



**E-LEARNING
INNOVATIONS
JOURNAL**

DOI: <https://doi.org/10.57125/ELIJ.2023.09.25.05>

How to cite: Aljad, R. R. (2023). Analysis of Development Trends and Experience of using LMS in Modern Education: An overview. *E-Learning Innovations Journal*, 1(2). 86-104.
<https://doi.org/10.57125/ELIJ.2023.09.25.05>

Analysis of Development Trends and Experience of using LMS in Modern Education: An overview

Reyad Rajab Aljad

*Lecturer at the University Libyan Ministry of Education, the city of al khoms Elmergib, Libya,
<https://orcid.org/0000-0002-2104-7401>*

Corresponding author: Ryiad.aljad@gmail.com.

Received: June 6, 2023 | **Accepted:** September 11, 2023 | **Available online:** September 25, 2023

Abstract: Modern information tools have a significant impact on the transformation of basic approaches to education, and learning management systems (LMS) have become an important mechanism in this process. The purpose of this review is to show the state of the art and trends in the use of LMS in modern education. To achieve this goal, the article uses the scientific method of content analysis of scientific literature selected specifically (78 items of literature were analysed in total). The results show that the development of Internet technologies contributes to the emergence of new forms of information exchange, including e-learning platforms. E-learning is convenient and mobile for students and provides an individual approach. Certain e-learning technologies can be used not only in online education, but also in traditional forms of education, such as full-time and part-time. The most popular are the capabilities of Moodle, which was established through the analysis of scientific literature. Blackboard and Google Classroom are also important and popular, but they have more situational applications. Other LMSs are more regionally popular, although they also play a role in the learning process. The results also emphasise that modern LMS technologies make learning more accessible and interesting for students, which makes the process more democratic and accessible to learning. The conclusions



draw attention to the importance of continuing research, as digital technologies is evolving, making them a subject for further studies.

Keywords: digital technologies, analysis, scientific literature, LMS, learning platforms.

Introduction

Modern information technology has significantly influenced the transformation of basic approaches to education, and learning management systems (LMS) have become an important tool in this process. They allow you to create, manage and control the implementation of the learning process. At the same time, they also provide access to learning materials, interactive classes and communication between teachers and students. Thus, the emergence of such platforms has led to a significant increase in online learning opportunities. The results of modern researchers show a variety of approaches to the implementation and use of LMS in different countries and educational institutions (Rhode et al., 2017). In particular, studies show that in developed countries, these learning management systems are widely used, while they also contribute to interactivity and personalisation of learning (Saadati et al., 2021). At the same time, the implementation of LMSs faces certain challenges in developing countries. In particular, some studies have highlighted various challenges, primarily logistical support for the effective implementation of e-learning (Parlińska, 2022; Vasilache, 2022). However, despite this, they have a high potential for a broad transformation of the educational system as a whole.

Research Problem

So, as can be seen from the previous review, there are different points of view regarding the effectiveness of using platforms for managing innovative education. At the same time, a significant problem is the lack of a systematic approach to the implementation and use of LMS in educational institutions of various levels. In particular, the lack of basic standardized methods for evaluating the effectiveness of LMS and the large number and variety of platforms affect the formation of additional challenges for teachers and students. The relevance of this study is due to the need to study approaches to the use of learning management systems in the available literature. This will make it possible to generalize and define effective platforms and mechanisms for their introduction into the system of modern electronic education.

Research Focus

Therefore, as can be seen from the previous review, there are different points of view regarding the effectiveness of using platforms for managing innovative education. At the same time, a significant problem is the lack of a systematic approach to the implementation and use of LMS in educational institutions of various levels. In particular, the lack of basic standardized methods for evaluating the effectiveness of LMS and the large number and variety of platforms affect the formation of additional challenges for teachers and students. The relevance of this study is due to the need to study approaches to the use of learning management systems in the available literature. This will make it possible to summarize and identify effective platforms and mechanisms for their implementation in the system of modern electronic education.



Research Aim and Research Questions

The purpose of this review is to show the state of the problem and trends in the use of LMS in modern education. For this, it is important to solve the following main research questions:

1. What is the state of the problem of studying the features of using education management systems?
2. What are the main LMS?
3. What are these systems used in modern education in different countries?

Literature Review

Modern scientists have described various technologies that ensure effective organization of the educational electronic space. E-learning is based on the use of various technologies to support and extend the learning process, which provides access to educational resources at any time (Amarneh et al., 2021; Brosner & Vrabie, 2015; Chakhaia & Bregvadze, 2018). Modern scholars have described the importance of the development of distance learning theories and their influence on the formation of e-learning (Chen & Tseng, 2012; Cheok & Wong, 2015). For this reason, technology, in particular virtual classrooms, learning platforms have influenced the change of learning and made it more accessible. The analysis of the results of scientists shows the numerous advantages of e-learning. According to research, the key opportunities are the flexibility of e-learning, its accessibility and the promotion of individualization of the educational process and the reduction of education costs (Edouard et al., 2010; Ejdyś & Kozłowska, 2021). Edelhauser and Lupu-Dima (2020) as well as Fauzi (2022) identified that an e-learning system facilitates opportunities for students to learn at their own pace, which is beneficial for those who combine study with work. At the same time, the effective functioning of this form of education depends on the use of various technologies. In particular, Alam (2021) investigated the features of the implementation of artificial intelligence in modern education. Alvi (2021) described the mechanisms of implementation of web technologies in the educational space and their impact on student results. An important study is Anggraini and Handayani (2022), in which a systematic review of the literature on the features of digitalization of education was carried out. The authors identified the main considerations of researchers and trends in the progress of digital education. Despite numerous advantages, e-learning is also characterized by certain challenges. Armour et al. (2020) highlighted the problem of individual difficulties requiring robust technical solutions. A number of studies determine that a key element of the effective implementation of electronic solutions in education is the training of teachers and the development of their digital skills (Barakat et al., 2022; Galynska & Bilous, 2022; Krylova-Grek & Shyshkina, 2021). The problem of the effectiveness of the introduction of electronic technologies in difficult and critical conditions has been emphasized by many scientists (Ebner et al., 2020; Kremenova et al., 2018; Maatuk et al., 2021). This topic became especially popular during the COVID-19 pandemic, during which the authors reflected on the effectiveness of using various electronic technologies (Favale et al., 2020). In particular, in the work of Jamalova and Bálint (2022), the peculiarities of the perception of electronic learning technologies by students and their impact on their academic performance during the pandemic are determined. Koloszár and Tóth (2020) also identified the possibilities of electronic technologies to ensure quality university education during the pandemic. The impact of e-learning on the motivation of teachers and students is described in detail in the paper of



