



Determinants of E-Learning Adoption among Students in Sierra Leone's Public Tertiary Institutions: A Cross-Institutional Survey of Digital Readiness, Communal Learning Preferences, and Platform Fit

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ABSTRACT

The global COVID-19 pandemic has forced Higher Education (HE) institutions to undergo a digital transformation that has reshaped their operations and made online learning platforms a necessity instead of a luxury. The adoption of e-learning is not uniform in Sierra Leone where seven public tertiary institutions have more than 40,000 students. Learners often use the resources provided for the course, but do not use interactive and collaborative resources very often. This partial adoption brings up important questions relating to how certain student behaviors are connected to the use of e-learning platforms, and why adoption levels may differ in various institutional contexts. This study investigates adoption factors of e-learning from students' perspectives in public tertiary institutions in Sierra Leone, which includes digital readiness, communal learning orientation and platform fit. The study combines existing technology acceptance factors with culturally-based constructs and context factors. The design of the study used was cross-sectional with 1100 undergraduate students from seven institutions. Hypothesized relations were tested by using partial least squares structural equation modelling. The results indicate that communal learning orientation had a significant total direct effect on e-learning adoption, and this effect was partially mediated by platform fit which accounted for 51.9% of the total effect. The results indicated that there were significant differences between the groups, with perceived usefulness being the most important at the institutions that had partial implementation of LMS, the facilitating conditions at the institutions where infrastructure was limited, and the digital readiness at the polytechnic. The study has both theoretical and practical implications, as it offers a possible mediating mechanism (platform fit), and evidence for differentiated intervention frameworks, and methodological implications by operationalizing communal learning orientation as a measurable construct.

Keywords: e-learning adoption; communal learning orientation; platform fit; digital readiness; Sierra Leone



INTRODUCTION

The past decade has witnessed a whole new digital revolution in higher education. The use of an auxiliary teaching support has turned from what was once thought to be a supplement, to an institutional mandatory requirement, in the aftermath of the COVID-19 Pandemic. In this sudden switch to online learning, universities worldwide had to rapidly implement online platforms to ensure the continuity of education (Zheng et al., 2025). While the acute phase of the pandemic is over, the challenge of what helps successful e-learning adoption among students is still an important question to ask especially in the developing country context where infrastructural and socio-cultural factors bring in different dynamics compared to the developed countries (Boateng et al., 2016). To effectively leverage digital learning opportunities in the institutions, these dynamics need to be understood. Only then will they be able to make better access and improve quality and prepare learners for a digitally connected life.

Sierra Leone's backdrop provides a fascinating situation in which to investigate the factors in the adoption of e-learning. In recent years, the country's higher education system has been undergoing a drastic transformation, with the establishment of new public universities, and changes to technical universities in response to the Universities Act 2021 (Sawaneh et al., 2024). There are some institutions that have already introduced learning management systems in their pedagogy such as the University of Sierra Leone, Njala University and Milton Margai Technical University. In some universities, such as Njala University, the importance of online learning has been made explicit as an institutional priority, and the use of Moodle platforms and collaboration with both government and international partners are all geared towards reducing the digital divide (Learning Passport, 2025). However, students' utilization of these platforms is not the same. High percentage of engagement with accessing content; low percentage of engagement of features that will facilitate collaborative learning. This partial take-up of e-learning platforms raises relevant questions: How often are students willing to spend time on e-learning platforms? What they like/dislike about the platform features? And why is there such a difference between institutions with respect to adoption?

This is by no means a unique pattern for Sierra Leone. Studies by Boateng et al. (2016) in Ghana showed that perceived usefulness and attitude toward use are significant factors that affect e-learning adoption while computer self-efficacy and ease of use had more indirect influence on e-learning adoption through the influence of attitude toward the use. According to a review of 91 empirical studies, covering almost 38,000 participants, habit, hedonic motivation, price value, performance expectancy, and facilitating conditions are all significantly related to behavioral intention to use e-learning (Zheng et al., 2025). Significantly, this is the same meta-analysis that found cultural orientation as a significant moderator of the relationship between various antecedents and adoption intention. Results show that e-learning models developed in the Global North might have to be culturally adapted to be implemented in the West African context.

The Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM) are the most popular models used to examine e-learning adoption. Zheng et al. (2025) have recently conducted a review of 183 articles and verified that these two frameworks are still the most popular to investigate adoption and the intention to use e-learning technologies. While these models have proven effective in various contexts, they have been mostly developed in reference to the acceptance of a technology by individuals and not to culturally embedded learning practices (Boateng et al., 2016). This distinction matters. Collective learning is a key element of many West African learning traditions, which involve co-constructing knowledge in dialogue, with others and through meaning making together (Ngubane & Makua, 2021). But, the traditional MOOC model, which is essentially a learner working with content, may not fit with these traditions. If the platform design is not aligned with the learning preferences of students, it will be difficult to sustain using the platform.

Recent research has started to reveal these processes in Sierra Leone. Based on a sociological study on social e-learning in the Universities in Freetown, Bangura (2024) concluded that the emphasis of the Universities towards social e-learning is still in its embryonic stage and that emphasis is more on administration than the building of teaching and learning platforms. Moreover, it has been noted that informal technologies (such as WhatsApp) can help to facilitate flexible learning in Sierra Leonean higher education as students are attracted



to technologies that support their communicative and collaborative learning. The Sierra Leone Digital Learning Landscape Analysis indicated that there was a general lack of technology reach in schools, with only 43% reporting that they use technology in their schools, and the majority of respondents reporting 10% or less of their schools to use technology for 3-month period (Waziri et al., 2025). All these findings emphasize the need to further research the subject in a more structured manner, and to understand what would encourage the use of e-learning in this national context.

A lot is not known about the mechanisms to drive e-learning adoption in Sierra Leone and other contexts. Although some studies have found that cultural orientations mediate the link between adoption and platform design (Zheng et al., 2025), no study has examined the effect of communal learning orientation as a between-person mediator between communal learning orientation and adoption in a West African educational context where communal learning is observed (Ngubane & Makua, 2021; Suliman et al., 2024). This is a significant mechanism for theory building as it does not simply assert the significance of culture, but helps to explain how and why it is significant. The present study fills this gap by examining platform fit as a mediator, and positing that the communal learning orientation will affect the adoption indirectly, via its effect on the perceived fit of the design of the LMS and the communal learning practices. It's an important difference to note. In the event that platform fit is the mediator, then interventions targeting only infrastructure or individuals' perceptions will be incomplete. It is the student's perception of congruency with preferred learning styles that is important.

There are six Government universities and one Polytechnic college in four regions of the country including urban and semi-urban areas in Sierra Leone. Significant variation in institution's capacities, digital maturity and infrastructure, and student characteristics. It is crucial to know if the same factors are at play in all these contexts or if they are unique to each context for effective and equitable digital learning policies to be developed. There can't be a one size fits all policy. Research which does not take into account this considerable institutional differences will not assist in shaping the policy and practice in a meaningful way. This study, thus, looks at adoption across all seven public tertiary institutions and tests the hypothesis that determinants of adoption vary across the different institutions.

The purpose of this study is to fill in these gaps by looking into the factors that hinder e-learning adoption among the students of the public tertiary educational institutions of Sierra Leone. The study has five objectives: The first is the main factors that influence the adoption of e-learning in the public tertiary institution among students in Sierra Leone. The second is to examine and analyses the correlation between digital readiness and e-learning adoption behaviour, to see how the access to digital devices, access to Internet and digital skills correlate with e-learning adoption behaviour. The third is to examine the relationship between communal learning orientation, platform fit and e-learning adoption; to test the hypothesis that platform fit is a mediator between communal learning orientation and e-learning adoption. The fourth is to understand if there are institutional type differences regarding the relationships between the key determinants and e-learning adoption, which factors are more important in which institutional contexts. The fifth is to analyze and compare the determinants of adoption between different types of institutions (older universities and newly upgraded technical universities and the polytechnic college) and make differentiated policy interventions. This is done by a cross sectional survey of students in seven institutions based on a sample of 1100 students analyzed through the partial least square structural equation modelling.

