
A SYSTEMATIC LITERATURE SEARCH AND BIBLIOMETRIC ANALYSIS OF THE SUCCESS MODEL OF AN E-LEARNING INFORMATION SYSTEM

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ABSTRACT

The Covid 19 epidemic has led to an enormous increase in e-learning usage. The subject of effective e-learning information systems has been the subject of numerous studies or research projects. However, there have never truly been any analytical studies employing bibliometrics on the subject of the effectiveness of e-learning systems. The primary goals of this study are to analyze the conceptual framework surrounding the effectiveness of e-learning systems and to identify new trends based on journal publications. We have analyzed a variety of works that were found in the Scopus database between 2006 and 2022. 46 articles, the outcomes of the inclusion and exclusion process from a search of 1,168 articles from 30 journals, were used as analysis material to create a map showing: (a) trends in e-learning publications, (b) the most productive and influential authors, (c) the most influential articles, (d) patterns of author and country collaboration, and (e) similarities in research themes. Next, VosViewer was used as a visualization tool to do bibliometric analysis. It was also done to create network maps utilizing bibliographic coupling and co-citation analysis to find intriguing trends and themes in the success of LMS information systems. The study's final results, which indicate research gaps, give a clear knowledge of theories concerning information system success that can be applied as research directions.

Key words: VosViewer; Bibliometrics; E-learning; IS Success Models; Systematic Literature Review (SLR)

INTRODUCTION

The global Corona Virus Disease-2019 (Covid-19) pandemic, which began in early March 2020, has compelled the government to restrict social interaction in order to stop the virus's spread. The learning system changed from face-to-face to distance learning using computers, smartphones, or other IT devices that contain applications, such as: Zoom, Google Meet, Edmodo, Blog, Social Media, Webex, Coursera, Microsoft Team, or specific platforms used by educational institutions (Rokhman et al., 2022). This was due to the conditions of social restrictions at the time.

According to DeLone & McLean (2016), as system utilization rises, it will become more important to determine whether the system being developed has achieved organizational goals or not. This evaluation of system success is crucial for the advancement of the information systems field in both research and practice. System success has been the subject of a lot of research, including a meta-analysis study that found more than a thousand empirical studies on online learning by conducting a thorough search of multiple literatures between 1996 and July 2008 (Sarana et al., 2010).

Al-fraihat et al. (2017) carried out research and determined the elements necessary for e-learning programs to be implemented successfully. Identification is based on 68 articles about e-learning in higher education that were published between 1998 and 2016 in this sector. The review outlined important parameters and themes, followed by comparisons and contrasts between studies. Using the quantitative technique Partial Least Squares - Structural Equation Modeling (PLS-SEM), the identification results were then assessed once more in 2020 for 563 students who had participated in the e-learning system at one of the universities in England (Al-Fraihat et al., 2020).

The greatest known evidence on how to implement synchronous hybrid learning throughout the globe was synthesized by Raes et al. (2019), using data from 47 examined studies. The review's goal is to give readers a broad overview of recent findings, paying particular attention to their advantages, drawbacks, and design principles. In order to understand the direction of research at the time Jeyaraj (2020) undertook a meta-critical assessment of the DeLone & McLean information systems success model from 1992 to 2003 during the first year of the pandemic. Some of this e-learning literature has widened the study perspective on several e-learning features; numerous individual studies have evaluated these aspects using diverse fundamental theories. For instance, e-learning is a notion that refers to a learning tool that, in conjunction with information technology, may provide knowledge regardless of the learner's time or location (Gunsekera et al., 2020).

Several studies on the use of e-learning during the pandemic have been conducted, including by Al-Adwan et al., 2021; Al-Harazneh et al., 2022; Al-shargabi et al., 2021; Alotaibi & Alshahrani, 2022; Alqahtani et al., 2022; Althunibat et al., 2021; Gharaibeh & Gharaibeh, 2020; Hussein et al., 2021; Rokhman et al., 2022). The

study studies that have been conducted split e-learning attention into three basic things, namely; learning model, students, and instructors, based on 46 journal papers regarding the effectiveness of different e-learning systems. Apart from that, these articles are packaged in several research objective contexts, such as: analysis of success factors (Alotaibi & Alshahrani, 2022; Bessadok, 2022) ; meta-analysis, systematic review by: (Anthony et al., 2006; Jami Pour et al., 2022; Mehta et al., 2021; Yeo, 2016) , as well as other research objectives beyond the aim of summarizing and synthesizing existing literature findings exists as an effort to map future research plans.

