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TO THE QUESTION OF DIGITALIZATION OF UNIVERSITIES IN THE CONTEXT OF STRIVING FOR ACADEMIC EXCELLENCE

Abstract

The article examines the possibilities of integrating digital technologies into university activities across its four missions: teaching, research, employer engagement, and community interaction. These missions are considered indirect parameters of academic excellence, which can be used to assess the effectiveness of university education. The article also analyzes processes supporting university activities, particularly management processes. An attempt is made to develop scientific, methodological, and conceptual foundations for implementing the academic excellence initiative in higher education. The article provides detailed descriptions of digital platforms and tools corresponding to each of the university's missions aimed at achieving academic excellence. In conclusion, it is noted that digital transformation significantly impacts the achievement of academic excellence through several key aspects: access to resources, personalized learning, interactive teaching methods and virtual reality, flexibility and accessibility, collaboration and networking, analytics and evaluation, innovative research, and future skills development. Thus, digital transformation in universities creates conditions for a higher level of academic excellence by ensuring quality education that meets modern requirements and challenges.

Keywords: academic excellence, digitalization of universities, digital transformation of universities, digital university.

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АКАДЕМИЯЛЫҚ БАСЫМДЫЛЫҚҚА ҚҰМЫТТАНУ ЖАҒДАЙЫНДА УНИВЕРСИТЕТТЕРДІ ЦИФРЛАНДЫРУ МӘСЕЛЕСІ ТУРАЛЫ

Аңдатпа

Мақалада авторлар университет қызметіне цифрлық технологияларды енгізу мүмкіндіктерін оның төрт миссиясы: оқыту, зерттеу, жұмыс берушілермен өзара әрекеттесу, қоғаммен өзара әрекеттесу – арқылы академиялық басымдылықтың көп өлшемді моделінің табиғи қырлары болып табылатын контекстінде қарастырады. Білім сапасының жанама параметрлері болып табылатын танылған рейтингтердің критерийлеріне талдау жүргізілді. Мақалада сонымен қатар университет қызметін, оның ішінде басқару процесін қамтамасыз ететін бизнес-процестер мен процестерді цифрландыру мүмкіндіктері талданады. Жоғары білім саласындағы академиялық басымдылық бастамасын жүзеге асыру үшін ғылыми, әдістемелік және тұжырымдамалық негізді әзірлеуге талпыныс жасалды. Академиялық басымдылыққа қол жеткізу үшін қолданылатын цифрлық технологиялар, платформалар мен құралдар университет миссиялары контекстінде егжей-тегжейлі сипатталған. Ол университеттердің цифрлық трансформациясы келесі негізгі аспектілер арқылы академиялық басымдылыққа жетуге айтарлықтай әсер етеді деген қорытындыға келеді: ресурстарға қолжетімділік,

дербестендірілген оқыту, интерактивті оқыту әдістері мен виртуалды шындық, икемділік пен қолжетімділік, ынтымақтастық және желілік байланыс, аналитика және бағалау, инновациялық зерттеулер, болашақ дағдыларын дамыту. Осылайша, университеттердің цифрлық трансформациясы ағымдағы және болашақ талаптар мен міндеттерге жауап беретін академиялық басымдылықты қамтамасыз ету үшін жағдай жасайды.

Түйін сөздер: академиялық шеберлік, университеттерді цифрландыру, университеттердің цифрлық трансформациясы, цифрлық университет.

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К ВОПРОСУ О ЦИФРОВИЗАЦИИ УНИВЕРСИТЕТОВ В КОНТЕКСТЕ СТРЕМЛЕНИЯ К АКАДЕМИЧЕСКОМУ ПРЕВОСХОДСТВУ

Аннотация

В статье авторами рассматриваются возможности интеграции цифровых технологий в деятельность университета в разрезе его четырех миссий: обучение, исследование, взаимодействие с работодателями, взаимодействие с обществом, которые по своей сути являются гранями многомерной модели академического превосходства. Проведен анализ критериев, признанных рейтингов, являющихся косвенными параметрами качества образования. Также в статье анализируются возможности цифровизации бизнес-процессов и процессов, поддерживающих деятельность университета, в том числе процесса управления. Предпринята попытка разработки научно-методологических и концептуальных основ реализации инициативы академического превосходства в сфере высшего образования. Подробно описаны в разрезе миссий вузов цифровые технологии, платформы инструменты, используемые для достижения академического превосходства. В заключении сделан вывод о том, что цифровая трансформация университетов существенно влияет на достижение академического превосходства через следующие ключевые аспекты: доступ к ресурсам, персонализированное обучение, интерактивные методы обучения и виртуальная реальность, гибкость и доступность, сотрудничество и сетевое взаимодействие, аналитика и оценка, инновационные исследования, развитие навыков будущего. Таким образом, цифровая трансформация университетов создает условия для обеспечения академического превосходства, отвечающего современным и будущим требованиям и вызовам.

