THE USE OF DIGITAL TECHNOLOGY IN UNIVERSITY LEARNING THROUGH A BIBLIOMETRIC APPROACH

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ABSTRACT

The article proposes a bibliometric analysis of digitalization in higher education. Based on research conducted in October 2023, the study explored 967 articles in the Web of Science (WOS) database. It highlights the growing importance of digitalization in higher education institutions and explores emerging trends in teaching practices and learning patterns. The study reveals a spike in publications in 2021-2022, likely in response to the COVID-19 pandemic and the transition to online learning. The most active countries in publications on the subject are Russia and Germany accounting for more than 45% of articles. In addition, the analysis of bibliographic networks identified collaborations between authors and the most cited articles, while the analysis of key terms highlighted important research topics such as e-learning and digitalization.

This bibliometric study sheds valuable light on an abundant field of research at the heart of the current transformations in higher education. However, additional analyses are needed to follow the rapid evolution of digital education in all its richness and diversity.

1.   Introduction.

The rapid rise of digital technologies has profoundly transformed all aspects of our society, including the field of education, and higher education has not escaped this transformation. Currently, many countries consider knowledge and information to be key elements in boosting their productivity, production capacity, competitiveness, and wealth (Escueta, Quan, Nickow, & Oreoupoulos, 2017). It has become imperative to evaluate schools and universities to ensure that they keep pace with the ever-

changing world in order to foster human capital development (Hamidi, Meshkat, Rezaee, & Jafari, 2011), (Kadri, Sassi Boudemagh, & Saighi, 2022).

Thus, this development highlights the need for a change in the pedagogical model of educational institutions to meet the demands of the new 'knowledge society' (Cerviño & Vera, 2020). Such a change would aim to achieve greater flexibility and adopt learning technologies to modernize and improve teaching in its formal and professional context (Chais, Ganzer, & Olea, 2017).

Similarly, these transformations have a significant impact on teaching practices and the experiences of learners, as authors such as Bertrand (2014), Dubarc et Djebara (2015) and Le Déaut (2015), have emphasized. Indeed, digitization opens up new horizons in terms of involvement and cooperation by facilitating access to a multitude of online educational resources through learning platforms and social networks. It also encourages the development of more interactive teaching methods tailored to the individual needs of learners (Fojtik, 2014).

Furthermore, this relationship between higher education and the digital world is rooted in the concept of teaching and learning, which encompasses the transmission of knowledge skills, and values by the teacher to the learner, as well as the acquisition of these elements, by the learner (Redjimi & Billel, 2020). These interactions can take place in a variety of contexts, such as schools, universities, vocational training centers and even online. Thus, digital integration in higher education encompasses the use of information and communication technologies to support and enhance teaching and learning processes, transforming the way knowledge is transmitted, acquired, and assessed in an academic context. This opens up new perspectives in higher education, requiring ongoing reflection.

In this context, digital technology is seen as an essential lever for renewing teaching practices at universities. The authors (Amélie Duguet, Sophie Morlaix, 2018) have highlighted the opportunities offered by digital technology in this area, particularly by enabling the diversification of teaching methods and modes of access to educational content and services. Thus, understanding the relationship between higher education and the use of digital becomes essential to grasping the issues, opportunities, and challenges emerging in this new educational landscape.

At the same time, this relationship between higher education and the use of digital technology also raises major challenges. It is essential to take into account issues such as equitable access to technologies, the high cost of these technologies, the confidentiality of learners' data, the training of teachers in the use of digital tools, and the measurement of the effectiveness of these digital teaching practices.

In order to gain a better understanding of recent developments in the integration of digital technologies in higher education and to highlight the main trends and digital teaching methods, this article proposes to carry out a bibliometric analysis.

The bibliometric method is a quantitative approach that studies scientific publications by analyzing citations and bibliographic references. It can be used to assess the scientific output of individuals, institutions, or specific fields of research.

The bibliometric analysis of the literature also aims to determine the amount of research on the relationship between higher education and the use of digital technologies and to identify emerging trends, the most frequently addressed topics, the evolution of research on the use of digital technologies in university learning, and the relevant research groupings and clusters in this field. The research question guiding this article is as follows: What are the recent trends in the use of digital technologies in higher education, and how have these trends been explored in academic research?