It is obvious that e-learning technology benefits its users. However, depending on the type of user relationship and the features of the e-learning system, these impacts may have different effects. The majority of e-learning satisfaction studies have made extensive use of reliable, current theories that have been developed and steadily enhanced over many years.

The goal of this study is to identify the conceptual, methodological, and geographic gaps present in the e-learning industry. Additionally, the overall goal of this research is to present a thorough summary of e-learning research that has been published between the years of 2006 and 2022.

In this study, the following research topics about e-learning are discussed:

- (1) How can I recognize and learn about publication trends in the e-learning space?
- (2) How can I recognize, describe, and learn more about the most prolific and significant authors in my field of study?
- (3) How do I determine which works or publications have had the most impact on my subject of study?
- (4) How may patterns of collaboration between authors and nations be recognized and discovered?
- (5) How can the common research themes that go through the field of study's researchers be identified and ascertained?

METHOD

This study combines bibliometric analysis, systematic literature review (SLR), and visualization methods with the VosViewer program. Systematic Literature Review (SLR), as it aims to summarize and synthesize findings from the literature that already exists on a subject or area of study (Donthu et al., 2021). This is predicated on the accessibility of sizable electronic databases, which makes it simpler for academics to carry out organized study quickly. The data used in this study are the outcomes of searches made in the Scopus database for the years 2006 through 2022 using the title, abstract, and keywords. "Information System" and "Success Model" are the terms used. The goal of the search term employed was to return the studies that were most pertinent to this field of study. 1,168 written items, including conference papers, articles, books, reviews, and conference summaries, were found in the initial search results. It would be more suitable to use research data as a reference in a systematic review. As a result, results other than articles were disregarded, and 674 articles in total were found. The inclusion procedure was then repeated using the keyword "e-Learning," which is the subject of this study. The 46 papers that were found in the results provided the basis for this research's literature analysis investigation.

The data is evaluated using bibliometrics as a bibliographic analysis study of scientific activities as a definitive statement of research outcomes (Tupan et al., 2018) to help grasp the intellectual structure, particularly with e-learning. Use VosViewer, a program that helps to visualize data maps based on bibliometric networks, to visualize development trends. The software also has extra zooming, scrolling, and searching features that greatly aid in detailed map inspection (Liao & Lin, 2020). The data is handled carefully by researchers and is kept in the Mendley library for later study. The data was previously exported and imported in.csv and bibtex formats. In order to be used for future bibliometric analysis, a copy of the chosen articles is also kept in a Scopus folder. The Scopus database's bibliographic information is presented and examined in the next part using free software R-Studio..

RESULTS AND DISCUSSION

The conversation is divided into two segments to address various research issues, including analysis utilizing Bibliometrix to address questions one through three. Additionally, the VosViewer tool was used to depict the bibliometric results for discussion of additional issues.

3.1. Results

Large amounts of scientific data can be explored and analyzed using the well-liked and exacting Bibliometrix approach (Donthu et al., 2021). This bibliometric analysis is used to examine how e-learning research has evolved, with a focus on publishing trends, the most productive and significant authors, and the identification of a number of significant papers.

Table 1. Main Information About Data.

Description	Results
Timespan	2006:2022
Sources (Journals, Books, etc)	30
Documents	46
Annual Growth Rate %	16.17

Document Average Age	0.27
Average citations per doc	51.26
References	2971
Keywords Plus (ID)	288
Author's Keywords (DE)	150
Authors	130
Authors of single-authored docs	4
Co-Authors per Doc	3.02
International co-authorships %	1.02
Articles	46

The main findings of a thorough scientific mapping analysis based on a prior bibliometric search are presented in Table 1: The results of the search reveal that there are 46 articles about successful models of e-learning information systems, written by 130 authors with backgrounds in various scientific disciplines. 4 of the total papers were research articles, and they were written by a single author, and they were published in 30 reliable peer-reviewed journals.