This research has a number of theoretical, practical and methodological contributions to make. The identification of platform fit as a mediating mechanism between the communal learning orientation and the adoption of e-learning is the main theoretical contribution. Cultural orientation has been identified as a moderating variable in the past (Zheng et al., 2025), and communal learning traditions have been seen to be critical in developing and using learning technologies by African students (Suliman et al., 2024). The present study adds to that stream of literature by demonstrating that the relationship between the cultural orientation and adoption is not direct but is mediated by platform design to cultural practice fit perception. In particular, 51.9% of the overall effect is found for platform fit. This mechanism specification answers to the calls for contextually sensitive adoption research, and offers a testable framework for future research in similar contexts.



Moreover, the study provides insights into the interaction of individual, cultural and institutional factors by analyzing adoption in different types of institutions in the same country. The findings will be shared with institutional stakeholders, decision makers in the Ministry of Technical and Higher Education, and other external stakeholders interested in optimizing the investment in e-learning in the context of resource-poor conditions. The impact of determinants varies between institutions, with perceived usefulness having greater impact at institutions with a partial LMS implementation and facilitating conditions and digital readiness having greater impact at less equipped institutions. These results indicate that a 'one size fits all' national solution is not suitable. Instead, there is a need for constant actions that are not only to create infrastructures, but also pedagogical and cultural aspects of adoption are taken into account.

A novel aspect of this study is that it openly acknowledges the conflict between the concepts of communal learning traditions with classic conceptualizations of technology acceptance. Although culture has been previously addressed in research as a factor to be taken into account when considering the adoption of e-learning, little research has been done to operationalize "communal learning orientation" as a measurable variable nor to test communal learning orientation as a predictor variable together with classic technology acceptance variables. Moreover, there is no systematic study to do a comparative study of the factors affecting the adoption of e-learning in all public tertiary institutions in Sierra Leone. This study integrates established theories, and constructs rooted in cultural context, to gain a fuller and comprehensive picture of adoption in this context.

The rest of this manuscript goes as follows. The pertinent literature related to technology acceptance, cultural dimensions of learning, digital readiness and empirical findings on e-learning adoption in the developing countries are reviewed in section 2. The hypotheses and the conceptual framework are also discussed in this section. The research methodology is explained in Section 3 which include research philosophy, research design, research area, population and sampling, data collection instrument, as well as data analysis strategy. The results are presented in section 4, which involves descriptive statistics, reliability and validity assessment, hypothesis testing, mediation analysis and multi-group analysis. The results are analyzed in the context of literature, implications are drawn and limitations and future directions are noted in section 5. The manuscript is summarized in section 6 which offers contributions and recommendations.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

In the last 20 years, significant research in higher education has been produced related to the use of e-learning. This section provides an overview of the literature underpinning this research, starting with the technology acceptance models that continue to dominate this field followed by the cultural aspects of learning that are relevant to the context of West Africa, and finally a summary of the empirical evidence from the developing world and the infrastructural issues. This section ends with a statement of the problem for the study and the hypotheses and conceptual framework that underlie the study.

Technology Acceptance Models in the context of E-Learning research

Two most influential models have emerged to research the adoption of e-learning: The Technology Acceptance Model (TAM) by Davis (1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003). These models have proven to be rather explanatory and have been used significantly in the field of higher education research. Even so, a recent review of 183 articles by Zheng et al. (2025) demonstrated that the TAM and UTAUT are still the most popular theoretical perspectives to consider factors that affect the adoption and behavioral intentions of e-learning technologies. Habit, hedonic motivation, price value, performance expectancy and facilitating conditions were found to be significantly associated with behavioral intention to use e-learning based on the meta-analytic results from the 91 empirical studies with a total of almost 38,000 participants. However, this same review found that there are significant cultural differences in the determinants of adoption and that the interconnections among determinants are different in different cultural contexts.

While these models serve as a good starting point, they have been developed to explain individual-level techn-



ology acceptance instead of culturally entrenched learning practices that influence students' engagement with educational technologies (Boateng et al., 2016). A systematic review of the cloud-based e-learning implementation in developing countries carried out by Boateng et al. (2016) revealed that the implementation intention was relatively high, with the exception of contextual conditions like infrastructure, connectivity, training, support, security and policy. This review also identified a lack of full integration of organisational level models in user level models, and an over-emphasis on perceptual measurements and not actual outcomes. These findings underscore the need to develop theories that consider the context, as context is not easily captured by existing theories such as the Technology Acceptance Model (TAM), especially in developing countries like West Africa where access to education remains uneven and learning processes may differ from those embedded in the model.

Cultural Aspects of Learning and Platform congruence

A great deal of research has been done over the years on the relationship between cultural orientation to learning and the use of technology in the Higher Education context in Africa. Much of these literatures are grounded in the philosophy of knowledge co-created episodically in a relational context of dialogue, collaborative engagement and relational accountability (Ubuntu philosophy of knowledge) (Ngubane & Makua, 2021). Ubuntu places the learner in the context of relationships with others. In terms of education, this means that learning takes place as a relational process of co-construction of meaning.

There are 4 main principles of Ubuntu which are applicable to the design of learning technologies. Relational personhood suggests that a person is whole in relation: that learning is a conversational and interrogational not a solo activity. Collective knowledge production means that the knowledge is community owned and community generated, which means that when learning, they would prefer collective deliberation and collective understanding. Oral and dialogic communication: In learning, people like to learn through discussion, questioning and exchange of oral words; the spoken word and people's deliberation play fundamental roles in the transmission of knowledge. Mutual support and interdependence indicate that students are expected to help each other learn, and they like to work in groups to help and solve problems.

Based on these four principles, the communal learning orientation construct was developed as used in this study. The five items in the construct have been derived from group discussion (relational personhood), peer support (mutual interdependence), collective understanding (collective knowledge production) and oral interaction (dialogic communication). The construct does not claim to be a description of the whole of Ubuntu but a reflection of aspects of Ubuntu which are relevant to the adoption of learning technology in Sierra Leone. Note that this is a personal choice and it does not mean that communal learning is not preferred by all students in Sierra Leone, or even Africa. Rather it is an indicator of how much each student values learning in a community, which may differ from student to student and school to school.

