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Bibliometric analysis of technology readiness and education in high-impact journals of social sciences

Análisis bibliométrico sobre preparación tecnológica y educación en revistas de alto impacto de las ciencias sociales

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ABSTRACT

In this bibliometric study, the close relationship between technology readiness and education is explored, particularly within the realm of social sciences. The main objective is to identify global trends and behaviors associated with these concepts. A qualitative scientometric review methodology was employed, focusing on the Web of Science (WoS) database, with 1366 articles analyzed. The application of various laws revealed the fundamental importance of Technology Readiness and Education for the long-term success of organizations in the digital age. Investing in the development of Technology skills strengthens competitiveness and fosters innovation. However, a minimal representation of educational topics in Social Sciences was observed, accounting for only 0.03% of the total articles. This knowledge gap is crucial to address, as training in technology and education is essential for both professional and scientific success. Having the appropriate competencies in technology and education is imperative to achieve greater productivity and professional success across various domains.

Keywords. Technology Readiness, TR, Education, Organizations, Bibliometric

RESUMEN

En este estudio bibliométrico, se explora la estrecha relación entre la preparación tecnológica y la educación, especialmente en el ámbito de las ciencias sociales. El objetivo principal es identificar tendencias y comportamientos globales asociados con estos conceptos. Se utilizó una metodología cualitativa de revisión cienciométrica, enfocada en la base de datos de Web of Science (WoS), con 1366 artículos analizados. La aplicación de diversas leyes reveló la importancia fundamental de la Preparación Tecnológica y la Educación para el éxito a largo plazo de las organizaciones en la era digital. La inversión en el desarrollo de habilidades tecnológicas fortalece la competitividad y fomenta la innovación. Sin embargo, se observó una mínima representación de temas educativos en Ciencias Sociales, apenas el 0.03% del total de artículos. Esta brecha de conocimiento es crucial de abordar, ya que la formación en tecnología y educación es esencial para el éxito laboral y científico. Tener las competencias adecuadas en tecnología y educación es imperativo para lograr una mayor productividad y éxito profesional en diversos ámbitos.

Palabras clave. Preparación Tecnológica, Educación, Organizaciones, Bibliometría

INTRODUCTION

Education for well-being and sustainability is crucial in shaping informed, responsible, and active citizens in the 21st century (Shah et al., 2023). This educational approach aims not only to impart academic knowledge but also to develop skills and values that enable individuals to contribute positively to their own well-being and that of the planet (Acevedo-Duque et al., 2021). In the face of the Technology growth experienced worldwide, technology readiness becomes crucial for the success of societies striving for sustainability in a highly digitized environment, where education must be considered as an indispensable pillar for achieving competitiveness.

These rapid changes occur simultaneously as institutions demand rapid evolution of strategies, capabilities, and adaptability of resources, applying various digital models and tools (Ali et al., 2022). While the earliest works addressing technology readiness date back to the 1970s, focusing on aerospace topics where technology readiness was vital for institutions such as NASA, which required highly developed Technology capabilities for atmospheric studies (Vojvodich et al., 1976) and the benefits of electricity produced by solar light (Chase, 1978). This trend continued

over the next two decades, where studies on technology readiness were mostly for areas of engineering and mechanics (Rosenberg & Schoenman, 1994).

It was not until 1994 that Bahouth presented his research, which highlighted the neglect in the training and updating of managers in terms of Technology management, being ahead of his time by presenting the importance of including this knowledge in universities and its impact on global economies (Bahouth, 1994). Parasuraman in 2000, established the definition of technology readiness and his study generated the Technology Readiness Index (TRI), which has served to generate a large number of research studies in different fields to measure how prepared customers, users, managers, among others, are in the use of technologies and digital tools.

By 2023, the United Nations Conference on Trade and Development (UNCTAD) determined that the United States, Sweden, Singapore, Switzerland, and South Korea are the most prepared countries to adopt cutting-edge technologies, where user development and capabilities are one of the elements to consider in this index; Latin American countries have areas of growth where Brazil ranks 40th, Chile 48th, and Costa Rica 57th in this index (UN-UNCTAD, 2023). However, the digital deficiency is increasing alarmingly among developing countries, directly impacting societies and companies that cannot keep pace with the digital transformation and digitization requires the globalized world (Chetroni, 2023).

In educational matters, technology readiness focused on social sciences plays an important role in taking advantage of the available technologies; however, little or almost no research has been generated that highlights the importance that this topic really has in companies (Kalia et al., 2022). The COVID-19 pandemic established the importance of technology use and being prepared for new technologies, but it can still be considered that scientific research on these two related topics is very low, considering the impact and value they have on organizations (Bhardwaj et al., 2021); (Laxton et al., 2021).

While Latin America has made some progress in the research of scientific articles, few countries manage to publish in leading scientific journals, as is the case with Brazil with 30 articles, followed by Colombia and Mexico with 12 and 10 respectively. However, in Central America, research has not been published in high impact journals, hence a micro-referential gap. Therefor this research will generate great value with its very important contribution, since it presents a global overview of research on these topics and where studies are heading in the upcoming years.

Therefore, this study will focus on a bibliometric analysis of the research published in the most prominent journals at the global level, specifically in the field of Social Sciences. We will focus on the most influential indexes, such as the “Science Citation Index Expanded (SCI-EXPANDED)” and the “Social Sciences Citation Index (SSCI)” of the Web of Science (WoS). The WoS database will be used to collect information on 1366 articles published between 1974 and 2023, in order to examine in depth the trends and impact of research in this field, where the following aspects will be bibliometrically analyzed both at the macro and micro levels: 1) Keywords: which show the occurrence of researchers' keywords on this topic. 2) Authors and co-authors: the volume of research conducted with the authors will be verified. 3) Production: the countries that conduct the most research on the topic, indices, etc., which will provide a more complete understanding of the research construction of Technology Readiness and Education.

To achieve the objectives of this research, the article was divided as follows: Theoretical Framework focuses on the background of technology readiness and education, Materials and Methods provide details of the approach and methodological process applied in the data analysis, Results and Discussion of the scientometrics applied in the research and generating the final conclusions respectively.

LITERATURE REVIEW

Technology Readiness (TR): Knowledge for the management of cognitive, social, and emotional skills.

When seeking a definition aimed at understanding what Technology Readiness (TR) means, contemporary researchers mostly cite authors (Parasuraman, 2000); (Parasuraman & Colby, 2015), who define it as "the propensity of individuals to adopt and use new technologies to achieve goals in family and work life." These studies, conducted during the early decades of the 21st century, have been applied in more than two dozen countries across different areas of knowledge, demonstrating their relevance and value to the scientific community. The instruments were designed to measure the Technology Readiness Index (TRI) that each person possesses, taking into account four dimensions: motivators (optimism and innovation) and inhibitors (discomfort and insecurity) that arise when using technology (Parasuraman, 2000); (Kuo et al., 2013); (Blut & Wang, 2020).

