



DIGITAL TRANSFORMATION AND GLOBAL INNOVATION IN THE 4.0 UNIVERSITY

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APA Citation:

Paula Alejandra Abdo Peralta, Miguel Ruiz, Frank Ángel Lemoine Quintero, Ernesto Esmeral, Basilide Avilés Puma, Luis Arturo Murillo Cuenca (2021). DIGITAL TRANSFORMATION AND GLOBAL INNOVATION IN THE 4.0 UNIVERSITY, *Journal of Language and Linguistic Studies*, 17(4), 2754-2768

Submission Date: 05/10/2021

Acceptance Date: 08/11/2021

DOI: 10.5489/jlls.5015924

Abstract

A documentary review was carried out on the production and publication of research papers related to the study of the variable Digital Transformation and Global Innovation in the University 4.0. The purpose of the bibliometric analysis proposed in this document is to know the main characteristics of the volume of publications registered in Scopus database during the period 2015-2020 globally, achieving the identification of 1043 publications in total. The information

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provided by said platform was organized by means of graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics were described, the position of different authors regarding the proposed topic was referenced by means of a qualitative analysis. Among the main findings of this research, it is found that the Russian Federation is the country with the highest production, with 208 publications. The area of knowledge that made the greatest contribution to the construction of bibliographic material related to the study of digital transformation and global innovation in the university 4.0 was computer science with 455 published documents, and the type of publication that was most used during the period mentioned above was the journal article, which represents 44% of the total scientific production.

Keywords: digital transformation, university 4.0.

1. Introduction

The university has a very important role as a transforming and innovative entity in society, so it is necessary that it adapts its processes to the new digital era, or as it is also called industry 4.0. For the digital transformation to be possible, the use of information and communication technologies (ICT) is considered necessary as key tools to promote innovation in the education sector, thus breaking the temporal and spatial limits by accessing this service anywhere and at any time (Cueva Gaibor, 2020). Therefore, the university must be, beyond being coupled, ahead of the changes that are generated in society because depending on the knowledge imparted and its methodologies, companies, institutions and industry will act. For Pedroza flores (2018), the university has undergone a hasty metamorphosis by becoming an intelligent organism that is now called university 4.0.

In the last 5 years, the university has been presenting changes in its methodology and the tools it uses to educate, being these more and more in line with what the fourth industrial revolution has sought to introduce in society; But this transformation was more accelerated in early 2020 when the health emergency was declared because of COVID 19 which forced people to isolate themselves and caused them to change the way they interact, and of course changed the methodologies of education from traditional classroom methodologies to become a 100% online university through educational platforms of mediated encounters. So the university plays an important role in the aptitude of future professionals for Industry 4.0 which demands both competencies related to their profession and soft skills.

Thanks to the digital transformation, an inclusive education can be possible since any person with knowledge about the use of digital tools can access education from anywhere. Therefore, it is important to know in terms of bibliographic resources, the current state of research related to

digital transformation and global innovation in the university 4.0, so it is proposed a bibliometric analysis of the scientific production registered in Scopus database during the period 2015-2020 to answer the question: How has been the production and publication of research papers related to the study of the variable digital transformation and global innovation in the university 4.0 during the period 2015-2020?

2. General objective

To analyze the production of high impact research papers on the variable Digital transformation and global innovation in university 4.0 from a bibliometric and bibliographic perspective, during the period 2015-2020.

3. Methodology

Quantitative analysis of the information provided by Scopus under a bibliometric approach on the scientific production concerning the Digital Transformation and global innovation in the university 4.0 is performed. Also, from a qualitative perspective, examples of some research papers published in the area of study mentioned above are analyzed from a bibliographic approach to describe the position of different authors on the proposed topic.

The search is performed using the tool provided by Scopus and the parameters listed in Table 1 are established.

