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The Effectiveness of Learning Management System (LMS) Use in Higher Education

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ABSTRACT

This study conducted a systematic review to assess the effectiveness of Learning Management Systems (LMS) in the context of higher education over the past decade. Following PRISMA guidelines and a structured methodological framework, peer-reviewed articles from a range of reputable academic databases were examined to uncover prevailing trends, key challenges, and effective practices in LMS adoption. The analysis demonstrated that LMSs played a significant role in fostering learning motivation, increasing student engagement, and improving the overall quality of the educational experience, particularly in online and blended learning settings. The effectiveness of LMS implementation was influenced by several factors, including the quality of digital instructional materials, the usability of the platform interface, the technological readiness of institutions, and the digital competencies of both educators and learners. Moreover, the review found that LMSs facilitated flexible learning pathways, enabled personalised content delivery, and supported performance tracking through integrated learning analytics. Despite these benefits, notable challenges persisted—most notably disparities in technology access, resistance to pedagogical innovation, and infrastructure deficiencies in underdeveloped, remote, or marginalised areas (commonly referred to as 3T regions: frontier, outermost, and disadvantaged). The study underscored the critical role of LMSs in the ongoing transformation of higher education in the digital era, highlighting the importance of aligning technological tools with pedagogical strategies and institutional policies. Ultimately, the findings provided important guidance for the development of more responsive, inclusive, and sustainable models for LMS integration that address both current demands and future advancements in higher education.

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1. INTRODUCTION

The advancement of information and communication technologies has revolutionised various aspects of human life, including the higher education sector. Digital transformation in

education is not merely cosmetic or administrative; it has fundamentally changed the way teaching, learning, and assessment are conducted. One tangible manifestation of this transformation is the use of Learning Management Systems (LMS), which are digital platforms designed to manage the entire learning process in both online and hybrid formats. LMSs enable instructors and students to interact beyond the constraints of time and space through features such as content delivery, online discussions, automated assessments, learning progress tracking, and real-time learning analytics.

In the face of the Fourth Industrial Revolution and the transition towards Society 5.0, LMSs have become a critical element in creating a flexible, inclusive, and adaptive higher education ecosystem [1], [2]. The momentum for LMS adoption was further accelerated by the onset of the COVID-19 pandemic in early 2020. In this emergency context, LMSs served as the backbone of distance education, filling the gap caused by restrictions on physical interaction. Universities around the world were forced to transform rapidly, making LMSs not just an option, but an urgent necessity. Interestingly, even as the pandemic has subsided, most institutions continue to utilise LMSs as part of a more modern and flexible approach to learning. This indicates that LMSs have evolved from being a temporary solution to becoming an integral component of contemporary higher education systems [3].

However, the transition to digital learning through LMSs has not always been seamless. The success of LMS implementation is not solely determined by the availability of technology but is also heavily influenced by human and institutional factors. Various studies have shown that LMS effectiveness varies widely depending on instructional design, active student engagement, educators' digital competencies, and institutional support [4], [5]. Moreover, challenges such as resistance to pedagogical change, lack of technical training, infrastructural limitations, and unequal access to technology—particularly in developing countries—remain significant obstacles [6], [7]. LMSs are also often not fully responsive to diverse learning styles, which may hinder the achievement of optimal learning outcomes.

This phenomenon suggests a gap between the pedagogical potential of LMSs and their realised benefits in practice. While some institutions have achieved significant improvements in teaching quality through LMS utilisation, others have experienced stagnation or even a decline in learning outcomes. In this context, a more comprehensive understanding of LMS effectiveness is essential—not only to assess success quantitatively but also to explore the qualitative dynamics that occur during implementation.

Previous studies have investigated LMS effectiveness from various perspectives, including user satisfaction, student academic performance, learning engagement, and institutional operational efficiency [8], [9]. However, the approaches used in these studies are highly diverse and often focused on specific contexts or LMS types such as Moodle, Google Classroom, or Blackboard [10]. This has resulted in findings that are fragmented and difficult to generalise globally. Additionally, many of these reviews emphasise technical aspects or final outcomes without delving into the social, cultural, and pedagogical contexts framing LMS implementation.

