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A Systematic Review on Digital Transformation and Organizational Performance in Higher Education

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ABSTRACT

This study aims to conduct a systematic literature review on digital transformation and organizational performance in higher education. By reviewing 183 publications obtained from the Scopus database, this study identified research trends and key focus areas in digital transformation and organizational performance in the higher education sector. Key findings include the increase of trend research on this topic, identification of the most influential journals, most active researchers, identification of core focus areas, geographical distribution of research in these studies. The results not only show an increased interest in digital transformation in higher education but also highlight the dominating research areas within the scope of this study. In conclusion, this study highlights the relevance of digital transformation in higher education by providing insights into the trends and areas that are the main focus of current research.

1. INTRODUCTION

Digital information technology has become integral to modern human life [1, 2]. In an increasingly sophisticated digital era, digital transformation (DT) has become an urgent need for various sectors, including higher education. Digital technologies affect the way we access and disseminate information, as well as how organizations operate and compete [3, 4]. In the scope of higher education, digital transformation can have a significant impact on organizational performance, ranging from operational efficiency to the quality of education. Various studies have proven that digital transformation plays an important role in organizational performance in higher education. Digital technology is not only used as a tool but also as part of an overall strategy to make the education process more efficient [5-7]. Linh et al. [7] found that digital transformation triggers an increase in students' digital capacity, on the other hand, organizations are able to adapt their processes, products, or services quickly to changes and capture existing challenges and opportunities. DT is also considered to provide convenience for educational actors in communication and interaction [2, 3, 8], management and administration [9], and adaptability and flexibility [5, 10].

Studies conducted [11] found that digital transformation increases accessibility, interaction, and communication between educational actors, both students and teachers. The use of communication technology caters to different needs and preferences allowing more personalized and effective communication [2, 3]. Digital transformation such as the use of online platforms also allows higher education institutions to be more flexible in providing educational services, providing learning materials that can be accessed anytime and anywhere [12].

The transformation to a more integrated and digital-based system is proven to increase effectiveness in various services or dimensions involved in higher education such as teaching, administration, finance, curriculum, human resources, and information. The application of digital technology facilitates a more engaging and interactive learning experience [13]. On the other hand, system-based administrative and financial services accelerate the flow of performance through automation and digital tracking [14]. Information services become more efficient by leveraging digital databases, data storage, retrieval and ease of information accessibility [15].

Curriculum development is also an important foundation in developing students' abilities and skills, helping to ensure the relevance of education to world demands. Digital-based curriculum development (data driven) and data analytics allow the formation of a more adaptive curriculum to adjust student learning performance and learning outcomes [16]. Digital transformation also plays an important role in human resource aspects, such as the utilization of digital tools for the recruitment process of education personnel, employees, staff, and lecturers [17]. Another positive implication of DT is the

implementation of training using digital platforms to develop the skills of employees and lecturers, support performance management and help increase engagement between members and departments [18].

However, although much research has been conducted into the role of digital transformation on organizational performance in higher education, there is still a need to systematically review the existing literature. Based on previous literature, no research has narrowly discussed bibliometric analysis of digital transformation and organizational performance in higher education. This article aims to identify research from 2017 to 2023 through systematic literature review. The research will be the basis of information for researchers to understand how research trends are evolving and understand the key focus areas in the scope of digital transformation and organizational performance in higher education. This research will answer the research questions listed in Table 1.

Table 1. Research question

No.	Research Question
RQ1	What is the distribution of studies selected by year in the area of digital transformation on organizational performance in higher education?
RQ2	Which journals are most influential in the area of digital transformation on organizational performance in higher education?
RQ3	Who are the most active and influential researchers in the field of digital transformation and organizational performance in higher education?
RQ4	What research focus (keywords) are most frequently chosen by researchers in the field of digital transformation on organizational performance in higher education?
RQ5	What is the distribution of scientific publications by country and organization within the scope of this study?
RQ6	What is the distribution of scientific publications by research area within the scope of this study?

This article will be divided into 5 parts, namely an introduction to the research in section one, section two; review methodology, section three; bibliometric analysis / descriptive statistics, and section four; review and discussion.

2. METHODOLOGY

In conducting research, the literature review is very important in building a strong knowledge base on the scope of the research to be carried out. This research uses the systematic literature review (SLR) methodology. Based on SLR research that has been done before [19], the SLR stages include 3 parts, namely planning, developing/conducting, and reporting results.

2.1 The planning stage

The planning stage begins with formulating research questions and determining the sources of information/literature that will become the research database. The formulation of research questions is adjusted to the research objectives and contains the right keywords to search for relevant literature. The type of literature/publication used in this research is an article in the electronic journal database from Scopus. The formulation of research questions can be seen in Table 1.

2.2 The development/conducting stage

At this stage, the steps taken include selecting digital libraries or digital databases, defining title keywords, defining search strings, retrieving the initial list of literature reviews, excluding primary studies based on full text, and creating a final list that includes primary studies/literature that meet the criteria and will be the basis for conducting further analysis. An overview of the process can be seen in Figure 1.

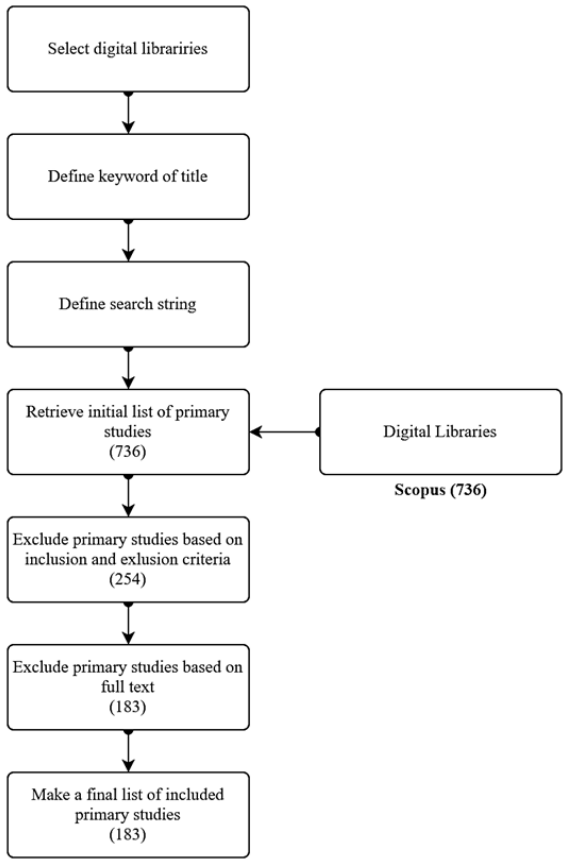

Figure 1. The flowchart of the development stage

The database used is Scopus to ensure that the publications available are high quality publications. The next step is to define the keyword of title, the main keywords used in the literature search include digital transformation, organizational performance, higher education and other relevant keywords such as university.

The next step is to define a search string that is used to narrow or expand the scope of the search including a combination of several title keywords and logical operators such as ("AND", "OR, "NOT"). Search string can be seen in Table 2

Table 2. Search string used in the literature search

Scopus
(TITLE-ABS-KEY (digital AND transformation) AND TITLE-ABS-KEY (organizational AND performance) OR TITLE-ABS-KEY (higher AND education) OR TITLE-ABS-KEY (university)) AND PUBYEAR > 2013 AND PUBYEAR < 2024 AND PUBYEAR > 2016 AND PUBYEAR < 2024 AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar"))

Retrieve initial list of primary studies is the next step, based on the initial search through a predetermined search string obtained as many as 736 publications from the Scopus database. Inclusion and exclusion criteria were used in selecting the primary studies that would serve as the basis for the research literature. These criteria are described in Table 3.

Table 3. Inclusion and exclusion criteria

Inclusion Criteria	All Open Access Articles
Exclusion Criteria	Research from 2017-2023 Research containing keyword digital transformation, organizational performance, and higher education/university Research outside the scope of higher education Non-English research Publications other than articles (conference papers, reviews, books, etc.)

From the 736 publications, 254 articles were filtered based on title and abstract as well as conformity with the research topic of digital transformation and organizational performance in higher education. The next step is to exclude primary studies based on full text, 180 articles were obtained which became the final list of articles to be analyzed bibliometrically.

2.3 The reporting result

The reporting results section includes the results of the descriptive statistics and bibliometric analysis that have been carried out will be explained in Sections 3 and 4. This result will directly answer the research question (RQ) in Table 1.

3. DESCRIPTIVE STATISTICS AND BIBLIOMETRIC ANALYSIS

3.1 Distribution of selected studies

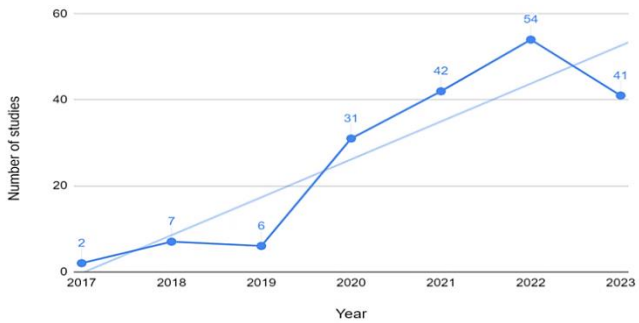

Figure 2. Distribution of selected studies over the years

In this subsection will answer RQ1, the data obtained in CSV form through the database is statistically analyzed using Microsoft Excel. Figure 2 shows the distribution of selected studies within the scope of the role of digital transformation on organizational performance in higher education. Understanding the distribution of selected studies provides insight into the development and trends of research in this area over time. Based on 183 articles in the research database, there is an increasing trend in the number of studies over the past 6 years, which indicates that there is an increase in researcher interest in this field from year to year.

