

Usability evaluation of the Blackboard Learning Management system at a South African university of technology

by

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ABSTRACT

The usability of Learning Management Systems (LMS) was critical for enhancing student engagement and learning experiences. This study focused on Blackboard Learn, a widely used LMS at Cape Peninsula University of Technology (CPUT). It addressed gaps in understanding the system's usability and its role in promoting Active Learning, aiming to provide insights into improving digital learning environments.

The main objective was to assess the current usability level of Blackboard Learn at CPUT and to determine how it could effectively promote Active Learning.

This qualitative study employed user testing sessions and online questionnaires. Data were collected from students and analysed using NVivo for thematic analysis. Key themes such as usability challenges, active learning facilitation, and technical issues were identified and examined.

The findings revealed several usability issues with Blackboard Learn, including navigation difficulties and technical problems. Despite these challenges, Blackboard Learn was found to significantly promote Active Learning by facilitating collaboration and engagement among students.

The study highlighted the importance of addressing usability issues to enhance the effectiveness of Blackboard Learn. By improving the platform's usability, educators could better support Active Learning, leading to improved student engagement and learning outcomes.

This research filled the gap in understanding the usability of Blackboard Learn at CPUT and its impact on Active Learning. The insights provided could guide the development of best practices for LMS implementation, contributing to the broader field of digital education and usability studies.

Keywords: Usability, Learning Management System, Active learning

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DEDICATION

My deepest appreciation goes to my beloved family, whose enduring love and support have been constant pillars throughout my academic journey. The sacrifices and encouragement you have provided have allowed me to pursue my research passion and achieve this significant milestone. In recognition of your invaluable contributions, I have dedicated this research to you as a token of my gratitude and appreciation.

THESIS SUMMARY

Chapter one – Introduction: The inaugural chapter sets the stage for the study by defining the research problem and outlining the objectives. It establishes the significance of exploring the usability of Blackboard Learn at Cape Peninsula University of Technology (CPUT) within the framework of Active Learning, providing a clear direction for the research.

Chapter two – Literature Review: This chapter delves into existing literature, synthesizing findings on common usability challenges in Learning Management Systems (LMSs), exploring student experiences, and emphasizing the importance of Active Learning. This chapter lays the theoretical groundwork necessary for understanding the complexities of Blackboard's usability.

Chapter three – Methodology: This chapter details the chosen methodology, elucidating the qualitative research design, user testing sessions, and purposive sampling. It provides transparency into the research process, ensuring the robustness of the study and a clear understanding of the chosen methods.

Chapter four – Findings and Analysis: The heart of the study unfolded in chapter four, where empirical findings from user testing sessions and online questionnaires are presented. Usability issues within Blackboard Learn are identified, offering a comprehensive understanding of the challenges faced by students. The chapter dissects the data, providing a rich narrative that illuminates the current state of Blackboard's usability at CPUT.

Chapter five – Recommendation and Conclusion: In the final chapter, recommendations are proposed to enhance Blackboard's usability, encapsulating the essence of the study's exploration. A comprehensive summary and conclusion were provided, paving the way for future endeavours in the realm of digital learning environments and wrapping up the research journey.

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GLOSSARY

Terms/Acronyms/Abbreviations	Definition/Explanation	
Active Learning	A pedagogical approach that engages	
	students in the learning process through	
	activities, discussions, and problem-solving,	
	promoting higher-order thinking and	
	retention of information.	
Google Forms	An online survey tool provided by Google	
	that allows the creation of customizable	
	forms and questionnaires.	
Human Computer Interaction (HCI)	A discipline focused on designing user-	
	friendly and interactive computer-based	
	systems.	
Learnability	An attribute of usability that defines how	
	easy systems are to learn to get to use them.	
Learning Management System (LMS)	A software application or platform that	
	facilitates the management and delivery of	
	educational courses and materials.	
Memorability	An attribute of usability which speaks to how	
	systems help users remember how to	
	perform tasks and activities.	
Mixed-Methods	An approach that combines both qualitative	
	and quantitative research methods in a	
	single study to provide a more	
	comprehensive understanding of the	
	research questions.	
Purposive Sampling	A non-probability sampling technique where	
	participants are selected based on specific	
	criteria relevant to the research objectives.	
Qualitative Research	A research method that aims to gain an in-	
	depth understanding of human behaviour,	
	attitudes, and experiences through methods	
	such as observations, and content analysis.	

Quantitative Research	A research method that involves the	
	collection and analysis of numerical data to	
	identify patterns, trends, and relationships.	
Usability	The extent to which a system, such as	
	Blackboard Learn, can be used by specified	
	users to achieve specific goals effectively,	
	efficiently, and with satisfaction.	
User Experience	The overall experience a person has when	
	interacting with a system, including aspects	
	such as usability, accessibility, and	
	satisfaction.	
User Testing	A method of evaluating the usability of a	
	system by observing users as they interact	
	with it, typically involving specific tasks and	
	scenarios.	

CHAPTER ONE – INTRODUCTION

In this chapter, we delved into the focal point of our study, introduced the background, research problem, aim, questions, and objectives. The narrative unfolded to provide an insightful overview of the anticipated research process. Ultimately, the chapter set the stage by outlining the structure and key elements of the ensuing report.

1.1 Introduction

Ever since its invention, the web became an important part of daily activities—it was a prevalent communication method (Cocquebert *et al.*, 2010; Gandhi, 2017). Consequently, the web provided opportunities to many industries and businesses alike. Education utilized this medium to afford universities a learning management system (LMS) (Almaiah *et al.*, 2020). These systems enabled universities to organize lessons remotely, store lessons in cloud-based systems, provide unlimited access to information for learners and teachers, track learners' progress, and more.

In recent years, the significance of LMS steadily grew (Burtsev, 2021). This trend became particularly pronounced during the COVID-19 pandemic, which imposed constraints on traditional, in-person education. Universities increasingly relied on LMS platforms to respond to the pandemic, allowing students worldwide to pursue their studies from the safety of their homes (Alsoud & Harasis, 2021; Mpungose, 2020).

LMSs enabled the sharing of information across entire universities and served as platforms for teaching and learning purposes. Both students and teachers effectively used these systems to assist with learning and teaching in a satisfying manner and meet their training needs. These educational systems became more relevant and convenient than traditional, face-to-face teaching methods due to advancements in technology. The integration of digital tools and platforms allowed for greater accessibility, flexibility, and efficiency in meeting the needs of both students and educators.

An LMS was an online educational tool that made distance learning possible during the coronavirus pandemic (Shkoukani, 2019). Thus, LMSs represented a new approach to traditional education. The transition from traditional education to advanced technology provided a wide range of opportunities (Ilie & Frăsineanu, 2019). Various authors (Kalakota & Whinston, 1996; Owens & Floyd, 2007; Owens & Price, 2010; Tonsmann, 2014; Alokluk, 2018) noted that the web and its components offered universities significant opportunities to enhance both teaching and learning environments. These opportunities included (i) delivering courses, (ii) making academic announcements, (iii) completing and submitting online assessments, (iv) uploading and sharing learning materials, and much more.

It was, therefore, important to take advantage of the affordances introduced by the internet. Based on previous studies (Baylari et al., 2009; Zhang et al., 2012; Aljeraiwi, 2017), teachers became capable of delivering learning materials, uploading content, and communicating with learners in a ubiquitous manner.

This chapter presented the research methodology used in this study. Research methodology involved the systematic application of philosophies, approaches, methods, and techniques to investigate specific phenomena (Vass, Rigby & Payne, 2017). According to the same authors, research methodology referred to the process used to gain a deeper understanding of people's perceptions and experiences related to observed occurrences.

1.1.1 Blackboard

Cape Peninsula University of Technology (CPUT) has embraced Blackboard as its online learning platform to improve the teaching and learning experiences for both faculty and students (Jamal *et al.*, 2011; Madoda, 2018). Blackboard is a web-based software suite that provides users with a better way compared to traditional, manual methods or less sophisticated digital systems to keep track of their performance (Alelaiwi *et al.*, 2015; Kunene *et al.*, 2017; Alokluk, 2018).

This online learning environment has certain features that allow academic staff and students to interact using the video conferencing facility (Bradford *et al.*, 2007; Madoda, 2018). In addition, Blackboard has functionalities that provide several other benefits to its end-users (Tonsmann, 2014; Alokluk, 2018). The online platform offers a range of functional features such as real-time support, submission of assignments, online exams and tests, grading enhancements, similarity checking, whiteboard, course portfolio, and announcements. These features are designed to help students learn, practice, and assess their knowledge.

The platform is user-friendly, meaning it has an intuitive interface, simple navigation, and minimal learning curve, enabling users to interact with it easily without requiring extensive technical skills. Furthermore, it is safe and efficient, making it an ideal choice for educational institutions and students.

This interaction design referring to the way users engage with and navigate the LMS, including its layout, tools, and overall functionality aims to create an environment where end-users can easily meet their needs when interacting with the system. User-friendly Learning Management Systems (LMSs) can attract students, but it is the work of Instructional Designers that ensures these systems are truly user-friendly. To attract students, an LMS must be easy to navigate, intuitive to use, and contain valuable, well-organized, and easy-to-read content.

While a user-friendly LMS can enhance the user experience by improving accessibility and efficiency, it is important to avoid overstating its role. A university's success relies on multiple factors, including quality education, supportive faculty, and effective digital platforms like LMSs. As argued by Tonsmann (2014) and Douneva et al. (2016), neglecting usability guidelines can lead to student frustration, which may, in turn, result in academic setbacks.

The authors further revealed that some universities fail to meet students' expectations due to a lack of engaging, traditional interactions in their LMSs such as dynamic discussions, meaningful feedback, and opportunities for collaboration. These gaps can adversely affect student performance and overall satisfaction with their learning experience.

Usability is a measurable attribute, although it is typically assessed qualitatively rather than quantitatively. These evaluations aim to enhance the user experience, as researchers such as Zaharias and Poylymenako (2009) and El-firjani et al. (2017) noted. Usability attributes, such as ease of navigation, intuitiveness, consistency, accessibility, and responsiveness, are crucial factors that impact the system's design, runtime behaviour, and overall user experience.

The following are some methods that can be used to measure the usability level (Maze, 2023):

- Usability testing: this involves conducting structured tests where participants perform specific tasks within the system. The objective is to gain meaningful insights into how users interact with the interface, identify potential usability issues, and determine whether the system is intuitive and efficient enough for users to achieve their goals. Usability testing often measures metrics like task completion rate, time taken to complete tasks, and error rates, providing both qualitative and quantitative data to evaluate the interface.
- **Design guidelines:** these are a set of standards and principles that guide the development of interfaces to ensure a positive and consistent user experience. They address aspects such as layout, typography, color schemes, and interactive elements to enhance usability. Design guidelines aim to make the interface predictable, visually appealing, and easy to navigate, ultimately improving user satisfaction and engagement.

- Field studies: this method involves observing and analyzing how users interact with the system in their natural environment. By studying real-world usage, researchers can better understand user behavior, identify challenges users face, and uncover opportunities for improvement. Field studies are especially valuable for capturing contextual factors that may influence usability, such as distractions, device preferences, or accessibility needs.
- Heuristic evaluation: this method relies on usability experts evaluating the system against a set of established heuristics (or usability principles), such as Nielsen's heuristics. The goal is to identify potential usability issues, such as inconsistencies, lack of feedback, or confusing navigation. Heuristic evaluation is a cost-effective way to detect usability problems early in the design process, allowing for iterative improvements.
- Participatory design: This approach actively involves end-users in the design process to ensure the system meets their needs and goals. By engaging users in brainstorming sessions, prototyping, and feedback cycles, participatory design fosters a sense of ownership among users and ensures that the final product aligns with their expectations. This collaborative method helps bridge the gap between user requirements and design decisions.

Panach et al. (2008) and Sholiq et al. (2021) emphasize the significance of understandability as a crucial factor influencing the manageability and overall quality of a system. To ensure a high-quality system, assessing the user experience is essential.

The research conducted in this research study is focused on evaluating the existing usability of Blackboard Learn and identifying potential usability issues that might impede students in enhancing their academic performance at CPUT.

1.2 Background to research problem

The internet is providing many opportunities in the field of education. Universities have adopted electronic learning systems to break barriers and provide education to people remotely. Universities use their websites to provide their students with information that enriches their knowledge by using certain tools that enable them to learn their subjects online (Harinarayana *et al.*, 2010). The objective of most university's e-learning systems is to deliver relevant information to ther students in a proper way (Jabar *et al.*, 2014).

In fact, university LMSs are designed to enhance interaction between students and their institutions (Muhammad *et al.,* 2021). These systems facilitate remote learning, a vital component in most universities. LMSs primarily support educational purposes, enabling students to access resources, communicate with faculty, and manage coursework effectively.

The performance of students can be significantly impacted by the usability and accessibility of these systems.

The absence of a user-friendly LMS can negatively affect the overall student learning experience. As Hasan et al. (2013) noted, poor usability in digital systems, such as websites, can lower user confidence and discourage engagement, a principle that applies to LMSs as well. In today's academic environment, students heavily depend on university LMSs to interact with professors, access learning materials, and manage online courses. Therefore, universities must ensure that these systems are accessible, intuitive, and capable of providing optimal learning conditions to support all students.

Furthermore, LMSs offer students convenient access to learning resources from anywhere (Donoghue *et al.*, 2002). For these systems to be effective, however, course material must be designed for easy comprehension. Unfortunately, usability issues in some university LMSs hinder student engagement and result in infrequent interaction with the platform.

Al-Furiah et al. (2020) emphasized the importance of LMSs, such as Blackboard, as essential tools for remote learning in universities. The study also highlighted a lack of sufficient research addressing the usability challenges of online course delivery systems, particularly in the context of universities in Saudi Arabia.

Despite the importance of a user-friendly LMS, common usability problems persist (Qutechate *et al.,* 2020). These issues can negatively impact student satisfaction and lead to reduced interaction with the system, ultimately hindering the learning process (Ohliati & Abbas, 2019; Vlachogianni *et al.,* 2020). Burtsev (2021) identified usability challenges within CPUT's Blackboard platform, emphasizing the need for improvements to enhance user experience.

However, to date, no published study has specifically evaluated the usability level of CPUT's Blackboard using established usability testing techniques. This gap is significant, as understanding these usability shortcomings is essential for making informed improvements that can foster better student engagement and learning outcomes. Further research addressing this gap would provide valuable insights into how usability impacts the effectiveness of LMS platforms in higher education institutions.

1.3 Research problem

The research problem identified in this study is *the absence of empirical data indicating the current usability level of CPUT's Blackboard platform, which plays a key role in supporting Active Learning. Without addressing this issue, students may face challenges in their learning process due to usability barriers*. This view is supported by Mtebe et al. (2015), who stated that most universities often do not conduct any usability evaluation before focusing on a system which could result in end-users being unable to satisfy their learning needs Identifying usability issues will provide CPUT with valuable insights into the current state of Blackboard, allowing for targeted improvements. This has the potential to increase student satisfaction and enhance the overall learning experience (Huynh et al., 2020).

