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Beyond Storage: Evaluating the Utilization of Learning Management Systems in Higher Education

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Abstract:

In the rapidly evolving landscape of higher education, the integration of Learning Management Systems (LMSs) has become pivotal, transcending mere content uploading to necessitate a deeper fusion of technology, pedagogy, and content knowledge, as emphasised by the Technological Pedagogical Content Knowledge (TPACK) model. This study addresses the knowledge gap in assessing the alignment of the usage LMSs with the TPACK. Usage patterns of the LMS were analysed and questionnaires were distributed and completed by 63 academic staff members. Analysing LMS usage patterns and distributing questionnaires to academics reveals the predominant use of LMSs for basic content storage, with limited incorporation of multimedia resources and infrequent utilisation of external and analytical tools. These findings raise concerns about universities' optimal utilisation of technology investments, highlighting the need to reassess LMS value and potential redesign. The study underscores the importance of enhanced training and support for academics to align LMSs with TPACK principles, emphasising the necessity of understanding this relationship. By doing so, educators can employ transformative strategies that extend beyond conventional boundaries, offering a more enriched educational experience.

Keywords: Higher education, Integration, Learning Management Systems (LMSs), Technological Pedagogical Content Knowledge (TPACK), Transformative education

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Introduction

The evolution of technology in education has ushered in transformative changes in higher learning(Hashim et al., 2022). Over the years, technology has played a pivotal role, progressing from the mere adoption of computers to the widespread use of digital tools and platforms, revolutionising the educational landscape. This evolution is linked to the ever-increasing demand for innovative approaches to teaching and learning, particularly in the higher education sector (Gopal, 2020).

(Lai & Bower, 2019)discuss the emergence of various technologies in higher education, such as intelligent technology, interactive tools, and engineering innovation, underscoring the significance of educational technologies in enhancing the quality of higher education. Similarly, (Dimitriadis, 2020) explores the role of chatbots in the learning process, highlighting the numerous benefits associated with their adoption in education.

One significant transition in higher education is the adoption of Learning Management Systems (LMSs). Reports from Bulgaria indicate that over 92% of higher education institutions now utilise LMSs for online learning (Blagoeva-Karamfilova & Parusheva, 2022). However, implementing LMS in a multi-cultural context comes with its own challenges, including cultural norms, language development, and the diffusion of technology (Vance & Crawford, 2013)

While LMSs offer many opportunities, such as enhanced learning experiences, flexibility in remote learning, data analytics, communication, collaboration, and integration with third-party tools, unlocking their full potential requires a skillset that seamlessly combines technical expertise, pedagogical knowledge, and subject content (Szymkowiak et al., 2021) The Technological Pedagogical Content Knowledge (TPACK) model emphasises the importance of this synergy, advocating for educators to operate at a higher level of technology integration.

Despite the proliferation of LMS platforms in educational environments, there remains a critical gap in understanding how educators effectively harness these systems within the TPACK framework to enrich teaching and learning. While various studies have explored LMS adoption and e-learning material development, the integration of LMSs within the TPACK framework is relatively uncharted territory. The TPACK model highlights that effective technology integration transcends mere technological proficiency and necessitates the seamless fusion of pedagogical and content knowledge (Zhou et al., 2023).

This research gap underscores the need to investigate how educators in higher education employ LMSs within the TPACK framework. By addressing this gap, valuable insights can be gained to identify best practices for leveraging technology to enhance the overall teaching and learning experiences.

To bridge this gap, this paper employs a multifaceted approach. We analysed usage data of the LMS from both the student and academic perspectives and administer questionnaires to academics to investigate how and for what purposes they use the LMS. The survey questions are structured within the context of the TPACK framework, with the aim of evaluating how academics infuse technology, pedagogy, and content knowledge when utilising the LMS.

The general findings of this research reveal that LMSs are predominantly used as repositories for subject notes and slides, with limited use of multimedia resources by academics. Integration with external tools and the use of analytical tools by lecturers are also infrequently observed.

These findings have significant implications. Universities may be investing in technologies that are not fully utilised, prompting a need to reassess the value that LMSs provide and potentially redesign these platforms. Additionally, there is a clear call for enhanced training and support for academics to maximise the potential benefits of LMSs in higher education.

The subsequent sections of this paper are structured as follows: Section 2 presents a brief literature review, while Section 3 outlines the methodology employed in this study. Section 4 provides the results and their analysis, and Section 5 concludes the paper, offering insights into the future of LMS integration in higher education.