Ключевые слова: академическое превосходство, цифровизация университетов, цифровая трансформация университетов, цифровой университет.

Main provisions

Digital technologies have had a significant impact on the specifics of the learning process at universities, creating new opportunities and changing the roles of students and teachers. Academic excellence involves continuous improvement in the process of preparing competitive graduates that meets the changing requirements of the labor market and the post-industrial economy.

The rankings contain direct and Digital transformation of universities significantly affects the achievement of academic excellence through several key aspects: access to resources, personalized learning, interactive teaching methods and virtual reality, flexibility and accessibility, collaboration and networking, analytics and assessment, innovative research, development of skills of the future. indirect indicators of the quality of education and academic excellence in the context of university missions.

The integration of digital technologies into the activities of the university occurs in the context of its four missions: teaching, research, interaction with employers, interaction with society, as well as in the context of the processes supporting the activities of the university, particularly the management process. The digitalization of education increases competition between universities, moving it from

the local to the global level, in connection with ensuring the sustainability of universities and creating ecosystems in which universities play leading roles is of particular importance.

Introduction

Academic excellence is a complex concept that involves training professionals at universities who succeed in the job market and support the country's competitiveness. Initiatives aimed at achieving academic excellence focus on advancing universities, continuously improving education, and increasing graduates' competitiveness. Digital technologies have led to the emergence of concepts like Economy 4.0 and the post-industrial economy, marking another information revolution that has reshaped professions and occupations. However, the digitalization of real, product-producing sectors of the economy has significantly outpaced the digital transformation of education [1]. The speed and volume of information processing have changed. The internet, social media, big data, and artificial intelligence have brought people closer together, creating a unified space where everyone is informed, aware of global processes, and can access information about anyone. Marshall McLuhan's 1962 metaphor of a "global village" has become a reality. The application of the quintuple helix model in universities supports their sustainability by digitizing all processes, integrating various development perspectives for the benefit of society [2]. The transformation of society is also changing university processes, including digitalization and analysis [3]. Researchers suggest that such measures are common in most neoliberal university policies within the context of academic excellence programs. Digitalization has become a critical factor in decision-making for effectively implementing quality standards, as it allows the use of numerous standardized forms and templates to automatically recognize and analyze data needed for management decisions. The trend towards enhancing university efficiency and reducing costs involves ensuring sustainability through continuous big data analysis during decision-making [4]. Digital transformation is leading to the emergence of the digital university model – a smart university where all processes are digitized at a systemic level, prioritizing AI technologies [5].

Universities in the new digital reality must systematically address challenges such as globalization, attracting new students, entering new markets, marketing promotion, massification, digitalization, creating digital twins, and promoting sustainable development goals [6]. Consequently, universities are evolving towards a new model called the digital university, which involves not only integrating new technologies but also strategically transforming systems, processes, and people [7-8]. Digital universities will dominate the education market and become leaders, provided they transform into partnership ecosystems that facilitate the acquisition, exchange, and generation of digital skills and technologies necessary for developing and managing the digital world [9]. Academic excellence becomes unattainable without the systematic digitalization of universities.

The standardization of university processes, harmonization of education levels based on the Dublin Descriptors, Qualification Frameworks, and Professional Standards, as well as internationalization, academic mobility, accreditation, and distance learning, have laid the foundation for viewing the university as a fractal and allowed the duplication of processes, approaches, teaching materials, and instructors. As a result, universities are gradually transforming into a global, distributed campus. Universities, through digital technologies, provide people with opportunities for education in a virtual environment, ensuring educational quality while changing the roles of teachers and students. The accessibility of education and digital educational resources has exponentially increased [10-11].

