

DOI: https://doi.org/10.48009/4_iis_2025_137

Using design science research in evaluating the usefulness of Blackboard for curriculum development

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Abstract

Integrating Learning Management Systems (LMS) such as Blackboard has transformed curriculum development in higher education. As institutions increasingly rely on digital platforms to enhance teaching and learning, there is a growing need to understand how these systems support core academic functions. Despite Blackboard's widespread use, limited empirical research examines its role in curriculum planning and delivery from the educators' perspective. This study addresses that gap by adopting a Design Science Research (DSR) approach to evaluate Blackboard's usefulness in curriculum development. DSR offers a structured framework for investigating technological tools in real-world educational contexts, making it well-suited for this purpose. The study explores how Blackboard supports the design, delivery and refinement of academic content, drawing insights from lecturers and instructional designers. A qualitative analysis using NVivo software is employed to generate thematic findings. Results reveal that Blackboard enhances collaborative curriculum design, increases flexibility in content access and improves instructional feedback and support. These findings offer practical insights for institutions seeking to leverage LMS platforms for innovative curriculum practices and contribute to a broader understanding of how such systems can be optimised to support pedagogical goals more effectively.

Keywords: Blackboard LMS, usefulness, design science research, learning management system, curriculum development

Introduction

Integrating Learning Management Systems (LMS) like Blackboard into higher education has significantly transformed teaching, learning and curriculum development (Almansoori, 2021). As one of the most widely adopted digital platforms, Blackboard offers a comprehensive suite of tools that support instructional design, content delivery, assessment and student engagement. Despite its growing use, questions remain about Blackboard's effectiveness and practical value in supporting curriculum development across diverse educational contexts (Conley et al, 2020).

Curriculum development is a dynamic, collaborative process involving designing, implementing and evaluating learning experiences to meet educational goals. This process increasingly depends on robust digital support to enable diverse pedagogical approaches, facilitate stakeholder communication and generate actionable data for continuous improvement. However, many institutions have not explored Blackboard's capabilities beyond its basic functions using rigorous methodologies such as Design Science Research (DSR) (Albakri & Abdulkhaleq, 2021).

DSR, commonly used in information systems and technology research, focuses on creating and evaluating practical solutions (such as models, systems or frameworks) that address real-world problems while contributing to theory (Yamani et al, 2022). In this study, DSR provides an iterative approach to examine Blackboard's role in curriculum development, offering insights into how the platform can be optimised to meet educators' pedagogical and operational needs better (Fahd et al, 2021). This research aims to inform institutional decision-making and academic discourse by evaluating the usefulness of a Blackboard-based artefact designed to bridge the gap between technological potential and educational practice in curriculum innovation.

Related Works

Information Systems Research

In a business setting, the primary role of Information Systems is to improve process efficiency and organisational performance (Hevner et al, 2004). Research in the Information Systems (IS) field typically follows one of two main paradigms: behavioural science, design science research or a combination of both approaches (Hevner et al, 2004). Behavioural science in the IS context uses a research approach parallel to natural science. From an IS point of view, this research paradigm is used to test and support theories that explain IS-related activities such as analysis, design, implementation and/or use within organisations (Bryan et al, 2021). This is important as it gives practitioners relevant information regarding individual, technological and organisational behaviours and how best to regulate them for improved efficiency and performance (Bryan et al, 2021). Bryan et al (2021) also note that this has been the preeminent research paradigm in the IS field, with most studies aiming to determine the impact of artefacts, such as design models and technologies, on people and organisations.

According to Tommelein (2020), Design Science is a field that significantly intersects with computer science and engineering. It is particularly effective in the face of unstable requirements, ambiguous environmental contexts, complex subcomponent interactions, lack of adaptability and high human cognitive input, which is required for successful results (Thuan et al, 2019). Design Science is the creation of new artefacts that are put to the test with behavioural science techniques. In addition, there is a very large and important relationship between behavioural science and design science, which is very much a part of the base to build and improve the IS body of knowledge. The mixed methods approach in IS research uses qualitative and quantitative research methods to study various issues in the IS field, which combines behavioural and design science research (DSR) (Stahl et al, 2019). In IS, this research put forth the mixed method as a powerful and flexible approach to answering complex research questions (Timans et al, 2019). In this study, DSR was used for its ability to solve problems with unstable requirements in uncertain environments, which are made up of very complex subcomponent interactions, lack adaptability and have large-scale human cognitive elements to produce successful results. This is shown in Figure 1.