Related Work

The integration of Learning Management Systems (LMS) into higher education has been a transformative shift, yet its adoption and effective utilization are influenced by a myriad of complex factors. This literature

review engages in a comparative and interpretive analysis of recent studies, aiming to uncover the nuanced dynamics of LMS adoption, usage, and impact within the higher education sphere.

The diverse challenges in LMS adoption are prominently highlighted in the studies by (Gani & van den Berg (2019) and Dlalisa & Govender (2020). Gani & van den Berg (2019)focus on infrastructural and resource-related impediments in open distance learning, illuminating how external factors can significantly hinder LMS potential. Conversely, Dlalisa & Govender (2020)highlight internal challenges, particularly the disparity between lecturers' acceptance of LMS and its actual utilization. These studies collectively underscore the necessity of aligning both external facilitating conditions and internal user attitudes for effective LMS integration.

The potential of LMS to revolutionize teaching methodologies is vividly explored in the works of Palahicky & Halcomb-Smith (2020) and Mohamed & Vengrasalam, (2022). While Palahicky & Halcomb-Smith, (2020) advocate for transformative power through case-based and gamified learning, Mohamed & Vengrasalam, (2022) propose a structured implementation model, emphasizing a systematic approach to harnessing LMS's educational benefits. This juxtaposition reflects a transition in LMS research from recognizing potential to seeking structured, actionable strategies for its integration into teaching practices.

Further, the studies by Darko (2022) and Fernando Raguro et al., 2022) delve into the relationship between LMS engagement and student performance. Darko's study finds a positive correlation between LMS usage time and academic outcomes, nuanced by fluctuating student engagement patterns. Fernando Raguro et al., 2022) highlight the negative impact of low engagement in online learning, suggesting a critical link between active engagement and academic success.

Contrasting perspectives on LMS adoption are revealed in the research by Lasanthika & Tennakoon, (2019) and Green & Chewning (2020). Lasanthika & Tennakoon's study of differing priorities between students and teachers in LMS usage offers insights into user experience, with students valuing satisfaction and usefulness, while teachers focus on ease of use. Green & Chewning (2020) observe that the most utilized LMS features are those related to the static transfer of information, indicating a potential underutilization of interactive features.

Lastly, Kamalludeen et al. (2018) highlight the critical role of instructors in enhancing student engagement with LMS. Their findings suggest that instructor involvement is a driving force in shaping student interaction with LMS, underscoring the need for a proactive, instructor-led approach in LMS usage.

This analysis unveils a landscape where LMS usage in higher education is as promising as it is challenging. The studies collectively highlight the need for a holistic approach in LMS integration, considering infrastructure, pedagogical models, user attitudes, and the temporal nature of student engagement. These findings serve as a crucial backdrop for our research, guiding us to explore gaps and opportunities in LMS utilization, particularly in aligning its capabilities with the diverse needs of educators and students in the evolving educational milieu.

Research Methodology

The Data Collection

The methodology for this research encompassed a mixed-method approach, involving both the analysis of usage patterns within the LMS and the distribution of questionnaires to academics. The data was collected at a University of Technology in South Africa. The objective was to gain insights into the alignment of the usage LMS with the TPACK framework.

Participants

A convenient sampling technique was employed to select participants for this study. The research primarily targeted academics from all three faculties within the University. This selection was deliberate, as it aimed to gather data from individuals who were not only accessible but also willing to participate in the research. This approach facilitated a streamlined sampling process, ensuring efficient data collection. A total of 63 academic staff members responded to the questionnaires.

Data Analysis

Data analysis for this research was primarily qualitative in nature. The qualitative analysis involved a thematic approach, wherein data collected from both the LMS usage patterns and the survey responses were subjected to rigorous analysis. Thematic analysis was chosen due to its effectiveness in identifying patterns, themes, and trends within qualitative data.

Analysis of LMS Usage Patterns

The analysis of LMS usage patterns involved examining user activities within the system. Data, such as the frequency of logins, the types of materials accessed, and the timing of interactions, were scrutinised. By delving into these usage patterns, the research aimed to identify trends and areas where the LMS was either actively used or underutilised.

Survey Distribution

The survey questions were carefully structured within the context of the research objectives, with a focus on understanding how academics infused technology, pedagogy, and content knowledge when utilising the LMS. The responses obtained from the survey were subsequently analysed to uncover common themes and patterns related to LMS adoption and usage.

Thematic Analysis

The data gathered through the analysis of LMS usage patterns enabled us to craft the appropriate questionnaire for the qualitative part of the research. In essence, the qualitative part of the research was used to triangulate the findings.

