Development Learning Management System: Publication Analysis Using Bibliometric Using Vosviewer Application

Asep Priatna
Universitas Mandiri
Subang, Indonesia
aseppriatna064@gmail.com

Abstract— **This study aims to map the development of computational mapping research using VOSviewer through bibliometric analysis in the Learning Management System study. Database article obtained from the Google Scholar by using Publish or Perish 8 Application. The keywords used to search for articles on Google Scholar are Learning Management System and LMS. To limit publications in this search, the researchers set a limitation on the year of publication, which is in the last 10 years from 2012-2022. The results show that Learning Management System Publication consists of 11 clusters with 1282 links and a total of 2823 Link Strengths. with the development of research that continues to increase over time and in 2021 the year of research with the most topics is 159 publications in one year. We examined how many articles have been published on Learning Management System and its relation to problem areas using VOSviewer. This review can be a starting point for further research related to LMS or Distance Learning Application**

Keywords—*bibliometric; distance learning; LMS; learning manegement system*

INTRODUCTION

The Pandemic conditions almost hit all countries in the world, causing problems in the world of education, especially in the learning process. Therefore, we need a media that can synchronize all learning activities. Learning management System makes it possible for School and universities to collect, store, and mine data for business intelligence, descriptive, and predictive analytics [1], [2]

Learning Management System (LMS) can be considered as one of the significant web-based innovations in an educational environment, LMS is known as an information system that facilitates e-learning through processing, storing, and disseminating educational material. It also used to support the administration and related communication of learning contexts [3]. Learning Management Systems (LMS) provide teachers and students with an online classroom that reinforces learning processes. In online classroom environments, Learning Management Systems (LMS) reinforce teachers and students in the learning process [4].

The use of LMS, especially in Indonesia, may only be famous when the pandemic hits, but if we look closely, the use of online learning development process has started far from that. Online learning has been around for a long time in higher education. Online learning is far from a new phenomenon. Tracing its history, it began in the early 18th century as a correspondence study to enable out-of-town students to continue their education without having to be on-site. Since then, it has grown and become more and more popular, especially with the rapid expansion of technological innovation [5], [6]

The use of LMS which is increasingly massive and widely used in the world of education, both formal and non-formal, is certainly an interesting thing, how the other side of the pandemic brings a change to a new learning method, which basically has been around for a long time, but its popularity is not too big and the need for these applications tends to be small and only for certain circles.

As time goes by and the need for LMS is increasing, there have been many studies conducted on LMS from time to time. Besides that, there is also a Learning Management System application, such as Moodle and Blackboard, have become indispensable and widely

adopted in higher education and now they used that in school [3]

Prior studies have investigated the continued use of LMSs from technology acceptance perspectives. In fact, the rationale behind using an LMS is to manage electronic learning and teaching [7], [8]. Recent studies about e-learning contexts and LMS primarily focused on adoption and system success [9]. In recent decades, [10] has claimed that more important than acceptance of e-learning and e-learning success, researchers should highlight the importance of continuance usage of e-learning programs.

with many studies and publications on the use of LMS in education from elementary education to higher education. researchers are interested in conducting a bibliometric analysis of publications on the use of LMS during the last 10 years from 2012 to 2022. With the hope of this research, researchers can provide an overview of what has been researched related to LMS and what kind of research has not carried out so that it can be used as research material in the future

METHODOLOGY

The method used in this study is the bibliometric method, which is useful for analyzing various trending research topics, the development of the number of studies and the variety of publications. Bibliometrics used for its capability to shows the relationships between keywords through direct and indirect relationships between keywords, which ultimately results in entities being placed closer to each other on the map [11], [12]

The data sources analyzed in this study were obtained from the Google Scholar database because free access and large database of publication. The research was conducted using Publish or Perish 8 (PoP 8) using the keywords, "Learning Management System" and "LMS" based on the criteria "title, keywords and abstract. The year of publication of the article is limited to 2012-2022. The research was conducted through several stages:

1) Chose The Publication Topic
2) Collection of publication data with PoP 8
3) Mapping of publication date of obtained articles using Microsoft Excel,
4) Mapping analysis of bibliometric publication data with the application VOSviewer
5) Analysis of results.

Publication data that has been obtained through PoP is then filtered and checked to see how the number of citations and publication titles correspond to the research topic. VOSviewer is used to create online publications, country or journal maps (co-referencing), or to create links between internet keyword maps or existing records. When creating a directory map, the keyword is set as desired and irrelevant or less important keywords are removed.