The following are examples of these cultural dimensions from empirical research conducted at universities in South Africa. In the case of a study on academic readiness programmes, a study of Ubuntu values based programme had a higher predictive value on academic preparedness than other academic readiness programmes. This is significant in the context of the present study as this shows that culture is no longer a marginal part of learning but is part and parcel of assessment and relating with technologies in the context of education. Technically there is nothing wrong with any platform, but if it is not linked to the learning practices of a community, then, adoption will be limited. Platform fit is the sense of congruence related to the design of the e-learning system and the process and style of the students' learning. The perception of students that the LMS is simply a space for documents and is not a learning management system (LMS) is linked with the reduction of sense of community and engagement (Suliman et al., 2024). One study revealed that the interaction in LMS was monologic and impersonal and students opted for relational communication. These findings are consistent with community of inquiry research which suggests that, in order to ensure cognitive presence in online learning, students need both social presence and teaching presence. Even with very complex designs, the platform adoption rate is low when the platform design fails to take into account relational aspects. These cultural aspects have relevance in Sierra Leone. Shared cultural values with the other West African countries include oral transmission of knowledge, group problem solving and relational accountability. A



study about how Moodle is used in Sierra Leone showed that students made good use of Moodle in accessing materials, but not Moodle forums, and the qualitative data revealed students' appreciation of the flexibility and self-paced learning in Moodle, and their problems with connectivity, course design and presence of the lecturer (Bangura, 2024). The use of social networking applications significantly impacted attitudes towards e-learning, suggesting that informal technology could serve as a moderator between attitudes towards formal technology, as found in previous studies on e-learning adoption among higher education students in Sierra Leone (Sawaneh et al., 2024). All of this suggests that the congruence between culturally embedded learning styles and e-learning systems on platforms might play an important role in determining adoption of e-learning in Sierra Leone, but this has not been thoroughly explored in the context of Sierra Leone.

Digital Readiness and Infrastructural context

Digital readiness is a key issue in the e-learning adoption and encompasses the readiness of learners to access e-learning, such as the availability of devices, the internet connection and digital skills. This is especially crucial in Sierra Leone where infrastructure is limited and plays a significant role in the potential for online learning. Waziri et al. (2025) revealed that 84.8% of students in distance learning of the University of Makeni, Sierra Leone, lack devices to access online learning materials, while Figure 1 showed that a significant number of the students do not know how to use a computer or phone for learning purposes. Among those who responded to using a device, 96.2% said they used mobile phones and these were limited in their ability to support academic work.

The Sierra Leone Digital Learning Landscape Analysis further showed that only 43% indicated the use of technology in their schools and most of the respondents estimated they used technology in school 10% or less in the past three months (Waziri et al., 2025). This is a good example of the importance of digital readiness to accessing technology, as well as what kind of e-learning can be done. When access is unreliable or inconsistent, the value or ease of use of a platform is not as important as whether or not it can be accessed.

Digital readiness is tightly linked to Platform Fit. For less digitally prepared students, a platform may be impractical to use, and even if it can be used, it can be tedious and discouraging enough to keep students from returning to the platform. At this level, students are less likely to perceive the platform as meeting their learning needs because of the lack of basics like devices, connectivity and digital skills. This means that digital readiness is not only affecting directly adoption but also influencing the perception of the design of the platform and the learners' learning process. It can, therefore, mean quite different things for the different students who are high or low digital readiness, using the same platform. This is a key part of the differential adoption phenomena among institutions in Sierra Leone.

Empirical evidence on the adoption of e-learning in developing countries

The use of e-learning in developing countries has increased vastly and empirical studies have been under way, especially in the case of West Africa. The study in Ghana showed that there was a significant relationship between perceived usefulness and attitude toward use on e-learning use, while the relationship between computer self-efficacy and ease of use were indirectly related through the attitudinal pathway (Boateng et al., 2016). The findings confirm the findings from the general technology acceptance studies and add to the knowledge base of attitudes that could be influenced by contextual aspects.

In Ghana, a research on distance learning identified perceived ease of use, perceived usefulness, and facilitating conditions as significant factors that affect the adoption of e-learning, and the most influential condition was 'facilitating condition' which is more prominent in the resource poor setting (Boateng et al., 2016). This finding suggests that institutional support and infrastructure is important for e-learning adoption, especially among the students who don't have capacity to access e-learning platforms. The study also indicated that social influence was significant statistically, so that in cases where there is a problem in the infrastructure, the students can be influenced to use e-learning through social influence.

A systematic review of e-learning in higher education has demonstrated that the use of e-learning helped to increase access to education but also increased the digital divide, particularly for low-income and rural



students (Singh et al., 2024). The review identified problems with costs, connections and institutional support, and identified strong relationships between demographic factors and readiness, indicating that the relationship between variables and readiness may differ among some subpopulations. The findings from these studies are pertinent to the ongoing research regarding the influences of adoption in the different settings.

Synthesis and Gap Identification

Three important patterns emerge from the literature reviewed which are important to the present study. Firstly, the technology acceptance research in developing countries has largely been dominated by TAM and UTAUT with little consideration for the organisational and contextual factors that can impact technology acceptance in practice (Boateng et al., 2016; Zheng et al., 2025). Although these models are useful theories with regard to perceptions of the individual, they do not adequately depict the specific infrastructural and cultural context of HE in Sierra Leone.

Second, cultural dimensions of learning which are often not measurable in adoption studies are not usually measured in many cultural learning systems such as communal orientations in many African cultural learning systems. Most important, there has been no study that has investigated if platform fit is a mediator between communal learning orientation and adoption. A platform fit, that is, the fit between platform design and cultural learning preference, might be important in bridging this gap, but has yet to be tested. To fill this void, this paper examines and tests a mediation model that considers platform fit as a mediator between communal learning orientation and adoption.

Thirdly, some of the researchers in Sierra Leone started documenting the issues of e-learning; however, they document the problems of e-learning at the level of a single institution or platform and failed to identify strong determinants of these problems at a cross-institutional level across various contexts (Bangura, 2024; Sawaneh et al., 2024). In this study these gaps are remedied by analyzing and extending the previous studies and incorporating culturally constructed constructs along with the traditional technology acceptance constructs and contextual constructs within a comprehensive model validated in seven public tertiary institutions in Sierra Leone. This is an empirical framework, a model that has been operationalized in the form of testable structures of direct and mediated paths towards e-learning adoption and which is more nuanced than just a technological or cultural explanation. Differences in the determinants across institutions are also examined in this study to see how this model generalizes in the different institutions. Results will be fed into theory and practice to contribute to increasing uptake of e-learning in Sierra Leone and in other developing country context.

Hypotheses

The empirical framework contains hypotheses operationalized as testable structural paths. The hypotheses are organized into four categories: direct effects of technology acceptance constructs on e-learning adoption, direct effects of technology acceptance constructs on platform fit, direct effects of digital readiness and communal learning orientation on outcomes, and the mediating role of platform fit.

Technology Acceptance → E-Learning Adoption

H1: Perceived usefulness has a positive direct association with e-learning adoption.

H2: Perceived ease of use has a positive direct association with e-learning adoption.

H3: Social influence has a positive direct association with e-learning adoption.

H4: Facilitating conditions have a positive direct association with e-learning adoption.

Technology Acceptance → Platform Fit

H5: Perceived usefulness has a positive direct association with platform fit.

H6: Perceived ease of use has a positive direct association with platform fit.



H7: Social influence has a positive direct association with platform fit.

Digital Readiness → Outcomes

H8: Digital readiness has a positive direct association with platform fit.

H9: Digital readiness has a positive direct association with e-learning adoption.

Communal Learning Orientation → Outcomes

H10: Communal learning orientation has a positive direct association with platform fit.

H11: Communal learning orientation has a positive direct association with e-learning adoption.

Mediation

H12: Platform fit has a positive direct association with e-learning adoption.

H13: Platform fit mediates the relationship between communal learning orientation and e-learning adoption, such that the indirect association is positive and statistically significant.

Moderation

H14: Institutional type moderates the relationships between the key determinants (perceived usefulness, facilitating conditions, and digital readiness) and e-learning adoption, such that the strength of these relationships differs across institutional types.

Variable Definitions and Operationalization

Perceived Usefulness (PU) is the degree to which a student thinks that the e-learning system will enhance the academic achievement (Boateng et al., 2016). There are four measures of beliefs regarding better learning and efficiency and higher academic productivity. Sample item: 'My academic achievement is positively affected by the use of e-learning'.