2.   Literature review on the use of digital technology in higher education.

The state of the art in this field is constantly evolving due to the rapid development of technologies and pedagogical approaches (Louisia, 2021). Thus, the use of digital technologies in teaching and learning has become a topic of growing interest worldwide.

Recent research, such as that conducted by Goretti Cabaleiro- Cerviño and Carolina Vera (Cerviño & Vera, 2020), as well as the study by Elena-V Frolova (Frolova, Elena V.; Rogach, Olga V.;

Ryabova, Tatyana M., Digitalization of Education in Modern Scientific Discourse: New Trends and Risks Analysis, 2020), has highlighted the scientific discourse surrounding the digitisation of education. This research reveals that various topics are being addressed in this constantly evolving field.

One of the key trends in the digitization of university learning concerns the rise of online teaching. This approach allows widespread access to electronic resources anywhere (Safuanov, Lekhmus, & Kolganov, E A, 2019), encompassing the use of online courses and learning platforms. This development has significantly expanded learning opportunities by offering students new hybrid models of teaching practice, with methods that are more accessible, flexible, and tailored to their needs (Ausin, Abella, & Horti, 2016).

Consequently, in this new learning paradigm, interactive and participatory teaching methods are also gaining in importance. This includes immersive and personalized learning experiences; self-learning (Hamiti Mentor, Reka Blerim, Baloghová Andrea, 2014) plays a central role, digital technology facilitates the search, access, and management of information content, enabling students to become active players in the construction of their knowledge and even increasing interest in learning (Nguyen, 2019).

In addition, it is essential to highlight the growing role of artificial intelligence technologies in learning, as evidenced by the research of Paskova A.A. (Paskova , 2019). These advances pave the way for personalized online learning while easing the workload of teachers, reflecting the constant evolution of pedagogical practices and the influence of digital technologies on higher education.

Furthermore, the growing use of artificial intelligence to adapt learning paths and provide individualized educational support is highlighted by (Ausin, Abella, & Horti, 2016). It can stimulate and motivate study within groups of students and improve teaching efficiency.

Horizontal networked communications, as mentioned by Dean G Campelj, encourage effective student collaboration and resource sharing, while facilitating knowledge modeling, updating of assessment tools, and transparency of results (Campelj Borut, Karnet Igor, Brodnik Andrej, Jereb Eva, Rajkovic Uros, 2019). Students' informal digital practices, as identified by Timmis and *al*. enrich collective activity and strengthen social, cultural, and educational capital (Timmis Sue , Muñoz-Chereau Bernardita, 2019).

In this context, the roles and functions of teachers are also changing. Once seen as the main holder of knowledge, the teacher's role is evolving towards that of a learning facilitator (Frolova, Elena V.; Rogach, Olga V.; Ryabova, Tatyana M., Digitalization of Education in Modern Scientific Discourse: New Trends and Risks Analysis, 2020). Questions are focusing on the nature of assessment and the redefinition of course, lecture, and seminar formats (Safuanov, Lekhmus, & Kolganov, E A, 2019).

It should also be noted that the scientific literature includes numerous studies examining the issues associated with the digitization of education and its adverse effects. Some scientific publications examine the risks and challenges associated with the increasing integration of digital technologies in education, sparking debate and concern among researchers and education professionals.

According to research by Josef Kuo-Hsun Ma (2019) and M A. Manikovskaya (2019), the digitization of society may reinforce social inequalities due to the growing demand for digital skills. Young people from low-income backgrounds tend to have shortcomings in the use of educational technologies and therefore in the acquisition of digital skills, which are essential if they are to remain competitive on the labor market.

This is in line, as Mikhail V. Pashkov 2022 "*with the theory of the digital divide, which suggests that digital technology alone cannot guarantee a more equitable and fair distribution of educational opportunities within society*" (Pashkov MV, Pashkova VM , Starostenko VA, 2022). Limited access to digital resources also remains one of the digital inequalities, with some higher education institutions, particularly those with limited resources, facing major challenges. The lack of infrastructural support, disparities in the use of digital technologies (Brotcorne Périne, Valenduc Gérard, 2009) and the reluctance of teaching staff to integrate digital technologies into the learning process hinder the full implementation of digitization in higher education (Freitas A, Paredes J., 2018).

Furthermore, during the COVID-19 pandemic, the widespread transition to distance learning highlighted and amplified the risks of increasing inequalities, as not all teachers and students were equally prepared or benefited equally from e-learning (Bekova Saule, Terentev Evgeny, Maloshonok Natalia, 2021).

