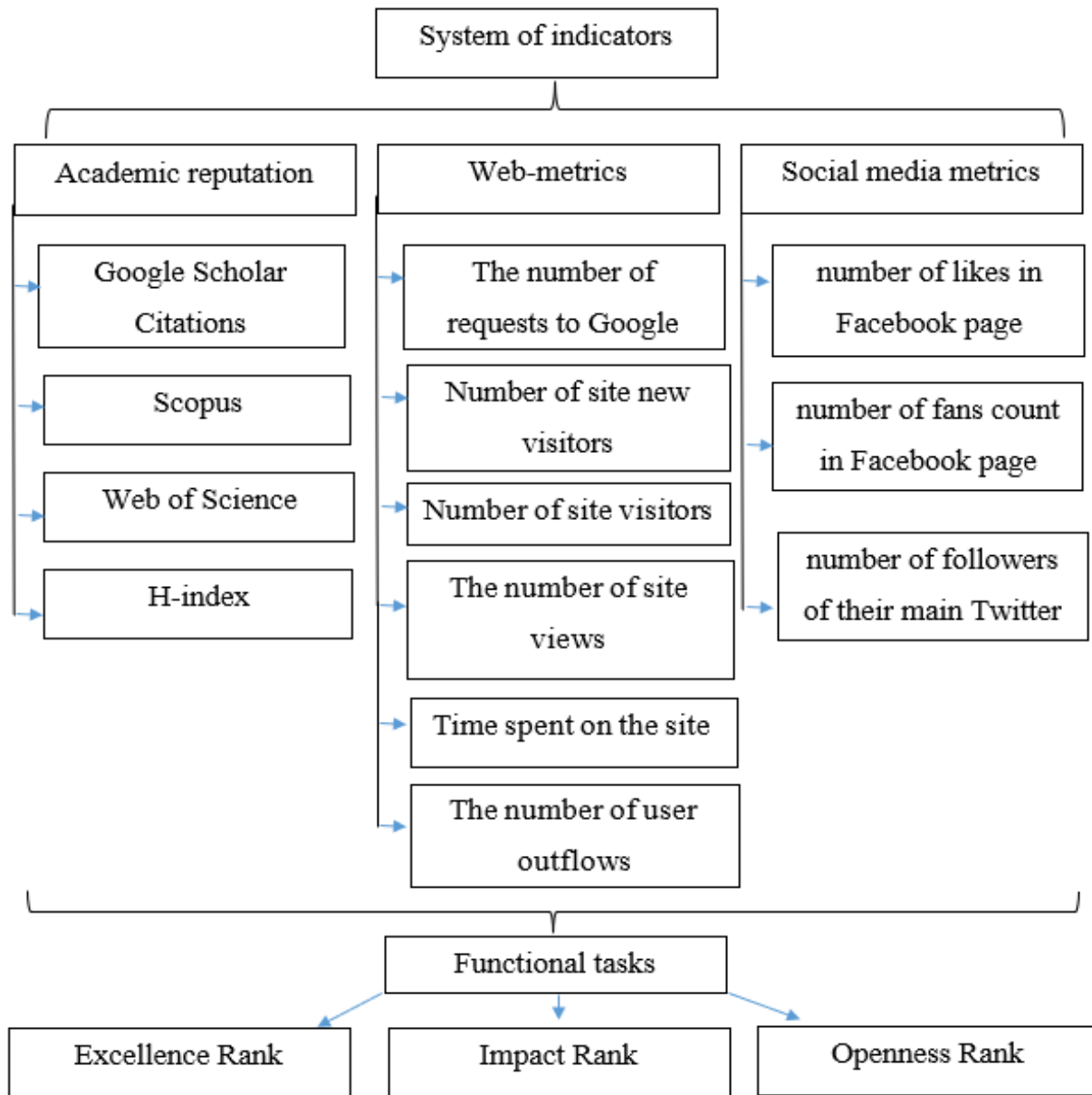

Figure 1. Structural and functional scheme of digital indicators of the competitiveness of educational institutions

Table 3.