Thus, there is a need to identify the impact of digitalization of universities in the context of the pursuit of academic excellence through the development of scientific and methodological foundations and concepts. At this stage, there is very little research on this issue.

Research Methodology

The research employed a multifaceted methodological framework, incorporating systems analysis, narrative review, and reflective practices derived from administrative activities within the university context. The conceptualization of the "digital university" remains nascent, necessitating an evolving

methodological approach that integrates both theoretical models and practical applications. The study utilized a combination of qualitative and quantitative data sources to assess the impact of digital technologies on university processes, with a specific focus on academic excellence and its associated indicators.

Results of the study

Digital Transformation in Higher Education

The transformation of higher education institutions into digital ecosystems is vital to maintaining academic excellence in the 21st century. Digitalization affects various facets of university operations, from teaching and research to governance and external engagement.

1. Educational Enhancement. Digital tools such as Learning Management Systems (LMS) and Massive Open Online Courses (MOOCs) provide global access to education. By personalizing learning experiences and expanding access to high-quality content, universities can reach a diverse population of students [11] (Alenezi et al., 2023). Hybrid learning models – combining in-person and online methods – further facilitate student engagement and knowledge retention.
2. Research and Collaboration. Cloud-based collaboration platforms and virtual research environments have revolutionized academic research. These tools enable real-time, cross-institutional collaboration, allowing researchers to conduct experiments using virtual labs, data analytics, and simulation tools [4] (Sulkowski, 2023). The digital university enhances research output by fostering innovation and interdisciplinary collaboration.
3. Governance and Decision-Making. Big data analytics and AI-driven tools have become integral to university decision-making processes. Data gathered through administrative, academic, and financial systems are used to track performance, forecast trends, and optimize resource allocation [6] (Giesenbauer & Müller-Christ, 2020). These technologies also provide insights into student success, allowing institutions to tailor interventions for students at risk of academic failure.
4. Challenges and Considerations. Despite the opportunities offered by digital transformation, universities face significant challenges, including the digital divide, cybersecurity concerns, and infrastructure limitations. Addressing these challenges requires a balance between adopting new technologies and ensuring equitable access to resources [5] (George & Wooden, 2023).

Digital University as a Strategic Ecosystem

The digital university model encompasses more than the mere adoption of technologies. It represents a shift towards a strategic ecosystem that fosters collaboration, innovation, and sustainability.

1. Collaborative Ecosystems. Digital universities form partnerships with industries, research institutions, and technology providers to create a networked ecosystem. These partnerships provide students and faculty access to state-of-the-art technologies, enhancing both the learning environment and research capabilities [7] (Fernández et al., 2023).
2. Sustainability and Infrastructure. The digital transformation process supports sustainable development by optimizing resource usage and reducing operational costs. Cloud computing, AI-based decision tools, and other digital solutions enable universities to align with the United Nations' Sustainable Development Goals (SDGs) [2] (Carayannis & Morawska-Jancelewicz, 2022).
3. Virtual Learning Environments. The advent of virtual campuses and digital learning environments offers greater flexibility and accessibility in education. This approach supports lifelong learning, allowing individuals to continually upskill and adapt to the demands of the digital economy [9] (Rousseau, 2023).

Digital technologies to achieve academic excellence

The use of digital technologies in higher education to achieve academic excellence encompasses various aspects, from improving the learning process to enhancing research activity and data

management. Below are the main areas of university digital transformation in relation to its processes and ecosystem creation.

Academic excellence involves training competitive graduates who meet the evolving demands of the labor market and post-industrial economy. The effectiveness of training, and therefore the level of academic excellence, can only be assessed retrospectively over a long period. However, there are secondary indicators and criteria that are essentially indirect parameters of academic excellence, suggesting the effectiveness of university training. These parameters include the main criteria of the four most well-known university rankings, categorized by the university's missions:

1. Teaching:
- Academic reputation (QS, THE)
- Ratio of undergraduates to doctoral students (THE)
- Attractiveness to international students (QS, THE)
- Attractiveness to international faculty (QS)
- Student-to-teacher ratio (QS, THE)
- Number of full-time faculty (ARWU)
- Development and teaching of courses on sustainable development (Greenmetrics).