As such, it is essential that educators and policymakers address these inequalities and develop strategies to make online learning more equitable. This may involve providing support to students who do not have access to the necessary technology, improving digital literacy, and finding ways to mitigate the disadvantages faced by disadvantaged students in the context of online learning (Hansen John D., Reich Justin, 2015) (Kizilcec René F, Davis Glenn M., Cohen Geoffrey L., 2017).

In current scientific discourse, questions are also frequently asked about the consequences of the disappearance of direct interaction between teachers and students as a result of the widespread adoption of digital tools in higher education (Cladis , 2018). This transition may have repercussions on the quality of teaching, student engagement (Van den Beemt A., Thurlings M., Willems M., 2019), pedagogical effectiveness, and the decrease in personal interactions between teachers and students (Strekalova , 2019).

It is therefore crucial to recognize these obstacles and put strategies in place to overcome them. Developing the technological infrastructure, training teachers, and changing the mindset within academic institutions are all essential measures for maximizing the benefits of digitizing higher education. Ultimately, digitization in learning has significant potential to improve the accessibility, quality, and personalization of learning, but its effective implementation will depend on the ability of educators and policymakers to meet these challenges.

3. Methods and materials.

As we stated earlier, the aim of our research is to define the publications dealing with the importance of digital technology in higher education in order to develop a solid knowledge base, identify best practices, and understand the constant developments in this field.

To achieve this, bibliometric analysis is now emerging as a recognized and commonly used tool by researchers, as stated by (Rodríguez-Bolivar, M. P., Alcaide-Munoz, L., Cobo, M. J., 2018), to assess scientific productivity and research quality.

This method is based on two main techniques:

Performance indicators provide quantitative data on scientific production, assessing the productivity of authors, countries, and journals in the fields of research.

Scientific mapping involves creating bibliometric networks to visualize the links between documents, authors, and keywords, making it easier to understand future research trends in different fields (Terán-Yépez, E., Marín-Carrillo, G. M., Casado Belmonte, M. d., Capobianco-Uriarte, M. d., 2019).

To this end, a bibliometric analysis was carried out on October 3, 2023, using the following queries: 'higher education' and 'digital', without any particular restrictions in order to encompass the maximum number of documents available on the subject. This search generated a total of 967 articles through the Web of Science (WOS) multidisciplinary database, which was the main source for this research. This database contains over one billion cited, searchable references and a significant number of renowned academic journals (Huang, L., Zhou, M., Lv, J., Chen, K., 2019).

Using the information extracted from the database, this research examined several aspects, including the evolution of scientific production over time, scientific productivity by country, journal, author, and impact, the identification of the most cited articles in the field, as well as the analysis of bibliographic networks to understand bibliographic coupling and the co-occurrence of terms.

As a result, all of these analyses will provide a comprehensive picture of trends in research and conceptual developments in the field of higher education and the use of digital technologies, as well as highlighting emerging trends, the most frequently addressed topics, and the evolution of research on the use of digital technologies in university learning. This approach is proving to be a valuable tool for researchers and decision-makers interested in the subject.

4.   Results.
4.1. Évolution de la production scientifique par année.
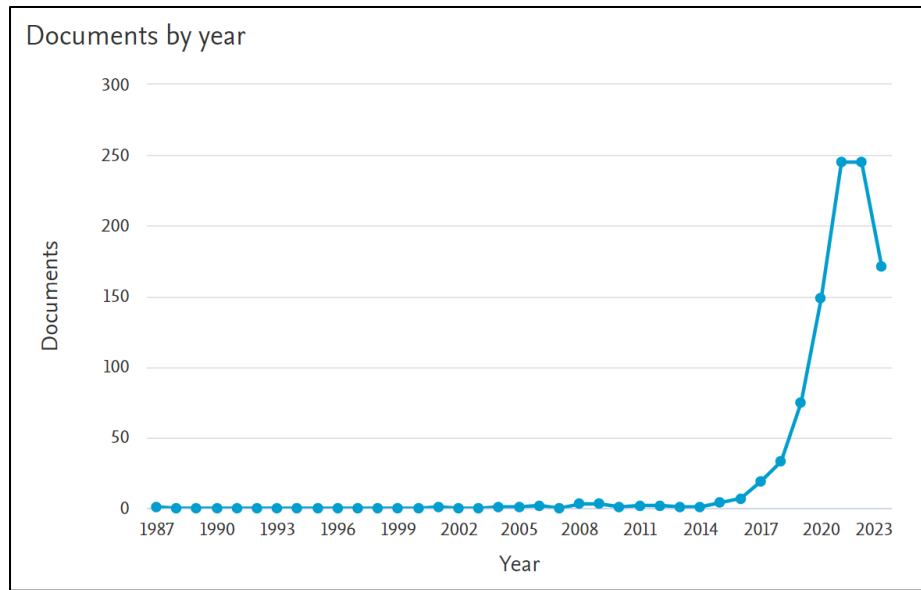
Source: Based on data from Web of Science, 2023.