To address this gap, the present study aims to conduct a systematic review of academic literature examining the effectiveness of LMS use in higher education. The systematic approach allows for a thorough screening and analysis of existing evidence, taking into account the diversity of contexts, methodological approaches, and variables influencing LMS success. By synthesising findings from cross-disciplinary and cross-national studies, this review seeks to develop a comprehensive conceptual framework on the key factors determining LMS effectiveness.

The novelty of this review lies in its integration of pedagogical, technological, managerial, and sociocultural perspectives in evaluating LMS effectiveness. Unlike previous research that tends to be siloed or limited to certain dimensions, this study offers a holistic approach that simultaneously considers the processes, contexts, and outcomes of LMS implementation. As such, the findings may serve as a strategic foundation for decision-making by stakeholders in higher education, including institutions, policymakers, and LMS platform developers [11].

Globally, LMS adoption trends continue to rise. A report by the Educause Center for Analysis and Research (ECAR) shows that nearly all higher education institutions in the United States have adopted LMSs, with most lecturers actively using them to enhance the learning process [12]. Similar trends are observed worldwide, with various LMS platforms being used depending on

institutional preferences and local conditions. However, high adoption rates do not always translate into effective usage, as numerous implementation challenges remain.

Recent studies highlight the importance of robust instructional design, active student participation, and relevant content as key success factors for LMS use. Research by Verawati (2020), for instance, found that well-designed e-learning can enhance students' critical thinking skills [13]. Utomo et al. (2022) added that the quality of digital content in LMSs plays a vital role in supporting effective learning, particularly in language education contexts [14]. These findings suggest that technology is merely a tool; the quality of the learning process remains the decisive factor in success.

Lutfi et al. (2024), through their systematic literature review, emphasised that in the era of Society 5.0, LMS integration must consider the increasingly intertwined nature of digital life with students' everyday experiences. An effective LMS supports contextual, data-driven, and personalised learning [15]. Indrawatiningsih (2021) also found that using Moodle as a discussion forum can enhance mathematics students' argumentative skills, provided that teaching strategies are relevant and aligned with students' needs [16].

Research by Bahri et al. (2024) in the context of Indonesian secondary schools highlighted the importance of infrastructure readiness, human resource training, and managerial support in ensuring successful LMS implementation [17]. Although conducted at a different educational level, these findings remain relevant to higher education. Similarly, Budhayanti (2023) underscored the need for ongoing maintenance, feature updates, and alignment of LMS platforms with user needs to maintain their long-term effectiveness [18].

Given the complexity and dynamics surrounding LMS implementation, this systematic review is expected to provide meaningful contributions in formulating implementation strategies that are not only technically effective, but also pedagogically relevant, socially inclusive, and sustainable in the long term.

2. METHOD

A systematic review is a research method conducted in a structured and comprehensive manner to identify, evaluate, and synthesise research findings relevant to a specific topic or question. Unlike a traditional literature review, a systematic review employs a transparent and standardised approach, including clearly defined inclusion and exclusion criteria, a systematic literature search strategy, and replicable data analysis procedures. Its aim is to produce reliable and unbiased conclusions, as well as to provide a comprehensive overview of the available scientific evidence.

This study adopts a systematic review approach to identify, evaluate, and synthesise scientific evidence related to the effectiveness of Learning Management Systems (LMS) in higher education. The systematic review was selected because it enables the researcher to summarise previous research findings in a comprehensive, structured, and transparent manner, while also reducing potential bias in data interpretation [19]. This approach follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines as a framework to ensure the validity and replicability of the review [20].