3.1.1. Publication trends in the e-learning sector

The annual number of publications on e-learning is depicted in Figure 1, and the first e-learning-related research findings date back to 2006 (Yeung & Jordan, 2006). The article is extremely fascinating because it was created as part of an initiative by the majority of Hong Kong corporations to suggest business e-learning programs as a means of enhancing the abilities of their personnel. These suggestions are founded on the idea of adult learning, which is voluntary and done of one's own free will, so that there are no obstacles in the way of employees who want to learn..

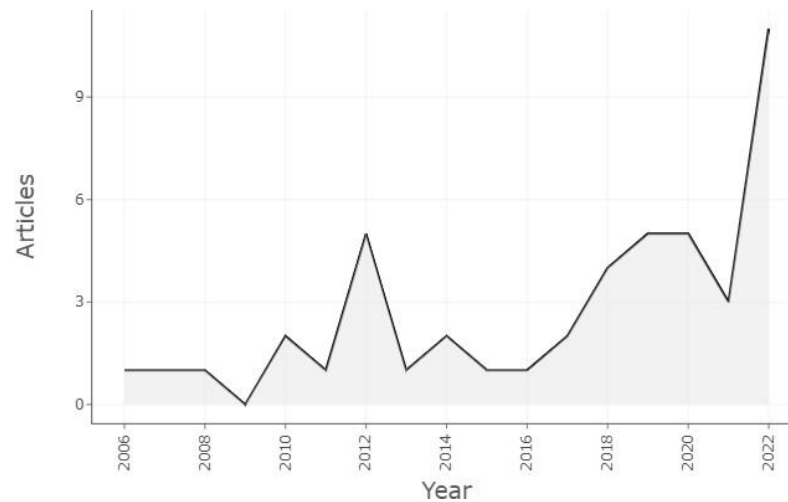


Figure 1. Annual Article Publications
(Source. Findings from Bibliometric Analysis)

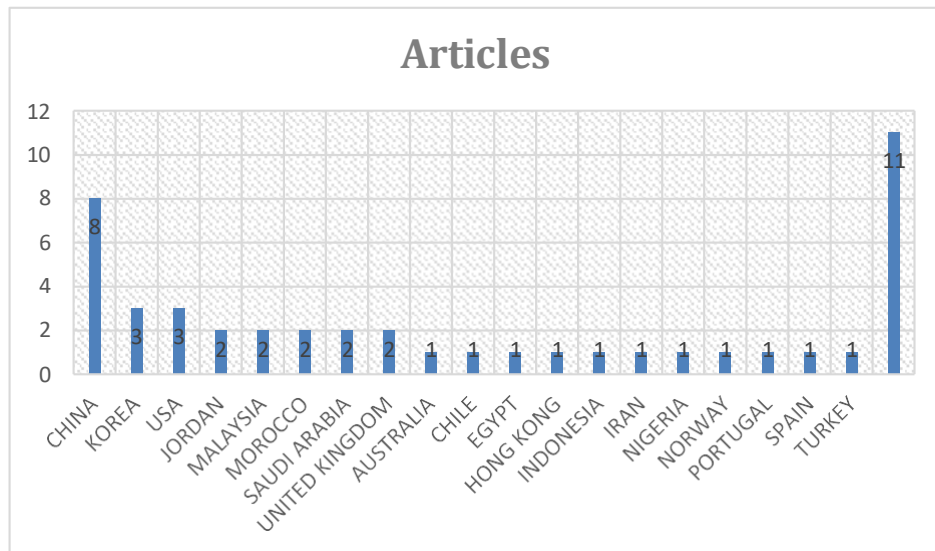


Figure 2. Country Wise Scientific Publication

Figure 2 shows that the number of articles about the success of e-learning systems began to rise in 2010, then leveled off until 2016. In 2017, the number of annual publications began to rise. Until 2020, the impact of the Covid 19 pandemic drew the attention of practitioners such as (Al-Harazneh et al., 2022; Al-Rahmi et al., 2022; Al-shargabi et al., 2021; Alajmi & Alotaibi, 2020 ; Alotaibi & Alshahrani, 2022; Lee et al., 2022). This demonstrates a consistent rate of growth.

