



# Information System Success Model: A Systematic Literature Search and Bibliometric Analysis

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**Abstract.** Research on the topics of successful e-learning information systems has been carried out a lot. However, an analytical study using bibliometrics for the topic of the success of an e-learning system has never actually been carried out. This study aims to uncover emerging trends and explore the intellectual structure of successful e-learning systems based on journal articles. The method used is the combination of systematic literature review (SLR) and bibliometric analysis techniques with visualization using VosViewer tools to review various literature sourced from the Scopus database from 2006 to 2022. A total of 46 articles, the results of the Inclusion and Exclusion process from an initial search of 1,168 articles, published by 30 journals were used as material for analysis. The final findings of this study provide a good understanding of theories about successful information systems that can be used as research directions by highlighting research gaps.

**Keywords:** Bibliometric, E-learning, IS Success Models, Literature study, VosViewer.

## 1 Introduction

The Corona Virus Disease-2019 (COVID-19) pandemic, which began in early March 2020, has a major impact on the use of e-learning or the Learning Management system (LMS). On a national scale, the use of LMS in Indonesia has been increasingly prioritized since the government has encouraged all tertiary institutions and all education units to move their lectures and face-to-face classes to online lectures in virtual classes [1]. In a global scope, UNESCO has launched the Global Education Coalition as a form of support for many countries in improving online technology-based learning or the Learning Management System [2]. However, the Covid-19 pandemic was not the only trigger for the development of e-learning information technology. Long before, the development of e-learning information technology was seen as having created an architecture, which promoted pedagogical innovation, and increased the dissemination of learning technology [3]. Accordingly, a lot of research in this field has also been carried out. A meta-analytic review through a systematic search of the literature from 1996 to

July 2008 identified more than a thousand empirical studies of online learning online [4].

Then Al-fraihat et al. (2017) conducted a study and identification of the factors that contributed to the successful implementation of the e-learning program. The identification is based on 68 articles in the field of e-learning in the context of higher education published from 1998-2016 [5]. The review explores 25 articles to identify key dimensions and themes, then similarities and differences between the studies. The identification results were then re-evaluated in 2020 by conducting an empirical study of the success of the e-learning system for 563 students involved with the e-learning system at one university in England through the Partial Least Squares - Structural Equation Modeling (PLS-SEM) quantitative method [6]. Furthermore, [7] conducted a systematic review and meta-analysis including 47 studies that analyzed and synthesized the best available evidence on setting up synchronous hybrid learning worldwide. The review is intended to provide an overview of current research, particularly regarding benefits, challenges, and design principles. In addition, in the first year of the pandemic, [8] conducted a meta-critical review of DeLone & McLean's models of information systems success from 1992 to 2003 to look at the current direction of research [8].

Previously, [9] argued that, with the increasing use of e-learning systems, there would be a need to identify whether the e-learning system being built had fulfilled organizational goals. [10] stated that evaluating the success of information systems is an important aspect of the information systems field in one and other research and practice. This research will explore and reveal some emerging trends and describe the intellectual structure of successful e-learning systems, based on journal articles retrieved from the Scopus database. The method used in the research combines systematic literature review (SLR) and bibliometric analysis techniques with visualization using VosViewer tools.

This study seeks to reveal the conceptual, methodological, and geographic gaps inherent in the field of e-learning. Moreover, the overarching aim of this study is to provide a comprehensive overview of the research on e-learning published in the period 2006-2022.

## 2 Methods

This study used a combination of systematic literature review (SLR) and bibliometric analysis techniques with visualization using VosViewer tools. Systematic Literature Review (SLR) was used because it has the aim of summarizing and synthesizing existing literature findings on a topic or research field [11]. This is based on the availability of an extensive electronic database that makes it easier for researchers to conduct systematic research on time. Following the direction and objectives of the research, the data used in this study were search results based on titles, abstracts, and keywords from the Scopus database in the period 2006-2022. The keywords used are "Information System" and "Success Model". The search string used is intended to return the most relevant studies in this research area. The initial search results yielded 1,168 papers in the form of conference papers, articles, books, conference reviews and reviews, etc. In a

systematic review, it would be more appropriate to use research data as a reference. Therefore, results gathered from other than articles were excluded, and the results obtained were 674 articles. Then the inclusion process was carried out again using the keyword "e-Learning" which is the focus of this research. The results obtained 46 articles which became a source of literature analysis studies in this research.