3.2 Significant journal publication

RQ 2 will be answered in this sub-section of the study. Figure 3 shows eleven journals that have at least 3 articles related to the digital transformation of higher education. Based on the selected pool of research in this area, the most significant journal is Sustainability (Switzerland) with a total of 19 publications, followed by the Journal Education Science with 12 publications, Journal Education and Information Technologies with 9 publications, the International Journal of Emerging Technologies in Learning with 6 publications. Understanding which journals are significant is the basis for researchers to find credible sources that are relevant as references for further research.

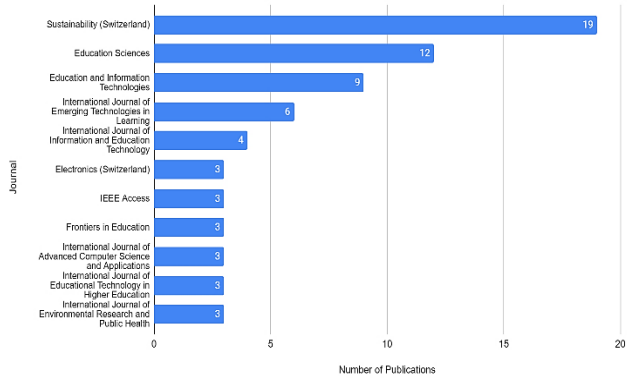

Figure 3. Number of articles from each journal

Table 4. Scimago Journal Rank (SJR) of selected journal

No.	Journal Publications	SJR	Q Category
1	International Journal of Educational Technology in Higher Education	2.05	Q1 in Education
2	Education and Information Technologies	1.249	Q1 in Education
3	IEEE Access	0.93	Q1 in Computer Science
4	International Journal of Environmental Research and Public Health	0.83	Q2 in Public Health, Environmental and Occupational Health
5	Frontiers in Education	0.66	Q2 in Education
6	Electronics (Switzerland)	0.63	Q2 in Computer Network and Communication
7	Education Sciences	0.61	Q2 in Education
8	International Journal of Emerging Technologies in Learning	0.54	Q2 in Education, E-learning
9	Sustainability (Switzerland)	0.37	Q3 in Control and System Engineering
10	International Journal of Advanced Computer Science and Applications	0.26	Q3 in Computer Science
11	International Journal of Information and Education Technology	0.24	Q3 in Education

Table 4 provides an overview of journal rankings based on the Scimago Journal Rank (SJR) and Q categories (Q1-Q3) of the most significant journals of selected studies. The journals in this table are sorted based on their SJR value, which indicates their level of influence and academic quality. The higher the SJR value of a journal, the higher its ranking and impact in its field.

3.3 Keyword co-occurrence and average publication year

Co-occurrence analysis was conducted to identify keywords or authors in the collection of literature that has become the database of this research. The analysis was conducted using Vos Viewer to understand how certain topics/keywords can relate to one another or an overview of how certain authors collaborate in this research field. Understanding keywords or topics helps in understanding what the main focus or topic is related to in the scope of this research. The visualization of co-occurrence keyword is depicted in Figure 4 and Figure 5. The analysis results are divided into 5 clusters and are distinguished by color. Cluster 1 with red color consists of 10 items focusing on education, students, human, and leadership. Cluster 2 with green color consists of 9 items focusing on teaching and learning, education 4.0, and industry 4.0. Cluster 3 in blue consists of 8 items focusing on digital transformation in higher education/university. Cluster 4 in yellow consists of 6 items focusing on innovation, digital literacy, digital competence, and information and communication technology (ICT), and Cluster 5 in purple is related to the COVID-19 pandemic, e-learning, and metadata in higher education.

Based on the results of Co-occurrence analysis through VosViewer software, a total of 38 keywords/items were obtained if at least 5 or more keywords were used in the literature being analyzed. The keywords that come out most often in this study are digital transformation (Occ. = 93, TSL = 222), higher education (Occ. = 82, TSL = 229), covid-19 (Occ. = 28, TSL = 119), e-learning (Occ. = 21, TSL = 94), education (Occ. = 28, TSL = 119), e-learning (Occ. = 21, TSL = 94). = 21, TSL = 94), education (Occ. = 19, TSL = 71), students (Occ. = 15, TSL = 70), digital technologies (Occ. = 15, TSL = 58), teaching (Occ. = 14, TSL = 84), and learning (Occ. = 15, TSL = 58). By the average publication year (APY), the research keywords teaching and learning (2022.2), industry 4.0 (2022.17), higher education institute (2022), and pandemic (2022) are the keywords used in this latest research.

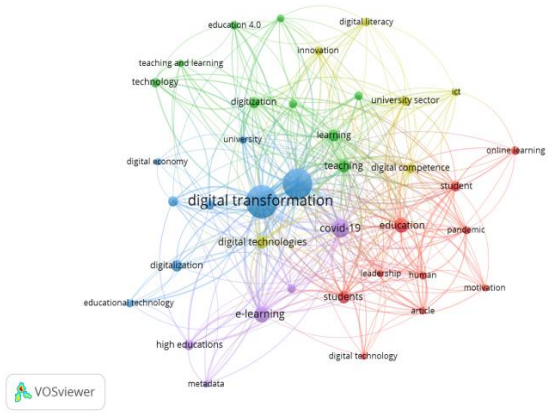

Figure 4. Network visualization of co-occurred keywords

Table 5. Summaries of co-occurrence keywords and average publication year

Cluster#1 (Red)	Occ	*TSL	`APY	Cluster#4 (Yellow)	Occ	*TSL	`APY
Article	5	41	2021.8	Digital competence	10	30	2021.5
Digital technology	5	14	2021.2	Digital literacy	7	20	2021.57
Education	19	71	2020.84	Digital technologies	15	58	2021.33
Human	6	45	2021	ICT	6	24	2021.33
Leadership	5	28	2021.4	Innovation	7	31	2021.86
Motivation	5	16	2021.2	University sector	8	47	2021.13
Online Learning	7	15	2021.43				
Pandemic	6	36	2022				
Student	9	55	2021.44				
Students	15	70	2021.07				
Cluster#2 (Green)	Occ	*TSL	`APY	Cluster#5 (Purple)	Occ	*TSL	`APY
Digitization	11	60	2021.82	Covid-19	28	119	2021.43
Education 4.0	7	20	2021.71	Covid-19 pandemic	7	29	2021.57
Industry 4.0	6	24	2022.17	E-learning	21	94	2021.19
Learning	13	83	2021.77	High education	9	39	2021.56
Sustainability	7	30	2021.43	Metadata	5	18	2020
Sustainable development	7	27	2020.86				
Teaching	14	84	2021.21				
Teaching and learning	5	20	2022.2				
Technology	8	25	2021.63				
Cluster#3 (Blue)	Occ	*TSL	`APY				
Digital economy	5	5	2020.8				
Digital education	8	33	2021.75				
Digital transformation	93	222	2021.59				
Digitalization	12	17	2021.17				
Educational technology	6	13	2021.67				
Higher Education	82	229	2021.38				
Higher education institute	10	29	2022				
University	6	21	2021.5				

*TSL = Total Strength Link `APY = average publication year ^2022.2 = year 2022 & 0.2 year (February 2022)

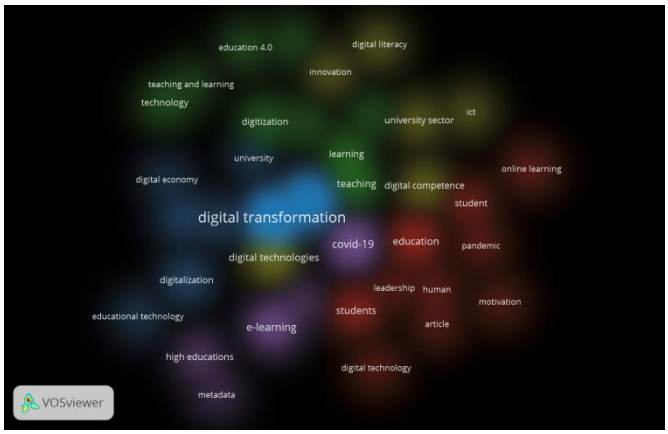

Figure 5. Density visualization of co-occurred keywords

3.4 Most active and influential researcher

Based on the selected set of key studies, a comprehensive analysis has been conducted to identify researchers who have made significant contributions to this area of research. Figure 6 shows the results of the co-authorship analysis using vos viewer while Figure 7 shows the results of the descriptive analysis of significant authors. Based on both analyses, the most active researchers were found to have produced at least 3 publications/articles related to this research either as main author or co-author. The results show that researchers Alenezi, M. (6 studies), and Akhmetshin, E.M. (4 studies) are the researchers with the most significant contributions within the scope of this research. Figure 5 shows researchers (Diaz-Noguera, M.D. and Hervas-Gomez), (C., Akhmetshin, E.M., Saifullin, M.R., and Vasilev, V.L.), (Alenezi, M., and Akour, M.) who have co-authored articles.