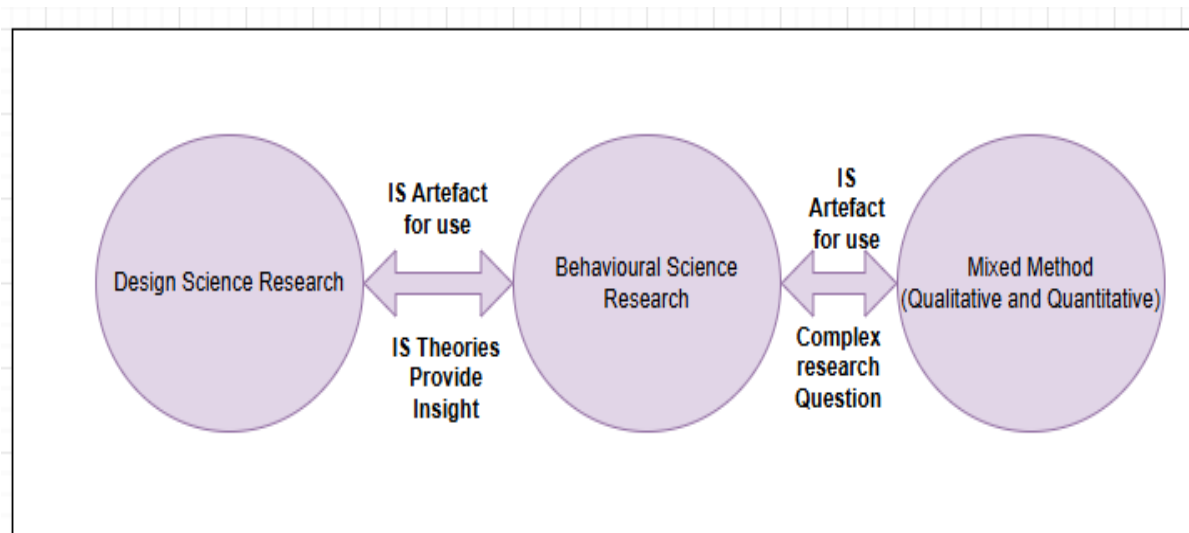


Figure 1: The Relationship between Design Science, Behavioural Science and Mixed Method

Figure 1 above shows the relationship between design science, behavioural science and mixed methods for this study. Design Science Research (DSR) is a field that studies artefacts, such as models, systems or processes, to solve real-world problems. On the other hand, Behavioural Science Research looks at and analyses human action and social play through empirical study, theory and observation. Mixed Methods Research is a mix of qualitative and quantitative methods used to answer research questions from many angles. This integration of methods is valuable as it improves upon DSR through a very in-depth, multi-dimensional study, making the artefacts valid from a technological standpoint and practical in the real world.

Design Science Research

This research work uses Design Science Research Methodology (DSRM), as put forth by Peffers et al (2018), in developing the research artefact. While other methodologies may have a similar number of stages, what sets Peffers et al's (2018) model apart is its iterative nature, which in turn makes it amenable to the research approaches predominantly used in this research area. The design science research model proposed by Peffers et al (2018), as seen in Figure 2, is among some existing models or frameworks in the literature, including ones by Baskerville et al (2009), Hevner et al (2004) and Vaishnavi et al (2004). This particular model will guide this study.