Bibliometric analysis techniques are used to understand the intellectual structure, especially regarding e-learning. The data is analyzed using bibliometrics as a study of bibliographic analysis of scientific activities as a definitive statement on research results [12]. In addition, the development trend was analyzed using VosViewer, which is software that functions to visualize data maps based on bibliometric networks. Apart from that, the software offers the additional functionality of zooming, scrolling, and searching, which mostly facilitates a detailed inspection of maps [13].

For further analysis, the data was stored in the Mendeley library. Previously, the data was extracted and imported in .csv and BibTeX formats. In addition, copies of selected articles were stored in the Scopus folder so that later they can be used for subsequent bibliometric analysis. In the next section, bibliographic data obtained from the Scopus database was presented and analyzed through the open-source R-Studio.

### 3 Results and Discussion

To answer some of the research questions, the discussion is separated into two parts. First, the analysis was typically carried out using Bibliometrics, a popular and rigorous method used to explore and analyze large volumes of scientific data [11]. This bibliometric analysis was used to answer questions number one to number three. By conducting this analysis, it is possible to unpack the evolutionary nuances as well as highlight emerging areas of the e-learning information systems field, such as publication trends, the most prolific and influential authors, and the identification of some influential articles. Second, for the discussion of questions number four to six, the bibliometric analysis was visualized using the VosViewer tool.

Table 1 contains the main information about the data as a result of a comprehensive science mapping analysis based on a bibliometric search that has been done previously. The search results show that there are 46 articles on the success model of e-learning information systems written by 130 authors with backgrounds from various disciplines and published in 30 reputable peer-reviewed journals, and of the total articles 4 research articles were written by a single author.

**Table 1.** Main Information About Data

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

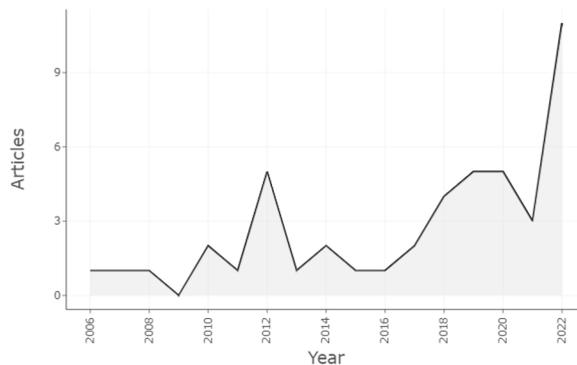
Document Average Age	0,27
Average citations per doc	51.26
References	2971
Keywords Plus (ID)	288
Author's Keywords (DE)	150
Authors	130
Authors of single-authored docs	4
Co-Authors per Doc	3.02
International co-authorships %	1,02
Article	46

Source: Author's work

### 3.1 Publication trends in the field of e-learning

The number of annual publications about e-learning is shown in Figure 1, with the earliest results of research in the field of e-learning started in 2006 [14]. This paper is quite interesting because it is compiled in the context of an attempt by most companies in Hong Kong to recommend business e-learning courses as a medium for quality development activities for their employees. The recommendations are based on the concept of voluntary adult learning, so that no barriers will prevent an employee from learning if he or she chooses to do so.

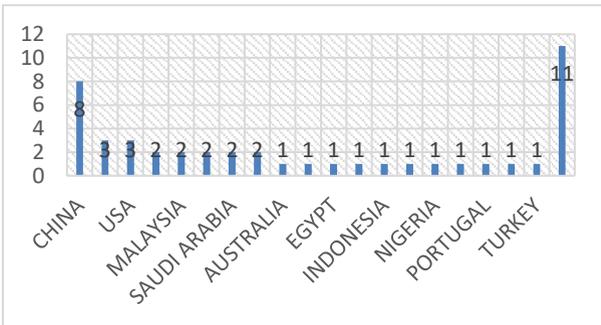
In Figure 2, it can be seen that the number of publications about the success of the e-learning system began to increase in 2010, then stuck until 2016. Moreover, in 2017 the number of annual publications began to pick up momentum. Until 2020, the influence of the covid 19 pandemic has increasingly attracted the attention of practitioners (such as: [15], [16], [17], [18], [19], [20], so that output in terms of research articles appears to have increased significantly with an annual scientific production growth rate of 16.17%. It shows a steady growth rate.