3.1 Methodological design

Table 1. *Methodological design.*

	PHASE	DESCRIPTION	CLASSIFICATION
PHASE 1	DATA COLLECTION	Data was collected using the Scopus web page search tool, through which a total of 1,043 publications were identified	Published papers whose study variables are related to digital transformation and global innovation in the university 4.0. Research papers published during the period 2015-2020.

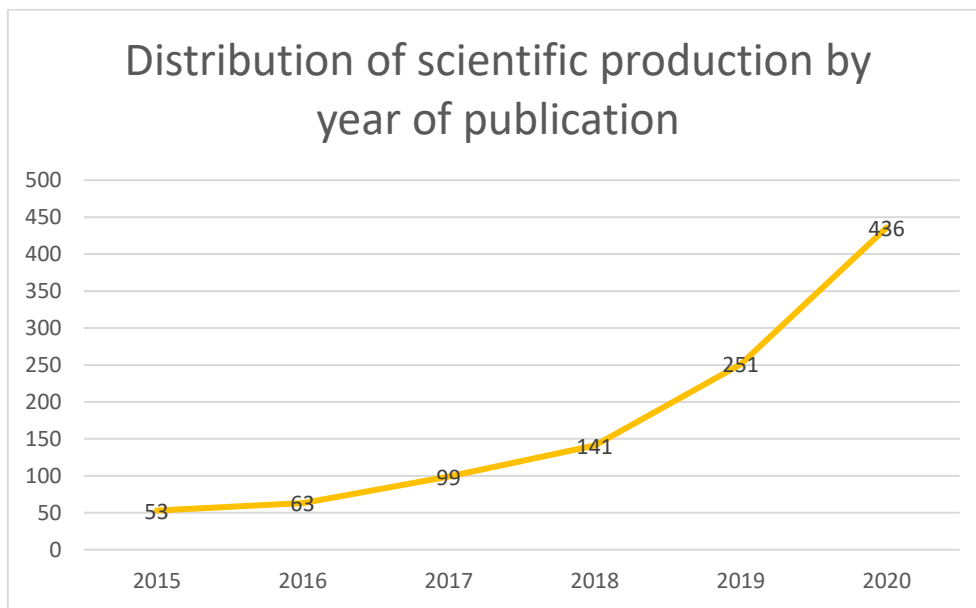
			Without distinction of country of origin. Without distinction of area of knowledge. Without distinction of type of publication.
PHASE 2	BUILDING THE ANALYSIS MATERIAL	The information identified in the previous phase is organized. The classification will be made by means of graphs, figures and tables based on data provided by Scopus.	Word Co-occurrence. Year of publication Country of origin of the publication. Area of knowledge. Type of publication
PHASE 3	DRAFTING OF CONCLUSIONS AND FINAL DOCUMENT	After the analysis carried out in the previous phase, the conclusions are drawn up and the final document is prepared.	

Source: Own elaboration (2021)

4. Results

4.1 Co-occurrence of words

Figure 1 shows the co-occurrence of keywords within the publications identified in the Scopus database.

Figure 2. Distribution of scientific production by year of publication.