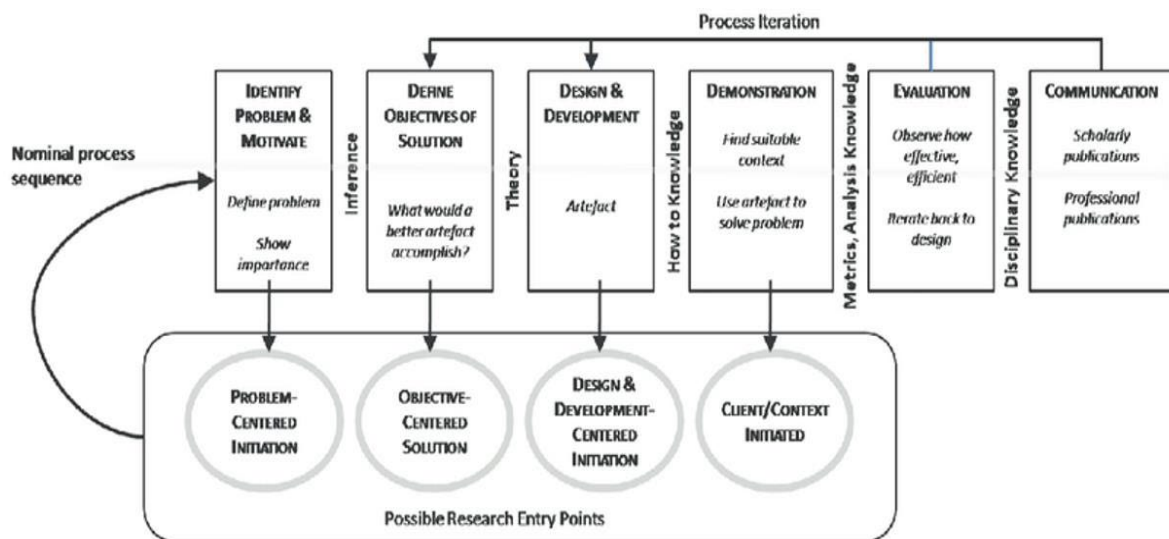


Figure 2: Design Science Research Model adapted from Peffers et al (2018)

This model comprises six stages that guide researchers through the DSR process. The first stage, "Identifying the Problem and Motivation," involves defining the problem and outlining the advantages of the proposed solution. Once established, the process advances to the "Define Objectives" stage, where the project's goals are specified. According to Tuunanen et al (2024), these objectives should focus on design and development, ultimately leading to the creation of an artefact. The "Design and Development" stage follows, where the artefact is constructed based on the predefined objectives. This artefact may take various forms, such as a model, framework, instance, object or resource, all aimed at improving organisational efficiency and effectiveness (Tuunanen et al, 2024). After development, the artefact undergoes "Demonstration" through case studies, experiments or simulations to validate its application. The next stage, "Evaluation," assesses the artefact's performance in solving the identified problem. Finally, the research process concludes with the "Communication" stage, where the findings and results are shared with relevant stakeholders (Tuunanen et al, 2024).

Theoretical Framework

This study is guided by the Technology Acceptance Model (TAM), a widely utilised theoretical framework for examining how users adopt and implement technology in practice. In 1986, Fred Davis introduced this model which has become highly valuable for understanding the adoption of systems, including Blackboard and other educational technologies. The model, represented in Figure 3, focuses on users' perceptions and their behavioural intentions. Additionally, TAM serves as a framework for assessing the degree of user acceptance, which is crucial in evaluating a given technology's perceived usefulness and overall effectiveness. (Granic & Marangunic, 2019). Furthermore, within the Design Science Research (DSR) method, which we adopt to ensure evaluation rigour, there is an emphasis on producing concrete evidence to support claims about technology's value. In addition, the principles outlined by TAM align closely with key concerns in DSR, particularly in identifying areas for design enhancement that can ultimately influence the future development of learning management systems (LMS).