Source: Author's work

**Figure 1.** Article Publication per Year

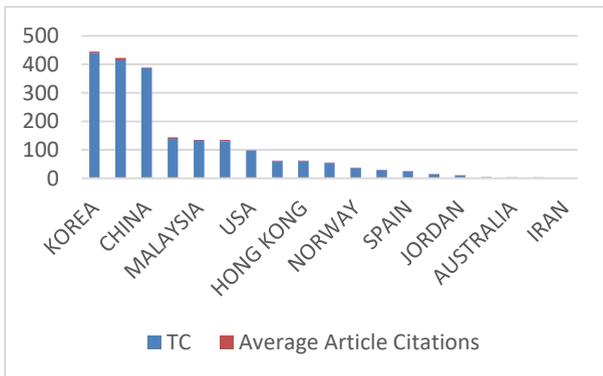
Another review on publication trends in the regional category (continent) shows that most of the research work on e-learning system success models is concentrated in the Asian continent region (47%). Certainly, this is a separate note that shows research trends in the Asian region are increasing. This view is not excessive because the trend of Scopus-indexed Indonesian international scientific publications from 2015 to 2019 experienced a significant increase of 549.71% [21]. Based on the data shown in Figure 2, of the 19 most productive countries, China emerged as the country with the highest number of research publications (n = 8), followed by Korea and the USA (n = 3). Indonesia has one publication in line with nine other countries, which are Malaysia, Jordan, Morocco, Saudi Arabia, and the United Kingdom (n = 2).



Source: Author’s work

Figure 2. Country Wise Scientific Publication

Moreover, in terms of citations (Figure 3), publications originating from Korea has the highest number of citations (n = 439), followed by the United Kingdom (n = 414) and China (n = 387). Publications originating from the USA has less impact impact than Portugal, Malaysia, Turkey, and the United Kingdom which has a smaller number of publications. Meanwhile, Indonesia has only shown an average article citation of 14%.



Source: Author’s work

Figure 3. Most Cited Countries

Regarding the dynamics of publication trends in the field of e-learning, it was found that research on e-learning is not new and most of the research work on successful models of e-learning systems is concentrated in the Asian continent (47%) and China emerges as the most productive country with the most number of 8 publications. After previously experiencing fluctuations, in 2020, research work has experienced an increase where researchers have disseminated their work in leading peer-reviewed journals. Trends reflect an overall increasing concentration of studies in the Asian region, most of which are developing countries. Countries in the Asian region are widely regarded as areas for innovative practices in the digitalization field as they have demonstrated access to requisite talent, enabling business conditions and further stimulating growth and innovation.

### 3.2 The Most Prolific and Influential Author

Productive writers are people who are always able to produce research work and contribute to the growth and progress of the research field [22]. Table 2 presents 10 out of a total of 116 authors who have contributed to increasing the amount of literature and conducting studies in the field of successful e-learning systems.

It is interesting to note that out of the ten authors, none of them dominantly produced works, where nine authors produced two works each and the rest only produced one work. Thus, it can be said that in the topic of the success of the e-learning system, it cannot be determined who is the most productive and influential writer. This condition is considered reasonable because the topic taken is specific and can offer researchers with two choices. First, this topic is very open for research and can provide opportunities for researchers to conduct research or studies on the success of e-learning systems or focus on examining the causal factors to serve as research material. The second possibility is because this topic is not interesting to study.

**Table 2.** Most Productive Authors in the Field of e-Learning

No	Author	Institute	Country	year	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 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	University Hassan II	Casablanca, Morocco	2019; 2020	2
7	Franck Poirier	University Bretagne Sud,	France	2019; 2020	2
8	Yassine Safsouf	Marrakech Center	Morocco	2019; 2020	2

9	Nour Awni Albelbisi	University of Malaya,	Putrajaya, Malaysia	2021; 2022	2
10	Ahmed Farouk delKader	Ab-College of Management Technology	and Cairo, Egypt	2022	1

Source: Author's work

The analysis reports that Chuiyi Liu, Hsiu-Ju Chen, Zainni Abdullah, and Ahmad Samed Al-Adwan are the most influential researchers in this field with the maximum number of scientific contributions.