1.4 Objectives, Research questions

1.4.1 Aim

The aim of this research study is to evaluate the usability of the Blackboard Learning Management System at CPUT and investigate how its features and functionalities support and enhance Active Learning practices. This study seeks to understand user perceptions and experiences to identify opportunities for improving the platform and fostering better student engagement and learning outcomes.

1.4.2 Objectives

Based on the aim of the research study, the objectives are as follows:

- RO1: Identify the usability/active learning problems that are commonly found in learning management systems.
- RO2: Identify the usability/active learning problems which are specifically found in the Blackboard Learn system at CPUT.
- RO3: Determine the usability level of CPUT's Blackboard implementations.
- RO4: Create a framework to enhance usability/active learning of CPUT's Blackboard Learn.

1.4.3 Research question

The research questions are as follows:

RQ1: How do users perceive the usability of Blackboard Learn at CPUT in supporting and promoting Active Learning?

RQ2: What strategies or practices can be adopted to optimize the usability of Blackboard Learn at CPUT and enhance its effectiveness in promoting Active Learning?

1.4.3.1 Sub-research questions for RQ1

- 1.4.3.1.1 What are the usability problems that are commonly found in learning management systems implementations?
- 1.4.3.1.2 What are the usability methods commonly used to assess learning management systems and implementations?
- 1.4.3.1.3 What is the current usability level of the Blackboard Learn system and implementations at CPUT?

1.4.3.2 Sub-research questions for RQ2

- 1.4.3.2.1 What is Active Learning on a Blackboard LMS?
- 1.4.3.2.2 How should Blackboard be implemented to promote Active Learning?
- 1.4.3.2.3 How should usability levels be optimised to promote Active Learning?

Objective (RO)	Research Question (RQ)	Sub-Research Question	Addressed in Chapter(s)
RO1: Identify the usability/Active Learning problems that are commonly found in LMS implementations.	RQ1: How do users perceive the usability of Blackboard Learn at CPUT in supporting and promoting Active Learning?	- What are the usability problems commonly found in LMS implementations? - What usability methods are commonly used to assess LMS implementations?	Chapter 2 (Literature Review) Chapter 3 (Research Design)
RO2: Identify the usability/Active Learning problems specifically found in the Blackboard Learn system at CPUT.	RQ1: How do users perceive the usability of Blackboard Learn at CPUT in supporting and promoting Active Learning?	- What is the current usability level of the Blackboard Learn system at CPUT?	Chapter 4 (Findings and Analysis)
RO3: Determine the usability level of CPUT's Blackboard implementations.	RQ1: How do users perceive the usability of Blackboard Learn at CPUT in supporting and promoting Active Learning?	 What is Active Learning on a Blackboard LMS? What is the current usability level of the Blackboard Learn system at CPUT? 	Chapter 4 (Findings and Analysis)
RO4: Create a framework to enhance usability/Active Learning of CPUT's Blackboard Learn.	RQ2: What strategies or practices can be adopted to optimize the usability of Blackboard Learn at CPUT?	 How should Blackboard Learn be implemented to promote Active Learning? How can usability levels be optimized to enhance Active Learning? 	Chapter 5 (Discussion and Recommendations) Chapter 6 (Framework Development)

Table 1: Alignment of Objectives, Research Questions, and Chapters

Table 1 provides an overview of how the research objectives and questions align with the aim of the study. It also indicates the chapters in which the research questions and sub-research questions are specifically addressed.

1.5 Significance and contribution of the study

The outcome of the study determined the current usability level of the Blackboard Learn implementations at CPUT, as well as described the challenges students faced while using Blackboard Learn. This research is expected to produce a framework to enhance the usability of Blackboard as implemented at CPUT.

The main problem addressed by this research is the lack of empirical data indicating the usability of CPUT's Blackboard platform. This study aims to assess the current usability of Blackboard at CPUT, providing valuable insights into its effectiveness. The findings of this research could contribute to the existing literature on the usability of LMSs and their role in enhancing user experience and promoting Active Learning in higher education.

In terms of practical contribution, the study identified usability issues within Blackboard and highlighted current best practices at CPUT. These findings could serve as a guide for users to utilize Blackboard more effectively.

The originality and significance of this research lie in its focus on evaluating the current usability of Blackboard at CPUT, making it one of the first studies to address this specific context. Additionally, the study promotes Active Learning by examining how Blackboard's usability and features can support and enhance interactive and student-centered learning experiences.

The focus of this study is to evaluate and enhance the usability of the Blackboard Learn system at CPUT, aiming to improve the user experience of students in digital learning environments. By identifying and addressing usability issues through data collection and analysis, the research seeks to optimize the platform to better support student engagement and Active Learning.

The study's findings are beneficial to a wide range of stakeholders. Students can utilize the recommendations to enhance their learning experience, while software developers can apply the findings to refine and optimize the already implemented Blackboard Learn system. Educators and administrators can use the research insights to make informed decisions and implement targeted improvements, enabling more effective use of the platform. These enhancements can lead to higher levels of student satisfaction and contribute to a more supportive and engaging learning environment at CPUT.

The findings from this study provide valuable insights for CPUT, particularly for those responsible for implementing and maintaining Blackboard Learn, such as the university's software developers. These insights can guide targeted improvements to the platform, enabling more efficient and satisfying use by students. By addressing identified usability issues, the study supports the enhancement of the overall learning environment at CPUT.

Additionally, this research bridges the gap between academic investigation and practical application, ensuring that its recommendations contribute directly to improving the design and functionality of Blackboard Learn.

1.6 Delineation of the research

This research study focused on testing and evaluating the implementation of Blackboard Learn to determine its usability at CPUT. Additionally, it examined how the platform supports Active Learning by exploring users' perceptions of Active Learning within the context of Blackboard at CPUT.

The researcher set out a user test for CPUT students interested in participating in the study. This is done to identify usability issues and assess the participant's satisfaction with Blackboard Learn.

1.7 Thesis structure

The thesis is structured into five chapters as illustrated in Figure 1.1.



Figure 1.1: Thesis Structure

Figure 1.1 provides a visual representation of the thesis structure, illustrating how the document is organized into chapters: Introduction, Literature Review, Research Methodology, Findings/Results, and Conclusion & Recommendations. The following subsections describe the content and purpose of each chapter:

• **Chapter One**: This chapter outlines the research aim, questions, and objectives, emphasizing the importance of investigating the usability of Blackboard Learn at CPUT in the context of Active Learning. It sets the stage for the study by presenting its significance and overall direction.

- **Chapter Two**: This chapter reviews the existing literature, focusing on common usability challenges in learning management systems, student experiences, and the role of Active Learning. It establishes the theoretical framework necessary to understand and analyze Blackboard's usability.
- **Chapter Three**: This chapter details the research methodology, including the sampling approach and data collection methods used. It provides a clear explanation of the research design and processes implemented to address the research questions.
- **Chapter Four**: This chapter presents and analyzes the data collected through various means, including the online questionnaire and user testing. It examines Blackboard's current usability at CPUT, offering insights into the Usability Level and its implications for users.
- **Chapter Five**: This chapter summarizes the key findings, providing recommendations for improving Blackboard's usability. It integrates the insights gained from the study, ensuring the research objectives are addressed and offering practical contributions to enhance the learning environment at CPUT.

1.8 Conclusion

This chapter introduces the study, offering background information and a concise statement of the research problem and objective. It also outlines the objectives derived from the main aim. The chapter includes a comprehensive review of relevant literature, emphasizing the core areas of the study. Overall, this chapter provides readers with a thorough overview of the thesis, effectively clarifying its content and purpose.

CHAPTER TWO – LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the literature related to the key areas explored in this study. A literature review, as defined by Rowe (2014), involves synthesizing existing research on a topic to identify research gaps and support the study's objectives. In this study, the literature review primarily focuses on examining the usability of LMSs, aligning with the study's aim to assess Blackboard users' perceptions of the platform's usability and the application of Active Learning at CPUT.

The literature review was conducted rigorously, providing an in-depth understanding of the relevant areas. This approach allowed for a comprehensive exploration of prior research findings, strengthening the study's research design. In addition to the usability of LMSs, the literature review covers related topics, including e-learning systems, interactive systems, LMS, Blackboard Learn, usability, usability measurement, and Active Learning.

The literature review is crucial to this study, forming the basis for the research design and methodology. The findings from this review will guide the interpretation of study results and the formulation of practical recommendations and suggestions for future research. In summary, the literature review provides a vital framework for understanding the research problem and is pivotal in advancing knowledge in this field.

2.2 E-learning systems

E-learning, an electronic learning platform, has become a promising educational system in recent years, thanks to the internet. This allows learners to access online education from anywhere and at any time, breaking geographical barriers to education. Universities have increasingly adopted these platforms to enhance student learning and engagement (Chang, 2013; Alsoud & Harasis, 2021).

This section explores the significance of interactivity in e-learning systems and its impact on the learning environment.

2.2.1 The importance of interactivity in e-learning systems

Interactivity plays a crucial role in e-learning by enabling users to engage actively with educational content, which enhances their understanding and retention. This engagement fosters deeper learning, allowing users to apply concepts more effectively and facilitating the development of critical thinking skills (Chopra *et al.*, 2019). Additionally, usability is another key factor influencing the effectiveness of e-learning systems, as it ensures that the system is user-friendly, accessible, and supports a seamless learning experience (Matera *et al.*, 2008).

2.2.2 The impact of interactivity on e-learning system design

As per Alberto *et al.* (2012), interactivity stands as a key factor in enhancing the learning environment for e-learning system users. The design of e-learning systems is influenced by interactivity, as it aids users in their learning journey (Evans *et al.*, 2007).

2.2.3 Factors affecting interactivity in e-learning systems

Previous studies (Cyr et al., 2009; McMillan et al., 2002; Pituch et al., 2006; Song et al., 2008; Wu, 2006) have identified critical factors that shape how users interact with e-learning systems. Recent studies have built upon these foundational findings. For example, Alsoud and Harasis (2021) highlight the influence of utility expectancy, social influence, and facilitating conditions on students' use of e-learning technologies, while noting that effort expectancy does not significantly impact engagement. Additionally, Alrawashdeh et al. (2022) extended the Unified Theory of Acceptance and Use of Technology (UTAUT), emphasizing the importance of system flexibility, interactivity, and enjoyment in enhancing user experience and engagement with e-learning platforms.

These key factors are as follows:

- **Controllability:** the e-learning system should be adaptable and manageable. Alberto et al. (2012) state that learning occurs through content manipulation. This implies that users should be able to control certain aspects of the system (Stary *et al.*, 2006).
- **Personalization:** The system should provide personalized content to users based on their preferences and learning styles.
- **Responsiveness**: refers to a system's ability to react within a specified time frame. When the system's response time is quick, consistent, and reasonable, it is perceived as effective and useful (Stary *et al.*, 2006). Cheng (2013) argues that the effectiveness of this responsiveness significantly impacts the success of e-learning systems, as slow or erratic responses can hinder the learning experience.

- **Collaboration:** The system should enable users to collaborate with other users and instructors to facilitate better learning.
- **Two-way communication:** this refers to the e-learning system's ability to facilitate interaction between users, as communication is a key factor in fostering collaboration, engagement, and the exchange of knowledge in the learning process (Stary *et al.*, 2006).
- **Feedback:** The system should provide feedback to users to help them assess their learning progress and identify areas for improvement.
- **Multimedia:** The system should incorporate multimedia elements such as videos, audio, and animations to enhance the learning experience.

In conclusion, e-learning systems have emerged as a promising educational platform, and interactivity plays a crucial role in their design and implementation. Interactivity factors such as responsiveness, personalization, collaboration, feedback, and multimedia can significantly impact how users interact with e-learning systems and improve the learning environment. Hence, e-learning systems must incorporate these interactivity factors to enhance the overall learning experience of its users.

2.3 Interactive systems

An interactive system is designed and programmed to enable continuous interaction between users and computers. Human-Computer Interaction (HCI) focuses on creating user-friendly computer systems, systems that are intuitive, easy to use, and efficient in helping users achieve their goals (Raees *et al.*, 2024). A user-friendly system is one that enhances service quality and task performance by minimizing complexity and ensuring accessibility. The system's performance is closely tied to its interface, making a well-designed interface essential for improving the overall user experience.

Effective system design is crucial as it enables users to communicate with the system through a user-friendly interface that meets their needs. Interactive systems, like websites, mobile apps, and desktop applications, strive to enhance service quality and task performance by providing intuitive interfaces for quick and easy access to information or services (Zhang *et al.*, 2020).

HCI is an interdisciplinary field that combines computer science, psychology, design, and many more to create effective and enjoyable systems (Sharp *et al.*, 2019). Understanding user needs and expectations and designing a well-crafted interface can significantly improve the user experience and overall performance.

Previous research has indicated that poorly designed interfaces can lead to user confusion and frustration, which in turn results in decreased performance and diminished user satisfaction. As such, the design of an interface is crucial for optimizing both user satisfaction and productivity.

In summary, HCI aims to develop user-friendly systems. The design of effective interfaces and systems is essential for enhancing user experience and task performance. A comprehensive understanding of user needs and expectations is critical for creating interactive systems that deliver a productive and satisfying experience.

Figure 2.1 illustrates the environment in which a user interacts with a system. This figure highlights the opportunities and services provided by the system, such as the functionalities, features, or support available to the user. Additionally, it includes a user block, which represents the internal state of the user, encompassing their needs, satisfaction, and expectations.



Figure 2.1: Impact of a system on user experience (Klotins et al., 2018)

Figure 2.1 is highly relevant to the study as it visually represents the interplay between the user, students and educators, and the system Blackboard Learn. It highlights the critical factors influencing UX, such as user needs, resources, expectations, and satisfaction, in relation to the functionalities provided by the system. By illustrating this relationship, the figure aligns with the study's aim of assessing the usability of Blackboard Learn and its role in supporting active learning at CPUT.

The figure contributes to the current topic by providing a theoretical framework to evaluate how effectively Blackboard Learn meets users' needs and expectations. It emphasizes the importance of understanding user perceptions and how they are influenced by interactions with system features like course materials, chat rooms, and other tools. This insight supports the study's focus on identifying usability challenges and promoting improvements to enhance user satisfaction and engagement.

Moreover, the figure reinforces the concept of usability as a dynamic relationship, where system design and user requirements must be harmonized. It adds value by framing the study's findings within a broader context of user-centered design, offering a basis for actionable recommendations to improve Blackboard Learn's functionality and, by extension, the digital learning environment at CPUT.

