THESIS ABSTRACT

Master of Computer Science

Adventist University of Africa

School of Post Graduate Studies

Title: TOWARDS A CULTURALLY AWARE USER INTERFACE EVALUATION INSTRUMENT FOR VIRTUAL LEARNING PLATFORMS: A CASE OF MOODLE IN KENYA

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The growing utilization of Virtual Learning Platforms (VLPs) in higher education, especially in Kenya, has underscored the necessity for user interfaces that are both technically functional and culturally attuned. Although current usability evaluation techniques prioritize technical and educational elements, they frequently neglect the cultural aspects that influence user experience, particularly in environments like Kenya. This work aimed to address that gap by creating and verifying a culturally sensitive user interface evaluation tool specifically designed for assessing VLPs, particularly Moodle, the most prevalent platform in Kenyan colleges.

The research was directed by three objectives: (1) Identify cultural dimensions influencing Kenyan users' UI preferences. (2) Adapt existing UI evaluation tools to incorporate these dimensions. (3) Test the instrument's efficacy in evaluating

Moodle's usability in Kenya. A hybrid framework was created by combining recognized usability heuristics, pedagogical usability principles, and cultural elements based on Hofstede's model and intercultural design approaches. The tool underwent evaluation by five specialists in usability, instructional design, and Kenyan culture. The feedback was assessed and incorporated to enhance the instrument, which was subsequently utilized in a pilot review of Moodle.

The findings indicated that the interface expectations of Kenyan learners are significantly shaped by cultural characteristics, including high power distance, collectivism, moderate uncertainty avoidance, and achievement incentive. The test successfully revealed culturally unique usability concerns frequently neglected in traditional assessments, including the necessity for localized language, prominent teacher supervision, and community-oriented learning aspects. The findings indicated that including cultural factors into UI assessment yields enhanced understanding of learner involvement and system effectiveness.

The study recommends the implementation of culturally relevant evaluation tools in the design and implementation of VLPs in Kenya. The proposed instrument functions as a valuable tool for e-learning designers, educators, and policy-makers aiming to improve cultural inclusion and user experience in virtual learning environments across many educational contexts.

Keywords: Usability Evaluation, Virtual Learning Platforms, Moodle, Culture-Centered Design, Hofstede's Dimensions, Human-Computer Interaction, Kenya, User Interface Design, Intercultural Usability, E-learning

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To God be the Glory!

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Thank you all.

CHAPTER 1

INTRODUCTION

The increased use of educational technologies has been caused by the globalization of education and rapid advancements in technology use. This has changed the way education is delivered worldwide, leading to an increase in the use of Virtual Learning Platforms (VLPs) as tools to deliver education across the world. In addition, the COVID-19 pandemic disrupted the face-to-face delivery of education. In an attempt to mitigate the global epidemic, a staggering number of students worldwide ceased physical attendance of classes at higher education institutions (HEIs); more than 850 million children and young students, or half of the world's student population, stopped going to school. Educational institutions were closed in more than 102 nations [1]. This phenomenon forced many higher education institutions to transition to the use of VLPs. To effectively use these platforms, we must consider the user interface and learning experience design. These design principles will ultimately affect user engagement and satisfaction as well as the accomplishment of learning outcomes. While the adoption of VLPs has increased access to education, the diverse cultural backgrounds of learners present challenges in evaluating their cultural appropriateness and efficient use. In addition, because these platforms are used across diverse cultural contexts, the design must meet the unique cultural needs of the users.

Background

A Virtual Learning Platform (VLP) can be defined as an electronic information system designed to comprehensively assist the administration and pedagogy of learning processes in higher education and professional training contexts by supplying learners with appropriate materials to systematically acquire desired qualifications. The creation and implementation of Virtual Learning Platforms (VLP) is warranted due to several advantages, including enhanced collaboration and communication, convenience (in terms of costs, pedagogy, and learning), efficiency, user autonomy, personalization, ubiquity, task orientation, and the timeliness of VLP-facilitated learning and instruction[2]. Several VLPs have been developed and adopted by higher education institutions globally, such as Moodle, Blackboard, Canvas, and Sakai.

Moodle, as a popular open-source learning management system, has been widely adopted in various educational contexts, including Kenya. The platform offers numerous tools and features for personalized learning, interactive engagement, and assessment[3] [4], [5]. Interestingly, while Moodle provides flexibility and efficiency in evaluating students' learning progress [6], there is a gap in understanding best practices and innovations in design methods within e-learning platforms, especially in diverse cultural contexts. This highlights the need for a culturally aware user interface evaluation instrument specifically tailored for the Kenyan context.

Kenya has experienced an increasing focus on digital education. In the recent past, Kenya has witnessed a high demand for university education due to increased numbers of high school graduates and employees wishing to further their education . To meet this demand, and increase flexibility for working class students, universities have had to embrace the use of VLPs [7]. In addition to that, the Kenyan education

system has rapidly adopted e-learning, especially after the COVID-19 pandemic, which underscored the necessity for resilient and culturally attuned virtual learning solutions [8]. However, when considering the implementation of Moodle in Kenya, it is crucial to evaluate its user interface from a culturally aware perspective.

The design of the VLP user interface is critical as it influences the overall learning experience and engagement of the users [2]. [9] has shown that a well-designed user interface can lead to increased user satisfaction, engagement, and learning outcomes. On the other hand, when these cultural factors are not considered in the design of virtual learning platforms, the users become frustrated, will have low engagement and poor learning outcomes[10]. Moreover, intercultural user interface design is crucial for improving the intercultural usability of software, which is imperative for worldwide sales prospects[11]. This indicates that developers of VLPs must consider cultural factors when designing the user interface to ensure it is usable and engaging for diverse learners.

The most commonly adopted approach in evaluating virtual learning platforms is to utilize standard evaluation frameworks that are general-purpose and universal in nature. However, this standard approach overlooks cultural nuances that influence how users interact with computer systems. A substantial body of research shows that cultural differences can affect human behavior and, consequently, the subjective experiences related to technology use [12]. Therefore, the evaluation of virtual learning platforms must be culturally aware to ensure that the diverse cultural needs of users are addressed in the design. This research aims to develop a culturally aware user interface evaluation instrument for virtual learning platforms, with a specific focus on the case of Moodle in Kenya. The proposed instrument will provide a

framework for evaluating the cultural appropriateness and usability of the Moodle user interface for Kenyan users.

Problem Statement

While VLPs such as Moodle have been widely adopted in Kenyan universities[13], there is a lack of understanding of how the interface design of these platforms aligns with the cultural preferences and needs of Kenyan learners.

While prior studies focus on technical usability using tools like Nielsen's Heuristics, System Usability Scale (SUS) and Questionnaire for User Interaction Satisfaction (QUIS) these lack metrics for measuring the impact of cultural factors on the usability and user experience of virtual learning platforms[11]. Few studies address Sub-Saharan Africa's User Interface (UI) needs, and none integrate cultural awareness with learning inclusivity. Kenya's context remains underexplored.

This research aims to address this gap by developing a culturally aware user interface evaluation instrument for virtual learning platforms, specifically for the case of Moodle in Kenya.

Research Questions

In order to address the above-stated limitations, the following research questions will guide the study:

1. What are the key cultural factors that influence the design and use of virtual learning platforms in the Kenyan context?
2. How effective are the current evaluation tools which integrate cultural aspects?
3. How best can the existing tools be tweaked to integrate the missing cultural aspects?

Purpose and Objectives of the Study

The primary objective of this study is to produce a user interface evaluation tool for virtual learning platforms that integrates Kenyan cultural aspects.

Specific objectives include:

1. Identify cultural dimensions influencing Kenyan users' UI preferences.
2. Adapt existing UI evaluation tools to incorporate these dimensions.
3. Test the instrument's efficacy in evaluating Moodle's usability in Kenya.

CHAPTER 2

LITERATURE REVIEW

This literature review chapter seeks to establish a thorough foundation and contextual background for the study. This chapter synthesizes current academic research pertinent to the study's focus areas, encompassing virtual learning platforms (VLPs), user interface (UI) usability evaluation methods, cultural factors in human-computer interaction (HCI), and the educational technology landscape particular to Kenya.

Virtual Learning Platforms

[14] Defines VLPs as information and communication technologies that integrate many functionalities to improve learning. Diverse commercial and open-source VLPs offer services for the creation and dissemination of course content and facilitate communication among users. According to Stantchev et al. [15], VLEs enable learners and instructors to interact online through various means, such as discussion forums, file sharing, and multimedia content delivery. [16] states that VLPs facilitate the online delivery of educational content, enable communication and collaboration among learners and instructors, and track and manage learning activities and performance. VLPs facilitate various activities within virtual learning, including content delivery, collaboration, assessment, and administrative tasks[17]. Whereas virtual learning is an instructional model where teaching and learning occur via the internet, rather than in a physical classroom [18], VLPs represent a shift from

traditional classroom-based learning to a more flexible, accessible, and technology-mediated approach to education [19].

In the context of this research, the term "Virtual Learning Platforms" encompasses both commercial and open-source systems, such as Moodle, Canvas, Blackboard, Sakai, Google Classroom, and Microsoft Teams, which are widely adopted within higher education settings [19], [20]. Moodle, created by Martin Dougiamas, is one of the most prevalent open-source Learning Management Systems (LMS), fundamentally designed to provide educators extensive control over the learning process. Educators develop and oversee courses inside Moodle. Moodle offers a versatile learning environment that enhances students' self-regulation skills and empowers them to achieve their objectives independently. It fosters a collaborative learning environment in which students acquire information via conversations with peers. The Moodle learning management system is being utilized by several universities globally for research and educational enhancement because of its different characteristics[14]. Its appeal arises from a comprehensive feature set that aligns with student-centered, constructivist learning philosophies. Moodle offers a diverse array of activities and tools for communication (chat, forums), content delivery (resource sharing, lesson modules), collaboration (wikis, group projects), and assessment (assignments, quizzes), all available via an intuitive interface.[13]. The platform’s open-source nature (no licensing fees) and compatibility with common devices have further spurred its adoption in diverse settings, including the Kenyan higher education context .[13].

In summary, Virtual Learning Platforms (VLPs) such as Moodle are characterized by their extensive capability to facilitate online teaching and learning,

providing vital features (flexibility, interaction, centralized management) that render them crucial infrastructure in modern education.

Adoption and Use of Virtual Learning Platforms in Higher Education and in Kenya

The use of virtual learning platforms has expanded tremendously in higher education globally, driven by several factors [21] [22]. The COVID-19 pandemic has further accelerated the widespread adoption of VLPs, as universities worldwide were compelled to shift to remote and online learning modalities. [16] According to Fidalgo et al., the pandemic stimulated a swift transition to virtual instruction across numerous educational institutions, leading to an exponential increase in the use of platforms like Moodle [21]. Citing Adedoyin and Soykan, the review notes that the pandemic compelled universities globally to resort to remote teaching via various online learning systems, making the adoption of VLPs indispensable. [21] [23]

In the Kenyan context, the literature reveals that the uptake and use of VLPs, particularly Moodle, have been steadily increasing in the higher education sector. Virtual learning platforms have gained importance as a strategy to expand access to higher education amid growing demand. The uptake was also driven by the necessity to address the growing student population, including working professionals, and to alleviate capacity limitations in conventional campus delivery methods[7]. By the mid-2010s, several Kenyan universities had established e-learning programs and begun deploying LMS platforms like Moodle to complement face-to-face teaching. The 2005-2006 ICT policy framework in Kenya provided impetus for this shift, as it encouraged the integration of ICT in teaching and learning across educational institutions[16].

According to [16], Kenyan public universities like Kenyatta University and the University of Nairobi were early adopters of open and distance learning initiatives, providing students with learning resources via offline media like CDs and floppy disks. Egerton University also established an African Virtual University infrastructure to facilitate e-learning. By the mid-2010s, several Kenyan universities had established e-learning programs and begun deploying LMS platforms like Moodle to complement face-to-face teaching. The COVID-19 pandemic also catalyzed the rapid adoption of VLPs in Kenya. Following the suspension of in-person classes, universities were required to transition to online instruction rapidly. By the conclusion of 2020, more than one-third of public universities in Kenya had implemented Moodle for course delivery, and the utilization of Virtual Learning Platforms (VLPs) increased significantly during lockdown periods. Moodle was commonly selected in Kenya because of its cost-effectiveness and suitability for local requirements[7]. However, several challenges have impeded the full-scale adoption and effective utilization of VLPs, particularly Moodle, in Kenyan higher education.

Early adoption in Kenya was characterized by caution, impeded by factors including inadequate ICT infrastructure, unreliable internet connectivity, and a lack of sufficient training for faculty and students in e-learning technologies [7]. These barriers led to lower usage and slow integration of VLPs before 2020. Mtebe and Raisamo (2014) note that many African universities that introduced VLP technology struggled with underutilization and user resistance, often due to these implementation challenges (e.g. lack of technical support and local content) [24].

During the COVID-19 lockdowns, the rapid scale-up to VLPs underscored both the potential and limitations of the current e-learning infrastructure. It illustrated the effectiveness of virtual platforms in maintaining educational continuity during

crises. Conversely, it revealed deficiencies in preparedness; numerous instructors and students faced challenges with the new modality and not all content was suitably adapted for online delivery. Surveys and literature reviews [7] have identified ongoing challenges in the implementation of e-learning at Kenyan universities, such as insufficient institutional e-learning policies, restricted bandwidth and device access, and low digital literacy among certain user groups. Addressing these challenges is essential to fully realize the benefits of VLPs in Kenya's higher education sector.

One frequently neglected factor in the swift adoption of VLPs is the quality of user experience and the cultural suitability of the platform's user interface for the local student demographic. Despite advancements in the deployment of VLPs by universities in Kenya, research indicates that the mere availability of technology does not ensure effective utilization or favorable learning outcomes [24]. Low utilization rates of LMS features and learner disengagement have in some cases been attributed to usability problems and misalignment with user expectations. For instance, [24] report that many Kenyan students used their university’s LMS only minimally, citing confusing interfaces and lack of training as key issues.

Consequently, in addition to institutional acceptance, the continued utilization of VLPs by educators and learners significantly relies on the platforms being user-friendly and responsive to users' requirements. This insight has prompted an increasing focus on assessing and enhancing the usability of e-learning systems within the local context. This study engages with this line of investigation by examining the culturally pertinent usability evaluation of Moodle in Kenya. The extensive implementation of Moodle at Kenyan colleges presents a significant opportunity—and necessity—to evaluate not just its technical performance but also the effectiveness of its interface design in appealing to Kenyan users.

Usability Evaluation of User Interfaces

Usability evaluation can be defined as a systematic procedure or a collection of methodologies employed to analyze how effectively, efficiently, and satisfactorily a product, system, or service may be utilized by designated users to accomplish certain objectives within a defined context of usage [14]. Usability is a core factor in the success and adoption of any interactive system. The major objective of usability assessment is to detect usability issues and analyze the usability characteristics of a system, such as an e-learning platform, about its strengths and shortcomings, finally facilitating interface modification and additions for prospective users[25] [26].

There are two key factors to be considered in usability evaluation. F. irst and foremost is the focus on user experienceUsability evaluation measures the user experience, specifically regarding user engagement when interacting with an application[17]. It considers how users perceive and respond to a system [27]. The second is the identification of problems. A core goal in usability evaluation is the identification of system usability problems [26], [25]**.**These problems can arise due to variations in behavior and cultural differences, where users from different cultures may interpret the same application differently[17].