Kulikowski et al. (2021). At the same time, Tomczyk and Walker (2021) investigated the key prospects for the further development of e-education, the authors also drew attention to the challenges associated with the introduction of this system. Zawacki-Richter (2020) also describes the impact of the pandemic on the development of e-education and its widespread adoption in Europe. A number of modern works also prove the effectiveness of e-learning in the period of wars and individual conflicts (Lucić, 2020; Rajab, 2018). Meshko et al. (2023) also identified the role of technology in providing a stable emotional state in wartime learners. The topic of emotional well-being of students during wars is also raised in the research of Mardila and Alfajri (2020).

Educational management systems play an important role in supporting the stable functioning of electronic education. Alfalah (2023) investigated the main factors that contribute to the implementation and adaptation of mobile learning systems based on a study of empirical measures obtained from a survey. AL-Nuaimi et al. (2022) described an evaluation of LMS use during the COVID-19 pandemic. Elfeky and Elbyaly (2021) identified the features of the application of data analytics in education management systems. The main issues related to LMS selection are described in a study by Mohd Kasim and Khalid (2016). The authors identified the key capabilities of these systems and their shortcomings. The specifics of implementing an LMS in an innovative learning environment are described in detail in a study by Nilo Pena and Manuel Pinto Santos (2022). Makhachashvili and Semenist (2022) emphasized the importance of appropriate digital literacy over the management of modern technologies. Consequently, modern literature presents the study of various technologies that ensure the functioning of electronic education. However, the problems of LMS implementation are not so widely presented, and if they are presented, they are mainly empirical studies. This same study will attempt to fill the gap and introduce a new theoretical summary study of LMS implementation characteristics.

Materials and Methods

This study belongs to the quantitative works formed on the basis of a scientific literature review. The main materials for the study were articles, chapters from books and materials from conferences, which were related to the implementation of electronic technologies and online learning management systems.

Data Collection

For the selection of scientific sources, the basic scientometric database of Google Scholar was used. Keywords such as "e-learning", "LMS", "technology", "e-learning management" are entered into this database. Date range for research selection from 2018. Total 765 results found. Based on a preliminary analysis of the titles, 187 papers relevant to the research topic were selected. After that, additional databases were connected, including Scopus, Web of Science and Index Copernicus. However, the range of dates has been expanded from 2015. This was done in order to trace the evolution of the appearance of scientific works over the last decade. 134 more relevant works are found here. The selection of scientific sources was based on the following inclusion criteria:

1. The research concerns electronic education
2. Features of using LMS are described



3. The mechanisms of electronic education management were studied
4. Modern innovative technologies of training management are characterized
5. Date range: 2015-2023.
6. There are no geographical restrictions

Using these criteria, 157 studies were selected from various databases. After that, attention is paid to the abstracts and results of the study. Therefore, a preliminary analysis of the annotations was carried out, where attention was paid to the research methodology and the main conclusions. Those works that were not related to education were screened out (a total of 132 results were obtained). After that, the analysis of the results itself was carried out and the following strict selection was carried out, which was based on the following criteria:

1. Scientific novelty of the research
2. Either the learning management system is characterized in general, or attention is paid to individual platforms used in the LMS
3. Presence of practical value of research
4. Local features of LMS implementation are characterized
5. The theoretical aspects of the introduction of e-learning are determined
6. Various technologies used in LMS are described

Based on the use of these criteria, 78 items of literature were selected for analysis. Table 1 details the steps involved in selecting studies.

Table 1

Step-by-Step Table of Selection of Scientific Sources

Description	Results
Artificial Intelligence (AI) The use of the main scientometric database Google Scholar for searching. Keywords: "e-learning", "LMS", "technology", "e-learning management" Date range: since 2018	765 results
Preliminary analysis of titles to select papers relevant to the research topic	187 papers
Connection of additional databases: Scopus, Web of Science, Index Copernicus. Date range extended to 2015	134 relevant papers
Combining the found works	321 papers (187 from Google Scholar + 134 from additional databases)
Selection of papers based on the main inclusion criteria	157 studies
Preliminary analysis of abstracts and research results to screen out irrelevant papers	132 papers



Source: Authors' own development.

These works (78) are divided into general works on the use of electronic technologies and learning support systems - 40 studies and works devoted to the use of concrete electronic education management tools Blackboard, Google Classroom, Moodle, Edmodo, Canvas, Sakai and others - 38 works. The first type of works is important for the theoretical clarification of the role of management systems, and the second type for the analysis of specific systems used in modern education.

Instruments

The main research tool was the Excel software, where the main data from the selected literature were entered into special tables. The tables were divided into such criteria as "authors", "country", "LMS tools", "technologies", "main results", "conclusions". This is done in order to briefly summarize, characterize and evaluate each selected work. This provision made it possible to approach this problem systematically and evaluate each point of the selected studies.

Data Analysis

Data analysis was carried out using modern methods of literature study. In particular, content analysis was important. Factors such as "country", "LMS tools and technologies" were analyzed using content analysis. The thematic analysis also played an important role. The main results are divided into separate thematic blocks and based on them, the role of LMS provision in modern e-education is revealed. Comparative analysis, which compared the obtained results with other modern works, also played an important role in the research.