Another analysis of publication trends in regional categories (continents) reveals that the Asian continent region accounts for 47% of all research on e-learning system success models. Of course, this is a separate note that demonstrates the growing importance of Asian research trends. This opinion is not exaggerated because, according to Putera et al. (2021), the trend of Indonesian foreign scientific articles indexed by Scopus increased significantly from 2015 to 2019 (549.71%). According to the statistics in Figure 2, China had the most research publications (n = 8), followed by Korea and the United States (n = 3), among the 19 most prolific nations. With one publication, Indonesia is comparable to Malaysia, Jordan, Morocco, Saudi Arabia, the United Kingdom, and other nations (n = 2).

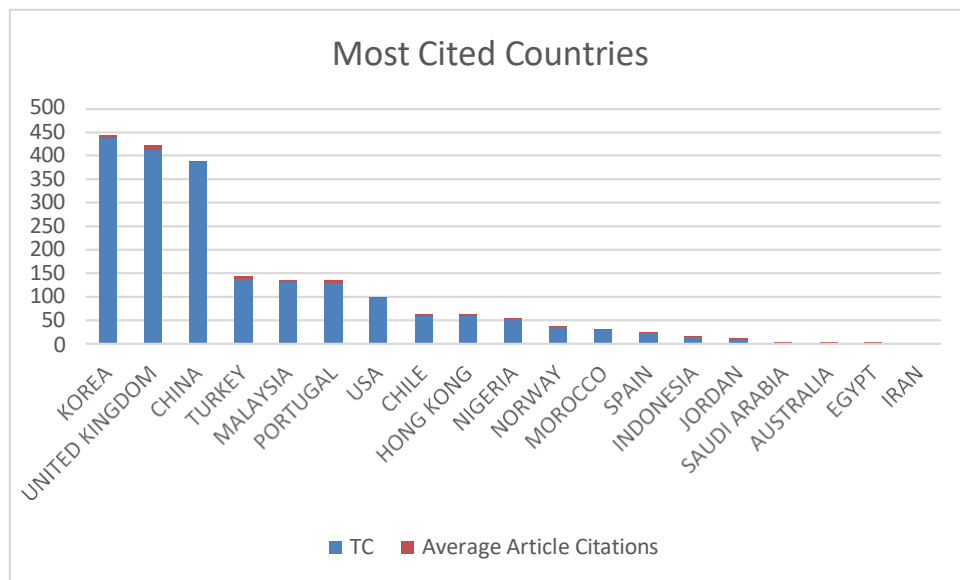


Figure 3. Most Cited Countries

Additionally, articles from Korea received the most citations (n = 439), followed by those from the United Kingdom (n = 414) and China (n = 387) (Figure 3). The United States' publications appear to have been unable to make a bigger influence than those from Portugal, Malaysia, Turkey, and the United Kingdom, countries with fewer publications. Indonesia has only demonstrated an average of 14% in article citations.

3.1.2. The Most Successful And Important Writer

According to Abdullah and Khan (2021), productive writers are those who are consistently able to generate research-related work and contribute to the development of the research field. Table 2 lists 10 of the 116 writers

who have worked to advance the body of knowledge and undertake research in the area of the effectiveness of e-learning systems.

In contrast to the nine authors who produced two works each and the remaining authors who produced just one work, none of the ten authors produced any dominant works, which is an interesting observation. Therefore, it may be claimed that it is impossible to identify the most significant and productive authors when discussing the effectiveness of e-learning systems. Because the chosen issue is so narrow, there are two possible directions that researchers can go in, thus we view this situation as typical. First off, there is a lot of room for research on this subject, and there may be potential for studies or research on the effectiveness of e-learning systems. Alternately, concentrate on researching the causes to use as research material. The second possibility is that study on this subject is no longer interesting.

