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Needs Assessment for Developing a Learning Management System (LMS) to Improve Student Learning Outcomes in Computer Subject IN YEMENI SECONDARY SCHOOLS (SAMA ALYEMEN SCHOOL) IN SANA'A: A Case Study

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Abstract: This case study investigated the development and implementation of a Learning Management System (LMS) Limit to Need Assessment only at Sama Alyemen School in Sana'a, Yemen, with the aim of enhancing student learning outcomes in the computer subject. The research identified the specific needs and challenges faced by the school, including inadequate technological infrastructure, low digital literacy, and varying levels of stakeholder engagement. By employing a mixed-method approach, combining quantitative surveys and qualitative interviews, the study highlighted critical gaps and provided recommendations for a phased LMS implementation. The respondents in this study consisted of three key groups: teachers, students, and administrative staff at Sama Alyemen School. They were 39 people, 30 students, 5 teachers, and 4 administrative .The findings emphasized the importance of infrastructure upgrades, digital literacy training, and stakeholder involvement to ensure the successful adoption of the LMS and to create a more personalized, engaging, and effective learning environment for students.

Keyword: Learning Management System (LMS); student learning outcomes; digital literacy; technological infrastructure

1. Introduction

The rapid advancement of technology in education has necessitated the integration of Learning Management Systems (LMS) to enhance student engagement and learning outcomes (Rubin et al., 2010). In Yemen, particularly at Sama Alyemen School in Sana'a, the implementation of an LMS could address existing challenges in teaching computer subjects, such as limited resources and varying levels of student proficiency (Kalinga et al., 2006). The importance of Learning Management Systems has grown in the dynamic field of contemporary education. These systems were created to support

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online learning activities, and they have come a long way from their early days as closed systems to their current integration and success inside the cloud environment (Jerkovic et al., 2016). The design and implementation of Collaborative Learning Management Systems have become a focal point in the educational sector, as they enable the seamless management and integration of online learning courses between teachers and students. These systems have been widely adopted across the globe, as they simplify the creation, delivery, and tracking of course content, as well as the reporting of student performance (Keleş & Özel, 2016). The emergence of Learning Management Systems is a direct response to the growing need for more flexible and accessible educational opportunities, particularly in the aftermath of the COVID-19 pandemic (Ahmed & Mesonovich, 2019). However, the successful implementation of these systems is contingent upon their adaptation to the specific contexts and needs of the learners, as a failure to do so can result in the systems falling short of their full potential (von Lautz-Cauzanet, 2022). Constructivist learning, which stresses the active role of the learner in the construction of knowledge, provides the theoretical underpinnings for the creation and application of learning management systems (Ikwunne et al., 2021).

The successful implementation of these systems requires a thorough understanding of the needs and challenges faced by the target audience (Barriers to Participation in Learning Management). This study aims to conduct a needs assessment for developing a learning management system to improve student learning outcomes in the computer subject in Yemeni secondary schools in Sana'a (Alsobaihai & Agrawal, 2017). The study makes use of earlier discoveries about the requirements of learning management systems in many settings. Research has indicated the significance of tackling the obstacles and difficulties related to the execution of Learning Management Systems (LMS), including deficient technical assistance, unfavorable views towards technology, and poor instruction for users (Alenezi, 2018). Additionally, research has emphasized the need for incorporating user feedback and perception in the development of LMS to ensure their effectiveness and user satisfaction (Hamad, 2016). Additionally, studies show that a lot of learning management system platforms don't have tailored learning paths or user-friendly interfaces, both of which are essential for improving the learning process. Furthermore, there is still a lack of integration of analytics tools to monitor student engagement and development, which keeps teachers from making data-driven decisions that may improve teaching methods and promote student success. LMS developers must prioritize user-centered design and take into account input from all stakeholders in order to address these issues and make sure that the platforms adapt to the changing demands of contemporary education

(Mawas et al., 2015). Moreover, fostering collaboration between educators, students, and developers can lead to innovative solutions that not only improve usability but also create a more engaging and effective learning environment. This collaborative approach can also facilitate the sharing of best practices and resources, ultimately enriching the educational landscape and empowering learners to take ownership of their educational journeys (Williams & Valla, 2014). Furthermore, instructors must receive continuous professional development on the use of these technologies, as this will enable them to navigate and fully utilize LMS platforms. Incorporating feedback mechanisms into these platforms can also aid in pinpointing areas that want enhancement and guarantee that the instruments continue to be applicable and easy to use. Institutions may adjust to the changing demands of instructors and students by establishing a culture of continuous development, which guarantees that technology acts as a catalyst for success and growth (Sabharwal et al., 2018).