Figure 6. Co-authorship author

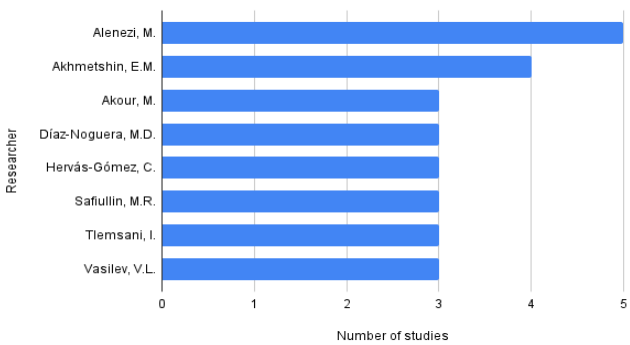

Figure 7. Influential researchers and number of studies

3.5 Publication by country and organization

This sub-section will answer RQ5, out of 183 publications used as primary studies. Identifying the distribution of scientific publications by country and organization gives an idea of the contribution of countries or institutions in the scope of this research. Based on the analysis, Russia (29) is the country with the highest number of publications, followed by Spain (23), Saudi Arabia (13), United Kingdom (13), and Portugal (10) as shown in Table 6. In terms of organization, Prince Sultan University (6) is the university with the highest number of studies, followed by Kazan Federal University (5).

Table 6. Publications by country and organization

Country	Records	Organization	Records
Russian Federation	29	Prince Sultan University	6
Spain	23	Kazan Federal University	5
Saudi Arabia	13	Sechenov First Moscow State Medical University	4
United Kingdom	13	Universitetet I Oslo	4
Portugal	10	Financial University under the Government of the Russian Federation	4
Australia	8	Universidad de Sevilla	4
United States	8	Universidade do Porto	3
Germany	7	Tecnológico de Monterrey	3
Norway	7	Oulun Yliopisto	3
Turkey	7	Universidade de Aveiro	3
China	6	Plekhanov Russian University of Economics	3
Italy	5	International University of La Rioja	3
Other Countries	42	Other Organization	138

3.6 Publication by research area

Understanding the research publications of the main set of studies on which the research will be based is a crucial step in conducting quality research. This allows researchers to understand the leaders in their field. Figure 7 shows the research areas of the selected study sets, Social Science is the most dominant area (33.6%), followed by Computer Science (19.8%), Engineering (8.4%), and Business, Management, and Accounting (7.2%).

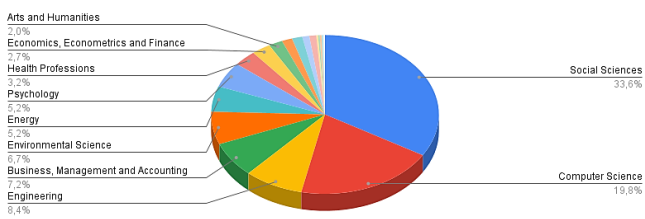

Figure 8. Research area of selected studies

4. REVIEW AND DISCUSSION

This "Review and Discussion" section aims to provide a synthesis of the main findings identified in this study. This research has collected and analyzed 183 scholarly articles that

focus on the impact or role of digital transformation on organizational performance in higher education. The findings show that there has been an increase in the number of publications in the last 6 years from 2017 to 2023, indicating that this is an area of research that is receiving increasing attention from the scientific community. This is important because it shows that digital transformation in education is a relevant and crucial issue as time progresses.

The findings show that Computer Science is the most dominant research area with 19.8% of the total studies, followed by Engineering (8.4%) and Business, Management, and Accounting (7.2%). This fact shows that digital transformation is not limited to a single discipline. Rather, it has far-reaching implications and affects various aspects of higher education, including management and business or certain areas that are often overlooked in discussions about digitalization.

The analysis also provides information on publications by country and organization, significant journals, and some of the most active researchers contributing to the scope of this research as well as visualization of the relationship between research keywords analyzed using VosViewer software. The analysis results divide the research keywords into 5 clusters with different colors. The most frequently occurring keywords are "digital transformation", "higher education", "COVID-19", and "e-learning" which shows that these issues are the center of attention in the current literature. In future research, the results of this study can serve as a basis, reference, and information in conducting further research, especially in the same research scope.

The limitations of the study lie in the database used and the selection of publications within a certain time span limited to the last 5 years from 2017 - 2023. The use of more diverse and high quality data base sources such as WOS or Scopus combined along with a wider range of research time spans may provide a more comprehensive picture of the trends and research focus in this area. Future research could include more in-depth qualitative analysis to understand the contextual aspects of digital transformation in higher education and its impact on organizational performance or conduct empirical studies i.e. comparative studies between countries to understand the influence of digital transformation in higher education in different countries. Future research could also address journal influences such as journal impact factors, citation counts that can be measured quantitatively.

5. CONCLUSION

This study emphasizes the importance of digital transformation in higher education. This study provides an understanding of trends, focuses, researchers, and dominating research areas. These findings reflect the relevance of digital transformation issues while providing direction for researchers to further explore the existing scope. By providing a strong foundation, the research results can guide researchers to look for research gaps that can be filled from previous research as well as foundation for designing future research.

REFERENCE

[1] Abad-Segura, E., González-Zamar, M.D., Infante-Moro, J.C., García, G.R. (2020). Sustainable management of digital transformation in higher education: Global research trends. Sustainability, 12(5): 2107. http://doi.org/10.3390/su12052107

[2] Al-Zu'bi, K.N. (2022). Digital transformation of the educational process during the COVID-19 pandemic. WSEAS Transactions on Business and Economics, 19: 1788-96. http://doi.org/10.37394/23207.2022.19.160

[3] Aditya, B.R., Ferdiana, R., Kusumawardani, S.S. (2021). Categories for barriers to digital transformation in higher education: An analysis based on literature. International Journal of Information and Education Technology, 11(12): 658-664. http://doi.org/10.18178/ijiet.2021.11.12.1578

[4] Akour, M., Alenezi, M. (2022). Higher education future in the era of digital transformation. Education Sciences, 12(11): 784. http://doi.org/10.3390/educsci12110784

[5] Afshar Jahanshahi, A., Polas, M.R.H. (2023). Moving toward digital transformation by force: Students' preferences, happiness, and mental health. Electronics (Switzerland), 12(10): 2187. http://doi.org/10.3390/electronics12102187

[6] Ait-Bennacer, F.E., Aaroud, A., Akodadi, K., Cherradi, B. (2022). Adopting a digital transformation in moroccan research structure using a knowledge management system: Case of a research laboratory. International Journal of Advanced Computer Science and Applications, 13(9): 375-384. http://doi.org/10.14569/IJACSA.2022.0130943

[7] Akhmetshin, E.M., Kozachek, A.V., Vasilev, V.L., Meshkova, G.V., Mikhailova, M.V. (2021). Development of digital university model in modern conditions: Institutional approach. Digital Education Review, (40): 17-32. http://doi.org/10.1344/der.2021.40.17-32

[8] Alenezi, M., Wardat, S., Akour, M. (2023). The need of integrating digital education in higher education: Challenges and opportunities. Sustainability, 15(6): 4782. http://doi.org/10.3390/su15064782

[9] Aljanazrah, A., Yerousis, G., Hamed, G., Khlaif, Z.N. (2022). Digital transformation in times of crisis: Challenges, attitudes, opportunities and lessons learned from students' and faculty members' perspectives. Frontiers in Education, 7: 1047035. http://doi.org/10.3389/feduc.2022.1047035

[10] Alenezi, M. (2023). Digital learning and digital institution in higher education. Education Sciences, 13(1): 88. http://doi.org/10.3390/educsci13010088

[11] Salem, M.A., Elshaer, I.A. (2023). Educators' utilizing one-stop mobile learning approach amid global health emergencies: Do technology acceptance determinants matter? Electronics (Switzerland), 12(2): 441. https://doi.org/10.3390/electronics12020441.

[12] Mishra, L., Gupta, T., Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. International Journal of Educational Research Open, 1: 100012. https://doi.org/10.1016/j.ijedro.2020.100012

[13] Jusoh, S., Almajali, S., Abualbasal, A. (2019). A study of user experience for e-learning using interactive online technologies. Journal of Theoretical and Applied Information Technology, 97(15): 4036-4047.

[14] Kim, E., Kim, M., Kyung, Y. (2022). A case study of digital transformation: Focusing on the financial sector in South Korea and overseas. Asia Pacific Journal of

