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Additional Information

The measurement of digital skills and competences: a bibliometric analysis

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International Journal of Innovation Management and International Journal of Contemporary Hospitality Management, Human Resource Management, International Journal of Project Management, Technological and Economic Development of Economy, Journal of Organizational Change Management. Associate Editor of International Entrepreneurship and Management Journal.

Abstract

The definition and measurement of digital skills and competences needed to succeed in the 21st century context has been a widely researched topic within the last years. Academics and professionals consider that it has an increasing importance due to the process of digital transformation in which the organizations and society are immersed, which is pushing to achieve a knowledge society. For these reasons, a bibliometric analysis of the topic plays a key role in order to have a big picture of the conducted research since the date and establish key countries, authors and journals which lead the investigation on the topic. Moreover, the analysis of the knowledge frontier and research gaps has discovered the stage in which this research line is situated and the needs for the establishment of future research guidelines.

Keywords: Bibliometrics; digital competences; digital skills; digital behaviours.

1. Introduction

21st century skills and digital competences play a key role in current fast-changing environment and economy. Digitalization implies the insertion of the ICT knowledge and technologies in organizations and personal spaces of individuals (Kateryna et al., 2020). It has reshaped working environments within companies, job positions and the capabilities need to achieve success in them. Innovation starts with people and ICT knowledge is not enough to achieve successful capabilities to compete in the current world (Davenport et al., 2007; Van Laar et al., 2017).

The first paper on digital skills and competences was published in the year 1995. It showed a case study of a Norwegian university that first incorporated distance education by videoconference (Spongberg, 1995). However, it was not until 2010 that the measurement of digital competences in professional environments was discussed for the first time (Van Deursen & van Dijk, 2010). After this first publication, various publications on the analysis of the framework of digital competences such as that of Ferrari (2012), Mengual-Andres et al., (2016) or later Neave et al., (2019) have been defining the definition, types, scales, motivating factors or explanation of digital competences in academic and professional environments. After a previous research, it is discovered that only in 2019, 20% of the papers on this topic were published globally, so we can confirm the increasing importance of the topic.

In the last years, it has been notorious the incorporation of ICT not only in professional but personal daily routines and activities. There is a need of improving digital skills and abilities according new lifestyles in the digital age (Barnes, 2020). Abilities and skills have been refashioned in the technological context (Avni & Rotem, 2019) and therefore the study of them becomes necessary to understand the reasons and steps needed to conduct a proper digital transformation starting from the digital skills and abilities of workers within the organizations (Ensour et al., 2020).

Although, we observe that in recent years this topic has grown in relevance and interest on the part of academics and professionals, it has done so even more as the result of the global pandemic of COVID-19. To contain this health crisis, confinement has been necessary and therefore teleworking, online education and virtual communication have been globally implemented. Numerous studies have already demonstrated the importance of digital competence to digital citizenry in the world post-covid-19 (Bartsch et al., 2020). COVID-19 has brought about a paradigm shift that entails the need to ask new questions and seek alternative answers in relation to new ways of working, behaving, relating and being successful. This will be analysed during the manuscript.

Bibliometric analysis is a methodology that analyzes current publications, citations, and their sources of information. One of the most important advantages is that it allows one to analyze a specific research field by considering papers, journals, authors, institutions, and countries. For this reason, it is possible to build a general picture of a research field (Merigó et al., 2015b). This will be the main goal of this manuscript, to provide the topic with an overview of the evolution of the concept.

In the field of bibliometric analysis, which is used to analyze and develop knowledge maps on emerging issues (Laudano et al., 2018), little has been investigated on digital skills and competencies. The bibliometric analysis performed by Rialti et al., (2019) about big data and dynamic capabilities and the bibliometric analysis on digital mediation written by Kumar et al. (2020), demonstrate the relevance and interest in similar topics today. However, a bibliometric analysis on the subject proposed by the authors has not yet been performed.

One of the objectives of this research is to check if it is a relevant and current topic due to the evolution of publications and the reputation of authors within the academy and the business world. Moreover, we will check the countries in which research about digital competences and skills is published, the top Journals which publish about the topic and the main research transversal areas. This proposes valuable information in order to have the big picture of the topic and establish some research guidelines. In addition, it is also important see what evolution is expected of this issue in the post-covid-19 world. In this way, we will be able to define what is the frontier of current knowledge in digital skills and carry out future research of impact and interest for the scientific community.