The readiness and acceptance of technology have a significant effect on the importance of cognitive, social, and emotional skills for the adoption of Technology innovations by society (Kuo et al., 2013). These cutting-edge technologies provide better experiences for users but may be too complex for others (Chen & Chang, 2023). Surprisingly, technology readiness represents human personality traits related to technology (Hallikainen et al., 2019), where age, education, and experience are related to individuals' Technology readiness (Blut & Wang, 2020), as several studies on technology readiness have been applied in various theories and through research models to broaden understanding of education and other areas of the social sciences (Lin et al., 2007); (Wang et al., 2012).

Aligned with the aforementioned, research addressing user behavior, their intention to use Technology services, as well as their impact on educational or work performance, has focused on the subject of study. Examples of such research include the works of Abdul (Abdul, 2022), El Barachi et al., (2022) , and Chen & Chang (Chen & Chang, 2023), which are scientific materials on digital transformation and the creation of intelligent organizational networks;;. However, authors like Clarke et al., (2000) point out that digitization has led to a decrease in face-to-face interactions in both educational and other areas. This shift has exposed students to various Technology perspectives and situational factors.

Within the organizational framework, it is noted that organizations are also affected by this rapid growth of technologies (Blut & Wang, 2020). New implementations of automated systems have generated new research on organizational practices. Seeking to advance the organizational journey towards the adoption of new technologies, expanding the lens of people, processes, and technologies (Uren & Edwards, 2023).

Regarding the panorama of the public sector, research and essays such as those by authors Yera et al., (2020) and Manohara & Ingrams (Manoharan & Ingrams, 2018) present a very real perspective on technology adoption. It is necessary to remember that public institutions are organizations with many years of history and often have outdated and rigid processes regarding citizen services. They point out that IT projects represent significant challenges for institutions, and there are important factors to consider when introducing citizens to new Technology tools (Manoharan & Ingrams, 2018).

In education, it is important to know where teaching is heading and the approaches with the new strategies brought by digital transformation. This is of vital importance as organizations and industries will be the recipients of the human talent that emerges from different universities with this preparation (Cepa & Schildt, 2023). Academia must enhance teaching and research (Cepa & Schildt, 2023). The academia has made progress in teaching and research, and thus minimizing the Technology gap, achieving digital empowerment through accessibility, employability and equity (Jiménez et al., 2017).

Although these behavioral patterns can be identified in some research, they indicate that technology alone will not make a city smarter or reduce the gap (Manoharan & Ingrams, 2018).

Therefore, there must be a collective synergy among institutions, citizens, and organizational ecosystems. While the TRI serves to understand the level of readiness of individuals, it is vital to know the impact of how it is related to organizations and education, how institutions make use of this knowledge, and what value this information can have for improving educational proposals. These questions help ensure that research does not stagnate in understanding the current state of a study population but generates value from the results obtained that affects decision-making and consequently digital transformation.

Education: The Crucial Role in Promoting New Knowledge.

The topic of education has been studied for many years, with authors defining it as an educational process to change reality (Díaz & Alemán, 2011), being essential in society to achieve progress (Hernandez, 2015). On the other hand, it is associated with a search for human perfection aimed at achieving freedom (León, 2007).

Currently, education remains a challenge, with the Covid-19 pandemic prompting nearly all countries worldwide to shift from in-person to virtual education in schools, colleges, and universities (Güiza Gonzáles, 2022). One of the greatest challenges was the lack of resources such as internet access. Tang et al., (2021), claims that "many communities, especially in the epicenter of the pandemic, a large number of students did not have access to the Internet" (p.2).

In addition to the need for Technology resources, motivation also played an important role as students had to make efforts to continue in the teaching-learning process (Olguín et al., 2023). Furthermore, the motivation of teachers was crucial for handling new Technology tools, along with daily follow-ups through calls to parents to ensure students' connectivity (Bolivar, 2021). Strategies to continue the teaching and learning process during the pandemic varied according to available resources, resulting in "experiences of conventional distance education centered on printed material, mail, and telephone; radio or television broadcasts and the use of digital systems, virtual platforms, etc. (García, 2021)".

For Turienzo (2024), the social transformation driven by innovation and digitization underscores the importance of technology readiness in education. Employing techniques such as brainstorming enhances students' creativity, fostering an optimal environment for student creativity and innovation (Cruz-Suarez et al., 2022). According to Martínez et al., (2023) also through games like board games, students have improved their socio-emotional skills, which influence their motivation and learning strategy. All of this can influence the relationship between Corporate Social Performance (CSP) and Corporate Financial Performance (CFP) within organizations (Robles-Elorza et al., 2023).

Due to many changes in teaching methods, virtuality caused uncertainty for both teachers and students, both of whom had to assess their digital competence (Castillejos, 2022). Although this modality has been proposed for many years as a necessity in the face of existing Technology advances (Lira Valdivia & Fëdorov Fëdorov, 2002), facing a pandemic that took the education system out of its comfort zone may lead to this type of teaching and learning becoming the new normal in the future (Tang et al., 2021).

The positive side of confinement in education is the students' motivation to seek available resources to fulfill the assignments for each class (Castillejos, 2022), leading to the frequent use of Technology resources or tools that have allowed students to possess greater skills at a higher educational level or for graduates to obtain a better profile that provides an advantageous position compared to other job applicants (Domínguez, 2009), considering that students have been required to graduate with certain knowledge and skills to be inserted into the job market (Castro, 2007), as much of the success of many companies is due to this determining variable known as education (Angulo Pico et al., 2012).

As a result of so many needs and changes, Ayuso & Gutiérrez (2022) comment that "international organizations have been focusing in recent years on the relevance of digitally literate all educational agents so that they can introduce technologies into their classrooms (p.348)". In this

way, students will acquire new experiences and knowledge by using recent Technology devices, platforms, and applications

METHODOLOGY

This study adopted a bibliometric approach to investigate the intersection between Technology Readiness and Education. Data were gathered through the Web of Science (WoS) using the following query: TS= (TECHNOLOGY NEAR/0 READINESS) Refined By: Web of Science Index: Science Citation Index Expanded (SCI-EXPANDED) or Social Sciences Citation Index (SSCI), followed by a bibliometric analysis. The study of scientific production began by employing Price's law (Salazar-Sepúlveda et al., 2023) hich entails reviewing an extensive period from 1976 to 2023. A total of 1366 articles focusing on technology readiness in social sciences were examined in the primary scientific database. The annual exponential growth of published documents was evaluated using the adjusted coefficient of determination (R2) of the trend line, employing Microsoft Excel as the analysis tool (refer to figure 1). This exponential function serves to describe how the number of publications tends to increase over time, reflecting the growth of this research and its relevance in the scientific field Price and Dobrov (Price, 1976) (Dobrov et al., 1979).