The literature was collected from several leading academic databases, including: Scopus, Web of Science, ERIC (Education Resources Information Center), Google Scholar, and Garuda Ristekbrin (for Indonesian local literature). The main keywords used in the search were: ("Learning Management System" OR "LMS") AND ("higher education" OR "university") AND ("effectiveness" OR "impact" OR "evaluation"). The search strategy was adjusted to suit the syntax of each database to obtain optimal results. The search process was conducted iteratively, including cross-referencing (snowballing) from the reference lists of key articles.

Article selection was carried out in three stages: First, Identification: collecting all articles based on the predefined keywords. Second, Screening: filtering articles based on titles and abstracts to check initial relevance. And finally, Eligibility and Inclusion: evaluating the full content of the articles to ensure alignment with the inclusion criteria. Each selection stage was conducted independently by two researchers, and any discrepancies were resolved through discussion.

3. RESULTS AND DISCUSSION

The results of a systematic review of various academic literature published over the past decade indicate that the effectiveness of Learning Management Systems (LMS) in higher education is neither singular nor uniform, but rather highly dependent on a combination of interacting factors. Of the 65 articles that passed the final selection, at least seven key themes consistently emerged: the level of adoption and user perceptions of LMS, student engagement, lecturer competence and roles, the quality of instructional design, institutional readiness and support, technical and infrastructure challenges, and the socio-cultural context framing LMS usage.

Regarding the level of LMS adoption, the majority of studies report that LMS platforms have been widely adopted by higher education institutions across the globe, in both developed and developing countries. This adoption has become even more widespread since the COVID-19 pandemic, which dramatically accelerated digital transformation [3], [12]. However, the extent to which LMS are actively utilised by lecturers and students varies considerably. A study by Al-Fraihat et al. (2020) revealed that although LMS are available, not all instructors use them to their full potential. Many only use basic features such as material uploads and assignment submissions, while more interactive features like discussion forums, online quizzes, or learning progress tracking are often overlooked [21]. This highlights that the mere presence of an LMS does not automatically guarantee its effectiveness in enhancing the quality of learning.

Student engagement is a crucial theme in assessing LMS effectiveness. Several studies indicate that LMS can enhance active student participation, particularly through features such as online discussions, interactive quizzes, and gamification. A study by Verawati (2020) found that LMS-based learning can stimulate students' critical thinking and problem-solving skills if properly designed [13]. However, such engagement is heavily dependent on the quality of learning activity design and students' intrinsic motivation. In this context, instructional approaches that emphasise active, collaborative, and project-based learning are deemed more effective than traditional methods focused solely on information transmission [14], [16]. Engagement is also closely tied to perceived ease of use and the comfort of the LMS interface. If students find the LMS platform too complex or unintuitive, they are less likely to participate actively.

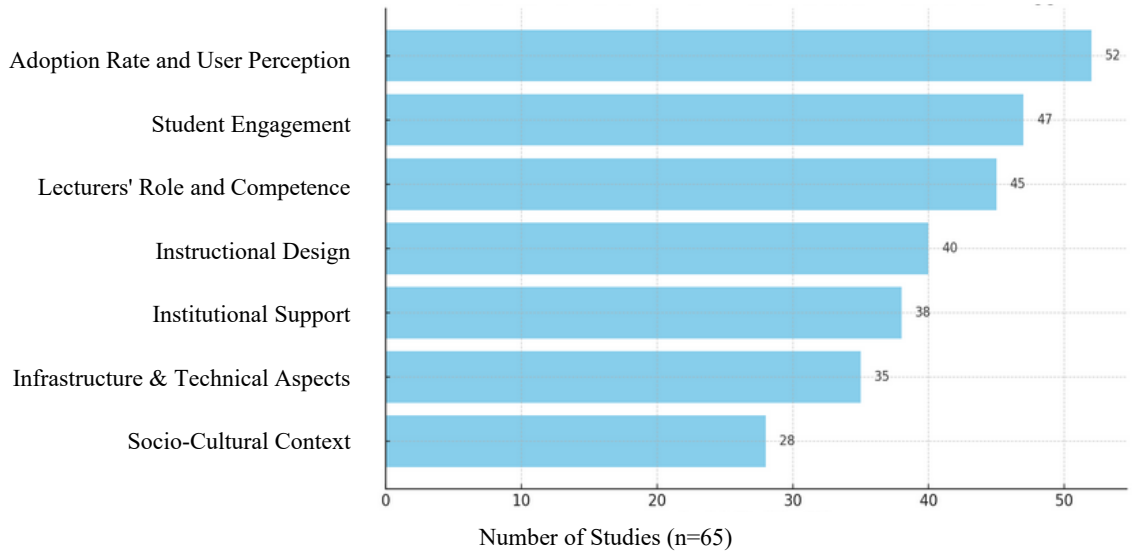
The role of lecturers as facilitators of digital learning is a crucial factor in the successful implementation of LMS. Many studies emphasise that lecturers' digital competence, particularly in designing content and managing online interactions, greatly affects LMS effectiveness [5], [15]. A study by Indrawatiningsih (2021) found that lecturers who actively moderate discussions in Moodle forums significantly improve the quality of mathematics students' argumentation [16]. This indicates that LMS are not merely technical tools, but require adaptive and innovative pedagogical approaches. Lecturers' readiness to shift from the role of information providers to facilitators also presents a unique challenge, especially for those accustomed to conventional teaching methods.