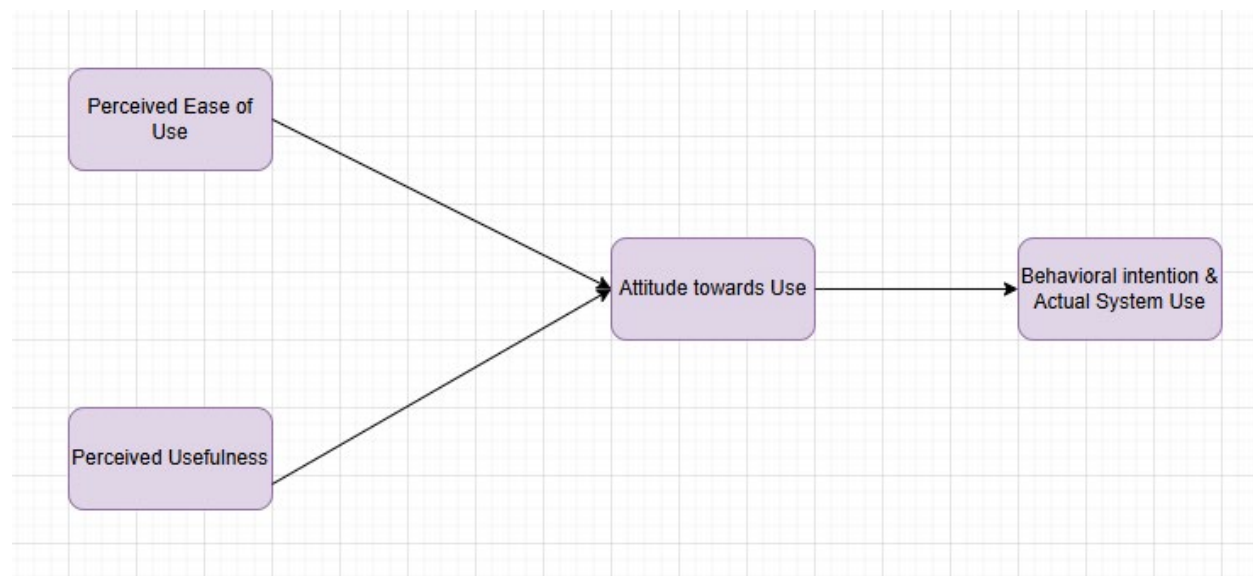


Figure 3: Technical Acceptance Model adapted from Al-qaysi et al (2020)

Research Aim

This study aims to apply the Design Science Research (DSR) methodology to evaluate the usefulness of the Blackboard Learning Management System (LMS) in supporting curriculum development processes within higher education. To achieve this goal, the research focuses on the following research questions:

1. To what extent does the Blackboard system support collaboration, feedback and content alignment in curriculum development?
2. What are the perceptions and experiences of academic staff regarding the usefulness of Blackboard for curriculum design and implementation?

Methodology

This section details how the design science research (DSR) methodology was used to evaluate the usefulness of the Blackboard system for curriculum development. As presented by Peffers et al (2018) and depicted in Figure 2, the DSR model provided the framework for the overall study. The steps as they were applied in this study are described in the sections that follow.

Identify the problem and motivate

Several issues play into this gap, including underutilisation of key features, discrepancies between instructional needs and system functionalities and low digital literacy. Also, there is a lack of institutional training and support and no structures to align LMS tools with curriculum development goals. Therefore, as a result, Blackboard is used mainly as a content repository or communication tool instead of what it is capable of as a dynamic environment for collaborative curriculum design, monitoring and revision. In addition, through the use of DSR, the assessment of the usefulness of the Blackboard system for curriculum development is a very valuable approach for research and, at the same time, adds to the body of knowledge.

The issues brought forth by Siriwatana and Pongpanich (2025) may be put to rest by achieving the very specific objectives in the forthcoming section.

Defining the objectives of the solution

The objectives for this study can be conceptualised from the problem identified and motivation as follows:

1. To assess user perceptions (lecturers or instructional designers) of the Blackboard system relevant to curriculum development
2. To evaluate the usefulness, usability and effectiveness of the Blackboard system in facilitating curriculum development through iterative DSR cycles.

Design and development

At this stage, the Blackboard artefact system is part of the broader study in evaluating the system's usefulness using DSR methodology for curriculum development. This paper focuses on applying the DSR methodology to evaluate the usefulness of the Blackboard LMS in supporting curriculum development processes within higher education.