The structure of this paper is as follows. Section 2 conducts a short literature review of the most used definitions of digital competences and skills, with the aim of studying the evolution and the context and elaborate a proper definition. Section 3 explains the methodology used and the research conducted. In section 4 the results are explained according different units of analysis used such as the most productive authors, countries, research areas, journals, and years of publication. In section 5 the discussion and conclusion are presented.

2. Literature review

The term **digital competences and skills** has been tried to define by the academia in the last ten years but not a final definition has been accepted yet (Vieru, 2015). The existing definitions of these terms are somehow 'generic' and they do not focus in a specific research area (Hoel & Holtkamp,

2012). For this reason, it is not yet clear which competences and skills must citizens and workers gain to successfully perform in the knowledge society (Van Laar et al., 2017). In this section a chronological literature review of the term digital competence and skills will be carried out.

Murawski & Bick (2017) performed a literature review of definitions of the term digital competences and highlighted the ones by Ala Mutka (2011), Ferrari (2012) and Vieru (2015). Van Laar et al., (2017) conducted a systematic analysis of 21st century skills and digital skills pointing out 7 core and 5 contextual 21st century digital skills. The authors will take these highly recognized papers in the academia as the main base of the evolution of the concept. Not only for the definition, but for the categories and clusters developed within the concept.

Although the first paper referring to digital competence is dated from 1995, Gilster & Glister (1997) firstly defined the term 'digital literacy' (before competence) as the capacity to understand and use information from different digital sources. Some years later, Eshet (2004) proposed a theoretical model in which the basic skills for digital literacy were included, plus combining the ability to use digital devices, and perform tasks or solve innovative problems in the digital and internet environment. Van Deursen and Van Dijk stated in 2010 a relation of 'digital and internet skills': operational, formal, information and strategic skills. They also started the research on the measurement of them to drive the path to future research.

Ala Mutka proposed in 2011 a conceptual model on digital competences and the related literacies: IC literacy as the core of digital competence, internet literacy, media literacy, digital literacy, and information literacy. He also divides digital competences in three differentiated clusters: instrumental skills and knowledge, advanced skills and knowledge and attitudes.

A validated definition of digital competence is the one by Ferrari (2012, p.3). The term is defined as 'set of knowledge, skills, attitudes, abilities, strategies and awareness that are required when using ICT and digital media work and behave in current society. Some daily routines are to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socializing, consuming and empowerment'. In that report, Ferrari positions digital competence as a human right and analyses the frameworks in which digital competences are present.

Moreover, Ferrari (2013) also identified five sets of competence areas in the framework of digital competences.

1. Information management and collaboration
2. Communication and sharing skills
3. Creation of content and knowledge
4. Digital safety
5. Technical operations and problem-solving abilities

Based on the definitions already presented, Vieru (2015) defined the key term of digital competence as the 'capacity to efficiently and critically use information technology for employment, learning, self-development and participation in society' He identified the dimensions of the concept in terms of knowledge, skills, and attitudes to be digitally able to perform in SME's

Regarding the evolution of measuring digital competences, Ferrari (2013) differentiated three competence levels in a rubric according different parameters, from level A (highest domain of digital competence) to level C (lower one). Mengual-Andres et al., (2016) designed a questionnaire to measure digital competences triangulating non-parametric techniques, focused in digital teaching and learning.

Van Laar et al., (2017) and Van Laar et al., (2019) differentiated above-mentioned core and contextual 21st century digital skills, somehow broader than digital competences which encompasses a wider set of competences. As commented, skills, knowledge and attitude have equalitarian key importance to perform successfully. Ethical awareness, cultural awareness, flexibility, self-direction, and life-long learning are the skills and attitudes needed to manage different and innovative situations, problems and human relationships in the digital context of the knowledge society.

Gekara et al., (2019) say in a report about skilling Australian workforce that digital skills are the combination of digital knowledge, cognitive knowhow, practical know-how, competence, and digital attitude. These are all areas of which employees need to demonstrate ability in the digital age. Moreover, they are divided in four categories (from down to top difficulty and relevance): digital tools and devices, digital environment, digital systems, and digital mindset. They also proposed five levels of measurement of digital competences, from digital skills literacy (lower level) to digital skills savvy (highest one).