Perceived Ease of Use (PEOU) is a student's belief of ease of use and not much effort is required to operate the e-learning system (Boateng et al., 2016). Four items measure ease of navigation, learning curve and overall usability. An example item is: "It is easy for me to learn how to use the e-learning platform.

Social Influence (SI) is the extent to which students feel that important others, such as peers, lecturers, and family, think that they should use the e-learning system (Zheng et al., 2025). There are four items that measure normative pressure from various reference groups. Sample item: "Others who are important to me think that I should be using the e-learning platform."

Facilitating Conditions (FC) is the resources and support that students are given for using the e-learning system, such as technical infrastructure, training, and institutional support (Zheng et al., 2025). There are four items related to access to devices, reliability of the internet, and access to help. One such item is: I have the tools I need to use the e-learning platform.

Digital Readiness (DR) refers to readiness of learners to participate in online learning which include the learners' devices readiness, access to internet and learners self-assessment of their digital skills (Waziri et al., 2025). There are five items that are representative of this multidimensional construct. One such item is 'I trust digital devices for learning.

Communal Learning Orientation (CLO) is the student's learning orientation towards collective, relational and dialogic process. It is built on the Ubuntu approach that emphasises relational personhood, collective knowledge creation, oral communication and mutual assistance (Ngubane & Makua, 2021). Group discussion,

peer support, shared understanding and verbal interaction is assessed by five items. An example item is "I learn best talking to my classmates about ideas. It is important to remember that this is a construct of personal preference and does not mean that communal learning is necessarily the preferred method of learning for all Sierra Leonean and African students. Rather it represents the extent to which students embrace a collective approach to learning, which can vary from student to student and institution to institution.

Platform Fit (PF) is the fit between learners' learning styles and the platform design (Suliman et al., 2024). Five items measure the perception of the support the LMS provides for collaborative learning, engagement and congruence with preferred learning styles. One such item is: 'I learn on the e-learning platform what I want to learn.'

E-Learning Adoption (ELA) is defined as a mixture of the intention to use e-learning systems and the usage of these systems. Five items ask about how often they use and want to continue using, and preferring e-learning to traditional instruction. Sample item: I will use the e-learning platform in future.

Conceptual Framework

The conceptual framework of this study adopts and combines technology acceptance constructs, cultural constructs, contextual constructs, a mediating variable, an outcome variable and a moderating variable. The framework assumes that there are relationships between technology acceptance constructs (perceived usefulness, perceived ease of use, social influence, and facilitating conditions) and contextual factors (digital readiness and communal learning orientation) and platform fit, and between platform fit and e-learning adoption. There is a mediation effect between the communal learning orientation and adopting e-learning through platform fit. The type of institution is a moderator variable for the relationships between the key determinants and the adoption of e-learning. The hypothesized relationships between all constructs is illustrated in Figure 2.1.

Conceptual Framework of E-Learning Adoption Determinants

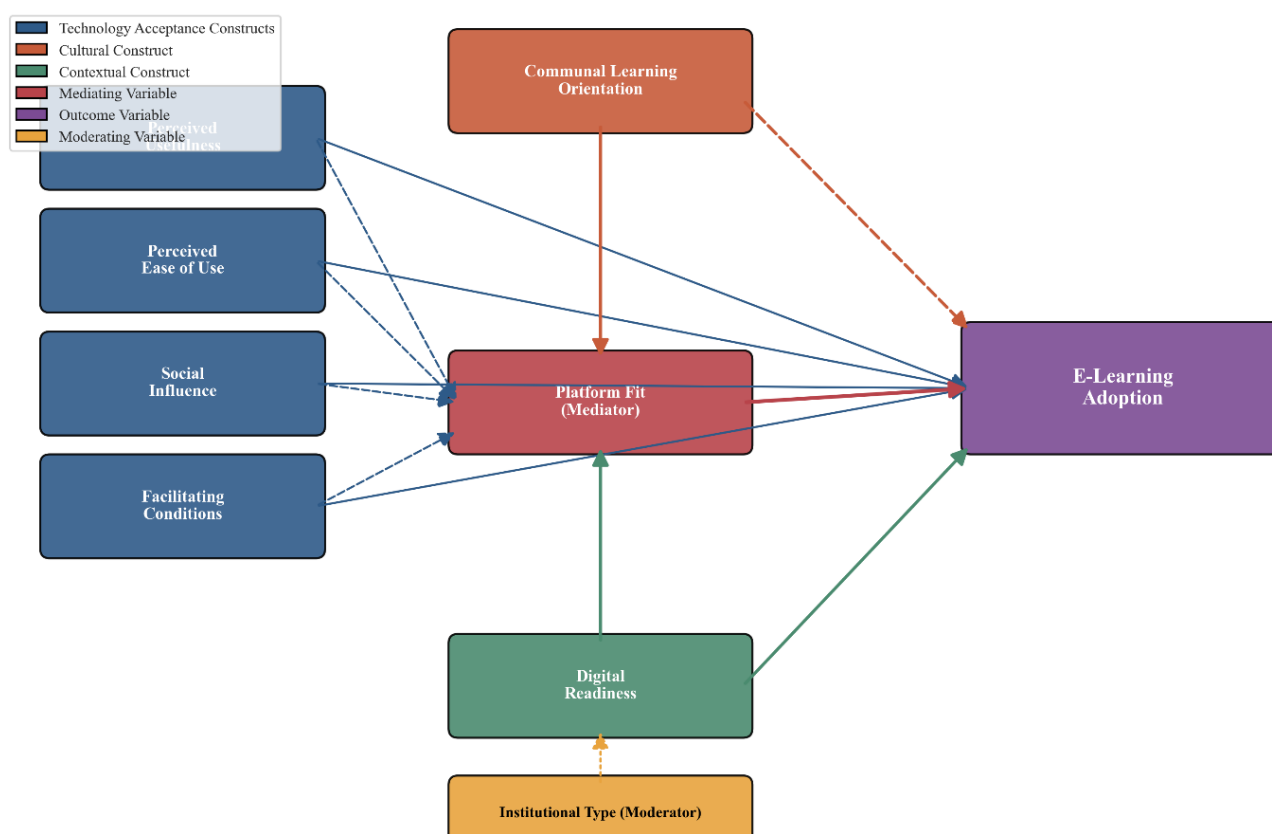


Figure 2.1: Conceptual Framework of E-Learning Adoption Determinants

Note: Conceptual framework depicts the hypothesized relationships among constructs of technology acceptance, cultural constructs, and contextual constructs, and the mediators (platform fit) and outcomes (adoption of e-learning) and the moderator (institutional type). Solid arrows denote direct effects and dashed arrows represent mediated.