Thematic analysis was the cornerstone of data analysis for the qualitative data gathered through the questionnaires. It involved systematically identifying recurring themes and patterns within the collected data. The thematic analysis enabled the research team to categorise and synthesise qualitative data, offering a comprehensive understanding of the nuances surrounding LMS adoption and usage in higher education.

This mixed-method approach provided a robust framework for investigating LMS utilisation by integrating usage data analysis with thematic analysis. It allowed the research to draw holistic insights into LMS's challenges, adoption, and impact while also uncovering the intricacies of how educators integrate technology, pedagogy, and content knowledge in their teaching practices.

Result and Analysis

This section presents the results based on an analysis of LMS logs and responses from academic staff. Our findings highlight a significant gap between the potential capabilities of LMSs and their actual application in academic settings. This discrepancy underscores the necessity for universities to reassess how they leverage these digital platforms and to consider enhancing educator training to maximize the benefits of LMS technology.

Limited integration with external Tools

Our analysis revealed that only 5% of the courses integrated external tools such as collaborative platforms, external resource libraries, or specialized software within the LMS. This indicates a notable gap in leveraging external resources for enhanced learning experiences. LMSs are designed with functionalities that allow for seamless integration with other educational tools and technologies. This finding shows that educators and institutions face a significant challenge in harnessing educational technology's full potential. Our study reveals that a majority of educators in higher education rely primarily on their LMS as a repository for subject notes, lecture slides, and basic course materials. Few lecturers take advantage of external digital technologies to enrich their teaching and engage students more deeply. This limited integration can be attributed to various factors, including educators' unfamiliarity with external tools or their uncertainty about how to integrate them effectively.

The consequences of limited integration of LMS with external tools are profound. Students are deprived of access to vast technological resources that could enhance their learning experiences. These external tools can provide opportunities for personalised learning, collaborative activities, increased engagement, and

comprehensive assessment. The full potential of technology in fostering a dynamic and enriching learning environment remains untapped when LMSs are not adequately integrated with external tools.

Limited Use of Analytical Tools in the LMS

Analytical tools play a pivotal role in tracking student progress and identifying individuals who may be at risk academically. However, our research has revealed a limited to no use of these analytical tools by academics. From analysing the usage patterns, we found that merely 1% of academic staff regularly utilized the LMS's built-in analytics for tracking and assessing student progress and engagement.

The results of the survey we discoved that less than 10% of the educators were aware of the analytical tools available within the LMS, and a mere 2% reported ever using these functionalities in the past 4 years. This finding raises profound concerns regarding the underutilisation of technology to support students at risk of falling behind in their studies.

Analytical tools in LMS platforms hold paramount significance, particularly in identifying students who are at risk academically. These tools can provide real-time student performance, engagement, and progress data. This information is invaluable for educators and institutions as it allows for timely interventions and support systems to be put in place, ultimately improving the chances of student success.

The limited use of analytical tools signifies that educators may not engage in data-driven decision-making processes. In the context of technology integration and the Technological Pedagogical Content Knowledge (TPACK) model, data-driven decision-making is essential. Analytical tools can give educators data that informs their teaching decisions in a systematic and evidence-based manner.

Data-driven decision-making offers numerous advantages. For example, educators can use analytical data to identify specific topics or areas where students are struggling. With this information in hand, targeted interventions can be developed and customised to meet the needs of individual students or specific groups(Mutanga, 2020). Without analytical tools, educators may rely on intuition and guesswork when making teaching decisions, potentially leading to less effective outcomes.

Furthermore, data-driven decision-making aligns with the principles of the TPACK model, where the seamless fusion of technology, pedagogy, and content knowledge is paramount. By integrating analytical tools into their teaching practices, educators can bridge the gap between technology and pedagogy, enhancing the overall quality of education and adapting their methods to cater to the specific needs of their students.

Use of the Learning Management Systems (LMS) mainly as Content Repository

Our analysis of the usage patterns of the LMS revealed a concerning trend: approximately 80% of the activities within the system were limited to the uploading and accessing of static content such as PDFs, PowerPoint slides, and text files. This finding is indicative of a predominant use of the LMS as a mere digital storage space, rather than as an interactive learning platform.

Further compounding this issue is the remarkably low level of student engagement with the uploaded materials. The data showed that only a mere 25% of students regularly interacted with or downloaded these resources. This low engagement rate was consistent across various types of content, including essential reading materials and supplementary resources.