Recently, Kateryna et al., (2020) analyzed the impact of digital literacy in the working environment. They identified three previous models of digital competences that are mutually complementary: DigCompEdu 2018, EU DigComp and Target Competency Model 2025. These authors consider digital skills as a transversal tool applicable in all aspects of human-being lives, from interpersonal relations to working performance. They will serve the authors for the future work and as a tool to describe the modifications in the job position requirements in the new context of digital transformation.

3. Methodology

Bibliometric techniques are mainly used to shed light in the construction of comprehensive maps of the knowledge structure in each streams of literature, normally in emerging fields of research (Laudano et al., 2018). Furthermore, to perform meticulous analysis of relevant literature, both bibliometric analysis and systematic literature review techniques are used (Caputo et al., 2019). It is important to carefully select the methods and tools that are going to be used and be informative and neutral in the conducted research process, which provide (De Bakker et al., 2005; Rey Martí et al., 2016).

This study considers the *Web of Science (Wos)*, and more specifically the *Wos Core Collection* as the most suitable database to obtain relevant bibliographic records (Rey-Martí et al., 2016). This scientific database is considered by the academia as the one having the highest quality standards (Merigó et al., 2015a).

To develop the research process, we have chosen the keywords 'digital competences' OR 'digital skills', since 1995. It has been used the conjunction 'OR' instead of 'AND' because the authors wanted to search both terms indistinctly in the Web of Science. As mentioned before, the first time that the concept 'digital competences' was explained and studied from a professional point of view was in 2010, but for this bibliometric analysis we wanted to study the concept and its evolution from the very beginning. The resulted search was of 13.308 documents. Afterwards only the relevant research areas with more than 50 published documents were considered to constraint the analyses. This resulted in 12.373 documents.

Of all the documents obtained, 6.993 were research papers. A little less than half of the total, 5.054 were proceedings papers. This high number of papers presented in conferences shows that the study of the digital competences of the workforce is a topic of special interest for the academic and professional community. 388 of research documents were book chapters, 341 were reviews, and 223 were early access documents.

4. Unit of analysis

The present analysis of *WoS* databased focuses in the research of digital competences. It took place on August 2020. The sample of analyzed papers obtain from the research of *WoS* comprised 12.373 documents, where papers, conference proceedings, book chapters or reviews could be found.

The bibliometric parameters used in this research are the following ones:

- Research areas with more than 50 papers in which the authors have published about digital competences.
- Temporal evolution of research documents published between 1995 and 2020. The time span is as this because in 1995 the first paper about digital competences was published.
- Top countries where authors have published papers about digital competences.
- Journals in which authors have published research documents about digital competences.
- Most prolific and relevant authors which have published papers on digital competences.

4.1 Research areas

The study of digital competences, skills and behaviors could be performed from different perspectives (Murawski & Bick, 2017), if it a transversal topic. In the Table 1 we can observe the number of publications according different research areas. 20 different research areas with more than 200 documents each have been identified in the afore-mentioned database. The Web of Sciences Core Collection contains 5.287 documents in educational research. It is the largest category. This finding implies that traditionally the subject of digital skills has been studied from the teaching and methodological point of view, as a tool for student learning and development (Ananiadou & Claro, 2009; Buscà Donet et al., 2017).

It was not until the 2010s when academia, companies and especially human resources departments began to worry directly about the complex digital skills and abilities of their workers, as an essential requirement to work successfully in 21st century organizations (van Laar et al, 2018).

After the first major research area, the Table 1 is followed by computer science interdisciplinary applications with 982 published documents and information science library, with 865 documents. Disciplines related to computer sciences and engineering, management, artificial intelligence, communication, and business also have a large number of publications, as can be seen in the table below. Therefore, from this analysis we can extract that digital competences are studied above all from the point of view of information systems, as a key to successful communication in changing environments and the organization of work in companies.

Table 1. Web of Science categories

<i>Ranking</i>	<i>Research Area</i>	<i>N. Publications</i>
1	EDUCATION EDUCATIONAL RESEARCH	5287
2	COMPUTER SCIENCE INTERDISCIPLINARY APPLICATIONS	982
3	INFORMATION SCIENCE LIBRARY	865
4	EDUCATION SCIENTIFIC DISCIPLINES	856
5	COMPUTER SCIENCE INFORMATION SYSTEMS	854
6	COMPUTER SCIENCE THEORY METHODS	766
7	ENGINEERING ELECTRICAL ELECTRONIC	680
8	COMMUNICATION	620
9	SOCIAL SCIENCES INTERDISCIPLINARY	384
10	MANAGEMENT	375
11	COMPUTER SCIENCE ARTIFICIAL INTELLIGENCE	369
12	BUSINESS	308
13	COMPUTER SCIENCE SOFTWARE ENGINEERING	237
14	ECONOMICS	233
15	HEALTH CARE SCIENCES SERVICES	229
16	ENGINEERING MULTIDISCIPLINARY	228
17	TELECOMMUNICATIONS	219
18	PSYCHOLOGY EDUCATIONAL	216
19	COMPUTER SCIENCE CYBERNETICS	212
20	PSYCHOLOGY MULTIDISCIPLINARY	209