Information Systems, 32(3): 537-563. https://doi.org/10.14329/apjis.2022.32.3.537
[15] Secundo, G., Rippa, P., Meoli, M. (2020). Digital transformation in entrepreneurship education centres: Preliminary evidence from the Italian Contamination Labs network. International Journal of Entrepreneurial Behavior & Research, 26(7): 1589-1605. https://doi.org/10.1108/IJEBR-11-2019-0618
[16] Gabriel, F., Marrone, R., Van Sebille, Y., Kovanovic, V., de Laat, M. (2022). Digital education strategies around the world: Practices and policies. Irish Educational Studies, 41(1): 85-106.
[17] Amuna, Y.M.A., Al Shobaki, M.J., Naser, S.S.A., El Talla, S.A. (2017). The reality of electronic human resources management in Palestinian universities-Gaza Strip. International Journal of Engineering and Information Systems (IJEAIS), 1(3): 37-57.
[18] Hashim, M.A.M., Tlemsani, I., Matthews, R., Mason-Jones, R., Ndrecaj, V. (2022). Emergent strategy in higher education: Postmodern digital and the future? Administrative Sciences, 12(4): 196. https://doi.org/10.3390/admsci12040196
[19] Mohamed Shaffril, H.A., Samsuddin, S.F., Abu Samah, A. (2021). The ABC of systematic literature review: The basic methodological guidance for beginners. Quality & Quantity, 55: 1319-1346. https://doi.org/10.1007/s11135-020-01059-6
[20] Alangari, S., Alshahrani, S.M., Khan, N.A., Alghamdi, A.A., Almalki, J., Al Shehri, W. (2022). Developing a blockchain-based digitally secured model for the educational sector in Saudi Arabia toward digital transformation. PeerJ Computer Science, 8: e1120. https://doi.org/10.7717/peerj-cs.1120
[21] Alenezi, M. (2021). Deep dive into digital transformation in higher education institutions. Education Sciences, 11(12): 770. https://doi.org/10.3390/educsci11120770
[22] Alenezi, M., Akour, M. (2023). Digital transformation blueprint in higher education: A case study of PSU. Sustainability, 15(10): 8204. https://doi.org/10.3390/su15108204
[23] Alhubaishy, A., Aljuhani, A. (2021). The challenges of instructors' and students' attitudes in digital transformation: A case study of Saudi universities. Education and Information Technologies, 26(4): 4647-4662. https://doi.org/10.1007/s10639-021-10491-6
[24] Almatrodi, I., Skoumpopoulou, D. (2023). Organizational routines and digital transformation: An analysis of how organizational routines impact digital transformation transition in a Saudi university. Systems, 11(5): 239. https://doi.org/10.3390/systems11050239
[25] Almeida, F., Morais, J., Santos, J.D. (2022). A bibliometric analysis of the scientific outcomes of European projects on the digital transformation of SMEs. Publications, 10(4): 34. https://doi.org/10.3390/publications10040034
[26] Antonopoulou, H., Halkiopoulos, C., Barlou, O., Beligiannis, G.N. (2020). Leadership types and digital leadership in higher education: Behavioural data analysis from University of Patras in Greece. International Journal of Learning, Teaching and Educational Research, 19(4): 110-129. https://doi.org/10.26803/ijlter.19.4.8
[27] Antonopoulou, K., Begkos, C., Zhu, Z. (2023). Staying afloat amidst extreme uncertainty: A case study of digital transformation in higher education. Technological Forecasting and Social Change, 192: 122603. https://doi.org/10.1016/j.techfore.2023.122603
[28] Arango-López, J., Cerón Valdivieso, C.C., Collazos, C.A., Gutiérrez Vela, F.L., Moreira, F. (2019). CREANDO: Tool for creating pervasive games to increase the learning motivation in higher education students. Telematics and Informatics, 38: 62-73. https://doi.org/10.1016/j.tele.2018.08.005
[29] Arnold, M.G., Vogel, A., Ulber, M. (2021). Digitalizing higher education in light of sustainability and rebound effects—Surveys in times of the COVID-19 pandemic. Sustainability, 13(22): 12912. https://doi.org/10.3390/su132212912
[30] Arrabal, A.K., Cardoso, R.S., Wiggers, V.R., Colombo, A.P. (2022). Digital transformation in university technology expo. Revista Administração Mackenzie, 23(5): eRAMR220093. https://doi.org/10.1590/1678-6971/eRAMR220093.en
[31] Awdziej, M., Jaciow, M., Lipowski, M., Tkaczyk, J., Wolny, R. (2023). Students digital maturity and its implications for sustainable behavior. Sustainability, 15(9): 7269. https://doi.org/10.3390/su15097269
[32] Bandrés, S.C., Orús, M.L., Toledo, S.V., Cosculluela, C.L., Oto, S.A. (2021). Digital competence of university teachers of social and legal sciences from a gender perspective. Education Sciences, 11(12): 806. https://doi.org/10.3390/educsci11120806
[33] Bebbington, W. (2021). Leadership strategies for a higher education sector in flux. Studies in Higher Education, 46(1): 158-165. https://doi.org/10.1080/03075079.2020.1859686
[34] Blayone, T.J.B., Mykhailenko, O., Kavtaradze, M., Kokhan, M., vanOostveen, R., Barber, W. (2018). Profiling the digital readiness of higher education students for transformative online learning in the post-soviet nations of Georgia and Ukraine. International Journal of Educational Technology in Higher Education, 15(1): 37. https://doi.org/10.1186/s41239-018-0119-9
[35] Bond, M., Marín, V.I., Dolch, C., Bedenlier, S., Zawacki-Richter, O. (2018). Digital transformation in German higher education: Student and teacher perceptions and usage of digital media. International Journal of Educational Technology in Higher Education, 15(1): 48. https://doi.org/10.1186/s41239-018-0130-1
[36] Bonfield, C.A., Salter, M., Longmuir, A., Benson, M., Adachi, C. (2020). Transformation or evolution?: Education 4.0, teaching and learning in the digital age. Higher Education Pedagogies, 5(1): 223-246. https://doi.org/10.1080/23752696.2020.1816847
[37] Builes, S., Esteve-Mon, F.M., Sánchez-Tarazaga, L., Arroyo-Ainsa, P. (2022). Analysis of the digital perspective in the frameworks of teaching competencies in higher education in Spain. RIED Revista Iberoamericana de Educación a Distancia, 25(2): 133-152. https://doi.org/10.5944/ried.25.2.32349
[38] Bygstad, B., Øvrelid, E., Ludvigsen, S., Dæhlen, M. (2022). From dual digitalization to digital learning space: Exploring the digital transformation of higher education. Computers & Education, 182: 104463. https://doi.org/10.1016/j.compedu.2022.104463
[39] Celik, I., Gedrimiene, E., Silvola, A., Muukkonen, H. (2023). Response of learning analytics to the online education challenges during pandemic: Opportunities and key examples in higher education. Policy Futures in

Education, 21(4): 387-404. https://doi.org/10.1177/14782103221078401
[40] Chang, L., Wang, Y., Liu, J., Feng, Y., Zhang, X. (2023). Study on factors influencing college students' digital academic reading behavior. Frontiers in Psychology, 13: 1007247. https://doi.org/10.3389/fpsyg.2022.1007247
[41] Connolly, C., Hall, T., Ryan, M., McMahon, J., McGann, M., Egan, A. (2021). A fusion of research-informed teaching and teaching-informed research: Designing a scalable online ecosystem for new partnerships in educational research. Australasian Journal of Educational Technology, 37(1): 82-95. https://doi.org/10.14742/ajet.6131
[42] Corbeil, M.E., Corbeil, J.R. (2022). Digital transformation of higher education through disruptive pedagogies: Wrapping a course around a course to promote learner agency. Issues in Information Systems, 23(2): 150-157. https://doi.org/10.48009/2_iis_2022_113
[43] Cunha, M.N., Chuchu, T., Maziriri, E.T. (2020). Threats, challenges, and opportunities for open universities and massive online open courses in the digital revolution. International Journal of Emerging Technologies in Learning, 15(12): 191-204. https://doi.org/10.3991/ijet.v15i12.13435
[44] D'Ambra, J., Akter, S., Mariani, M. (2022). Digital transformation of higher education in Australia: Understanding affordance dynamics in E-textbook engagement and use. Journal of Business Research, 149: 283-295. https://doi.org/10.1016/j.jbusres.2022.05.048
[45] Dai, Z., Sun, C., Zhao, L., Li, Z. (2021). Assessment of smart learning environments in higher educational institutions: A study using AHP-FCE and GA-BP methods. IEEE Access, 9: 35487-35500. https://doi.org/10.1109/ACCESS.2021.3062680
[46] Damșa, C., Langford, M., Uehara, D., Scherer, R. (2021). Teachers' agency and online education in times of crisis. Computers in Human Behavior, 121: 106793. https://doi.org/10.1016/j.chb.2021.106793
[47] de S. Oliveira, K.K., de Souza, R.A.C. (2022). Digital transformation towards Education 4.0. Informatics in Education, 21(2): 283-309. https://doi.org/10.15388/infedu.2022.13
[48] Deja, M., Rak, D., Bell, B. (2021). Digital transformation readiness: Perspectives on academia and library outcomes in information literacy. Journal of Academic Librarianship, 47(5): 102403. https://doi.org/10.1016/j.acalib.2021.102403
[49] Demartini, C.G., Benussi, L., Gatteschi, V., Renga, F. (2020). Education and digital transformation: The "riconnessioni" project. IEEE Access, 8: 3018189. https://doi.org/10.1109/ACCESS.2020.3018189
[50] Demchenko, M.V., Gulieva, M.E., Larina, T.V., Simaeva, E.P. (2021). Digital transformation of legal education: Problems, risks and prospects. European Journal of Contemporary Education, 10(2): 297-307. https://doi.org/10.13187/ejced.2021.2.297
[51] Deroncele-Acosta, A., Palacios-Núñez, M.L., Toribio-López, A. (2023). Digital transformation and technological innovation on higher education post-COVID-19. Sustainability, 15(3): 2466. https://doi.org/10.3390/su15032466
[52] Díaz-Garcia, V., Montero-Navarro, A., Rodríguez-Sánchez, J.L., Gallego-Losada, R. (2023). Managing digital transformation: A case study in a higher education institution. Electronics (Switzerland), 12(11): 2522. https://doi.org/10.3390/electronics12112522
[53] Díaz-Noguera, M.D., Hervás-Gómez, C., De la Calle-Cabrera, A.M., López-Meneses, E. (2022). Autonomy, motivation, and digital pedagogy are key factors in the perceptions of Spanish higher-education students toward online learning during the COVID-19 pandemic. International Journal of Environmental Research and Public Health, 19(2): 654. https://doi.org/10.3390/ijerph19020654
[54] Dindar, M., Çelik, I., Muukkonen, H. (2022). #WedontWantDistanceEducation: A thematic analysis of higher education students' social media posts about online education during COVID-19 pandemic. Technology, Knowledge and Learning, 27(4): 1337-1355. https://doi.org/10.1007/s10758-022-09621-x
[55] Drugova, E., Zhuravleva, I., Aiusheeva, M., Grits, D. (2021). Toward a model of learning innovation integration: TPACK-SAMR based analysis of the introduction of a digital learning environment in three Russian universities. Education and Information Technologies, 26(4): 4925-4942. https://doi.org/10.1007/s10639-021-10514-2
[56] Ducas, A., Michaud-Oystryk, N., Speare, M. (2020). Reinventing ourselves: New and emerging roles of academic librarians in Canadian research-intensive universities. College & Research Libraries, 81(1): 43. https://doi.org/10.5860/crl.81.1.43
[57] Ehlers, U.D. (2020). Digital leadership in higher education. Journal of Higher Education Policy and Leadership Studies, 1(3): 6-14. https://doi.org/10.29252/johepal.1.3.6
[58] Evans, N., Miklosik, A. (2023). Driving digital transformation: Addressing the barriers to engagement in university-industry collaboration. IEEE Access, 11: 60142-60152. https://doi.org/10.1109/ACCESS.2023.3281791
[59] Farias-Gaytan, S., Ramirez-Montoya, M.S., Aguaded, I. (2023). Educational innovation with alternative credentials as a driver of the digital transformation of the university: A case study in Latin America. Journal of Interactive Media in Education, 2023(1): 1-18. https://doi.org/10.5334/jime.793
[60] Faridi, M.R., Ebad, R. (2018). Transformation of higher education sector through massive open online courses in Saudi Arabia. Problems and Perspectives in Management, 16(2): 220-231. https://doi.org/10.21511/ppm.16(2).2018.20
[61] Fernández, A., Gómez, B., Binjaku, K., Meçe, E.K. (2023). Digital transformation initiatives in higher education institutions: A multivocal literature review. Education and Information Technologies, 28(10): 12351-12382. https://doi.org/10.1007/s10639-022-11544-0
[62] Fernback, J. (2018). Academic/digital work: ICTs, knowledge capital, and the question of educational quality. TripleC: Communication, Capitalism & Critique, 16(1): 143-158. https://doi.org/10.31269/vol16iss1pp143-158
[63] Fleaca, B., Fleaca, E., Maiduc, S. (2022). Digital transformation and current challenges of higher education. TEM Journal, 11(3): 1235-1241. https://doi.org/10.18421/TEM113-32