The quality of instructional design within LMS is a key determinant of its effectiveness. Instructional design encompasses course structure, navigation flow, content organisation, and the integration of meaningful learning activities. A study by Utomo et al. (2022) highlighted the importance of digital content quality in enhancing learning effectiveness, particularly in language education contexts [14]. Relevant, contextualised content integrated with interactive media such as videos, simulations, or educational games has been shown to improve student engagement and comprehension. However, many institutions lack standardised instructional design guidelines for LMS, resulting in widely varying course quality. Furthermore, the absence of adequate training or instructional design guidance often hampers the creation of optimal learning experiences.

Institutional readiness and support are components that cannot be overlooked. A study by Bahri et al. (2024) emphasised that LMS implementation success is strongly influenced by the readiness of technological infrastructure, human resource training, and managerial support [17]. Although the study focused on secondary schools, its findings remain relevant for higher education, given similar challenges. Institutional support includes reliable server provision, data security systems, technical help services, and policies that encourage active and innovative LMS usage. In many cases, LMS implementation failures are not due to poor systems, but rather the lack of systemic institutional support.

Technical and infrastructural challenges continue to be major obstacles, particularly in developing countries. Disparities in access to devices and stable internet connections result in some students falling behind in online learning processes. Additionally, LMS that are not optimised for mobile device use present further challenges, given that many students access learning solely via their phones. A study by Budhayanti (2023) highlighted the importance of system maintenance, feature updates, and adaptation to user needs to ensure LMS remain relevant and functional in the long term [18]. Static and undeveloped LMS can become burdens rather than solutions.

The socio-cultural context serves as an important frame influencing the dynamics of LMS implementation. Some studies show that LMS developed without considering social backgrounds, learning styles, and local values tend to receive limited user acceptance. Lutfi et al. (2024) stressed the importance of LMS integration into students' digital lives in the Society 5.0 era, where learning is increasingly contextual, data-driven, and personalised [15]. Rigid and uniform approaches are no longer adequate to address students' diverse learning preferences, motivations, and socio-economic conditions.



Graph 1. Determining Factors of LMS Effectiveness in Higher Education

Delving deeper into each main theme, findings from various studies reveal a complexity in the relationships between these factors. For instance, although student engagement is often linked to quality learning design, it is also heavily influenced by how lecturers facilitate interaction through the LMS. A study by Martín-Blas & Serrano-Fernández (2020) found that LMS equipped with rapid feedback features and active forums enhance students' perception of the value of online learning [22]. Students feel more appreciated and motivated when lecturer feedback is accessible and integrated into the system.