Numerous proven methodologies exist for assessing UI usability, broadly classified into expert-based inspections and user-based testing**.** Expert-based approaches, such as cognitive walkthroughs, consistency inspections, heuristic evaluation, and guideline reviews, and rely on UI design experts to identify potential issues based on established usability principles[28] . User-based testing on the other hand,collects data from actual users interacting with the system, often through activities like usability testing, surveys, and interviews. In the context of virtual

learning platforms, user-based and expert-based evaluation approaches are both valuable and complementary.

Heuristic Evaluation

A prevalent expert-based approach is heuristic evaluation, where UX specialists examine the interface and assess its adherence to established usability criteria or "heuristics." Jakob Nielsen's 10 usability heuristics [28] are well-recognized standards, including aspects such as visibility of system status, match between system and the real world, consistency, feedback, mistake avoidance, error prevention, user control, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, and user help. During a heuristic assessment, usually 3 to 5 evaluators separately assess the user interface and identify usability problems, which are subsequently aggregated and evaluated according to severity.

The commonly used expert-based methodology is heuristic evaluation, where UX specialists examine the interface and assess its adherence to established usability criteria or "heuristics." Jakob Nielsen is a notable individual linked to heuristic assessment, which he initially developed in 1990 alongside Rolf Molich [26] [29]. The objective of heuristic evaluation is to identify usability issues in a user interface design for resolution within an iterative design process. This method is regarded as a cost-effective usability evaluation technique because of its reduced expenses related to time, the number of usability experts, and resources, as well as its minimal preparation requirements. It may also be utilized in the first phases of software development[30]. In a heuristic evaluation, usually 3 to 5 evaluators independently assess the user interface and identify usability concerns, which are subsequently collated and scored for severity and priority [26].

Nielsen [28] proposed the following ten general principles for user interface design: “Visibility of system status, Match between system and the real world, User control and freedom, Consistency and standards, Error prevention, Recognition rather than recall, Flexibility and efficiency of use, Aesthetic and minimalist design, Help users recognize, diagnose, and recover from errors, and Help and documentation”: These heuristics can both be applied in general user interface evaluations and customized to the context of virtual learning platforms like Moodle.

Several scholars have used Nielsen’s heuristics to assess the usability of e-learning platforms like Moodle. [31] used Nielsen’s heuristics in a self-directed usability testing approach to evaluate a Moodle course from a student perspective. The study was able to identify usability issues and recommend areas of improvement to enhance the course’s usability. In this study, [28] heuristic evaluation by six experts were able to identify usability problems in e-learning materials, detecting many serious issues quickly although one serious problem was missed. When analyzing the usablility of a VLP in [32], heuristic severity ratings were used to evaluate the difficulty or severity of usability issues. In another study, the user evaluation of UbiQuitous Access Learning (UQAL) portal was conducted; the interface was evaluated by experts using a heuristic evaluation technique based on Nielsen’s ten heuristics, which was able to identify some flaws in the user interface design[33]. In yet another study, used Nielsen's heuristics to assess the usability of two eLearning management systems and found the dotLRN system to be more usable than Moodle [34] [33] [35]. While heuristic evaluations provide useful insight into potential usability issues, they do not replace the need for user-based evaluations.

User-based Evaluation

On the other hand, user-based testing entails monitoring actual users or representative end-users as they engage with the system to complete designated tasks. A traditional method involves enlisting several participants, assigning them scenario-based tasks on the interface, and gathering both quantitative metrics (task success rates, duration on task, error counts) and qualitative feedback (via post-test interviews or questionnaires). Methods such as the think-aloud protocol are frequently employed, wherein users articulate their cognitive processes and frustrations while interacting with the user interface, yielding valuable insights on usability challenges[24].

Subsequent to these sessions, standardized surveys may be conducted; for instance, the System Usability Scale (SUS), a ten-item Likert scale questionnaire, provides an overall usability score from the user's viewpoint. Other instruments, such as the Questionnaire for User Interaction Satisfaction (QUIS) and the Computer System Usability Questionnaire (CSUQ), also assess user satisfaction across several characteristics of the interface. These tools generate quantitative ratings that are beneficial for benchmarking and comparison.

Usability Evaluation for VLPs

Usability evaluation for e-learning interfaces adheres to generic methodologies while also integrating criteria pertinent to educational situations, sometimes referred to as **pedagogical usability**. For example, evaluators may assess not only fundamental UI elements (navigation, visual clarity, etc.) but also the efficacy of the LMS interface in supporting learning activities—specifically, does it promote student interaction, deliver suitable feedback on quizzes, and encourage learner engagement? In certain instances, a mix of techniques is utilized to achieve a thorough evaluation. [24] detail a methodology that combines user testing, wherein students engage in

activities on Moodle while articulating their thoughts, with expert heuristic evaluation, further enhanced by post-test surveys, to assess a Learning Management System (LMS) — a strategy that utilizes both authentic user perspectives and expert analysis.

By employing various methodologies, assessors can encompass diverse aspects of usability. In another instance, Mtebe and Kissaka [24] adapted the heuristics to the context of web-based learning management systems in African universities, adding six additional criteria related to instructional design and learning effectiveness. Zaharias proposed twelve usability parameters, five related to interface design and seven to instructional design, for evaluating e-learning platforms [36]. By triangulating multiple methods, evaluators can capture different facets of usability.

Overall, the goal of UI evaluation is to ascertain that the platform is accessible to the intended audience, allowing users to intuitively comprehend and use the system without undue effort or misunderstanding. An effective interface is essential for virtual learning platforms; if students and instructors see the LMS as burdensome or perplexing, they may underutilize its functionalities or resort to less efficient alternatives, therefore diminishing the technology's potential advantages. Consequently, meticulous usability assessment is a crucial component of the creation and implementation of VLPs in any environment.

Limitations of Standard Usability Evaluation Methods in Multicultural Contexts (Kenya)

Over-generalized Evaluation Methods

Traditional usability evaluation methodologies and criteria, as previously outlined, were predominantly formulated in Western contexts and presuppose a universal user profile. Instruments such as Nielsen’s heuristics, the System Usability

Scale (SUS), and the Questionnaire for User Interaction Satisfaction (QUIS) are founded on universal principles of human-computer interaction and cognitive ergonomics. They concentrate on elements considered universal to all users, such as the necessity for consistent interfaces, the minimization of cognitive strain, and the provision of feedback. Although these standard frameworks effectively identify general usability problems, they do not explicitly consider cultural aspects. They presume that what is functional for one user group will be similarly functional for another, irrespective of variations in cultural backgrounds, language, social conventions, or past experiences. This presumption may provide challenges in multicultural environments such as Kenya.

Neglect of Cultural Nuances

In sub-Saharan Africa, as well as in any culturally diverse region, traditional usability tests may neglect significant cultural nuances in user interaction. For instance, examine interface language and terminology: A usability checklist may guarantee consistency in terminology within the interface; however, if the language employed is excessively colloquial or idiomatic in a manner that does not resonate with local users (or is an unnatural translation from English), users may continue to experience difficulties or feelings of alienation—an issue that a standard heuristic evaluation may overlook. Likewise, visual design choices, including color schemes and iconography, may convey varying implications between cultures. An emblem or color deemed benign in one culture may be perplexing or even insulting in another; conventional assessments never account for such cultural discrepancies[17]. The content and navigation structure may clash with dominant learning methods; certain cultures prefer linear, instructor-led instruction, while others are more inclined towards self-directed inquiry. If an LMS's interface design deviates from local

expectations (for instance, a highly learner-independent model in a culture accustomed to teacher guidance), users may perceive the system as less intuitive or satisfying, despite its compliance with generic usability best practices.

Previous research has demonstrated that cultural disparities markedly affect users' behaviors and perceptions in their interactions with technology. Traditional usability measures fail to encompass aspects such as cultural familiarity, localization quality, or compliance with cultural communication standards. In Kenya, the majority of usability assessments of educational software have predominantly concentrated on general metrics (such as load times, error rates, and task success) or content relevance, neglecting to consider whether the user interface design aligns with Kenyan cultural preferences (including the degree of formality in on-screen language, the focus on individual versus group activities, and feedback styles). This has resulted in a discrepancy where a Learning Management System (LMS) may successfully meet basic usability criteria—classified as “usable” in an absolute sense—yet still have challenges with user adoption and satisfaction owing to cultural mismatch[17].

A platform may adhere to all of Nielsen’s guidelines (such as the absence of consistency errors and effective error reporting) and get a satisfactory SUS score across a diverse user sample; nonetheless, Kenyan students could see the system as "not for them" or cumbersome to navigate. This criticism may arise from nuanced cultural discrepancies: the tone of system communications may be excessively impersonal, or the collaborative tools may not align with the primarily communal learning methodologies in Kenya. Conventional assessments may overlook these concerns due to their absence of inquiries on cultural comfort or identity.

In conclusion, whereas conventional usability evaluation methodologies establish a robust foundation for measuring interface quality, they include intrinsic

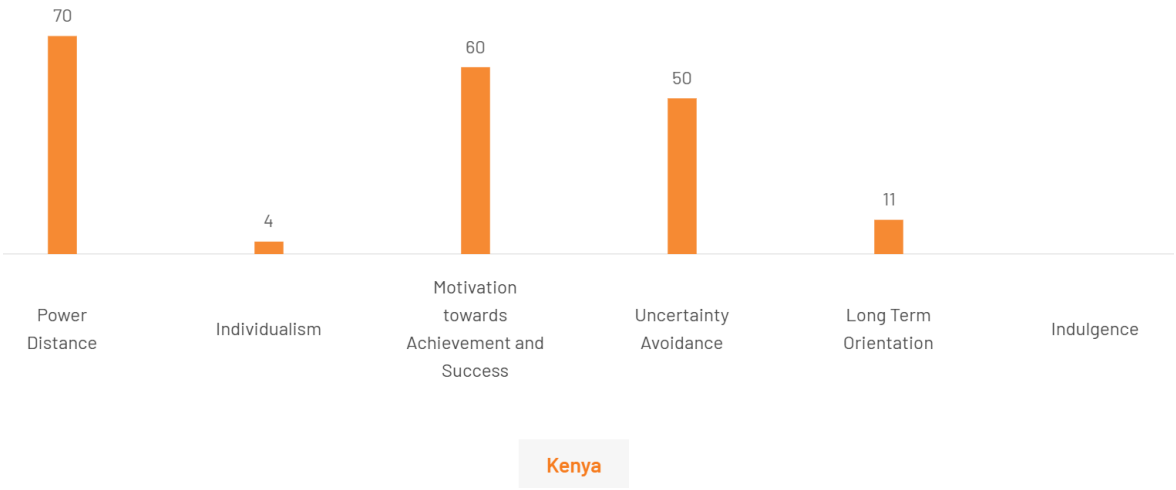
limitations in multicultural settings. They frequently presume a reasonably uniform user profile and global usability standards, which do not reflect the reality of culturally varied user groups. This has necessitated the development of comprehensive methodologies for usability evaluation that incorporate cultural factors, guaranteeing that assessments of "usability" and "user satisfaction" accurately represent the experiences of local users in Kenya and other locations, rather than only reflecting a generic user archetype.

Cultural Context of Kenya via Hofstede's Dimensions and UI Design Implications

Kenya's cultural context can be characterized through the lens of Hofstede's dimensions, which provides insight into how Kenyan users might interact with educational technology. Although Hofstede's original studies did not include Kenya as a separate country data point, the Culture Factor Group's country score tool, which references Hofstede's and other researchers' work, provides indicative dimensional scores for Kenya, which can be used to elucidate potential cultural tendencies that may influence interface design preferences. According to the tool, Kenya scores high in Power Distance (70), Motivation towards Achievement and Success (60), and Uncertainty Avoidance (50), and Collectivism (96).

Figure 1

Kenya Country Score



Source: Culture Factor Group

Power Distance

This refers to the degree to which less powerful people of a community acquiesce to the unequal distribution of power. Kenya's elevated score of 70 indicates that it tends to have a relatively higher power distance culture, and it is generally a hierarchical society; traditionally, teachers and elders are respected authorities, and classrooms have been teacher-centric. In terms of UI design, this suggests that Kenyan learners may prefer a learning platform that provides clear structure, guidance, and authority signals. For instance, they may respond positively to a dashboard prominently displaying instructions from the instructor or official announcements. Additionally, they may gravitate towards a hierarchical navigation mirroring a formal syllabus. However, this high power distance dynamic may also mean students are less likely to openly critique or question the system, potentially resulting in unreported usability issues. Evaluators should be mindful of this cultural context when gathering user feedback, potentially utilizing indirect methods or

carefully worded questions to elicit more honest user critiques in this deferential cultural environment.

Motivation Towards Achievement and Success

Kenya's high score of 60 on Motivation Towards Achievement and Success indicates a cultural preference for competition, performance, and accomplishment. In the context of an LMS, this could manifest in users valuing progress tracking tools, leaderboards, and other mechanisms that foster a sense of individual advancement and mastery. Therefore, an effective platform should incorporate feedback loops and visual cues that allow learners to gauge their standing relative to peers or course objectives.

Uncertainty Avoidance

This dimension has to do with how a society addresses the inherent unpredictability of the future: should we endeavor to regulate it or allow it to unfold naturally? This uncertainty induces uneasiness, and many cultures have developed distinct methods to address this unease. The Uncertainty Avoidance score indicates the extent to which culture members see hazards from ambiguous or unclear occurrences and have developed ideas and institutions to offset these concerns. Kenya's intermediate score of 50 on Uncertainty Avoidance suggests that Kenya is an interesting mix; Concerning Kenyan learners' cultural context, they often operate within resource-constrained and unpredictable environments, but in formal educational settings, there is typically an emphasis on clear instructions and expectations. If Kenyan e-learning users demonstrate a moderate degree of uncertainty avoidance, they would likely appreciate interfaces that are straightforward, with explicit guidance on the next steps to take.

Complex or ambiguous navigation, as well as hidden functionalities, could be particularly detrimental in this context. The virtual learning platform should make it evident how to get started in a course, locate required readings, submit assignments, and check grades, thereby reducing uncertainty at each stage. Consistency in the interface becomes even more crucial in this setting, as it helps build a sense of predictability and control, which these learners would value.

Individualism vs Collectivism

This dimension addresses the extent of interconnectedness within a society's members. It pertains to whether individuals' self-concept is characterized by "I" or "We". In individualistic society, individuals are expected to care for themselves and their immediate family alone. In collectivist cultures, individuals are part of 'in-groups' that provide support in return for allegiance.

Kenya, with a notably low score of 4 on this category, is unequivocally a collectivistic country. This is shown in a sustained, long-term dedication to the member 'group', whether it be a family, extended family, or broader ties. Loyalty in a collectivist culture is vital and supersedes most other societal norms and regulations. The society cultivates robust connections in which all members assume accountability for one another.

Frameworks and Methods of Intercultural User Interface Evaluation

To systematically include culture in UI design and evaluation, specialized frameworks have been developed in recent years. These schemes leverage established models of cross-cultural psychology, such as Hofstede's cultural dimensions, to analyze how cultural factors influence user perceptions and behaviors.

Intercultural User Interface Design (IUID) method-mix

Heimgärtner (2019) [11] developed a method-mix for Intercultural User Interface Design (IUID) as part of a toolkit for culturally aware design and evaluation. Heimgärtner's IUID method-mix integrates many components: it utilizes Hofstede's cultural dimensions, intercultural variables (distinct features that vary across cultures), UI design attributes, and overarching HCI principles in a hybrid framework. The objective of the IUID method mix is to establish a systematic approach for incorporating cultural context into the UI development lifecycle. [11] illustrates application examples, including comparisons of German and Chinese user interactions, to elucidate the impact of cultural factors on usability and user experience.

Through the analysis of empirical data, he established connections between particular cultural aspects and UI design parameters, which provide the foundation of a model for culturally impacted human-computer interaction. This model and technique combination subsequently informs a series of design and assessment criteria. The IUID method-mix functions as a framework to motivate and direct practitioners in considering culture throughout the study of requirements, design, and assessment of interfaces.