### 3.3 Most Influential Works

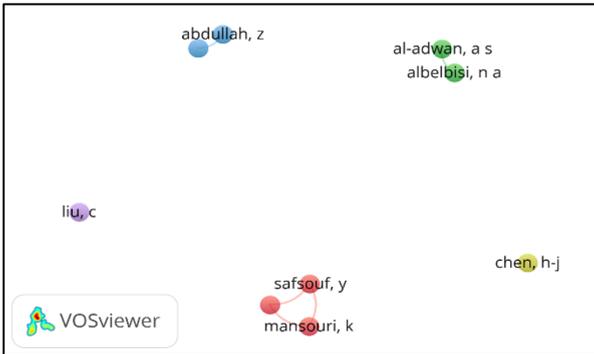
The most influential works can be determined by looking at the number of citations or identifying research articles that are widely cited so that they can provide new paths according to the direction of the research field. To find out which of the most influential articles were published in the area of the success of e-learning systems, a minimum threshold of 50 citations was set [22].

Table 3 shows a list of papers and their number of citations, arranged by the highest number of citations. The results of the analysis show that the paper that are often cited lead to [23], followed by [24]; [25]; and [26]. Thus, out of 11 papers, only 4 were able to make a significant contribution to research on the success of e-learning systems. Chen H.J. (2010) contributes to the literature in the context of MOOC learning which identifies critical quality factors and provides managerial guidelines for MOOC utilization and generalization. However, the overall implications of this number of citations are very useful for future research as a basis for empirical research and as opening new vistas of scientific inquiry in the field of e-learning. Yang et. al. work is one of the most frequently cited studies (n=17,714 per year) and has laid the foundation for subsequent empirical research in the field of e-learning. This research work was published in 2017, which is more than ten years after the journal search period that began in 2006.

### 3.4 Analysis of Co-authorship Networks of Authors and Countries

Co-authorship networks are part of the author's performance analysis by examining research maps in certain field. This is standard practice in conducting reviews to display the author's performance in each study and represents the number of collaborations between authors, organizations, or countries [11]. Co-authoring produces a synergistic effect and results in new scientific output and better-quality research papers. Moreover, in general practice, researchers collectively participate in and contribute to the production of scientific articles, which because of individual contributions, results in a greater quantity and quality of scientific output.

Figure 4 shows the visualization of the results of the analysis using VOSviewer. The analysis resulted in a total of 9 authors grouped in 5 clusters represented by a different color for each cluster. Cluster 1 (red) and three authors, namely: Khalifa Mansouri, Franck Poirier and Yassine Safsouf, who come from three universities and two different countries namely France and Morocco, form the strongest co-authoring network with 2 documents written together.



Source: Author’s work

**Figure 4.** Co-Authorship Network of Author

Thus, regarding the author's collaboration network, it can be said that the author's affiliated country collaboration network illustrates the lack of networks between countries that are actively conducting research in the field of e-learning.

**Table 3.** High cited research papers on e-learning

No	Author/DOI	Title	Source Title	TC	Tcpy
1	[23] 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	[24] 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	[25] 10.1016/J.Tele.2018.03.012	The Role Of Transformational Leadership As A Mediating Variable In Delone And Mclean Information System Success Model: The Context Of Online Learning Usage In Yemen	Telematics And Informatics	108	18.000
4	[26] 10.3390/Su13169453	Developing A Holistic Success Model For Sustainable E-Learning: A Structural Equation Modeling Approach	Sustainability (Switzerland)	50	16.667

5	Abdullah, at 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 H.J. (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, at 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	Liu C. (2015) 10.3233/Thc-150949	Effectiveness Of E-Learning In Hospitals	Technology And Health Care	10	1.111
9	Al-Adwan, at 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	Safsouf, at 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 A.F. (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

Source: Author's work

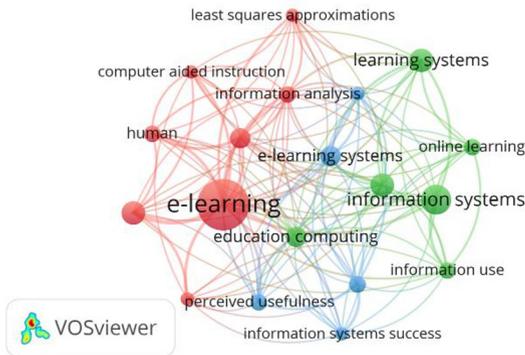
### 3.5 Common Research Themes that Flow among E-Learning Researchers

In order to see the similarity of themes or research trends that apply among researchers and to generate shared keyword networks that are applicable in the field of e-learning, a keyword analysis was conducted by using VOSviewer.