4.2 Year of publication

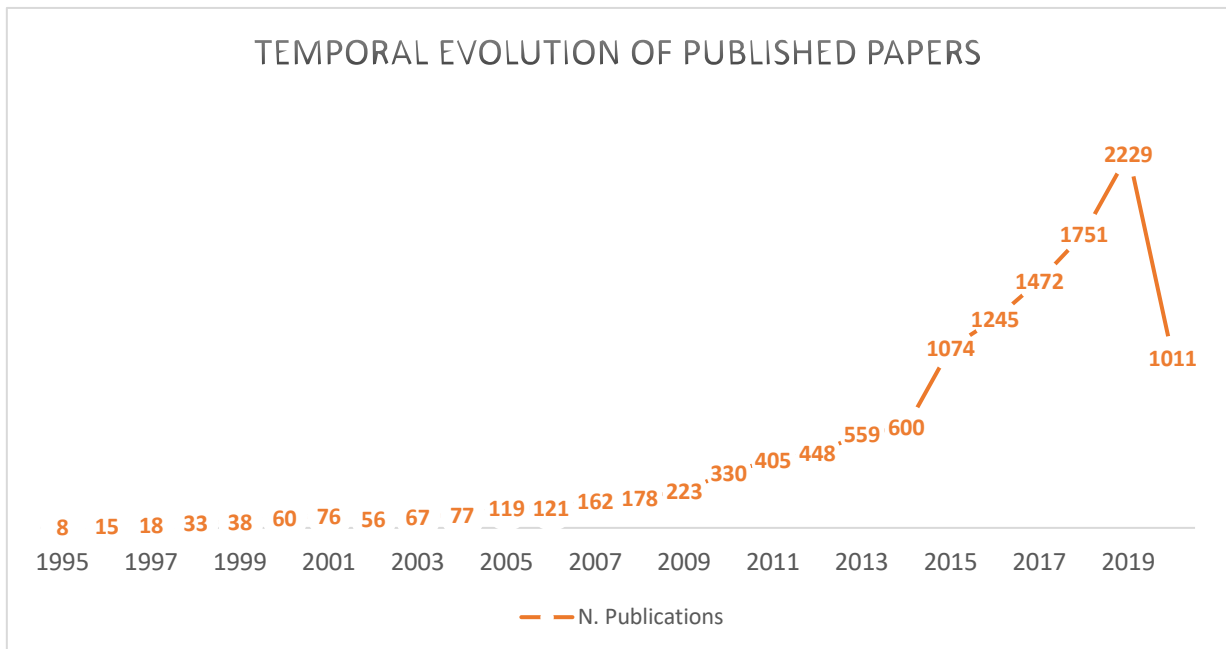
When searching the keywords digital competences and digital skills in the Web of Science, we go back to 1991, where this concept was introduced by Hurford (1991). This paper explains the possible use that an IBM computer could be given as a tool to train children with literacy disabilities, thus developing their skills. However, this use is not the one to be studied in this bibliometric analysis. For this reason, we consider as the first article on digital skills that of Professor Spongberg in 1995, in the educational field. However, until the year 2000, the production of articles on the subject is

rather scarce, without reaching 50 annual publications. As of this year, it begins to increase gradually until 2014, the year in which 600 documents on this subject were published. It was from 2015 that interest in research in digital competences and skills grew to reach more than 1000 publications annually.

This interest and growth in the subject of digital competences is since numerous authors indicate the gaps of study and future lines of research in their articles. For example, in the educational field, Buffardi & Tadeo (2017) point out that the influence of new technologies in the private lives of students has a decisive weight in the development of their digital skills. Therefore, it should be studied how these competencies can be trained and increased in an equal way, by educational institutions. Van Laar et al., (2017) highlighted in their systematic analysis of the literature the need for the topic to carry out empirical analyzes to demonstrate the theoretical hypotheses that were raised, since it is in an incipient stage of the study. In addition, they also pointed out the importance of studying this issue from the point of view of workers in companies and not only of high school or university students.