Table 2. Most productive author in the e-learning industry

No	Author	Institute	Country	years	freq
1	Zaini Abdullah	Management and Science University,	Shah Alam, Malaysia	2018; 2020	2
2	Osama Isaac	Lincoln University College,	Petaling Jaya, Malaysia	2018; 2020	2
3	Ahmad Samed Al-Adwan	Al-Ahliyya Amman University,	Amman, Jordan	2021; 2022	2
4	Chuiyi Liu	University of Finance and Economics,	Beijing, China	2015; 2017	2
5	Hsiu-Ju Chen	I-Shou University	Kaohsiung, Taiwan	2010; 2012	2
6	Khalifa Mansouri	Hassan II University	Casablanca, Morocco	2019; 2020	2
7	Franck Poirier	University of Brittany Sud,	France	2019; 2020	2
8	Yassine Safsouf	Marrakech Center	Morocco	2019; 2020	2
9	Nour Awani Albelbisi	University of Malaya,	Putrajaya, Malaysia	2021; 2022	2
10	Ahmed Farouk AbdelKader	College of Management and Technology	Cairo, Egypt	2022	1

3.1.3. Most Important Works

The most influential works can be identified by counting the number of citations or by picking out research articles that receive a lot of citations because they open up new avenues in line with the development of the research area. A minimal threshold of 50 citations was established to determine which publications had the most impact on the success of e-learning systems (Abdullah & Khan, 2021) .

Table 3. Hight cited e-learning research papers

No	Author /DOI	T itle	Source Title	T.C	Tcpy
1	Yang et al. (2017) 10.1007/S11423-017-9513-6	Understanding The Quality Factors That Influence The Continuance Intention Of Students Toward Participation In Moocs	Educational Technology Research and Development	124	17,714
2	Chen, (2010) 10.1016/J.Compedu.2010.07.005	Linking Employees' E-Learning System Use To Their Overall Job Outcomes: An Empirical Study Based On The Is Success Model	Computers And Education	118	8,429
3	Aldholay et al. (2018) 10.1016/J.Tele.2018.03.012	The Role Of Transformational Leadership As A Mediating Variable In Delone And Clean Information System Success Model: The Context Of Online Learning Usage In Yemen	Telematics And Informatics	108	18,000

No	Author /DOI	T title	Source Title	T.C	Tcpsy
4	Al-Adwan et al. (2021) 10.3390/Su13169453	Developing A Holistic Success Model For Sustainable E-Learning: A Structural Equation Modeling Approach	Sustainability (Switzerland)	50	16,667
5	A. Aldholay et al. (2020) 10.1108/ITP-02-2018-0095	Perspective Of Yemeni Students On Use Of Online Learning: Extending The Information Systems Success Model With Transformational Leadership And Compatibility	Information Technology And People	24	6,000
6	Chen (2012) 10.1016/J.Compedu.2011.07.010	Clarifying The Empirical Connection Of New Entrants' E-Learning Systems Use To Their Job Adaptation And Their Use Patterns Under The Collective-Individual Training Environment	Computers And Education	24	2,000
7	Safsouf et al. (2019) 10.28945/4518	An Analysis To Understand The Online Learners' Success In Public Higher Education In Morocco	Journal Of Information Technology Education: Research	22	4,400
8	Chuo et al. (2015) 10.3233/Thc-150949	Effectiveness Of E-Learning In Hospitals	Technology And Health Care	10	1,111
9	Al-Adwan et al., (2022) 10.28945/4980	Towards A Sustainable Adoption Of E-Learning Systems: The Role Of Self-Directed Learning	Journal Of Information Technology Education: Research	9	4,500
10	Yassine Safsouf et al. (2020) 10.28945/4526	An Analysis To Understand The Online Learners' Success In Public Higher Education In Morocco	Journal Of Information Technology Education: Research	7	1,750
11	AbdelKader & Sayed (2022) 10.1016/J.Acalib.2022.102506	Evaluation Of The Egyptian Knowledge Bank Using The Information Systems Success Model	Journal Of Academic Librarianship	2	1,000