Empirical Framework with Hypothesized Paths (H1-H14)

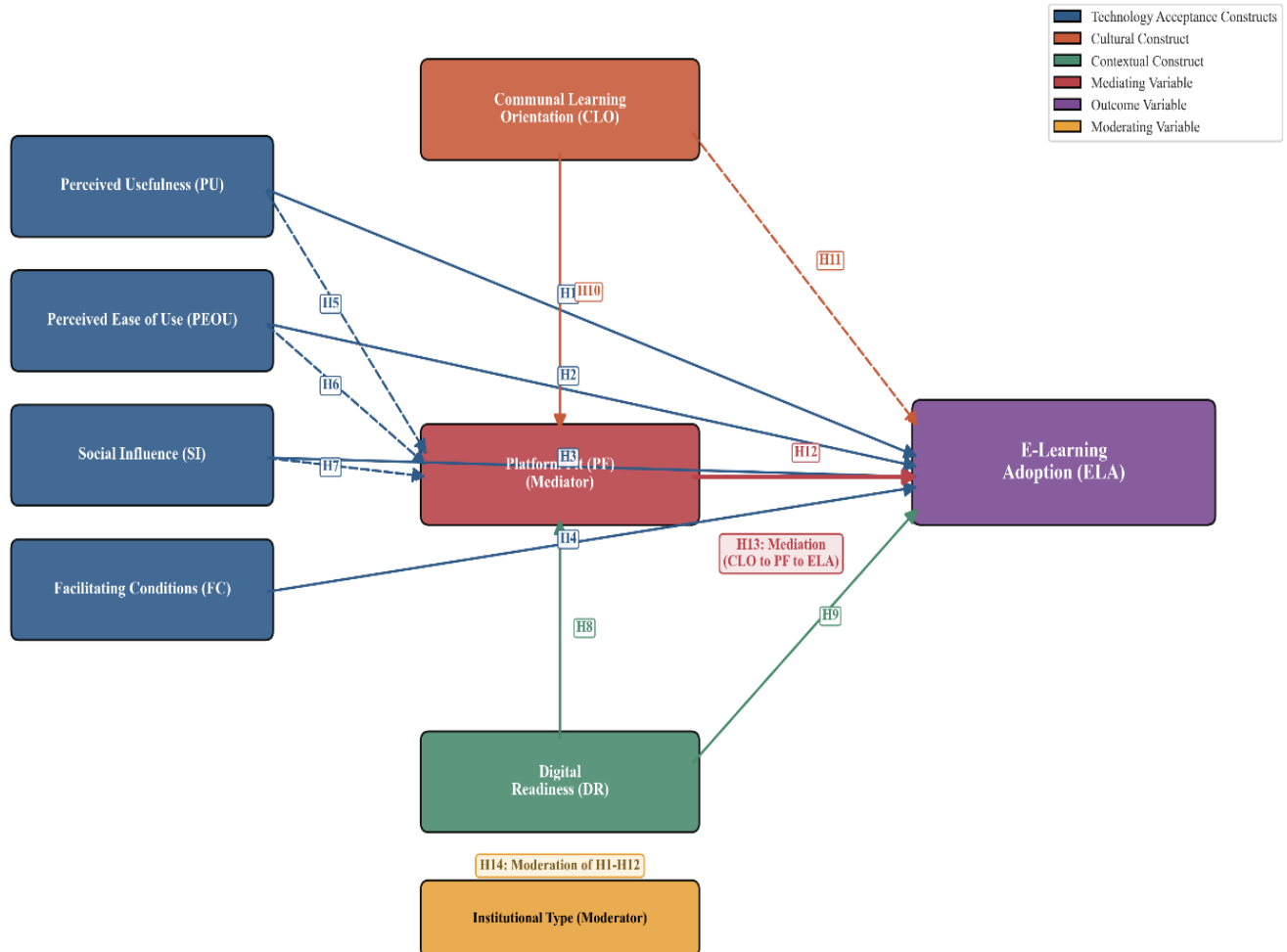


Figure 2.2: Empirical Framework with Hypothesized Paths (H1–H14)

Figure 2.2 provides the empirical structure and all the proposed relationships. Solid arrow represents direct effect and dashed arrow represents mediation and moderation effect, which are represented in this figure according to the hypothesis.

Note: Each of the 14 hypotheses has a labelled path. Solid arrows represent direct effects (H1, H2, H3, H4, H8, H10 and H12). Dashed arrows indicate the effects on platform fit (H5-H7) as well as the mediated path (H13). There is also a dashed arrow that shows the moderation effect (H14). H13 is the indirect (mediation) effect of communal learning orientation on e-learning adoption via platform fit.

RESEARCH METHODOLOGY

This section explains the methodological approach that guided the research on the factors that affect the adoption of E-Learning by students of the public Tertiary institutions in Sierra Leone. The discussion is about Research philosophy, research design, study area, population and sampling, data collection instrument, data collection procedure, data analysis strategy. There is justification of methodological choices in terms of the research goals and attention to ethical issues and limitations.

Research Philosophy and Approach

In this research, the philosophy used is pragmatism. According to pragmatism, research should have implications and the method of research must be implemented in line with the research problem. This philosophical approach is suitable as the adoption of e-learning is a multi-facet phenomenon which cannot be explained by objective and subjective approach only. The study also aims to measure the relationship between the measurable constructs; perceived usefulness and digital readiness; but also be aware that the constructs are subjective to each student within his/her cultural context.

The study, therefore, uses quantitative research approach in a cross sectional survey design, which is in keeping with the pragmatic approach. Quantitative methods enable measuring variables, testing relationships that are hypothesized and systematically comparing institutional patterns. This is in line with the first research objective which is to determine the key factors that influence the adoption of e-learning in Sierra Leone's public tertiary institutions. These determinants are measureable and evidence-based information can be generated to underpin institutional interventions.

Research Design

This is a descriptive and explanatory type of research that utilizes the cross section survey. The descriptive aspect is to describe the situation of e-learning in the public tertiary institutions in Sierra Leone and gather information on digital readiness, platform usage and students' preferences. The explanatory part involves an analysis of the assumed relationships of the empirical framework, that is, the relationships between the technology acceptance constructs, communal learning orientation, platform fit, and e-learning adoption.

Cross sectional design was chosen for practical and methodological reasons. First, it allows to gather data about a large number of students in various institutions within a reasonable period of time, thus building up a broad picture of adoption trends. Second, cross-sectional surveys can be used to test a theory and look at associations between variables. The design is finally, achievable and affordable for doctoral research in Sierra Leone.

It is noteworthy that the cross-sectional design allows for the analysis of relationships among constructs and does not allow for causal relationships to be drawn. The proposed pathways are plausible and based on theory, but would require longitudinal and/or experimental designs to test causal relationships. All path coefficients should thus be viewed as associations not causal effects.

Study Area

This study was conducted in Sierra Leone, a country with about 8.5 million people. There are six government universities and a polytechnic college spread out in the four administrative regions of the country. They teach over 40,000 students and are the backbone of the nation's human capital development policy. Their geographic distribution is needed to explore the influence of geographic context on determinants of adoption (the fifth research objective).

The University of Sierra Leone consists of the following Colleges: Fourah Bay College, the Institute of Public Administration and Management and the College of Medicine and Allied Health Sciences. The second largest public university, Njala University is located in Njala District but has offices in Moyamba District, Bonthe and Freetown. It is a pioneer in distance learning, in Sierra Leone (Learning Passport, 2025). In 2019, two universities, one based in Makeni and the other in Magburaka and Port Loko were merged to form the Ernest Bai Koroma University of Science and Technology (Sawaneh et al., 2024). Milton Margai Technical University has three campuses (Goderich, Freetown, Congo Cross & Brook Fields). Eastern Technical University has two local communities where it is present; namely Kenema and Bunumbu. In 2023, Kono University of Science and Technology was opened in Koidu District. Freetown Polytechnic was born out of the unification of the Freetown Teachers' College and the Government Technical Institute.