The impact of the LMS on students' experiences is significant, particularly when considering its role as an interactive system. As interactive systems, LMS platforms allow students to engage with course materials and communicate with instructors and peers. A study conducted by Chen and Lin (2021) found that the usability of an LMS greatly influences student engagement and satisfaction. Students who found the LMS easy to use were more actively engaged with the course materials and reported higher satisfaction with their learning experience. In contrast, students who faced usability challenges tended to disengage, leading to a more negative perception of their learning experience.

Additionally, Waddell *et al.* (2015) argue that the usability of an interactive system and its user interface are crucial factors in determining the quality of results and overall system performance.

For optimal performance, the system should cater to the learning needs and requirements of its users. A flexible, interactive system allows users to interact in ways that meet their needs and desires, while a poorly designed user interface can lead to user errors (Dix *et al.*, 2004).

Dix *et al.* (2004) also argue that an interactive system can only be considered useful if it is designed with a goal-driven approach. Designers must understand users' needs, capabilities, and limitations to create systems that align with their objectives (Preece *et al.*, 2019). For students using interactive systems, these objectives may differ, but they all ultimately relate to improving their learning experiences and meeting academic goals. For example, students may need an interactive system that allows them to communicate with their lecturers or engage in online classes, which facilitates their learning process.

However, If the system's interface is not user-friendly, students may struggle to navigate it, and the lack of essential tools can hinder their ability to learn and achieve their academic goals. To address these challenges, systems like Blackboard, which feature tools such as Blackboard Collaboration, enable direct interaction between students and instructors during classes. When designing such systems, it is crucial to empower both students and instructors to achieve their respective educational goals (Ayman Zaky Elsamanoudy *et al.*, 2020). This involves understanding users' needs and capabilities and tailoring the system to support these objectives.

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Usability and the user interface are key factors in an interactive system's performance and the quality of the learning outcomes it supports. A flexible system allows users to interact in ways that best meet their needs, while a poorly designed interface can lead to errors and hinder learning (Lewis & Sauro, 2021). To ensure that an interactive system is effective, it must be designed with a goal-driven approach that considers users' needs, capabilities, and limitations. Ultimately, a well-designed system can significantly aid students in achieving their learning objectives, leading to better academic performance and overall success in their courses.

Klotins *et al.* (2018) believe that some attributes significantly impact how users interact with a system and how their performance is affected by that interaction.

These attributes include the following:

- Interfaces: Refers to how users interact with the system. A user interface that is easy to navigate and understand is more likely to result in positive user experiences, which can improve user performance—the effectiveness with which users accomplish tasks within the system.
- **Visual Display:** refers to the way in which system content is presented to users. Visual aesthetics such as colour, layout, and typography can impact a user's emotional response to the content, and ultimately, their ability to understand and process it.
- **Content:** Refers to the information made available within the system for users to access. Relevant and useful content can facilitate learning and academic performance, while irrelevant or inaccurate information can negatively impact learning outcomes and user engagement.
- **Function:** Refers to the capabilities of the system, such as those provided by Blackboard, an online LMS used by academic staff and students. Key functions, such as SafeAssign, Collaboration integration, and grading enhancements, can enhance the system's utility and overall UX.
- **Performance:** Refers to the system's ability to meet user expectations in terms of speed, responsiveness, and reliability. A system that performs well increases user confidence and trust, leading to improved learning outcomes and a better overall user experience.

In conclusion, as outlined by Klotins *et al.* (2018), these attributes are pivotal in shaping how users interact with a system and the outcomes they achieve. Therefore, it is crucial to carefully consider these attributes when designing and implementing interactive systems to optimize their overall effectiveness.

2.4 Learning management system

An LMS, as defined by Lopes *et al.* (2020), is a web-based platform designed to create an effective online learning environment. It supports academic information delivery, remote access, administration, and management of services.

Today, LMS usage is widespread in colleges and universities, forming an essential part of the educational experience, with Moodle, Blackboard, Desire2Learn, and Schoology being some of the notable platforms (Collins *et al.*, 2017). These systems offer tools to enhance teaching and learning, facilitating online education.

One significant application of LMS is in knowledge management (KM), closely linked with educational institutions (Collins *et al.*, 2017). KM activities include gathering, analysing, and sharing knowledge, making LMS a valuable resource.

The introduction of LMSs in higher education has significantly transformed the way institutions manage and deliver education. These platforms allow educators to create, distribute, and track learning materials, providing students with easy access to resources and enabling communication between students and instructors. The widespread adoption of LMS platforms, such as Blackboard, Moodle, and Canvas, has made online education more accessible and organized, supporting both traditional and remote learning environments. As higher education continues to embrace digital learning, the role of LMSs in enhancing educational delivery becomes increasingly vital (Rahmatullah, 2021).

LMS platforms present various opportunities, such as streamlining course management, fostering collaboration, and enabling personalized learning experiences. They provide students with 24/7 access to course materials, assignments, and discussions, enhancing flexibility and learning autonomy (Beharry, 2024). However, there are also significant challenges associated with their implementation and use. These challenges include technical issues, resistance to change from faculty, and the need for ongoing training and support (Beharry, 2024). Ensuring that both students and instructors are equipped to fully leverage the LMS is crucial for maximizing its potential and overcoming these challenges (Chen & Lin, 2021).

One of the primary goals of implementing an LMS is to address the diverse learning needs of students. These systems allow instructors to tailor content, provide immediate feedback, and create a more engaging and interactive learning environment (Rahmatullah, 2021). For e-learning instructors, their tasks involve designing effective online courses, managing digital content, monitoring student progress, and providing timely support. The LMS plays a crucial role in these tasks by offering tools that facilitate communication, collaboration, and assessment (Preece *et al.*, 2019). By aligning the LMS features with student needs, instructors can create a more personalized and effective learning experience (Chen & Lin, 2021).

While LMS platforms offer numerous benefits, they also raise concerns for institutions, teachers, and students. For institutions, there are challenges related to the cost of implementation, system maintenance, and ensuring data security (Beharry, 2024). Teachers may struggle with adapting their teaching styles to the online environment, particularly if they lack experience with digital tools (Rahmatullah, 2021). Students, on the other hand, may face difficulties with navigating the system, engaging with course materials, or managing their time effectively (Chen & Lin, 2021). Addressing these concerns is essential to ensuring that all stakeholders have a positive experience with the LMS and that its integration leads to improved educational outcomes.

The successful integration of an LMS requires a careful evaluation of an institution's specific needs and goals. Factors such as course delivery methods, student demographics, and the institution's pedagogical approach must all be considered when selecting and implementing an LMS (Preece *et al.*, 2019). It is essential to choose a system that is user-friendly, flexible, and capable of supporting the institution's unique educational objectives. By involving all stakeholders, faculty, students, and administrators, in the decision-making process, institutions can ensure that the LMS is well-suited to their needs and can be effectively integrated into the learning environment (Beharry, 2024). Proper training and support are also necessary to ensure that users can maximize the benefits of the system (Chen & Lin, 2021).

2.5 Blackboard Learn

In response to the increasing demand for digital learning environments, LMS have become essential tools for delivering educational content effectively. Blackboard, as one of the leading LMS platforms, provides a comprehensive solution for course management, content delivery, and student engagement. It offers a range of features that support both asynchronous and synchronous learning, allowing educators to organize course materials, communicate with students, and track academic progress. The integration of Blackboard in higher education has played a pivotal role in the evolution of teaching and learning, particularly in the context of remote education.

The effectiveness of any LMS, including Blackboard, is largely dependent on its usability. According to Al-rahmi et al. (2021), usability issues, such as poor design and navigation, can significantly hinder the learning process. As such, it is crucial for educational institutions to conduct thorough assessments of Blackboard's usability before its implementation. Features such as the user interface, ease of navigation, and the accessibility of tools are vital components that influence how effectively both students and instructors can use the platform. Ensuring that Blackboard's design meets the needs of its users is essential for enhancing engagement and improving learning outcomes.

The COVID-19 pandemic highlighted the critical role of Blackboard and other LMS platforms in facilitating remote learning. As educational institutions worldwide shifted to online teaching, Blackboard became a central platform for maintaining academic continuity. Features such as real-time collaboration tools, video conferencing integration, and content management capabilities allowed instructors to engage with students and deliver lessons remotely (Alsoud & Harasis, 2021; Mpungose, 2020). The rapid transition to remote learning required both faculty and students to adapt quickly to these tools, underscoring the importance of an LMS that supports seamless communication and learning management in a virtual environment.

Blackboard's communication tools are integral to fostering student engagement in an online learning environment. Discussion boards, announcements, and direct messaging systems facilitate regular interaction between students and instructors, helping to maintain a sense of community and support. These features, combined with grading and feedback functionalities, are essential for tracking student performance and ensuring timely support. Furthermore, the ability to provide personalized feedback within Blackboard enables instructors to guide students effectively and address their individual needs, thus enhancing the overall learning experience.

As the field of education continues to evolve, Blackboard remains a prominent LMS in higher education. The platform's ongoing development includes the integration of mobile access, advanced analytics, and adaptive learning features, which aim to further enhance the user experience. However, continual assessment of Blackboard's usability and its alignment with the pedagogical needs of instructors and students is necessary to ensure its continued effectiveness. Educational institutions must stay attuned to user feedback and adapt the platform's features to meet emerging challenges and demands in the rapidly changing landscape of higher education.

Blackboard's online environment has various characteristics for teaching and learning, as well as several crucial features.

The following are some of these characteristics (Alokluk, 2018):

Flexibility

Blackboard offers significant flexibility for both students and instructors, a crucial feature in modern education. The platform allows users to access materials and participate in courses from anywhere at any time, aligning with the growing demand for remote learning and accessibility. Blackboard's mobile-friendly interface and cloud-based infrastructure provide students with the ability to engage with course content, submit assignments, and participate in discussions while on the move, offering a level of flexibility that enhances the learning experience (Joan, 2013).

Accessibility

Blackboard places a strong emphasis on accessibility, ensuring that its platform is usable by students and instructors with varying needs and abilities. The system is designed in compliance with WCAG (Web Content Accessibility Guidelines) to support users with disabilities. Features such as screen reader compatibility, keyboard shortcuts, and customizable display settings make Blackboard a more inclusive tool for diverse user groups (Matera *et al.,* 2008). By meeting these standards, Blackboard provides a more equitable learning environment for all users, regardless of their backgrounds or physical abilities.

Variety

One of Blackboard's standout features is its variety of tools and resources that enhance the learning experience. Instructors can upload multimedia content, including videos, documents, and interactive elements, and incorporate third-party applications such as LTI (Learning Tools Interoperability) compatible tools, which help to expand the range of resources available to students. Additionally, Blackboard supports integration with external content repositories and open educational resources, allowing students to access a wealth of materials and learning methods. This variety helps to cater to different learning styles and broadens the scope of educational content available to learners.

Time

Blackboard is designed to save both time and effort for instructors and students. Features such as recorded lectures, asynchronous discussions, and pre-recorded materials ensure that students can review content they may have missed or revisit concepts they find challenging. This flexibility reduces the need for students to attend live lectures, saving time and allowing for more personalized learning experiences. Instructors benefit from time-saving tools like automated grading, streamlined communication through announcements, and integrated feedback systems, allowing them to manage courses efficiently and devote more time to engaging with students (Alokluk, 2018).

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A study conducted at Umm Al-Qura University in the Kingdom of Saudi Arabia assessed the usability of Blackboard and identified several significant usability issues (Alhabeeb & Rowley, 2017; Alzain, 2021). These findings suggest that the usability of Blackboard could be improved by customizing the platform to better meet the specific needs of its users. While customization can address certain usability challenges, it may not fully resolve all issues without a deeper understanding of how users interact with the system and their unique needs. Customization could include altering the user interface, improving navigation, or tailoring features to enhance user experience, but it is important to first evaluate the underlying causes of usability problems.

Alhadreti (2021) underscores the importance of usability evaluations in determining how easy a system is to use. A comprehensive usability assessment ensures that a system is user-friendly, efficient, and capable of meeting the needs of its users (Rahmatullah, 2021). Key usability goals, such as effectiveness, efficiency, safety, and simplicity, should guide the design and evaluation of systems like Blackboard. However, the repeated mention of these goals may need further elaboration in the context of how they specifically apply to Blackboard's usability.

Notably, there has been a lack of research into the usability of Blackboard at CPUT (Cape Peninsula University of Technology) in South Africa, which is a significant gap given the rapid shift to online learning during the COVID-19 pandemic. The usability of Blackboard plays a crucial role in influencing learning outcomes, particularly when students and instructors rely on the platform for remote education. Mahyoob (2020) emphasizes that usability directly affects how effectively students can engage with content and complete their assignments, which, in turn, impacts academic success. This study aims to address this gap by exploring how CPUT users perceive the usability of Blackboard and identifying areas for improvement.

2.6 Usability

LMSs are becoming richer and more complicated systems, and making them accessible and useable to users with varying needs can be nearly impossible if they are not designed for simple use (Peters, 2021). The human's perceptual and cognitive faculties limit the application of LMS from the users' perspectives.

The greater the interaction an LMS offers, whether in terms of features, options for collaboration, or accessibility, the more user-friendly it becomes. This, in turn, leads to higher user satisfaction with the tools they use. When an LMS facilitates interaction between users, such as students, instructors, and peers, through features such as discussion forums, real-time feedback, and multimedia resources, it enhances the overall user experience. As usability improves, students are better able to navigate and engage with the system, resulting in a more effective learning experience and improved academic performance. Consequently, a key focus in LMS design and development is to create an interface that is both intuitive and conducive to learning (Ertürk & Önaçan, 2016; Merritt & Zhao, 2021).

Usability plays a crucial role in determining a system's overall quality and whether it can be easily used by its intended audience. A well-designed system is one that enables its users to achieve their goals with minimal effort, and it is essential that LMS platforms prioritize usability in their design to ensure effectiveness. A system with a high degree of usability fosters a positive relationship between the system and its users, placing particular emphasis on user trust, security, and ease of use, which are vital for user engagement and satisfaction.

To improve the usability of a system, its design must focus on easing the interaction between users and the system HCI. According to Deutsch (2008), web designers must leverage current technology to minimize usability issues and enhance the overall experience. Incorporating HCI principles ensures that users can quickly learn and navigate the system, resulting in a smoother and more efficient interaction.

A system's usability is defined by several important factors, such as its effectiveness, efficiency, user satisfaction, safety, error minimization, and the ease with which new users can learn and memorize its functions. These factors are fundamental to ensuring that users can interact with the system effortlessly and that their needs are met without unnecessary complexity (Smith *et al.*, 2022).