In addition, it educates UI/UX professionals on intercultural usability difficulties and gives methodological expertise (e.g., relevant cultural factors and assessment of cultural influences on UX) essential for adapting interfaces to specific cultural contexts. Consequently, evaluators employing this framework may formulate specific design suggestions or heuristics suited to the relevant culture and even assess the effort necessary for the cultural localization of an interface. Heimgärtner's toolkit

exemplifies the transition from ad-hoc cultural modifications to a systematic methodology for multicultural user interface assessment.

Gozde Culture-Centered Design Framework

Building upon these principles, [37] carried out a study exploring the design processes involving designers and users from different cultural backgrounds, and developed a framework to address the challenges and strategies in cross-cultural design. The framework outlines the unique challenges encountered when designing for a culture outside of one's own, emphasizing the importance of a crucial pre-design phase to prepare for effective cross-cultural communication. Furthermore, the framework suggests that despite variations in products, the design process for different cultures follows a similar pattern, highlighting the need for cultural competence among designers.

Tsai and Zhao Culture-Centered Design Framework

Furthermore, culture-centered design philosophies emphasize a holistic approach to interface design that considers the cultural context and values of the intended users. For instance, [38] proposed a culture-centered design approach that combines Hofstede's cultural dimensions with a user-centered design process. The framework involves phases of understanding cultural context, identifying culturally-relevant design goals, generating culturally-appropriate design solutions, and evaluating the culturally-adapted interface. A key aspect of this model is the continuous iteration between cultural analysis and design decisions, recognizing that the influence of culture on interface design is bidirectional and dynamic[38].

Structure of the Conceptual Framework

The conceptual framework is structured around the interaction between System Design Attributes and User-Centered Outcomes, as illustrated below:

System Design Attributes (Input Layer):

1. Usability Factors (from Nielsen, Zaharias, Musau and others):
    - Content clarity and structure
    - Ease of navigation
    - Learner support and feedback mechanisms
    - Motivation and engagement tools
    - Accessibility and interface aesthetics
2. Cultural Factors (via IUID + Hofstede dimensions):
    - UI alignment with authority structures (PD)
    - Reduction of ambiguity (UA)
    - Design support for collaborative vs. independent work (IC)
    - Motivational design reflective of local values (MAS)
    - Symbolic relevance and localized language/communication

Mediating Construct:

- **Perceived Cultural Usability (Culturability):** The degree to which users feel the platform aligns with their cultural expectations and learning styles. This concept links both usability and culture, highlighting whether the platform "feels usable" from the learner's perspective.

Evaluation Outcomes (Output Layer):

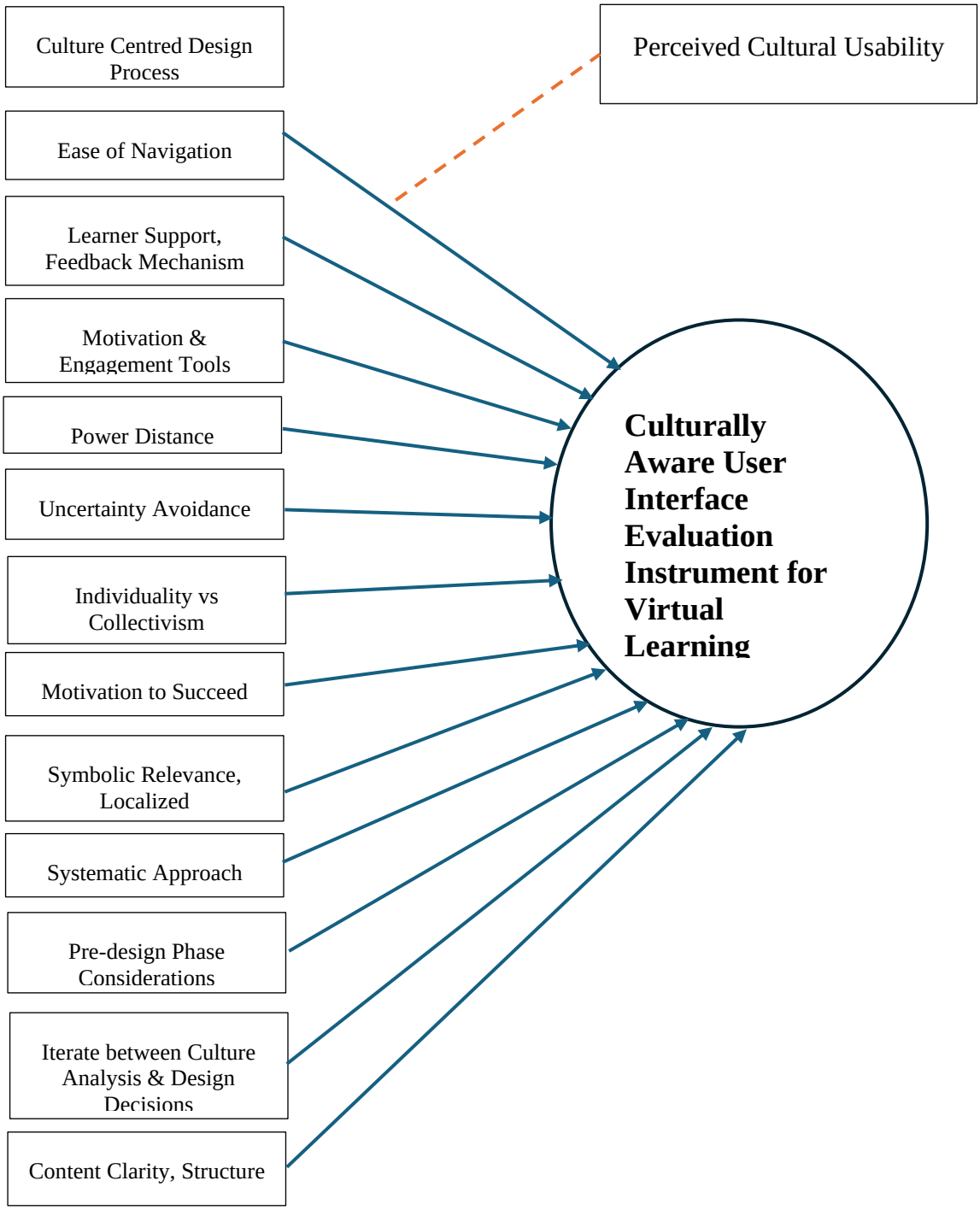
- Effectiveness of the UI evaluation instrument (based on expert feedback)

- Contextual relevance and completeness of the heuristics
- Identification of culturally-linked usability issues
- Recommendations for design improvements or local adaptations

The conceptual framework can be represented diagrammatically as follows:

Figure 2

Conceptual Framework



This integrated framework, therefore, allows researchers and designers to systematically evaluate Moodle—or similar virtual learning platforms—for both usability and cultural appropriateness in the Kenyan context.

Culture-Centered Design Methods

Other researchers have also contributed methods for intercultural or cross-cultural UI evaluation. For instance, Marcus (2006) [39] outlined principles of cross-cultural user-experience design, emphasizing early incorporation of cultural factors in usability testing protocols (such as recruiting users from target cultures and interpreting results through a cultural lens). [40] proposed a culture-centered design approach, which includes a set of questions evaluators should ask about an interface: Does it conform to local conventions? Is the content culturally appropriate? They argue that including these questions in heuristic evaluations or cognitive walkthroughs leads to better identification of culture-related usability issues. Similarly, Smith et al. (2004) developed a process model for culturally adaptive usability engineering, recommending an upfront cultural analysis phase and the creation of culture-specific personas to guide evaluations.

Customized Heuristic Sets

Researchers have augmented Nielsen’s heuristics with culture-specific heuristics. For instance, the study by Díaz et al. employed Hofstede's cultural dimensions to iteratively develop a set of 12 culture-oriented usability heuristics [41]. These cross-cultural design guidelines were tailored to specific cultural factors. Their empirical evaluation demonstrated that e-commerce websites incorporating these culturally relevant characteristics exhibited enhanced usability. This work exemplifies

a direct effort to create heuristics customized for cultural contexts, which can be utilized in heuristic evaluations.

Frameworks and Methods Expanded for VLP Evaluation

Given the pedagogical and functional uniqueness of virtual learning platforms, researchers have long recognized that general-purpose usability heuristics may not be sufficient to evaluate LMS interfaces [24], [42], [43]. This has led to the development of e-learning specific evaluation frameworks that incorporate educational usability criteria.

Squires and Preece Framework

One influential framework is the Squires and Preece model, which expanded Nielsen's heuristics to include educational dimensions[44] . The study argued that traditional checklist approaches for evaluating educational software are inadequate because they don't fully consider learning principles, especially socio-constructivist perspectives. It proposed a set of heuristics for “learning with software” that extend Nielsen’s principles with cognitive and contextual aspects relevant to learning, such as promoting reflection and engagement in software use. The framework highlights the need for predictive evaluation methods that go beyond superficial assessments and provide teachers with a solid foundation for choosing and using software effectively in the classroom.

Zaharias E-learning Usability Evaluation Framework

According to [24], Zaharias developed a comprehensive e-learning usability evaluation framework that explicitly integrated traditional usability factors with aspects of instructional design and learner motivation. This framework identified 12 evaluation parameters, with five addressing standard interface design criteria and the remaining elements focusing on e-learning-specific elements such as content clarity, learner guidance, feedback, and motivational support. Zaharias argued that an

effective learning management system must not only be user-friendly, but also motivationally engaging and pedagogically supportive. One outcome of this research was the creation of a questionnaire instrument to assess these aspects from the learner's perspective. Empirical validation demonstrated that incorporating motivation-related questions provided insights that could not be captured by pure usability metrics alone.

Subsequently, [29] conducted a comparative investigation of two e-learning heuristic frameworks – one by Reeves et al. (2002) and another by Mehlenbacher et al. (2005) – in the assessment of online courses. Both heuristic procedures detected a broad spectrum of usability concerns in e-learning programs, demonstrating substantial coverage of possible difficulties. The distribution of issues among heuristics was unequal; certain heuristics were linked to several problems, whilst others identified few. The Reeves et al. collection, being more brief, exhibited less repetition in detected concerns compared to the Mehlenbacher set. This indicates that although specific heuristics are advantageous, their formulation must prevent redundancy and guarantee that each addresses unique facets of e-learning usability.

Musau Usability Evaluation Framework for Web-based LMS Used in Kenyan Universities

In the Kenyan context, Musau et al. [24] developed a usability evaluation framework specifically tailored for web-based learning management systems used in Kenyan universities. This framework built upon existing heuristics by incorporating an additional dimension focused on "da," reflecting the significance of student engagement within the local context. When applied to the evaluation of Moodle, the framework proved effective in uncovering a range of usability issues, including both technical and affective aspects, through a combination of expert evaluation and

student user testing. The study concluded that this contextualized framework outperformed standard methods in diagnosing learning-related usability problems, addressing the gap between generic usability guidelines and the domain-specific needs of e-learning systems. However, even this framework did not explicitly incorporate cultural dimensions beyond the educational domain factors, focusing primarily on pedagogical usability rather than the cultural customization of the interface.

Ssemugabi and de Villiers Framework

Within the broader African context, [45] in South Africa created an evaluation instrument that integrates heuristics and user surveys for e-learning courses, as part of a wider Africa-focused research initiative. Their methodology emphasized criteria such as student feedback, self-directed learning assistance, and accessibility, recognizing the contextual requirements of African learners, including low bandwidth constraints. Although effective for its intended function, it failed to address cross-cultural interface concerns once more.

In summary, the literature supports that domain-specific heuristics or checklists for e-learning lead evaluators to find issues that might be missed with generic heuristics – for instance, problems related to learning feedback, content appropriateness, or learner motivation. These frameworks and instruments (Squires & Preece, Quinn, Zaharias, etc.) form a knowledge base that the present study can build upon. They provide validated criteria and methods for assessing LMS usability in general. What remains under-addressed, however, is the cultural aspect. Few if any of the established e-learning evaluation models explicitly include checks for cultural appropriateness of the UI or consider cultural variation among users. As highlighted

by Heimgärtner[9], [11] and others, this is a critical omission especially when deploying an LMS like Moodle in a culture different from where it was designed.

Theoretical Framework: Expanded Heuristics for VLP and Hofstede's Cultural Dimensions

To address this research gap, the present study proposes a novel hybrid evaluation instrument combining usability heuristics, pedagogical usability, and Hofstede's cultural factors. An appropriate theoretical framework would likely need to accommodate the multifaceted nature of these elements.

Proposed Expanded Heuristics for VLP

Studies have already established the need for heuristics tailored to the specific domain of e-learning systems, as generic usability heuristics may fail to identify important pedagogical and user engagement factors [46]. At the same time, existing e-learning heuristics do not fully account for cultural differences in interface preferences and expectations. [47]. Therefore this study will build on existing e-learning usability models. The Expanded Heuristics for Virtual Learning Platforms framework borrows from established systems like Zaharias' E-learning Usability Evaluation Framework and Musau's LMS Usability Evaluation Model, which emphasize e-learning-specific usability elements such as:

- Content Organization & Relevance -The e-learning content should be logically structured, well-organized, and aligned with the curriculum. Learners should be able to easily locate materials, with clear module delineations and topic indexing. Effective content organization supports efficient knowledge acquisition and mitigates cognitive burden for learners.

- Learner Guidance and Support- The interface should provide adequate guidance, help, and instructional support for learners. This includes clear instructions for tasks, easily accessible help documentation or tutorials, and prompts that guide learners through activities. Effective learner support features (hints, examples, FAQs) foster learner independence and confidence in using the platform.
- Interactivity and Feedback - Interactive elements (quizzes, discussions, simulations) are integral to e-learning usability. The system should allow learners to actively engage with content and receive timely, informative feedback on their actions and performance. For example, after a quiz or an assignment submission, the platform should deliver feedback or results promptly. Robust interaction and feedback mechanisms keep learners motivated and aware of their progress
- Navigation and Findability - The platform's navigation structure must be intuitive, enabling users to move through courses, modules, and activities without confusion. Clear menus, links, and search functions are critical so that learners can locate resources or return to previous pages easily. Good navigation design reduces frustration and ensures efficiency in accomplishing learning tasks
- Visual Design and Aesthetics- The user interface should employ a clear and appealing visual design. This includes readable typography, appropriate color contrast, and uncluttered layouts that focus attention on learning content. An attractive, well-designed interface can positively influence learners' engagement and concentration, while poor visual design may distract or hinder usability

- Accessibility and Inclusivity - The user interface should be designed to accommodate a wide range of user needs and contexts. The LMS platform must be accessible to individuals with disabilities and function effectively under varied bandwidth or device constraints. Addressing accessibility not only expands the potential user base but also aligns with the principles of universal design, thereby enhancing overall usability and ease of use for all learners.
- Learnability and Self Learning Support- First-time users should be able to quickly familiarize themselves with the platform's functionality. The system ought to minimize the learning curve through the use of consistent user interface patterns and, where appropriate, onboarding tutorials. Additionally, features that foster learnability, such as self-assessment tools that assist learners in developing effective learning strategies within the system, should be incorporated. A high degree of learnability ensures that students can focus their attention on the actual learning tasks rather than becoming hindered by struggles with the interface
- Drive to Learn- A key usability factor for learning platforms is their capacity to maintain learner motivation. The interface and feature set should be designed to foster engagement, curiosity, and persistence in learning activities. This may entail incorporating gamified components, social learning tools, or simply a user-friendly experience that minimizes frustration. Recognizing motivation as a usability criterion acknowledges that the interface can directly influence a learner's enthusiasm and emotional investment in the learning process.