Figure 1. Evolution of scientific production on digital technology in higher education.

Figure 1 shows a significant change in the annual production of scientific literature on digitization in higher education. It suggests a slow start to research on the subject between 1987 and 2014. Thereafter, we observe expansive growth from 2015 onwards, indicating growing interest.

This interest in the subject can be explained by the significant advances in information and communication technologies. In particular, the expansion of broadband internet connectivity and widespread accessibility to the internet around the world have created an environment conducive to large-scale, global e-learning.

This has also enabled educational establishments to offer a rapid transition to distance learning and give students easy access to online educational resources, encouraging researchers to explore these opportunities further.

The most striking trend will be seen in the years 2021 and 2022, when there will be a peak in scientific output. This peak can certainly be explained by the COVID-19 pandemic, which broke out in 2019 and had an unprecedented impact on higher education and the need for distance learning as an alternative.

This situation has led to growing interest among researchers in assessing the effectiveness of online teaching, identifying best practices, solving technical and pedagogical problems, and understanding the challenges faced by teachers and students.

4.2. Scientific production by country.
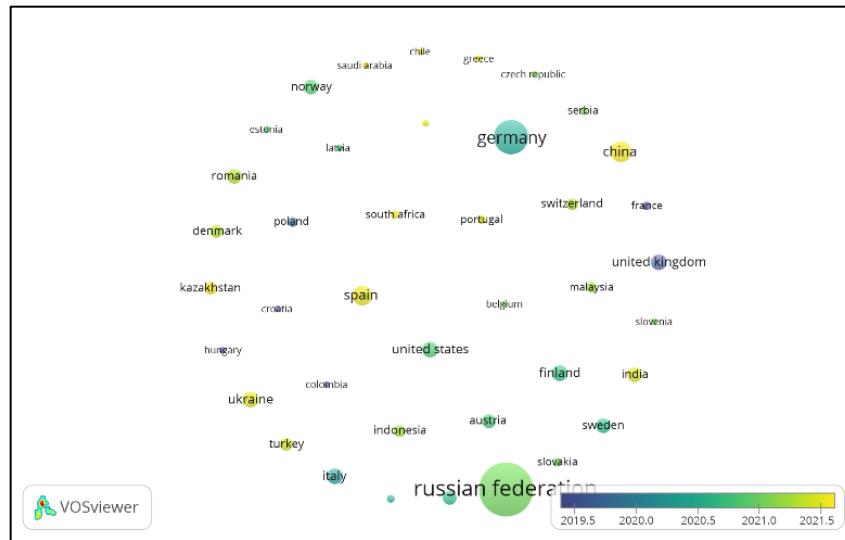
Source: Based on data from Web of Science, 2023.

Figure 2 . Geographical distribution of publications.

Figure 2 and Table 1 show the geographical distribution of publications on the subject of digitization in higher education.

It can be seen that publications in this field are dominated by two European countries, Russia and Germany, which together account for more than 45% of publications on the subject. China is the only Asian country in the top 10. There is also a total absence of African countries, which shows that there is little interest in the subject and that digitization of higher education in Africa is still in its infancy.

Russia's dominance of the rankings, with more than 312 publications and 884 citations (almost 32%), is explained by trends in Russian policies for the reform of the higher education system over the years, with initiatives aimed at improving the quality of education, strengthening the international competitiveness of universities, and aligning with global standards.

One example is the launch in 2013 of the '5-100-2020'[1] program, a state-funded initiative aimed at positioning at least five Russian universities among the top 100 in world rankings by the year 2020. The aim of the '100' figure was to demonstrate a significant improvement in the quality of higher education in Russia on a global scale. This ambitious program aimed to strengthen the competitiveness of Russian universities by investing in areas such as scientific research, recruiting renowned researchers, improving infrastructure, and promoting international collaboration. Although the original deadline was 2020, achieving these goals in the education sector may take longer.