Source data for the construction of control maps of ratings of digital popularity of educational institutions

i	Academic Reputation	GSC	∫ SP; WOSP; HI; GAR; SNV; SV; SVi	$\int FFb; LFb$	FT	Groups of indicators		
						Impact Rank	Openness Rank	Excellence Rank
1	1	1,017	1	1,307	1,137	1	0,96	0,85
2	1	0,917	0,83	2,33	0,592	0,79	0,95	0,86
3	1	1,496	1	1,411	0,729	0,97	0,98	0,96
4	1	0,911	0,88	4,267	0,832	1	0,92	0,87
5	1	1,812	1	6,148	1,224	1	1	1
6	0,97	1,029	0,91	0,483	0,168	0,77	0,79	0,19
7	0,97	0,747	0,9	1,366	0,565	0,9	0,87	0,71
8	0,95	0,853	45	0,541	0.120	0,57	0,9	0,94
9	0,936	0,813	0,93	0,495	0,249	0,92	0,88	0,92
10	0,932	0,621	0,19	0,401	0,137	0,94	0,31	0,9

To analyze the initial data, a correlation analysis of the ratio of indicators was carried out. The results of the analysis are presented in the Table 4.

Table 4.

Results of correlation analysis of indicators of digital popularity of educational institutions

i	AR	GSC	∫ SP; WOSP; HI; GAR; SNV; SV; SVi	∫FFb; LFb	FT
AR		0,62	-0,311	0,644	0,808
GSC	0,62		-0,154	0,656	0,653
∫ SP; WOSP; HI; GAR; SNV; SV; SVi	-0,311	-0,154		-0,24	0,556
∫FFb; LFb	0,644	0,656	-0,24		0,737
FT	0,808	0,653	0,556	0,737	

As a result of the analysis, we have a high degree of correlation between Academic Reputation indicators and indicators of journalistic activity and positioning in social networks. However, the Academic Reputation indicator is weakly correlated with web activity indicators.

We will conduct a correlation analysis of the ratio of the resulting indicator of the overall QS rating to the selected indicators. The results of the correlation analysis are presented in Table 4.

Table 5.
The results of the correlation analysis of the final place in the rating for the selected digital indicators

	AR	GSC	∫ SP; WOSP; HI; GAR; SNV; SV; SVi	∫FFb; LFb	FT
K	0,8	0,4	0,5	0,4	0,7

So, because of the correlation analysis, a high level of interdependence of indicators to the final place in the consolidated rating was determined, which confirms the hypothesis about the significant impact of digital indicators on the competitiveness of educational institutions.

As a result of the analysis, it is proposed to form a control map of ratings of the digital popularity of educational institutions. For this, we will use groups of indicators Impact Rank, Openness Rank, Excellence Rank. The statistical data summarized for these groups of indicators are presented in the diagram of Figure 2.
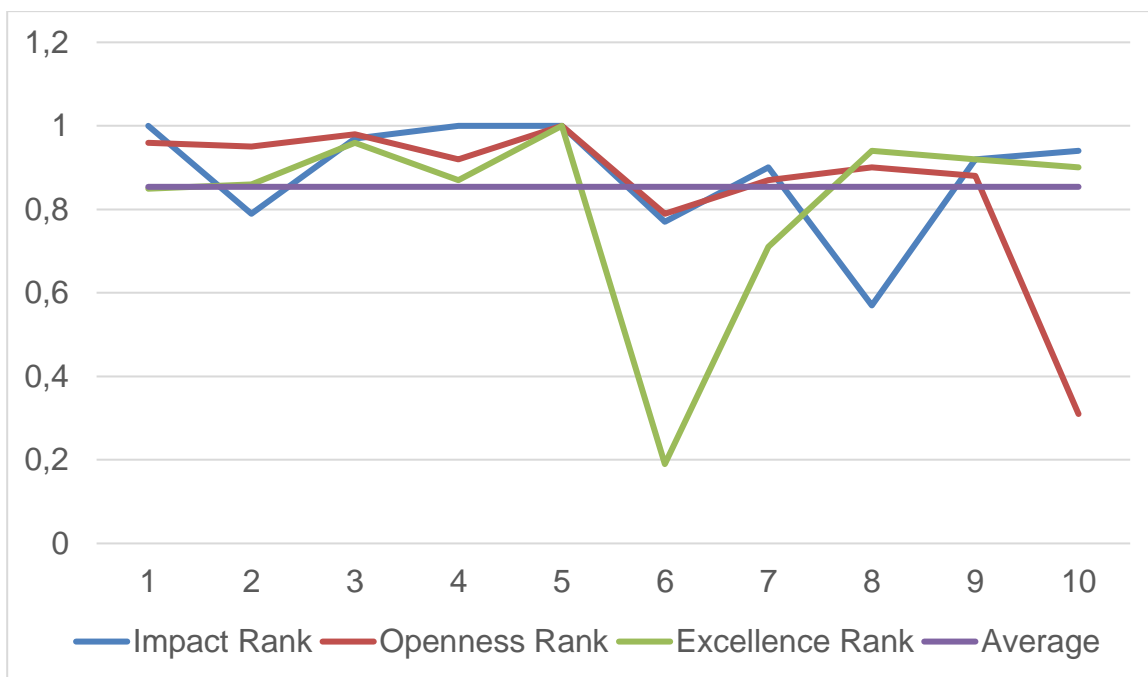