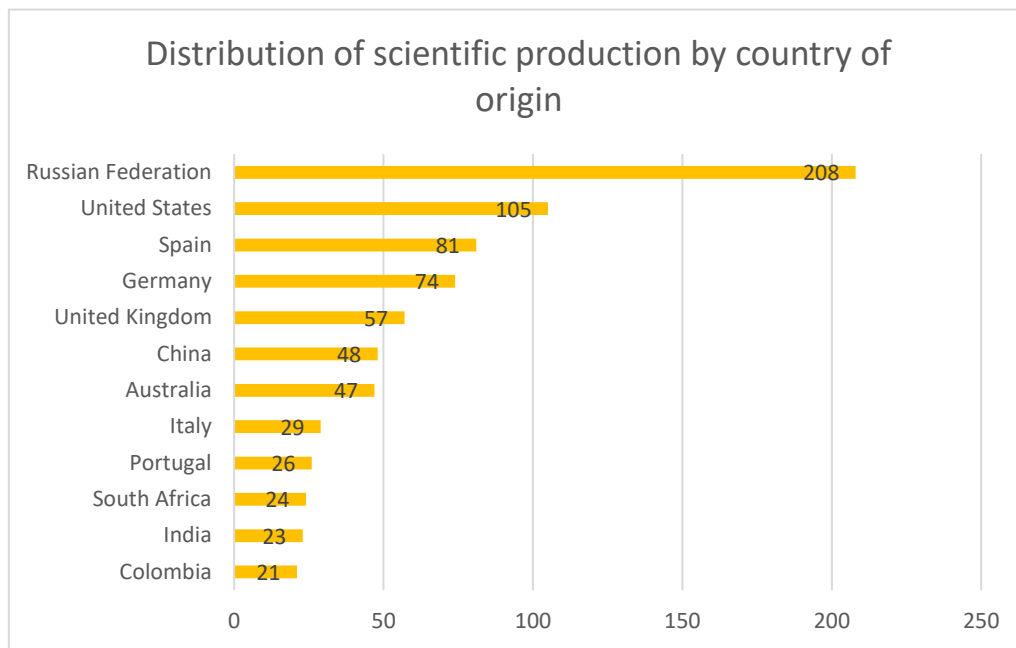
Source: Own elaboration (2021); based on data provided by Scopus.

As shown in Figure 2, 2020 is the year with the highest number of publications related to Digital Transformation and Global Innovation in University 4.0 with a total of 436 papers within which is "Digital transformation in higher education: a framework for maturity assessment" (Marks et al., 2020). This research explores the maturity and challenges of digital transformation within higher education, starting from 2014 to 2019 and analyzing how much digital innovation has matured in educational processes. Thus, this study concludes that there is a lack of holistic vision, competence in digital transformation and data structure and processing as the main challenges of digital transformation in universities.

The second year with the second highest number of publications recorded was 2019 with a total of 251 papers within which we can identify "The Fourth Industrial Revolution: Contemplations on curriculum revision and its implementation in Malaysian higher education institutes" (Majid & Zamin, 2019). This study aims to address a similar issue by discussing the curriculum revisions made by higher education institutes in adopting the fourth industrial revolution, focusing on the changes made in terms of subject content, delivery methods and assessment methods and how these changes will help to introduce professionals with curricula fit for industry 4.0. 2018. The third year with the third highest number of publications, 2018 has a total of 141 registered papers, followed by 2017 with 99, 2016 with 63 and 2015 with 53 publications.

4.3 Distribution of scientific production by country of origin.

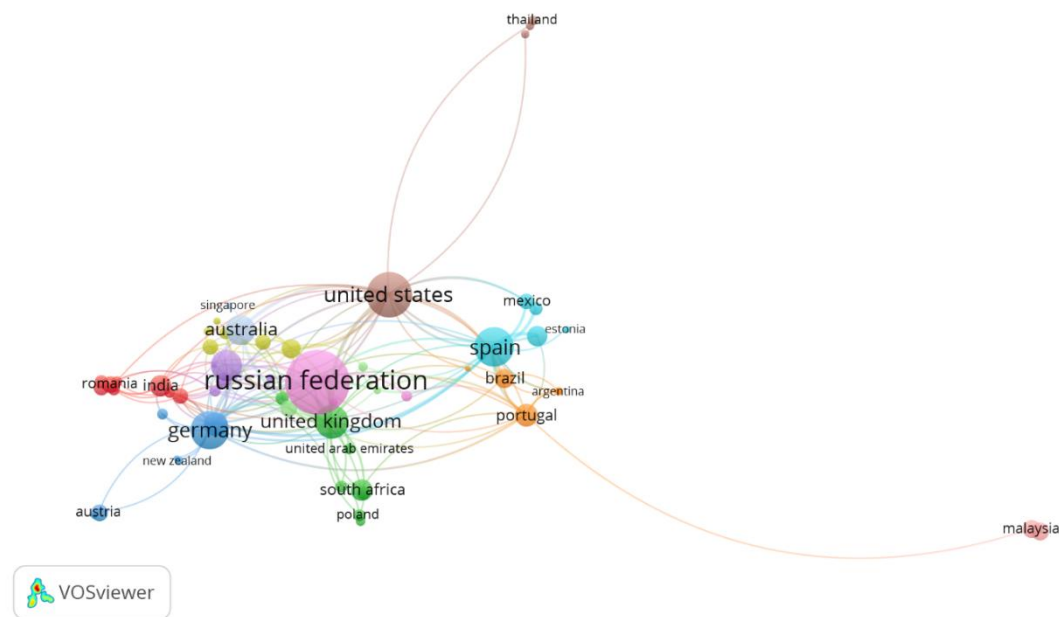
Figure 3 shows the distribution of scientific production according to the nationality of the authors.