[64] França, A. (2021). Transforming library collections in a pandemic: The perspective from Edge Hill University. Insights: the UKSG Journal, 34: https://doi.org/10.1629/UKSG.536
[65] Gafurov, I.R., Safiullin, M.R., Akhmetshin, E.M., Gapsalamov, A.R., Vasilev, V.L. (2020). Change of the higher education paradigm in the context of digital transformation: From resource management to access control. International Journal of Higher Education, 9(3): 71-85. https://doi.org/10.5430/ijhe.v9n3p71
[66] Garcez, A., Silva, R., Franco, M. (2022). The hard skills bases in digital academic entrepreneurship in relation to digital transformation. Social Sciences, 11(5): 192. https://doi.org/10.3390/socsci11050192
[67] García-Peñalvo, F.J. (2021). Avoiding the dark side of digital transformation in teaching: An institutional reference framework for eLearning in higher education. Sustainability, 13(4): 1-17. https://doi.org/10.3390/su13042023
[68] Garzón Baquero, J.E., Bellon Monsalve, D. (2022). Challenges in teaching of renewable energies in a digital world during COVID-19: From face-to-face to remote learning in Colombia. International Humanities Review / Revista Internacional De Humanidades, 14(5): 1-12. https://doi.org/10.37467/revhuman.v11.4156
[69] Ge, C., Lv, W., Wang, J. (2023). The impact of digital technology innovation network embedding on firms' innovation performance: The role of knowledge acquisition and digital transformation. Sustainability, 15(8): 6938. https://doi.org/10.3390/su15086938
[70] Giang, N.T.H., Hai, P.T.T., Tu, N.T.T., Tan, P.X. (2021). Exploring the readiness for digital transformation in a higher education institution towards industrial revolution 4.0. International Journal of Engineering Pedagogy, 11(2): 4-24. https://doi.org/10.3991/IJEP.V11I2.17515
[71] González-Varona, J.M., López-Paredes, A., Poza, D., Acebes, F. (2021). Building and development of an organizational competence for digital transformation in SMEs. Journal of Industrial Engineering and Management, 14(1): 15-24. https://doi.org/10.3926/jiem.3279
[72] Grigorescu, A., Lincaru, C., Sigurjonsson, T.O., Pîrciog, S. (2023). Regional digital resilience and the 4Helix model—The higher education institutions' case in Romania. Journal of Theoretical and Applied Electronic Commerce Research, 18(2): 928-958. https://doi.org/10.3390/jtaer18020048
[73] Guşe, G.R., Mangiuc, M.D. (2022). Digital transformation in Romanian accounting practice and education: Impact and perspectives. Amfiteatru Economic, 24(59): 252-267. https://doi.org/10.24818/EA/2022/59/252
[74] Habib, M. (2023). Digital transformation strategy for developing higher education in conflict-affected societies. Social Sciences and Humanities Open, 8(1): 100627. https://doi.org/10.1016/j.ssaho.2023.100627
[75] Hamdani, N.A., Maulani, G.A.F., Nugraha, S., Mubarok, T.M.S., Herlianti, A.O. (2021). Corporate culture and digital transformation strategy in universities in Indonesia. Estudios de Economía Aplicada, 39(10). https://doi.org/10.25115/eea.v39i10.5352
[76] Hardy, A., McKenzie, C. (2020). Meeting students where they are: Just in time embedded delivery of information and digital literacy skills. International Information & Library Review, 52(1): 64-72. https://doi.org/10.1080/10572317.2019.1710672
[77] Hervás-Gómez, C., Díaz-Noguera, M.D., De la Calle-Cabrera, A.M., Guijarro-Cordobés, O. (2021). Perceptions of university students towards digital transformation during the pandemic. Education Sciences, 11(11): 738. https://doi.org/10.3390/educsci11110738
[78] Hoang, T.S., Nguyen, M.L.T., Pham, L.N., Nguyen, T.H.T., Nguyen, L.T. (2022). Digital competence of lecturers at the universities of education: In the context of education digital transformation Vietnam. International Journal of Information and Education Technology, 12(10): 1085-1089. https://doi.org/10.18178/ijiet.2022.12.10.1724
[79] Iivari, N., Sharma, S., Ventä-Olkkonen, L. (2020). Digital transformation of everyday life – How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? International Journal of Information Management, 55: 102183. https://doi.org/10.1016/j.ijinfomgt.2020.102183
[80] Ivancheva, M., Garvey, B. (2022). Putting the university to work: The subsumption of academic labour in UK's shift to digital higher education. New Technology, Work and Employment, 37(3): 381-397. https://doi.org/10.1111/ntwe.12237
[81] Jayson Andrey, B., Javier Andrés, V.G. (2020). Challenges and trends of the 21st century in higher education. Revista de Ciencias Sociales, 26(2): 141-154. https://doi.org/10.31876/rcs.v26i0.34119
[82] Jiménez-Bucarey, C., Acevedo-Duque, Á., Müller-Pérez, S., Aguilar-Gallardo, L., Mora-Moscoso, M., Vargas, E.C. (2021). Student's satisfaction of the quality of online learning in higher education: An empirical study. Sustainability, 13(21): 11960. https://doi.org/10.3390/su132111960
[83] Jugembayeva, B., Murzagaliyeva, A. (2023). Physics students' innovation readiness for digital learning within the university 4.0 model: Essential scientific and pedagogical elements that cause the educational format to evolve in the context of advanced technology trends. Sustainability, 15(1): 233. https://doi.org/10.3390/su15010233
[84] Kabashkin, I., Misnevs, B., Puptsau, A. (2023). Transformation of the university in the age of artificial intelligence: Models and competences. Transport and Telecommunication, 24(3): 209-216. https://doi.org/10.2478/ttj-2023-0017
[85] Kaya-Capocci, S., O'Leary, M., Costello, E. (2022). Towards a framework to support the implementation of digital formative assessment in higher education. Education Sciences, 12(11): 823. https://doi.org/10.3390/educsci12110823
[86] Khammatova, R.S., Gribkova, O.V., Tkhugo, M.M., Ushakova, O.B., Shchetinina, N.N., Krasheninnikova, E.I., Erofeeva, M.A. (2021). Specific features of value orientations among the student youth in the context of digital transformation of the education system. World Journal of Educational Technology, 13(2): 297-306. https://doi.org/10.18844/wjet.v13i2.5714
[87] Khitskov, E.A., Veretekhina, S.V., Medvedeva, A.V., Mnatsakanyan, O.L., Shmakova, E.G., Kotenev, A. (2017). Digital transformation of society: Problems entering in the digital economy. Eurasian Journal of