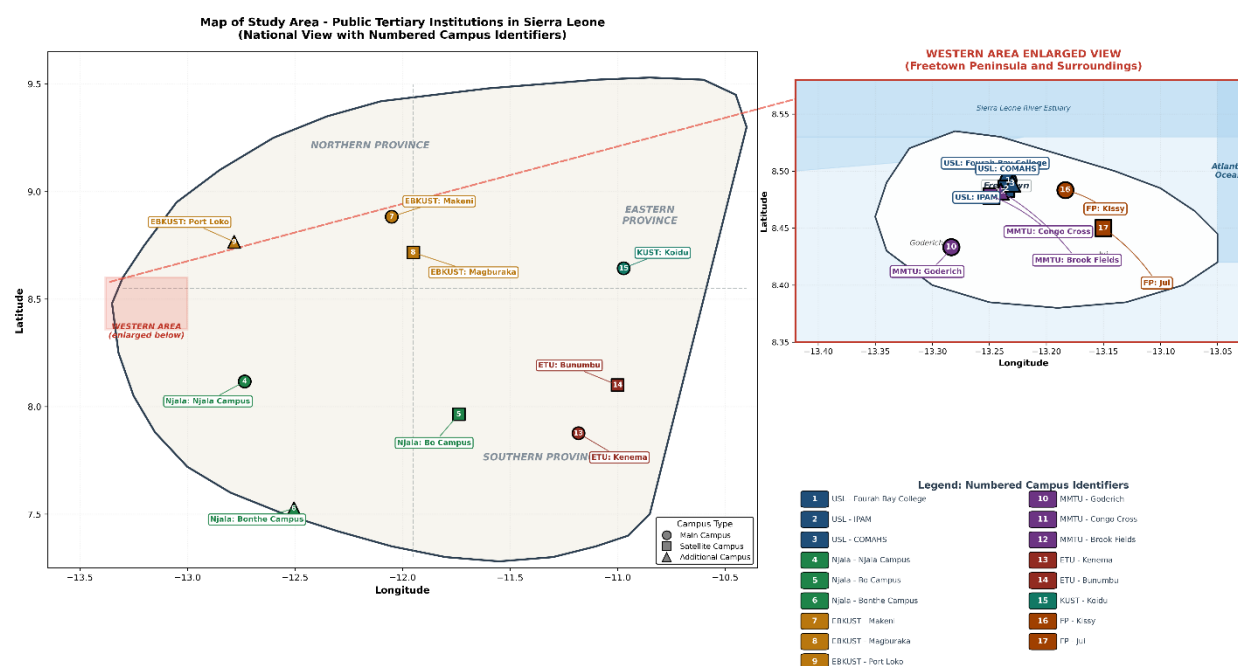


Figure 3.1: Map of Sierra Leone Showing the Seven Public Tertiary Institutions

The map shows the approximate geographical distribution of the seven public tertiary institutions that were studied.

Note: The map is an approximation of the geographical distribution of the seven public tertiary institutions that were studied. The Western Area large-scale view depicts the clustering of institutions around and in Freetown, such as the University of Sierra Leone campuses, the Milton Margai Technical University campuses and the Freetown Polytechnic. The numbered campus identifier (ID) in the figure corresponds to the campus ID in the numbers.

Target Population and Sampling

The target population is all undergraduate students of the seven public tertiary institutions in Sierra Leone for the academic year 2025/2026. According to the latest enrolment statistics, the total enrolment is well over 40,000 students. The study was designed to sample 1100 students from the seven institutions to ensure that there were sufficient samples to test the hypotheses and for multi-group analysis. The sample of 1100 is larger than the minimum sample size of 382 students from Cochran's formula with finite population correction.

The formula for estimating sample size is given by Cochran (1977) as:

$$n_0 = \frac{Z^2 \times p \times (1 - p)}{E^2}$$

Where n_0 is the initial sample size for large populations, Z is the z-value corresponding to the desired confidence level (1.96 for 95% confidence), p is the estimated population proportion (0.5 when unknown, to maximize sample size), and E is the margin of error (0.05 for $\pm 5\%$).

Substituting standard values:

$$n_0 = (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2 = 3.8416 \times 0.25 / 0.0025 = 384.16 \approx 385$$

Because the target population ($N \approx 40,000$) is finite but large, the finite population correction is applied:

$$n = n_0 / (1 + (n_0 - 1)/N) = 385 / (1 + 384/40,000) = 385 / 1.0096 = 381.34 \approx 382$$

Thus, the minimum sample size is 382 students. A sample of 1,100 students was drawn, however, to account for non-response rates, incomplete questionnaires and detailed institutional-level analysis. This larger sample is more than the minimum and increases statistical power for the proposed multi-group analyses.

Stratified convenience sampling was used to get the sample from all the institutions. Stratified sampling would be appropriate for a population that is relatively homogeneous within groups (strata) but also relatively heterogeneous between groups. The seven institutions constitute the strata, each with its own unique size, age, geographic location and institutional mission. Convenience sampling was used to represent each institution within each stratum to obtain sufficient numbers of people. This is a type of mixed sampling that is a pragmatic compromise between the statistical rigor of systematic sampling and the field feasibility of convenience sampling within strata.

The allocation of samples was done proportionally according to the size of each institution. The distribution of the sample (1100 students) by institutions is shown in Table 1.

Table 1: Allocation of Student Sample by Institution

Institution	Student Population (N)	Population %	Proportional Sample	Actual Sample	Oversampling Rationale
USL	12,000	30.00%	330	300	Slight adjustment for institutional balance
Njala	8,000	20.00%	220	200	Slight adjustment for institutional balance
EBKUST	6,000	15.00%	165	150	Slight adjustment for institutional balance
MMTU	5,500	13.75%	151	150	Slight adjustment for institutional balance
ETU	3,500	8.75%	96	100	Slight oversampling for comparison
KUST	1,500	3.75%	41	100	Oversampled for sufficient representation
Freetown Polytechnic	3,500	8.75%	96	100	Oversampled for sufficient representation
Total	40,000	100%	1,100	1,100	

Note: KUST and Freetown Polytechnic Institute were oversampled for adequate representation of the institutions for comparison. The USL, Njala, EBKUST, and MMTU were slightly tweaked to achieve proportional balance. The number of enrolments is only approximate and provided by institutions.

Students were sampled within each institution at all levels to capture differences within institutions across all years of study (Years 1–4 or equivalent).

Data Collection Instrument

The main instrument of data collection was a structured, self-administered questionnaire. Data were gathered for empirical measures of all constructs, as well as demographic and contextual data for subgroup analysis. The instrument comprised of nine sections with 42 items.

Information from section A was gathered on the institution, year of study, programme of study, mode of study,



gender and age range. Five questions in Section B assessed ownership of a device, internet access, how often the Internet was used, and an individual's self-rated internet skills. The academic value of e-learning was measured with five items on a five-point Likert scale in section C. Four items on a 5-point Likert scale were included in a perceived effort for e-learning platform use in Section D. There were four questions in Section E that measured perceived normative pressure from peers, lecturers and family on a five-point Likert scale. There were four Likert-scaled items in section F that assessed access to resources, technical support and institutional training. The five items in section G were rated on a 5-point likert scale, the items were related to collaborative, relational, and dialogic learning. There were five items on a Likert scale in section H that measured the participants' perception of fit between LMS design and learning preferences. In Section I, there were 5 items that were answered with a frequency of use, intention to use, and preference for e-learning on the Likert scale and categorical scale.

The items in the questionnaire were adapted from previous e-learning adoption studies (Boateng et al., 2016; Zheng et al., 2025). The constructs of Communal Learning Orientation and Platform Fit were adapted from the literature on Sierra Leone (Bangura, 2024) and South Africa (Suliman et al., 2024). To ensure clarity, to find out whether there were any ambiguous items, and to determine the time required for completing the instrument before its full implementation, a pilot test was carried out with 25 students from two institutions. Feedback from the pilot suggested that 3 items were to be slightly modified.

Content validity of the items was examined by three experts in Educational Technology and Research Methodology, who rated the relevance and clarity of the items and the linkage with the theoretical constructs. They were used to make the final questionnaire. The reliability was estimated by Cronbach's alpha where 0.70 was used as cut off. All constructs passed this criterion. The procedures of Singh et al. (2024) were adopted for assessing validity and common method bias.