- Efficiency: this element defines how accurate and complete the system is in helping users fulfil their objectives (Dubey *et al.*, 2012). In addition, the interaction between users and the system According to Deutsch (2008), should be simple.
- Effectiveness: This refers to how well the system meets users' needs in terms of completing tasks and achieving their goals. An effective system allows users to perform their tasks without obstacles, ensuring that the platform delivers the desired outcomes.
- **Satisfaction:** this refers to how easy and pleasant the system should be to use, as it impacts the user experience (Winter *et al.*, 2008).
- **Safety:** Winter *et al.* (2008) state that the system should have a set of security measures as the users should feel comfortable while interacting with the system.
- **Errors:** usability can refer to error handling (Visser & Weideman, 2011). Users expect systems to have a low percentage of errors. Should an error occur during the use of a system, the user must be able to recover from it with no or little effort.
- Learnability: this is an important attribute that a system should have as it tends to facilitate the way users learn (Dubey *et al.*, 2012). Users need to be able to understand the system functionalities to be able to get to use the system at the start as quickly as possible.
- **Memorability:** This refers to the ability of users to recall the system's functionalities, especially after a period of not using it. Dubey et al. (2012) note that this attribute is particularly important for users who have used the system previously but may need time to reacquaint themselves with its features. Systems with high memorability enable users to quickly get back into the workflow after returning to the platform.

In summary, a system's usability hinges on these factors, collectively contributing to a positive user experience and efficient interaction.

2.7 Usability measurement

The aim of this research is to understand how Blackboard users at CPUT perceive the usability of the implemented Blackboard LMS. Evaluating the usability of CPUT's Blackboard implementation can provide valuable insights to improve the user experience for both students and staff. This study builds on previous research that investigates the usability of Learning Management Systems (LMSs), including similar platforms used in educational institutions, but does not rely on prior studies specific to CPUT.

To assess usability, this research adopts established usability metrics such as success rate, user satisfaction, and time efficiency. These metrics are applied to measure how effectively users can complete tasks, their overall satisfaction with the system, and the time taken to perform key functions (Nielsen, 2001). The study seeks to determine whether the current implementation of Blackboard at CPUT meets these criteria, thereby supporting effective teaching and learning outcomes.

Usability in the context of LMS refers to designing systems that meet the needs and expectations of students and teachers, aligning with their cognitive perceptions and attitudes to ensure effectiveness (Bradley, 2021). Measuring usability is critical to developing platforms that truly support user needs. Recent research underscores the importance of usability testing in LMS implementations. For example, Althobaiti and Mayhew (2023) evaluated LMS usability using metrics like satisfaction, operability, content quality, and communication tools, while Revythi and Tselios (2017) extended the Technology Acceptance Model with the System Usability Scale to assess behavioral intentions toward e-learning platforms.

Utilizing usability metrics such as these validates both the design and UX of LMS systems, ensuring they are user-friendly and effective (Mifsud & Dingli, 2011; Sahni & Dubey, 2014).

Jacob Nielsen (1994), categorizes usability measurement methods into four groups, which are as follows:

- **Automatic:** Usability measures are automatically computed by running a user interface specification through special software.
- Empirical: Usability is evaluated by testing the interface with real users or experts.
- Formal: Precise models and procedures are used to calculate usability measures.
- **Informal:** Usability measurements are derived using rules of thumb, evaluators' expertise, and experience.

Empirical methods, particularly user studies, are the most commonly employed. Some researchers use a single technique, while others use a combination of these methods (Alhadreti, 2020), like using questionnaires in a multi-method usability assessment, often referred to as usability testing.

Usability testing is indispensable for collecting data to identify user issues and enhance website usability. The resulting metrics can be both quantitative and qualitative (Alhadreti, 2020). Additionally, usability testing is a valuable method for evaluating the effectiveness of e-Learning systems, helping assess how technology and tools benefit users. LMSs can benefit from usability research to gauge their ease of use and user satisfaction (Alhadreti, 2020).

All the above studies mentioned so far refer to the importance of usability for university websites. These research studies have greatly contributed to the literature by providing ways to identify and solve usability issues.



Figure 2.2: Basic measurement attributes (Klotins et al., 2018)

Figure 2.2 illustrates the core attributes essential for evaluating the usability of a system, particularly in the context of e-learning platforms like Blackboard. These attributes, effectiveness, understandability, operability, attractiveness, and learnability, serve as critical benchmarks for assessing how well a system supports its users in achieving their objectives (Alturki *et al.*, 2016). The attributes shown in the figure are interconnected, collectively shaping the overall usability of the system.

- Completeness of Operation and Security: This aspect ensures that the system delivers all the required functionalities while maintaining high levels of security. A system that meets operational requirements without compromising user data enhances user trust and supports safe usage by students and staff. Security is particularly significant in Blackboard, which handles sensitive data, such as student records, grades, and personal information.
- Clarity of Operational Possibilities: This attribute emphasizes how easily users can understand the available functionalities of the system. For Blackboard, this includes ensuring that students and instructors can clearly navigate its tools, such as the grade book, discussion boards, and collaboration features, without confusion.
- Ease of Operation and Control: Ease of operation and control reflects the system's ability to facilitate smooth interactions and intuitive navigation. In Blackboard, this would translate to users being able to submit assignments, access learning resources, or

participate in online classes with minimal effort or guidance. This attribute ensures that the system meets the demands of both novice and experienced users.

- Ease of Use and Satisfaction: A user-friendly system significantly impacts user satisfaction, as it determines how comfortable and pleasant the experience is. Blackboard's usability, for example, plays a role in shaping perceptions of the platform and can influence both students' engagement levels and instructors' efficiency in managing course content.
- Instruction and Message Readiness: Providing clear instructions and well-designed notifications is critical for usability. In the context of Blackboard, features such as prompts for submission deadlines, announcements, and feedback from instructors align with this attribute, ensuring that users remain informed and supported in their tasks.

The attributes at the foundation of the figure, effectiveness, understandability, operability, attractiveness, and learnability, reinforce the usability assessment. Effectiveness ensures that the system allows users to achieve their objectives accurately and efficiently. Understandability reflects how easily users can comprehend the system's functions, while operability ensures smooth task execution. Attractiveness enhances user engagement by providing a visually appealing interface, and learnability facilitates quick adaptation, particularly for first-time users.

Collectively, the attributes depicted in the figure provide a framework for understanding how usability testing and design improvements can positively impact Blackboard's role in improving teaching and learning outcomes. This aligns with Alturki et al.'s (2016) emphasis on optimizing usability to meet the expectations and requirements of diverse users in educational environments.

2.8 Active learning

Active learning is a process where learners engage in activities like reading, writing, discussion, or problem-solving to analyse, synthesize, and evaluate class content (Slep, 2019). It's different from traditional lectures and can be applied in various ways, both in face-to-face and online classes (Burt, 2004; Parramore, 2019).

For instance, in a classroom, the instructor might have students discuss a topic with their neighbour, while in an online course, this interaction could happen through discussion threads, document sharing, or instant messaging. The concept remains the same, but the approach varies.

Research indicates that active learning helps students learn more effectively (Slep, 2019). Lectures can still be part of both face-to-face and online learning, but active learning goes beyond passive listening. It emphasizes higher-order thinking skills like creating, analysing, applying, understanding, evaluating, and remembering (Hartikainen *et al.*, 2019).

Due to the COVID-19 pandemic, traditional face-to-face lectures have given way to entirely online learning. This transition is challenging for instructors who must create digital educational content and for students who must adapt to a new, isolated working environment.

Luburić et al. (2021) research shows that Active Learning is an important component to include in most LMSs. The same author stresses that active learning is also a component that influences how students interact with course materials and engage with online courses.



Figure 2.2: Bloom's Taxonomy (Hyder & Bhamani, 2016)

Figure 2.3 illustrates a hierarchical framework for educational achievement, modeled after Bloom's Revised Taxonomy. This structure emphasizes the interdependence of cognitive processes, where each level builds upon the preceding one, creating a foundation for deeper learning and intellectual growth. By adhering to this framework, educators can design instructional strategies that systematically guide students through progressive stages of learning, ensuring comprehensive understanding and skill development.

At the base of the hierarchy is remembering, which involves recalling facts, definitions, and basic concepts. For example, within Blackboard, this level can be supported through features like content repositories that provide lecture notes, video recordings, and reading materials. Students can review previous lecture content to prepare for exams or revisit core concepts for clarification. For instance, a history student might refer to uploaded timelines or study flashcards available in the course material section to memorize key events and dates.

The second level, understanding, focuses on interpreting and explaining concepts. Blackboard facilitates this through discussion boards, quizzes, and multimedia tools. For example, a science lecturer might upload a video demonstration of a chemical reaction and then assign a multiple-choice quiz to assess students' comprehension of the process. Alternatively, discussion forums can prompt students to explain theories or concepts in their own words, fostering a deeper grasp of the material.

Applying entails the practical use of learned information in real-world or simulated scenarios. Blackboard supports this level through assignments and simulation tools. For example, in a marketing course, students might be tasked with using Blackboard's assignment feature to submit a case study analysis, applying marketing principles to solve a business problem. Similarly, engineering students might participate in virtual labs to test their understanding of theoretical principles in a simulated environment.

The analyzing stage requires students to examine relationships, compare ideas, and break down information into components. Blackboard's tools, such as collaborative group projects and peer review features, are instrumental at this level. For instance, a literature class might use collaborative projects to analyze themes and character development in a novel, with students sharing their insights via Blackboard Collaborate or discussion forums.

At this stage, students are expected to critique information and assess its validity. Blackboard supports evaluation through rubrics, peer assessment tools, and debate forums. For example, students in a law course might engage in debates about case rulings or evaluate the effectiveness of different legal arguments. These activities not only develop critical thinking but also foster collaboration and communication skills.

The apex of the framework, creating, involves synthesizing information to generate original ideas, designs, or solutions. Blackboard facilitates creativity through project-based assignments, research submissions, and portfolio tools. For instance, students in a design course might use Blackboard to submit a prototype of a product, accompanied by a detailed report outlining the creative process. Alternatively, a business class might use Blackboard Collaborate to pitch innovative startup ideas to peers and instructors.

This hierarchical framework assists lecturers in structuring their instructional strategies effectively. For instance, a lecturer might design a course on Blackboard that transitions students from remembering basic facts about a subject to creating innovative solutions for real-world challenges. By utilizing features such as quizzes for recalling facts, discussion forums for understanding concepts, and project assignments for higher-order tasks like creating, lecturers ensure that learning objectives align with cognitive goals.

Figure 2.3 underscores the importance of a progressive approach to learning, where foundational knowledge supports the development of advanced cognitive skills. By leveraging Blackboard's diverse tools, educators can address each level of this hierarchy, ensuring that students not only achieve their academic goals but also gain the critical thinking and problem-solving skills needed for future success.

As mentioned earlier, active learning involves active participation, collaboration, and the practical application of concepts in real-life situations. While it demands significant mental engagement, the benefits include enhanced retention and comprehension, which can be transferred to different contexts (Hartikainen *et al.*, 2019).

The primary objective of active learning is to encourage students to independently engage with the material, fostering deeper understanding and participation. Recent research highlights the effectiveness of active learning in improving academic outcomes and reducing course failure rates (Bonwell & Eison, 2020). According to Parramore (2019), active learning provides opportunities for feedback at multiple intervals, enabling students to reflect on their progress and make necessary adjustments.

Active learning not only enhances engagement but also develops critical and creative thinking skills. By solving real-world problems and receiving immediate feedback, students retain information more effectively and are better equipped to apply their knowledge in practical scenarios. Furthermore, this approach encourages collaboration, an essential skill in professional and social contexts. Trial and error, as part of active learning, helps students navigate challenges, build resilience, and discover innovative solutions. Overall, active learning is a transformative teaching method that fosters both academic growth and personal development.

While active learning provides excellent opportunities for dynamic and interactive learning, it also poses unique challenges. According to Rahman and Manaf (2017), active learning can create a chaotic environment that is difficult to manage, especially in more extensive courses. MacLachlan *et al.* (2021) assert that the COVID-19 pandemic has severely disrupted our society, especially affected various organizations, and made them function differently (Alsoud & Harasis, 2021). Those affected had to adapt to digital technologies swiftly.

Educational institutions had to switch from traditional classrooms to online courses to enable distance learning. Fortunately, some had already integrated e-learning technologies, such as LMS, before the crisis. However, transitioning from an LMS-supported traditional classroom to a fully virtual one posed significant challenges (Khalil *et al.*, 2020). This shift led to student difficulties, including reduced motivation and engagement due to the absence of in-person interactions (Rahman & Manaf, 2017).

Luburić *et al.* (2021) suggest that instructors may lack the skills and knowledge needed to create engaging digital educational content, contributing to these challenges. According to Topali *et al.* (2019), many students found most LMS platforms stressful and unpleasant due to their unfamiliarity with the system (Alhazmi & Rahman, 2012). Additionally, Araka *et al.* (2021) noted that most LMSs do not effectively promote active learning, a crucial element in education.

2.9 Summary

This chapter offers a thorough examination of relevant literature crucial to the research study. It delved into essential areas like e-learning systems, interactive systems, and LMSs, focusing on Blackboard Learn, usability, measurement, and active learning. By doing so, it highlights gaps in existing research, emphasizing the significance of the study. Chapter 3 will further expound on the research methodology employed to fulfill the study's aim and objectives.

CHAPTER THREE – RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology used in this study. Research methodology involves the systematic application of philosophies, approaches, methods, and techniques to investigate a specific phenomenon (Vass, Rigby & Payne, 2017). According to the same authors, research methodology is the process used to better understand people's perceptions and experiences related to the observed occurrence.

The methods and approaches selected for this study are designed to investigate how CPUT users perceive the usability of Blackboard and its role in promoting active learning.

This section provides an overview of the research process, detailing the research approach, methodology, design, data collection techniques, sampling strategy, data analysis methods, and an outline of anticipated findings. These elements are comprehensively addressed in Chapter 3.

3.2 Research approach

This section outlines the research approach to be employed in this study. According to Kothari *et al.* (2014), a research approach encompasses the plans, strategies, and methods used in conducting research for data collection, analysis, and interpretation. There are two primary research approaches: inductive and deductive. An inductive approach involves conducting research from the specific to the general, which can result in the development of new theories. A previous study by Klotins et al. (2018) states that a deductive approach begins with a theory that goes from general to specific and applies that theory to a specific phenomenon.

This research study followed an inductive approach, focusing on the specific LMS implemented at CPUT. While the findings are centered on CPUT's Blackboard Learn system, they may offer valuable insights that could benefit other universities. However, generalizing these results requires caution, as each institution's unique needs, context, and user behaviors significantly influence LMS usage and usability. This highlights the importance of tailoring solutions to address the distinct requirements of individual institutions.