The theoretical framework establishes that a well-designed learning management system interface should possess several key attributes. These include being content-rich and structured in an organized manner, providing guidance and engagement for learners, enabling interactive and feedback-driven learning experiences, offering intuitive navigation, maintaining visual clarity, ensuring accessibility for all users, facilitating easy learning, and cultivating user motivation. These foundational elements set the groundwork for evaluating the extent to which Moodle's design effectively supports meaningful learning for its general user base.

Incorporation of Cultural Dimensions

As a starting point for developing such an expanded framework, we can draw insights from Hofstede's influential model of cultural dimensions, which has been widely applied in user interface design and cross-cultural studies [17]. Through The cultural factor group’s country scores we have already identified the top 4 cultural variables that would be interesting in our study:

- Power Distance - The degree to which less powerful institutional members accept unequal distribution of power.
- Uncertainty Avoidance - The degree to which a culture tolerates unpredictability and ambiguity.
- Individualism vs. Collectivism - The degree to which individuals are integrated into groups [48].
- Motivation towards achievement and success -The degree to which a culture emphasizes success and achievement in life.

In addition, using guidelines from [11], we can further expand the cultural criteria above to include:

- Intercultural Communication Preferences – Communication and interaction styles that are culturally prevalent. For example, the Kenyan educational culture may combine formal instructor-led guidance and informal peer-to-peer communication; the platform should accommodate these cultural preferences.
- Symbolism and Imagery – The cultural symbolism and visual representation used in the user interface should be mindful of local Kenyan context. Imagery, color schemes, and iconography should be selected to resonate with the target student population, drawing on familiar local references and avoiding symbols that may carry unintended negative meanings from a Kenyan cultural perspective.
- Local Educational Practices – The user interface design should be consistent with Kenya's prevailing pedagogical practices and academic norms. This encompasses the organization and structure of course content, the degree of formality in instructor-learner interactions, and the expectations surrounding feedback mechanisms and assessment methods. Where Kenyan educational institutions place emphasis on specific learning activities, the LMS interface should be designed to support and promote those activities.
- Language and Localization –While English is an official language in Kenya, the platform's language use should be culturally sensitive and straightforward. All text and instructions should be readily comprehensible to the target student population, eschewing idiomatic expressions or technical jargon that might confuse local users. Offering options for

Kiswahili language support or translation of key terminology could also enhance usability for those more comfortable with the local language.

- Social Interaction Norms – Cultural preferences for social interaction in online learning environments. For instance, Kenyan learners typically prioritize collaborative learning communities, therefore, the platform should prominently feature and optimize user-friendliness for forums, chat, and group functionalities. Conversely, any platform features that may clash with prevailing local social norms should be thoughtfully adapted.

The incorporation of these cultural dimensions into the evaluation criteria ensures that the user interface assessment instrument is responsive to and considerate of the cultural context of Kenyan learners.

Further to that, [11] gives a systematic way of incorporating the cultural factors to derive concrete UI design recommendations. This practically means that our evaluation instrument will, for each usability heuristic, pose questions or checkpoints that account for cultural relevance. For instance, when evaluating Content Organization, we not only examine logical structure in abstract terms, but also whether the content presentation aligns with local academic norms (such as including examples or case studies relevant to Kenyan context). When assessing Interactivity and Feedback, we consider whether the types of feedback provided match what Kenyan students expect from instructors or systems (timeliness, tone, and format of feedback can have cultural connotations). The IUID framework effectively *infuses* each usability criterion with a cultural lens, ensuring that the evaluation is not one-size-fits-all, but tailored to the cultural profile of the users.

The theoretical framework underscores the interdependence between usability and cultural compatibility as a key determinant of overall user satisfaction. A highly

usable interface that disregards cultural expectations may alienate or confuse users, just as a culturally adapted interface with poor design could frustrate them. Only when an LMS interface excels on both dimensions can we anticipate optimal outcomes in terms of user satisfaction, adoption, and learning effectiveness. This conceptual model therefore predicts that Moodle's efficacy in the Kenyan context hinges on its cultural awareness: the degree to which it aligns its functional excellence with the cultural needs of Kenyan learners. By applying this integrated set of heuristics, researchers and practitioners can systematically evaluate Moodle or analogous platforms, identifying not only conventional usability issues but also culturally-embedded concerns.

The theoretical framework guiding this study integrates technical usability heuristics, e-learning usability heuristics with Heimgärtner's intercultural design methodology, and Hofstede's Cultural Dimensions to give a comprehensive conceptual foundation for developing a culturally sensitive user interface evaluation instrument for Moodle. This holistic approach ensures that the assessment covers the full range of usability factors, from interface design and content organization to learner support and motivation, while simultaneously examining each aspect for cultural appropriateness in the Kenyan context. This unified framework is expected to yield a more nuanced and effective evaluation of Moodle's user interface, ultimately contributing to recommendations that can enhance both the usability and cultural alignment of virtual learning platforms in Kenya.

Conceptual Framework

This study proposes a novel hybrid evaluation framework that merges traditional e-learning usability heuristics with culturally-informed evaluation criteria to assess the user interface (UI) of virtual learning platforms—specifically Moodle—

in the Kenyan higher education context. The conceptual framework is built upon the idea that *interface usability and cultural congruence* are both critical for effective adoption and meaningful engagement with e-learning systems.

Foundation of the Hybrid Evaluation Framework

The framework draws from three main domains:

- Usability Heuristics – The foundation of the framework is built upon established usability heuristics from the field of Human-Computer Interaction. In particular, J Nielsen's ten heuristics are considered the bedrock for assessing the general usability of Moodle's interface [24].
- Usability Heuristics for Virtual Learning Platforms (VLPs): Grounded on frameworks that have expanded Nielsen's ten heuristics specifically for e-learning contexts, this component includes dimensions such as content organization, navigation, interactivity, learner guidance, feedback, motivation, and accessibility. These dimensions ensure the platform supports instructional effectiveness, ease of use, and learner engagement.
- Cultural Evaluation Layer: Guided by Heimgärtner's *Intercultural User Interface Design (IUID) Method Mix*, this layer incorporates selected cultural variables—adapted from Hofstede's framework—that significantly influence user experience in the Kenyan context. These include:
    - Power Distance (PD): The need for hierarchical structuring, instructor-led guidance, and formal communication within the LMS.
    - Uncertainty Avoidance (UA): The preference for structured, predictable navigation, clear help systems, and low ambiguity in instructions.

- Individualism vs. Collectivism (IC): The extent to which users prefer group-based learning features and visible peer interactions.
- Motivation Toward Achievement and Success (MAS): Learners' response to motivational elements like feedback, recognition, and progress tracking.

The hybrid model posits that both layers—**usability** and **cultural appropriateness**—must be evaluated together for a holistic understanding of the system's effectiveness in a specific cultural setting.

Summary of Literature and Research Gap

This literature review examines virtual learning platforms, technology adoption in Kenya, cultural influences on technology use, and usability evaluation methods, culminating in a focused discussion on culturally aware UI evaluation for e-learning platforms. The main points can be summarized as follows:

- Virtual learning platforms such as Moodle are essential in higher education worldwide, providing various advantages, including flexibility, accessibility, and interactivity, which facilitate their widespread adoption.
- Kenya has adopted VLPs to enhance educational access, particularly in response to COVID-19; however, challenges related to infrastructure and user preparedness remain.
- The usability of VLPs is essential for their effective application. An effectively designed user interface significantly improves learner engagement and success, while usability issues can hinder adoption and negatively affect learning outcomes. Conventional usability evaluation techniques, such as heuristics, user testing, and SUS surveys, have been employed to enhance LMS platforms. Additionally, specialized

frameworks have emerged to address the specific needs of e-learning, including the support of learning tasks and motivation within LMS environments.

- Cultural dimensions significantly influence user interactions with e-learning interfaces. Evidence from various contexts indicates that neglecting cultural factors can result in suboptimal or unsuccessful e-learning implementations. Conversely, aligning interfaces with users' cultural expectations generally enhances user satisfaction and engagement.
- Standard usability evaluation methods exhibit limitations in multicultural contexts such as Kenya. Culturally-rooted usability issues are frequently overlooked; these aspects may not be perceived as problematic by generic users but pose challenges for Kenyan users due to differing norms and preferences. This highlights a significant deficiency: the necessity for evaluation tools that integrate cultural criteria with general usability criteria.
- Various frameworks for intercultural UI design, such as the IUID method-mix, and e-learning usability frameworks, including Zaharias's framework and Musau et al.'s Kenyan LMS framework, have been proposed. However, none have fully integrated these two aspects (culture and e-learning usability) in the evaluation of an LMS in sub-Saharan Africa.

The analysis of these works reveals a research gap in the creation of a culturally responsive usability evaluation framework tailored for virtual learning platforms in Kenya. A standardized instrument to rigorously evaluate the cultural suitability of Moodle's interface for Kenyan students is currently lacking. Current usability tools and surveys operate under the assumption of a universal user, whereas

cultural HCI frameworks have not been specifically adapted for the e-learning context in Kenya.

This gap encompasses both theoretical and practical aspects: theoretically, what is the appropriate method for integrating cultural dimensions into usability assessment? Practically, what would an evaluation checklist or questionnaire look like for a VLP used by Kenyan learners? The literature indicates the solution space. Cultural factors of significance include language, social context, and local symbols, while key usability factors for VLPs encompass navigation and feedback. The objective is to integrate these components into an evaluation instrument and verify that it effectively identifies issues overlooked by conventional methods. This approach addresses the gap where existing usability tools do not account for cultural dimensions of user experience, highlighting the necessity for an alternative method that integrates cultural usability factors into the evaluation of VLPs.

This literature review has established the foundation for the study. The study emphasized that although Moodle and other Virtual Learning Platforms (VLPs) are essential and extensively utilized in Kenya, the challenge of ensuring their interfaces are user-friendly and culturally relevant remains unresolved. The examination of existing research and frameworks serves as a foundation for our study, *"Towards a Culturally Aware User Interface Evaluation Instrument for Virtual Learning Platforms."* We aim to synthesize these insights to create a practical evaluation instrument and framework that addresses existing gaps, allowing Kenyan institutions, and potentially others in similar contexts, to enhance the cultural usability, or culturability, of the virtual learning platforms they increasingly depend on.

CHAPTER 3

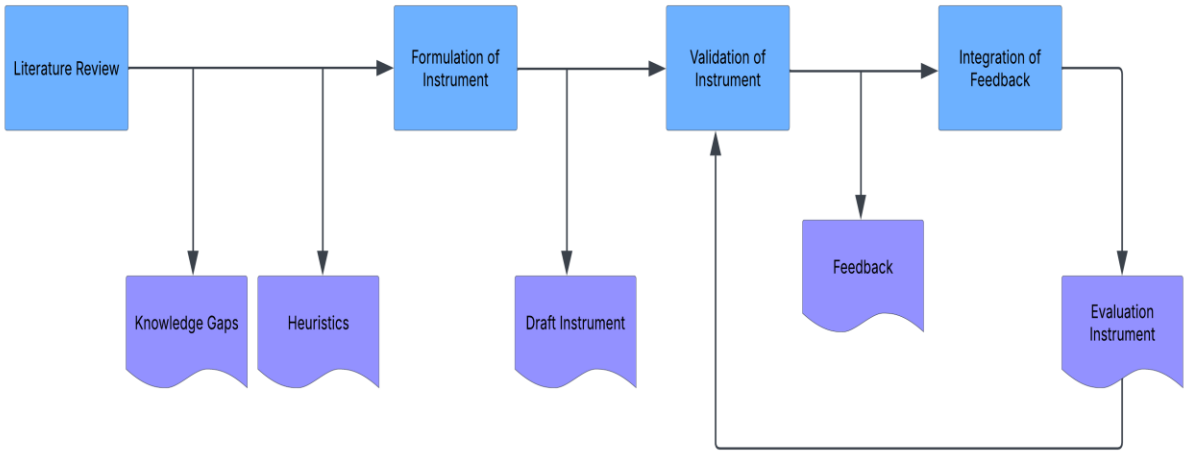
METHODOLOGY

This chapter outlines the methodology employed in this research to develop a culturally aware user interface evaluation instrument for virtual learning platforms, specifically focusing on Moodle in the Kenyan context. The goal is to create an evaluation instrument that effectively integrates cultural factors with traditional usability criteria to identify culturally specific usability issues within VLEs that may impede user experience and learning outcomes [24]. This study addresses the identified gap by developing a culturally sensitive evaluation instrument for Moodle in Kenyan universities and aims to rigorously assess the cultural appropriateness of the platform's interface for Kenyan students, ensuring that it meets both general usability standards and specific cultural expectations [31], [16]. By addressing the identified gaps, the research contributes to the body of knowledge on e-learning by providing a method to ensure that VLPs are user-friendly and culturally relevant, thereby improving user satisfaction and educational outcomes in Kenyan institutions[49].

The study adopted a methodology that is represented in Figure 2 below.

Figure 3

Research Methodology



Literature Review

The literature review aimed to gather insights on cultural factors that influence user interface design and interaction, examine existing usability evaluation frameworks for e-learning platforms, and identify gaps in the integration of cultural factors within e-learning usability evaluations, particularly in the Kenyan context. To accomplish this, a systematic literature review was conducted.

The initial phase involved a comprehensive search of academic databases (such as Google Scholar, ScienceDirect, ACM Digital Library, and IEEE Xplore) using keywords related to usability evaluation of VLPs, cultural dimensions evaluation, user interface design, e-learning, and Moodle use in Kenya. Sources included academic journals, conference proceedings, books, and reports focusing on e-learning, HCI, and cultural studies. The information extracted included established usability heuristics, models for cultural dimensions (such as Hofstede's Cultural Dimensions), and existing frameworks for evaluating e-learning platforms [50]. A total of 64 papers were selected based on relevance, quality, and publication date.

These were analysed, and 3 key thematic areas in usability evaluation were identified, broadly categorized as:

- General usability evaluation frameworks
- Enhanced usability frameworks for VLPs
- Cultural-based evaluation frameworks

These insights informed the identification of key heuristics that need to be considered in the design or evaluation of a VLP.

In addition, the literature review uncovered gaps in existing usability evaluation methodologies. Existing literature provided a foundation of knowledge, theories, and tools for usability evaluation and cultural factors that affect technology use but lacked specific integration for virtual learning environments within the Kenyan context. The general usability evaluation frameworks had been extended to focus on needs specifically for e-learning, however these did not capture the cultural factors that impact user interaction with VLPs [17]. The literature review also informed the key cultural considerations in VLE design and evaluation.

Design of the Culturally Aware Evaluation Instrument

The design of the culturally aware evaluation instrument followed a systematic approach that integrates established usability principles. First, the general usability evaluation frameworks were examined and J Nielsen's 10 usability heuristics were identified from the literature as the most widely used evaluation method. Next, methods that have extended Nielsen's heuristics to include pedagogical heuristics such as those by Zaharias [29], Musau and Waiganjo [24] Nyang'or, Ssemugabi and De Villiers [45], and others were identified. The extended heuristics sets were delineated and then grouped according to the nature of the underlying issues they

address. In this process, 71 usability parameters were identified and grouped into 7 groups. Finally, the findings from the literature on cultural dimensions from Hofstede [51], Heimgatner [11] were synthesized with the general and pedagogical heuristics. The resulting instrument was a hybrid framework that includes usability heuristics, pedagogical heuristics, and cultural considerations tailored for the Kenyan context.