A study by Chen et al. (2021) found that perceived LMS effectiveness declines when lecturers lack the time or skills to utilise the full potential of the platform. This serves as evidence that digital competence among lecturers is not merely technical, but also includes pedagogical understanding for designing meaningful digital learning experiences [23]. The study recommends continuous training for lecturers so that they not only understand LMS features, but also can incorporate them within a robust instructional framework.

The issue of digital content quality is a particular concern in many studies. Content limited to transcripts or presentation files is often considered unengaging and ineffective in encouraging active student participation. Conversely, multimedia-based content—such as interactive videos, simulations, and podcasts—is more effective in capturing students' attention and facilitating the understanding of complex concepts. A study by Zhang et al. (2020) showed that courses with strong visual components had higher completion rates than text-based ones [24]. This reinforces the

view that visual design and multimodality in LMS are critical factors. To clarify these findings, Table 1 presents a thematic summary of the main studies analysed in this review::

Table 1. Thematic Focus of Studies in the LMS Systematic Review

Main Theme	Number of Studies	Example Studies	Key Findings
Adoption & User Perceptions	52	Al-Fraihat et al. (2020)	LMS widely adopted but limited to basic features
Student Engagement	47	Verawati (2020), Martín-Blas (2020)	LMS can enhance participation if designed with interactivity
Lecturer Roles & Digital Competence	45	Indrawatiningsih (2021), Chen et al.	Learning quality strongly depends on lecturer readiness and strategy
Instructional Design	40	Utomo et al. (2022)	Project-based and multimedia designs enhance learning effectiveness
Institutional Support	38	Bahri et al. (2024)	Infrastructure and training determine LMS sustainability
Technical Challenges	35	Budhayanti (2023)	Device and network limitations affect access and user satisfaction
Socio-Cultural Context	28	Lutfi et al. (2024)	LMS must be aligned with students' lifestyles and backgrounds

The interconnection between the factors in the table also suggests the need for a systemic approach to LMS implementation. Technically strong LMS that are not supported by lecturer readiness or the appropriate social context will fail to maximise their educational potential.

In some studies, the dimensions of sustainability and continuous improvement in LMS have begun to receive attention. Many institutions still use outdated LMS versions or cease development after initial implementation. A longitudinal study by Sorensen & Takle (2022) found that without regular evaluations of LMS performance, institutions tend to lose sensitivity to changing user needs [25]. Such evaluations include measuring user satisfaction, analysing activity logs, and conducting perception surveys on online learning.

Focus on specific platforms, as shown in the previous pie chart, reflects a tendency for research to centre around popular systems such as Moodle, Google Classroom, and Blackboard. Moodle, for instance, is widely used in higher education due to its open-source nature, customisability, and large user community. This offers high flexibility in integrating new features such as gamification plugins, learning analytics, and integration with academic information systems.

Findings indicate that advanced features remain underutilised. A study by Mustofa et al. (2023) revealed that most Moodle users only utilise 40–60% of the available features, typically accessing materials, discussion forums, and assignment submissions, while features such as analytics, reflection, and progress tracking are rarely used [26]. This indicates a gap between the technical potential of LMS and their actual implementation in learning contexts.

Technology integration with pedagogical strategies is a key indicator of LMS success. LMS are not merely content repositories but are also spaces for pedagogical interaction. In this regard, several studies recommend using blended learning or flipped classroom approaches to optimise LMS. A study by Mahendra & Sukmawati (2021) found that implementing an LMS-based flipped classroom enhances student participation and deepens conceptual understanding through asynchronous discussions [27]. LMS allows students to study materials in advance, then engage in case or problem-based discussions in class—a strategy proven to improve learning outcomes.

Experts from various institutions have also provided concrete examples of effective LMS implementation approaches. For instance, Universitas Gadjah Mada developed an internal Moodle-based LMS integrated with the academic system and featuring online attendance tracking. An evaluative study by Wahyuni et al. (2022) showed that this system encouraged better compliance

among lecturers in uploading materials and providing timely assessments [28]. A similar initiative at the National University of Singapore saw the development of adaptive learning analytics via Canvas to monitor student engagement and deliver personalised interventions [29].