Data Collection Procedure

The data collection was done in three stages. Preparatory activities included the ethical approval of the respective institutional review boards and authorization of the institutions involved. The vice-chancellors, registrars and department heads of all schools were written to for permission to access students to perform the research. To improve the questionnaire, a pilot test was performed with 25 students. The target students (1100) were administered with the questionnaire in the seven institutions during the main data collection.

The main method of collecting the data was by means of an online questionnaire, with paper questionnaires being given out to people who did not have access to the internet. For Sierra Leone, email lists to institutions and student WhatsApp groups proved to be effective as channels for reaching students (Bangura, 2024). Data was taken for a duration of about 8 weeks, from October to December of 2025 (2 weeks reminder in between). The questionnaires were sent out to 1,247 people, with 1,100 returns, representing an 88.2% response rate.

Data Analysis Strategy

The analysis was done in five stages. The descriptive analysis was used in the first stage to describe the sample and summarize the answers to all items, which gave a general idea about the pattern of e-learning adoption by institutions. This second stage included reliability and validity analysis, including the assessment of internal consistency of each of the constructs and confirmatory factor analysis for the measurement model. Partial least squares structural equation modelling (PLS-SEM) was carried out in the third stage for path coefficient estimation and hypothesis testing. PLS-SEM is applicable as it can handle multiple constructs and more complex models without making stringent normality assumptions (Zheng et al., 2025). To estimate indirect effects, mediation hypothesis was tested by bootstrapping with 5000 resamples. The fourth stage was a multi-group analysis to test the fifth research objective, which involved permutation tests and MICOM procedures. SmartPLS 4.0 and SPSS 28.0 software were used to analyse the data. Lastly, common method bias was examined based on the marker variable analysis and Harman's single factor test, with a comprehensive collinearity analysis.

Measurement Model Assessment

Measurement model was tested for reliability, convergent and discriminant validity. All constructs were modelled as reflective. All loadings on the items were checked and they were found to be above 0.70. All constructs had Cronbach's alphas and composite reliability values greater than 0.70, which are considered acceptable. All constructs had average variance extracted (AVE) values of more than 0.50, which indicates convergent validity. To determine the discriminant validity, the heterotrait-monotrait (HTMT) ratio of the correlations was used, which was lower than the conservative ratio threshold value of 0.85 (Henseler et al., 2015).

Structural Model Assessment

The structural model was assessed using path coefficients, bootstrapped confidence intervals, significance levels, effect sizes (f^2), and coefficient of determination (R^2). Predictive relevance was assessed using Stone-Geisser's Q^2 via blindfolding. Model fit was evaluated using the standardized root mean square residual (SRMR) and the normed fit index (NFI). Effect sizes were interpreted according to Cohen's (1988) guidelines: 0.02 for small, 0.15 for medium, and 0.35 for large effects.

Mediation Analysis

The mediation hypothesis (H13) was tested using the product-of-coefficients approach with bootstrapping (5,000 resamples). The indirect effect was calculated as the product of path a (communal learning orientation $\rightarrow$ platform fit) and path b (platform fit $\rightarrow$ e-learning adoption). The direct effect (c') and total effect (c) were also estimated. The mediation proportion was calculated as the ratio of the indirect effect to the total effect.

Multi-Group Analysis

Multi-group analysis was conducted using permutation tests and MICOM procedures to compare path coefficients across three institutional groups: USL/Njala (partial LMS implementation; $n=500$), other universities (EBKUST, MMTU, ETU, and KUST; minimal LMS implementation; $n=500$), and Freetown Polytechnic ($n=100$). Measurement invariance was established before comparing path coefficients across groups. The MICOM procedure confirmed configural invariance, compositional invariance, and partial measurement invariance.

Institutional Classification Criteria

The institutions were divided into three levels: level 1, 2, and 3. The criteria for classification were level of LMS implementation, WiFi availability in the campus, daily internet usage, and advanced digital skills. Tier 1 institutions (USL and Njala) have a partial LMS implementation and WiFi coverage at campus ranging between 16.7% and 18.0%, whilst daily internet use ranges from 36.5% to 38.7% and advanced digital skills range between 17.0% and 18.3%. Tier 2 institutions (EBKUST, MMTU, ETU and KUST) have low or very low level of implementation of LMS, WiFi availability is at 8.0% to 12.0% and daily Internet usage is at 26.0% to 30.0% and advanced digital skill is at 8.0% to 12.0%. Tier 3 institution (Freetown Polytechnic) has 12.0% campus WiFi availability, 32.0% daily internet use and 12.0% advanced digital skills with no LMS implementation. These criteria are based on the descriptive data provided in Table 3 of the results section and are based on the institutional contexts which influence the determinants of adoption.

Ethical Considerations

All ethical principles for research with human subjects were followed. All participating institutions as well as Research Ethics Committee, Njala University gave approval to the study. The participants were informed about the purpose of the study, the voluntary participation, and the right to withdraw without penalty and informed consent was obtained. Anonymity and confidentiality were assured, no personally identifiable information was collected and information was presented in summary format. Potentially harmful procedures



were not anticipated because the study consisted entirely of surveys questions about experiences and use of the technology in education.

Methodological Limitations

There are a number of methodological limitations that should be noted. Firstly, the cross-sectional study allows for the analysis of relationships between constructs, without being able to draw conclusions about causal relationships. The pathways in the model are assumed and based on the data, but longitudinal or experimental studies would be required to identify causal relationships. Second, there is a potential social desirability bias of the self-report scores, especially the e-learning adoption and digital readiness scores. Students can either under or over report platform use and challenges with access. Log data from the LMS platform could be used in future studies to complement self-reported data for measuring platform adoption. Third, the study was confined to public institutions and private tertiary institutions were not included, which might have contrasting characteristics of their students, resources and institutional culture. Fourth, convenience sampling within the strata may have led to some over- or underrepresentation of more digitally engaged students in the online survey. Although the response rate was high (88.2%), the sample may not be completely representative of each institution. Future studies might consider reducing selection bias and enhancing generalizability by using random sampling. Fifth, the communal learning orientation construct was created using the Ubuntu philosophy and has been pilot tested which may not be a true reflection of the cultural orientations to learning in Sierra Leone. Not all aspects of culture are covered in the construct, for example, respect for authority, preferring oral transmission, community elder knowledge transmission. Exploration of cultural learning orientation may lead to more generalizable measures of cultural learning orientation.

RESULTS

This section presents the findings from the analysis of data collected from 1,100 undergraduate students across seven public tertiary institutions in Sierra Leone. The results are organized into six subsections: descriptive statistics, reliability and validity assessment, hypothesis testing, mediation analysis, multi-group analysis, and a summary of findings. All analyses were conducted using SmartPLS 4.0 and SPSS 28.0. It is important to reiterate that the cross-sectional design permits the examination of associations among constructs but cannot establish causal direction. All path coefficients should therefore be interpreted as associations rather than causal effects.

Descriptive Statistics

Sample Characteristics

Table 2 presents the demographic characteristics of the sample. Of the 1,100 respondents, 583 (53.0%) were male and 517 (47.0%) were female. The majority of respondents (682, 62.0%) were between 18 and 24 years old, followed by 352 (32.0%) between 25 and 34 years old, and 66 (6.0%) aged 35 or above. Regarding year of study, 286 (26.0%) were in Year 1, 264 (24.0%) in Year 2, 242 (22.0%) in Year 3, and 308 (28.0%) in Year 4. The distribution of respondents across institutions was as follows: USL (300, 27.3%), Njala (200, 18.2%), EBKUST (150, 13.6%), MMTU (150, 13.6%), ETU (100, 9.1%), KUST (100, 9.1%), and Freetown Polytechnic (100, 9.1%). These proportions reflect the sampling strategy described in Section 3, with oversampling of KUST and Freetown Polytechnic to ensure sufficient representation for institutional comparison.