Results

The development of Internet technologies facilitates new forms of information exchange. To this end, new dynamic e-learning platforms are being created to replace traditional ones. In particular, the use of technology for training specialists is gaining popularity as a result of the large-scale introduction of e-learning using the Internet and various electronic tools. Besides, e-learning has a number of advantages due to its accessibility, flexibility, cost-effectiveness and structured learning material. Thus, the availability of digital learning materials, a system of comfortable learning, and an individual approach are important features of modern e-learning. At the same time, certain e-learning technologies can be used not only in online education, but also in other forms of education, including full-time and part-time. Thus, they facilitate the adaptation of certain educational components into the learning process and act as elements of independent work. To support this system of education, Learning Management Systems play an important role. These learning management systems are important tools in the modern education system (Polianovskiy et al., 2021). An important management system is Moodle, which is an open-source modular software package. The main function of the system is to create e-learning courses and websites. The most important characteristics of the formation and functioning of training complexes in the Moodle environment, which distinguish them from the accepted traditional means of teaching, include: the prospect of interactive interaction of participants in synchronous and asynchronous modes, unlimited functions of course integration with both internal and external electronic learning materials through hyperlinks; the use of all types of multimedia



technologies in teaching, which contributes to the accumulation and systematisation of a lot of information useful for studying. In addition, there is also a clear planning of the learning process and course management in accordance with the basic requirements of the curriculum.

The new generation of e-learning systems, eFront, also ensures efficient management. This software product is easy to navigate and understand; the primary advantage is that during the initial stages of growth, the eFront interface was designed with ease of use in mind. Its structure is convenient, and it uses colour accents and icons with a minimal number of modal windows. The eFront system combines training management and training material development functions. The first of the system's important functions is organising the learning process, as it allows you to create online content, create tests, communicate with the class, assign homework, and track learning progress. For the user, it looks very familiar and simple, just like any social network. The system fully meets the needs of e-learning because it is compact and easily accessible.

The Web-based Blackboard system allows for integration with student information systems and has an open architecture for course management that can be customised with procedures for verification. The main goals of this system, which can be hosted by Blackboard ASP solutions or installed on personal computers, are to create entirely virtual courses with few or no in-person meetings and to include online components in traditional face-to-face course delivery. Users of the Blackboard Learning System have access to an environment for conversation and material sharing.

Another important tool is Google Classroom. It is part of the Google Workspace for Education tools and provides tight integration with other Google services. In turn, it facilitates quick document sharing, creating new tasks and editing old ones, and organising an interactive learning environment. An important factor is that Google Classroom has a simple and intuitive interface for creating and managing tasks. This platform was mentioned in 13.64% of cases. The next cloud-based LMS, Canvas, is an important platform for learning management. This system is designed to easily customise courses, store learning materials, and track student progress. The platform provides extensive integration with many other learning tools and resources. It also helps teachers create multifunctional learning environments.

Sakai is also an open management platform that provides modern educational institutions with the ability to customise and extend functionality to meet their needs. This platform facilitates the creation of various training courses, the use of a wide range of tools for creating training materials and tests. At the same time, this system also supports integration with various content formats. Another important platform is Claroline. It also allows teachers to create online courses and manage learning materials. With its use, modern educators can create courses and add various learning materials and tasks to them. The platform also includes various communication tools. Chamilo is also an important platform for organising learning. It facilitates the integration of various e-learning materials and is easy to use. Edmondo is also an important learning management platform. It is designed to organise effective cooperation between all participants: parents, students and teachers. The platform provides various tools for tracking students' results, and there are special journals and reports. The platform also has a simple and user-friendly interface. Table 2 summarises the main tools, their functionality and authors

**Table 2***LMS Systems and Their use in Scientific Works*

LMS	Using	Authors
Blackboard	Integration of electronic educational materials measuring the impact of the Blackboard system on blended learning, supporting self-regulated learning Integrations with other platforms; Conducting communication; Conducting mass courses	Alhussain (2017); Alturki et al. (2016); Bervell and Arkorful (2020); Chen et al. (2019); Kibirige and Odora (2023); Mouakket and Bettayeb (2016); Saqr et al. (2023); Svobodova (2016); Tawalbeh (2017)
Moodle	Use as a system in critical conditions for higher education to improve students' educational activity online learning support; Integration with other platforms; Ensuring the use of multimedia content; Distribution of various educational electronic resources; Implementation of testing	Bakała and Molenda (2020); Bervell and Arkorful (2020); Brosser & Vrabie (2015); Deliwe (2020); Jamalova and Bálint (2022); Krylova-Grek and Shyshkina (2021); Oliveira et al. (2015); Simanullang and Rajagukguk (2020); Warid et al. (2022); Wiyono and Oktabrianto (2021)
Google Classroom	Use in mixed courses; Support for the inverted problem-based learning model; Integration in the Google environment; Using different Google tools; Filling with various educational resources; Implementation of control and testing	Bervell and Arkorful (2020); Gumasing et al. (2023); Hidayat et al. (2019); Oliveira et al. (2015); Ramadhani et al. (2019)
Canvas	Optimization of functions from the perspective of students; Implementation of various multimedia tools; Distribution of electronic educational materials; Integration with different platforms	Gumasing et al. (2023); Oliveira et al. (2015); Parveen et al. (2023); Song and Luan(2020)
Chamilo	Use of educational media in courses; Integration with various educational platforms; Intuitive interface; Wide access to educational materials and resources; Conducting analytics	Nasir et al. (2023); Nasrum and Nasir (2023); Oliveira et al. (2015)
eFront	Use for online learning; digital and technological support for e-learning; Distribution of various educational materials; Conducting analytics; Testing and uploading various tasks	Aydemir et al. (2015); Bradley (2020); Oliveira et al. (2015)
Sakai	Flexible options for creating online courses; Contains a resource library;	Boateng (2020); Tagoe and Cole (2020)



	Various tools for conducting quick communication; Evaluation is presented by magazines; Contains resources for testing and uploading tasks; Conducting analytics and reports	
Edmondo	Organization of effective communication; Progress tracking; Logs and performance reports; Distribution of educational materials	Oliveira et al. (2015); Palahicky (2015); Saqr et al. (2023)
General e-Learning platforms Using LMS in collaboration	Using different e-Learning platforms (Blackboard, Moodle, Edmodo, Coursera, edX) Using LMS to achieve differentiated learning; research on instructional design for online learning	Bervell and Arkorful (2020); Marzano and Zajac (2020); Matei and Vrabie (2013); Oliveira et al. (2015); Rauf et al. (2023); Saadati et al. (2021); Saqr et al. (2023)

Source: Authors' development.