According to the largest number of citations, Table 3 presents a list of papers together with their number of citations. The analysis's findings indicate that Yang et al. (2017) are the most often cited works, followed by Chen, (2010), Aldholay et al. (2018), and Al-Adwan, et al. (2021). Thus, only 4 of the 11 studies were able to significantly advance knowledge about the effectiveness of e-learning systems. In addition to adding to the research on MOOC learning, Chen (2010) also identified important quality aspects and offered managerial advice for the application and expansion of MOOCs. The overall effects of this amount of citations, however, are highly helpful for future research as a foundation for empirical study and as a means of opening up new avenues for scholarly investigation in the area of e-learning (Yang et al., 2017) .

3.1.4. Analysis of Author and Country Coauthorship Networks

The number of collaborations between authors, organizations, or nations is represented by the co-authorship network, which is a component of the analysis of author performance by examining research maps in a specific field or is a standard practice in conducting reviews to display author performance in each study (Donthu et al., 2021). Co-authorship results in a synergistic effect, fresh scientific output, and higher-caliber research articles. Additionally, researchers typically work together to generate scientific publications, which results in a higher volume and higher caliber of scientific output thanks to individual contributions. (Abdullah & Khan, 2021) .

The visualization of the analysis findings using VOSviewer is shown in Figure 4. Nine authors in all were identified by the study, and they were divided into five clusters, each of which was symbolized by a distinct hue. The strongest co-authoring network is formed by Cluster 1 (red), which includes three writers from two different countries—France and Morocco—Khalifa Mansouri, Franck Poirier, and Yassine Safsouf. Together, they have co-authored two documents..

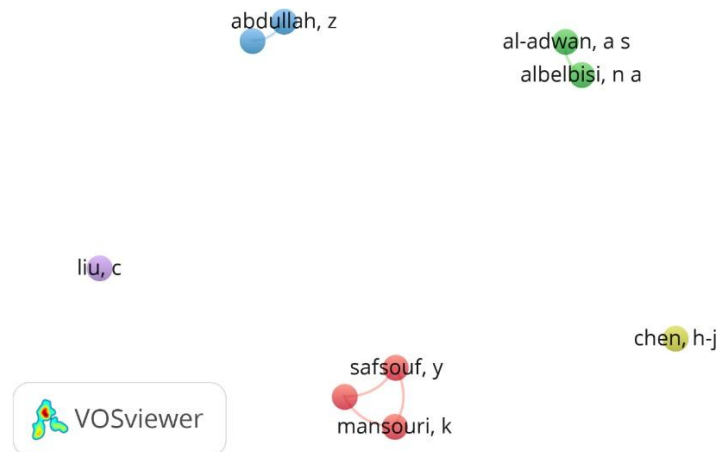


Figure 4. Authors' Co-Authorship Network

3.1.5. Determine the recurring study themes that affect e-learning researchers.

The author used VOSviewer to conduct keyword analysis in order to identify common themes or research trends among scholars and to create a network of common keywords applicable to the subject of e-learning. The initial analysis of the 46 papers that were extracted revealed 288 keywords in total. Then, the keywords were restricted to 4 occurrences to produce the author's most popular terms, yielding a total of 19 keywords. 19 of the 288 keywords thus satisfied the threshold requirements. The occurrence network of frequently used author keywords is shown in Figure 5. Overall, the network map (based on 19 keywords) reveals that all keywords are split into 3 clusters, namely Cluster 1 (red), Cluster 2 (green), and Cluster 3 (blue), each of which has 8 keywords, 6 keywords, and 5 keywords, respectively. With 18 links out of a total of 55 links and 16 occurrences, the keyword "e-learning" is in cluster 1 as an established topic or idea.