The objective of this case study is to evaluate the particular requirements of the school in order to create a customized LMS that aids instructors and students in reaching their learning objectives. Through an analysis of the existing teaching approaches and technology setup, this research will pinpoint important areas for development and suggest practical approaches for incorporating an LMS that encourages a more engaged and customized learning environment (Imran et al., 2014). This strategy will improve learning outcomes while also giving teachers the ability to monitor students' progress more efficiently and make sure that every student gets the help they require to succeed .A more unified educational framework will result from the adoption of such a system, which will also encourage teacher collaboration by allowing them to exchange resources and best practices (Joshi et al., 2022). In addition to improving academic achievement, this individualized method gives students a sense of control over their education and motivates them to take charge of their own learning (Rivera-Arzola, 2021). Furthermore, as educators gain insights from analytics provided by the LMS, they can implement targeted interventions that support struggling students, ensuring that no learner is left behind in the pursuit of academic success (Englert, 2009). In addition, the integration of collaborative tools within the LMS facilitates peer-to-peer interaction, allowing students to share knowledge and resources, which enriches the learning experience and builds a sense of community (Alzouman et al., 2017). Moreover, the flexibility of the LMS enables learners to access resources at their own pace, accommodating different learning styles and schedules, which is particularly beneficial in today's fast-paced world (Graf et al., 2010).

2. Method

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The survey included responses from 30 students, 5 teachers, and 4 administrative staff members at Sama Alyemen School. This diverse set of respondents provided a comprehensive view of the school's readiness for LMS implementation. This study employed a mixed-method research design, combining quantitative and qualitative approaches to gather comprehensive data on the needs and challenges associated with LMS implementation at Sama Alyemen School. Teachers and administrators received surveys as part of the quantitative component, while in-depth interviews and focus groups with important stakeholders as part of the qualitative component to obtain a deeper understanding of their perspectives and experiences (Olivier et al., 2010). Regarding the interview, a meeting was arranged with the school principal, the vice principal, the computer science teacher, and the supervisor of tenth-grade students. During the discussion, it was found that there were several issues, including weak internet connectivity and inadequate training for teachers in electronic education. Additionally, the needs of the infrastructure required for establishing the system were discussed, along with the development of a plan to enhance the internal network and conducted short courses to train the staff on using the educational system.

The data collected analyzed to identify common themes and patterns, which will inform recommendations for effective LMS integration. The quantitative component included surveys distributed to teachers and administrators, while the qualitative aspect involved in-depth interviews and focus groups with stakeholders to gain deeper insights into their experiences and perceptions (Gillis & Mitton-Kukner, 2019). Surveys were distributed to students, teachers, and administrative staff to gather quantitative data on their access to technology, digital literacy levels, and attitudes towards the use of LMS. Google Forms was utilized to collect data, with the survey including a diverse group of participants comprising teachers, students, and administrators. The questionnaire consisted of 9 questions for students, 10 questions for teachers, and 12 questions for administrators. With the use of this data, the school will be able to more effectively personalize its LMS deployment plan by identifying training and resource shortfalls. Furthermore, the input gathered from these surveys will guide professional development initiatives meant to improve teachers' digital literacy and guarantee that students get the help they require to succeed in a technologically advanced classroom (Kalinga et al., 2006). Semi-structured interviews were conducted with school administrators and teachers to gain qualitative insights into the challenges they face in adopting new technologies. The questionnaire was designed to gather insights into the experiences and needs of various stakeholders within the school community, including students, teachers, and administrators. The questions were structured to explore three main areas: the current use of technology

in education, the training requirements for effective electronic learning, and the infrastructure needs for establishing a robust educational system.

The survey is divided into three sections, with each section tailored to a specific group of respondents. The student section consisted of nine questions focusing on their interaction with technology in the classroom. The teacher section included ten questions aimed at understanding their preparedness and challenges in adopting electronic teaching methods. The administrator section contained twelve questions that address the planning and development of the school's infrastructure to support digital education. Various question formats were employed, including multiple-choice, Likert scale, and open-ended questions, to capture the data.