Subsequently, a similar approach was pursued to ascertain the scientific community's interest in advancing research on a topic, utilizing the Law of Aging or Obsolescence of Scientific Literature (Price) (Salazar-Sepúlveda et al., 2023) Next, the linguistic principle describing the distribution of word frequency in a corpus of documents was applied, thereby establishing the frequency of relevant words. This analysis revealed a set of keywords whose selection could significantly influence the outcomes, underscoring the importance of the research. Fifty keywords were identified and used to compile the dataset of documents following the review strategy established by Zipf's Law (Zipf, 1932), with these details presented in the second outcome of the study (see figure 1).

For the study of scientific production, the Price's Law (Salazar-Sepúlveda et al., 2023) was utilized to assess the annual exponential growth of published documents, based on the coefficient of determination adjusted (R2) of the trend line using Microsoft Excel. Similarly, it was worked upon to corroborate whether there is scientific community interest in advancing research on a topic. Applying Lotka's Law on authors, it was used to identify the most prolific author group and study them separately from other authors with a smaller number of articles based on the unevenly distributed scientific production among authors (Lotka, 1926).

To observe how some documents in this set form the basis for the creation of new knowledge (subsequent documents), the Hirsch index (h-index) was employed, which specifies a set of "n" documents with "n" or more citations (Hirsch, 2005). Concluding with the analysis of scientific production areas, Zipf's Law (Zipf, 1932) was utilized to determine the most commonly used keywords in a set of documents, estimated using the square root of the total number of keywords; complementarily adjusting the power law, this can be verified with the coefficient of determination (R2).

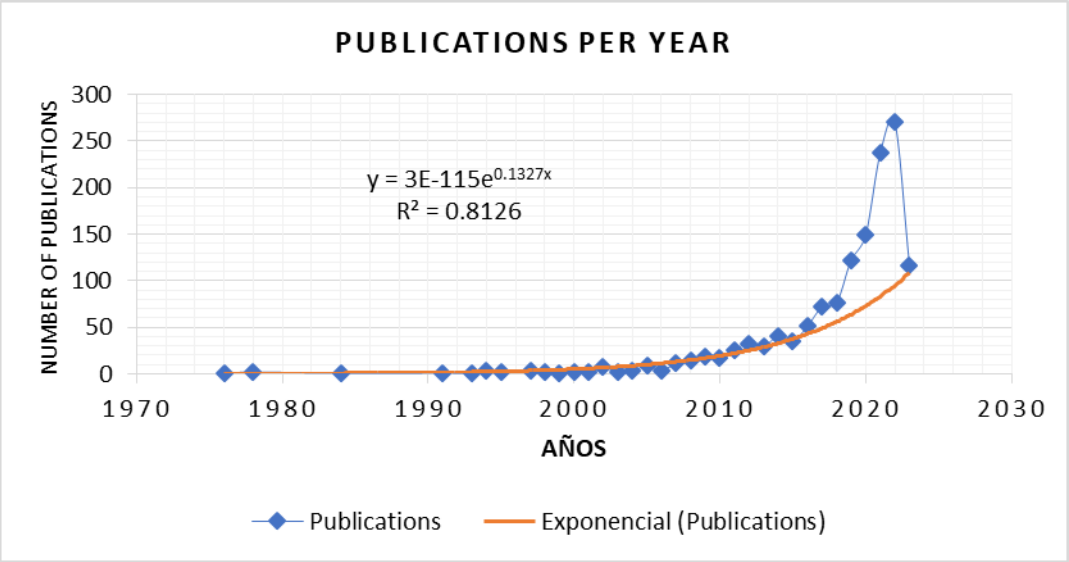
Information processing and visualization of spatiality, co-authorship, and co-occurrence, countries, and keywords were analyzed using Vosviewer software, employing fragmentation analysis for temporal and thematic trend visualization outcomes.

RESULTS

Between the years 1974 and 2023, a total of 1366 articles focused on TR were published. However, scientific production per decade reveals that it is in the last three decades that there has been a true takeoff in publications on this topic, with the mid-2000s seeing a greater flow of

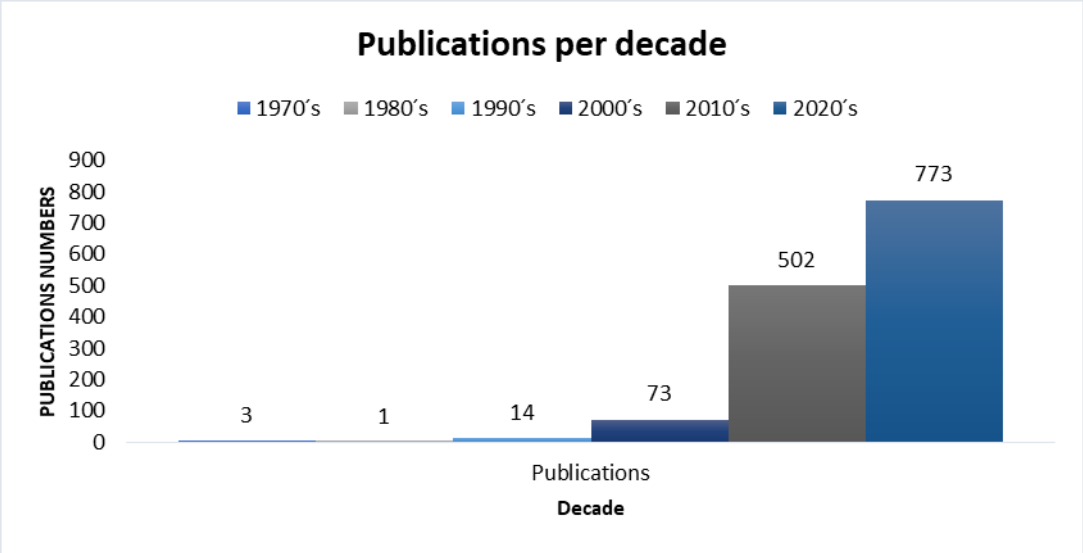
information, demonstrating an R2 of approximately 81%. Therefore, studies on the concept of TR presented a considerable amount of researchers worldwide.

Figure 1. Time series and trend of Technology Readiness publications



*Where the blue line represents a temporal series of research and the orange lines depict a trend.