Another noteworthy finding emerges from the socio-cultural context. Studies from Pakistan and Indonesia show that LMS overly reliant on foreign languages or that fail to consider local interaction norms (e.g., lecturer-student hierarchies) often face adoption barriers. Hence, local adaptation is key to LMS effectiveness in non-Western contexts. Successful LMS are those that are "grounded" in local language, formats, and interactional values [30].

Although LMS adoption trends are increasing, implementation challenges still pose significant obstacles to achieving optimal effectiveness. These challenges are not only technical but also structural, cultural, and social. One of the most frequently highlighted issues in the literature is digital access inequality, particularly in developing countries.

Several studies from Indonesia, Nigeria, and India show that infrastructure limitations such as slow internet, expensive digital devices, and power outages significantly hinder LMS effectiveness among students and lecturers [31], [32]. Students from rural or economically disadvantaged areas often struggle to participate fully in online learning, leading to academic achievement disparities between those with and without access to technology.

Digital literacy is another critical factor in LMS success. A study by Rahman et al. (2022) revealed that a lack of intensive training for lecturers results in limited use of LMS features, with little innovation in content delivery or assessment [33]. Consequently, LMS becomes merely a "digital vessel" for traditional (chalk-and-talk) approaches, without yielding significant pedagogical shifts.

To assess institutional readiness for LMS adoption, some studies employed frameworks such as Technological Pedagogical Content Knowledge (TPACK) or the Institutional Readiness Framework. The findings show that many institutions lack internal policies, technical support systems, and organisational cultures that support full LMS integration [34].

In terms of inclusivity, many LMS platforms are not yet fully accessible to users with disabilities or diverse learning styles. Few platforms offer features such as screen readers, automatic subtitles, or voice-based navigation. A study from Australia by Lim & Ford (2023) noted that although institutions have adopted universal design for learning (UDL) principles, practical implementation still lags, mainly due to lecturers' lack of training in creating inclusive digital content [35].

Based on these findings and discussions, it can be concluded that the effectiveness of Learning Management Systems (LMS) in higher education is determined by the complex interaction between technological, pedagogical, institutional, and socio-cultural aspects. Although LMS implementation has shown positive impacts on learning quality, success is highly dependent on robust instructional design, active student engagement, lecturers' digital competence, and adequate managerial and infrastructural support. This review affirms that technology is merely a tool, while the quality of the learning process and the readiness of the educational ecosystem are the primary determinants. Therefore, a holistic, adaptive, and context-based approach is essential in designing sustainable LMS implementation strategies that are relevant to the challenges of higher education in the digital era.

4. CONCLUSION

Based on a systematic review of various academic literature over the past ten years, it can be concluded that Learning Management Systems (LMS) have become a crucial component in the digital transformation of higher education. In general, LMS implementation has demonstrated a positive contribution to learning flexibility, expanded access, and increased student engagement in academic processes. LMS are not merely technological tools, but also new pedagogical spaces that facilitate learning across time and space. Although adoption levels have increased globally, the effectiveness of their utilisation remains highly dependent on the readiness and strategic approach of institutions in managing these changes comprehensively.

The findings of this review indicate that the successful use of LMS is not solely determined by the availability of technical features or the platform employed, but is significantly influenced by appropriate instructional design, active student participation, and the digital competence of educators. Furthermore, institutional support in the form of training, internal policies, and adequate infrastructure has proven to play a major role in promoting optimal use of LMS. Access disparities and resistance to change remain challenges, particularly in the context of developing countries, thus requiring inclusive and contextual approaches in formulating implementation policies.

Empirically, this review highlights the importance of a holistic approach in assessing and developing the effectiveness of LMS in higher education. An effective LMS is not only technologically sophisticated, but also pedagogically relevant, adaptive to student needs, and integrated within a sustainable educational management system. The integration of pedagogical, managerial, and socio-cultural perspectives is key to designing a digital learning ecosystem that is not only efficient, but also meaningful and transformative for all stakeholders within the higher education environment.

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