3.3 Research methods

Three primary research methods are commonly used: qualitative, quantitative, and mixed research methods, as described by Kothari *et al.* (2014). The mixed research method, as defined by Doyle *et al.* (2016), is a blend of both qualitative and quantitative approaches. Qualitative research aims to offer valuable insights and achieve a comprehensive understanding of a particular issue by exploring the perspectives of individuals involved in the study, as outlined by Kothari *et al.* (2014). In contrast, the quantitative research method is a form of research focused on quantifying data, which can be expressed numerically and transformed into statistical figures. It aims to uncover factual information and understand the causes behind phenomena (Geoff, 2005).

This research study aims to describe how Active Learning influences the Blackboard design and enhances usability at CPUT. Based on the aim, the qualitative research method was employed in this study to obtain a deeper understanding of the current usability level of Blackboard from CPUT students' point of view. Fox (2015) emphasizes that the qualitative method focuses on data quality and offers a direct assessment of a system's usability. This assessment occurs as researchers observe students interacting with the system, enabling them to identify areas in the design that require enhancement for an improved UX.

In designing the research methodology for this study, the researcher intentionally chose a qualitative research method to capture detailed and meaningful insights from CPUT students regarding the usability of Blackboard in the context of Active Learning. The research study captures meaningful insights to understand students' perceptions, experiences, and challenges on a deeper level, revealing aspects of their interactions with Blackboard that might otherwise go unnoticed. The study's focus extends beyond simply collecting numerical data; instead, it seeks to explore and interpret the complexities of UXs, ultimately providing a thorough understanding of Blackboard's current usability.

Qualitative research, as described by Kothari et al. (2014) and highlighted by Fox (2015), is well-suited to this type of inquiry. By adopting this approach, the researcher aims to engage with students and how they use Blackboard Learn, focusing on the phenomenological aspects of their interactions. This methodological stance allows for the identification and interpretation of subtle usability issues, which might be overlooked by quantitative methods. Consequently, this approach provides richer insights into the effectiveness and challenges of Blackboard, particularly in fostering Active Learning.

Moreover, the qualitative method is inherently suited to exploring the influence of Active Learning on Blackboard design. By centring on the perceptions, opinions, and behaviours of users, the researcher aims to uncover the dynamic relationship between pedagogical strategies and the design elements of Blackboard Learn.

While recognizing the merit of quantitative and mixed research methods, the qualitative approach, in this context, aligns seamlessly with the exploratory nature of the research questions and the depth of understanding sought. It is the researcher's firm belief that by adopting a qualitative lens, this study can unearth actionable findings that contribute not only to the academic discourse but also to the practical enhancement of Blackboard's usability at CPUT.

3.4 Research design

Kothari *et al.* (2014) define research design as a blueprint for data collection in empirical research studies. The same authors define the survey method as providing multiple advantages that allow the researcher to set up questions for the respondents about the phenomenon being studied (Glasow, 2005).

In line with the study's goals and objectives, the research employed a survey research approach. According to Glasow (2005), this method is advantageous for swiftly amassing and efficiently managing a substantial volume of data. Surveys offer both quantitative and qualitative utility.

This survey research facilitated a more profound grasp of the respondents' perspectives concerning the study, as noted by Glasow (2005).

3.5 Respondents and sampling

Sampling is a method used to select units of interest for a study (Gentles et al., 2015). There are two main types of sampling: probability sampling and non-probability sampling. For this study, non-probability sampling was chosen, specifically purposive sampling, which focuses on selecting knowledgeable participants familiar with the subject matter (Kothari *et al.*, 2014).

Purposive sampling was employed to identify individuals who are proficient in computer usage, familiar with CPUT's LMS, and willing to participate in the study (Taherdoost, 2018). This method ensures that participants possess relevant knowledge and experience, aligning with the study's aim of exploring Blackboard usability and its impact on active learning.

To gather data efficiently, the study adopted a survey research approach, allowing for the collection of a substantial volume of information from a targeted group. The selection process focused on participants with expertise in using CPUT's Blackboard platform, ensuring their ability to provide valuable insights into its usability.

The sampling process included a total of 50 participants, primarily composed of students from various departments across CPUT, representing the institution's diverse academic environment. Ethical considerations were adhered to throughout the process, ensuring participants' anonymity by not disclosing personal information, such as gender or names, to protect their privacy. This intentional approach to sampling contributed to a comprehensive understanding of Blackboard usability within the context of CPUT's unique academic setting.

3.6 Data collection

Data collection in this study involved a structured two-phase approach to assess the usability of Blackboard Learn as implemented at CPUT. The methodology aimed to gather qualitative data through a combination of usability testing and online questionnaires.

Phase 1: Usability Testing

The first phase centered on usability testing, where participants were engaged in a series of guided activities on Blackboard. The goal was to identify specific usability challenges or strengths. Participants were provided with detailed instructions to ensure a structured and consistent approach to the testing process:

1. Step 1: Log in to Blackboard (https://myclassroom.cput.ac.za/). Participants were encouraged to take a few minutes to familiarize themselves with the platform if they had forgotten any features. They were advised to browse the platform thoroughly.

2. Step 2: Navigate to the "Courses" section. Participants explored each of their courses, reviewing all available pages. If enrolled in multiple courses, they were encouraged to complete a separate questionnaire for each course.

3. Step 3: Select one course of their choice and browse through the information presented.

4. Step 4: Locate the course contents/materials and explore them. Participants were required to perform specific actions on the course materials and record their experiences.

Throughout the testing process, participants were instructed to observe and note any issues that could make Blackboard Learn easier or more difficult to use. These observations were recorded in the subsequent online questionnaire. Participants were reminded not to rush through the questionnaire, as their detailed input was essential for the study's success.

Phase 2: Online Questionnaire

The second phase involved an online questionnaire distributed via Google Forms. This platform was chosen for its efficiency in streamlining responses into a centralized repository and its ability to generate visual diagrams based on participant feedback.

The questionnaire's initial section provided:

- A brief description of the study.
- Clear instructions for completing the tasks on Blackboard.
- Guidelines for filling out the questionnaire to minimize confusion.

The questions were carefully curated to remain relevant to the study's objectives, ensuring that participants provided targeted insights into the usability of Blackboard Learn.

By integrating usability testing with the online questionnaire, this approach ensured a comprehensive evaluation of Blackboard's usability from multiple perspectives. The findings from both phases were critical in identifying user experience challenges and opportunities for improvement, contributing significantly to the study's goals of enhancing Blackboard Learn at CPUT.

3.7 Data analysis

Kothari *et al.* (2014) define data analysis as the systematic process of modelling, evaluating, cleansing, and scrutinizing gathered data using specific techniques to extract valuable insights from the information.

The techniques during the data analysis process are analytical and logical techniques (Kothari *et al.*, 2014). Onwuegbuzie *et al.* (2011), stress that data analysis provides the researcher with a better insight on the collected data.

Since this study aims to describe how users of Blackboard see usability at CPUT, the thematic analysis was mainly used to analyse the data collected from the user testing session.

Thematic analysis was the primary method used to evaluate the qualitative data collected from the usability testing sessions. This approach enabled the researcher to identify patterns, group the data into codes, and summarize these codes into broader categories. Thematic analysis was the primary method used to evaluate the qualitative data collected from the usability testing sessions. This approach enabled the researcher to identify patterns, group the data into codes, and summarize these codes into broader categories. As defined by Kothari et al. (2014), thematic analysis involves systematically examining content—such as words, phrases, or other textual data—to uncover recurring themes. In this study, it facilitated the identification of patterns and deeper interpretations within participants' responses. The data was first coded based on shared characteristics, and then these codes were grouped into categories to provide meaningful insights into the usability of Blackboard Learn at CPUT.

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The researcher employed sentiment analysis (SA) to undertake a thematic text analysis with the help of NLP.

SA is a NLP tool that assisted the researcher in detecting and determining positive, negative, and neutral sentiments in text (Joan-Francesc *et al.*, 2013; Shofiya & Abidi, 2021).

3.8 Research ethics

Ethics comprises a consistent set of rules that serve as a solid foundation for guiding moral actions (Pasztor, 2015).

Before conducting the study, the researcher obtained ethics approval from CPUT and finalized the required ethics documentation. A consent form was also created, reviewed by the research supervisor, and distributed to potential participants. The inclusion criteria required participants to:

- Be tech-savvy and familiar with CPUT's Blackboard Learn system.
- Be willing to participate in the research and complete the usability testing session.
- Consent to anonymously share their perceptions and findings during the study.

No restrictions were placed on participants' age or academic discipline to ensure diverse perspectives, but they had to be active users of Blackboard Learn.

Ethical Practices

- **Voluntary Participation**: Participation in the usability testing was entirely voluntary. No participants were coerced or incentivized to join the study.
- **Informed Consent**: Participants were provided with detailed consent forms outlining the study's purpose, procedures, and ethical safeguards. They were required to sign these forms to confirm their agreement.
- **Privacy and Anonymity**: Participants' identities were anonymized, and no personal details were disclosed in the research findings.
- **Data Collection**: The study did not involve audio, video, or still-picture recordings. Instead, participants recorded their observations and feedback on a pre-designed form, accessible only to the researcher and supervisor.
- **Non-Deception Policy**: Participants were provided with clear instructions about the study's aims and procedures to avoid any form of deception.
- Environmental and Social Responsibility: The study ensured no harm to the environment or any individual during its execution.

Exclusions

Participants who did not meet the inclusion criteria, such as those unfamiliar with Blackboard Learn or unwilling to participate, were excluded. Furthermore, the study avoided sensitive or intrusive questions that could make participants uncomfortable.

By adhering to these ethical guidelines, the researcher ensured the study was conducted responsibly and respectfully, maintaining the integrity of the research process.

During the usability study, no audio, video, or still picture recordings were made. Instead, participants documented their findings on a pre-designed form that was accessible only to the researcher and the supervisor. To ensure that all participants were informed of the study's terms and conditions, consent forms were sent to them for agreement. The security of participants' information was maintained, and the published results did not reveal any personal details. Additionally, the researcher took measures to ensure that participants were not misled in any way during the study, thus upholding the integrity of the research.

3.9 Conclusion

This chapter outlines the methodology of the study, including the research methods, approaches, sampling procedures, and tools used for data collection and analysis. It provides a clear overview of the researcher's approach in achieving the study's objectives. The following chapter (Chapter Four) presents the study's results and findings.

CHAPTER FOUR – RESULTS AND ANALYSIS

4.1 Introduction

This chapter aims to gather and assess the responses and findings derived from the sources employed. This chapter presents the data gathered from an online questionnaire, encompassing an evaluation of participant responses, an analysis of the questionnaire data, and a thorough discussion of the findings.

4.2 User Testing

The data collection process for this study was carried out following a structured approach, as outlined in the research methodology section (Section 3.6). The process consisted of five primary stages, each executed with careful attention to detail to ensure comprehensive and reliable results. The first stage involved formulating questions aligned with the study's objectives (Section 3.5). The researcher used qualitative methods to design open-ended questions aimed at encouraging participants to express their experiences and perspectives on the subject matter. This method was chosen to ensure that the data collected would offer a rich, detailed understanding of the topic under investigation.

In the second stage, participants were selected using a convenience sampling method. The researcher conducted a preliminary study to identify students who had prior experience with LMS being examined. All participants were students at CPUT, and each volunteered to participate in the study. A total of thirty-five participants were selected based on the research objectives, ensuring a relevant sample for the study.

The third stage of the process involved distributing the survey questionnaire to the selected participants. To ensure that the participants understood the purpose of the study and were willing to participate, the researcher took time to clearly explain the study's objectives to them. The survey was then sent via email invitations, allowing for a convenient and efficient method of participation without the need for in-person meetings.

The fourth stage focused on documenting and analyzing the responses from participants. The researcher employed thematic analysis to identify common themes and patterns in the data, ensuring that the findings were closely aligned with the research questions. The responses were carefully coded, categorized, and analyzed to gain a comprehensive understanding of the participants' experiences with the LMS. This process allowed the researcher to identify key trends and insights from the data.

In the final stage, the data was prepared for further analysis by cleaning and backing up the data-containing files. This preparation ensured that the data was securely stored and ready for in-depth analysis, which would form the foundation for drawing conclusions and making recommendations based on the study's findings. The entire data collection process was executed meticulously, maintaining the accuracy and reliability of the data throughout the study.

4.3 Analysis of the data

The data analysis in this study utilized thematic analysis, a method for identifying and examining patterns within qualitative data. The researcher began by reviewing the questionnaire responses to understand participants' experiences with Blackboard Learn. NVivo software was then used to organize the data and identify codes related to specific themes.

These codes were grouped to form initial themes, which were refined throughout the analysis process. The researcher compared the codes, looking for patterns and similarities, and continued to refine the themes as they emerged.

To gain a deeper understanding of participants' views, the researcher remained flexible and open-minded, allowing for improvisation and innovation while adhering to established methods and standards. The study aimed to investigate the usability of Blackboard Learn and its impact on active learning among university students.

The key to interpreting the data was to sift through vast amounts of information, recognize patterns, and create a framework that conveyed the data's essence. The researcher communicated the findings using simple language, keeping sentences concise and avoiding technical jargon to ensure clarity for the target audience.

Files Name Description References 7 Assessment and This code refers to any aspect of usability 9 Feedback and active learning in connection to assessment and feedback. It contains feedback from participants on the quality, clarity, and relevance of feedback they received on their assignments, as well as their experiences with various types of assessments available on the platform. Collaboration 13 This code refers to any instances where 12 participants discussed collaboration in the context of using Blackboard. This could include comments on the effectiveness of group work within the platform, as well as any barriers or challenges that they experienced while collaborating with others. Collaboration and This code includes any conversations 13 13 Communication about communication and collaboration while using Blackboard. It could include comments on the effectiveness of communication tools within the platform, such as discussion forums, email, or chat. Evaluation This refers to the opinions of some 1 1 participants regarding the functionality of Blackboard as implemented by CPUT. Participants provided feedback on the platform's overall design, functioning, userfriendliness, and suggestions for improvement. Guideline This code includes any remarks about 58 26 guidelines or best practices for using Blackboard effectively. It includes feedback on suggested workflows or procedures for completing assignments, as well as any

Table 2: Representation of codes generated using NVivo as a thematic analysis tool

Name	Description	Files	References
	tips or techniques that participants discovered beneficial for navigating the platform.		
Interactivity and Engagement	This code refers to any debates on the level of interactivity and engagement given by Blackboard as a LMS. It could include comments regarding the effectiveness of immersive features such as videos or interactive quizzes, as well as the platform's capacity to foster active learning and student involvement.	26	73
Navigation and Layout	This code refers to any comments about Blackboard's navigation and layout as an LMS. The feedback on the platform's content organization, convenience of use, and overall user-friendliness directly relates to the navigation and layout of the system. The way content is structured and presented affects how easily users can navigate through the platform. A well- organized layout improves the convenience of use by allowing users to quickly find information and complete tasks, enhancing the overall user- friendliness of the platform. The organization of menus, links, and course materials, as well as the intuitive placement of key features, are critical components of navigation that influence user experience.	26	89
Surveys and Questionnaires	This includes any discussions around surveys or questionnaires used to evaluate the usability and active learning of Blackboard. It could include comments on the quality and relevance of survey questions and the effectiveness of the	1	1

Name	Description	Files	References
	platform for administering surveys, allowing participants to improve their abilities and understand how to use the platform without feeling lost.		
Technical Issues	This refers to any technical challenges that participants encountered while using Blackboard. It could include input on the platform's responsiveness, compatibility with various browsers or devices, or any other technical problems that users encountered.	18	30
User Testing	this code encompasses any comments related to user testing of Blackboard as an LMS. It includes feedback on the effectiveness of various testing approaches, such as usability testing, as well as insights gained from user feedback.	3	3

Thematic analysis was conducted to extract codes, and Table 2 presents the resulting codes.