The results of the initial analysis of the 46 extracted papers identified a total of 288 keywords. Then, to generate the most used author keywords, the keywords are limited to 4 occurrences, and the total of the results is 19 keywords. Thus, out of 288 keywords,

19 keywords met the threshold criteria. Figure 5 illustrates the frequently used author keyword occurrence network.

Overall (based on 19 keywords), the network map shows all keywords are divided into 3 clusters, namely: Cluster 1 (red), which has 8 keywords, Cluster 2 (green), with 6 keywords, and Cluster 3 (blue), which has 5 keywords. The keyword "e-learning" is in cluster 1 as a topic or concept that is widely studied which has 18 links out of a total of 55 links and 16 events (Figure 5).



Source: Author's work

**Figure 5.** Co-Occurrence Network of Keyword

Keyword analysis helped researchers determine the common themes of research flowing among researchers in the e-learning field. This shows that the DeLone McLeod information system success model is widely used by researchers.

## 4 CONCLUSION

The results of the bibliometric analysis show: 1) The trend of publication in the field of e-learning in leading peer-reviewed journals; within the scope of all continents concentrated in the Asian continental region; and highly heterogeneous researchers with different disciplinary backgrounds. 2) There are no dominant authors who produce work on the topic of e-learning system success. Another scientific production analysis shows that research works from the US are less influential in terms of citations, in contrast to Korea which has shown a leap forward by achieving the highest number of citations even surpassing China. 3) The most influential articles point to Yang (2017), followed by Chen H.J. (2010); Abdullah Z., et al. (2018); and Al-Adwan, et al. (2021). In addition, the results of the analysis using VosViewer show that 4) the pattern of cooperation between writers and countries has not shown any connection with each other, and research convergence is still in the developing stage between writers and selected countries and 5) of the 46 articles, it is known that 288 keywords are used most often. Moreover, of the 288 keywords, 19 of them met the threshold criteria and were divided into three clusters. The keyword "e-learning" is in cluster 1, is the most studied topic, and has 18 links out of a total of 55 links, and 16 events. This paper can be used as a reference and can provide a comprehensive review, especially in research on the success of

e-learning systems, which will be very useful for academics and practitioners. For future research, several things must be considered. To broaden the scope of research by accessing several different databases, such as Proquest, IEEE Explore, Web of Science, Google Scholar, etc.; manual keyword search should be used to find appropriate studies in the existing literature. It is also advisable to use other bibliometric tools, such as Bib excel, HistCite, Gephi, etc.

## References

1. Belawati, T. & Nizam. *Portrait of Higher Education in the Time of Covid-19*. (Dirjen DIKTI, 2020).
2. Azoulay, A. UNESCO snapshots, 'Let us reaffirm the primacy of education, science, culture and knowledge to help us surmount crisis.' *United Nations Educational* (2020).
3. Llc, E. *E-LEARNING Concepts, Trends, Applications*. vol. 1.1 (Epignosis LLC, California, 2014).
4. Sarana, B., Toyama, Y., Murphy, R., Bakia, M. & Jones, K. *Evaluation of Evidence-Based Practices in Online Learning*. (2010).
5. Al-fraihat, D., Joy, M. & Sinclair, J. Identifying Success Factors for e-Learning in Higher Education Identifying Success Factors for e-Learning in Higher Education : (2017).
6. Al-Fraihat, D., Joy, M., Masa'deh, R. & Sinclair, J. Evaluating E-learning systems success: An empirical study. *Computers in Human Behavior* **102**, 67–86 (2020).
7. Raes, A., Detienne, L., Windey, I. & Depaepe, F. A systematic literature review on synchronous hybrid learning: gaps identified. *Learning Environments Research* (2019) doi:10.1007/s10984-019-09303-z.
8. Jeyaraj, A. International Journal of Information Management DeLone & McLean models of information system success : Critical meta- review and research directions. *International Journal of Information Management* **54**, 102139 (2020).
9. DeLone, W. H. & McLean, E. R. Information Systems Success Measurement. *Foundations and Trends® in Information Systems* **2**, 1–116 (2016).
10. Chuo, Y., Liu, C. & Tsai, C. Effectiveness of e-learning in hospitals. *Technology and Health Care* **23**, S157–S160 (2015).
11. Donthu, N., Kumar, S., Mukherjee, D., Pandey, N. & Marc, W. How to conduct a bibliometric analysis : An overview and guidelines. *Journal of Business Research* **133**, 285–296 (2021).
12. Tupan, Rahayu, R. N., Rachmawati, R., Rahayu & Rusmiyati, E. S. Analisis Bibliometrik Perkembangan Penelitian Bidang Ilmu Instrumentasi. *Jurnal Dokumentasi dan Informasi* **9008**, 135–149 (2018).
13. Lu, Y.-H., Yeh, C.-C. & Liao, T.-W. Exploring the key factors affecting the usage intention for cross-border e-commerce platforms based on DEMATEL and EDAS method. *Electronic Commerce Research* (2022) doi:10.1007/s10660-022-09548-6.