In 2019, 2.229 were published, this being the highest figure in its history, and in August 2020, when the present study is being carried out, 1,100 documents have been published. Therefore, the publication forecasts are for continuous growth, especially after the global pandemic and paradigm shift (from analog to digital) that Covid-19 has brought.

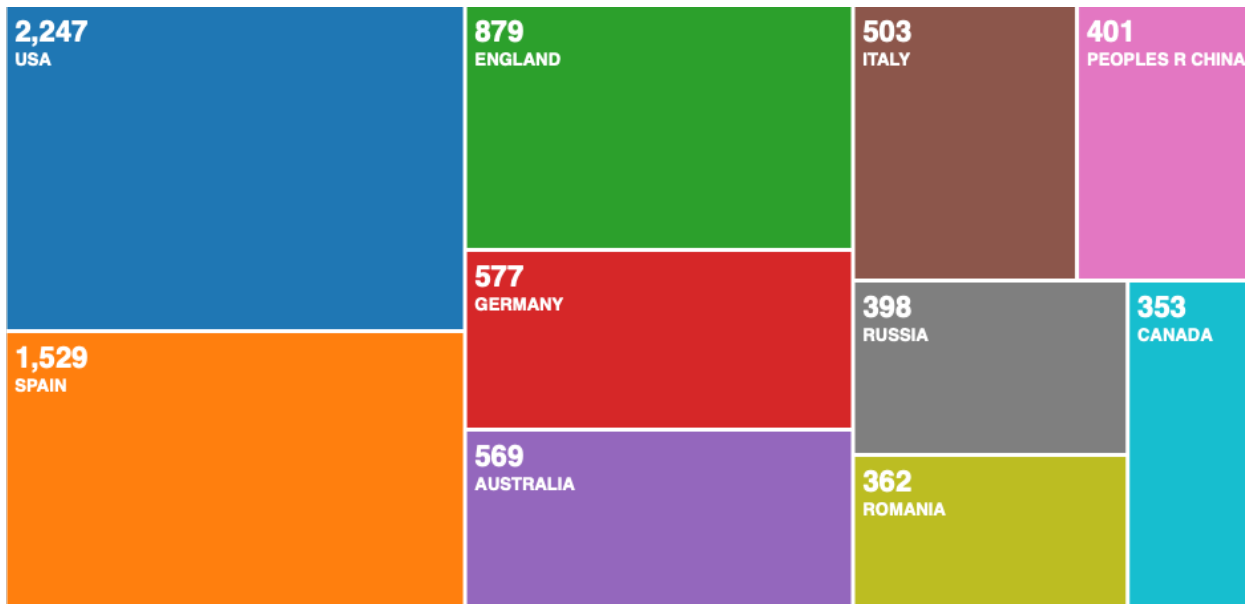
Figure 1. Temporal evolution of publications in digital competences between 1995 and 2020



4.3 Countries

In Table 3 we observe which are the top 25 countries where more studies on the analysis and measurement of digital competences have been published, since 1995. The USA collects the highest number of publications with 2247 documents, 18.161% of the total. Spain is the second country in the ranking with 1529 published documents, especially in the universities of Salamanca, Valencia, and Madrid (12.35% of the total). It is followed by European countries such as England (879 documents) or Germany (569 documents). This is because many JCR Journals are from the USA or England. Australia occupies the fifth position with 569 documents, from which we can highlight the report published in 2019 by Gekara et al. Where an exhaustive study is made on the Australian workforce and its preparation in digital skills and abilities for the jobs and needs of companies in the 21st century. This report highlights the role of workers so that organizations successfully achieve the digital transformation in which they are embarked and can overcome all the challenges that society and the current world propose.

Figure 2. Countries where digital competences research has been published



4.4 Journals

Analyzing which journals have published the most about digital competences is undoubtedly a very useful tool in bibliometric analysis, due to the importance and topic-journal fit that editors give to their journal publications (Laengle et al., 2018). Therefore, to carry out a good analysis of the literature on the present topic, it is necessary to know which journals to read and which not, depending on the research area on which we want to focus.