Analytical Chemistry, 12(5): 855-873. https://doi.org/10.12973/ejac.2017.00216a
[88] Klochkova, E., Serkina, Y., Prasolov, V., Movchun, V. (2020). The digitalisation of the economy and higher education. Space and Culture, India, 7(4): 70-82. https://doi.org/10.20896/SACI.V7I4.697
[89] Kolomiets, O., Litvinova, T. (2020). Analysis of the situation in higher education during the COVID-19 pandemic in the world: Opportunities and threats of online training. Economic Annals, 185(9-10): 167-177. https://doi.org/10.21003/EA.V185-16
[90] Korepin, V.N., Dorozhkin, E.M., Mikhaylova, A.V., Davydova, N.N. (2020). Digital economy and digital logistics as new area of study in higher education. International Journal of Emerging Technologies in Learning, 15(13): 137-154. https://doi.org/10.3991/ijet.v15i13.14885
[91] Kosenchuk, O.V., Kulapov, M.N., Diner, Y.A., Zinich, A.V., Revyakina, Y.N., Adelfinskiy, A.O. (2021). Transformation of education processes and preparation of competencies for the digital economy. International Journal of Criminology and Sociology, 10: 192-198. https://doi.org/10.6000/1929-4409.2021.10.23
[92] Kuzu, Ö.H. (2020). Digital transformation in higher education: A case study on strategic plans. Vysshee Obrazovanie Rossii, 29(3): 9-23. https://doi.org/10.31992/0869-3617-2019-29-3-9-23
[93] Labadze, O.E., Efimov, A.V., Sych, V.V., Petrova, N.F., Lipchanskaya, I.V., Ivanenko, N.S. (2021). Digitalization of higher education, the crisis of educational culture and Russian economic development. World Journal of Educational Technology, 13(4): 1051-1060. https://doi.org/10.18844/wjet.v13i4.6300
[94] Lacka, E., Wong, T.C., Haddoud, M.Y. (2021). Can digital technologies improve students' efficiency? Exploring the role of virtual learning environment and social media use in higher education. Computers & Education, 163: 104099. https://doi.org/10.1016/j.compedu.2020.104099
[95] Langseth, I., Jacobsen, D.Y., Haugsbakken, H. (2023). The role of support units in digital transformation: How institutional entrepreneurs build capacity for online learning in higher education. Technology, Knowledge and Learning, 28(4): 1745-1782. https://doi.org/10.1007/s10758-022-09620-y
[96] Laorach, C., Tuamsuk, K. (2022). Factors influencing the digital transformation of universities in Thailand. International Journal of Innovative Research in Science Studies, 5(3): 211-219. https://doi.org/10.53894/ijirss.v5i3.646
[97] Laufer, M., Deacon, B., de Brichambaut, P.P., Fecher, B., Kobsda, C., Hesse, F. (2021). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. International Journal of Educational Technology in Higher Education, 18(1): 51. https://doi.org/10.1186/s41239-021-00287-6
[98] Liebowitz, J. (2022). Digital transformation for the university of the future: A perspective. Computer, 55(10): 66-69. https://doi.org/10.1109/MC.2022.3178625
[99] Linh, C.T.T., Huong, H.T., Tien, N.D. (2023). Enhancing digital capacity for students at higher education institutions under the Ministry of Home Affairs in the context of digital transformation. Review of Gestão Social e Ambiental, 17(5): e03567. https://doi.org/10.24857/rgsa.v17i5.018
[100] Llorente-Cejudo, C., Palacios-Rodríguez, A., Fernández-Scagliusi, V. (2022). Learning landscapes and educational breakout for the development of digital skills of teachers in training. Interaction Design and Architecture(s), 53: 176-190. https://doi.org/10.55612/s-5002-053-009
[101] Lokesh, C., Shankar, S., Shilpa, R., Rekha, K.R. (2022). Digital transformation and hybrid model in engineering education. Journal of Engineering Education Transformations, 36(2): 93-98. https://doi.org/10.16920/jeet/2023/v36is2/23013
[102] López-Nores, M., Pazos-Arias, J.J., Gölcü, A., Kavrar, Ö. (2022). Digital technology in managing Erasmus+ mobilities: Efficiency gains and impact analysis from Spanish, Italian, and Turkish universities. Applied Sciences, 12(19): 9804. https://doi.org/10.3390/app12199804
[103] Luna, F.D.S., Breternitz, V.J. (2021). Digital transformation in private Brazilian higher education institutions: Pre-coronavirus baseline. Revista Administração Mackenzie, 22(6). https://doi.org/10.1590/1678-6971/eRAMD210127
[104] Lund, A., Aagaard, T. (2020). Digitalization of teacher education: Are we prepared for epistemic change? Nordic Journal of Comparative and International Education, 4(3-4): 56-71. https://doi.org/10.7577/njcie.3751
[105] Maltese, V. (2018). Digital transformation challenges for universities: Ensuring information consistency across digital services. Cataloging & Classification Quarterly, 56(7): 592-606. https://doi.org/10.1080/01639374.2018.1504847
[106] Marks, A., Al-Ali, M., Atassi, R., Abualkishik, A.Z., Rezgui, Y. (2020). Digital transformation in higher education: A framework for maturity assessment. International Journal of Advanced Computer Science and Applications, 11(12): 504-513. https://doi.org/10.14569/IJACSA.2020.0111261
[107] Martín-Gutiérrez, A., Díaz-Noguera, M.D., Hervás-Gómez, C., Morales-Pérez, G.L. (2022). Models of future teachers' adaptation to new post-pandemic digital educational scenarios. Sustainability, 14(21): 14291. https://doi.org/10.3390/su142114291
[108] Mhlanga, D., Denhere, V., Moloi, T. (2022). COVID-19 and the key digital transformation lessons for higher education institutions in South Africa. Education Sciences, 12(7): 464. https://doi.org/10.3390/educsci12070464
[109] Mhlanga, D., Moloi, T. (2020). COVID-19 and the digital transformation of education: What are we learning on 4ir in South Africa? Education Sciences, 10(7): 180. https://doi.org/10.3390/educsci10070180
[110] Mian, S.H., Salah, B., Ameen, W., Moiduddin, K., Alkhalefah, H. (2020). Adapting universities for sustainability education in industry 4.0: Channel of challenges and opportunities. Sustainability, 12(15): 6100. https://doi.org/10.3390/su12156100
[111] Mikheev, A., Serkina, Y., Vasyaev, A. (2021). Current trends in the digital transformation of higher education institutions in Russia. Education and Information Technologies, 26(4): 4537-4551.