14. Yeung, P. & Jordan, E. Understanding the Continued Usage of Business e-learning Courses in HK Corporations. **210**, 245–254 (2006).
15. Al-Adwan, A. S., Nofal, M., Akram, H., Albelbisi, N. A. & Al-Okaily, M. Towards a Sustainable Adoption of E-Learning Systems: the Role of Self-Directed Learning. *Journal of Information Technology Education: Research* **21**, 245–267 (2022).
16. Al-Harazneh, Y. M., Alobeytha, F. L. & Alodwan, T. A. A. Students' Perceptions of E-Learning Systems at the Jordanian Universities Through the Lens of E-Business Booming During the Coronavirus Pandemic. *International Journal of Distance Education Technologies* **20**, (2022).
17. Al-shargabi, B., Sabri, O. & Aljawarneh, S. The adoption of an e-learning system using information systems success model: a case study of Jazan University. *PeerJ Computer Science* **7**, 1–21 (2021).
18. Alajmi, M. A. & Alotaibi, J. H. Reconceptualization of system use in the context of the digital library: what are the roles of UTAUT and IS success models? *Journal of Electronic Resources Librarianship* **32**, 151–181 (2020).
19. Alotaibi, R. S. & Alshahrani, S. M. An extended DeLone and McLean's model to determine the success factors of e-learning platform. *PeerJ Computer Science* **8**, e876 (2022).
20. Lee, J. C. & Xiong, L. N. Investigation of the relationships among educational application (APP) quality, computer anxiety and student engagement. *Online Information Review* **46**, 182–203 (2022).
21. Putera, P. B. *et al.* Tren Publikasi Ilmiah Internasional Indonesia Tahun 2015-2019 Indonesian International Scientific Publication Trend ., **5**, 77–96 (2021).
22. Abdullah & Khan, M. N. Cogent Business & Management Determining mobile payment adoption : A systematic literature search and bibliometric analysis **MARKETING | REVIEW ARTICLE** Determining mobile payment adoption : A systematic literature search and bibliometric analysis. *Cogent Business & Management* **8**, (2021).
23. Yang, M., Shao, Z., Liu, Q. & Liu, C. Understanding the quality factors that influence the continuance intention of students toward participation in MOOCs. *Educational Technology Research and Development* **65**, 1195–1214 (2017).
24. Chen, H.-J. Linking employees' e-learning system use to their overall job outcomes: An empirical study based on the IS success model. *Computers and Education* **55**, 1628–1639 (2010).
25. Aldholay, A. H., Isaac, O., Abdullah, Z. & Ramayah, T. The role of transformational leadership as a mediating variable in DeLone and McLean information system success model: The context of online learning usage in Yemen. *Telematics and Informatics* **35**, 1421–1437 (2018).
26. Al-Adwan, A. S., Albelbisi, N. A., Hujran, O., Al-Rahmi, W. M. & Alkhalifah, A. Developing a holistic success model for sustainable e-learning: A structural equation modeling approach. *Sustainability (Switzerland)* **13**, (2021).

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