Figure 3. *Distribution of scientific production by country of origin.*

Source: Own elaboration (2021); based on data provided by Scopus.

The Russian Federation is the country with the highest number of publications registered, presenting 208 in total, among which is "Digital transformation and its risks in higher education: attitude of students and teachers" (Yureva et al., 2020) with the objective of determining the level of use of digital tools and technologies by students and teachers in the educational process to identify the main problems and risks of the digitization of higher education. This study resulted in the limited use of technological tools by both students and teachers, so it considers digital training for teachers so that they can impart knowledge through more advanced platforms that allow education in Russia to be in line with the challenges of the fourth industrial revolution. The second country with the second highest number of publications is the United States with 105 documents, followed by Spain with 81, Germany with 74 and the United Kingdom with 57 publications.

At this point, it should be noted that the production of scientific publications, when classified by country of origin, presents a special characteristic and that is the collaboration between authors with different affiliations to public and private institutions, and these institutions can be from the same country or from different nationalities, so that the production of an article co-authored by different authors from different countries of origin allows each of the countries to add up as a unit in the overall publications. This is best explained in Figure 4, which shows the flow of collaborative work from different countries.

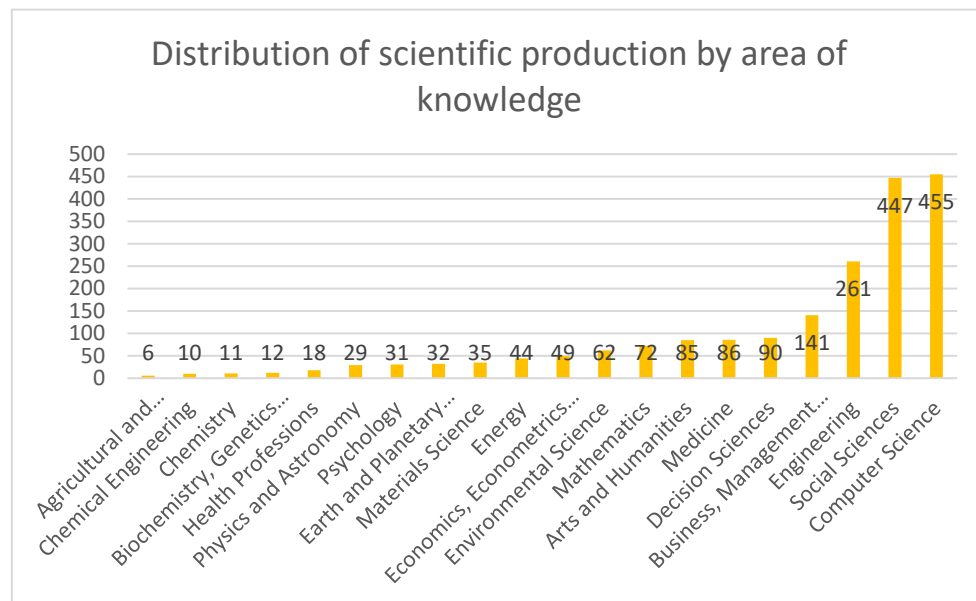
Figure 4. Co-citations between countries.