Table 1. Scientific production by country.

Country	Documents	Citations	Country	Documents	Citations
1	2	3	4	5	6
Russian Fédération	312	884	Denmark	17	20
Germany	122	1097	Indonesia	16	17

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[1] University Transformation : Explaining PolicyMaking and Trends in Higher Education in Russia Madeleine Block, Tatiana Khvatova Journal of Management Development ISSN : 0262-1711 Date de publication de l'article: 10 juillet 2017.

Table 1. Continuation.

| 1	2	3	4	5	6
Spain	44	484	Switzerland	15	129
China	42	128	Malaysia	14	47
United Kingdom	29	578	Poland	12	29
Ukraine	28	66	Portugal	10	131
Italy	27	89	South Africa	10	28
United states	26	453	Slovakia	9	18
Romania	25	75	France	9	97
Finland	25	77	Serbia	7	43
Sweden	24	427	Slovenia	6	2
Norway	23	229	Saudi Arabia	6	109
India	21	62	Latvia	6	9
Austria	21	93	United Arab emirates	5	57
Australia	18	182	Colombia	5	25
Turkey	18	48	Croatia	5	5
Karakhstan	18	38	Hungary	5	2

Source: Based on data from Web of Science, 2023.

In Germany, there are also numerous reforms to promote digitisation, such as the Hochschulforum Digitalisierung "Digitalization in Higher Education Forum", a German initiative launched in 2014 to promote the digital transformation of higher education institutions. It serves as a platform for dialogue, collaboration and knowledge exchange between various stakeholders in the academic community, including universities, policymakers, researchers and industry partners. The forum covers topics such as digital teaching and learning, the digital infrastructure at universities, the use of digital tools and technologies for research, and the overall impact of digitisation on higher education. Or Qualitätspakt Lehre (Quality Pact for Education), launched in Germany in 2011. Although not exclusively focused on digitisation, it includes funding for projects aimed at improving the quality of education, which may involve digital elements. And the Beschleunigte Digitalisierung in Bildung und Wissenschaft: This initiative was announced in 2020 as a response to the COVID-19 pandemic, highlighting the importance of accelerating digitisation in education and research.

In response to these reforms and policies, scientific publications in Germany focus on the implications, challenges and opportunities arising from the integration of ICT into higher education. In particular, researchers are exploring how these changes impact on teaching practices, teacher training, the quality of learning, and the international competitiveness of German institutions.

4.3. Analysis by research area.

Figure 3 shows the main domains or sectors of research in which the topic of digitization in higher education has been addressed. There is a predominance of three domains, namely: social sciences with 24% of publications, computer science and technology with 22.9%, and the engineering field with 14.3%.
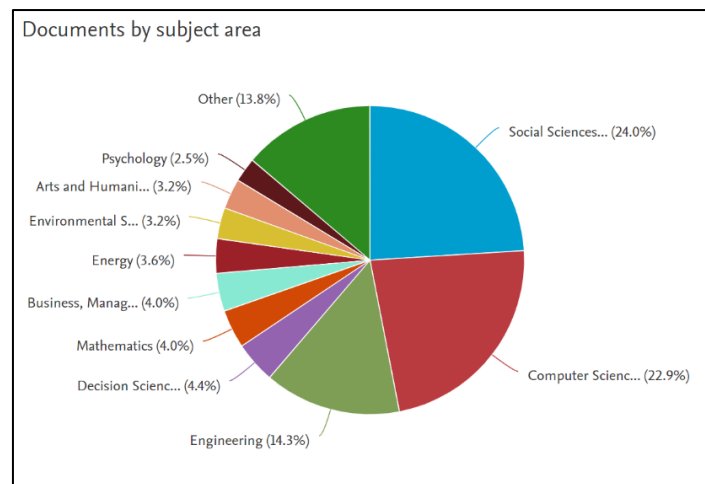
Source: Based on data from Web of Science, 2023.

Figure 3. The top 10 domains most frequently used in publications.

The figure also shows that the subject is present in other fields, such as mathematics or business and management, with a low rate of representativeness, but this attests to the multidisciplinary nature of the subject of digital technology in higher education.

The predominance of digital research in university education within the social sciences, computer sciences, and technology is the result of a combination of disciplinary, technological, social, and economic factors.