When LMSs are primarily perceived as content repositories, students may view them as static, one-dimensional platforms. They access the system merely to retrieve course materials, and their engagement with the platform is often limited to downloading notes and viewing lecture slides. This perception may lead to a reduced willingness and motivation among students to log in frequently, as they see no facility to interact with both the content and the lecturer.

Moreover, the average download rate per uploaded file was surprisingly low, with some critical resources being accessed by less than 10% of the intended student audience. These statistics highlight a significant disconnect between the resources provided and the students' engagement with them.

This situation raises critical questions about the effectiveness of the LMS as a tool for enhancing learning. It suggests that while academic staff members are utilizing the LMS to make resources available, these efforts may not be translating into meaningful student interaction or learning. The underutilization of the LMS's capabilities for fostering a more dynamic and interactive educational experience is a glaring issue that needs immediate attention and action.

The findings strongly suggest the need for a strategic reassessment of how LMSs are employed within the institution. This should include not only a reevaluation of the types of materials being uploaded but also an exploration of more engaging and interactive ways to utilize the LMS, thereby encouraging higher levels of student interaction and engagement with the learning materials.

Student Interaction and Engagement

The data from the usage patterns showed an average time spent on the LMS per login was less than 10 minutes. Additionally, there was an average of less than 1 discussion post or reply per student per semester, and only 30% of students participated in interactive elements like quizzes or forums. These metrics indicate a low level of student interaction and engagement within the LMS.

Another striking observation is that the primary mode of communication within LMS platforms is often restricted to lecturers sending notifications to students. While notifications are valuable for disseminating important information and updates, they do not inherently foster the kind of meaningful interaction that drives deep learning. LMS platforms offer diverse communication tools, such as discussion forums, but their underutilisation is a common theme.

Notably, we observed a lack of lecturer feedback provided directly within the LMS. This absence may indicate students receiving feedback using other platforms or mechanisms outside the LMS. While feedback remains a vital element of the learning process, the limited integration of this function within the LMS can lead to fragmented communication and a potential disconnect between educators and their students.

Furthermore, an absence of student-to-student interaction was evident, as many modules lacked the use of discussion forums. Students were not actively engaging amongst themselves on the LMS, and the platforms often remained dormant in terms of discussions. This lack of student participation may partly be attributed to a lack of discussion prompts initiated by lecturers.

For effective learning to transpire, student interaction and engagement are paramount(Mutanga et al., 2023). Learning is not solely a passive reception of information; it thrives when students actively engage with the content, their peers, and their educators.

Diverse LMS Adoption Across Different Departments within the institution

The analysis of LMS usage data across various faculties within the institution has revealed significant disparities in adoption and engagement levels. These differences are indicative of how the faculties integrate technology into their teaching and learning processes.

- **Faculty of Natural Science:** This faculty showed an LMS usage rate of only 26%. This relatively low percentage suggests that the faculty either relies less on digital platforms for coursework and materials distribution, or they may be utilizing other methods or platforms for their educational needs.
- **Faculty of Management Science:** In contrast, the Faculty of Management Science demonstrated a significantly higher usage rate of 46%. This suggests a more robust integration of the LMS in their curriculum. The higher usage could be attributed to a greater alignment of LMS features with the teaching methodologies preferred in management studies, such as case studies, collaborative projects, and online discussions.
- **Faculty of Engineering:** The Faculty of Engineering recorded an LMS usage rate of 22%. This is amongst the lowest in the institution, raising questions about the reasons behind this limited engagement. It might reflect a preference for more hands-on, practical methods of teaching and learning, or it could indicate a need for more tailored LMS functionalities that better suit the needs of engineering courses.

These figures highlight a significant variation in LMS adoption and utilization across the faculties. Such diverse usage patterns necessitate a closer examination of the reasons behind these disparities. It may be essential to explore whether the LMS functionalities align with the specific needs and teaching styles of each faculty, and if not, what enhancements or alternative solutions could better support their educational objectives. This understanding is crucial for ensuring that the investment in LMS technology is effectively leveraged to enhance the learning experience across the entire institution.

In the context of the TPACK model, the diverse adoption of LMS platforms across departments underscores the importance of tailoring technology integration to the specific needs and objectives of each discipline. It

calls for a flexible approach that allows for customisation of the LMS to cater to the distinct requirements of different departments while maintaining a unified and coherent institutional framework.

Discussion

The findings of our research, particularly regarding the limited integration of Learning Management Systems (LMS) with external tools and the underutilization of critical features, align with and extend existing literature in several key ways. Our exploration of 'technology overload' as a primary factor offers a novel perspective to the challenges of LMS adoption in higher education.