Figure 3. Control map of ratings of digital popularity of educational institutions

In Figure 3 presents a control map formed by groups of digital activity indicators of the world's leading educational institutions. The yellow line of the "average indicator" defines the border between satisfaction with the use of digital technologies in educational institutions (above the average) and the need to find management mechanisms for the introduction of digital technologies in the educational process and the positioning of the educational institution (below the average). This control map can be used to determine

the positions and projection of prospects for the development of digital technologies in an educational institution for ensuring its competitiveness.

5. Discussion

Digital technologies are actively being implemented in all spheres of people's lives. The development of digital technologies is closely related to the development of science and technology, and the needs of modern business in digital specialists and specialists of other specialties who have qualifications and skills in the use of digital technologies determine new requests for the education system (Adonis and Drira, 2007; Bautista-Puig, Orduña-Malea and Perez-Esparrells, 2022). The research hypothesizes that one of the key factors in ensuring competitiveness is the use of digital technologies in the education system.

To confirm the hypothesis, the leading world rankings of educational institutions were analyzed (Tutterow, and Evans, 2016; McCoy, Nelson and Weigle, 2018). Scientists note the role of ratings in the education system as an important factor of competitiveness. Because, firstly, the ratings form an unbiased and objective result of the assessment of the quality of the provision of educational services in accordance with the needs and demands of society. Secondly, the ratings indicate to educational institutions the most urgent tasks that must be performed by managers in order to ensure competitiveness (Markpin, Premkamolnetr, Ittiritmeechai, Wongkaew, Yochai, Ratchatahirun, Lamchatur apatr, Sombatsompop, Kanok-Nukulchai, Inn Beng and Sombatsompop, 2013; Doğan & Al, 2019). Based on the analysis of the leading world ratings, the authors proposed the introduction of a system of indicators characterizing the level of application of digital technologies as a factor of ensuring competitiveness.

Digital indicators, their implementation and impact on the quality of the educational process are a debatable topic among scientists (Jabnoun, 2009; Waheeduzzaman, 2007; Aranguren and Magro, 2020), however, it is worth noting that most scientists are inclined to the opinion that the introduction of digital technologies is directly proportional to the competitiveness of an educational institution. The research confirmed the hypothesis of directly proportional dependence of the selected indicators on the rating indicators of educational institutions, which was proved by the quantitative results of correlation analysis of static data of QS World University Rankings, Webometrics, Google Scholar Citations and UniRank ratings.

As a result of the study, it was proposed to use a control map of ratings of the digital popularity of educational institutions, which can be used in the management system of the competitiveness of educational institutions by determining the level of effectiveness of the use of digital technologies to create the image, reputation and positioning of the educational institution in accordance with public needs.

6. Conclusion

The study analyzed and systematized trends in the development of the education system, determined the important role of digital technologies in ensuring the competitiveness of educational institutions. With the purpose to confirm the hypothesis about the role of digital technologies in ensuring the competitiveness of educational institutions, the leading world rankings of educational institutions were analyzed and indicators that could affect competitiveness were determined. The hypothesis was confirmed by conducting a correlation analysis of the relationships between the indicators and the final ratings. Analyzing the rating indicators of the leading educational institutions in the world, a function of directly proportional dependence of the university's competitiveness on the indicators selected for the formation of world ratings in the block of application of digital technologies was developed. At the same time, for the formation of dependence, the indicators were grouping into blocks, among which the following were selecting: Academic Reputation, Web-metrics, social media metrics. Based on these indicators, a structured control map of ratings of digital popularity of educational institutions was developed, based on the structural and functional scheme of indicators of competitiveness.

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