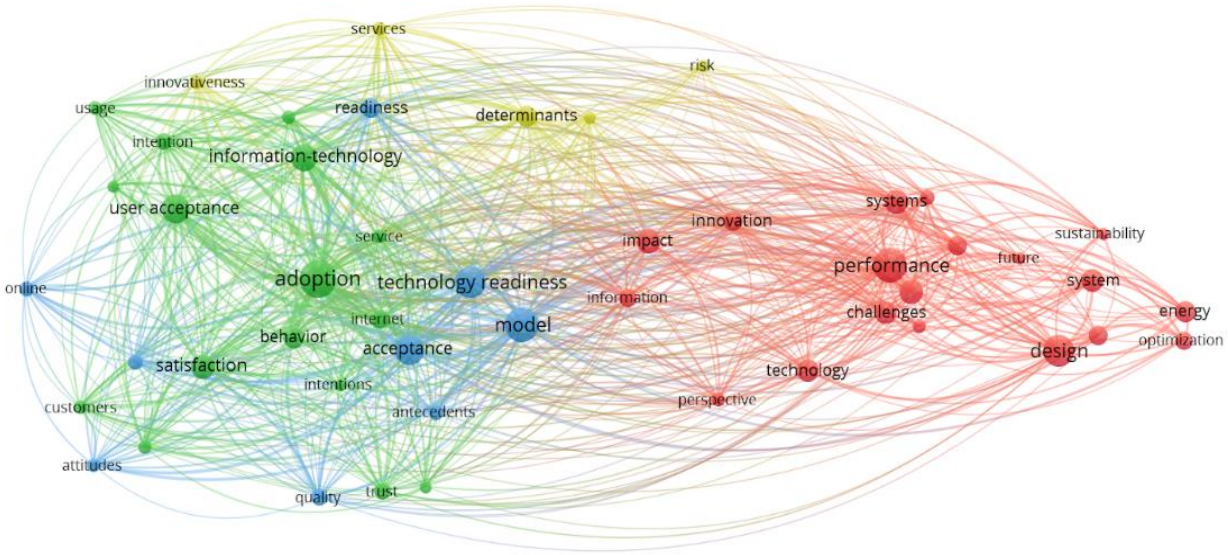
Figure 2. Publications per decade of Technology Readiness



The information was approached inductively, meaning there was no predetermined guideline or analysis categories providing guidance on the step-by-step process. Upon initiating the data generation process through Vosviewer, it was immediately identified that the thematic focus would revolve around the concepts of TR and education. By exclusively utilizing the WoS journal indexing database, the addition of information from other databases that are not comparable in terms of citations was avoided, as several studies indicate that the results of systematic literature reviews may vary depending on the database used. The search was conducted on May 27th, 2023.

Scientific production on Technology Readiness led to the creation of keyword clusters. For the 1366 documents, a total of 3831 Plus keywords were established. Following Zipf's law, 68 Plus keywords were selected, considering the square root of 3831 (=61.90) as an estimator, with the highest frequency of use ranging between 14 and 94 occurrences (see Figure 3).

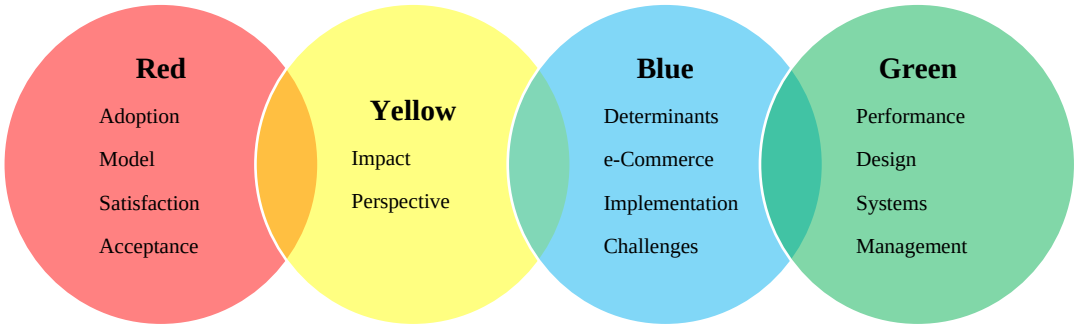
Figure 3. Keywords Plus co-occurrence graph



Nodes of the same color form a thematic cluster.

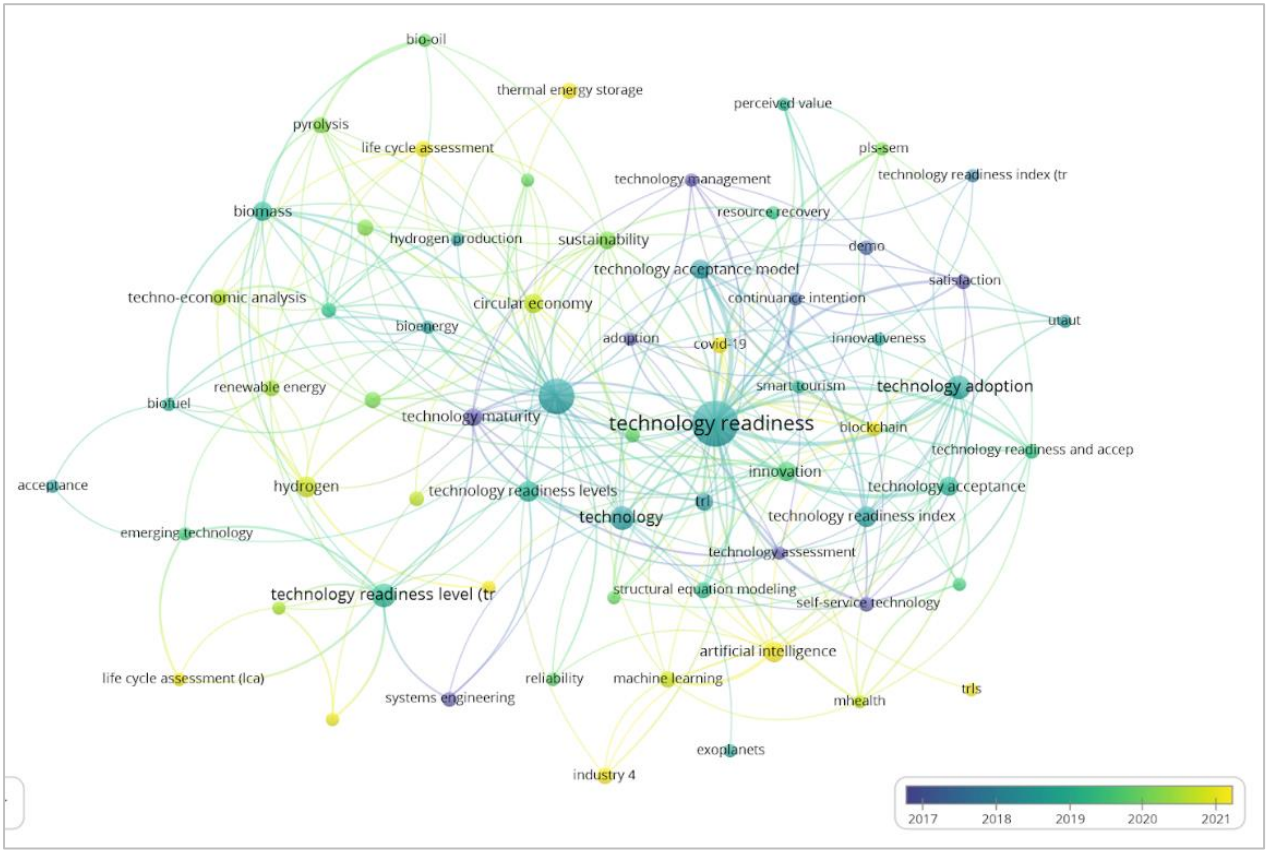
Thus, the set of Keywords Plus generated four clusters: red, adoption, model, satisfaction, and technology readiness; yellow with impact and perspective; blue with Determinants, e-Commerce, implementation, Challenges, and Industry; and green, with performance, design, systems, management, and technologies. It is important to highlight that the level of connection between the four clusters is significant.