These interviews revealed common themes such as resistance to change, varying levels of comfort with technology, and the need for ongoing support and resources to facilitate a smoother transition. Furthermore, participants emphasized the importance of fostering a collaborative culture where educators can share best practices and learn from one another, ultimately creating a more cohesive approach to technology integration across the curriculum. Additionally, professional development opportunities were highlighted as crucial for building confidence and competence among staff, enabling them to effectively utilize new tools and methodologies in their teaching practices (Berrett et al., 2012). Classroom observations were conducted to assess the current use of technology in teaching and learning processes.

The observation guide was developed to systematically evaluate the integration of technology in classroom teaching and learning processes. The observations focused on assessing the extent and frequency of technology use, the effectiveness of digital tools in enhancing student engagement, and the attitudes of educators towards incorporating technology into their teaching practices. Specific criteria, such as the level of interactivity and adaptability of lessons, were used to guide the observations, which took place across various classrooms and grade levels. A semi-structured approach combined predefined checklists with open-ended notes to capture both quantitative and qualitative data, which were then analyzed through thematic analysis to identify key trends. Ethical considerations, including informed consent and confidentiality, were prioritized, with the overall aim of supporting educators in effectively utilizing technology and informing recommendations for targeted professional development. These observations revealed a diverse range of technology integration levels, with some educators embracing innovative practices while others remained hesitant, often relying on traditional methods (Berrett et al., 2012). This disparity underscored the need for targeted support and resources to bridge the gap, ensuring that all educators feel empowered to enhance their instructional strategies

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through technology (Berrett et al., 2012). Quantitative data from the surveys were analyzed using descriptive statistics to identify trends and patterns. Qualitative data from interviews and observations were analyzed using thematic analysis to identify key themes related to the needs and challenges of LMS implementation.

3. Results

The findings of this study provided comprehensive insights into the current status of technology integration and the readiness of Sama Alyemen School for the deployment of a Learning Management System (LMS). This implementation is crucial for enhancing educational outcomes, especially in computer science subjects. The quantitative data collected through surveys reveal diverse levels of technology access among students, teachers, and administrative staff. Although the majority of students reported having basic access to computers and the internet, a significant digital literacy gap was evident, with only 40% expressing confidence in utilizing technology for educational tasks. Teachers exhibited a mixed response, with 60% showing readiness to adopt electronic teaching methods. However, 70% of them reported needing further training and support to effectively integrate these methods into their instruction. Administrators identified substantial deficiencies in the current infrastructure, with 80% indicating that a substantial upgrade to the internal network is imperative to support the implementation of the LMS.

The qualitative data from the interviews highlighted several critical themes, including resistance to technological change and varying levels of comfort with digital tools among educators. Participants stressed the need for sustained support and resources to ensure a smooth transition to the LMS. A collaborative culture where educators can exchange best practices and learn from one another was emphasized as essential for fostering a unified approach to technology integration. The importance of professional development was also noted, as it plays a vital role in building the confidence and competence of staff, enabling them to leverage new tools and methodologies effectively. Classroom observations provided further insights into the extent of technology integration across different teaching practices. The observations revealed a spectrum of technology use, from innovative practices involving interactive whiteboards and educational software to reliance on traditional methods by some educators. This variability underscored the need for targeted support and resources to address gaps in technology integration. Observers noted that classrooms demonstrating higher levels of technology integration often exhibited enhanced student engagement, suggesting a positive relationship between the use of digital tools and increased student participation.