In the research process, initial themes are generated from the emerging data codes. These themes are carefully reviewed and refined to ensure they align with the research questions. This means that the themes must be directly relevant to addressing the central research inquiry and its sub-questions, providing a clear and focused response to the study's objectives. The research has identified several key themes, such as technology in education, usability, active learning, evaluation and guidelines, feedback, and surveys. These themes are derived from the research title, associated questions, sub-questions, codes generated through thematic analysis, and the content collected from the online questionnaire. After the initial themes are generated, they undergo a process of review and refinement to confirm their relevance and coherence with the research questions. Themes may be combined, reorganized, or removed as necessary to ensure that they best reflect the data and address the research aims. Table 2 provides an overview of the generated themes along with a brief description of each.

Themes	Description
Technology in Education	This theme focuses on the role of technology, specifically Blackboard Learn, in supporting the academic environment at CPUT. It emphasizes how Blackboard Learn enhances the platform's usability and facilitates active learning among students, contributing to an improved learning experience at the institution.
Usability	This theme focuses on the usefulness of Blackboard Learn as a platform for promoting active learning among students at CPUT. It encompasses aspects such as platform navigation and layout, technical concerns, and user testing, including effectiveness, efficiency, learnability, memorability, and utility. These factors contribute to how well Blackboard Learn supports student engagement and learning outcomes.
Active Learning	The usage of Blackboard Learn to promote active learning among students at CPUT is the topic of this theme. Interactivity and involvement, collaboration and communication, and assessment and feedback are all part of this.
Evaluation and Guidelines	This theme focuses on the professional evaluation of Blackboard Learn, as well as the establishment of guidelines for its application in encouraging student active learning.
Feedback and Surveys	This theme centers on evaluating the effectiveness of Blackboard Learn in fostering active learning among students through the use of feedback and surveys.

Table 3: Representation of themes generated using Nvivo

The aim of this research study is to describe how users of Blackboard perceive usability and active learning at CPUT. As the research progressed, several themes emerged from the data collected. Participants shared their experiences with Blackboard Learn, highlighting factors that influenced its usability. They also discussed how Blackboard Learn facilitated active learning, such as promoting collaboration and engagement among students.

The study also involved the evaluation of Blackboard Learn by CPUT participants who were familiar with the platform as implemented at the university. This evaluation led to the development of guidelines for using Blackboard Learn effectively. These guidelines included best practices for designing and implementing online courses using the platform. Additionally, participants highlighted the use of feedback and surveys to assess the platform's effectiveness

in promoting active learning. They stressed the importance of continuous evaluation and improvement to ensure that online learning platforms meet the needs of both instructors and students.

In conclusion, NVivo coding and grouping procedures were used to identify themes in the data. These themes emerged and evolved throughout the analysis process, with regular modifications made to reflect the content of the data.

Regarding the fifth and final step in the research process, it involved the creation of a comprehensive report to present the identified themes and patterns from the collected data. This report was developed to summarize the findings and insights gained from the analysis, not merely to identify them. The primary objective of this report was to provide a comprehensive understanding of the research results, which would be accompanied by relevant quotes from the participants to enhance the clarity and credibility of the findings. The report was created after careful consideration and analysis of the data, and it served as a valuable resource for researchers and stakeholders who were interested in gaining a deeper insight into the research topic. Overall, the report was a crucial component of the research process, as it offered a comprehensive overview and analysis of the data that was collected during the study. Table 3 provides an overview of the report.

Theme	Patterns	Codes
Technology in Education	Blackboard Learn increases engagement with course materials	Assessment and Feedback
	Blackboard Learn makes learning more accessible and convenient	Technical Issues
Usability	Usability of Blackboard Learn is generally good	Navigation and Layout
	Technical issues and navigation problems affect usability	Questionnaires
Active Learning	Blackboard Learn is effective in promoting active learning	Collaboration
	Blackboard Learn is engaging and interactive	Collaboration and Communication
	Blackboard Learn provides opportunities for collaboration and	Evaluation

Table 4: Representation of themes, patterns, and codes generated during data analysis

Theme	Patterns	Codes
	communication	
	Assessment and feedback features are useful in promoting active learning	Guideline
Evaluation and Guidelines	The evaluation is important to ensure effectiveness	Interactivity and Engagement
	Guidelines for use are essential for effective use	User Testing

Table 4 provides an organized summary of the themes, patterns, and codes derived from the analysis of data collected in this research study. These insights are crucial for understanding the participants' experiences and perceptions of Blackboard Learn, specifically regarding its usability, role in fostering active learning, and the importance of evaluation and guidelines.

The theme of Technology in Education highlights Blackboard Learn's potential to enhance student engagement and accessibility. The patterns identified such as increased engagement with course materials and the convenience of learning—reflect positive user perceptions of Blackboard Learn as a tool for modern education. However, the inclusion of technical issues as a code reveals challenges that may hinder the platform's efficacy. This suggests that while Blackboard Learn holds promise as an educational tool, technical support and consistent updates are necessary to maximize its benefits.

The usability of Blackboard Learn emerged as a key theme, supported by patterns indicating its generally positive reception. The codes under this theme—Navigation and Layout and Questionnaires—suggest that while users appreciate the platform's design, navigation difficulties and technical issues may negatively impact their overall experience. This finding aligns with the study's aim of exploring how usability influences active learning, emphasizing the importance of addressing these usability challenges to enhance learning outcomes.

Active learning is a significant focus, with patterns emphasizing Blackboard Learn's ability to foster engagement, interactivity, and collaboration. Codes such as Collaboration, Communication, and Assessment and Feedback highlight how specific features of the platform contribute to an active learning environment. These findings are particularly relevant as they demonstrate Blackboard Learn's alignment with pedagogical practices that prioritize student-centered and interactive approaches to learning.

The final theme underscores the importance of evaluating the platform to ensure its effectiveness and establishing guidelines for optimal use. Patterns such as Interactivity and Engagement and User Testing reflect a user-driven need for continuous improvement. The inclusion of Guidelines emphasizes that structured instructions and recommendations can help users better navigate and utilize Blackboard Learn's features, leading to enhanced educational outcomes.

The themes, patterns, and codes presented in Table 4 are directly aligned with the study's aim of describing how Blackboard users at CPUT perceive usability and active learning. They provide a detailed framework for understanding user experiences and identifying areas for improvement. Moreover, the analysis demonstrates the interconnectedness of usability, active learning, and the need for systematic evaluation, which are critical for informing the development of more user-friendly and engaging digital learning environments.

4.4 Findings

The LMS is now an essential tool for online education and training. It serves as a platform for students to learn and helps educators manage, deliver, and monitor learning activities. Additionally, it facilitates learners' access to course content and interaction with instructors and peers. However, the usability of an LMS profoundly influences the overall learning experience, impacting both learner engagement and satisfaction. Equally important is addressing the needs of educators, who rely on the system to efficiently deliver content, track progress, and communicate with students. Therefore, it is imperative to regularly evaluate LMS usability, addressing issues that impact both learners and lecturers, to ensure the platform meets the needs of all users.

This section presents the results of a study that assessed the usability of the Blackboard Learn system and its implementations at CPUT in South Africa. The study gathered data through online questionnaires and user testing, which were analysed using qualitative thematic analysis. The analysis aimed to identify common usability and active learning issues in LMSs, typical methods used to assess LMSs, and the current usability status of Blackboard Learn at CPUT.

Appendix A provides information about the questionnaire used to evaluate the usability of the Blackboard Learn system and its implementation at CPUT in South Africa. The primary objective of the questionnaire was to collect data on various aspects related to usability and active learning issues within LMSs, with a particular focus on Blackboard Learn at CPUT. The questionnaire included a series of questions designed to gather feedback on the usability of Blackboard Learn, identify any active learning issues encountered by users, and explore the methods commonly used to assess LMSs.

Additionally, user testing was conducted to complement the questionnaire responses, offering a hands-on evaluation of Blackboard Learn's functionality and effectiveness. The data from both the questionnaire and user testing were analysed using qualitative thematic analysis techniques to gain insights into the usability status of Blackboard Learn at CPUT, as well as broader trends in LMS usability and assessment methodologies, such as user satisfaction, accessibility, and the alignment of LMS features with instructional needs.

The results of this study hold significance as they offer valuable insights into the present usability of LMS at CPUT and pinpoint areas that need enhancement. Moreover, this research adds to the existing knowledge about LMS usability assessment and offers recommendations for future research in this field.

Participants were questioned about their perceptions of Blackboard as it was used at CPUT, aligning with the study's aim and objectives. The aim of the study was to describe how usability and active learning were occurring at CPUT, specifically focusing on how users experienced the system in terms of its effectiveness, ease of use, and its ability to promote active learning. Usability in this context refers to the ease with which users can navigate and use Blackboard Learn, while active learning refers to how the platform encourages student engagement, interaction, and collaboration. The User Technology Interaction Log (UTIL), a tool designed to gather detailed feedback, covered various topics, including questions on the platform's navigation, layout, technical issues, and its role in facilitating active learning activities such as discussions and group work. The specific questions aimed to gather insights into these areas to understand users' experiences with Blackboard at CPUT.

The thematic analysis of the data identified three main themes and several subthemes. The themes were as follows:

4.4.1 Research sub-question 1: Usability problems commonly found in learning management systems implementations

The analysis of the questionnaire data revealed several usability problems commonly found in learning management system implementations. The following themes emerged:

4.4.1.1 Navigation and layout

The subthemes under this theme were the difficulty in finding course materials, navigating between pages, and the complexity of the interface.

Participants identified navigation and layout as significant usability issues in learning management systems. They expressed difficulty in finding and accessing the relevant course content due to complex navigational menus and cluttered layouts.

4.4.1.2 Technical issues

Common usability issues in LMSs include slow loading times, system crashes, and compatibility problems with various devices. Participants stressed the importance of technical support and training to resolve these concerns.

4.4.1.3 Communication

Participants reported that communication with lecturers and other students was a significant usability issue in LMSs. They expressed difficulty in accessing and using communication tools, such as discussion boards and messaging systems.

4.4.1.4 Assessment and feedback

Participants identified assessment and feedback as a significant usability issue in LMSs. They expressed difficulty in understanding assessment requirements and receiving timely and constructive feedback from lecturers.

4.4.1.5 Interactivity and engagement

This explores the extent to which Blackboard Learn facilitates interactivity and engagement in the learning process. The subthemes under this theme include the limited interactivity features of Blackboard Learn, the lack of engagement with course content, and the need for more multimedia content. These subthemes highlight specific areas where Blackboard Learn could be enhanced to foster greater student involvement and active learning.

4.4.2 Research sub-question 2: Usability methods commonly used to assess learning management systems and implementations.

The questionnaire data analysis revealed several usability methods commonly used to evaluate LMSs and implementations.

The following themes became apparent:

4.4.2.1 User testing

According to participants, user testing is a popular usability method for evaluating LMSs and implementations. They proposed that including end users in the design and development process would improve the usability of these systems.

4.4.2.2 Surveys and questionnaires

Surveys and questionnaires were also identified as commonly used usability methods to assess LMSs and implementations by participants. They proposed that these methods could provide useful feedback on user experiences and help identify areas for improvement.

4.4.2.3 Expert evaluation

Expert evaluation, according to participants, is a less commonly used usability method for assessing LMSs and implementations. They proposed that involving usability experts in the design and development process could provide valuable insights into usability issues and potential solutions.

4.4.3 Research sub-question 3: Current usability level of Blackboard Learn system and implementations at CPUT.

Mixed opinions about the current usability level of the Blackboard Learn system and implementations at CPUT were found after analysing the questionnaire results. The following themes emerged:

4.4.3.1 Navigation and layout

Participants reported that the navigation and layout of the Blackboard Learn system and implementations at CPUT were complex and difficult to navigate. They suggested that simplifying the layout and improving the navigation would enhance usability.

4.4.3.2 Technical issues

The subthemes under this theme were system downtime, slow loading times, and system errors.

Participants reported experiencing technical issues with the Blackboard Learn system and implementations at CPUT, such as slow loading times and system crashes. They suggested that technical support and training could address these issues.

4.4.3.3 Communication and collaboration

The subthemes under this theme were the lack of effective communication channels, the need for more collaborative tools, and the importance of timely feedback.

Participants reported that communication with lecturers and other students within the Blackboard Learn system at CPUT was challenging. They suggested that improving the communication tools, such as discussion boards, messaging features, and real-time chat options, as well as providing clear guidelines on how to effectively use these tools, could significantly enhance usability.

4.4.3.4 Assessment and feedback

Participants in the study reported challenges in understanding assessment requirements and receiving timely, constructive feedback within the Blackboard Learn system at CPUT. They expressed concerns about the clarity of the assessment guidelines, particularly regarding the structure, process, and expected outcomes of assessments. Additionally, participants highlighted the need for improved feedback mechanisms, with a focus on providing more timely and detailed feedback after assessments. These suggestions were made with the aim of enhancing the usability of the system, particularly in terms of supporting students' understanding of assessment expectations and fostering their learning through constructive feedback.

4.5 Discussion

The findings suggest that the implementation of Blackboard Learn at CPUT faces usability and active learning challenges that negatively affect students. The navigation and layout of the system were found to be complex and difficult to use, which may hinder students' ability to find course materials and navigate between pages. Additionally, the limited interactivity features and lack of engagement with course content reduce the potential for active learning. Technical issues such as system downtime and slow loading times further detract from the system's usability.

Despite Blackboard Learn's advantages in providing access to learning materials, communication, and organization, it is clear that usability and active learning issues need to be addressed. A major concern raised by participants was the lack of opportunities for active learning within the platform. The limited interactive features and engagement with course content suggest that Blackboard Learn does not fully align with the principles of active learning, which emphasize student engagement, critical thinking, and problem-solving. Without sufficient interactive elements, students feel restricted in their participation, which may hinder learning outcomes.

The usability of Blackboard Learn is also hampered by its complex navigation and system layout. These challenges significantly affect students' ability to access course materials and effectively use the platform. The reported navigation difficulties led to frustration and wasted time, ultimately impairing the user experience and hindering active learning efforts.