Validation of the Evaluation Instrument

To ensure that the developed instrument is valid and reliable for evaluating Moodle's user interface in the Kenyan context, a two-phase validation process was adopted: expert review and pilot testing. To begin with, the study adopted a qualitative research design employing expert review to evaluate and refine a culturally aware user interface (UI) evaluation instrument for virtual learning platforms (VLPs). The research aimed to validate the content, clarity, and cultural relevance of the proposed evaluation instrument. This approach allows for in-depth feedback from experts, making it suitable for exploring how cultural, pedagogical, and usability heuristics intersect to inform UI design for culturally diverse users.

Participants and Sampling

The study employed expert purposive sampling, selecting five experts with demonstrated experience in:

- Usability evaluation, instructional design, or human-computer interaction (HCI)
- E-learning systems, particularly Moodle VLP, through practice or research.
- Kenyan educational contexts to judge whether the instrument’s heuristics are appropriate for that setting.

These experts provided the specialized insights necessary to evaluate both the technical and cultural appropriateness of the instrument. Their familiarity with both global usability standards and local cultural norms enabled a critical assessment of the tool's applicability in Kenya. In addition, engaging 5 experts is consistent with recommendations in usability research, where a handful of evaluators can identify the majority of design issues or gaps[52]. This sample size is deemed sufficient for a qualitative expert review, given the anticipated overlap of insights from seasoned professionals and the in-depth feedback expected from each expert.

Data Collection Procedures

Each expert received the draft evaluation instrument and a structured feedback questionnaire by email designed to assess:

- Comprehensiveness – Does the instrument capture all key usability and cultural factors relevant to e-learning platforms?
- Clarity – Are the heuristic statements understandable and unambiguous?
- Contextual and Cultural Fit – Are the heuristics aligned with Kenyan cultural norms and learning expectations, particularly in relation to Power Distance, Uncertainty Avoidance, Collectivism, and Achievement Motivation?

The questionnaire included Likert-scale items, binary inclusion suggestions (Yes/No), and open-ended questions to capture detailed feedback and recommendations. Experts were allowed 3 weeks to complete and return the evaluation, with follow-up for clarification if needed.

Integration of Feedback

Expert responses were analyzed through quantitative descriptive analysis. Responses were coded into themes such as clarity issues, heuristic redundancy, cultural misalignment, and suggestions for new heuristics. Particular attention was paid to cultural alignment feedback linked to Hofstede's dimensions—e.g., whether experts believe a heuristic appropriately addresses power distance or uncertainty avoidance in interface design.

Quantitative Likert-scale responses provided a supporting overview of consensus or divergence across heuristics, but the core findings were drawn from open-ended feedback. Based on the analysis:

- Heuristics were revised, merged, or removed for clarity or relevance.
- New heuristics were added to strengthen cultural or pedagogical validity.

In the second phase, the expert reviewers then used the instrument to evaluate a VLP. The goal of the pilot testing was to assess the instrument's practical applicability, identify any ambiguities or difficulties in its use, and gather initial data on the usability of Moodle's interface from a cultural perspective. The research used a case study approach. The case study was based on Moodle which had been identified by the literature to be the most widely used VLP by Kenyan universities [13].

Through this process, the final instrument was refined into a robust evaluation tool sensitive to both usability standards and Kenya's sociocultural learning environment, thereby contributing to the development of more inclusive and effective e-learning platforms.

CHAPTER 4

PROPOSED EVALUATION TOOL

Building upon the comprehensive literature review and the insights derived from expert consultations, this chapter introduces a new heuristic evaluation tool specifically designed to assess the cultural usability of Virtual Learning Platforms in Kenya. The main objective is to adapt existing usability evaluation frameworks to come up with a hybrid framework that incorporates cultural considerations relevant to the Kenyan context, ensuring that digital learning environments are not only usable but also culturally appropriate and effective for local users.

The Development Process

The development of the evaluation tool was an iterative process, which involved several stages:

1. Initial Framework Development: Based on a review of the existing literature on usability heuristics, cultural dimensions, and e-learning evaluation, a preliminary framework was developed.
2. Expert Consultation and Feedback: The initial framework was presented to a panel of experts in usability engineering, cultural studies, and e-learning in Kenya. These consultations provided insights into the relevance and applicability of the proposed heuristics and identified additional heuristics that should be considered.

3. Revision and Refinement: Based on the feedback from the expert panel, the framework was revised and refined.
4. Pilot Testing and Validation: The refined framework was pilot-tested on a sample Moodle platform which is commonly used in Kenyan universities. This process helped to identify any remaining ambiguities or inconsistencies in the heuristics and allowed for final adjustments to be made.

These insights informed the identification of key usability heuristics that need to be considered in the design or heuristic evaluation of a VLP. The components of the evaluation tool consist of the following:

- Technical Usability Heuristics Section
- Pedagogical Heuristics Section
- Cultural Considerations Section

The categorization of the heuristics sets are represented in Table 1 below:

Table 1

Thematic Categorization of Evaluation Methods

Evaluation Category	Usability Heuristics	Supporting Literature
Technical Usability Heuristics [28]	• Visibility of system status • Match between system and the real world • User control and freedom • Consistency and standards • Recognition rather than recall • Flexibility and efficiency of use • Aesthetic and minimalist design • Error prevention • Help users recognize, diagnose, and recover from errors • Help and documentation [28]	Jakob Nielsen (1994) [28]
Pedagogical Usability Heuristics	• Effectiveness • Efficiency • Satisfaction • Learnability • Utility • Interface design • System interaction • Learner-centered instructional design • System's navigation and orientation • Visibility • Functionality • Aesthetics • Feedback and Help • Error prevention • Memorability • Course management • Interactivity • Flexibility • Consistency • Efficiency • Reducing redundancy • Accessibility • Content • Learning and support • Visual design • Navigation • Accessibility • Interactivity • Self-Assessment& learnability • Drive to learn [24] [29][45]	Nyang'or, Ssemugabi, and De Villiers (2013) [45] Zaharias (2009) [29] Musau (2020) [24]

Table 2 continues

Table 2 (Continued).

Cultural Factors	• UI alignment with authority structures (PD) • Reduction of ambiguity (UA) • Design support for collaborative vs. independent work (IC) • Motivational design reflective of local values (MAS) • Symbolic relevance and localized language/communication [11][48]	HOFSTEDE & HEIMGÄRTNER'S IUID METHOD MIX [11], [48]

In the following sections, each of these components is described in detail, outlining the specific heuristics and guidelines included in the evaluation tool.

Usability Heuristics Section

The usability heuristics section of the evaluation tool is based on established usability principles but has been adapted to reflect the specific needs and expectations of Kenyan users [24]. Each heuristic is accompanied by a set of guidelines and examples to aid evaluators in their assessment[53]. The following heuristics are included in this section:

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Error prevention
- Help users recognize, diagnose, and recover from errors
- Help and documentation [28]

Pedagogical Heuristics Section

This section focuses on the instructional design aspects of the VLP, ensuring that the platform supports effective teaching and learning practices. It was observed that various researchers have extended J. Nielsen's original heuristics to fit them for e-learning specific context. The findings are represented in the table below:

Table 2

Summary of Extended Technical Heuristics for e-Learning

Heuristic Set	Author(s)	Title of the Paper	Detailed Heuristic Parameters
Learning with Software Heuristics [44]	Squires and Preece (1999) [44]	Predicting quality in educational software: Evaluating for learning, usability and the synergy between them [44]	1. Match between learner and designer models. 2. Navigational fidelity. 3. Appropriate level of learner control. 4. Prevention of peripheral usability errors. 5. Understandable and meaningful symbolic representation. 6. Support for personally significant approaches to learning. 7. Strategies for the cognitive error recognition. 8. Diagnosis and recovery cycle. 9. Match with curriculum. [44]]
Educational Design Heuristics [24]	Quinn (1996) [24]	A Usability Evaluation Framework for Web Based Learning Management Systems Used in Kenyan Universities [24]	1. Clear goals and objectives. 2. Context meaningful to domain and learner. 3. Content clearly and multiply represented and multiply navigable. 4. Activities scaffolded. 5. Elicit learner understanding. 6. Formative evaluation. 7. Performance should be criteria-referenced. 8. Support for transference and acquiring, 'self-learning' skills. 9. Support for collaborative learning. [24]
Principles for Effective Online Learning [24]	Vrasidas (2004) [24]	A Usability Evaluation Framework for Web Based Learning Management Systems Used in Kenyan Universities [24]	1. Learner-centricity. 2. Engagement and activity. 3. Constructive. 4. Situated and contextual learning. 5. Collaboration. 6. Reflection. 7. Prompt feedback. 8. Record-keeping. [24]
Didactic Effectiveness Heuristics	Mtebe, Kissaka (2015) [24]	A Usability Evaluation Framework for Web Based Learning Management Systems Used in Kenyan Universities [24]	1. Instructional material. 2. Collaborative learning. 3. Learner control. 4. Feedback and assessment. 5. Accessibility. 6. Drive to learn. [24]

Instructional Design Heuristics [24]	Zaharias (2009) [24]	A Usability Evaluation Framework for Web Based Learning Management Systems Used in Kenyan Universities; An efficient approach to improve the usability of e-learning resources: the role of heuristic evaluation [24]	1. Interactivity. 2. Content and Resources. 3. Instructional feedback. 4. Instructional assessment. 5. Learner guidance and support. 6. Media use. 7. Learning strategies design. [24]
E-Learning Heuristics (set compared with Reeves et al.) [29]	Mehlenbacher et al. (2005) [29]	Assessing the Relative Importance of an E-learning system's Usability Design Characteristics Based on Students' Preferences; Heuristic evaluation of e-learning courses: a comparative analysis of two e-learning heuristic sets [29]	Dimensions of all instructional situations & Heuristics: 1. Learner background and knowledge: Accessibility, Customisability and maintainability, Error support and feedback, Navigability and user movement, User control, error tolerance, and flexibility. 2. Learner tasks and activities: Instructional content Completeness, Examples and case studies, Readability and quality of writing, Relationship with real-world tasks. 3. Interaction display: Aesthetic appeal, Consistency and layout, Typographic cues and structuring, Visibility of features and self-description. 4. Social dynamics: Mutual goals and outcomes, Communication protocols. 5. Instructor activities: Authority and authenticity, Intimacy and presence. 6. Learning environment and tools: Help and support documentation, Metaphors and maps, Organization and information relevance, Reliability and functionality.
Instructional Design Heuristics (part of Reeves et al. protocol)	Reeves et al. (2002)[29]	Assessing the Relative Importance of an E-learning system's Usability Design Characteristics Based on Students' Preferences; Heuristic evaluation of e-learning courses: a comparative analysis of two e-learning heuristic sets [29]	1. Interactivity. 2. Message Design. 3. Learning Design. 4. Media Integration. 5. Instructional Assessment. 6. Resources. 7. Feedback. [29]

Learning Heuristics (customized set used in study) [26]	(Synthesised from educational design heuristics) [26]	Heuristic Evaluation of an Institutional E-learning System: A Nigerian Case [26]	1. Quality of learning content. 2. Assessment and feedback. 3. Drive to Learn. 4. Interactive learning. 5. Learning orientation. 6. Support for group interaction and collaborative learning. 7. Personalised learning. 8. Support for variant Learning mechanisms. 9. Support for problem-based learning, knowledge exploration and self-learning. [26]
Tool Heuristics (customized set used in study) [26]	(Focused on essential attributes for effective online learning) [26]	Heuristic Evaluation of an Institutional E-learning System: A Nigerian Case [26]	1. Accessibility. 2. Support for Instructor Activity. 3. Privacy and Security. [26]
Web 2.0 Heuristics (customized set used in study) [26]	(Combines Nielsen's heuristics with Web 2.0 considerations) [26]	Heuristic Evaluation of an Institutional E-learning System: A Nigerian Case [26]	(Typically Nielsen's 10 heuristics plus the following three additional heuristics): 1. Interactive interface (support for active interaction and Web 2.0 features). 2. Data ownership and control (control over user-generated content). 3. Multimedia Technologies (voice and video support). [26]
The E-Learning Usability Scale (EUS)	Sandoval (2016)	An Indonesian Adaptation of the E-Learning Usability Scale	Categories & Instruments: Content: C01-C09 (Clarity of objectives, logical organization, chunking, accuracy, currency, relevance, consistency, understandability, appropriate language). Interactivity: I01-I06 (Opportunities for interaction, variety of resources, meaningful interactions, media aiding understanding, practice opportunities, discussion forums). Instructor presence: IP01-IP06 (Easy to find contact info, prompt communication, clear instructions, encouragement, constructive feedback, creates supportive environment). Course design: CD01-CD06 (Clear navigation, easy access, high quality media, consistent layout, easy to find important info, easy to follow structure).

The detailed Heuristics above were categorized into groups based on similar underlying issues they are addressing. These groupings are based on the conceptual themes that link the heuristics as below:

- Navigation and Structure- The platform's navigation structure must be intuitive, enabling users to move through courses, modules, and activities without confusion. Clear menus, links, and search functions are critical so that learners can locate resources or return to previous pages easily. Good navigation design reduces frustration and ensures efficiency in accomplishing learning tasks
- User-Friendliness and Intuitiveness: This group focuses on how easy the system is to learn and use and how intuitive the interface is. It includes parameters related to the ease of learning, the predictability of links, the ability to use the interface without a long introduction, the clarity of wording, overall consistency, and ease of use and an Intuitive visual layout
- Visual Design and Aesthetics: The user interface should employ a clear and appealing visual design. This includes readable typography, appropriate color contrast, and uncluttered layouts that focus attention on learning content. An attractive, well-designed interface can positively influence learners' engagement and concentration, while poor visual design may distract or hinder usability
- Information Quality and Content Support: This addresses the quality of the learning materials and the support provided to learners. It includes parameters related to Information correctness, relevancy, coverage and timelines, the use of multimedia and authentic learning materials. It also

encompasses course information content support, such as announcements and reminders.

- Assessment and Feedback: This focuses on the assessment tools and the feedback provided to students. It includes parameters related to: Assessment tools effectiveness and ease of use, Achievements of learning objectives and understanding the learning materials, Assessment policies, collection of timely instructional and informative feedback, as well as access to assessment policies.
- Interaction and Collaboration: Interactive elements (quizzes, discussions, simulations) are integral to e-learning usability. The system should allow learners to actively engage with content and receive timely, informative feedback on their actions and performance. For example, after a quiz or an assignment submission, the platform should deliver feedback or results promptly. Robust interaction and feedback mechanisms keep learners motivated and aware of their progress
- Accessibility and Inclusivity: The user interface should be designed to accommodate a wide range of user needs and contexts. The LMS platform must be accessible to individuals with disabilities and function effectively under varied bandwidth or device constraints. Addressing accessibility not only expands the potential user base but also aligns with the principles of universal design, thereby enhancing overall usability and ease of use for all learners.
- Drive to learn: A key usability factor for learning platforms is their capacity to maintain learner motivation. The interface and feature set should be designed to foster engagement, curiosity, and persistence in

learning activities. This may entail incorporating gamified components, social learning tools, or simply a user-friendly experience that minimizes frustration. Recognizing motivation as a usability criterion acknowledges that the interface can directly influence a learner's enthusiasm and emotional investment in the learning process.

These groupings provide a structure for understanding the key areas of e-learning system usability based on the detailed heuristics. However, it was noted that some usability heuristics are similar to what was detailed in the Technical Usability Heuristics and were merged.

Cultural Considerations Section

Cultural considerations are integral to the design of user interfaces, especially in diverse cultural contexts such as Kenya. This section of the evaluation tool aims to integrate cultural sensitivity into the usability assessment process, ensuring that the VLE is aligned with the cultural values and norms of Kenyan users. These cultural dimensions were drawn from Hofstede's Cultural Dimensions's top-scoring cultural indices for Kenya as per research done by the Culture Factor group as well as Heimgatner's IUID method-mix tool.