Figure 4. Most Important Plus Keywords by Cluster



It is crucial to highlight that in recent years, training has focused on topics related to technology adoption, such as emerging technologies, Technology acceptance models, user satisfaction, and Technology maturity, which have been thoroughly investigated by scholars. New trends have focused on areas such as artificial intelligence, Industry 4.0, circular economy, and sustainability, which have emerged as the main focuses in this field of study (see Figure 5).

Figure 5. Emerging Author Keywords



Upon analyzing the authors' contributions to these topics, several key ideas that have enriched the understanding in the field were identified. These ideas include Business Industry 4.0, Artificial Intelligence, Dynamic Capabilities, Technology Readiness, and Adoption of AI. To facilitate visualizing the relationship between the ideas/contributions and the authors, we have prepared a table that highlights the main ideas and connects them with the corresponding authors, enabling a clear visual understanding of how each author has contributed to developing certain ideas and topics in the field (see Table 1).

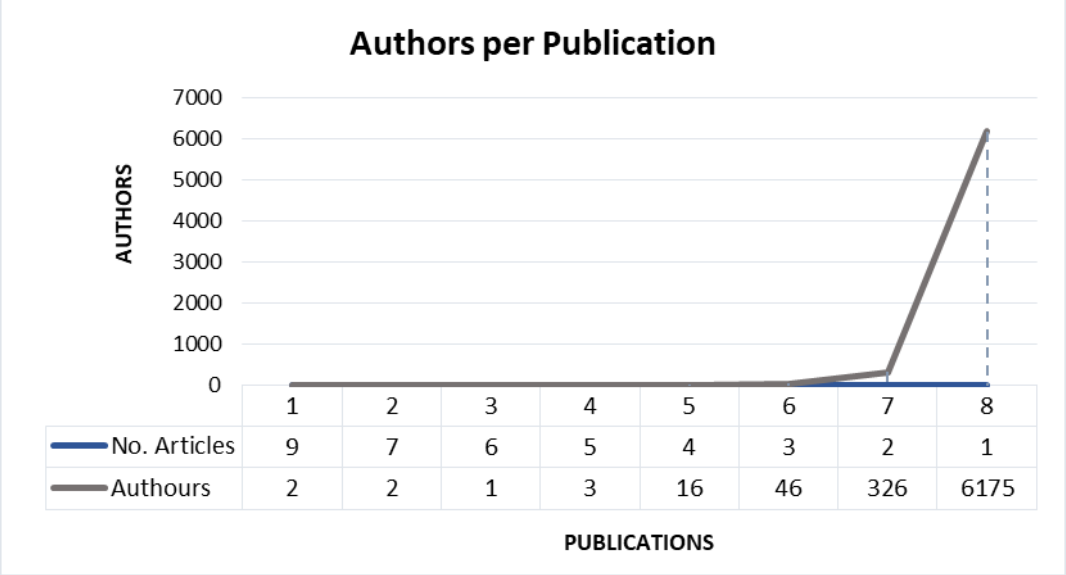
The total of 1366 articles represent the scientific output of 6571 authors, and prolific authors were estimated using Lotka's law (Lotka, 1926) (square root of (6571) ≈ 81.06). Thus, it was estimated that authors with the greatest contribution to the production of this knowledge were 81, considering a minimum of 2 documents published in the WoS database and a minimum of 83 citations for each author. However, given the discrete number of articles (see figure 6), it is interesting to note that out of the 1366 articles, 93.97% were contributions from authors with only one published article or co-authorship, and similarly, 4.96% have participated in only two articles. These constitute 98.93% of the total publications, as these authors cannot be considered prolific since they have contributed to knowledge generation only once or twice on this topic (see Table 1).

Table 1. Relationship between Keywords and Research Areas

Reference	Publications	Year	Keywords	Source	Area WoS
(Silva et al., 2021)	Business analytics in Industry 4.0: A systematic review	2021	Big Data Analytics; Decision-Support-System; Predictive Maintenance; Neural-Network; Artificial-Intelligence;	EXPERT SYSTEMS	Computer Science
(Uren & Edwards, 2023)	Technology readiness and the organizational journey towards AI adoption: An empirical study	2023	Artificial-Intelligence; Decision-Making; Maturity Model; Big Data; Innovation; Machines; Future; Performance;	INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT	Information Science & Library Science
(Rahman et al., 2023)	Technology readiness of B2B firms and AI-based customer relationship management capability for enhancing social sustainability performance	2023	Confirmatory Factor-Analysis; Resource-Based View; Big Data Analytics; Dynamic Capabilities; Supply Chain; Artificial-Intelligence; Marketing Capabilities;	JOURNAL OF BUSINESS RESEARCH	Business & Economics
(Forgas-Coll et al., 2023)	Social robot-delivered customer-facing services: an assessment of the experience	2023	Artificial-Intelligence; Technology Readiness; Gender-Differences;	SERVICE INDUSTRIES JOURNAL	Business & Economics
(Sabir et al., 2023)	Consumer Acceptance and Adoption of AI Robo-Advisors in Fintech Industry	2023	Students Behavioral Intention; Artificial-Intelligence; External Variables; User Acceptance; Use Peou	MATHEMATICS	Mathematics

As shown in Figure 6, applying Lotka's law reveals that the number representing prolific authors is 81. However, as Table 2 indicates, TR as a research topic exhibits a significant gap in research. This is because 93.97% of the generated publications belong to authors who have only produced 1 publication. Therefore, by examining the collaborations generated on this topic through Vosviewer and applying a much stricter criterion regarding citations and co-authorship, a minimum of 4 publications was established, resulting in the following relationships of authors who have conducted work focused on Technology Readiness.

Figure 6. Relationship between scientific production level and authorship



*The blue line represents the number of publications over time, and the gray line represents the authorship.

Table 2. Distribution of Documents by Authors

Published Articles	Authors	Percentage
9	2	0.03%
7	2	0.03%
6	1	0.02%
5	3	0.05%
4	16	0.24%
3	46	0.70%
2	326	4.96%
1	6175	93.97%
Total	**6571**	**100.00%**

As part of the findings, it is noteworthy how these prolific authors have contributed to the publication on digital strategy and how there is strong collaborative work in their research projects. These jointly conducted works have been carried out by researchers from Denmark, Italy, Taiwan, Thailand, China, and the USA, each with a minimum of 4 publications on this topic. However, none of the nodes or networks are related to each other, but rather are isolated works that have been developed, as depicted in Figure 7, where each network appears as an island with no contributions between researchers from these universities and institutes.