Source: Own elaboration (2021); based on data provided by Scopus.

The Russian Federation, as mentioned above, is the country with the largest contribution of publications related to Digital Transformation and Global Innovation in the University 4.0 in collaboration with authors affiliated to institutions mainly from Australia, the United Kingdom and South Africa, which shows a broader view of the variables under study. The United States also presents publications with authors from Mexico, Spain and Singapore, among which is "The university of the future: Stiegler after Derrida" (Mui & Murphy, 2020), in which two philosophers, Jacques Derrida and Bernard Stiegler, examine the challenge of the digital transformation of universities through the question "Will the university survive in the future and, if so, with what purpose? So in this research he argues that Stiegler's reading of Derrida points to the university not as an anachronistic form of knowledge displaced by the digital revolution, but as vital to a politics of the spirit in a democratic future.

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows how the production of scientific publications is distributed according to the area of knowledge through which the different research methodologies are executed.

Figure 5. Distribution of scientific production by country of origin.

Source: Own elaboration (2021); based on data provided by Scopus.

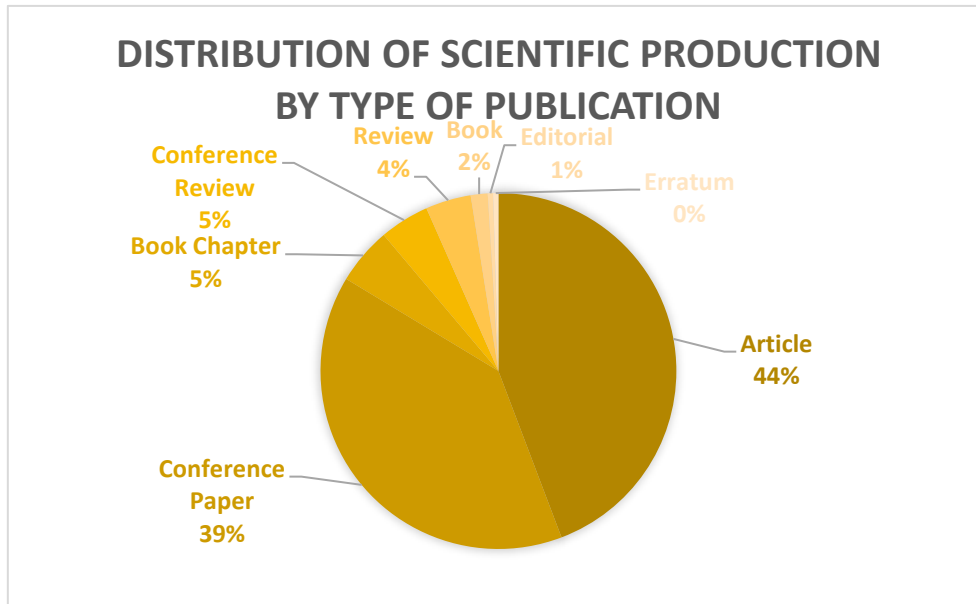
The area of knowledge with the highest number of publications on topics related to Digital Transformation and Global Innovation in University 4.0 is computer science with 455 publications registered in Scopus, within which is the paper entitled "Digital literacy and higher education during the COVID-19 blockade: Spain, Italy and Ecuador" (Tejedor et al., 2020) with the objective of determining how they have faced the global lockout situation, focusing on the development of digital literacy in Spain, Italy and Ecuador through a comparative analysis. The results of this study point out the need to enhance the main aspects such as digital competences of teachers, adaptive learning sources, communication between universities and students and teaching methodologies adequate to the current context and suggest rethinking higher education learning and reinforcing the main issues for this digital transformation.