https://doi.org/10.1007/s10639-021-10467-6
[112] Mirata, V., Awinia, C., Godson, E., Bergamin, P. (2022). The future of technology-based learning at the Open University of Tanzania. International Journal of Emerging Technologies in Learning, 17(15): 28-42. https://doi.org/10.3991/ijet.v17i15.33273
[113] Mkrttchian, V., Gamidullaeva, L., Finogeev, A., Chernyshenko, S., Chernyshenko, V., Amirov, D., Potapova, I. (2021). Big data and internet of things (IoT) technologies' influence on higher education: Current state and future prospects. International Journal of Web-Based Learning and Teaching Technologies, 16(5): 137-157. https://doi.org/10.4018/IJWLTT.20210901.oa8
[114] Mohamed Hashim, M.A., Tlemsani, I., Duncan Matthews, R. (2022). A sustainable university: Digital transformation and beyond. Education and Information Technologies, 27(7): 8961-8996. https://doi.org/10.1007/s10639-022-10968-y
[115] Mohamed Hashim, M.A., Tlemsani, I., Matthews, R. (2022). Higher education strategy in digital transformation. Education and Information Technologies, 27: 3171-3195. https://doi.org/10.1007/s10639-021-10739-1
[116] Mohammadi, M.K., Mohibbi, A.A., Hedayati, M.H. (2021). Investigating the challenges and factors influencing the use of the learning management system during the COVID-19 pandemic in Afghanistan. Education and Information Technologies, 26: 5165-5198.
[117] Mohammadyari, S., Singh, H. (2015). Understanding the effect of e-learning on individual performance: The role of digital literacy. Computers & Education, 82: 11-25.
[118] Mohammed, N.Y., Omar, H.A., Aziz, A.A. (2022). Contributions of leadership styles to digital transformation-An exploratory study of the opinions of a sample of administrative leaders at the Northern Technical University. Ingénierie des Systèmes d'Information, 27(6): 865-873. https://doi.org/10.18280/isi.270602
[119] Monteiro, A.R., Leite, C. (2021). Digital literacies in higher education: Skills, uses, opportunities and obstacles to digital transformation. Revista de Educación a Distancia, 21(65): 6. https://doi.org/10.6018/RED.438721
[120] Mospan, N. (2023). Digitalisation of writing in higher education: The COVID-19 pandemic impact. Journal of University Teaching and Learning Practice, 20(2): 8. https://doi.org/10.53761/1.20.02.08
[121] Mospan, N. (2023). Trends in emergency higher education digital transformation during the COVID-19 pandemic. Journal of University Teaching and Learning Practice, 20(1): 50-70. https://doi.org/10.53761/1.20.01.04
[122] Msila, V. (2022). Higher education leadership in a time of digital technologies: A South African case study. International Journal of Information and Education Technology, 12(10): 1110-1117. https://doi.org/10.18178/ijiet.2022.12.10.1728
[123] Nebot, M.Á.L., Cosentino, V.V., Esteve-Mon, F.M., Segura, J.A. (2021). Diagnostic and educational self-assessment of the digital competence of university teachers. Nordic Journal of Digital Literacy, 16(3-4): 115-131. https://doi.org/10.18261/ISSN.1891-943X-2021-03-04-03
[124] Niță, V., Guțu, I. (2023). The role of leadership and digital transformation in higher education students' work engagement. International Journal of Environmental Research and Public Health, 20(6): 5124. https://doi.org/10.3390/ijerph20065124
[125] Nurhas, I., Aditya, B.R., Jacob, D.W., Pawlowski, J.M. (2022). Understanding the challenges of rapid digital transformation: The case of COVID-19 pandemic in higher education. Behaviour & Information Technology, 41(13): 2924-2940. https://doi.org/10.1080/0144929X.2021.1962977
[126] Ødegaard, N.B., Røe, Y., Dahl-Michelsen, T. (2022). "Learning is about being active, but the digital is not really active": Physiotherapy teachers' attitudes toward and experiences with digital education. Physiotherapy Theory and Practice, 2022. https://doi.org/10.1080/09593985.2022.2119907
[127] Okoye, K., Hussein, H., Arrona-Palacios, A., Quintero, H.N., Ortega, L.O.P., Sanchez, A.L., Ortiz, E.A., Escamilla, J., Hosseini, S. (2023). Impact of digital technologies upon teaching and learning in higher education in Latin America: An outlook on the reach, barriers, and bottlenecks. Education and Information Technologies, 28(2): 2291-2360. https://doi.org/10.1007/s10639-022-11214-1
[128] Omar, A., Almaghthawi, A. (2020). Towards an integrated model of data governance and integration for the implementation of digital transformation processes in the Saudi universities. International Journal of Advanced Computer Science and Applications, 11(8): 588-593. https://doi.org/10.14569/IJACSA.2020.0110873
[129] Øvrelid, E. (2022). Exploring the alignment between digital strategies and educational practices in higher education infrastructures. Education Sciences, 12(10): 711. https://doi.org/10.3390/educsci12100711
[130] Pashkov, M.V., Pashkova, V.M. (2022). Problems and risks of digitalization in higher education. Vysshee Obrazovanie Rossii, 31(3): 40-53. https://doi.org/10.31992/0869-3617-2022-31-22-3-40-57
[131] Perevalov, V.D., Novgorodtseva, A.N., Sivkova, N.I., Korelin, A.V., Korelina, E.V. (2020). Digitalization of Russian higher education: Educational process technologies (Experience of universities of the Ural Federal District of Russian Federation). Perspectives of Science and Education, 46(4): 36-46. https://doi.org/10.32744/pse.2020.4.3
[132] Pilav-Velić, A., Jahić, H., Okičić, J., Selimović, J., Grabovica, E. (2021). Emergency remote learning acceptance among higher education students during COVID-19 pandemic. Proceedings of Rijeka Faculty of Economics, 39(2): 325-347. https://doi.org/10.18045/zbefri.2021.2.325
[133] Pletyago, T., Antonova, S. (2023). BRICS in creating digital educational environments: Social and legal aspects of 'a new normal'. BRICS Law Journal, 10(2): 101-122. https://doi.org/10.21684/2412-2343-2023-10-2-101-122
[134] Quy, V.K., Thanh, B.T., Chehri, A., Linh, D.M., Tuan, D.A. (2023). AI and digital transformation in higher education: Vision and approach of a specific university in Vietnam. Sustainability, 15(14): 11093. https://doi.org/10.3390/su151411093

[135] Rabin, E., Kalman, Y.M., Kalz, M. (2020). The cathedral's ivory tower and the open education bazaar–catalyzing innovation in the higher education sector. Open Learning, 35(1): 82-99. https://doi.org/10.1080/02680513.2019.1662285
[136] Rashid, S., Fayez, O., Ismail, H., Khan, R.F. (2021). Digital social support for undergraduate students during COVID-19: Pivotal support for the digital transformation. Journal of Public Health Research, 10(4): 2148. https://doi.org/10.4081/jphr.2021.2148
[137] Rasli, A., Tee, M., Lai, Y.L., Tiu, Z.C., Soon, E.H. (2022). Post-COVID-19 strategies for higher education institutions in dealing with unknown and uncertainties. Frontiers in Education, 7: 992063. https://doi.org/10.3389/feduc.2022.992063
[138] Redondo, M., Sánchez-García, P., Etura, D. (2017). Research on ethics education for journalists in Spain. Bibliometric analysis and applied educational terms (2005-2015). Revista Latina de Comunicación Social, 72: 235-252. https://doi.org/10.4185/RLCS-2017-1163
[139] Rezer, T.M. (2021). Social values of students in conditions of digitalization of education and COVID-19. Integrative Education, 25(2): 226-243. https://doi.org/10.15507/1991-9468.103.025.202102.226-243
[140] Rodríguez-Abitia, G., Bribiesca-Correa, G. (2021). Assessing digital transformation in universities. Future Internet, 13(2): 1-17. https://doi.org/10.3390/fi13020052
[141] Rodríguez-Abitia, G., Martínez-Pérez, S., Ramirez-Montoya, M.S., Lopez-Caudana, E. (2020). Digital gap in universities and challenges for quality education: A diagnostic study in Mexico and Spain. Sustainability, 12(21): 1-14. https://doi.org/10.3390/su12219069
[142] Rodríguez-Moreno, J., Ortiz-Colón, A.M., Cordón-Pozo, E., Agreda-Montoro, M. (2021). The influence of digital tools and social networks on the digital competence of university students during COVID-19 pandemic. International Journal of Environmental Research and Public Health, 18(6): 1-18. https://doi.org/10.3390/ijerph18062835
[143] Røe, Y., Wojniusz, S., Bjerke, A.H. (2022). The digital transformation of higher education teaching: Four pedagogical prescriptions to move active learning pedagogy forward. Frontiers in Education, 6: Art. 784701. https://doi.org/10.3389/feduc.2021.784701
[144] Rof, A., Bikfalvi, A., Marquès, P. (2020). Digital transformation for business model innovation in higher education: Overcoming the tensions. Sustainability, 12(12): 4980. https://doi.org/10.3390/su12124980
[145] Rogozin, D.M., Solodovnikova, O.B., Ipatova, A.A. (2022). How university teachers view the digital transformation of higher education. Educational Studies Moscow, 2022(1): 271-300. https://doi.org/10.17323/1814-9545-2022-1-271-300
[146] Ronzhina, N., Kondyurina, I., Voronina, A., Igishev, K., Loginova, N. (2021). Digitalization of modern education: Problems and solutions. International Journal of Emerging Technologies in Learning, 16(4): 122-135. https://doi.org/10.3991/ijet.v16i04.18203
[147] Sá, M.J., Serpa, S. (2020). The COVID-19 pandemic as an opportunity to foster the sustainable development of teaching in higher education. Sustainability, 12(20): 1-16. https://doi.org/10.3390/su12208525
[148] Safiullin, M.R., Akhmetshin, E.M. (2019). Digital transformation of a university as a factor of ensuring its competitiveness. International Journal of Engineering and Advanced Technology, 9(1): 7387-7390. https://doi.org/10.35940/ijeat.A3097.109119
[149] Safiullin, M.R., Akhmetshin, E.M., Vasilev, V.L. (2019). Production of indicators for evaluation of digital transformation of modern university. International Journal of Engineering and Advanced Technology, 9(1): 7399-7402. https://doi.org/10.35940/ijeat.A3100.109119
[150] Şahin, F., Şahin, Y.L. (2022). Drivers of technology adoption during the COVID-19 pandemic: The motivational role of psychological needs and emotions for pre-service teachers. Social Psychology of Education, 25(2-3): 567-592. https://doi.org/10.1007/s11218-022-09702-w
[151] Santos, H., Batista, J., Marques, R.P. (2019). Digital transformation in higher education: The use of communication technologies by students. Procedia Computer Science, 164: 123-130. https://doi.org/10.1016/j.procs.2019.12.163
[152] Secundo, G., Mele, G., Vecchio, P.D., Elia, G., Margherita, A., Ndou, V. (2021). Threat or opportunity? A case study of digital-enabled redesign of entrepreneurship education in the COVID-19 emergency. Technological Forecasting and Social Change, 166: Art. 120565. https://doi.org/10.1016/j.techfore.2020.120565
[153] Sejane, L. (2017). Access to and use of electronic information resources in the academic libraries of the Lesotho library consortium.
[154] Sharlovych, Z., Vilchynska, L., Danylyuk, S., Huba, B., Zadilska, H. (2023). Digital technologies as a means of improving the efficiency of higher education. International Journal of Information and Education Technology, 13(8): 1214-1221. https://doi.org/10.18178/ijiet.2023.13.8.1923
[155] Sharma, S., Sharma, M. (2022). Impact of digital transformation on academicians' well-being: A study with the moderating role of public and private universities in India. Digital Education Review, 42: 118-135. https://doi.org/10.1344/der.2022.42.118-135
[156] Shenkoya, T., Kim, E. (2023). Sustainability in higher education: Digital transformation of the fourth industrial revolution and its impact on open knowledge. Sustainability, 15(3): 2473. https://doi.org/10.3390/su15032473
[157] Simchenko, N.A., Berkovich, M.L. (2021). Ecosystem designing for the development of universities in a digital environment. Perspectives of Science and Education, 49(1): 491-505. https://doi.org/10.32744/PSE.2021.1.34
[158] Sjöberg, J., Lilja, P. (2019). University teachers' ambivalence about the digital transformation of higher education. International Journal of Learning, Teaching and Educational Research, 18(13): 133-149. https://doi.org/10.26803/ijlter.18.13.7
[159] Soltovets, E., Chigisheva, O., Dmitrova, A. (2020). The role of mentoring in digital literacy development of doctoral students at British universities. Eurasia Journal of Mathematics, Science and Technology Education, 16(4): em1839. https://doi.org/10.29333/ejmste/117782
[160] Stare, J., Klun, M., Dečman, M. (2023). A case study on the development of digital competences of teachers at

the University of Ljubljana. NISPAcee Journal of Public Administration and Policy, 16(1): 138-166. https://doi.org/10.2478/nispa-2023-0006