Figure 7. Prolific Co-authorship Network and Its Relationships

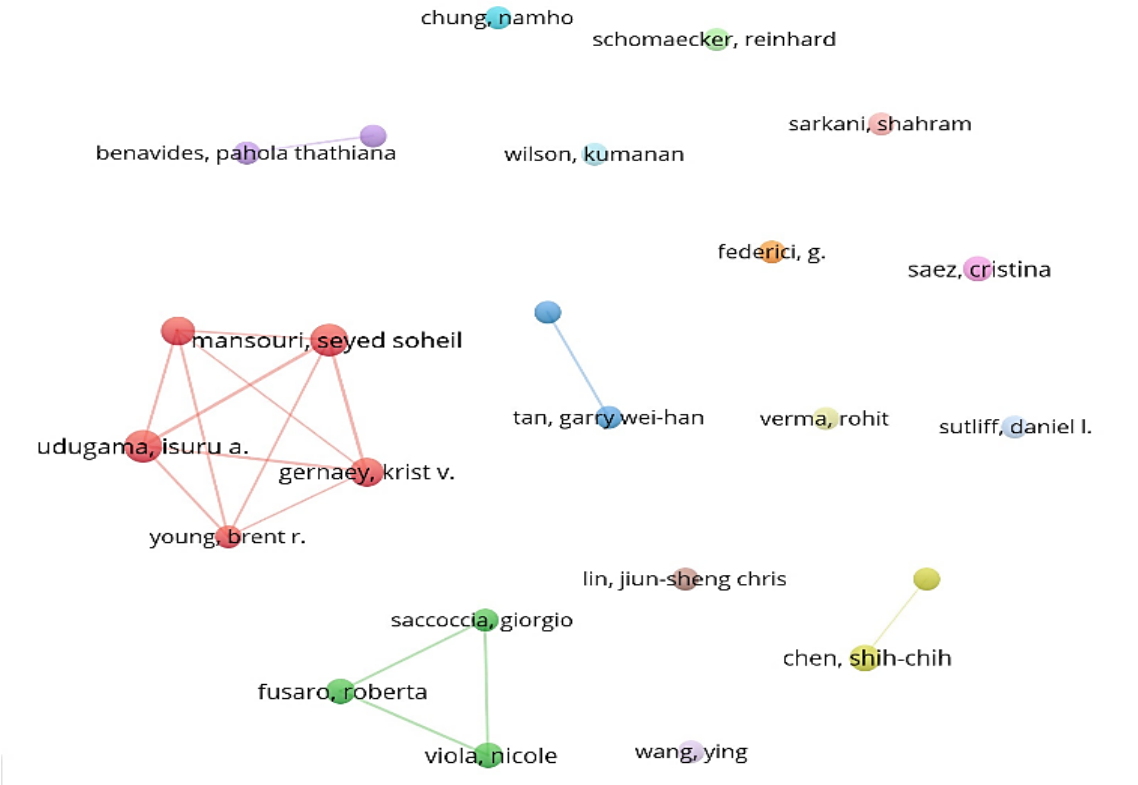


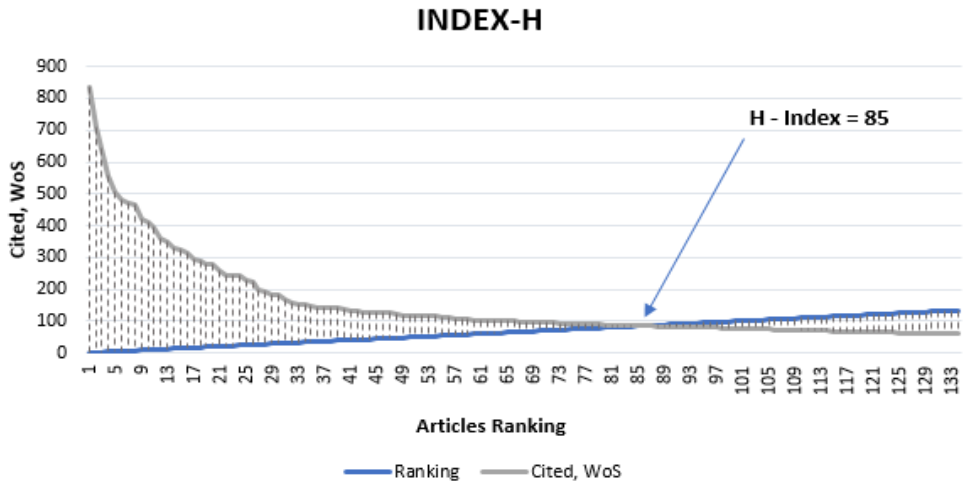
Table 3 provides detailed information on each of the clusters in terms of their institutional and national affiliations.

Table 3. Prolific Author Groups and Affiliations

Author Names	Networks	Affiliation	Country	Articles
Mansouri, Seyed Soheil	Red	University of Auckland;	Denmark	9
Udugama, Isuru A.	Red	University of Auckland;	Denmark	9
Gernaey, Krist V.	Red	University of Auckland; Technical University of Denmark	Denmark	7
Young, Brent R.	Red	University of Auckland;	Denmark	4
Baroutian, Saeid	Red	University of Auckland; Technical University of Denmark	Denmark	7
Saccoccia, Giorgio	Green	Polytechnic University of Turin; European Space Agency	Italy	4
Fusaro, Roberta	Green	Polytechnic University of Turin;	Italy	5
Viola, Nicole	Green	Polytechnic University of Turin; European Space Agency	Italy	5
Chen, Shih-Chih	Blue	National Kaohsiung University of Science & Technology	Taiwan	6
Ruangkanjanases, Athapol	Blue	Chulalongkorn University; King Abdulaziz University	Thailand	4
Ooi, Keng-boon	Yellow	Chang Jung Christian University	Taiwan	4
Tan, Garry Wei-han	Yellow	Nanchang Institute Technology	China	4
Benavides, Pahola Thathiana	Purple	United States Department of Energy (DOE)	USA	4
Tao, Ling	Purple	National Renewable Energy Laboratory – USA	USA	4

To understand the connection between authors, journals, and WoS categories of technology readiness studies, we incorporated the Hirsch index (h-index) as a factor to weigh the impact of citations. Figure 8 shows the interception of the h-index, with 85 documents having 85 or more citations. These are the most cited articles regarding Technology Readiness, listed in Table 3.

Figure 8. Hirsch Index Estimation.



The blue line represents the pecking order, and the gray line indicates the quantity of citations. In Table 4, shows the details regarding Figure 5, indicating the specifics of each h-index document.