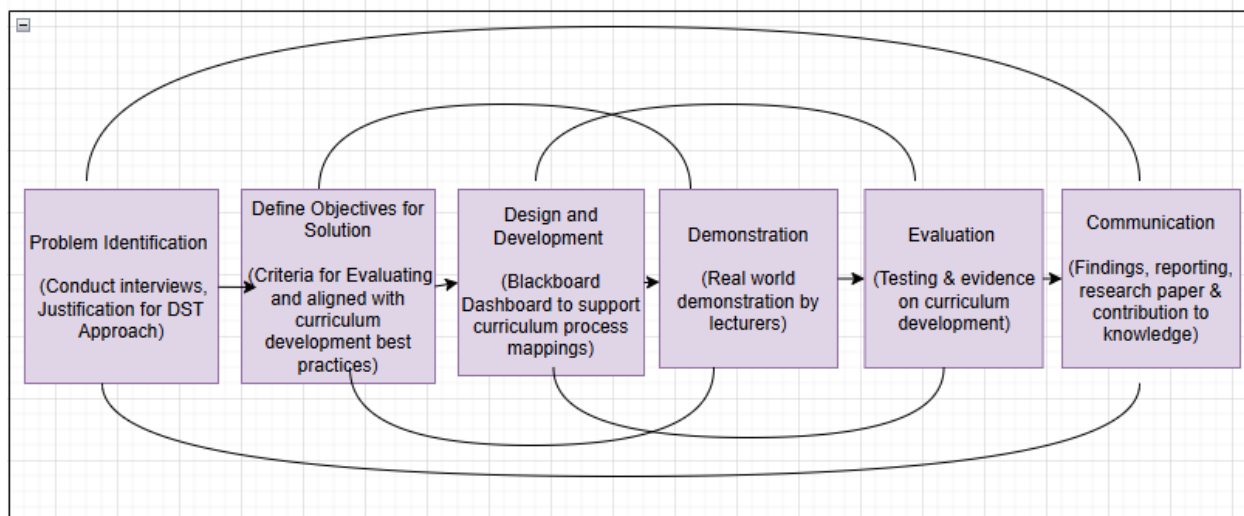


Figure 4: DSR Process Model for Blackboard Artefact System

Figure 4 presents the DSR process model used to evaluate Blackboard's role in curriculum development. The model identified the first stage, problem analysis, which includes early interviews, determination of key issues in using Blackboard for curriculum design and the gap between Blackboard's features and academic needs. The output of this stage is a basis for DSR and the problem statement. The second stage is to define the solution's goals, including alignment of the evaluation with curriculum goals pedagogically and in terms of collaboration. Here, the study goal is to achieve best practice in curriculum development. Then, we move to the design and development of the Blackboard dashboard, which supports the curriculum development process and course design. The focus is on improving Blackboard's value in curriculum processes, which brings us to the demonstration stage of the process, which is the engagement of curriculum designers and lecturers with the solution, and presents evidence of Blackboard's support for curriculum. Evaluation is implemented via testing and looks at the artefact's performance in curriculum development. Finally, the communication stage is to present our research to institutional stakeholders or publish in academic forums.

Demonstration

The University of Fort Hare Inter-Faculty Human Research Ethics Committee (IFHREC) granted ethics approval, which gave clearance number **FUN002-24** (Project). This study also obtained a written informed consent form from the participants (lecturers) by informing them of the nature of the study. In addition, it was clear to the participants that their part in the study was not required. During this stage, the Blackboard system will address what was identified in the early stages. At this point, the Blackboard system is tested in terms of how well it solves issues related to curriculum development. Therefore, this study presents demonstration methods, including case studies, interviews in the Faculty of Management and Commerce's Business Innovation and Entrepreneurship (BIE) department, and lecturer participation in the Blackboard system's evaluation for use. There is a total population of eight (8) lecturers in the BIE department.

Evaluation

The evaluation testing on the Blackboard system assesses how effectively Blackboard supports key aspects of curriculum development, including course planning, learning outcomes alignment, instructional design, collaboration and assessment integration. Also, this study uses qualitative analysis using NVivo, which allows us to pull out meaningful insights from case studies and feedback into lectures that then help us refine what the system can do more effectively. Additionally, for the evaluation, there is a performance comparison to other artefact systems on IT-based incident management for acceptable quality when compared to other studies in this field of research.

Communication

The final phase focuses on clearly articulating to all key stakeholders what the developed artefact entails and why it holds significance. This includes disseminating research findings, emphasising the artefact's value to researchers and practitioners, and illustrating its practical utility. The results of this study serve a communicative function, showcasing the relevance and effectiveness of the artefact in evaluating the usefulness of the Blackboard system in curriculum development. The study also documents the processes in designing and applying artefacts within the identified problem context. It is important to acknowledge that the stages of the design science research (DSR) methodology are not strictly linear; rather, the model supports iterative movement across stages such as development, demonstration, evaluation and communication.