Technical issues, such as system downtime and slow loading times, also emerged as significant barriers to the effective use of Blackboard Learn. When the platform is inaccessible or operates slowly, students face difficulties in submitting assignments, accessing lecture materials, or participating in online discussions, which further reduce the system's usability and effectiveness.

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To address these challenges, CPUT should implement measures aimed at improving the usability and active learning potential of Blackboard Learn. Providing comprehensive training and support for both students and lecturers would help familiarize them with the platform's features. Efforts should also be made to enhance the platform's interface and navigation, making it more intuitive and user-friendly. Regular maintenance and updates are essential to minimizing technical issues and ensuring a smoother user experience.

Participants also expressed a strong need for additional guidance when using Blackboard Learn. They highlighted issues such as login difficulties, where the requirement for third-party authentication, instead of using regular university credentials, added complexity and frustration. This login issue created barriers to engagement and potentially disengaged students from the platform.

Another issue raised by participants was the way course content was organized on Blackboard Learn. Several participants mentioned the lack of flow and coherence in the organization of materials, which led to confusion and a reluctance to thoroughly review the course materials. The disjointed presentation of content affected students' ability to follow the logical progression of the course, thus diminishing their overall understanding of the subject matter. Poor organization of course materials can negatively affect active learning by discouraging deeper engagement with content.

Addressing these issues is essential to improving both usability and active learning. CPUT should streamline the login process, ensuring compatibility with students' familiar login methods. Furthermore, lecturers should be provided with clear guidelines on structuring course materials logically and coherently, paying attention to the flow of information. Regular reviews and updates to course content will enhance its organization and presentation, motivating students to engage more deeply with the material.

Additionally, providing tutorials, workshops, and comprehensive support will help students navigate Blackboard Learn effectively, enabling them to make the most of the platform's features and enhance their active learning experience. A proactive approach to addressing these challenges and offering ongoing support will contribute to a more positive and productive learning environment at CPUT.

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4.6 Framework for Enhancing Usability and Active Learning in Blackboard Learn at CPUT

To address the challenges identified in the study, it is essential to develop a structured framework for improving both usability and active learning in Blackboard Learn at CPUT. This framework should be built on the foundation of user-centered design principles, ensuring that both students and lecturers can interact with the platform in a way that supports their needs and enhances the overall learning experience.

Relevance of the Framework

The relevance of this framework stems from the findings of the study, which revealed specific usability challenges and limitations in promoting active learning through Blackboard Learn at CPUT. These challenges, such as complex navigation, lack of interactive features, technical issues, and inadequate support, impede both students' engagement and their overall learning outcomes. By implementing this framework, CPUT can systematically address these issues, providing solutions that directly align with students' needs and expectations. Furthermore, the framework helps ensure that the university is meeting its educational goals by fostering a learning environment that enhances both usability and active learning. The framework not only improves the overall user experience but also contributes to achieving a more effective and engaging online learning environment for both students and lecturers.

1. User-Centered Design Principles

The framework should prioritize the UX by ensuring that Blackboard Learn is intuitive and easy to navigate for all users, with a focus on students' ability to easily access course materials, participate in discussions, and complete assessments. Clear guidelines should be established for lecturers to design courses that align with best practices in usability, ensuring the platform's features are used effectively. By focusing on user-centered design, the framework would ensure that usability is tailored to the actual needs and preferences of CPUT students and instructors.

2. Streamlined Navigation and Interface Enhancements

A central element of the framework should involve improving the platform's navigation and layout. This could include simplifying menus, providing clearer pathways to access course content, and minimizing the number of clicks required to perform common tasks. Additionally, improving the interface with visual cues and consistent design elements would enhance the overall user experience. The framework should recommend periodic reviews of the system interface based on student and lecturer feedback to maintain its relevance and effectiveness.

3. Promoting Active Learning

To foster active learning, the framework should advocate for the inclusion of interactive elements within Blackboard Learn. These could include tools such as discussion boards, collaborative spaces, multimedia content, quizzes, and peer assessments, all designed to engage students actively with course content. The framework should also emphasize the importance of using formative assessments and real-time feedback, which encourage continuous engagement and the development of critical thinking skills.

4. Technical Support and Training

The framework should emphasize the importance of providing robust technical support to both students and lecturers. This includes offering clear, accessible tutorials for new users, regular training sessions on platform updates and features, and a responsive helpdesk for addressing technical issues. Additionally, the framework should advocate for a structured approach to onboarding students and lecturers, ensuring they are familiar with the platform's features before they begin their courses.

5. Regular Evaluation and Feedback Mechanisms

A critical component of the framework is the establishment of regular evaluation and feedback loops. This involves periodic surveys and usability studies to assess the platform's effectiveness and identify areas for improvement. Based on this feedback, the framework should recommend continuous refinement of both Blackboard Learn's usability and the active learning strategies implemented within it. Feedback from students and lecturers should be analyzed and acted upon to ensure the platform evolves in line with user needs.

6. Addressing Technical Issues

The framework should also include strategies for minimizing technical disruptions, such as system downtime or slow loading times. Regular maintenance schedules should be implemented to prevent such issues, along with contingency plans to address system failures promptly. This would ensure that students and lecturers can rely on Blackboard Learn as a stable and effective tool for their learning and teaching activities.

7. Supportive Community and Collaboration

Finally, the framework should promote the development of a collaborative and supportive community within Blackboard Learn. This could be achieved by encouraging lecturers to foster peer-to-peer learning opportunities, using group projects and discussion forums to build a sense of community among students. In addition, creating avenues for students to interact with support staff or IT helpdesks would enhance the overall experience, ensuring that users feel supported and engaged.

4.6 Conclusion

In conclusion, the qualitative thematic analysis identified significant usability and active learning problems in the Blackboard Learn system implementation at CPUT. The study recommends that the university should address these issues by enhancing the navigation and layout of the system, providing more interactivity and engagement features, improving communication and collaboration channels, and resolving technical issues. The study's framework can help improve the usability/active learning of Blackboard Learn, ultimately leading to a more efficient and effective learning environment for students at CPUT.

These findings could inform the development of a framework to enhance usability and active learning of Blackboard Learn as implemented at CPUT.

CHAPTER FIVE – RECOMMENDATION and CONCLUSION

5.1 Introduction

This chapter discusses the usability of Blackboard Learn as implemented by CPUT within the context of Active Learning. The researcher aimed to comprehend the current state of Blackboard's usability, identify challenges faced by students, and propose recommendations for improvement. The chapter provides an overview of the research problem, literature review, methodology, empirical findings, and recommendations for enhancing Blackboard's usability.

5.2 Recommendation

This chapter offers a summary of the study's findings, outlining recommendations and implications related to the role of Blackboard Learn in enhancing active learning at CPUT. The recommendations proposed herein aim to directly address the challenges uncovered in Chapter four, thereby augmenting the overall learning experience for CPUT students. Moreover, this section deliberates on the ramifications of these recommendations for CPUT and its users.

Based on the research findings, we suggest the following recommendations to enhance the adoption of Blackboard Learn and promote active learning at CPUT:

5.2.1 Comprehensive training and support

CPUT should proactively institute a comprehensive training and support framework for students and lecturers, focusing on effectively utilizing Blackboard Learn. This encompasses organizing workshops, providing tutorials, and offering user-friendly manuals elucidating the platform's features and functionalities. A continuous support structure must be in place to promptly resolve technical glitches and empower users to harness the platform's full potential.

5.2.2 Enhanced interactivity and engagement

The augmentation of Blackboard Learn should involve the institution, specifically CPUT's IT and instructional design teams, collaborating with educators to integrate interactive elements designed to bolster student engagement. By incorporating features such as discussion forums, collaborative tools, and interactive multimedia components, the platform can evolve beyond a simple content delivery system. This transformation would ignite active learning, stimulate critical thinking, and foster problem-solving skills in students. Additionally, ongoing support and training for lecturers in utilizing these features effectively will be crucial to ensuring their successful implementation and usage.

5.2.3 Improved learning experience

The proactive resolution of the usability and active learning challenges identified in this study will significantly enhance the learning experience for CPUT students. Optimizing the usability and navigability of Blackboard Learn will facilitate easier access to course materials, reducing frustration and improving students' ability to stay organized and focused. Comprehensive training and support provisions will enable students to utilize the platform's features more effectively, building confidence and fostering a more positive user experience.

The infusion of interactive elements, such as multimedia resources and collaborative tools, will encourage active participation, critical thinking, and deeper engagement with the course content. This, in turn, could lead to measurable improvements in learning outcomes, including higher pass rates, increased retention of knowledge, and greater overall satisfaction with the learning process. Additionally, a more intuitive and engaging platform could contribute to students' sense of accomplishment and motivation, promoting long-term academic success.

5.2.4 Elevated student satisfaction

Enacting these recommendations is poised to elevate student satisfaction with the Blackboard Learn platform. Streamlined navigation, intuitive interfaces, and robust technical support will collectively diminish frustrations, cultivating a more gratifying student experience. Additionally, heightened interactivity and engagement will infuse the learning process with enjoyment and significance, paving the way for amplified satisfaction levels among students.

5.2.5 Advancements in teaching and learning practices

The recommendations enunciated in this chapter wield transformative potential over teaching and learning practices at CPUT. Through comprehensive training and support for lecturers, they will be primed to architect and deliver courses that harness Blackboard Learn's potential for active learning. Infusing interactive facets and multimedia elements will facilitate pioneering and captivating teaching methodologies, accentuating a student-centric educational approach.

Overall, the recommendations in this chapter emerge as a cogent response to the usability and active learning challenges unearthed during the study. The integration of these recommendations bears the potential to augment Blackboard Learn's usability and functionality at CPUT, fostering active learning and facilitating the overall learning experience. The implications are vast and far-reaching, spanning augmented student satisfaction, refined teaching and learning methodologies, and a bolstered institutional reputation for CPUT. These recommendations, forming a comprehensive and strategic framework, offer CPUT a clear path toward surmounting challenges and propelling the evolution of Blackboard Learn into a dynamic and student-centric learning ecosystem.

5.3 Summary

This section offers an overview of the research carried out to investigate how Blackboard Learn contributes to enhancing active learning for students at CPUT. The research findings identified usability and active learning challenges associated with implementing Blackboard Learn at CPUT. The findings pinpointed key issues concerning usability and active learning barriers that emerged from using Blackboard Learn at CPUT. Drawing from these discoveries, a set of well-considered recommendations was formulated to effectively tackle the identified challenges and elevate the overall educational encounter for the students.

The study's outcomes revealed a prevalent desire among the participants for increased guidance and assistance in navigating the intricacies of Blackboard Learn. In particular, the research highlighted persistent problems related to login procedures, challenges in comprehending and organizing course materials, and a noticeable absence of interactive elements, all of which contributed to a lack of engagement and immersion with the platform. These issues inhibited students' ability to actively participate in the learning process and served as barriers that curtailed the platform's potential to facilitate dynamic and participatory learning experiences.

In response to these pressing challenges, a series of comprehensive recommendations were outlined. These suggestions encompassed strategies to enhance the user-friendliness and navigability of Blackboard Learn. Additionally, the proposals aimed to bridge the knowledge gap and empower both students and instructors by implementing extensive training and support programs. Addressing the shortage of interactivity and engagement, the recommendations put forth approaches to augment the platform's interactive features, thus fostering a more dynamic and participative learning atmosphere. Moreover, recognizing the ever-evolving nature of technological tools, the study underscored the necessity of periodic system maintenance and updates to ensure the continued smooth functioning of Blackboard Learn.

Overall, the investigation underscored the intricate interplay between technology, usability, and active learning within the context of Blackboard Learn at CPUT. By delving into the multifaceted challenges that students encountered, the study offered a holistic perspective on the potential limitations of the platform. The proposed recommendations, rooted in these findings, serve as a blueprint for optimizing Blackboard Learn's efficacy as a facilitator of active learning, by streamlining its usability, enhancing interactivity, and fostering a supportive environment for both learners and educators. Ultimately, this research contributes to the ongoing dialogue on leveraging technology to promote more engaged and participatory educational experiences.

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5.4 Evaluation of the study

5.4.1 Research questions

5.4.1.1 What are the usability levels of Blackboard Learn implementations at CPUT in promoting active learning?

The research question regarding the usability levels of Blackboard Learn implementations at CPUT and their role in promoting active learning was thoroughly investigated. This study used data collected through questionnaires distributed via Google Forms to participants. The responses highlighted both strengths and limitations of the platform's usability. Key areas assessed included login procedures, navigation efficiency, and the organization and presentation of course materials.

Findings indicated that while Blackboard Learn provided a functional platform for delivering educational content, several usability challenges hindered its potential to fully promote active learning. These challenges included:

- Complicated login procedures requiring third-party authentication, which caused delays and user frustration.
- Difficulties in navigating the platform due to inconsistent layouts and unintuitive designs, which impeded users' ability to locate and engage with course materials efficiently.
- Poorly organized course content, resulting in confusion about course progression and a lack of clarity in accessing learning resources.

Despite these challenges, participants recognized the system's potential for enhancing the learning experience if these issues were addressed. These insights provide a detailed understanding of Blackboard Learn's current usability levels and its impact on promoting active learning at CPUT.

5.4.1.2 How should Blackboard Learn be implemented to optimize usability levels for Blackboard users at CPUT and promote active learning?

To address this question, the study examined how Blackboard Learn could be optimized to enhance usability and promote active learning. Data gathered through surveys highlighted that current implementations lacked the interactive elements necessary to fully engage students in active learning. Participants identified specific areas for improvement that would foster usability and interactivity:
- Incorporating interactive tools such as discussion boards, collaborative activities, and multimedia content to encourage active participation, critical thinking, and engagement with course materials.
- Simplifying navigation through a more intuitive interface, ensuring that students and lecturers can easily locate resources and tools.
- Enhancing training and support for both lecturers and students to ensure they can fully utilize the platform's features.

Participants emphasized the importance of a clear structure for course materials, as well as regular system updates to address technical issues such as slow loading times and downtime. By implementing these improvements, Blackboard Learn could better support active learning and provide a more user-friendly experience for both students and lecturers at CPUT.

In conclusion, the findings suggest that enhancing Blackboard Learn's usability levels and integrating features that actively engage students would significantly improve its effectiveness in fostering active learning at CPUT.

5.4.2 Aim

The aim of this research study was to describe how users of Blackboard perceive usability and active learning at CPUT taking place. This objective was addressed through a thorough investigation of user experiences, focusing on the platform's usability challenges and its role in facilitating active learning. By collecting and analyzing participant feedback, the study captured insights into how Blackboard Learn is experienced and utilized by its users at CPUT. The findings provided a nuanced understanding of the platform's strengths and limitations, culminating in recommendations to improve its usability and support for active learning. This comprehensive approach ensured that the aim of the research was effectively met.