In addition, it is important to consider the impact factor and the quartile in which the journals we consult are located. The journal's impact factor is a number which refers to the information contained in the Journal Citation Reports (JCR) by the Science Citation Index (SCI). The JCR compiles and delivers annually information about research in diverse areas according to the citations received and made of all published articles within a year (Leydesdorff & Meyer, 2006). This number is a key indicator that measures the quality and category of the journal for academics and researchers. The quartile in which the journal is located serves for comparing journals among them.

As we see in Table 2, the journals with more than 20 publications on digital competences have been identified. As commented previously, the largest traditional publication of research on digital competences has been in the field of education and teaching. For this reason, the JCR Journal with the most publications are *Computers & Education* (112 documents), published by Elsevier. The impact factor of this journal in 2019 was 5,296 and it is in the first quartile.

It is followed by the journals *Computers in Human Behavior* with 75 documents (journal dedicated to examining the use of computers and ICT sciences from a psychological perspective) and '*Comunicar*', with 62 documents. *Computers in Human Behavior* is also owned by Elsevier publishing house and has an impact factor of 5,003. It is in the first quartile in its discipline. The Journal '*Comunicar*' is a Latin American scientific communication and education journal. It is Q1 in JCR and has an impact factor of 3,375. In table 2 we see the other journals with the highest production of

articles related to digital skills that have more than 20 publications. Many others have been discarded, due to the insignificant number of them.

Table 2. Journals which have published research on digital competences

<i>Ranking</i>	<i>Source Titles</i>	<i>records</i>
1	COMPUTERS EDUCATION	112
2	COMPUTERS IN HUMAN BEHAVIOR	75
3	COMUNICAR	62
4	EDUCATION AND INFORMATION TECHNOLOGIES	55
5	BRITISH JOURNAL OF EDUCATIONAL TECHNOLOGY	49
6	NEW MEDIA SOCIETY	48
7	INFORMATION TECHNOLOGIES AND LEARNING TOOLS	43
8	INFORMATION COMMUNICATION SOCIETY	41
9	SUSTAINABILITY	40
10	EDUCATIONAL TECHNOLOGY SOCIETY	39
11	JOURNAL OF MEDICAL INTERNET RESEARCH	38
12	INTERNATIONAL JOURNAL OF EMERGING TECHNOLOGIES IN LEARNING	37
13	ELECTRONIC LIBRARY	29
14	FRONTIERS IN PSYCHOLOGY	29
15	REVISTA LATINOAMERICANA DE TECNOLOGIA EDUCATIVA RELATEC	28
16	EDMETIC	26
17	LIBRARY HI TECH	26
18	AUSTRALASIAN JOURNAL OF EDUCATIONAL TECHNOLOGY	25
19	LEARNING MEDIA AND TECHNOLOGY	25
20	PIXEL BIT REVISTA DE MEDIOS Y EDUCACION	25
21	DIGITAL EDUCATION REVIEW	24
22	ETR D EDUCATIONAL TECHNOLOGY RESEARCH AND DEVELOPMENT	24

4.5 Authors

Finally, it is important to also analyze which authors have published the most about interest of the bibliometric analysis that is being carried out. The measurement of research performance has traditionally viewed as problematic and challenging (Cole, 1989). For this reason, it is useful to discover, first, who are the most expert authors on the subject due to their experience and scientific background with bibliometric tools and indexes. Undoubtedly, these authors and their papers should have greater prestige and recognition at the time of carrying out the analysis of the literature on the subject in question. We have chosen the top 10 authors with more publications on digital competence. The cut-off point is on 12 publications.

One of the ways to measure the quality and performance of authors and publications on digital competences and skills is by counting the total citations that each author has. However, this number may be biased by the popularity of the author and not the article itself (Duque Oliva et al., 2006). Another tool to analyze and characterize the scientific output of a researcher is the H-index, proposed by Hirsch (2005). This index gives an overview about the importance, relevance, and general impact of an academic's cumulative research contributions at a micro-level (Bornmann & Daniel, 2006; Rey-Martí et al., 2016). The self-citations do not impact so much in this index and it is a great tool as well to analyze the researcher's impact over the time (Cronin and Meho, 2006). An H-index of 0 points represents inactive authors (Glänzel, 2006). They had no visible impact, although they may have different published papers.

In the Table 3 it can be observed the number of publications, the times cited and the H-index. This is ordered according the number of publications of each author, but the times cited, and H-index do not position the authors in the same ranking.