Findings Themes for the Study

As mentioned in the demonstration section, it presents feedback from the case study, incorporating insights from all eight participants regarding their perspectives on the artefact Blackboard system within the University of Fort Hare. Key findings show three themes generated for this study in finding design science research in evaluating the usefulness of the Blackboard system for curriculum development. The themes were identified based on the data collected, transcribed and imported to NVivo for file classification, creating codes as the generated themes analysis using NVivo. The three generated themes are: collaborative curriculum design, flexibility in content access and instructional feedback and support.

Collaborative Curriculum Design

Collaborative curriculum design is where educators create, develop, and refine course content, instructional strategies and assessments (Suartama et al, 2019). In Blackboard, a widely used Learning Management

System (LMS), several tools and features support this collaborative process effectively. Therefore, the participant responses are highlighted below, which are in line with the submission from Suartama et al (2019)

"Blackboard is a versatile and valuable educational platform that supports a range of multimedia formats, including videos, audio clips, and YouTube integration."

"Instructors can easily share content by embedding links or uploading resources, making it convenient to demonstrate complex concepts through diverse media."

"The platform fosters flexibility and collaboration by allowing both synchronous and asynchronous engagement".

"Tools such as course rooms, discussion boards, and group features enable instructors to facilitate personalised learning paths, support peer-to-peer interactions, and create spaces for students who may struggle with participating in larger groups".

"This enhances inclusivity and accommodates different learning styles, particularly for visual and written learners".

"Blackboard also allows for effective course management, enabling instructors to modify, adapt, and reuse course materials across semesters. Features like customisable course templates and editable multiple-choice questions streamline content delivery and help ensure consistency and relevance".

"From a teaching perspective, Blackboard enhances communication and interaction between instructors and students". It allows for real-time support, one-on-one consultations, and ongoing engagement through messaging and forums".

"Instructors can better respond to student needs, including those facing challenges, without drawing attention to them in group settings".

These participant responses reinforce Suartama et al. (2019)'s assertion that Blackboard meaningfully supports collaborative curriculum design by offering versatile tools that enhance content creation, sharing, and refinement. Features such as multimedia integration, discussion boards and course rooms enable both synchronous and asynchronous engagement, fostering deeper collaboration among instructors and students. The ability to personalise learning paths, manage reusable course templates and facilitate peer-to-peer interactions aligns with the core principles of collaborative design by promoting inclusivity and accommodating diverse learning styles. Moreover, Blackboard's communication tools support real-time feedback, private consultations, and ongoing dialogue, ensuring that instructors can adapt instruction to meet evolving student needs. Collectively, these capabilities identified by the participants illustrate how Blackboard facilitates a dynamic, interactive and student-centered approach to curriculum development.

Flexibility in Content Access

Blackboard, as a Learning Management System (LMS), offers significant flexibility in accessing course content, which enhances both teaching and learning experiences (Zang et al, 2022). This flexibility supports diverse learning styles, schedules and accessibility needs.

"Blackboard is generally user-friendly and offers flexibility for content creation and course management, especially when instructors are familiar with the platform or have received training. Creating and uploading materials, such as documents, videos, and assessments, is straightforward, and the ability to organise content into topic-specific folders makes structuring a course easier".

"It is manageable, but a step-by-step manual for navigating as the system is updated should always be provided. One has to do trial and error until you figure out which is which, and this consumes time. Myself I have not created discussions on Blackboard but for videos and documents it's well organised."

"Creating and organising course content has been easy because with bb you are able to create folders for each topic. Then one can collect and add all those materials within those folders. I have been able to do so with no problems."

"Creating and uploading course content on Blackboard is straightforward, however it can be time consuming depending on the type of test/ assessment you are creating. For example, when creating a MCQ test it takes time. Yes, it is easy to create any course content on Blackboard, as long as they have stable internet connectivity."

"Very easy especially if you went through the training. The university needs to ensure that training is for both full and part time lecturers."

"The layout and structure are fine, but it lacks detail again. With each option, a clear step by step guide should be provided, as one gets to explore different areas with each module or depending on assessment. I would appreciate bringing back the previous bb site that was more conducive to navigate. With this one it took some time, and some options do get forgotten."