Therefore, modern authors explore various platforms that provide organization and management of e-learning. Moodle remains one of the most popular e-course development and classroom management systems. According to researchers, this system was used in many countries of the world, and now more than 90 thousand officially registered sites work on Moodle. In the study, out of the total number of works on LMS systems, 26.32% belong to this platform. Blackboard is also popular among scientists (23.68%). It is mainly used in the USA and European countries. Google Classroom is popular among European researchers and accounts for 13.16% of the total number of mentions. This platform is common for the countries of Central and Eastern Europe. Canvas and Chamilo are mentioned by both European and Asian researchers (10.53% and 7.89%). These platforms are common among countries in Europe, the USA and Africa. In addition, eFront and Sakai were mentioned by 7.98% and 5.26% respectively. At the same time, Edmondo - 7.98% of the platform is used in Asia, Africa, and certain countries of the European Union. There are also works that generally mention various systems, their number is 18.42% of the total number. Table 3 provides summary information on the use of platforms in different countries and their % of the total number of works.

Table 3

Using the LMS in different countries

Country	LMS	Using
USA	Canvas, Blackboard	In universities and schools
Great Britain	Moodle, Blackboard	In higher educational institutions
Canada	Moodle, E-Font	In universities and schools
Australia	Moodle, Blackboard	In universities and schools
Poland	Moodle, Blackboard, Canvas	All levels of education
German	Moodle, ILIAS Google Classroom EFont	Universities
Slovakia	Moodle, Blackboard	All levels of education
Hungary	Moodle, Blackboard, Google Classroom	All levels of education



France	Moodle, Claroline	In universities and schools
Spain	Moodle, Canvas	At all levels of education
Ukraine	Moodle, Google Classroom E-Font	At all levels of education
China	Blackboard, Moodle	Higher educational system
Japan	Moodle, Google Classroom	All levels of education
Brazil	Moodle, Blackboard	In universities and schools
South Africa	Moodle, Sakai, Edmondo	Universities.
India	Moodle, Sakai, Edmondo	All levels of education
Saudi Arabia	Blackboard, Moodle	Universities
South Korea	Moodle, Blackboard	All levels of education

Source: Authors' development.

Consequently, LMSs are popular tools for effective e-learning management in educational institutions of various levels around the world. They help to integrate various educational electronic resources into the educational process and track the progress of education seekers.

Discussion

This study aimed to fill in the gaps in the state of the art of LMS research and identify the main tools for using LMS in modern education. Thus, the state of the art of studying the peculiarities of using educational management systems is quite thorough. Modern scientists have characterized various aspects of the functioning of this system and its use, paying attention to management technologies and certain organizational and methodological aspects. This coincides with the study by Anggraini and Handayani (2022), which reviews research on the digitalization of education. These results also coincide with the study by Cheek and Wong (2015), which reviewed the implementation of LMS in schools. The authors emphasized that it is important to consider the basic learning needs and conditions when implementing an LMS. A carefully selected and effective system can make a difference in the classroom itself. The review of the scientific literature showed that the use of LMS usually covers all levels of education in the country. This confirms the conclusions of researchers about the importance of digitalization for modern education (Boateng, 2020), which is proposed to be interpreted as a completely objective process of educational development based on the use of the latest technologies. The study also updated the opinion that the most popular LMS in the world practice are Moodle, Canvas, Blackboard. This confirms the opinions of researchers about the ease of use of Moodle and its corresponding prevalence and popularity in the educational environment (Kumar Basak et al., 2018; Picciano, 2018). At the same time, this somewhat contradicts the findings of Tagoe and Cole (2020), who emphasized the popularity of other LMSs. This variation can be explained primarily by the different empirical experiences that may exist in individual countries. Undoubtedly, this only points to the importance of further research on this issue.

As a result of the study of scientific literature, it was found that LMS are popular tools for effective management of e-learning in educational institutions of different levels around the world. They help to integrate various e-learning resources into the learning process and track the



progress of students. Besides, these results confirm the results of other researchers on the importance of LMS for modern educational development and the positive effects of their implementation (Rutkowska et al., 2021; Taha et al., 2023). Additionally, it should be recognized that the active use of LMS makes education more accessible, which generally corresponds to the democratic trends of modern development (Tinterri et al., 2022; Yonata, 2022). Taking these aspects into account suggests that these tools will be more actively used in the future. In addition, it was found that the most popular platforms for supporting and organizing e-learning are Moodle and Blackboard, which are widely used in America and Europe. These platforms are mostly used at all levels of education. However, Sakai and Edmondo are more popular in the countries of the African continent. They are mainly used in the higher education system. The popularity of this tool will also grow because modern technologies are constantly evolving, and their improvement will make it even easier to use them, making them more adaptable for teachers and students.

The proposed results are based on a specific methodology. Like any other methodology, it has certain limitations. First of all, we are talking about the emphasis on the use of English-language literature that was available to the authors. This approach made it possible to take into account the main achievements of the scientific literature, but also certain generalizing works written in other languages may have been left out of the research. This does not detract from the work done, but demonstrates that the proposed topic requires further research and updating. In addition, the study is limited by the specific date range of the literature selection: from 2015. Therefore, the paper ignores the work of authors who have previously dealt with this issue. However, despite these limitations, this work has a scientific novelty, which is manifested in the systematization of the main approaches and LMS tools used in different countries. In addition, this work opens up several new ways to study this problem, and certain aspects of the use of learning management systems are also of practical importance.