FINDING AND DISCUSSION

A. *Publication data and Search Result*

From the last the year of publication that has been obtained, there are 2131 cites/year, 21 cites/paper and total 21.314 Citation. For more information you can see on Figure 1 and Table 1 Shows some examples of published article that have been used in VOSviewer analysis. The sample of data taken is the most cited articles form each year from 2012 to 2022.
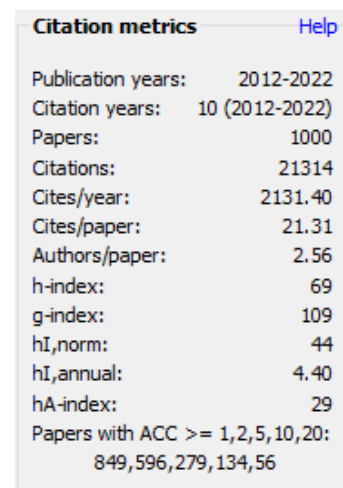

Figure 1 Citation Metrics

Table 1 List of Publication

Author	Title	Cite	Year
Chien-Yuan Su, Cheng-Huan Chen	Investigating university students' attitude and intention to use a learning management system from a self-determination perspective	8	2022
Tamsik Udin, et al	Student's Self-Efficacy and Perceptions of Online Learning on the Use Learning Management System	3	2022

Author	Title		Year
Abednego Kofi Bansah, Douglas Darko Agyei	Perceived convenience, usefulness, effectiveness, and user acceptance of information technology: evaluating students' experiences of a Learning Management System	9	2022
Syed A. Raza, et al.	Social Isolation and Acceptance of the Learning Management System (LMS) in the time of COVID-19 Pandemic: An Expansion of the UTAUT Model	302	2021
Vaughn Malcolm Bradley	Learning Management System (LMS) Use with Online Instruction	79	2021
Alturki, Uthman, Aldraiweesh, Ahmed	Application of Learning Management System (LMS) during the COVID-19 Pandemic: A Sustainable Acceptance Model of the Expansion Technology Approach	40	2021
Maan Ali Alkhateeb, et al	Factors Influencing Student Satisfaction Towards Using Learning Management System Moodle	24	2021
Emiliana Putri, Fatimah Mulya Sari	Indonesian EFL Students' Perspectives Towards Learning Management System Software	245	2020
N H S Simanullang J Rajagukguk	Learning Management System (LMS) Based On Moodle To Improve Students Learning Activity	80	2020
Amir Ashrafi	Exploring factors influencing students' continuance intention to use the learning management system (LMS): a multi-perspective framework	71	2020
Ann Hill Duin, Jason Tham	The Current State of Analytics: Implications for Learning Management System (LMS) Use in Writing Pedagogy	56	2020
Abdulaziz Aldiab	Utilization of Learning Management Systems (LMSs) in higher education system: A case review for Saudi Arabia	161	2019
Anja Garone	Clustering university teaching staff through UTAUT: Implications for the acceptance of a new learning management system	80	2019
Sambit Dash	Google classroom as a learning management system to teach biochemistry in a medical school	69	2019
Yun Zheng	The impact of organisational support, technical support, and self-efficacy on faculty perceived benefits of using learning management system		2018
MiaotingCheng	Student continuance of learning management system use: A longitudinal exploration	101	2018
Khaleel Mershad & Pilar Wakim	A Learning Management System Enhanced with Internet of Things Applications	83	2018
Feng HsuWang	An exploration of online behaviour engagement and achievement in flipped classroom supported by learning management system	218	2017
Mohammed Ouadoud,	Learning Management System and the Underlying Learning Theories	110	2017
NoorUl Ain	The influence of learning value on learning management system use: An extension of UTAUT2	280	2016
Nurul Nadirah Mohd Kasim	Choosing the Right Learning Management System (LMS) for the Higher Education Institution Context: A Systematic Review	257	2016
David A. Back	Learning management system and e-learning tools: an experience of medical students' usage and expectations	105	2016
Ana Horvat	Student perception of Moodle learning management system: a satisfaction and significance analysis	222	2015
Won Sug Shin	The use of a mobile learning management system at an online university and its effect on learning satisfaction and achievement	176	2015
Miguel Á. Conde	An evolving Learning Management System for new educational environments using 2.0 tools	246	2014
Nor Azura Adzharuddin	Learning Management System (LMS) among University Students: Does It Work?	232	2013
Qiyun Wang, Huay Lit Woo	Using the Facebook group as a learning management system: An exploratory study	947	2012

B. *Reseach In The Field learning Management System*

Table 2 below explains the Learning Management System published in Google Scholar. From Table 2, the number publication was 1000 articles within teh years (2012-2022). Furthermore Figure 2 shows the development of Learning Management System publication director over the past 10 years, from 2012 to

2012. Figure 2 it is known that the development of research related to Learning Management System has already started to become popular, especially during and after pandemic hit, so the graph tends to develop positively from year to year.