"Instructors can customise the layout and structure of their Blackboard course to meet their specific teaching needs. Blackboard allows lecturers to customise layout to suit the needs of the lecturers, so this is a tool that also allows lecturers creativity."

"Blackboard permits instructors to organise their course material in a way that will be easily understood by students. Blackboard does give that flexibility of putting or changing the layout as you wish."

"Yes, lecturers have the ability to create those platforms in order to manage their teaching and learning processes. Yes, the instructor can create and manage peer review and other collaborative assignment, however, I believe you need to notify the groups before creating group work."

"For the period I have joined teaching we have not done collaborative assessments, all our assessments are individual, so I have not been exposed to this."

"Yes, Blackboard allows instructors to create assignment groups, where students will be allocated to certain groups and submit the assignments. However, it would be great if the system could provide an option where only one student per group can be allowed to submit the assignment."

"Yes, I can. Creating groups is very easy. When I break them into groups during the class to do a small task, I can visit most of the groups to see how they are working. However, this is not easy for big classes."

"Peer Review works quite well with smaller classes and can easily be done on the Blackboard. This is all easy but for bigger classes, they need time and more resources to manage it."

The participant feedback highlights Blackboard's flexibility as a key enabler of effective course design and delivery, supporting diverse teaching styles and learner needs. Instructors noted the platform's ease of use for creating, uploading and organising materials into topic-specific folders, which streamlines course structuring and enhances content accessibility. While multimedia integration and customizable layouts provide opportunities for creative course management, some participants emphasised the need for clearer navigation guides and regular training, especially for part-time staff, to fully leverage these capabilities. Additionally, Blackboard's ability to support collaborative assignments, group work and peer reviews demonstrates its adaptability, though larger class sizes present challenges that require additional time and resources. Overall, these responses underscore that Blackboard's flexible design enhances both instructional management and student engagement, provided institutions support users with adequate training and platform optimisation.

Instructions, Feedback & Support

Blackboard is designed to deliver content and facilitate clear instructions, effective feedback and support mechanisms for instructors and students (Fidan & Gencel, 2022). These features are vital in enhancing student understanding, engagement and success in digital learning environments.

"Blackboard offers a reasonable level of flexibility for grading and providing feedback, although experiences among users vary".

"Many instructors find the platform useful for assessing student work, offering feedback, and managing grades. The ability to assess previous assessments and comments at a later stage is particularly appreciated".

"Some features are seen as highly convenient such as downloading assessment results in various formats, editing grades and feedback at any time, and marking directly on the platform without the need for manual downloads. This streamlines the grading process and saves time."

Certain limitations were noted, particularly in subjects like economics, where posting complex visuals like graphs can be difficult. Others found Blackboard less flexible when providing feedback on specific types of submissions, suggesting the platform could be improved with pre-made templates for comments.

"This would be especially helpful for instructors managing large classes (e.g., 300+ students), by reducing the time spent writing repetitive feedback".

"In terms of support, the Teaching and Learning Centre (TLC) provides valuable resources, including training workshops and guidance on platform updates".

"Some lecturers, especially part-time staff, feel they need more access to ongoing training to fully benefit from Blackboard's features. There is also a call for more inclusive communities of practice, such as webinars or peer learning sessions, to support shared learning and continuous development".

The participant insights demonstrate that Blackboard provides practical tools for delivering instructions, managing assessments and offering timely feedback, which collectively enhance student engagement and learning outcomes. Instructors valued the platform's ability to streamline grading through features such as editable feedback, downloadable results and integrated marking tools that save time and improve efficiency. However, challenges remain in providing feedback on complex submissions, such as visual data in

economics, highlighting the need for improved functionality, including pre-made feedback templates to reduce repetitive tasks in large classes. Additionally, while institutional support through the Teaching and Learning Centre (TLC) was acknowledged, there was a clear call for more consistent training opportunities and peer-learning communities to help lecturers, especially part-time staff, fully utilise Blackboard's capabilities. Overall, the responses indicate that Blackboard is a strong platform for managing instruction and feedback, but its effectiveness depends on ongoing user support and targeted platform enhancements.