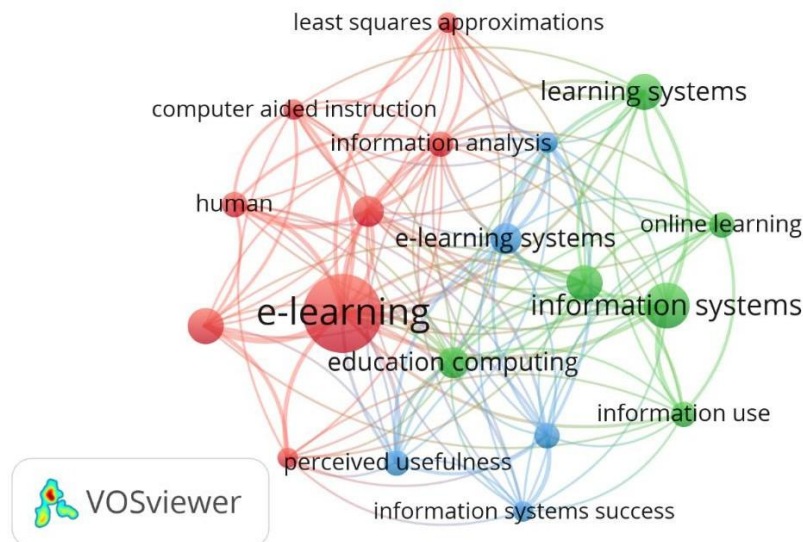


Figure 5. Keyword Co-Occurrence Network

3.2. Discussion

In this section, we discuss a number of research-related topics, particularly those pertaining to the conclusions drawn from the process of formulating the five research questions described in the introduction. The following are the results in relation to these five questions:

- (1) The dynamics of publication trends in the area of e-learning are covered in RQ (1). It was discovered that e-learning research is not new and that the Asian continent accounts for 47% of all successful e-learning system research. And with 8 publications, China emerged as the nation with the highest level of productivity. After varying in the past, research output has increased in 2020, with more scholars publishing the findings of their study in prestigious peer-reviewed publications. a pattern that shows an overall rise in the concentration of studies in Asia, the majority of which are in developing nations. Because they have shown access to the requisite personnel, supportive economic environment, and further encouraged growth and innovation, Asian nations are often regarded as a place for new practices in the field of digitalization.

- (2) According to RQ (2), the author's work is the most fruitful and significant in the e-learning industry. According to the analysis, Chuiyi Liu, Hsiu-Ju Chen, Zainni Abdullah, and Ahmad Samed Al-Adwan are the scientists in this subject who have made the most significant contributions to science.
- (3) According to RQ (3), Chuiyi Liu's study is one of the most frequently cited studies (n=17,714 each year), and it served as the starting point for later empirical studies in the area of e-learning. This study project was actually published in 2017, which is more than ten years after the start of the journal search period in 2006.
- (4) RQ (4), data from this session revealed that there was still a lack of collaboration between the researchers' home countries. Researchers from the same geographic region are more active in their collaboration and have synergistic effects, which improve academic outcomes, according to author collaboration networks. As a result, it can be claimed that the author's associated country cooperation network exemplifies the lack of networks between nations that are actively engaged in e-learning research.
- (5) Using keyword analysis, we were able to identify the common topics of study being conducted by researchers in the field of e-learning for RQ (5). This demonstrates that researchers frequently employ DeLone McLeod's information systems success model.

CONCLUSION

E-learning research is at a higher level and spans all continents; the work has been published in prominent peer-reviewed journals, and the researchers come from a diverse range of backgrounds. An examination of comparable scientific output reveals that US research has not made major advances. Korea, on the other hand, has made a significant leap, overtaking China in terms of quotations. The scientific collaboration network demonstrates that authors and nations are not strongly connected with one another, implying that research convergence among selected authors and countries is still in its early stages. This study contains numerous limitations assumptions, such as: articles are only obtained from the Scopus database with a limited time span (2006 - 2022), and VOSviewer is used just as a visualization tool. Other databases, such as Proquest, IEEE Explore, Web of Science, Google Scholar, and others, are recommended for further research. And can broaden the area of research by incorporating other visualization tools, such as Bib Excel, HistCite, and Gephi, among others. Aside from the limitations indicated, this study can be used as a reference and can provide a comprehensive review, particularly in e-learning research, which will be very valuable for academics and practitioners.

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