- Power Distance (PD): To assess whether UI structures and instructional cues accommodate hierarchical expectations typical of Kenyan education (e.g., presence of instructor authority indicators, structured navigation, and informal peer-to-peer communication).
- Uncertainty Avoidance (UA): To evaluate how the platform mitigates ambiguity for users (e.g., clarity of workflows, help systems, consistent navigation).

- Individualism vs. Collectivism (IC): To examine the degree to which the LMS supports group-based versus independent learning tasks, and whether users are socially engaged through collaborative features. The platform should be assessed on whether it prominently features and optimizes user-friendliness for forums, chat, and group functionalities.
- Motivation Toward Achievement and Success (MAS): To determine whether the interface provides motivational cues, gamification, or performance feedback in ways that resonate with goal-oriented learners.
- Symbolic relevance and localized language/communication: While English is an official language in Kenya, the platform's language use should be culturally sensitive and straightforward. All text and instructions should be readily comprehensible to the target student population, eschewing idiomatic expressions or technical jargon that might confuse local users. Offering options for Kiswahili language support or translation of key terminology could also enhance usability for those more comfortable with the local language. In addition, the cultural symbolism and visual representation used in the user interface should be mindful of local Kenyan context. Imagery, color schemes, and iconography should be selected to resonate with the target student population, drawing on familiar local references and avoiding symbols that may carry unintended negative meanings from a Kenyan cultural perspective.

Each cultural dimension is operationalized into heuristics/questions reflecting its relevance to Moodle's UI design in a Kenyan context. For instance, a heuristic might ask, "Does the platform's organization reflect clear instructor control and

sequencing (Power Distance)?" or "Are collaboration tools visible and culturally appropriate (Collectivism)?"

The draft evaluation tool was structured to combine all the usability and cultural considerations, where each heuristic was rated on a Likert scale (e.g., from "Strongly Disagree" to "Strongly Agree"). This is represented in the table below:

Table 3

Draft Evaluation Tool

Criteria 1: Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree N/A						
CATEGORY 1: Technical Usability Heuristics						
NAVIGATION & WHETHER THE STATUS OF THE SYSTEM CAN BE SEEN						
The system design clearly communicates its state.	1	2	3	4	5	N/A
Feedback is presented quickly after user actions.						
The system design presents clear menus, links, search functions and the ability to navigate easily.						
The course structure and layout is presented in a hierarchical structure.						
Learners can easily pick and choose which parts of the course to study and how fast they want to learn.						
The courses let the student leave whenever they want and quickly go back to the most reasonable place in the course.						
MATCH BETWEEN SYSTEM AND THE REAL WORLD						
The language and terminology used is familiar to Kenyan users.						
There are options to translate the site to Kiswahili.						
USER CONTROL AND FREEDOM						
The design's controls follow real-world conventions.						
The system has undo and redo features, emergency exit links, and gives the user control to reverse changes.						
CONSISTENCY AND STANDARDS						
The system interface design consistently uses the same visual treatments like graphics, icons and terminology of the functions.						
PREVENTING AND FIXING OF ERRORS						
The system design prevents mistakes by using helpful limitations like error messages and provides a way to recover from mistakes						

The system design warns users before they perform risky actions like making deletions or submitting content						
The system design uses standard warning messagegraphics, like bold, red text.						
RECOGNITIONS RATHER THAN REMEMBERANCE						
Users don't have to remember important information because the system design makes it easy to see it.						
The system design makes it easy to see how tools (like menus, icons, and images) relate to the actions they represent, so you don't have to remember or look them up.						
USE THAT IS FLEXIBLE AND EFFICIENT						
The system design includes buttons and other shortcut keys to make it easier for both novice and experienced users.						
The system offers the option mobile use.						
AESTHETIC AND SIMPLE DESIGN						
The visual design is clear, and uses uncluttered layouts that focus attention on learning content.						
All distracting, and unnecessary elements been removed from the interface design.						
The system design includes readable typography, and appropriate color selection for Kenyan users.						
HELP AND DOCUMENTATION						
As a way to help users, the system design includes things like welcome pages or walkthroughs, chats, popovers, tooltips, and videos.						
Help is given right when the person needs it, based on their current situation.						
CATEGORY 2: Pedadogical Usability Heuristics						
INFORMATION QUALITY AND CONTENT SUPPORT						
The material in the course is accurate, current, and relevant						
The courses provide learners opportunity for reflection.						
Each unit/module in the courses comprises an overview and a summary section						
It is clear what the learning goals are for each lesson.						
Content is structured in a logical sequence and divided into concise chunks for flexible learning.						
The information presented to the learners is easy to understand with clear explanations and examples						
The course content includes use of multi-media						
There is use of course information content support, such as announcements and reminders						
ASSESSMENT AND FEEDBACK						
The courses offer self-assessment options (post-tests and other assessments) that gauge the learners' accomplishments in alignment with the learning objectives.						
The assessment tools provided are intuitive and easy to use						
The system design offers the learners access to assessment policies						
INTERACTION AND COLLABORATION						

The system design includes collaboration features such as chat, discussion forums, student-to-student and Instructor-to-student communication						
The system design includes engaging interaction features to break monotony e.g embedded quizzes, tests, simulations, games						
ACCESSIBILITY AND INCLUSIVITY						
The system design accommodates individuals with disabilities						
The system design can function effectively with varied devices						
THE DRIVE TO LEARN						
The system design has features that foster engagement, curiosity, and persistence in learning activities e.g gaming, simulations						
The system design offers learners diverse and frequent types of activities that enhance educational performance.						
The course makes it clear what learning needs to be done and how to do define learning success						
CATEGORY 3: Cultural Factors POWER DISTANCE						
The system design provides clear structure, guidance, and authority signals e.g a dashboard prominently displaying instructions from the instructor or official announcements						
The system design provides hierarchical navigation structure mirroring a formal syllabus.						
The system design includes indirect/anonymous feedback gathering mechanisms						
The system design makes provision for informal peer-to-peer communication and help						
MOTIVATION TOWARDS ACHIEVEMENT AND SUCCESS						
The system design uses progress tracking tools, leaderboards, and other mechanisms that foster a sense of individual advancement and mastery.						
The system design incorporates feedback loops and visual cues that allow learners to gauge their standing relative to peers or course objectives.						
UNCERTAINTY AVOIDANCE						
The system interface design is straightforward, with explicit guidance on the next steps to take.						
The system design does not contain ambiguous navigation or hidden functionalities						
The system interface design is consistent that helps build a sense of predictability and control						
COLLABORATIVE VS. INDEPENDENT WORK (IC)						
The system design includes social support, and group-based learning features						

The experts then evaluated the instrument using a structured feedback questionnaire which would assess the following:

- Comprehensiveness – Does the instrument capture all key usability and cultural factors relevant to e-learning platforms?
- Clarity – Are the heuristic statements understandable and unambiguous?
- Contextual and Cultural Fit – Are the heuristics aligned with Kenyan cultural norms and learning expectations, particularly in relation to Power Distance, Uncertainty Avoidance, Collectivism, and Achievement Motivation?

The questionnaire included Likert-scale items, binary inclusion suggestions (Yes/No), and open-ended questions to capture detailed feedback and recommendations. The questionnaire is as below:

Expert Review Questionnaire: Evaluation of Hybrid VLP Evaluation Tool

Thank you for taking the time to evaluate the attached Hybrid Usability Evaluation Tool for Virtual Learning Platforms (VLPs) in the Kenyan Context. Please provide your expert assessment based on comprehensiveness, clarity, and cultural/contextual fit specifically for Kenyan higher education.

Rating Scale

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

Section 1: Comprehensiveness

The instrument adequately covers all necessary Technical Usability heuristics.

Rating: _____ (1-5)

The instrument adequately covers all necessary Pedagogical Usability heuristics.

Rating: _____ (1-5)

The instrument adequately covers all necessary Cultural heuristics relevant to Kenya.

Rating: _____ (1-5)

There are no critical usability or cultural factors missing.

Rating: _____ (1-5)

Would you suggest adding any other heuristics?

Yes ☐ No ☐

If yes, please specify:

_____

Detailed recommendations to improve comprehensiveness:

_____

Section 2: Clarity

The heuristic statements are clearly written and easily understandable.

Rating: _____ (1-5)

There is no ambiguity in the heuristic statements.

Rating: _____ (1-5)

Instructions for applying the heuristics are clear.

Rating: _____ (1-5)

Are there heuristics you would recommend rewording for clarity?

Yes ☐ No ☐

If yes, please specify:

_____

Detailed suggestions to improve clarity:

_____

Section 3: Contextual and Cultural Fit

Heuristics related to Power Distance effectively reflect Kenyan educational norms.

Rating: _____ (1-5)

Heuristics addressing Uncertainty Avoidance effectively capture Kenyan learners' expectations for clarity and predictability.

Rating: _____ (1-5)

Heuristics related to Individualism vs. Collectivism are aligned with Kenyan collaborative learning practices.

Rating: _____ (1-5)

Heuristics related to Motivation towards Achievement and Success reflect Kenyan cultural attitudes toward education.

Rating: _____ (1-5)

Do you think any cultural dimension is inadequately represented?

Yes ☐ No ☐

If yes, please specify:

_____

Recommendations to enhance alignment with Kenyan cultural norms:

_____

Additional Feedback

Please provide any other comments, insights, or suggestions for the usability evaluation tool not addressed above:

_____

This chapter has laid the groundwork for a culturally aware user interface evaluation instrument tailored for virtual learning platforms. It has explored the methodology employed to validate and refine this instrument, ensuring its relevance and applicability. The next chapter will present the research findings, discussions and recommendations

CHAPTER 5

RESEARCH FINDINGS, DISCUSSIONS AND RECOMMENDATIONS

The study aimed to evaluate the usability and cultural relevance of Moodle in Kenyan universities using a newly developed culturally aware user interface evaluation instrument. This chapter presents findings from expert reviews, user testing, and surveys on the proposed culturally-aware usability evaluation tool. It further provides a discussion of the findings, conclusions drawn from the study, and recommendations for future research and practice.

Currently, the methods used to evaluate VLP usability often emphasize the technical and pedagogical usability aspects but frequently disregard cultural factors. Various studies have shown that user interfaces that are not culturally attuned can lead to dissatisfaction, decreased engagement, and low adoption of VLPs, especially in educational contexts where effective communication and understanding are paramount [38] [54] [55], [56]. Whenever cultural factors were considered in the evaluations, pedagogical factors were left out. The developed instrument, by integrating technical usability heuristics, pedagogical usability heuristics, and cultural dimensions, addresses a critical gap in the existing evaluation methodologies by providing a comprehensive approach that ensures VLPs are user-friendly, well-adapted to online learning, and culturally appropriate.

The proposed Instrument consolidates the key components of a comprehensive VLE evaluation framework, bridging the gap between technical functionality,

pedagogical effectiveness, and cultural relevance. A thorough literature review was done to identify existing instruments, their constructs, and the methods used for validation. It was found out that Nielsen's Heuristics were the most common heuristics used when evaluating VLPs and were therefore adopted in the proposed instrument and customized to suit the VLP. In addition to Nielsen's Heuristics, other Pedagogical and cultural heuristics were added to further refine the tool for a more robust evaluation.

To achieve the desired objectives, the study used a quantitative research design, employing expert review to get feedback on how the instrument could be further refined. The experts were drawn from diverse backgrounds, including: experts in e-learning/ educational technology, experts in interface design, experts in e-learning course design, experts in usability evaluation, and experts in Kenyan culture. Their expertise was essential in ensuring that the instrument covers all essential aspects of usability, pedagogy, and cultural relevance.

The instrument was then subjected to usability testing to determine its ease of use and effectiveness in identifying areas of concern in the VLP. After that, quantitative data on the perceived usability and cultural relevance of the VLP being evaluated was gathered from the evaluation tool.

Five expert evaluators reviewed the Virtual Learning Platform (VLP) Usability Evaluation Tool, which is structured into three main categories: Technical Usability Heuristics, Pedagogical Usability Heuristics, and Cultural Factors. Each item in the tool was rated by the experts on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree. The goal of this analysis is to assess how well the evaluation instrument covers each category and to identify any notable trends in the expert feedback. Descriptive statistics (mean, median, mode, and standard deviation)

for each item were computed across the five experts' responses, and the results are grouped by the three categories. Key findings are presented in tables (one per category), accompanied by narrative summaries and visualizations to illustrate the distribution and variation of the ratings.

Technical Usability Heuristics Findings

Coverage of Technical Heuristics: The experts' ratings indicate a generally positive assessment of how comprehensively the tool covers technical usability aspects. *Table 4* shows that the statement *"The instrument adequately covers all necessary Technical Usability heuristics"* received a mean rating of 4.0 out of 5, with a median of 4.0. The ratings were somewhat bimodal (modes = 4 and 5), as three experts agreed or strongly agreed (rating 4 or 5) while one expert disagreed strongly (rating 2). This outlier low rating is reflected in a relatively high standard deviation of 1.22, indicating some divergence in opinion among the experts.

The median rating of 4 ("Agree") suggests that most experts felt the instrument largely covers the critical technical usability heuristics. However, the presence of one strongly dissenting rating (2) implies that at least one expert perceived a gap or deficiency in the technical coverage. In fact, when asked if they would suggest adding any heuristics to improve the tool, 2 out of 5 experts indicated "Yes" (providing suggestions), which further underscores the concern that some technical or other usability factors might be missing. Overall, the trend for the technical category is one of broad agreement tempered by a single critical perspective, pointing to mostly complete coverage but a need to address the specific concerns raised by the outlier.

Table 4

Descriptive Statistics for Technical Usability Heuristics Items

Item	Mean	Median	Mode	Std. Dev.
Adequate coverage of Technical Usability heuristics	4.0	4	4, 5[1]	1.22
No critical usability/cultural factors missing (overall)	3.4	3	3	1.14

[1] *Bimodal distribution; two modes identified.*

Table 4 also includes the experts' feedback on the general completeness of the instrument (*"There are no critical usability or cultural factors missing"*). Interestingly, this item had a lower **mean of 3.4** (median 3) with ratings spanning from 2 (Disagree) to 5 (Strongly Agree). The mode of 3 suggests that several experts were neutral or only somewhat confident that **no important factors were missing**. This broader question of completeness garnered a **standard deviation of 1.14**, indicating noticeable variability in responses. The fact that one expert gave a low rating of 2 (indicating they believed some factors **were** missing) aligns with the earlier observation of an outlier in the technical coverage rating. In summary, **technical usability heuristics** in the tool are viewed as well-covered by most experts, but there is at least one dissenting opinion pointing out potential omissions. The feedback implies that while the technical aspects of the Moodle-based VLP interface are mostly addressed, the instrument might require minor additions or revisions to satisfy all expert perspectives.

Pedagogical Usability Heuristics Findings

Coverage of Pedagogical Heuristics: The expert ratings for the pedagogical usability aspects of the tool closely mirror those of the technical category. *Table 5* shows that the statement *"The instrument adequately covers all necessary*

Pedagogical Usability heuristics" also achieved a **mean of 4.0** and a **median of 4.0**, identical to the technical coverage item. The distribution of responses was again **bimodal (modes = 4 and 5)**, with a majority of experts agreeing or strongly agreeing, counterbalanced by one expert who strongly disagreed (rating this item as 2). The **standard deviation was 1.22**, indicating a similar level of variance as seen in the technical category.