Table 2 Research Learning Management System

Year	Total Publication
2012	60
2013	59
2014	75
2015	83
2016	83
2017	88
2018	79
2019	95
2020	140
2021	159
2022	79
Total	**1000 Publication**
Average	**90 Publication/year**
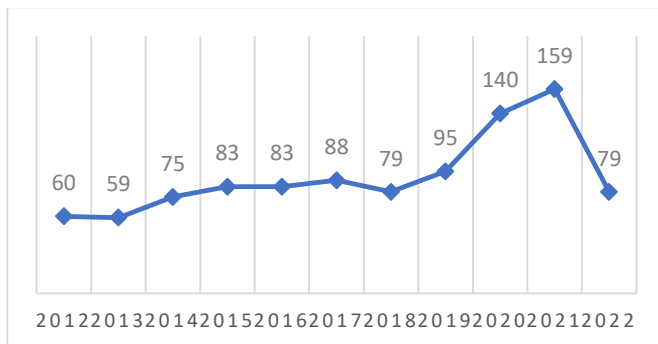
Figure 2 Research Development in LMS (2012-2022)

C. *Visualization of Learning Management System Topic Areas Using Vosviewer*

the results of mapping using VOSViewer show the number of distributions items of keywords related to the Learning Management System, Each item found related to the LMS in data mapping was divided into 11 clusters, namely:

1) Learning Management System, Perspective, Satisfaction, Investigation, Facebook Group, blended Learning, Perception, Intention, Role

2) Study, Higher Education, Era, Tool, Technology Acceptance Model, User, usability Evaluation, Management System Adoption

3) Student, Education, School, Model, Development, Effectiveness, Influence, Assessment, Artificial Intelligent, Utilization

4) Management System, Computer, Motivation, Self, Effect, Process, Web, Cloud, Review

5) Couse, Performance, LMS, Technology, E-Learning, Teaching, Moodle Learning Management System

6) Benefit, Challenge, Schoology, Edmodo, Adaption, Attitude, Online, Comparation,

7) Covid, Acceptance, Pandemic, Time, Application

8) Analysis, Implementation, Method, Design, Interaction, Integration, Adaptive Learning Management

9) E-Learning Management System, University level, frame Work, Usability, Blackboard

10) Experience, Usage, Higher Education, Success, Distance, Factor

11) Moodle, Library

Cluster Shows the relationship between each element. Labels are assigned to each term with colored circles. The size of the circle for each cluster varies depending on the frequency of occurrence of the cluster. The more often the term is encountered, the larger the label size. The mapping description analyzed in this study consists of 3 parts: Network Visualization (see Figure 3), Density Visualization (see Figure 4), and Overlay Visualization (see Figure 5).

Figure 3. the relationship between concepts. The relationship between terms is described in the connected network. Figure 3 shows the classification of each frequently searched term related to the topic of Learning Management Systems. From the clusters included in the network visualization, the Learning Management System consists of 11 clusters with 1282 links and a total of 2823 Link Strengths.
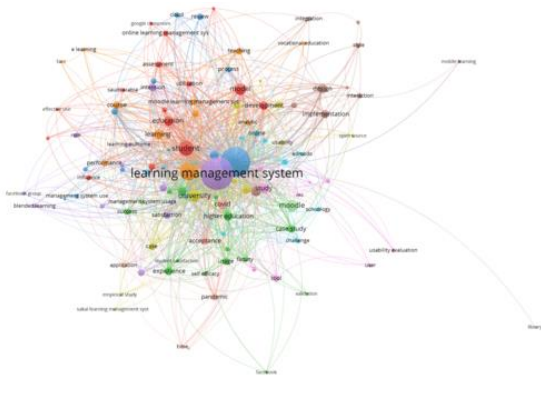
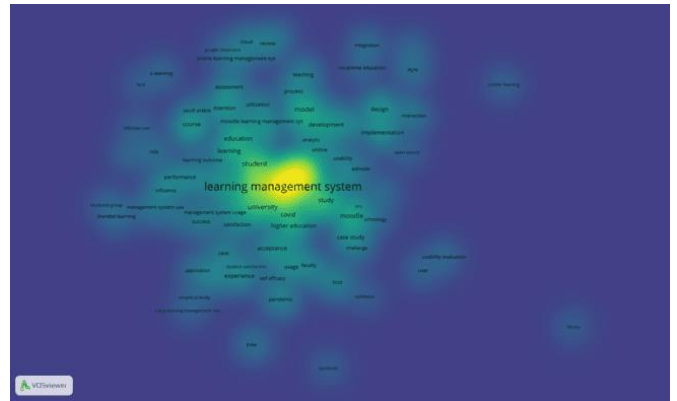Figure 3 Network Visualization in Learning Management System