The social sciences, which focus on the social and behavioral aspects of learning, are naturally inclined to examine the social, cultural, and psychological implications of educational technology. On the other hand, computer sciences and technology are intrinsically linked to information and communication technologies (ICT), which motivates researchers to explore their integration into education.

4.4. Analysis of bibliographical networks.

Bibliographic networks are one of the analysis tools used in bibliometrics. They are used to graphically represent the relationships and connections between a set of publications based on their common bibliographic references. Using VosViewer, we have generated bibliographic networks offering a detailed representation of the relationships in a corpus of publications for bibliographic coupling (its structuring in terms of disciplines and research fields, author co-occurrence), the citation network (CAN) and term co-occurrence.

4.4.1. Bibliographic linkage network by authors[1].

The author co-occurrence network is a type of bibliometric network based on authors who have co-authored publications together. The nodes in this network represent the authors, and the links between them indicate that they have co-authored one or more articles or documents.

For our study, Figure 4 of author co-occurrence shows that the network comprises 14 nodes, each node representing an author or a group of authors who have co-authored together, consisting mainly of collaborations in pairs or triples on a few publications.

Overall, the co-author network does not have very central nodes with many connections. It seems fairly sparse and fragmented, based on collaboration in small groups on a few publications. With

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[1] This type of network makes it possible to identify collaborations between researchers and research groups. It highlights central authors who have many connections and who play an important role in a field of research. It can also be used to detect communities of authors working together on similar themes. Analysis of author co-occurrence networks therefore provides valuable information about patterns of collaboration and the social structure of research in a given field. It is a useful complement to other bibliometric indicators

a link strength equal to 0, this can be explained by the absence of any significant collaboration or co-publication between these authors in the corpus of documents analyzed.

There are also a number of small research groups that collaborate regularly:

Frolova Elena V and Rogach Olga V. have co-authored 3 papers, all revolving around digital education, educational technologies, and their impact in the Russian school context.

There is a thematic continuity and a progressive deepening in this series of articles, starting with an in-depth study of the 'Moscow Electronic School' project to introduce digital technologies into Moscow schools[1], followed by a general review of the trends and risks of digital education in scientific publications on the digitization of education[2], and finally focusing specifically on online education during the COVID-19 pandemic[3].
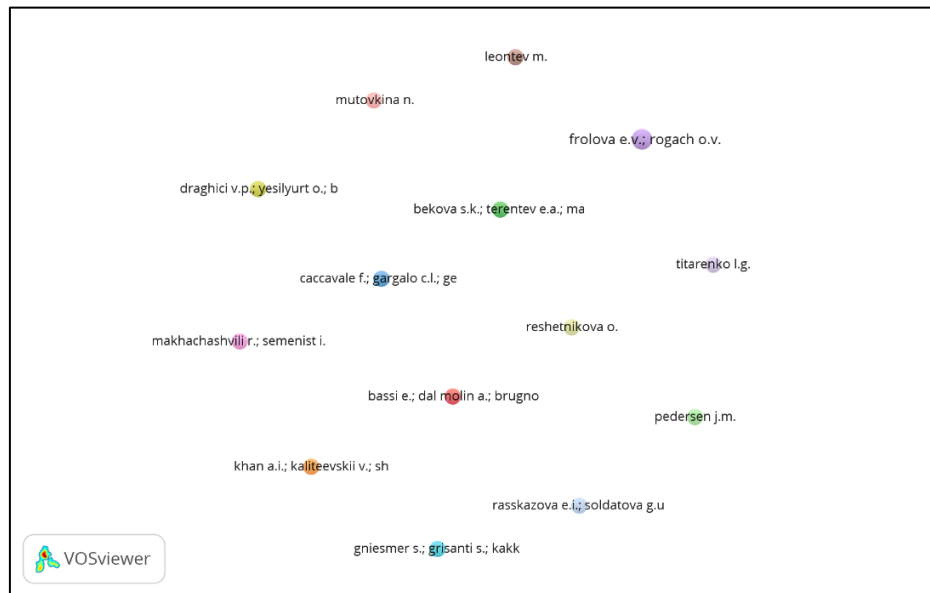
Source: Based on data from Web of Science, 2023.

Figure 4. Authors' co-occurance network.