The general consensus is that **pedagogical heuristics** — which relate to the learning design, instructional strategies, and educational appropriateness of the Moodle platform's interface — are well represented in the evaluation tool. Three experts gave ratings of 4 or 5, implying confidence that important pedagogical considerations (such as clarity of learning objectives, feedback mechanisms, and learner engagement features) are covered. However, the one low rating (2) again signals a **concern from a single expert** about the completeness of this category. This pattern suggests that the **pedagogical section of the instrument is strong overall**, but it may require addressing specific criticisms (perhaps by incorporating additional pedagogical criteria or clarifying existing ones) to fully satisfy all reviewers. Notably, the same two experts who suggested adding heuristics in general might also be considering pedagogical additions, as no expert singled out the pedagogical area as lacking during qualitative feedback, yet the quantitative dissent indicates a slight perceived shortfall by one reviewer.

Table 5

Descriptive Statistics for Pedagogical Usability Heuristics Item

Item	Mean	Median	Mode	Std. Dev.
Adequate coverage of Pedagogical Usability heuristics	4.0	4	4, 5[1]	1.22

[1] *Bimodal distribution; two modes identified.*

Overall, the usability heuristics (technical and pedagogical) sections of the tool received high marks for coverage from most experts. Both categories have a strong central tendency at "Agree" and a similar response pattern, as illustrated by the descriptive statistics and echoed in expert comments praising the tool's structure and coverage. The consistency between technical and pedagogical results indicates that the instrument was uniformly developed across these two domains of usability. The primary implication is that only *minor improvements* may be needed for completeness — for instance, addressing the concerns of the outlier expert by double-checking if any specific pedagogical principle might be insufficiently represented. Otherwise, experts generally validate that the instrument's usability criteria for Moodle in the Kenyan educational context are appropriate and comprehensive in these two categories.

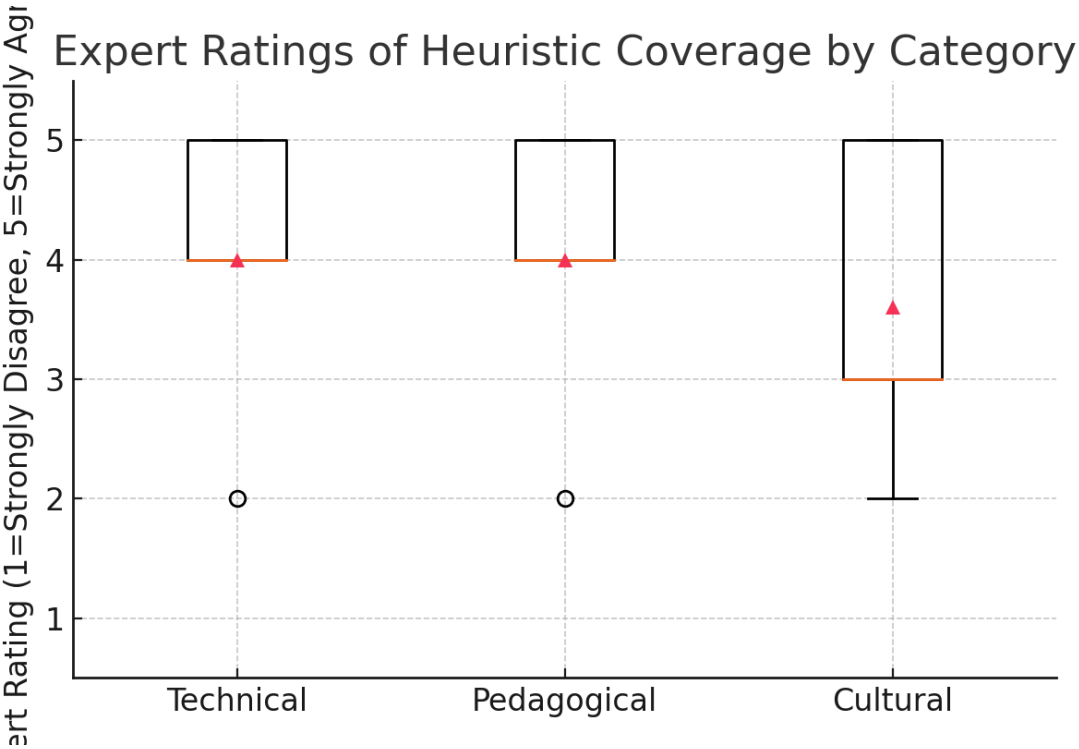
Cultural Factors Findings

As the third category, Cultural Factors yielded more varied feedback from the experts. *Figure 4* illustrates the distribution of ratings for the adequacy of heuristic coverage across the three categories. Notably, the Cultural category's median rating was lower (3, i.e. "Neutral", as indicated by the orange median line at 3 in the rightmost box) compared to the Technical and Pedagogical categories (which had medians of 4, or "Agree"). The boxplot for the cultural coverage item spans a wider

range downwards, reflecting greater variability in responses. In contrast, the technical and pedagogical boxes are clustered toward the top of the scale, showing more agreement among experts in those areas. We also observe an outlier point at 2 for the Technical and Pedagogical categories (the open circles in Figure 4), representing the one expert who gave a low rating for those; a similar low rating of 2 was given for Cultural coverage by that expert, but it falls within the whiskers due to the broader interquartile range for Cultural ratings**.** In summary, experts had more mixed views on the cultural heuristics coverage, with generally strong agreement on technical and pedagogical coverage but a noticeable drop in consensus for the cultural category.

Figure 4

Distribution of Expert Ratings for Adequacy of Heuristic Coverage in Each Category



Distribution of expert ratings for adequacy of heuristic coverage in each category (Technical, Pedagogical, Cultural). The orange line in each box represents the median rating, and red triangles denote the mean.

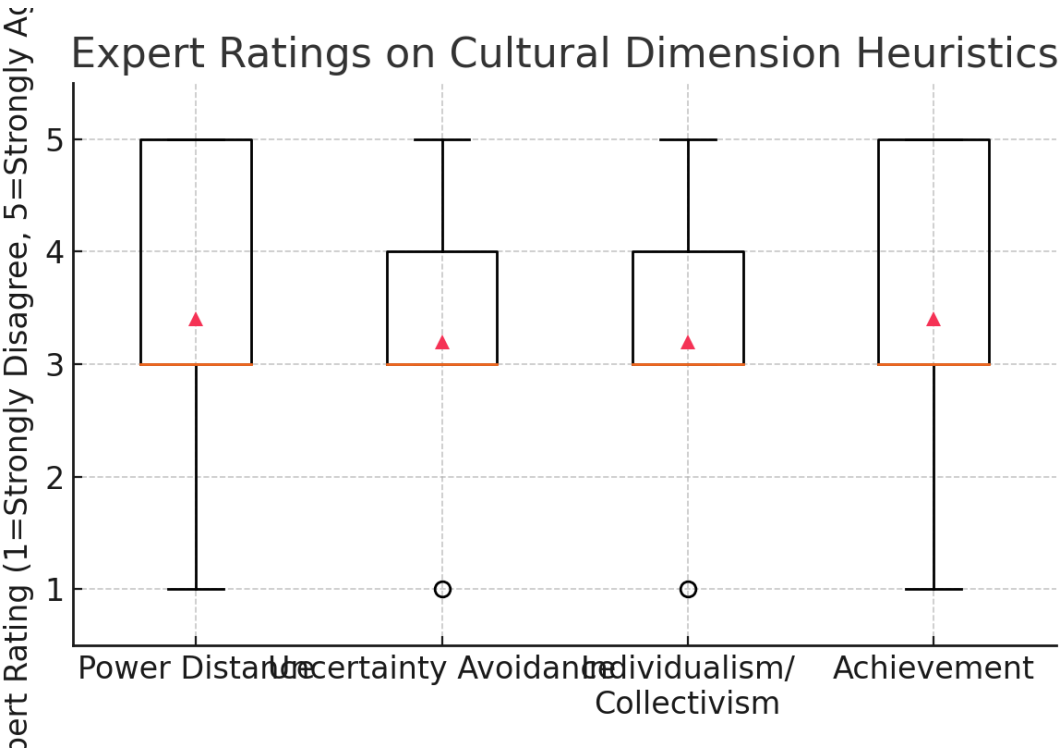
Overall Coverage of Cultural Heuristics: The specific item *"The instrument adequately covers all necessary Cultural heuristics relevant to Kenya"* received a mean rating of 3.6 and a median of 3.0 *(Table 6).* The ratings ranged from 2 to 5, yielding dual modes at 3 and 5 (two experts rated it 3, and two rated it 5). This bimodal/neutral skewed distribution indicates a split in opinion: some experts strongly believed the cultural factors were well covered, while others were uncertain or mildly positive at best.

The standard deviation (1.34) for this item was higher than that for the technical and pedagogical coverage items, reinforcing that there was less consensus among the experts regarding the completeness of the cultural heuristics. In practical terms, while two experts were very confident that the instrument addresses relevant cultural factors for Kenyan Moodle users, two others were ambivalent, and one disagreed outright. This divergence suggests that the cultural aspect of the evaluation tool may require further refinement or expansion to ensure all relevant cultural dimensions are included and clearly addressed.

Specific Cultural Dimension Heuristics: In addition to the overall cultural coverage item, the tool included heuristics related to particular cultural dimensions (drawn from cultural usability and Hofstede's cultural dimensions, adapted for the Kenyan context). These were assessed by the experts as follows: Power Distance, Uncertainty Avoidance, Individualism vs. Collectivism, and Motivation toward Achievement/Success. *Table 6* summarizes the descriptive statistics for each of these cultural dimension items, and *Figure 5* visualizes the distribution of the five experts' ratings on each item.

Figure 5

Distribution of Expert Ratings for Heuristics Addressing Specific Cultural Dimensions



Distribution of expert ratings for heuristics addressing specific cultural dimensions (Power Distance, Uncertainty Avoidance, Individualism/Collectivism, and Achievement). Each box shows the median (orange line) and interquartile range of ratings; red triangles indicate means, and open circles denote outlier points.

As shown in *Figure 5*, each cultural dimension exhibited a wide spread of ratings. The median rating was 3 (Neutral) for all four cultural dimension heuristics, indicated by the orange median lines at the "3" level across all boxes. In every case, there was at least one expert who rated the item as 1 (Strongly Disagree) and at least one who rated it as 5 (Strongly Agree), evidenced by the isolated points at 1 and the upper whiskers reaching 5 (or an outlier at 5 when not all 5s fell within the box). This pattern highlights a notable divide in expert opinions for each cultural criterion. The mean ratings for these items ranged only from 3.2 to 3.4 (*Table 6*), underscoring that

on average the experts were between “Neutral” and “Agree” about the effectiveness of these cultural heuristics. Specifically, heuristics related to *Power Distance* and *Achievement* had a slightly higher mean (3.4 each) compared to *Uncertainty Avoidance* and *Individualism/Collectivism* (3.2 each). However, these differences are minor, and all are well below the maximum of 5, indicating room for improvement. The variability was high for all four items (standard deviations approximately 1.5–1.7), the highest variances among any of the instrument’s items. This high variance confirms that expert feedback on cultural dimensions was far from uniform – some experts felt the cultural factors are effectively captured by the tool, while others were far less convinced.

Table 6

Descriptive Statistics for Cultural Factors Heuristics

Item (Cultural Factors)	Mean	Median	Mode	Std. Dev.
Adequate coverage of Cultural heuristics (overall)	3.6	3	3, 5[1]	1.34
Power Distance heuristic reflects Kenyan norms	3.4	3	3, 5[1]	1.67
Uncertainty Avoidance heuristic captures expectations	3.2	3	3	1.48
Individualism/Collectivism heuristic aligns with practice	3.2	3	3	1.48
Achievement heuristic reflects educational attitudes	3.4	3	3, 5[1]	1.67

[1] *Bimodal distribution; two modes identified.*

The trends in *Table 7* indicate that *none* of the cultural dimension-specific heuristics achieved a unanimous agreement among the experts. For instance, the Power Distance and Achievement-related statements each had a bimodal distribution of scores (modes at 3 and 5), meaning some experts strongly agreed that those aspects

of Kenyan culture were well reflected, while others were neutral or uncertain. The Uncertainty Avoidance and Individualism/Collectivism heuristics had a single mode at 3, with fewer experts giving the highest rating of 5 — suggesting slightly more conservative confidence in those items. The consistency of the median being neutral (3) across all these items is a signal that, *collectively*, the expert panel was ambivalent about the cultural section's effectiveness. This ambivalence may stem from differences in each expert's perspective or expertise regarding Kenyan cultural pedagogy and student expectations.

Qualitative Insights on Cultural Relevance

The experts' open-ended comments provide additional context to these ratings. When asked if any cultural dimension is inadequately represented in the tool, two experts explicitly responded "Yes" – indicating they felt at least one important cultural aspect was not sufficiently covered – while another expert was unsure. Only one expert responded "No" (meaning they felt all relevant cultural dimensions were addressed). One expert noted recent societal changes ("since COVID-19") that may have shifted cultural dynamics, suggesting that the tool should be updated to reflect evolving cultural norms. In the recommendations, experts suggested ensuring *all aspects of Kenyan cultural norms in education are considered*. For example, an expert recommended adding or clarifying heuristics related to how content aligns with local contexts and languages, and another emphasized making sure terms and concepts translate well for Kenyan users. These qualitative insights reinforce the quantitative findings by highlighting that the cultural heuristics section may require enhancement.

It's worth noting that despite lower agreement, the mean ratings for cultural items were still above neutral (around 3.2–3.4), implying that on average experts did

lean slightly toward affirming these heuristics. Thus, the cultural section is on the right track but requires refinement rather than a complete overhaul.

Summary of Findings Across Categories

In summary, the expert review of the VLP Usability Evaluation Tool shows a strong performance in covering Technical and Pedagogical usability heuristics, with high agreement among experts that the instrument addresses the key issues in those domains. The Cultural Factors category, while recognized as important (as evidenced by its inclusion and detailed consideration in the tool), emerged as the area needing improvement to achieve a truly culturally aware evaluation instrument. The results indicate that ensuring cultural relevance and completeness is challenging, and what constitutes adequate coverage of cultural usability needs further clarification and consensus. These findings informed the iterative refinement of the evaluation tool: new heuristics were added to strengthen cultural and pedagogical validity. By addressing the insights from this expert evaluation, the instrument was better equipped to effectively evaluate Moodle's usability in Kenyan higher education contexts, aligning with the ultimate goal of a culturally aware UI evaluation framework.

Revised Evaluation Tool

Based on the research findings, the insights from the experts was incorporated into the draft evaluation tool to come up with a revised tool. The new tool is represented in *Table 7* below:

Table 7

Revised Evaluation Tool

Criteria 1: Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree N/A						
CATEGORY 1: Technical Usability Heuristics						
NAVIGATION & WHETHER THE STATUS OF THE SYSTEM CAN BE SEEN						
The system design clearly communicates its state.	1	2	3	4	5	N/A
Feedback is presented quickly after user actions.						
The system design presents clear menus, links, search functions and the ability to navigate easily.						
The course structure and layout is presented in a hierarchical structure.						
Learners can easily pick and choose which parts of the course to study and how fast they want to learn.						
The courses let the student leave whenever they want and quickly go back to the most reasonable place in the course.						
MATCH BETWEEN SYSTEM AND THE REAL WORLD						
The language and terminology used is familiar to Kenyan users.						
There are options to translate the site to Kiswahili.						
USER CONTROL AND FREEDOM						
The design’s controls follow real-world conventions.						
The system has undo and redo features, emergency exit links, and gives the user control to reverse changes.						
CONSISTENCY AND STANDARDS						
The system interface design consistently uses the same visual treatments like graphics, icons and terminology of the functions.						
PREVENTING AND FIXING OF ERRORS						
The system design prevents mistakes by using helpful limitations like error messages and provides a way to recover from mistakes						
The system design warns users before they perform risky actions like making deletions or submitting content						
The system design uses standard warning messagegraphics, like bold, red text.						
RECOGNITIONS RATHER THAN REMEMBERANCE						
Users don't have to remember important information because the system design makes it easy to see it.						
The system design makes it easy to see how tools (like menus, icons, and images) relate to the actions they represent, so you don't have to remember or look them up.						
USE THAT IS FLEXIBLE AND EFFICIENT						
The system design includes buttons and other shortcut keys to make it easier for both novice and experienced users.						