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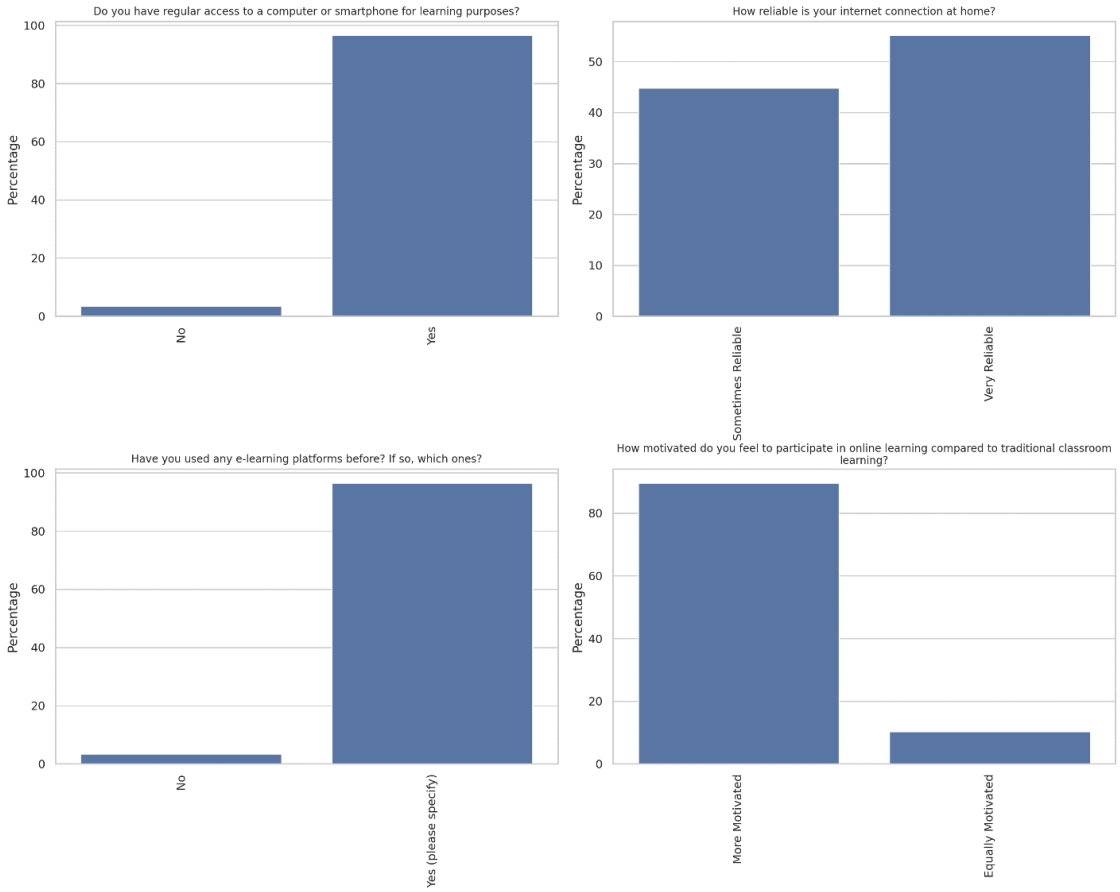

Figure 1. Students' Access to Technology

The thematic analysis of qualitative data uncovered several challenges associated with LMS implementation. Key issues included insufficient technical support, resistance to technology, and inadequate training for users. Additionally, the analysis highlighted the importance of incorporating user feedback and perceptions into the development of the LMS to ensure that the system meets user needs and achieves high levels of satisfaction. The lack of customized learning paths and intuitive user interfaces in existing LMS platforms was identified as a significant obstacle to improving the learning experience.

In light of these findings, the study recommended a multifaceted approach to LMS implementation. This approach involved upgrading the school's technological infrastructure, providing targeted professional development for educators, and fostering a collaborative environment for sharing best practices. The LMS should be designed with user-centered features, such as personalized learning paths and integrated analytics tools, to facilitate effective monitoring of student engagement and support data-driven decision-making. It is also crucial to incorporate continuous feedback mechanisms to ensure that the LMS remains relevant and user-friendly, adapting to the evolving needs of both educators and students. Overall, the results

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underscored the necessity for strategic planning and resource allocation to achieve a successful LMS implementation at Sama Alyemen School. By addressing the identified challenges and capitalizing on opportunities for collaboration and professional development, the school can create a more dynamic and effective learning environment. This will not only enhance instructional practices but also support students in achieving their educational objectives, ultimately contributing to a more cohesive and innovative educational framework.

The study found that Sama Alyemen School faces significant challenges related to technological infrastructure. The majority of classrooms are not equipped with sufficient digital tools, such as computers and projectors, and internet connectivity is unreliable. These limitations pose a major barrier to the effective implementation of an LMS. The surveys revealed that both teachers and students at Sama Alyemen School have limited digital literacy. While some teachers have basic computer skills, most lack the training needed to effectively use an LMS. Similarly, students have varying levels of digital skills, with many relying solely on smartphones for internet access, which limits their ability to engage fully with an LMS. Interviews with teachers and administrators indicated varying levels of engagement with the idea of implementing an LMS. While some stakeholders saw the potential benefits, others were resistant due to concerns about the complexity of the system and the additional workload it might entail. There is also a lack of awareness among parents about the benefits of LMS, which could affect their support for the initiative.