Conclusions and Implications

To conclude, the process of development of Internet services has led to the emergence of new forms of information exchange, in particular e-learning platforms. E-learning is comfortable and mobile for students and provides an individual approach. Certain e-education technologies can be used not only in online education, but also in traditional forms of education, such as full-time and part-time. Modern authors explore various platforms for organising and managing e-learning. Moodle is one of the most popular systems, with more than 90 thousand officially registered sites around the world, accounting for 26.32% of all LMS studies. Blackboard takes 23.68% and is popular in the US and Europe. Google Classroom, which accounts for 13.16%, is widespread in Central and Eastern Europe. Canvas (10.53%) and Chamilo (7.89%) are used in Europe, the US and Africa. eFront and Sakai are mentioned in 7.98% and 5.26% of cases, respectively. Edmondo (7.98%) is used in Asia, Africa and some European countries. Various LMS systems are mentioned in 18.42% of articles in total. LMSs are a popular tool for effective e-learning management in educational institutions at various levels around the world. They help to integrate various e-learning resources into the learning process and track student progress.

Suggestions for Future Research

Considering the scientific novelty and the obtained results, which systematized and summarized the main approaches to understanding the importance of the implementation of learning management systems, this study opened new promising directions for the study of this



topic, which become the basis for conducting future research in the field of e-learning. The prospects for researching this topic cover several important areas. First of all, this is a global comparison of LMS platforms, which involves analyzing the advantages and disadvantages of different systems such as Moodle, Blackboard, Google Classroom, Canvas, Chamilo, eFront, Sakai, Edmodo in different countries, as well as studying the regional peculiarities of their use in education. The second area concerns the integration of the latest technologies. Studying the impact of artificial intelligence, virtual and augmented reality on the development of LMS is an important aspect of understanding their effectiveness in improving the learning process. The third area involves the analysis of pedagogical approaches and innovations implemented through LMS. Research into new teaching and learning methods made possible by these systems will help to identify their potential benefits. The fourth area is the economic aspect of using LMS. Studying the cost-effectiveness of implementing LMS in educational institutions of different levels, assessing the costs and benefits of using LMS compared to traditional teaching methods are important to justify the feasibility of such investments. The last but not least is the social impact of LMS. It is also important to take into account the introduction of new technologies that can make adjustments to the current state of affairs in the LMS sector.

Acknowledgements

None.

Conflict of Interest

None.

Funding

The Author received no funding for this research.

References

- Alam, A. (2021). Possibilities and apprehensions in the landscape of artificial intelligence in education. In *2021 International Conference on Computational Intelligence and Computing Applications (ICCICA)*. IEEE. <https://doi.org/10.1109/iccica52458.2021.9697272>
- Alfalah, A. A. (2023). Factors influencing students' adoption and use of mobile learning management systems (m-LMSs): A quantitative study of Saudi Arabia. *International Journal of Information Management Data Insights*, 3(1), Article 100143. <https://doi.org/10.1016/j.jjime.2022.100143>
- Alhussain, T. (2017). Measuring the impact of the blackboard system on blended learning students. *International Journal of Advanced Computer Science and Applications*, 8(3). <https://doi.org/10.14569/ijacsa.2017.080341>
- AL-Nuaimi, M. N., Al Sawafi, O. S., Malik, S. I., Al-Emran, M., & Selim, Y. F. (2022). Evaluating the actual use of learning management systems during the covid-19 pandemic: An integrated theoretical model. *Interactive Learning Environments*, 31(10), 6905-6930. <https://doi.org/10.1080/10494820.2022.2055577>



- Alturki, U. T., Aldraiweesh, A., & Kinshuck, D. (2016). Evaluating the usability and accessibility of LMS "Blackboard" at King Saud University. *Contemporary Issues in Education Research (CIER)*, 9(1), 33-44. <https://doi.org/10.19030/cier.v9i1.9548>
- Alvi, I. (2021). Effects of technology-based feedback on learning. In S. L. Gupta, N. Kishor, N. Mishra, S. Mathur, & U. Gupta (Eds.), *Transforming higher education through digitalization* (pp. 203-219). CRC Press. <https://doi.org/10.1201/9781003132097-12>
- Amarneh, B. M., Alshurideh, M. T., Al Kurdi, B. H., & Obeidat, Z. (2021). The impact of COVID-19 on e-learning: Advantages and challenges. In *Proceedings of the International Conference on Artificial Intelligence and Computer Vision (AICV2021)* (pp. 75-89). Cham: Springer. https://doi.org/10.1007/978-3-030-76346-6_8
- Anggraini, R., & Handayani, Y. (2022). Digitalisation in education: A literature review. *Journal of Digital Education, Communication and the Arts*, 4(2), 62-73. <https://doi.org/10.30871/deca.v5i01.2942>
- Armour, K. M., Goodyear, W. A., & Sandford, R. (2020). The challenge of the digital age. In A. MacPhail & H. Lawson (Eds.), *School physical education and teacher education* (pp. 92-102). Routledge. <https://doi.org/10.4324/9780429330186-9>
- Aydemir, M., Özkeskin, E. E., & Akkurt, A. A. (2015). A theoretical framework on open and distance learning. *Procedia - Social and Behavioral Sciences*, 174, 1750-1757. <https://doi.org/10.1016/j.sbspro.2015.01.833>
- Bąkała, A., & Molenda, M. (2020). Using Moodle as a response system for higher education in Poland: Benefits and challenges. *Informatyka Ekonomiczna*, 2020(4), 33-49. <https://doi.org/10.15611/ie.2020.4.03>
- Barakat, N., Al-Shalash, A., Biswas, M., Chou, S.-F., & Khajah, T. (2022). Engineering experiential learning during the COVID-19 pandemic. In M. E. Auer, H. Hortsch, O. Michler, & T. Köhler (Eds.), *Mobility for Smart Cities and Regional Development - Challenges for Higher Education* (p. 991-1003). Cham: Springer. https://doi.org/10.1007/978-3-030-93907-6_105
- Bervell, B., & Arkorful, V. (2020). LMS-enabled blended learning utilization in distance tertiary education: Establishing the relationships among facilitating conditions, voluntariness of use and use behaviour. *International Journal of Educational Technology in Higher Education*, 17(1), Article 6. <https://doi.org/10.1186/s41239-020-0183-9>
- Boateng, J. K. (2020). Using SAKAI LMS for enhanced instructor-student interactions and effective student learning: Perceptions of students from the University of Ghana. *Ubiquitous Learning: An International Journal*, 13(4), 1-10. <https://doi.org/10.18848/1835-9795/cgp/v13i04/1-10>
- Bradley, V. M. (2020). Learning Management System (LMS) use with online instruction. *International Journal of Technology in Education*, 4(1), 68-92. <https://doi.org/10.46328/ijte.36>