There has also been collaboration between Bekova, Terentev, and Malosho on 2 papers. Their joint work, published in 2018 and 2021, provides essential critical insight into some of the structural bottlenecks that can lead to the development of innovative teaching practices at the university level in Russia.

Table 2. Author co-occurrence network analysis table.

Authors	Documents	Citations	Total strength of the link
1	2	3	4
Bassi e.; Dal Molin a.; Brugnolo a.; c..	2	1	0
Bekova s.k.; terentev e.a.; malosho…	2	13	0
Caccavale f.; gargalo c.l.; gernaey k…	2	1	0
Draghici v.p.; yesilyurt o.; bauer d.; …	2	1	0

[1] Digital Technologies in Education: Problems and Prospects for "Moscow Electronic School" Project Implementation (2019).

[2] Digitalization of Education in Modern Scientific Discourse: New Trends and Risks Analysis (2020)

[3] Online Student Education in a Pandemic: New Challenges and Risks (2021)

Table 2. Continuation.

1	2	3	4
Frolova e.v.; rogach o.v…	3	13	0
Gniesmer s.; grisanti s.; kakkassery…	2	0	0
Khan a. i.; kaliteevskii v.; shnai i.; ch…	2	3	0
Leontev m.	2	0	0
Makhachashvili r.; semenist i.	2	0	0
Mutovkina n	2	0	0
Pedersen j.; m.	2	0	0
Rasskazova e. i.; soldatova g.u.	2	2	0
Reshtnikova o.	2	4	0

Source: Authorship based on Web of Science data, 2023.

4.4.2. Citation network analysis (CAN).

Source: Based on data from Web of Science, 2023.

Figure 5. Author citation network.

A citation analysis was conducted to identify the most cited articles in the field of research on the use of digital technology in university learning. The results, presented in Figure 5, show that the article «*COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration*», published by Richard Watermeyer, Tom Crick, Cathryn Knight, and Janet Goodall in 2020, came out on top, with no fewer than 947 citations.

This article examines the impact of the digital transition on universities and the importance of rethinking the role and relevance of universities in the face of rapid technological and societal change. The authors argue that COVID-19 has not only forced change in higher education, but has also exposed the sector's shortcomings and the need for digital transformation. The article also discusses the future of higher education in the digital age and highlights the importance of understanding the perspectives and experiences of academics to effectively manage the impact of digital transformation.

In second place, Anders Norberg, Chuck Dziuban, and Patsy D. Moskal received 409 citations for their study published in 2011 on «*time-based blended learning model*», which explores the concept of blended learning in education, focusing specifically on a time-based model. Blended learning is described as a combination of face-to-face and online learning, offering flexibility and increased access

to education. By tackling this subject in depth as early as 2011, the authors demonstrate a real intellectual advance, dealing with an educational theme that has proved to be one of the most crucial over the years.

Suivie par l'article de Crina Damșa, Malcolm Langford, Dan Uehara et Ronny Scherer (2022), sur «*Teachers' agency and online education in times of crisis*», qui complètent le top 3 de ce classement. Cette étude examine la réponse des enseignants universitaires norvégiens à la crise de la COVID-19 et à la digitalisation de l'éducation. Il met en lumière l'importance de la compétence numérique des enseignants et de l'infrastructure numérique pour soutenir l'enseignement en ligne de qualité, ce qui est crucial pour l'avenir de l'éducation en ligne.

Followed by the article by Crina Damșa, Malcolm Langford, Dan Uehara and Ronny Scherer (2022), on «*Teachers' agency and online education in times of crisis*», which completes the top 3 in this ranking. This study examines the response of Norwegian university teachers to the COVID-19 crisis and the digitalization of education. It highlights the importance of teachers' digital competence and digital infrastructure in supporting quality online education, which is crucial for the future of online education.

Table 3. Most frequently cited articles.

Title	Authors	Year of publication	Citations
COVI-19 and digital disruption in UK universities: Afflictions and affordances of emergency online migration	R Watermeyer, T Crick, C Knight, J Goodall	2021	927
A time based blended learning model	A. Norberg, C. Dziuban, P. D. Moskal	2011	409
Teachers' agency and online education in times of crisis	C. Damșa, M. Langford, D. Uehara, R. Scherer.	2021	222
Online teaching and learning in higher education: Lessons learned in crisis situations.	S. Hofer, N. Nistor, C. Scheibenzuber	2021	206

Source: Based on data from Web of Science, 2023.