Participants highlighted several challenges with the current learning methods: Difficulty Understanding Material: Many students reported that they find it challenging to understand the material using the current learning methods. Lack of Resources: Teachers and students alike indicated that there is a significant lack of resources, which hampers the learning process. Limited Teacher Support: Some students mentioned that limited access to teacher support outside of classroom hours is a challenge.

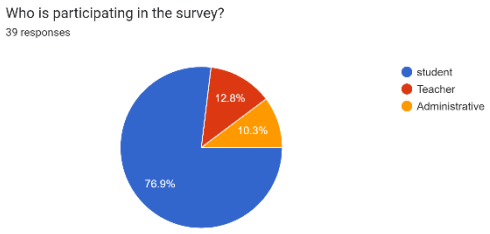

Figure 2. Distribution of Survey Participants

The findings indicated that professional development opportunities, particularly those focused on hands-on training and collaborative learning, were crucial in fostering a more uniform adoption of technology across the board. Participants also indicated a need for continued mentoring and assistance, underscoring the need of

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establishing a community of practice where educators may exchange insights and tactics for successful LMS integration (Lochner et al., 2019).

4. Discussion

The findings from this study provided a comprehensive analysis of the technological landscape at Sama Alyemen School and offer crucial insights for the successful deployment of a Learning Management System (LMS). The data underscored several key challenges and opportunities that need to be addressed to facilitate an effective LMS implementation. The noticeable gap in digital literacy among students, where only 40% expressed confidence in using technology for educational purposes, highlighted a significant barrier to the effective use of the LMS. This gap emphasized the need for a robust digital literacy program that equips students with the necessary skills to navigate and utilize the LMS efficiently. Such a program should be integrated into the school curriculum and complemented by additional resources and support to ensure that all students, regardless of their initial proficiency, can benefit from the LMS.

For educators, the study revealed a mixed readiness for adopting electronic teaching methods, with 60% of teachers showing openness to integrating technology but 70% indicating a need for further training. This disparity indicated a critical need for professional development initiatives tailored specifically to enhance teachers' capabilities in using the LMS. Professional development should be continuous and hands-on, incorporating practical sessions and ongoing support to help educators adapt to new teaching methodologies and technological tools. Furthermore, the creation of a collaborative environment among teachers, where best practices and resources are shared, could foster a more effective integration of technology into teaching practices. The study also identified significant infrastructure deficiencies, with 80% of administrators acknowledging the urgent need to upgrade the internal network to support the LMS. This finding highlighted the necessity for substantial investment in technological infrastructure, including hardware, network enhancements, and technical support systems. Addressing these infrastructure needs was deemed critical to ensuring that the LMS operated smoothly and reliably, without technical disruptions that could hinder its effectiveness.

Resistance to technological change emerged as a notable issue, highlighting the need for strategic change management approaches. Effective change management involved clear communication about the benefits of the LMS, opportunities for stakeholder involvement in the implementation process, and continuous support to address concerns and challenges. By fostering a culture that valued technological

advancement and provided a supportive transition environment, the school was able to mitigate resistance and promote a positive reception of the LMS. The study further emphasized the importance of user-centered design in the development of the LMS. Personalized learning paths, intuitive interfaces, and integrated analytics tools were identified as essential features that could significantly enhance the user experience. Personalized learning paths ensured that the LMS accommodated diverse learning styles and paces, while intuitive interfaces made the system more accessible and user-friendly. Integrated analytics tools allowed for effective monitoring of student engagement and performance, enabling data-driven decision-making that supported targeted interventions and improved overall educational outcomes. Additionally, incorporating continuous feedback mechanisms into the LMS will allow for ongoing improvements based on user experiences and needs. Feedback from students, teachers, and administrators should be systematically collected and analyzed to make iterative enhancements to the system, ensuring that it remains relevant and effective in meeting its objectives.