- Brosser, L., & Vrabie, C. (2015). The quality initiative of e-learning in Germany (QEG)-management for quality and standards in e-learning. *Procedia - Social and Behavioral Sciences*, 186, 1146-1151. <https://doi.org/10.1016/j.sbspro.2015.04.214>
- Chakhaia, L., & Bregvadze, T. (2018). Georgia: Higher education system dynamics and institutional diversity. In J. Huisman, A. Smolentseva, & I. Froumin (Eds.), *25 Years of Transformations of Higher Education Systems in Post-Soviet Countries* (pp. 175-197). Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-319-52980-6_7
- Chen, H.-R., & Tseng, H.-F. (2012). Factors that influence acceptance of web-based e-learning systems for the in-service education of junior high school teachers in Taiwan. *Evaluation and Program Planning*, 35(3), 398-406. <https://doi.org/10.1016/j.evalprogplan.2011.11.007>
- Chen, J. C., Dobinson, T., & Kent, S. (2019). Lecturers' perceptions and experiences of Blackboard Collaborate as a distance learning and teaching tool via Open Universities Australia (OUA). *Open Learning: The Journal of Open, Distance and e-Learning*, 35(3), 222-235. <https://doi.org/10.1080/02680513.2019.1688654>
- Cheok, M. L., & Wong, S. L. (2015). Predictors of e-learning satisfaction in teaching and learning for school teachers: A literature review. *International Journal of Instruction*, 8(1), 75-90. <https://doi.org/10.12973/iji.2015.816a>
- Deliwe, A. P. (2020). The use of learner management system (MOODLE) in promoting teaching and learning. *Universal Journal of Educational Research*, 8(12B), 8383-8392. <https://doi.org/10.13189/ujer.2020.082644>
- Ebner, M., Schön, S., Braun, C., Ebner, M., Grigoriadis, Y., Haas, M., Leitner, P., & Taraghi, B. (2020). COVID-19 Epidemic as e-learning boost? Chronological development and effects at an Austrian university against the background of the concept of "E-Learning Readiness". *Future Internet*, 12(6), Article 94. <https://doi.org/10.3390/fi12060094>
- Edelhauser, E., & Lupu-Dima, L. (2020). Is Romania prepared for eLearning during the COVID-19 pandemic?. *Sustainability*, 12(13), Article 5438. <https://doi.org/10.3390/su12135438>
- Edouard, G., Dominique, B., Moussiliou, P., Francis, G., Khaled, B., & Serge, B. (2010). E-Learning and North-South collaboration: the experience of two public health schools in France and Benin. *Pan African Medical Journal*, 3(1). <https://doi.org/10.4314/pamj.v3i1.52443>
- Ejdys, J., & Kozłowska, J. (2021). Acceptance of e-learning at university level during the Covid-19 pandemic situation-teachers' and students' perspective. *Polish Journal of Management Studies*, 23(2), 106-129. <https://doi.org/10.17512/pjms.2021.23.2.07>
- Elfeky, A. I. M., & Elbyaly, M. Y. H. (2021). The use of data analytics technique in learning management system to develop fashion design skills and technology acceptance. *Interactive Learning Environments*, 31(6), 3810-3827. <https://doi.org/10.1080/10494820.2021.1943688>



- Fauzi, M. A. (2022). E-learning in higher education institutions during COVID-19 pandemic: Current and future trends through bibliometric analysis. *Heliyon*, 8(5), Article e09433. <https://doi.org/10.1016/j.heliyon.2022.e09433>
- Favale, T., Soro, F., Trevisan, M., Drago, I., & Mellia, M. (2020). Campus traffic and e-Learning during COVID-19 pandemic. *Computer Networks*, 176, Article 107290. <https://doi.org/10.1016/j.comnet.2020.107290>
- Galynska, O., & Bilous, S. (2022). Remote learning during the war: challenges for higher education in Ukraine. *International Science Journal of Education & Linguistics*, 1(5), 1-6. <https://doi.org/10.46299/j.isjel.20220105.01>
- Gumasing, M. J. J., Kaye Endozo, E., Ceasar Laingo, J. C., & Henry Tapucar, W. (2023). Usability evaluation of online learning management system: Blackboard, Google Classroom and Canvas. In *2023 11th International Conference on Information and Education Technology (ICIET)*. IEEE. <https://doi.org/10.1109/iciet56899.2023.10111426>
- Hidayat, M. L., Prasetyo, W. H., & Wantoro, J. (2019). Pre-service student teachers' perception of using Google Classroom in a blended course. *Humanities & Social Sciences Reviews*, 7(2), 363-368. <https://doi.org/10.18510/hssr.2019.7242>
- Jamalova, M., & Bálint, C. (2022). Modelling students' adoption of e-learning during the COVID-19 pandemic. *International Journal of Emerging Technologies in Learning (iJET)*, 17(07), 275-292. <https://doi.org/10.3991/ijet.v17i07.29243>
- Kibirige, I., & Odora, R. J. (2023). Pre-service teachers' use and usefulness of blackboard learning management systems for self-regulated learning. *Journal of Education Technology*, 7(2), 226-234. <https://doi.org/10.23887/jet.v7i2.52194>
- Koloszár, L., & Tóth, Z. (2020). E-learning in Hungarian higher education: Experience at University of Sopron. In *3rd International Scientific Conference Teaching Methods for Economics and Business Sciences*. University of Maribor Press. <https://doi.org/10.18690/978-961-286-356-2.11>
- Kremenova, I., Fabus, J., Fabusova, V., & Tothova, D. (2018). E-learning at slovak university of agriculture in Nitra and at university of Zilina - comparative study. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *EDULEARN18 Proceedings* (pp. 8435-8441). IATED. <https://doi.org/10.21125/edulearn.2018.1965>
- Krylova-Grek, Y., & Shyshkina, M. P. (2021). Online learning at higher education institutions in ukraine: Achievements, challenges, and horizons. *Information Technologies and Learning Tools*, 85(5), 163-174. <https://doi.org/10.33407/itlt.v85i5.4660>
- Kulikowski, K., Przytuła, S., & Sułkowski, Ł. (2021). E-learning? Never again! On the unintended consequences of COVID-19 forced e-learning on academic teacher motivational job characteristics. *Higher Education Quarterly*, 76, 174-189. <https://doi.org/10.1111/hequ.12314>



- Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media*, 15(4), 191-216. <https://doi.org/10.1177/2042753018785180>
- Lucić, L. (2020). War schools: Teaching innovations implemented across makeshift educational spaces during the military siege of Sarajevo. *Pedagogy, Culture & Society*, 29(4), 573-592. <https://doi.org/10.1080/14681366.2020.1768582>
- Maatuk, A. M., Elberkawi, E. K., Aljawarneh, S., Rashaideh, H., & Alharbi, H. (2021). The COVID-19 pandemic and E-learning: Challenges and opportunities from the perspective of students and instructors. *Journal of Computing in Higher Education*, 34, 21-38. <https://doi.org/10.1007/s12528-021-09274-2>
- Makhachashvili, R., & Semenist, I. (2022). Dynamic e-skills development for foreign languages education in the emergency digitization paradigm. In L. G. Chova, A. L. Martínez, & J. Lees (Eds.), *EDULEARN22 Proceedings* (pp. 6900-6907). IATED. <https://doi.org/10.21125/edulearn.2022.1622>
- Mardila, R., & Alfajri, A. (2020). Prioritizing human security for the global justice: Case of Syrian refugees in Germany. In A. Munhanif, A. Bakir Ihsan, I. Halimatusa'diyah, B. Ruswandi, & K. Nisa (Eds.), *ICSPS 2019: Proceedings of the 5th International Conference on Social and Political Sciences*. EAI. <https://doi.org/10.4108/eai.12-11-2019.2293515>
- Marzano, G., & Zajac, A. (2020). Managing education during the coronavirus emergency: The case of a Polish higher education institution. *Education. Innovation. Diversity.*, 1(1), 37-47. <https://doi.org/10.17770/eid2020.1.5324>
- Matei, A., & Vrabie, C. (2013). E-learning platforms supporting the educational effectiveness of distance learning programmes: A comparative study in administrative sciences. *Procedia - Social and Behavioral Sciences*, 93, 526-530. <https://doi.org/10.1016/j.sbspro.2013.09.233>
- Meshko, H. M., Meshko, O. I., & Habrusieva, N. V. (2023). The impact of the war in Ukraine on the emotional well-being of students in the learning process. *Journal of Intellectual Disability - Diagnosis and Treatment*, 11(1), 55-65. <https://doi.org/10.6000/2292-2598.2023.11.01.7>
- Mohd Kasim, N. N., & Khalid, F. (2016). Choosing the right learning management system (LMS) for the higher education institution context: A systematic review. *International Journal of Emerging Technologies in Learning (iJET)*, 11(06), 55-61. <https://doi.org/10.3991/ijet.v11i06.5644>
- Mouakket, S., & Bettayeb, A. M. (2016). Factors affecting university instructors' continuance intention to use learning management systems: The Blackboard System case. In S. Hammoudi, L. Maciaszek, M. M. Missikoff, O. Camp, & J. Cordeiro (Eds.), *Proceedings of the 18th International Conference on Enterprise Information Systems - Volume 2: ICEIS* (pp. 215-222). SciTePress. <https://doi.org/10.5220/0005748102150222>



- Nasir, A., Nasrum, A., Haeniah, N., & Haeniah, N. (2023). Utilization of Chamilo LMS in learning media courses as an effort to digitalize education. *International Journal of Business, Law, and Education*, 4(2), 1394-1407. <https://doi.org/10.56442/ijble.v4i2.284>
- Nasrum, A., & Nasir, A. (2023). Chamilo LMS research trend. *International Journal of Business, Law, and Education*, 4(2), 730-737. <https://doi.org/10.56442/ijble.v4i2.233>
- Nilo Pena, S. B., & Manuel Pinto Santos, A. (2022). Implementation of a learning management system (LMS) in an Angolan higher education institution: A systematic literature review. In *2022 17th Iberian Conference on Information Systems and Technologies (CISTI)*. IEEE. <https://doi.org/10.23919/cisti54924.2022.9820406>
- Oliveira, P. C. d., Cunha, C. J. C. d. A., & Nakayama, M. K. (2015). Learning Management Systems (LMS) and e-learning management: An integrative review and research agenda. *Journal of Information Systems and Technology Management*, 13(2). <https://doi.org/10.4301/s1807-177520160002000001>
- Palahicky, S. (2015). Utilizing learning management system (LMS) tools to achieve differentiated instruction. In J. Keengwe & J. Agamba (Eds.), *Models for Improving and Optimizing Online and Blended Learning in Higher Education* (pp. 12-33). IGI Global. <https://doi.org/10.4018/978-1-4666-6280-3.ch002>
- Parlińska, A. (2022). E-learning challenges in poland during the Covid-19 pandemic. *Zeszyty Naukowe SGGW, Polityki Europejskie, Finanse i Marketing*, (27(76)), 80-88. <https://doi.org/10.22630/pefim.2022.27.76.7>
- Parveen, S., Ikhtiar, A., & Iqbal, A. (2023). An extensive examination of Canvas learning management system (LMS) integration within EnglishWorks! Assessing efficacy in English language enhancement. *Global Language Review*, VIII(I), 360-369. [https://doi.org/10.31703/glr.2023\(viii-i\).34](https://doi.org/10.31703/glr.2023(viii-i).34)
- Picciano, A. G. (2018). The history and evolution of online education. In *Online Education: Foundations, planning, and pedagogy*, (pp. 11-24). Routledge. <https://doi.org/10.4324/9781315226750-2>
- Polianovskyi, H., Zatonatska, T., Dluhopolskyi, O., & Liutyi, I. (2021). Digital and technological support of distance learning at universities under COVID-19 (Case of Ukraine). *Revista Romaneasca pentru Educatie Multidimensionala*, 13(4), 595-613. <https://doi.org/10.18662/rrem/13.4/500>
- Rajab, K. D. (2018). The effectiveness and potential of e-learning in war zones: An empirical comparison of face-to-face and online education in Saudi Arabia. *IEEE Access*, 6, 6783-6794. <https://doi.org/10.1109/access.2018.2800164>
- Ramadhani, R., Umam, R., Abdurrahman, A., & Syazali, M. (2019). The effect of flipped-problem based learning model integrated with LMS-Google Classroom for senior high school students. *Journal for the Education of Gifted Young Scientists*, 7(2), 137-158. <https://doi.org/10.17478/jegys.548350>