The system offers the option mobile use.						
AESTHETIC AND SIMPLE DESIGN						
The visual design is clear, and uses uncluttered layouts that focus attention on learning content.						
All distracting, and unnecessary elements been removed from the interface design.						
The system design includes readable typography, and appropriate color selection for Kenyan users.						
HELP AND DOCUMENTATION						
As a way to help users, the system design includes things like welcome pages or walkthroughs, chats, popovers, tooltips, and videos.						
Help is given right when the person needs it, based on their current situation.						
CATEGORY 2: Pedadogical Usability Heuristics						
INFORMATION QUALITY AND CONTENT SUPPORT						
The material in the course is accurate, current, and relevant						
The courses provide learners opportunity for reflection.						
Each unit/module in the courses comprises an overview and a summary section						
It is clear what the learning goals are for each lesson.						
Content is structured in a logical sequence and divided into concise chunks for flexible learning.						
The information presented to the learners is easy to understand with clear explanations and examples						
The course content includes use of multi-media						
There is use of course information content support, such as announcements and reminders						
ASSESSMENT AND FEEDBACK						
The courses offer self-assessment options (post-tests and other assessments) that gauge the learners' accomplishments in alignment with the learning objectives.						
The assessment tools provided are intuitive and easy to use						
The system design offers the learners access to assessment policies						
INTERACTION AND COLLABORATION						
The system design includes collaboration features such as chat, discussion forums, student-to-student and Instructor-to-student communication						
The system design includes engaging interaction features to break monotony e.g embedded quizzes, tests, simulations, games						
ACCESSIBILITY AND INCLUSIVITY						
The system design accommodates individuals with disabilities						
The system design can function effectively with varied devices						
THE DRIVE TO LEARN						

The system design has features that foster engagement, curiosity, and persistence in learning activities e.g gaming, simulations						
The system design offers learners diverse and frequent types of activities that enhance educational performance.						
The course makes it clear what learning needs to be done and how to do define learning success						
COGNITIVE LOAD						
The course design helps students recall related knowledge at the beginning of each topic						
The course design uses familiar examples in the Kenyan context to explain concepts						
The course design promotes generative learning by prompting students to articulate their comprehension of a topic using their own words.						
The system interface design is simplified so that there's not a lot of items to distract the students from the learning material.						
The system design makes provision for informal peer-to-peer communication and help						
MOTIVATION TOWARDS ACHIEVEMENT AND SUCCESS						
The system design uses progress tracking tools, leaderboards, and other mechanisms that foster a sense of individual advancement and mastery.						
The system design incorporates feedback loops and visual cues that allow learners to gauge their standing relative to peers or course objectives.						
UNCERTAINTY AVOIDANCE						
The system interface design is straightforward, with explicit guidance on the next steps to take.						
The system design does not contain ambiguous navigation or hidden functionalities						
The system interface design is consistent that helps build a sense of predictability and control						
COLLABORATIVE VS. INDEPENDENT WORK (IC)						
The system design includes social support, and group-based learning features						
LANGUAGE						
The system interface can be translated into Kiswahili for better understanding						
USE OF CULTURAL SYMBOLS						
The system interface uses imagery, color schemes, and iconography that resonates with the target student population, and draws on familiar local references.						
The system interface does not use symbols that carry unintended negative meanings from a Kenyan cultural perspective.						

Discussions

This study aimed to develop and validate a culturally aware user interface evaluation instrument for virtual learning platforms used by Kenyan users. The new instrument addresses the identified gaps by integrating cultural dimensions with established usability heuristics, thereby ensuring a holistic evaluation of VLPs in diverse cultural contexts.

The study first undertook to understand the cultural dimensions of Kenyan e-learning users that would affect their preferences in UI design. Experts agreed that hierarchical structuring, instructor-led cues, clear navigation, collectivist features, and achievement motivation were important aspects of a platform's usability. Moodle's straightforward layout and consistent interface met these cultural expectations, while its collectivist features, such as forums and group workspaces, were deemed crucial. Achievement motivation was also emphasized, with Moodle's support for grade displays, quiz scores, and completion tracking being seen as beneficial. However, the study found that overt competition in an academic context might conflict with the collaborative ethos of Kenyan classrooms. The instrument's inclusion of a heuristic about progress tracking was useful in evaluating Moodle, revealing that it provided basic progress indicators but not flashy competitive rankings.

The research findings also highlighted the significance of language, terminology, and symbolic context in the user interface. Experts noted that phrasing should be culturally sensitive and familiar, and that offering content or support in Kiswahili would enhance usability. However, the platform's English-only interface and generic icons lacked local cultural reference, which was a concern for the study.

In summary, the study confirmed the importance of cultural factors in UI design for Kenyan users, highlighting the need for authority cues, structured navigation, collectivist features, and motivational feedback. The study laid a culturally-informed foundation for the development of the UI evaluation instrument, ensuring that any subsequent tool or design recommendation is rooted in authentic user cultural preferences rather than assumptions of a "one-size-fits-all" user.

Building on the cultural insights, the study' second objective was to adapt existing user interface evaluation tools to include those cultural dimensions, as conventional usability heuristics would not fully capture culturally contingent issues. A hybrid evaluation instrument was developed, combining established technical and pedagogical usability criteria with new cultural heuristics derived for the Kenyan context. The instrument was structured into multiple categories (technical usability, pedagogical usability, and cultural usability), ensuring that traditional usability facets were thoroughly evaluated while systematically checking for cultural fit.

Expert review feedback indicated that the instrument's technical and pedagogical heuristics were comprehensive and aligned with known best practices, suggesting that the adaptation maintained the strengths of existing evaluation tools. Experts gave high consensus scores on the technical and learning-related sections, reflecting their confidence that the instrument still covered all essential usability aspects expected in an e-learning platform review. This outcome supports insights from the literature that emphasize the continued importance of general usability principles and shows that even when focusing on culture, one must uphold those foundational heuristics.

The more challenging aspect was the cultural category of the instrument, which was novel but ultimately constructive. Experts unanimously recognized the necessity of having cultural heuristics, reinforcing the literature's argument that context-specific factors need to be evaluated. However, their feedback revealed that the initial set of cultural criteria required further refinement. This feedback validates the premise that cultural usability is a less charted domain, as cultural considerations may be interpreted differently by different experts. The expert review findings did not undermine the idea of cultural heuristics but indicated that the initial adaptation left some gaps or ambiguities in this category.

The study aimed to improve a culturally adaptive UI evaluation tool by incorporating new or modified heuristics, particularly in the cultural and pedagogical sections. The revised instrument was based on expert suggestions and included items for local language and symbol appropriateness, as well as clarifications related to community engagement and instructor roles. These changes demonstrate how theoretical cultural constructs were translated into concrete evaluation statements and how this translation had to be calibrated through real-world feedback.

The study's findings support the conceptual frameworks that emphasize culturally adaptive design as an iterative, feedback-driven process. The initial synthesis of literature provided a solid starting point, and the expert review provided the cultural calibration needed for the instrument to truly fit the Kenyan context. This iterative refinement confirms theoretical expectations that no single pass at integrating culture will be perfect; continuous validation is essential.

The final instrument was more robust and contextually grounded, merging international best practices of UI evaluation with Kenyan cultural insights. It directly addressed the problem statement by producing a tailored evaluation instrument that

neither existed in the literature nor in practice before, bridging the gap noted in prior research where usability tools assumed a culturally neutral user.

The experience from this research confirms that existing UI evaluation models can be successfully adapted to a new cultural context, but it also highlights the importance of validation. By adapting and validating the instrument, the research supports the broader notion from HCI literature that usability evaluation is not one-size-fits-all; it must evolve with user context.

The third objective tested the newly developed instrument on a real-world platform – in this case, Moodle – to assess its efficacy and practical value in evaluating usability from a Kenyan cultural perspective. This phase was essentially the culmination of the research, demonstrating how well the instrument performs and whether it indeed surfaces issues and insights that justify its development. The discussion here contrasts the outcomes of this pilot evaluation with expectations drawn from both the literature and the conceptual framework, thereby closing the loop between theory, design, and practice.

The findings confirmed many anticipated strengths of Moodle while revealing subtle culturally-linked usability issues that a standard evaluation might have missed. For example, Moodle performed well on technical and pedagogical fronts, scoring highly on general usability metrics like navigation, content organization, and basic interactive functionality. However, the instrument also revealed issues tied specifically to cultural context, such as the lack of local language support or localized terminology in the interface. This highlights the theoretical proposition that culturally aware evaluation will catch "soft" usability issues relating to user familiarity and comfort.

The evaluation raised considerations about interface hierarchy and instructor presence in Moodle, highlighting the instrument's efficacy in bridging the gap between abstract cultural expectations and practical design feedback for the platform. The instrument also highlighted the need for more prominent display of current instructor messages or clear course structures to satisfy high power-distance learners who prefer teacher direction.

The study also highlighted the importance of motivational and engagement features in Moodle, leading experts to consider features beyond the default, such as public leaderboards, badges, or other competitive gamification features. The instrument provided a framework to articulate improvements that align Moodle more closely with Kenyan user expectations, validating its practical value.

The Moodle evaluation was conducted using a culturally augmented evaluation framework, which was expected to reveal issues invisible to conventional evaluations. The results confirmed the hypothesis that incorporating cultural dimensions yields a more thorough and realistic evaluation of usability for the target user group. The instrument's usability and reliability were also reflected in the success of the evaluation. Experts found the instrument workable and consistent, indicating its effectiveness in diagnosing usability in a culturally aware fashion.

The study's pilot was controlled, but true efficacy is ultimately proven through end-user outcomes. The expert-based pilot demonstrated the instrument's ability to function as intended, demonstrating its effectiveness in diagnosing usability in a culturally aware fashion. The study's findings align with HCI methodology, where expert evaluations often precede and inform user testing.

In conclusion, the pilot evaluation of Moodle using the new instrument fulfilled Objective 3 by demonstrating the instrument's efficacy in a real-case scenario. The instrument not only upheld Moodle's known strengths but crucially brought new cultural insights to the fore, thereby directly addressing the initial research problem: the previously unchecked cultural fit of a widely used LMS was finally evaluated and understood. The coherence between these findings and the study's theoretical underpinnings reinforces the study's overall argument that culture matters in UI evaluation. The successful test on Moodle indicates that the instrument can serve as a practical tool for stakeholders (e.g. interface designers, e-learning administrators in Kenya) to evaluate and improve their platforms in ways that standard usability checklists would not prompt. It transforms the research from an academic exercise into tangible impact, as Moodle's case has shown what kind of enhancements could be made for Kenyan users. Taken together, the outcomes of Objectives 1, 2, and 3 form a cohesive narrative: the research identified what cultural aspects are important, embedded them into a usability evaluation framework, and proved that this new framework is effective in practice. This narrative closes the loop on the problem statement – it provides evidence that a culturally aware UI evaluation instrument is not only necessary but also feasible and valuable for improving virtual learning platforms in Kenya. This discussion, therefore, converges on a clear message: integrating cultural dimensions into UI evaluation leads to a deeper understanding of usability and more culturally resonant e-learning experiences, which is the fundamental goal that motivated this research.

Conclusion

In this study, the cultural factors that affect Kenyan users using VLPs were described. A hybrid tool that integrates Kenyan cultural aspects was then created and

tested on a Moodle platform to evaluate its usability. Considering the results of the usability testing, we can conclude that the new instrument proved more effective than traditional usability evaluations by revealing culturally specific issues that would otherwise be overlooked.

By addressing the identified gaps and providing a validated evaluation tool, this research contributes to enhancing the usability and cultural relevance of virtual learning platforms in Kenyan universities and similar contexts. The findings offer valuable insights for developers, educators, and policymakers seeking to improve the online learning experience and promote inclusivity in digital education.

Future research should focus on expanding the tool to include sub-cultures to capture richer and more nuanced aspects of cultural influence. In addition, longitudinal studies to assess the long-term impact of culturally aware VLP design on student engagement and learning outcomes should be conducted.

Based on the findings of the study, a number of recommendations can be made to improve the design and implementation of VLEs in Kenyan universities:

1. Incorporate Cultural Dimensions in UI Design: Kenyan universities and VLP developers should ensure that platform interfaces reflect key cultural dimensions identified in this study:
    - High Power Distance: Incorporate structured learning pathways, with clear instructor presence (e.g. “Start Here” modules, instructor messages prominently displayed).
    - Collectivism: Enhance features for peer interaction and group work such as visible forums, group dashboards, peer feedback tools, and virtual group study rooms.

- Uncertainty Avoidance: Design interfaces with clear, step-by-step navigation, consistent layouts, and prominent help options to minimize ambiguity.
- Achievement Orientation: Integrate progress tracking tools (e.g. visual progress bars, performance dashboards) and optional gamification elements (badges or milestones) to support self-monitoring and motivation.

2. Localize Language, Icons, and Content Examples. To enhance familiarity and reduce cognitive load:
    - Use localized terminology and avoid Western-centric idioms or culturally irrelevant references.
    - Ensure that icons and visual metaphors used in the interface are intuitive to the Kenyan context.
    - Where possible, integrate local case studies, examples, and images in content templates.
    - Offer Kiswahili language support or translation for essential system instructions, particularly for basic tasks or help sections.
3. Customize VLP Templates to Reflect Kenyan Educational Norms. When deploying VLPs like Moodle:
    - Design default course templates that align with Kenyan pedagogical norms, such as instructor-led modules, sequential content presentation, and regular formative assessments.
    - Encourage the use of announcements, guidelines, and summaries by instructors at the beginning of each learning section to provide direction and structure.

4. Enhance Training and Orientation Programs. Many usability issues stem from unfamiliarity with the platform. To mitigate this:
    - Provide targeted onboarding sessions for students and faculty that reflect both technical use and cultural expectations.
    - Include training on collaborative features, feedback systems, and how to track academic progress within the VLP.
    - Develop visual quick-start guides or walkthroughs using localized examples.
5. Include Culturally-Aware Heuristics in Platform Evaluation Cycles. Universities should:
    - Regularly use the culturally aware evaluation instrument developed in this research to assess the usability of VLPs.
    - Train ICT and instructional design teams to apply the tool during both initial adoption and post-implementation review phases.
    - Combine findings with student feedback to guide interface redesigns or plugin selections.
6. Collaborate with Developers to Improve VLP Flexibility. Where local institutions rely on global platforms like Moodle:
    - Advocate for configurable UI options that allow institutions to adapt layouts, content structures, or labels to their specific user needs.
    - Engage in open-source communities to contribute culturally-relevant themes or plugins for broader African or Kenyan use.
7. Foster a Feedback Loop with End Users. Establish systems for continuous usability feedback from students and faculty:

- Include culturally-informed usability questions in course evaluations or system feedback forms.
- Periodically conduct expert or user-based evaluations using the hybrid tool.
- Use findings to iterate the platform's design and training materials.

8. Institutionalize Cultural Usability in Digital Education Policy. Universities and education regulators should:
    - Embed cultural usability criteria into ICT integration policies and e-learning standards.
    - Encourage curriculum developers and LMS administrators to consider culturally inclusive design as a norm, not a one-time customization.

These recommendations, when implemented systematically, will ensure that virtual learning platforms not only meet technical and pedagogical standards but also align with the cultural expectations and learning behaviors of Kenyan university students. This alignment is essential for improving user satisfaction, engagement, and ultimately, academic outcomes.

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EXPERIENCE

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