5.4.3 Objectives

5.4.3.1 Identify the usability challenges of Blackboard Learn at CPUT

This objective was met by conducting usability testing to pinpoint the specific usability challenges students and lecturers faced while using Blackboard Learn. The results were synthesized in chapter four, highlighting login issues, navigation difficulties, and challenges related to comprehending and organizing course materials.

5.4.3.2 Evaluate the impact of Blackboard Learn on active learning among CPUT students

This objective was fulfilled through usability testing that probed into students' perceptions of Blackboard Learn's influence on active learning. The study uncovered that the absence of interactive features hindered active learning, answering this objective. 5.4.3.3 Propose recommendations for improving the usability of Blackboard Learn and enhancing active learning at CPUT

The study provided a set of detailed recommendations in chapter five, drawing from the research findings. These recommendations aimed to address the identified usability challenges and promote active learning, aligning with the third objective.

5.4.4 Overall evaluation

In retrospect, this study effectively addressed the research questions, aim, and objectives outlined at the outset. It not only identified the usability challenges and active learning barriers associated with Blackboard Learn at CPUT but also proposed comprehensive recommendations for addressing these issues. Consequently, the study contributes valuable insights that can inform the enhancement of Blackboard Learn's usability and its potential to promote active learning among students at CPUT.

5.5 Contribution of the research

This section highlights the significant contributions of the research from three main perspectives: theoretical, methodological, and practical.

5.5.1 Theoretical contribution

From a theoretical perspective, this study contributes to the current knowledge base in several meaningful ways:

- 5.5.1.1 Advancing Understanding of Learning Management Systems: This study enhances the field of educational technology and Learning Management Systems (LMS) by conducting a comprehensive analysis of usability challenges and their influence on active learning using Blackboard Learn as a context. Identifying distinct usability problems and their associated effects deepens our comprehension of how LMS functions in an educational environment.
- 5.5.1.2 Active Learning Frameworks: This research contributes to the development of an active learning framework by exploring the intersection of technology and student engagement, particularly within the context of Blackboard Learn at CPUT. It provides a nuanced understanding of how the LMS can either facilitate or hinder active learning, aligning with the study's overarching framework. By identifying usability challenges, such as navigation difficulties and limited interactivity, and their impact on active learning, the research highlights areas for improvement in LMS design and implementation.

For educators, this framework offers actionable insights into optimizing Blackboard Learn to enhance student engagement and participation. Researchers can utilize the findings to further refine theories related to technology's role in active learning, providing a foundation for future studies. Policymakers and university administrators also benefit from this framework, as it underscores the importance of integrating user-friendly tools and training to maximize learning outcomes.

The relevance of this framework extends beyond CPUT, as it serves as a model for evaluating and improving LMS usability and active learning support in other educational institutions. By bridging theory and practice, the study emphasizes the need for continuous evaluation and adaptation of educational technologies to meet the evolving needs of students and educators.

5.5.1.3 **Human-Computer Interaction:** In the domain of Human-Computer Interaction (HCI), this study offers empirical evidence of the usability challenges encountered by both students and lecturers while interacting with Blackboard Learn at CPUT. It extends the body of HCI literature by shedding light on the specific issues and barriers that hinder seamless interaction with the platform, such as navigation difficulties, limited interactivity, and technical problems.

The study emphasizes the need for designing user-friendly educational platforms. In this context, user-friendly refers to systems that are intuitive to navigate, efficient in supporting user tasks, and accessible to diverse user groups, thereby minimizing frustration and cognitive load. A user-friendly LMS should provide straightforward interfaces, logical workflows, and easily understandable features that enhance usability and user satisfaction.

By addressing these usability issues, the findings underscore the importance of integrating HCI principles into the design and implementation of LMS platforms. This contribution is relevant not only for improving Blackboard Learn but also for guiding the development of other educational technologies aimed at fostering effective teaching and learning experiences.

5.5.2 Methodological contribution

Methodologically, this research offers several contributions:

5.5.2.1 **Contextual Analysis**: This research extends beyond CPUT to consider the diverse student body, including varying socio-economic backgrounds, technological skills, and learning needs, which significantly impact LMS interaction. Institutional factors like infrastructure, technical support, and training for users are also examined, highlighting their role in usability and active learning. These insights are valuable for similar institutions, emphasizing the need to tailor LMS design and implementation to the unique needs of diverse educational settings.

5.5.3 Practical Contribution

This research provides valuable insights for different stakeholders from a practical standpoint:

5.5.3.1 Educators and Administrators: The findings of this study offer educators and administrators at CPUT practical recommendations for improving the usability of Blackboard Learn, which in turn has the potential to enhance active learning experiences. These insights can inform the development of targeted training programs for both students and staff, the optimization of instructional design to align with usability principles, and the introduction of specific policies to support more effective LMS utilization. Such policies could include mandatory LMS training programs for new students and staff to ensure foundational platform literacy, the establishment of course design standards that require consistency in navigation, content formatting, and resource accessibility, as well as the implementation of regular usability evaluations to assess and address user challenges. Furthermore, policies could mandate accessibility compliance to cater to diverse user needs, integration protocols for third-party tools to enhance functionality, and ongoing monitoring mechanisms for identifying and resolving usability issues. These measures would collectively ensure that Blackboard Learn remains a user-centered platform, actively contributing to improved learning outcomes and enhanced active learning experiences.

- 5.5.3.2 **Software Developers:** The research identifies specific usability challenges that can inform the development and improvement of learning management systems. A user-friendly platform refers to a system that is easy to navigate, intuitive in its design, and requires minimal effort for users to accomplish their tasks efficiently. Software developers can use these insights to create more user-friendly and effective educational platforms, ensuring that users, regardless of their technical proficiency, can interact with the system seamlessly. This will not only benefit CPUT but also have broader implications for institutions worldwide seeking to enhance their digital learning environments.
- 5.5.3.3 **Students:** This research benefits students by showing how important it is for them to actively participate in the learning process. The study's findings emphasize the need for user-centered design and a student-centric approach to technology-enhanced learning, ultimately improving the overall learning experience.

Overall, this research makes notable contributions to the theoretical, methodological, and practical aspects of educational technology and active learning within the context of Blackboard Learn at CPUT. It enriches our understanding of LMS, offers a robust research methodology, and provides actionable recommendations for stakeholders involved in technology-enhanced education.

5.6 Conclusion

In conclusion, this study sheds light on the usability and active learning challenges associated with the implementation of Blackboard Learn at CPUT.

The findings suggest that there is room for improvement in providing a more user-friendly and interactive learning environment. By addressing the identified challenges and implementing the proposed recommendations, CPUT can enhance the usability and active learning potential of Blackboard Learn, leading to a more engaging and effective learning experience for students.

The recommendations provided in this study are intended to guide CPUT in addressing the identified challenges and improving the implementation of Blackboard Learn. By prioritizing usability, providing comprehensive training and support, enhancing interactivity, and ensuring regular maintenance and updates, CPUT can create an educational setting that is more focused on students and encourages active participation.

Recognizing the importance of addressing these challenges and implementing the recommendations is crucial for CPUT. Doing so will improve student satisfaction, enhanced teaching and learning practices, and a strengthened institutional reputation. By leveraging the potential of Blackboard Learn and promoting active learning, CPUT can foster a positive and effective learning environment that prepares students for success in their academic and professional endeavours.

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APPENDICES

Appendix A: Questionnaire

2/21/23, 12:26 PM

User Test: Questionnaire

User Test: Questionnaire

Research title: "The role of Blackboard Learn in promoting Active Learning among students at the Cape Peninsula University of Technology."

Concerning the research study:

Lionel-Nathan Masamba is a Master of Information and Communication Technology (MICT) student at the Faculty of Informatics and Design at Cape Peninsula University of Technology (CPUT).

This research study is being conducted under the supervision of Professor Melius Weideman and Doctor Wilhelm Rothman, who have been assigned by CPUT.

The research aim is to determine the current usability of Blackboard Learn at CPUT.

All information you provide is kept strictly confidential and will only be used for research purposes. If you are interested in the results of this evaluation, please include an email address in the personal details section at the beginning of the questionnaire.

Use the questionnaire to assess the usability of the Blackboard LMS. Aside from anything you pick up on this questionnaire, you may have noticed in Steps 1 and 2 below, please feel free to include any other issues you have had with this platform in the past, if relevant to the current situation.

Contact the researcher: 218186657@mycput.ac.za or masambalioneInathan@gmail.com

* Required

1. Please select a qualification: *

Mark only one oval.

Advanced Diploma

Diploma

- Master's Degree
- Postgraduate Diploma/Honours

https://docs.google.com/forms/d/11FpLJO71ZaXAqm71Fsz4O0h3qq0f-VCEYQ8GZblx1S8/edit

INTRODUCTION

As you go through the steps, keep an eye out for any issues with Blackboard Learn that may make it easy or difficult to use or learn. If you encounter such issues, you should describe them in the questionnaire on the next pages when completing the questions. Please do not rush through the questionnaire; your contribution is important to this research study.

Step 1: Log in to Blackboard (<u>https://myclassroom.cput.ac.za/</u>), take a few minutes to familiarize yourself with the platform if you have forgotten some of its features. Browse the platform.

Step 2: Navigate to the "Courses" section. Please take your time going through each of your courses and browsing through all the pages, depending on your courses. Feel free to submit this questionnaire again for another course for which you are enrolled.

Step 3: Select one course of your choice. Browse through the information presented to you.

Step 4: Find the course contents/materials and explore them.

You will be required to perform certain actions on these course materials and record your experience or the results further down.

Please keep in mind that this is not a test to see whether you know something or not. There are no right or wrong answers. You cannot do well or poorly. So please take each section, read through each section, and give your honest opinion.

When completed, click on the submit button at the bottom.

Thank you for taking the time to consider participating in this usability test. We would appreciate it if you could complete this brief survey. The survey will take 5 or 10 minutes to complete.

Please select a qualification: *

- 1. Advanced Diploma
- 2. Diploma
- 3. Master's Degree
- 4. Postgraduate Diploma/Honours

Please select a faculty: *

- 1. Applied Sciences
- 2. Business & Management Sciences
- 3. Education
- 4. Engineering
- 5. Health & Wellness Sciences
- 6. Informatics & Design

:::

Please select a course subject: *

- 1. Accounting
- 2. Application Development Theory
- 3. Artificial Intelligence
- 4. Big Data & Analysis
- 5. Business & Management studies
- 6. Business Computer Applications
- 7. Business Fundamental
- 8. Communication Networks Theory
- 9. Communication Networks Practice
- 10. Computer Security
- 11. Computer Skills
- 12. Data Mining and Information Analysis
- 13. Data Science
- 14. Database Management systems

- 15. Economics
- 16. Information Management
- 17. Information Systems
- 18. Interior Design
- 19. Interior Technology
- 20. Marketing
- 21. Mathematics
- 22. Media Studies
- 23. Mobile Technologies
- 24. Network Management Models
- 25. Operating Systems
- 26. Project Management
- 27. Quantity Surveying
- 28. Research Methodology
- 29. Research Methods
- 30. Site Surveying
- 31. Software Engineering

Section A: Usability

:

×

Usability is an important factor that defines a system's quality and determines whether or not a system is simple to use.

1. How was your interaction with the login page when login into Blackboard?

Short answer text

2. Did you have any difficulties accessing the course/subject?

Short answer text

3. Was it clear to you what you should select or click when accessing Blackboard from within the course/subject content?

Strongly disagree

Disagree

Neutral

Agree

Strongly agree

4. How confident do you feel about the contents of the subject?

	1	2	3	4	5	
Not confident at all	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	Very confident

5. How easy was it to navigate through the content pages?

O Very difficult
O Difficult
O Neutral
C Easy
O Very easy
6. How satisfied are you with the available workflows? A workflow refers to the sequence of activities required to complete a task.
O Dissatisfied
O Somewhat dissatisfied
O Neither satisfied or dissatisfied
O Somewhat satisfied
O Satisfied
7. How comfortable did you feel that you will be achieving your goals while using the interface * of Blackboard?

Short answer text

Section B: Active Learning

8. The following are included and provided by Blackboard:

	Strongly disagr	Disagree	Neutral	Agree	Strongly agree
A. A home pag	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
B. Videos, Audi	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
C. The course	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc

9. How consistent is the flow of the subject's content? *

	1	2	3	4	5	
Not at all consistent	0	\bigcirc	0	\bigcirc	0	Very consistent

*

Thank You For Your Participation!

Please click on the submit button to record your response.

Consent form to receive an academic research survey

This consent form is intended to generate a list of potential participants who are willing to participate in Lionel-Nathan Masamba's academic research. Please help me by completing this consent survey. Please keep in mind that this is not the final survey, but rather a request for permission to send the survey in the near future.

 \odot

masambalionelnathan@gmail.com Switch account

Not shared

* Indicates required question

Consent to collect data Please respond to the questions below.

Lionel-Nathan Masamba is a Master of Information and Communication Technology (MICT) student at Cape Peninsula University of Technology's Faculty of Informatics and Design (CPUT). His thesis is titled as follows:

"The role of Blackboard Learn in promoting Active Learning among students at the Cape Peninsula University of Technology".

To satisfy the university's Higher Degrees Committee (HDC) criteria, the student must obtain consent to collect data from individuals identified as potential data sources.

Appendix C: Ethical clearance

Cape Peninsula University of Technology PO Box 1906, Beliville, 7535 Symphony Way, Beliville, Cape Town, South Africa creating futures 🚯 + 27 (0)21 959 6767 👔 www.facebook.com/cput.ac.za 📵 info@qput.ac.za 😗 www.qput.ac.za Office of the Research Ethics Committee Faculty of Informatics and Design Room 2.09 80 Roeland Street Cape Town Tel: 021-469 1012 Email: ndedem@cput.ac.za Secretary: Mziyanda Ndede 18 July 2022 Mr. Lionel-Nathan Masamba c/o Department of Information Technology CPUT 218186657/2022/9 Reference no: Project title: The role of Blackboard Learn in promoting Active Learning among students at the Cape Peninsula University of Technology Approval period: 18 July 2022 - 31 December 2023 This is to certify that the Faculty of Informatics and Design Research Ethics Committee of the Cape Peninsula University of Technology approves the methodology and ethics of Mr Lionel-Nathan Masamba (218186657) for Master's in ICT. In the interest of transparency, the ethics committee advises the applicant to inform the institutions whose websites they are studying about their research. Any amendments, extension or other modifications to the protocol must be submitted to the Research Ethics Committee for approval. The Committee must be informed of any serious adverse event and/or termination of the study. Malewamber **Dr Blessing Makwambeni** Acting Chair: Research Ethics Committee Faculty of Informatics and Design Cape Peninsula University of Technology