- Rauf, W., Rajab, A., & Nashruddin, N. (2023). Exploring the learning design on learning management system for online learning: A case study in higher education. *Jurnal Ilmiah Profesi Pendidikan*, 8(1), 1-10. <https://doi.org/10.29303/jipp.v8i1.1075>
- Rhode, J., Richter, S., Gowen, P., Miller, T., & Wills, C. (2017). Understanding faculty use of the learning management system. *Online Learning*, 21(3), 68-86. <https://doi.org/10.24059/olj.v21i3.1217>
- Rutkowska, A., Liska, D., Cieřlik, B., Wrzeciono, A., Broďáni, J., Barcalová, M., Gurín, D., & Rutkowski, S. (2021). Stress levels and mental well-being among Slovak students during e-Learning in the COVID-19 pandemic. *Healthcare*, 9(10), Article 1356. <https://doi.org/10.3390/healthcare9101356>
- Saadati, Z., Zeki, C. P., & Vatankhah Barenji, R. (2021). On the development of blockchain-based learning management system as a metacognitive tool to support self-regulation learning in online higher education. *Interactive Learning Environments*, 31(5), 3148-3171. <https://doi.org/10.1080/10494820.2021.1920429>
- Saqr, R. R., Al-Somali, S. A., & Sarhan, M. Y. (2023). Exploring the acceptance and user satisfaction of AI-driven e-Learning platforms (Blackboard, Moodle, Edmodo, Coursera and edX): An integrated technology model. *Sustainability*, 16(1), Article 204. <https://doi.org/10.3390/su16010204>
- Simanullang, N. H. S., & Rajagukguk, J. (2020). Learning Management System (LMS) based on Moodle to improve students learning activity. *Journal of Physics: Conference Series*, 1462, Article 012067. <https://doi.org/10.1088/1742-6596/1462/1/012067>
- Song, Y. N., & Luan, Z. Q. (2020). Function design optimization of Learning Management System (LMS) based on student perspective—case study of Canvas application University of Colorado Denver. *Journal of Physics: Conference Series*, 1621, Article 012058. <https://doi.org/10.1088/1742-6596/1621/1/012058>
- Svobodova, L. (2016). Financial and economics subjects, utilization of LMS blackboard and results from examination. In *2016 IEEE Global Engineering Education Conference (EDUCON)* (pp. 834-841). IEEE. <https://doi.org/10.1109/educon.2016.7474649>
- Taha, M., Husain, N., Nuri Osman Mukhtar, W., & Elhassan Abdalla, M. (2023). Consolidating medical education in Sudan during war. *Sudan Journal of Medical Sciences*, 18(3), 402-412. <https://doi.org/10.18502/sjms.v18i3.14093>
- Tawalbeh, T. I. (2017). EFL instructors' perceptions of Blackboard learning management system (LMS) at university level. *English Language Teaching*, 11(1). <https://doi.org/10.5539/elt.v11n1p1>
- Tagoe, M. A., & Cole, Y. (2020). Using the Sakai learning management system to change the way distance education nursing students learn: are we getting it right?. *Open Learning: The Journal of Open, Distance and e-Learning*, 35(3), 201-221. <https://doi.org/10.1080/02680513.2019.1704232>



- Tinterri, A., Eradze, M., Limone, P., & Dipace, A. (2022). Students' coping and study strategies: Did emergency remote teaching support the students during the pandemic?. In *Higher education learning methodologies and technologies online* (p. 117-128). Cham: Springer. https://doi.org/10.1007/978-3-030-96060-5_9
- Tomczyk, Ł., & Walker, C. (2021). The emergency (crisis) e-learning as a challenge for teachers in Poland. *Education and Information Technologies*, 26, 6847-6877. <https://doi.org/10.1007/s10639-021-10539-7>
- Vasilache, S. (2022). Suddenly online: Active learning implementation strategies during remote teaching of a software engineering course. In M. E. Auer, H. Hortsch, O. Michler, T. Köhler (Eds.), *Mobility for smart cities and regional development - challenges for higher education* (p. 395-402). Cham: Springer. https://doi.org/10.1007/978-3-030-93904-5_40
- Warid, H., Musyarofah, L., & Taufik, K. S. (2022). Sustainability of a Moodle-based learning management system (LMS) based on post-graduate students' perspectives. *Budapest International Research and Critics Institute (BIRCI-Journal)*, 5(1), 5439-5447. <https://doi.org/10.33258/birci.v5i1.4250>
- Wiyono, N., & Oktabrianto, O. (2021). Implementasi dan evaluasi Moodle dalam menunjang pembelajaran daring menggunakan technology acceptance model [Implementation and evaluation of Moodle in supporting online learning using the technology acceptance model]. *Jurnal Basicedu*, 5(6), 5929-5936. <https://doi.org/10.31004/basicedu.v5i6.1681>
- Yonata, F. (2022). Teaching and assessing intercultural communicative competence - revisited. *Intercultural Education*, 33(3), 355-357. <https://doi.org/10.1080/14675986.2022.2071038>
- Zawacki-Richter, O. (2020). The current state and impact of Covid-19 on digital higher education in Germany. *Human Behavior and Emerging Technologies*, 3, 218-226. <https://doi.org/10.1002/hbe2.238>