Figure 4 we can see the results of the Learning Management System Publication. Figure four shows how publications on LMS are developing, the brighter the colour indicates that the topic is newer, and the darker the colour, the longer the publication period is. The popularity of research on Learning Management System in research has been around for a long time, more and more topics related to Learning Management System over time. with this visualization So we can easily do the latest studies on LMS
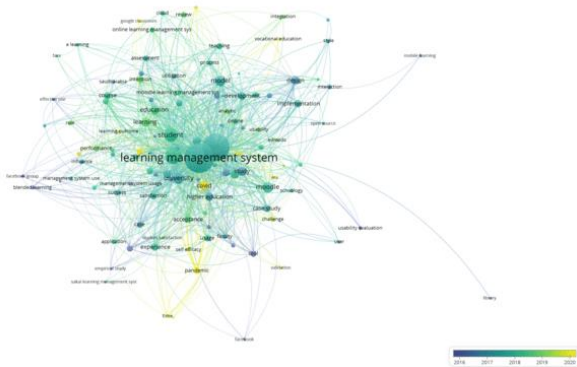

Figure 4 Overlay Visualization in Learning Management System

Figure 5 shows the density curve. means that the brighter and larger the diameter of the big topic indicator, the more often that term appears in search results, which means more related terms have been researched. On the other hand, if the color of the term fades to near the background color, there is still little research on the term.

Figure 5 Density Visualization in Learning Management System

Based on the results of the mapping analysis with VOSViewer, Figure 7 shows that the development of research and publications on LMS has changed from year to year. such as research conducted by [13] in his research he explained how the LMS was used and what obstacles he faced such as unprepared resources to Operate LMS.

based on the results of data visualization analysis only in the 2015-2019 period, several LMS applications such as Edmodo, Moodle, and Blackboard appeared [14]. approaching 2020 where the pandemic occurred, research began to shift towards a pandemic with emerging topics such as covid, besides that over time the use of LMS not only for learning Process but also for evaluation [15]–[17]
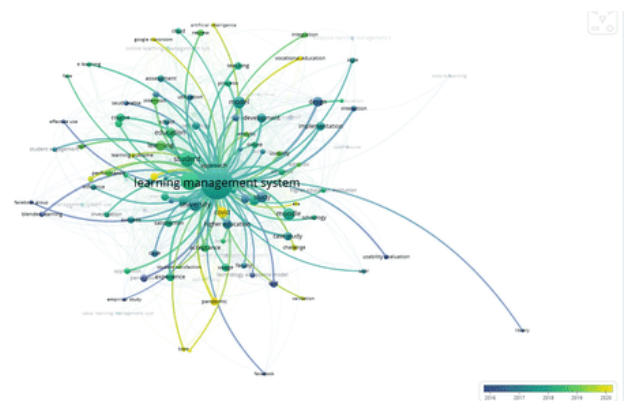

Figure 6 Development of LMS Publication

Based on the mapping results of the article data collected by Google Scholar up to 1000 articles, the publication of Learning Management System has begun to study a lot, it can be seen from the graph of the number of articles. which grows every year. The results of this study can be used to search for newer and more up to date LMS research that has broad implications for Education

model development, institution development, and the implications of LMS itself.

CONCLUSION AND RECOMMENDATION

This study explores publications on the topic of Learning Management Systems regarding the development of computer mapping research with VOSviewer using data sources from Google Scholar, articles filtered using the Publish or Perish 8 (POP 8) application. In this research, the keywords used are Learning Management System and LMS as a reference for the title and abstract. from the search results using PoP 8 software obtained 1000 articles. In the search process, the researcher gave the number of articles published in the last 10 years, namely in 2012-2022. The results show that research on LMS continues to develop if in the period 2012-2015 the use of LMS is more for certain groups who have distance learning innovations, and there are still few people who do research on LMS, but 5 years of research on LMS is increasingly being done. especially in the last two years (2020-2022) after the pandemic hit LMS is used by almost every group. from primary education to higher education.