In comparing our findings to Gani & van den Berg (2019), we observe a similarity in identifying barriers to LMS utilization. However, our research goes further by pinpointing technology overload as a critical barrier. This extends Gani & van den Berg's discussion on infrastructural and resource limitations, suggesting that even in environments where these basic needs are met, technology overload can still impede effective LMS use.

Our study diverges from the insights of Mohamed & Vengrasalam (2022), who emphasize a lack of effective implementation models for LMS. While their findings are crucial, our study contributes an additional layer of understanding by illustrating that the sheer complexity and abundance of LMS features can be overwhelming for users, thus hindering engagement with more sophisticated functionalities.

The concept of technology overload resonates with Dlalisa & Govender (2020)'s observations on the acceptance and utilization gap of LMS among educators. Our findings bridge this gap by highlighting that it's not just a matter of acceptance but also the ability to effectively navigate and utilize the extensive features of LMS, a challenge exacerbated by technology overload.

Our research also contributes a unique insight into the training and awareness programs necessary to mitigate technology overload. Unlike general training programs, we advocate for targeted, user-centric training that addresses the specific challenges posed by technology overload. This recommendation builds on Kamalludeen et al. (2018)'s emphasis on the instructor's role in LMS engagement, suggesting that effective training can empower educators to guide students through the complexities of LMS.

Furthermore, our findings suggest a more nuanced approach to user-centered design in LMS, as advocated by Green & Chewning (2020). We propose that understanding and addressing technology overload can significantly enhance the design and implementation of user-friendly LMS interfaces, thereby facilitating better utilization and engagement.

In conclusion, our study enriches the existing literature by shedding light on the phenomenon of technology overload in the context of LMS in higher education. By offering new insights and recommendations, our research provides a foundational understanding for institutions and educators to enhance LMS adoption and utilization, thereby optimizing the educational experience in the digital age.

Conclusions

The evolution of technology in education, driven by the demand for innovative teaching and learning approaches, has ushered in transformative changes in higher education. Learning Management Systems (LMS) have emerged as central tools in this evolving landscape, offering a myriad of features and functionalities designed to enhance teaching and learning. This paper explored recent research findings to shed light on the adoption, usage, and impact of LMS in higher education.

The literature reveals that the adoption and effective utilisation of LMS are critical for optimising their educational benefits. The challenges of under-utilisation in open distance learning, such as poor internet access and the need for essential skills, highlight the crucial role of facilitating conditions. Providing an appropriate environment and resources is essential for the successful adoption of LMS in higher education. Success models for LMS implementation, as proposed by some researchers, can play a pivotal role in enhancing their utilisation.

LMS tools offer the potential to facilitate innovative teaching methodologies, enabling educators to transcend traditional paradigms and create engaging and interactive learning experiences. They support case-based, scenario-based, and gamified learning, which can enhance student engagement and participation.

Research emphasises the impact of instructors in shaping LMS usage and student engagement. Teachers' active participation in LMS platforms is a key factor in driving student engagement and interaction. The

timing of LMS usage, as revealed by specific patterns in student engagement, underscores the importance of responsiveness to student needs and preferences.Diversity in perspectives between students and teachers regarding LMS adoption underscores the need to consider the diverse needs and expectations of both user groups. Students prioritise satisfaction, ease of use, and usefulness, while teachers focus on ease of use. Balancing these perspectives is crucial for effective LMS implementation.

The literature also highlights the significance of specific LMS features, particularly those that facilitate the transfer of static information, such as assessment-related details. These features tend to be the most frequently used in practice, indicating their relevance. Effective teaching on LMS platforms requires adaptation to the online environment. Instructors play a crucial role in guiding and facilitating learning, underlining the need for a teacher-centered approach to enhance LMS utilisation.

The impact of low engagement in online learning on academic performance is a concern, emphasising the need for strategies to promote student engagement in LMS-based courses. The moderate impact of LMS on academic achievement suggests that instructional design and student engagement play pivotal roles in determining LMS effectiveness.

In conclusion, the findings presented in this paper offer a comprehensive understanding of the adoption, usage, and impact of Learning Management Systems in higher education. They underscore the need to address challenges, tailor implementation models, promote engagement, enhance teaching effectiveness, and prioritise content quality to optimise the benefits of LMS for both educators and students. Acknowledging the diverse perspectives and requirements of students and instructors is essential for facilitating effective and impactful learning experiences in higher education. The continued exploration of LMS utilisation is paramount as technology continues to evolve and shape the educational landscape.

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