According to the Web of Sciences, the author with the most publications is Van Deursen (23 documents published), among which his collaborations with Van Dijk, Van Laar, de Hahn and Peters stand out. This group of authors has published the most relevant articles on digital skills, digital competences, 21st century skills and has developed some interesting definitions, classified them, and made study models, hypotheses, and scales to measure digital skills.

Regarding times cited, the most relevant author is Hargittai, whose publications were cited 284 times only in 2019. His papers are about internet skills and digital inequality among both students and adults. He has also the higher H-Index, followed by Van Deursen and Van Dijk.

Table 3. Authors which have published research on digital competences

<i>Ranking</i>	<i>Author name</i>	<i>N. Publications</i>	<i>Times cited</i>	<i>H-index</i>
1	VAN DEURSEN, AJAM	23	1271	15
2	CAR, LORAINNE TUDOR	17	167	7
3	HARGITTAI, ESZTER	17	1830	16
4	HATLEVIK, OVE	16	317	8
5	HWANG, GWO-JEM	16	530	8
6	CAR, JOSIP	13	210	6
7	MOZELIUS, PETER	13	12	2
8	SANCHEZ, SANTIAGO POZO	13	14	2
9	VAN DIJK, JAN G.M.	13	1454	11
10	BELMONTE, JESÚS LÓPEZ	12	14	2

5. Conclusions

This article aims to conduct a bibliometric analysis about digital skills and competences and its measurement in order to determine the most important journals, cross-sectional areas of research, temporal evolution of publications, and the most prolific authors on the subject. All this information is essential to determine the current situation and the importance of the chosen topic and to establish the study gaps and further research that can be derived on this topic, since it is in an incipient phase of research.

A total of 12,373 documents on the topic of digital competences have been analyzed, of which 6,993 are papers, 5,045 are conference proceedings, 389 are book chapters and 341 reviews. 223 are early access documents. In relation to the main research areas, we can determine that studies on digital competences have been directed, to date, mainly on educational research. Because most researchers and academics dedicate part of their time to teaching, there is greater ease of access to student databases and as part of their educational evolution studies can be carried out on their digital skills, evolution, advantages, transversality and so on. However, both theoretical and empirical studies on the application of digital skills in other areas such as interdisciplinary computer sciences, communication, management or interdisciplinary social sciences are scarcer, and studies of a theoretical and qualitative nature stand out. This is due to the novelty of the topic, because in the next phases of the development of this research topic, quantitative research should be encouraged where the measurement scales proposed by different authors can be applied and hypotheses validated.

Knowing the most important, relevant, and reputable authors on this topic allows us to decide which articles we consider as the basis for the review of the literature in our study on the subject of digital skills and competences. It also serves to know the authors who have gone further to the knowledge border and where is the starting point to continue with the study gaps. In the field of digital skills, we can distinguish Alexander Van Deursen from the University of Twente (Netherlands) whose research lines are about digital inequality and digital skills for 21st century labor. Eszter Hargittai from the University of Zurich works on Internet skills and digital literacy. Van Dijk, from the University of Twente also focuses on digital media, network society and digital skills.

Among the Journals where most articles are published on digital competences and its measurement, we can outstand Computers & Education published by Elsevier, Computers in Human Behavior and the Journal 'Communicate'. All of them are ranked in top positions within their areas and in the JCR reports.

In conclusion, we can reaffirm our hypotheses announced in the introduction on the current and relevance of the issue of digital competences both for academia and for the success of organizations in the post-covid-19 world. The evolution of interest on this topic in the academy is undoubtedly growing, due to the continuous and organic increase of publications throughout the last 20 years. In addition, one of the main keys in the world after the post-covid-19 paradigm shift is the rapid digital transformation and the need for an increase in digital skills and abilities in students, professionals, academics, and organizations (Iivari et al., 2020). For this reason, the studies on this topic that we are analyzing are very important and should serve as a guide for companies and universities in changing ways of working, organizational culture, and training of their employees.

A limitation of this study is that only papers from the *Web of Science Core Collection* have been considered. Further studies can also consider papers that are not in the *Web of Science* but in Scopus. However, the scientific community does not consider that they have a higher impact factor. A bibliometric analysis could also be carried out in the future by determining some specific research areas such as the educational area, information sciences, computational analysis, or behavioral economics. Moreover, it can be also performed considering only the papers on digital competences from 2010 on, when the concept was firstly explained from a professional point of view.

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