Table 4. Top h-Index Documents on Technology Readiness and Education

Authors	ISO Journal Abbreviation	Position	Cited, WoS	Publication Year	Category	Research Area
(Olson & Olson, 2000)	Hum.-Comput. Interact.	1	834	2000	Technology Readiness	Computer Science
(Barbarino et al., 2011)	J. Intell. Mater. Syst. Struct.	2	709	2011	Technology Readiness	Materials Science
(Zhu et al., 2006)	Manage. Sci.	3	643	2006	Technology Readiness	Business & Economics; Operations Research & Management Science
(Low et al., 2011)	Ind. Manage. Data Syst.	4	559	2011	Technology Readiness	Computer Science; Engineering
(Gorsse et al., 2017)	Sci. Technol. Adv. Mater.	5	506	2017	Technology Readiness	Materials Science
(Farsad et al., 2016)	IEEE Commun. Surv. Tutor.	6	483	2016	Technology Readiness	Computer Science; Telecommunications
(Preuster et al., 2017)	Accounts Chem. Res.	7	469	2017	Technology Readiness	Chemistry
(van Doorn et al., 2016)	J. Serv. Res.	8	465	2017	Technology Readiness	Business & Economics
(Parasuraman & Colby, 2015)	J. Serv. Res.	9	419	2015	Technology Readiness	Business & Economics
(Zhu K. et al., 2004)	J. Manage. Inform. Syst.	10	409	2004	Technology Readiness	Computer Science; Information Science & Library Science; Business & Economics
(Tang Y. M. et al., 2021)	Comput. Educ.	49	119	2021	Education	Computer Science; Education & Educational Research
(Blut & Wang, 2019)	J. Acad. Mark. Sci.	57	109	2020	Education	Business & Economics
(Geng et al., 2019)	Int. J. Educ. Technol. High. Educ.	89	83	2019	Education	Education & Educational Research
(Eckert et al., 2019)	JMIR mHealth uHealth	91	83	2019	Education	Health Care Sciences & Services; Medical Informatics
(Kuo et al., 2013)	BMC Med. Inform. Decis. Mak.	118	67	2013	Education	Medical Informatics

Within the generated analysis, it is striking that only 44 documents touch on Education, representing only 0.03% of the total publications regarding Technology Readiness. Considering the database is comprise of 1366 articles of the Web of Science (WoS) database in the indices such as Science Citation Index Expanded (SCI-EXPANDED) or Social Sciences Citation Index (SSCI).

For the elaboration of geographic co-authorships in Figure 6, international collaboration among countries producing knowledge on Technology Readiness is determined. Among them, countries with a high degree of scientific production stand out, such as the United States, England, Germany, Italy, Spain, and the People's Republic of China. Among Latin American countries, Brazil stands out with 30 works, followed by Colombia with 12, Mexico with 10, and Chile with 6 publications.

Figure 9. Co-authorship Graph / Countries

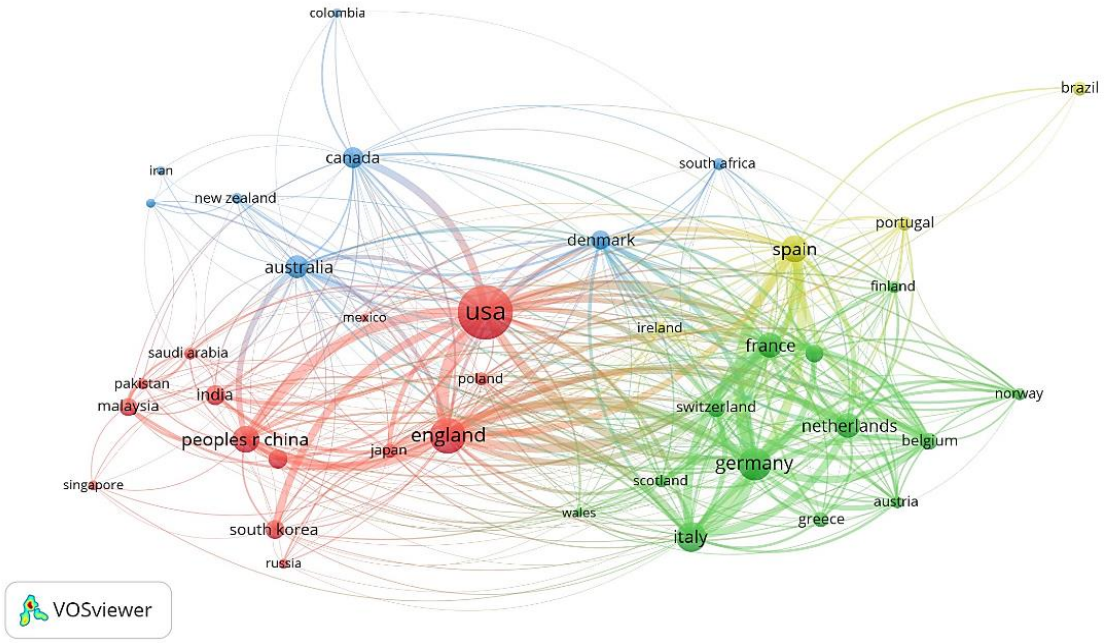


Table 5 shows the information related to Figure 6, indicating the details of the top 20 countries with the highest number of publications and citations.

Table 5. Countries with the highest publication output

No.	Country	Article	Citeds	Percentage
1	USA	384	13675	16.80%
2	England	170	4823	7.44%
3	Germany	148	4129	6.47%
4	Italy	120	2797	5.25%
5	Spain	100	1607	4.37%
6	Peoples R China	98	2715	4.29%
7	France	88	2674	3.85%
8	Netherlands	84	2113	3.67%
9	Australia	72	2471	3.15%
10	Canada	60	1865	2.62%
11	India	54	1303	2.36%
12	South Korea	52	1711	2.27%
13	Taiwan	50	2765	2.19%
14	Denmark	48	1213	2.10%
15	Malaysia	45	877	1.97%
16	Switzerland	44	1244	1.92%
17	Sweden	43	977	1.88%
18	Belgium	42	1513	1.84%
19	Greece	32	429	1.40%
20	Brazil	30	525	1.31%

As seen in Table 5, scientific production on Technology Readiness features significant co-authorship in the United States of America, representing 16.80% of scientific output, with the top 20 countries in this list contributing to 77.17% of research on Technology Readiness.

And finally, the Bradford's Law establishes which journals represent the dispersion of scientific literature on TR, highlighting the areas of Business & Economics, Engineering, and Science & Technology – Other Topics, which generate the highest scientific contribution with 98, 161, and 33 publications respectively. However, their impact on the cumulative citations amounts to 8273, representing 24%. Thus, the total citations for TR according to Bradford's Law are 17496, which represent 50% of the citations in the WoS database. (See Table 6).

Table 6. Bradford's Law by Research Area

Research Areas	Publications	Cited, WoS Core	Accumulated Citations	% Accumulated Citations
Business & Economics	98	4054	4054	12%
Engineering	161	2710	6764	19%
Science & Technology - Other Topics; Energy & Fuels	33	1509	8273	24%
Computer Science	20	1492	9765	28%
Materials Science	13	1387	11152	32%
Computer Science; Information Science & Library Science; Business & Economics	11	1112	12264	35%
Computer Science; Engineering	16	1080	13344	38%
Nuclear Science & Technology	34	928	14272	41%
Science & Technology - Other Topics; Engineering; Environmental Sciences & Ecology	30	918	15190	43%
Engineering; Operations Research & Management Science	26	837	16027	46%
Engineering; Environmental Sciences & Ecology	12	743	16770	48%
Chemistry	18	726	17496	50%

In Table 7, the estimation of the Bradford areas is shown, highlighting five journals (the number of published documents and the WoS indexing category are indicated in parentheses): SUSTAINABILITY (36; Science & Technology - Other Topics; Environmental Sciences & Ecology), ACTA ASTRONAUTICA (32; Engineering), ENERGIES (32; Energy & Fuels), JOURNAL OF CLEANER PRODUCTION (28; Science & Technology - Other Topics; Engineering; Environmental), and RENEWABLE & SUSTAINABLE ENERGY REVIEWS (20; Science & Technology - Other Topics; Energy & Fuels). All with an impact factor exceeding 2.5.