2. Research:
- Research reputation (THE)
- Publication activity of researchers, including the number of publications per scholar in Scopus (QS)
- Number of publications in Nature & Science (ARWU)
- Number of WoS-indexed publications (ARWU)
- Number of publications prepared in collaboration with international researchers (QS)
- WoS citation index (THE)
- Number of Nobel or Fields Medal laureates among faculty (ARWU)
- Number of highly cited researchers among faculty and graduates (ARWU).

3. Labor Market Interaction:
- Employer reputation (QS)
- Graduate employment rate (QS)
- Contribution to industry, revenue from companies using its inventions and innovations (THE).

4. Societal Engagement:
- Number of successful graduates (QS)
- Research within the framework of the UN Sustainable Development Goals (QS)
- Greenmetrics indicators of resource consumption and conservation
- Compliance with environmental norms (Greenmetrics).

Digital technologies play a significant role in advancing universities in global rankings by enhancing compliance with criteria, thereby indirectly influencing the quality of graduate training. Below are the opportunities for integrating digital technologies into university activities based on its four missions: teaching, research, employer engagement, and societal engagement, as well as supporting university processes, particularly management. The university management process, like all processes, follows the PDCA cycle – plan, implement, check/control, and make decisions. Digitalization accompanies all these stages. There are software tools for strategic planning, cascading, and monitoring. Corporate email systems that manage document flow ensure information dissemination and support decision-making. Collaboration platforms like Zoom Workplace, Microsoft Teams, and Google Workplace enable seamless work among colleagues, sometimes located in different parts of the world, monitoring work processes and ensuring decisions are implemented on time. Online meetings have become the norm, as AI now transcribes and subtitles these meetings, which are then used to create minutes. Digital traces allow events to be recorded and stored. Applications like Power BI and others (Statistica, 1C. Analytics, etc.) enable data analysis, visualization, accumulation, and comparison of large volumes, facilitating deep, time-series research. Modern corporate management systems impact productivity by monitoring staff activities, including

account usage, university e-resources, cloud technology, scientific databases, digital libraries, and the use of computer and printing equipment. Implementing CRM systems and other digital tools help optimize administrative processes, improving efficiency. Using data to analyze program, course, and initiative effectiveness allows universities to make informed decisions to enhance the academic environment. The university's first mission is education – the transfer of societal culture into student knowledge, meaning effectively fostering cultural internalization in a person's mind. All attention is focused on ensuring educational quality. All graduates must achieve the learning outcomes declared in the program. The transmission of culture occurs both in education and character development:

- Online courses and MOOCs allow universities to expand access to quality education, attracting students from different regions and other countries. Furthermore, online courses attract students for virtual academic mobility programs, which may later lead to offline education at other universities.
- Educational platforms enable universities to become global, recognized by students from various countries. The availability of courses from leading universities posted on educational and institutional platforms levels the quality of education, showcasing the best teaching practices and courses.
- Hybrid learning, combining traditional and online methods, allows students to learn at their own pace while teachers can tailor materials to different learning styles.
- Platforms for collaboration (e.g., Google Classroom, Google Docs, Microsoft Teams, Canva, Notion, ClickUp) create interactive environments where students can engage with each other and their instructors.
- Learning management systems (LMS) manage educational processes, course transfers, student progress tracking, data monitoring, and trend identification in university learning.
- Adaptive learning systems analyze student performance and provide personalized study material recommendations, enhancing knowledge acquisition.
- Data analytics to track student performance ensures quality and process adjustments, helping universities identify problem areas and provide timely support where needed.
- Digital tools for collecting student feedback on courses and instructors help universities improve education quality based on real data.
- Digital laboratories, including virtual labs, allow experiments and research in a safe environment with unlimited repetitions for each student.
- Access to digital libraries 24/7 helps students and faculty find current information for educational purposes.
- Digital technologies allow universities to establish connections with educational institutions worldwide, opening opportunities for student and faculty exchanges, joint research, and projects.
- Software helps create unique educational paths by optimizing routes based on graph theory, building optimal learning trajectories.
- Messengers, corporate e-mail systems.