[161] Stone, C. (2019). Online learning in Australian higher education: Opportunities, challenges and transformations. Studies in Success, 10(2): 1-11. https://doi.org/10.5204/ssj.v10i2.1299

[162] Strielkowski, W., Korneeva, E., Gorina, L. (2022). Sustainable development and the digital transformation of educational systems. Intellectual Economics, 16(1): 134-150. https://doi.org/10.13165/IE-22-16-1-08

[163] Strielkowski, W., Korneeva, E.N., Sherstobitova, A.A., Platitzyn, A.Y. (2022). Strategic university management in the context of digitalization: The experience of the world's leading universities. Integrated Education, 26(3): 402-417. https://doi.org/10.15507/1991-9468.108.026.202203.402-417

[164] Suárez, L.M.C., Núñez-Valdés, K., Alpera, S.Q.Y. (2021). A systemic perspective for understanding digital transformation in higher education: Overview and subregional context in Latin America as evidence. Sustainability, 13(23): 12956. https://doi.org/10.3390/su132312956

[165] Szabó, K., Varga, E., Juhász, T. (2023). Higher education experience in the shadow of COVID-19: The Hungarian online education. European Journal of Contemporary Education, 12(2): 629-645. https://doi.org/10.13187/ejced.2023.2.629

[166] Sziegat, H. (2022). Transforming governance of German higher education institutions. Research in Educational Administration and Leadership, 7(3): 472-517. https://doi.org/10.30828/real.1164190

[167] Tabachuk, N.P., Ledovskikh, I.A., Shulika, N.A., Kazinets, V.A., Polichka, A.E. (2018). Internet activity and internet addiction: Where is the borderline in developing one's information competency? Eurasia Journal of Mathematics, Science and Technology Education, 14(12): Art. em1640. https://doi.org/10.29333/ejmste/97828

[168] Taşkın, N., Kandemir, B., Erzurumlu, K. (2023). University student satisfaction and behavioural engagement during emergency remote teaching. Canadian Journal of Learning and Technology, 49(1): 28242. https://doi.org/10.21432/cjlt28242

[169] Teixeira, A.F., Gonçalves, M.J.A., Taylor, M.L.M. (2021). How higher education institutions are driving to digital transformation: A case study. Education Sciences, 11(10): 636. https://doi.org/10.3390/educsci11100636

[170] Tejedor, S., Cervi, L., Pérez-Escoda, A., Jumbo, F.T. (2020). Digital literacy and higher education during COVID-19 lockdown: Spain, Italy, and Ecuador. Publications, 8(4): 1-17. https://doi.org/10.3390/publications8040048

[171] Teresa Ribeiro, R., Cunha, G., Silva, C., Medeiros, N., Viegas, C., Ferro, A., Poças, I., Raposo, H., Eiras, M. (2023). Determinants influencing distance learning at health technology higher education institutions in Portugal. Education Sciences, 13(2): 189. https://doi.org/10.3390/educsci13020189

[172] Teslia, I., Yehorchenkova, N., Khlevna, I., Kataieva, Y., Latysheva, T., Yehorchenkov, O., Khlevnyi, A., Veretelnyk, V. (2020). Developing a systems engineering concept for digitalizing higher education institutions. Eastern European Journal of Enterprise Technologies, 6(2-108): 6-20. https://doi.org/10.15587/1729-4061.2020.219260

[173] Timokhova, G., Kostyukhin, Y., Sidorova, E., Prokudin, V., Shipkova, O., Korshunova, L., Aleshchenko, O. (2022). Digital transformation of the university as a means of framing eco-environment for creativity and creative activities to attract and develop talented and skilled persons. Education Sciences, 12(8): 562. https://doi.org/10.3390/educsci12080562

[174] Tito-Huamani, P., Aponte, S., Custodio, F., Castañeda, T., Garamendi, K., Soto, E. (2022). Virtual university and educational transformation in the context of the pandemic. Journal of Higher Education Theory and Practice, 22(11): 203-214. https://doi.org/10.33423/jhetp.v22i11.5424

[175] Toprak, M., Bayraktar, Y., Erdoğan, A., Kolat, D., Şengül, M. (2019). Developing a tool for quality and accreditation of a new generation university in the digitalized society: The case of a thematic-technical university. Economics of Innovation and New Technology, 7(2): 69-89. https://doi.org/10.2478/eoik-2019-0017

[176] Tóth, T., Virágh, R., Hallová, M., Stuchlý, P., Hennyeyová, K. (2022). Digital competence of digital native students as prerequisite for digital transformation of education. International Journal of Emerging Technologies in Learning, 17(16): 150-166. https://doi.org/10.3991/ijet.v17i16.31791

[177] Tóth-Pajor, Á., Bedő, Z., Csapi, V. (2023). Digitalization in entrepreneurship education and its effect on entrepreneurial capacity building. Cogent Business & Management, 10(2): 2210891. https://doi.org/10.1080/23311975.2023.2210891

[178] Tri, N.M., Hoang, P.D. (2023). The impact of digital transformation in higher education: The case study from Vietnam. Journal of Higher Education Theory and Practice, 23(5): 17-26. https://doi.org/10.33423/jhetp.v23i5.5922

[179] Tshivhase, L., Bisschoff, C.A. (2023). Designing a model to measure and manage the implementation of green initiatives at South African universities. Environmental Economics, 14(1): 1-12. https://doi.org/10.21511/ee.14(1).2023.01

[180] Turpo-Gebera, O., Gonzales-Miñán, M., Venegas-Mejía, V., Loayza-López, M. (2023). Research on digital culture in Peruvian universities: Productivity, knowledge, potentials and challenges. Revista de Ciencias Sociales, 29(7): 342-357. https://doi.org/10.31876/rcs.v29i.40469

[181] Umah, E.C., Imron, A., Hadi, S., Praherdhiono, H. (2023). Madrasah principal digital leadership innovation in digital learning transformation. Revista de Gestão Social e Ambiental, 17(3): e03365. https://doi.org/10.24857/rgsa.v17n3-025

[182] Vachkova, S.N., Petryaeva, E.Y., Tsyrenova, M.G., Shukshina, L.V., Krasheninnikova, N.A., Leontev, M.G. (2022). Competitive higher education teacher for the digital world. Contemporary Educational Technology, 14(4): ep391. https://doi.org/10.30935/cedtech/12553

[183] Valdés, K.N., Alpera, S.Q.Y., Suárez, L.M.C. (2021). An institutional perspective for evaluating digital transformation in higher education: Insights from the Chilean case. Sustainability, 13(17): 9850.

https://doi.org/10.3390/su13179850
[184] Veiga, F.J.M., de Andrade, A.M.V. (2021). Critical success factors in accepting technology in the classroom. International Journal of Emerging Technologies in Learning, 16(18): 4-22. https://doi.org/10.3991/ijet.v16i18.23159
[185] Vicente, P.N., Lucas, M., Carlos, V., Bem-Haja, P. (2020). Higher education in a material world: Constraints to digital innovation in Portuguese universities and polytechnic institutes. Education and Information Technologies, 25(6): 5815-5833. https://doi.org/10.1007/s10639-020-10258-5
[186] Walczak, K., Cellary, W. (2023). Challenges for higher education in the era of widespread access to generative AI. Economics and Business Review, 9(2): 71-100. https://doi.org/10.18559/ebr.2023.2.743
[187] Wang, K., Li, B., Tian, T., Zakuan, N., Rani, P. (2023). Evaluate the drivers for digital transformation in higher education institutions in the era of industry 4.0 based on decision-making method. Journal of Innovation and Knowledge, 8(3): 100364. https://doi.org/10.1016/j.jik.2023.100364
[188] Xu, D., Gao, Y., Tu, T., Xiao, X. (2022). A big data integration platform for ideological and political education for smart campuses. Security and Communication Networks, 2022: 5973920. https://doi.org/10.1155/2022/5973920
[189] Yang, L., Martínez-Abad, F., García-Holgado, A. (2022). Exploring factors influencing pre-service and in-service teachers' perception of digital competencies in the Chinese region of Anhui. Education and Information Technologies, 27(9): 12469-12494. https://doi.org/10.1007/s10639-022-11085-6
[190] Yang, Z. (2022). Digital transformation to advance high-quality development of higher education. Journal of Education, 15(2): 15-23. https://doi.org/10.18785/jetde.1502.02
[191] Yavuz, M., Kayalı, B., Karaman, S. (2023). An investigation of digital transformation activities of higher education in Türkiye. Participatory Educational Research, 10(4): 237-255. https://doi.org/10.17275/per.23.69.10.4
[192] Yureva, O.V., Burganova, L.A., Kukushkina, O.Y., Myagkov, G.P., Syradoev, D.V. (2020). Digital transformation and its risks in higher education: Students' and teachers' attitude. Universal Journal of Educational Research, 8(11): 5965-5971. https://doi.org/10.13189/ujer.2020.082232