Discussion

In curriculum development, this study reports on using the Blackboard system, a key issue in higher education institutions. Design Science Research Methodology (DSRM) is used to study the system's value via a structured model. Three main themes from the evaluation are collaborative curriculum design, flexibility in content access, and instructional feedback and support. This study used the Design Science Research (DSR) approach to assess the value of Blackboard as a Learning Management System (LMS) in the online teaching and learning environment. DSR is centred on the development and iterative improvement of a tool, such as the Blackboard platform, that is used in a school setting.

The findings demonstrate that Blackboard meaningfully supports collaborative curriculum design by enabling educators to create, refine and share content more effectively. Features such as discussion boards, course rooms and multimedia integration allow instructors to design inclusive, student-centered learning environments. This aligns with Suartama et al. (2019), who emphasise the importance of tools that support both synchronous and asynchronous engagement to accommodate diverse learning needs. However, while Blackboard provides these capabilities, they are often underutilised, indicating a need for better awareness and institutional support to maximise their collaborative potential.

Similarly, the theme of flexibility in content access highlights Blackboard's role in enhancing teaching and learning by allowing instructors to easily organise materials into topic-specific folders, customise layouts, and support multiple content formats. These flexible options improve navigation and allow instructors to tailor course structures to their teaching styles and students' needs. Nevertheless, participants noted that without proper training and clear navigation guides, some of these benefits remain inaccessible, especially for part-time staff or new users. Therefore, the platform's flexibility must be complemented by institutional efforts in continuous training and platform optimisation to ensure consistent use.

In terms of instructional feedback and support, Blackboard's integrated grading tools, editable feedback options and downloadable assessment results streamline the feedback process and support student learning. Yet, challenges remain in providing feedback for complex submissions, particularly in subjects requiring graphical or data-heavy inputs, such as economics. Participants also emphasised the need for features like pre-made feedback templates, especially for large classes where repetitive grading tasks consume significant time. Moreover, while the Teaching and Learning Centre (TLC) provides valuable training and platform updates, there is a clear need for more ongoing support and peer-learning communities to help instructors fully leverage Blackboard's potential.

Overall, this study's findings confirm that Blackboard, evaluated through the DSR framework, is a powerful digital learning tool that addresses many pedagogical and functional needs in higher education. However, its full value is realised only when supported by institutional strategies, such as continuous training, improved platform usability and enhancements to feedback and collaboration tools. By addressing these gaps, Blackboard can better facilitate dynamic, inclusive and student-focused curriculum development. Continuous design improvements, particularly targeting usability, scalability for large classes and real-time collaboration, will greatly enhance its performance. DSR thus proves to be a valuable framework for

systematically improving educational technologies through iterative evaluation and feedback, ensuring that they evolve in line with real-world teaching and learning needs.

Recommendation and Conclusion

This research applied the Design Science Research (DSR) approach to evaluate the value of Blackboard as a learning management system (LMS). Conducted through a structured and iterative research lens, the study gathered input from key stakeholders, who highlighted Blackboard's strengths in flexibility, multimedia integration and collaborative functionality. At the same time, several areas requiring improvement emerged, including usability challenges, limited feedback options and the need for more robust instructor support.

The findings emphasise that the success of LMSs such as Blackboard depends not only on their technical capabilities but also on how well they align with users' needs, support pedagogical objectives and integrate into institutional processes. To maximise the platform's impact, continuous user feedback, iterative design enhancements and targeted training are essential. Furthermore, integrating the Technology Acceptance Model (TAM) within the DSR framework enables a comprehensive evaluation that bridges theory and practice, offering actionable insights for both research and real-world educational contexts.

Based on these insights, the following recommendations are proposed:

1. Implement a continuous improvement cycle driven by DSR principles, incorporating regular user feedback to refine Blackboard's design and functionality.
2. Enhance feedback and assessment tools, including the introduction of template-based feedback mechanisms to reduce repetitive grading tasks in large classes.
3. Expand specialised features to better support discipline-specific needs, such as complex economic models, coding environments, and other subject-specific tools.

Ultimately, using frameworks such as TAM within a DSR methodology provides an action-oriented, theory-informed approach to evaluating and improving digital learning platforms. This dual perspective benefits both academic research and practical applications, ensuring that learning management systems remain responsive, user-centered and pedagogically effective.

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