REFERENCES

[1] N. I. S. Rakhmawati, S. Mardliyah, R. Fitri, D. Darni, and K. Laksono, "Pengembangan Learning Management System (LMS) di Era Pandemi Covid-19 pada Pendidikan Anak Usia Dini," Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini, vol. 6, no. 1, pp. 107–118, Apr. 2021, doi: 10.31004/obsesi.v6i1.991.

[2] A. H. Duin and J. Tham, "The Current State of Analytics: Implications for Learning Management System (LMS) Use in Writing Pedagogy," Comput Compos, vol. 55, p. 102544, Mar. 2020, doi: 10.1016/j.compcom.2020.102544.

[3] A. Ashrafi, A. Zareravasan, S. Rabiee Savoji, and M. Amani, "Exploring factors influencing students' continuance intention to use the learning management system (LMS): a multi-perspective framework," Interactive Learning Environments, vol. 30, no. 8, pp. 1475–1497, Jul. 2022, doi: 10.1080/10494820.2020.1734028.

[4] V. M. Bradley, "Learning Management System (LMS) Use with Online Instruction," International Journal of Technology in Education, vol. 4, no. 1,

p. 68, Dec. 2020, doi: 10.46328/ijte.36.

[5] H. E. Kentnor, Distance education and the evolution of online learning in the United States, Curriculum and teaching dialogue. 2015.

[6] S. Syahruddin et al., "Students' acceptance to distance learning during Covid-19: the role of geographical areas among Indonesian sports science students," Heliyon, vol. 7, no. 9, p. e08043, Sep. 2021, doi: 10.1016/j.heliyon.2021.e08043.

[7] Z. Nurakun Kyzy, R. Ismailova, and H. Dündar, "Learning management system implementation: a case study in the Kyrgyz Republic," Interactive Learning Environments, vol. 26, no. 8, pp. 1010–1022, Nov. 2018, doi: 10.1080/10494820.2018.1427115.

[8] S. Ozkan and R. Koseler, "Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation," Comput Educ, vol. 53, no. 4, pp. 1285–1296, Dec. 2009, doi: 10.1016/j.compedu.2009.06.011.

[9] M. Aparicio, F. Bacao, and T. Oliveira, "Grit in the path to e-learning success," Comput Human Behav, vol. 66, pp. 388–399, Jan. 2017, doi: 10.1016/j.chb.2016.10.009.

[10] M.-C. Lee, "Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model," Comput Educ, vol. 54, no. 2, pp. 506–516, Feb. 2010, doi: 10.1016/j.compedu.2009.09.002.

[11] R. De', N. Pandey, and A. Pal, "Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice," Int J Inf Manage, vol. 55, p. 102171, Dec. 2020, doi: 10.1016/j.ijinfomgt.2020.102171.

[12] R. Komalasari, Z. Munawar, and N. I. Putri, "Review Penelitian Teknologi Informasi, Komunikasi dan Covid 19 menggunakan teknik Bibliometrik," Jurnal ICT : Information Communication & Technology, vol. 20, no. 1, pp. 34–41, Jul. 2021, doi: 10.36054/jict-ikmi.v20i1.303.

[13] N. Adzharuddin, "Learning Management System (LMS) among University Students: Does It Work?," International Journal of e-Education, e-Business, e-Management and e-Learning, 2013, doi: 10.7763/IJEEEE.2013.V3.233.

[14] A. Horvat, M. Dobrota, M. Krsmanovic, and M. Cudanov, "Student perception of Moodle learning management system: a satisfaction and significance analysis," Interactive Learning Environments, vol.

23, no. 4, pp. 515–527, Jul. 2015, doi: 10.1080/10494820.2013.788033.

[15] S. A. Raza, W. Qazi, K. A. Khan, and J. Salam, "Social Isolation and Acceptance of the Learning Management System (LMS) in the time of COVID-19 Pandemic: An Expansion of the UTAUT Model," Journal of Educational Computing Research, vol. 59, no. 2, pp. 183–208, Apr. 2021, doi: 10.1177/0735633120960421.

[16] U. Alturki and A. Aldraiweesh, "Application of Learning Management System (LMS) during the COVID-19 Pandemic: A Sustainable Acceptance Model of the Expansion Technology Approach," Sustainability, vol. 13, no. 19, p. 10991, Oct. 2021, doi: 10.3390/su131910991.

[17] T. Udin, S. Maufur, and O. R. Riyanto, "Student's Self-Efficacy and Perceptions of Online Learning on the Use Learning Management System," Journal of Education Technology, vol. 6, no. 1, p. 165, Mar. 2022, doi: 10.23887/jet.v6i1.41884.