These statistics bear witness to the considerable influence of their authors. Their pioneering thinking has paved the way for the current transformation of teaching practices in higher education, the emerging issues linked to the integration of digital education, and the development of an innovative model in this field.

4.4.3. Keywords Analysis.
Based on our in-depth literature review of 967 publications, an analysis of keyword co-occurrences enabled us to highlight the main research themes or trends on the subject of the use of digital technology in higher education. Figure 5 shows the bibliometric network of the terms most present and co-occurring in our corpus. There are 6 clusters, each corresponding to a different color. The green cluster is the broadest and includes terms relating to e-learning, digitalization, students, etc. On the other hand, the orange cluster is the smallest and includes articles dealing with university issues in general.

Source: Based on data from Web of Science, 2023.

Figure 6. Bibliometric network of term co-occurrence.

Table 4. The most recurring terms.

Keyword	Occurrences	Total "strength of the link
E-learning	311	2131
Students	182	1281
Digitalization	196	995
Teaching	110	933
Human	57	680
Higher education	135	650
Covid-19	89	625
Humans	47	598
Engineering education	93	582
Learning systems	71	542
Education	68	538
Curricula	62	443
Digital transformation	78	423
Personnel training	53	421
Education computing	55	419
Learning	48	419
Article	31	379

Source: Based on data from Web of Science, 2023.

Table 4 also shows the number of occurrences of each term. A large proportion of the articles study the impact and practical applications of e-learning (311 occurrences) and digitization (196 occurrences) on teaching learning, and assessment methods. A second group focuses more specifically on the experiences and results of students (182 hits) faced with these new online educational methods,

as well as the challenges faced by teachers and universities in general in adapting to them (teaching 110 hits, higher education 135 hits).

The adaptation of educational content and methods to the digital age (digital transformation 78 hits, curricula 62 hits) is another key focus for researchers.

Finally, another crucial aspect is the impact of the COVID-19 pandemic on education. 89 articles explore the particular role played by the pandemic in accelerating the digital transition.

Overall, these thematic clusters illustrate the diversity and richness of research on learning and the use of digital technology in education.

5.   Discussion of the results.

The study highlighted several research trends and dynamics in the field of digitisation of higher education, based on an in-depth analysis of Web of Science data. These results offer interesting insights into the evolution of research in this field and the challenges and opportunities it presents.

The results of the analysis revealed a significant increase in research on the digitisation of higher education, particularly from 2015 onwards, with a notable peak in 2021-2022. This trend is largely influenced by technological advances, in particular the expansion of broadband internet access and the COVID-19 pandemic. European countries, particularly Russia and Germany, dominate scientific output, supported by national initiatives to modernise education. In addition, analysis by field of research highlighted the interdisciplinary nature of the subject and the need for holistic approaches to understanding its implications.

Finally, the keyword analysis revealed the main research themes, such as e-learning, digitalisation, and the academic challenges linked to the digital transition. These themes reflect the current concerns of researchers and underline the importance of understanding the implications of the digitisation of education.

6.   Conclusions.

This study provides a comprehensive overview of research trends and dynamics in the field of digitization of higher education. It looked at the publications available in the Web of Science database concerning the use of digital technology in higher education, providing an overview of the main aspects characterizing this area of research.

The results indicate a peak in scientific production in 2021-2022, probably in response to the COVID-19 pandemic and the transition to online learning. The countries most active in publishing on the subject include Russia, Germany and China, reflecting national initiatives to modernize higher education.

Analysis of the bibliographic networks reveals collaboration between authors and the identification of the most cited articles. The key terms identified highlight the main research themes, such as e-learning, digitalization, and academic challenges.

Faced with these trends and changes, higher education institutions must adapt and rise to the challenge. As key players in the production and transmission of knowledge, universities are well positioned to develop the use of digital technologies in higher education. Nevertheless, this requires a renewal of traditional teaching practices.

However, several limitations need to be taken into account when interpreting the results. Apart from the restriction to the Web of Science database, there are other aspects to consider when interpreting the results. Firstly, the dynamism of the field implies the continuous emergence of new trends, which are difficult to capture over a limited analysis period. Secondly, the keyword search criteria may have excluded relevant contributions classified differently, published in other sources not covered.

Despite these reservations, this bibliometric study sheds valuable light on an abundant field of research at the heart of current transformations in higher education.

Declaration of Interest Statement.

The author declare that she has no conflict of interest.

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