The second area of knowledge with the highest number of publications is social sciences with 447 documents, among which is "Digital transformation of education in Slovakia in the context of European documents" (Ftacnik, D., & Kires, 2020). This study analyzes the digital transformation plan in Slovakia through European documents such as the Digital Education Action Plan, the European Skills Agenda, the Digital Competence Framework for Citizens among others, which highlight the need for digital literacy for both students and teachers to obtain an online education of excellence. The third area of knowledge that made the greatest contribution in relation to the variables in studies was engineering with 261 documents, followed by business with 141 and decisive sciences with 90 publications.

4.5 Type of publication

Figure 6 shows how the bibliographic production is distributed according to the type of publication chosen by the authors.

Figure 6. Type of publication



Source: Own elaboration (2021); based on data provided by Scopus.

As shown in Figure 6, within the different types of publications, 44% of the total number of documents identified through Phase 1 of the Methodological Design, correspond to Journal Articles, among which is the one entitled "An artificial intelligence educational strategy for digital transformation" (Cantú-Ortiz et al., 2020). This study analyzes the role of artificial intelligence in the training of students according to the needs posed by industry 4.0 with the objective of providing qualified human capital to companies and determining the trends and challenges of AI of interest to academic institutions with emphasis on intelligent human-computer communication and interactive design and manufacturing to educate engineers for the company of the future.

In second place are conference proceedings with 39% of the total number of papers registered in Scopus within these is "Digital transformation in education during COVID-19: A case study" (Bogdandy et al., 2020). This study was conducted through surveys among students of Computer Science and Information Technology at Eszterhazy Karoly University in Hungary, and its results showed that students enjoyed digital education and half of them are willing to continue it in the future using their own devices. Another part of the students presented problems in the management of the platform, but it is something that can be solved with support and digital literacy. Therefore, it is concluded that the digital transformation was considered successful in

Hungary and are directed towards the fulfillment of the challenges of industry 4.0. In third place are book chapters and conference reviews representing 5% of the total number of registered documents each, followed by reviews with 4% and books with 2%

5. Conclusions

Thanks to the bibliometric analysis proposed in this research, it can be determined that the Russian Federation is the country with the largest number of bibliographic records in the Scopus database globally during the period from 2015 to 2020 with a total of 208 documents. The scientific production related to the study of the Digital transformation and global innovation in the university 4.0, has presented an important growth during the above mentioned period, going from 53 publications in 2015 to 436 units in 2020, that is to say a great increase in the creation of bibliographic records in a period of 5 years, which indicates the importance that the Digital transformation and global innovation in the university 4.0 represents in the change of methodologies of the education of the universities as the way to reinvent itself managing to be according to the changes that occur in the society and in the needs of the companies.

In the last 5 years there have been innovations in educational methodologies, increasingly focused on the use of technological resources, but it was much more accelerated at the beginning of 2020 because of COVID 19 forced higher education institutions to provide knowledge through classes mediated in digital educational platforms. This was a breakthrough for what will be the university 4.0 as it is classified as a transforming entity that has a fundamental role in the education of professionals suitable for the fourth industrial revolution. Industry 4.0 has meant several challenges for higher education since not only professionals with competencies in the profession are needed, but also with knowledge of soft skills and technological literacy that allows them to be in line with the mechanisms used by companies to make their processes much easier and accessible for the benefit of the user. All of the above allows this article to conclude highlighting the importance of knowing the theory or bibliographic resources that seek to awaken the interest of higher education institutions in adapting their educational processes to the needs that are created from the fourth industrial revolution using information and communication technologies to offer quality education and provide a curriculum to professionals according to the needs presented by industry 4.0. That is why the need for studies such as the one presented in this document is highlighted, which make a tour of those texts that address the aforementioned topic, in order to give the reader a broad view of the current situation of the literature on digital transformation and global innovation in the university 4.0.

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