Research Mission:

- Use of cloud technologies and specialized platforms (e.g., ResearchGate) for collaboration on scientific projects accelerates research processes and improves quality. In joint research, methodologies are transferred, best practices are adopted, and approaches are compared. An essential factor is the presence of researchers who think beyond the boundaries and limitations inherent in the research culture of a specific university or country. Another approach is to establish mirror laboratories that conduct the same research in another country, constantly comparing and discussing the results. Sometimes distributed laboratories emerge, where different stages of the research are conducted at different universities. Virtual laboratories, where scientists from various countries can work simultaneously, also deserve special attention.
- Organization of virtual and hybrid dialogue platforms, online forums, and conferences simplifies the participation of scientists and students in international discussions, promoting knowledge and idea exchange. New ideas are quickly transformed into knowledge and disseminated to a broad audience of scientists. Online platforms facilitate the rapid spread of ideas and help find

individuals interested in discussing or continuing the research. Additionally, digital services like YouTube and Facebook serve as repositories, storing broadcasts and various event recordings, allowing access at any time.

- Descriptive information models allow the collection, storage, and analysis of information written in natural language.
- Development environments (e.g., R Studio, MS Visual Studio) and specialized programs (e.g., MathCAD, MATLAB) enable the creation of mathematical models that form the basis of research. These environments allow for simulation modeling, virtual debugging of models, and experiments.
- Scientific platforms help identify top researchers, recognize those whose studies have gained prominence, and provide equitable access to new knowledge.

Mission: Engagement with Employers

- Digital student portfolios allow interested employers to access comprehensive information about students.
- Employers can promptly express their needs for research to be conducted by researchers and students from various universities.
- Digital and virtual technologies make it possible to involve students from different universities in internships within virtual spaces without physical relocation, enabling dual learning and continuous professional practice, particularly in humanities and IT programs.

Mission: Engagement with Society

- University websites, digital educational platforms, digital resources, and libraries provide reliable information beneficial for developing the competencies of citizens and community members. MOOCs deliver knowledge and foster new learning outcomes, upgrading existing competencies.
- Universities also promote digital literacy in society by offering courses and programs for the elderly, bridging skill gaps, expanding opportunities, and minimizing digital inequality.
- In the digital world, universities' role in informing the public extends beyond reporting on their processes and specifics; they also actively participate in building a sustainable society, including implementing the UN Sustainable Development Goals.

Discussion

Digital technologies open new horizons for universities in their pursuit of academic excellence. Their use not only enhances educational quality but also promotes scientific achievements, international cooperation, and effective management. It is crucial for universities to actively integrate these technologies into their practices, adapting to the modern demands of the educational environment. Digitalization intensifies competition between universities, shifting it from a local to a global level, which emphasizes the importance of ensuring the sustainability of universities and creating ecosystems where universities play a central role.

Conclusion

The digital transformation of universities plays a vital role in enhancing academic excellence. By integrating digital tools into their core functions, universities not only improve the quality of education but also strengthen research capabilities and foster global collaboration. However, successful digital transformation requires a comprehensive strategy that incorporates technological, organizational, and cultural changes. As universities evolve into digital ecosystems, they must navigate challenges such as the digital divide and cybersecurity while leveraging the opportunities presented by new technologies. Ultimately, digital universities will serve as catalysts for innovation, contributing to the development of a more equitable and sustainable global society.

The transformation of digital universities into full-fledged digital ecosystems characterizes the current stage in higher education development. These processes are systematic and encompass various aspects of activities, creating new opportunities and alliances. The transition to digital technologies not only changes traditional educational processes but also creates unique opportunities for personalized learning, increased accessibility, and improved quality of educational content.

However, the successful implementation of digital university transformation requires a detailed systematic approach, including technological, resource, and organizational changes, as well as human capacity development. Additionally, social and cultural aspects must be considered to ensure inclusiveness and equal access to educational resources for all students. In a rapidly changing world, digital universities should not only serve as knowledge repositories but also as open sources of innovation, transforming society and contributing to the achievement of sustainable development goals. In the aspect of human potential development, universities foster critical thinking, creativity, and skills necessary for successful professional activity not only among students but also for regional residents through lifelong learning. Thus, a country's competitiveness directly depends on the quality and attractiveness of higher education. In turn, the future of higher education will be defined by universities' ability to adapt to new challenges and leverage digitalization and artificial intelligence opportunities. The digital transformation of universities significantly influences the achievement of academic excellence through several key aspects: resource access, personalized learning, interactive learning methods and virtual reality, flexibility and accessibility, collaboration and networking, analytics and assessment, innovative research, and skills development for the future. Hence, the digital transformation of universities creates conditions for a higher level of academic excellence, providing quality education that meets contemporary demands and challenges.

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