Table 7. Bradford's Law by Number of Publications per Journal

Row Labels	Articles	WoS Citations	WoS Index	Research Area	Impact Factor
Sustainability	36	372	Science Citation Index Expanded (SCI-EXPANDED); Social Science Citation Index (SSCI)	Science & Technology - Other Topics; Environmental Sciences & Ecology	3.8
Acta Astronautica	32	653	Science Citation Index Expanded (SCI-EXPANDED)	Engineering	2.9
Energies	32	315	Science Citation Index Expanded (SCI-EXPANDED)	Energy & Fuels	3.2
Journal Of Cleaner Production	28	810	Science Citation Index Expanded (SCI-EXPANDED)	Science & Technology - Other Topics; Engineering; Environmental Sciences & Ecology	11.1
Renewable & Sustainable Energy Reviews	20	1408	Science Citation Index Expanded (SCI-EXPANDED)	Science & Technology - Other Topics; Energy & Fuels	16.8

DISCUSSION

During the bibliometric study, several findings were encountered. Firstly, it is worth noting that scientific production on this topic spans from 1974 to 2023, exhibiting exponential growth since the 2000s, demonstrating the relevance and investigative strength that the topic has garnered in the past 20 years.

Moreover, the study identified keywords such as adoption, impact, determinants, and performance, which are the most representative in the database, indicating a strong connection between them. Furthermore, research such as that of Blut & Wang (2020) "Technology readiness: a meta-analysis of conceptualizations of the construct and its impact on technology usage " and de Carvalho et al., (2012) "Competitiveness of nations: review of the metric used by the World Economic Forum " presents studies regarding technology readiness from the organizational perspective. However, there are another 16 investigations presenting bibliometrics, meta-analyses, and literary reviews oriented towards topics of science (Thonemann, 2022), engineering (Frondelius, 2022), among others.

The new trends at the intersection of social sciences and technology are radically transforming how organizations operate and adapt to the changing environment. Among these trends, Business Industry 4.0 stands out in the business realm, representing the integration of advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), and data analysis across all aspects of the value chain. AI, in particular, is revolutionizing decision-making and process automation, enabling organizations to optimize efficiency and productivity.

Additionally, Dynamic Capabilities are emerging as agile responses to the rapid evolution of social needs and market demands, empowering organizations to adapt and thrive in turbulent environments. Technology readiness has become a critical factor for success, as organizations must be ready to adopt and implement new technologies effectively and timely. The adoption of AI is on the rise as organizations recognize its potential to enhance innovation, customer experience, and operational efficiency. Collectively, these trends are reshaping the social and Technology landscape, driving competitiveness, and fostering continuous innovation

Additionally, the prolific authors who have made the most contributions on the topic are from Denmark, Italy, Taiwan, Thailand, China, and the United States. However, these authors have not collaborated on this topic. While the most cited research includes Olson & Olson (Olson & Olson, 2000) which addresses remote collaborative work and the sociotechnical conditions for its implementation, Barbarino et al., (2011) mentions the challenge of intelligently designing aircraft wing structures, and Zhu et al., (2006) describes innovations in internet-based e-commerce. Thus, demonstrating the diverse applications of the term technology readiness across various fields.

It is noteworthy that only 0.03% of articles corresponding to the Web of Science (WoS) database in its SCI-EXPANDED and SSCI indices pertain to the educational area, with the most cited research being that of Tang et al., (2021) exploring motivation for learning and student self-efficacy from a virtual modality. Additionally, Chau et al., (2021) analyzed the importance of students' technology readiness in facilitating online learning implementation.

Finally, the resulting scientific production worldwide is significant, with up to 95 countries within the database having published at least one article on technology readiness. However, the study indicates a lack of research on this topic in the Central American region, especially in Honduras, highlighting the need for significant contributions to advance technology readiness and education in both public and private sectors, which undoubtedly require this change involving the adoption and transformation of Technology tools to compete in this globalized world.

According to the objective established for this research, it can be concluded that technology readiness is the propensity of individuals to adopt and utilize new technologies to achieve personal and professional goals, which are determined by motivators that lead users to adopt these digital changes or, conversely, present inhibitors that deter users from utilizing these resources. Meanwhile, education is conceived as the educational process that changes a reality, whether of a society or a nation. While technology readiness and education are indispensable elements for the long-term success of organizations in the digital age, investing in the development of individuals' Technology skills and knowledge enables companies to strengthen their competitiveness, increase their innovation capacity, and create a work environment that fosters growth and excellence.

According to bibliometric analysis, it provides an insightful view of the trend over the years, observing a significant increase in scientific production at an exponential rate ($R2 \approx 81\%$), allowing 8571 authors to build a substantial knowledge base on technology readiness. However, of the total authors, according to Lotka's law, only 81 authors were estimated as prolific, contributing two or more publications on the subject under study, and only two authors have conducted 9 investigations on this topic; furthermore.

In addition, it was found, 5 groups of researchers from different countries have conducted studies on Technology Readiness, but collaboration among them has been nonexistent. Moreover, the Hirsch index (h-index) as a weighting factor for citation impact determined that 85 articles out of 1366 articles had 85 or more citations.

Regarding technology readiness and education, it is interesting to note that these topics together are not addressed in WoS journals oriented towards the Social Sciences, comprising only 0.03% of the total articles published, indicating a significant knowledge gap. This void must be filled as all users entering the workforce, whether in public or private companies, or participating in scientific research, must possess the necessary competencies in technology and education to achieve greater productivity. Finally, as future lines of research, it is recommended to delve into studies of technology readiness regarding the digital maturity of organizations, the impact of technology readiness, and the cost of not learning digital readiness at early levels in education.

Based on the results obtained and in line with the proposed objective of this research advancement, it is concluded that technology readiness and education are crucial elements for long-term success in the social sciences. However, there are still areas of research that remain unexplored. Bibliometric analysis reveals exponential growth in scientific production on technology readiness in education, though only a small percentage of authors are considered prolific, indicating

a lack of collaboration among researchers. Furthermore, the intersection of technology readiness and education is underexplored in Social Sciences journals, highlighting a significant knowledge gap. Research on organizational digital maturity, the economic impact of technology readiness, the comparison of widely accepted models (TAM, TPB, or UTAUT) in the face of a new digitally native generation which may require revisiting them, and the implications of digital skills deficits in education are recommended as future lines of investigation.

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