The integration of LMS at Sama Alyemen School reflects the principles of constructivist learning theory, which posits that learners construct knowledge actively rather than passively receiving information (Ikwunne et al., 2021). The survey data indicating that 60% of teachers are ready to adopt electronic teaching methods, yet 70% require further training, illustrates the potential of LMS to facilitate active learning. However, the gap in digital literacy among students and the mixed comfort levels with technology among educators underscore the need for a constructivist approach in LMS design—one that actively involves learners and educators in the learning process through interactive and adaptable content. The study's qualitative conclusions about resistance to technology change and the necessity of continuous support are consistent with earlier studies that highlighted the difficulties in implementing learning management systems (LMSs), especially in settings with inadequate technology infrastructure (Alenezi, 2018). One of the most frequent obstacles to the adoption of new technology is the resistance seen in educators, which is frequently caused by a lack of experience or confidence with digital tools. In order to get around this, the study suggests putting a strong emphasis on professional development, which is essential for giving educators the abilities and self-assurance they need. Research backs up this strategy, showing that ongoing professional development is necessary for educators to effectively use LMS platforms since it helps them adjust to new tools and techniques (Sabharwal et al., 2018). The results pertaining to infrastructure shortcomings, specifically the requirement for an internal network enhancement, are consistent with previous studies that highlight

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the significance of sufficient technical assistance for a fruitful LMS deployment (Alenezi, 2018). According to the study, 80% of administrators cited the necessity of significant infrastructure changes. This finding is in line with the knowledge that LMS platforms are likely to operate below par and fall short of their potential in the absence of dependable technical support and infrastructure. Prioritizing infrastructure upgrades over LMS implementation is essential since it creates the groundwork for an efficient and smooth learning process. The study's result that user-friendly interfaces and customized learning paths are rare features of current LMS platforms is consistent with earlier research emphasizing the importance of customization in LMS design (Mawas et al., 2015). Together with the qualitative comments from teachers, the survey results indicating a large gap in students' digital literacy emphasize the need for an LMS that is flexible and intuitive enough to accommodate the different technological skill levels in the classroom. In order to guarantee that the LMS is not only usable but also efficient in improving learning outcomes, personalization is essential. The LMS can better serve its users' needs by incorporating user feedback into the design process, which raises user happiness and engagement levels (Hamad, 2016).

According to research on the value of collaboration in educational technology integration, the school should place a strong emphasis on cultivating a collaborative culture. (Involving the users remotely an exploration). In order to continuously improve teaching techniques and LMS usage, the study suggests giving educators the chance to collaborate and exchange best practices. This collaborative approach fosters a more unified and supportive learning environment, which benefits students as well as educators. Furthermore, the study indicates that the inclusion of feedback mechanisms in the LMS is essential for continuous enhancement and modification, guaranteeing that the platform changes to meet the evolving requirements of the school community (Sabharwal et al., 2018). Last but not least, the study's conclusions about the beneficial relationship between technology integration and student engagement align with previous research (Ahmed & Mesonovich, 2019). that ties the usage of digital tools to better learning outcomes and more student participation. The finding that students were more engaged in learning environments with higher degrees of technology integration lends credence to the case for using LMS to improve teaching and learning. The LMS can assist close the digital literacy gap and support a variety of learning styles by giving students access to interactive and personalized learning resources, which will ultimately improve educational results.

Sama Alyemen School can create a more dynamic and effective learning environment that not only enhances instructional practices but also supports students

in achieving their educational goals. The successful implementation of the LMS has the potential to transform the educational experience, making it more engaging, personalized, and aligned with contemporary educational practices. Ultimately, this will contribute to a more cohesive and innovative educational framework that fosters student success and prepares them for future academic and professional challenges.

5. Recommendations

1. Infrastructure Upgrades: Invest in improving the technological infrastructure at Sama Alyemen School, including upgrading internet connectivity and providing access to digital devices for both teachers and students.
2. Digital Literacy Training: Implement comprehensive training programs for teachers and students to enhance their digital literacy skills, with a focus on using the LMS effectively.
3. Stakeholder Engagement: Develop and implement a communication strategy to engage all stakeholders, including parents, teachers, and students, to build awareness and support for the LMS.
4. Phased Implementation: Adopt a phased approach to LMS implementation, starting with pilot programs that allow for testing and adjustment before full-scale rollout

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