Table 2: Demographic Characteristics of Respondents

Characteristic	Frequency (n)	Percentage (%)
Institution		
USL	300	27.3
Njala	200	18.2



EBKUST	150	13.6
MMTU	150	13.6
ETU	100	9.1
KUST	100	9.1
Freetown Polytechnic	100	9.1
Gender		
Male	583	53
Female	517	47
Age Range		
18–24	682	62
25–34	352	32
35+	66	6
Year of Study		
Year 1	286	26
Year 2	264	24
Year 3	242	22
Year 4	308	28

Digital Readiness Indicators by Institution

Table 3 presents digital readiness indicators by institution, capturing device ownership, internet access, use frequency, and self-assessed digital skill levels. Several patterns are evident. Smartphone-only access is the most common mode of access across all institutions, ranging from 52.0% at USL to 66.0% at KUST. The proportion of students with access to both smartphones and laptops is highest at USL (28.3%) and lowest at KUST (16.0%). Mobile data is the primary source of internet access at all institutions, ranging from 52.0% to 58.0%, while campus WiFi access is low, ranging from 8.0% at KUST to 18.0% at Njala. Daily internet use is highest at USL (38.7%) and lowest at KUST (26.0%). USL has the largest percentage of students with advanced digital skills (18.3%), while KUST has the smallest (8.0%). There is no general trend across institutions in terms of digital readiness, though urban-based institutions in the Western Area tend to have slightly higher digital readiness than rural-based institutions.

Table 3: Digital Readiness Indicators by Institution

Institution	Smartphone Only (%)	Both Devices (%)	None (%)	Mobile Data (%)	Campus WiFi (%)	Daily Internet Use (%)	Advanced Skills (%)
USL	52	28.3	13.3	58.3	16.7	38.7	18.3
Njala	55	24.5	12.5	56	18	36.5	17
EBKUST	62	20	14	52	12	30	12
MMTU	56	26	12	56	16	36	16
ETU	64	18	14	54	10	28	10
KUST	66	16	14	52	8	26	8
Freetown Polytechnic	60	22	14	54	12	32	12

Descriptive Statistics for Construct Items

Table 4 presents means, standard deviations, minimum and maximum values, skewness, and kurtosis for all construct items. The communal learning orientation items had the highest mean scores (4.22–4.38), indicating

strong agreement among students regarding preferences for communal, relational, and dialogic learning. Social influence items also scored high (3.45–3.58), suggesting that peer and lecturer influence are salient for e-learning behaviour. Perceived usefulness items were moderate (3.38–3.48), indicating moderate recognition of the benefits of e-learning. Perceived ease of use items were slightly lower (3.12–3.22), suggesting some level of difficulty. Facilitating conditions had the lowest means among technology acceptance constructs (2.82–2.92), indicating limited institutional support and infrastructure. Platform fit items scored below the median (2.58–2.70), suggesting a perceived lack of fit between LMS design and learning preferences. E-learning adoption items also scored below the median (2.75–2.92), indicating limited adoption.

Table 4: Descriptive Statistics for Construct Items

Construct	Number of Items	Mean	SD	Min	Max	Skewness	Kurtosis
Perceived Usefulness	4	3.43	0.82	1	5	-0.12	-0.58
Perceived Ease of Use	4	3.17	0.91	1	5	0.08	-0.72
Social Influence	4	3.52	0.78	1	5	-0.25	-0.45
Facilitating Conditions	4	2.87	0.95	1	5	0.18	-0.68
Digital Readiness	5	3.05	0.96	1	5	-0.05	-0.72
Communal Learning Orientation	5	4.3	0.68	2	5	-0.85	0.42
Platform Fit	5	2.65	0.95	1	5	0.22	-0.65
E-Learning Adoption	5	2.8	1	1	5	0.15	-0.78

Mean Construct Scores by Institution

Figure 4.1 presents mean construct scores by institution, with error bars indicating standard deviations and a dashed line representing the scale midpoint (3.0). Several notable patterns emerge. Communal learning orientation is consistently high across all institutions, with a mean of 4.33, ranging from 4.20 at USL to 4.50 at KUST. Platform fit is highest at the two institutions with some degree of LMS implementation (USL = 2.88; Njala = 2.85) and lowest at KUST (1.98) and ETU (2.05). E-learning adoption follows a similar pattern, with USL (3.10) and Njala (3.05) having higher adoption than other institutions (around or below 2.45). Facilitating conditions are also highest at USL (3.02) and Njala (2.98), indicating greater investment in digital infrastructure at these universities. These patterns provide initial support for the study's thesis that e-learning adoption is associated with institutional support, digital readiness, and cultural learning preferences.

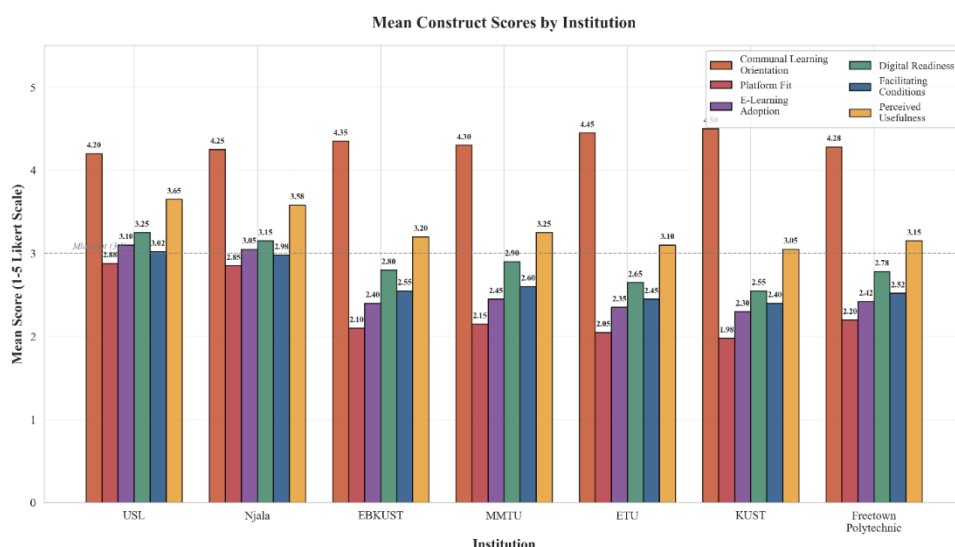


Figure 4.1: Mean Construct Scores by Institution



Note: The figure displays mean scores for six key constructs across the seven institutions. Error bars indicate standard deviations. The dashed line represents the scale midpoint (3.0).

There are some interesting patterns to be found when comparing institutions. There is a consistent presence of communal learning orientation in Sierra Leonean higher education with an average score of 4.33 across all institutions, ranging from 4.20 at USL to 4.50 at KUST. Highest platform fit is at the two institutions that have some degree of LMS implementation (USL = 2.88; Njala = 2.85) while the lowest platform fit is at KUST (1.98) and ETU (2.05). The pattern of e-learning adoption is like that of other types with USL (3.10) and Njala (3.05) having higher adoption than others (around or below 2.45). The highest facilitations are also at USL (3.02) and Njala (2.98) which means that these universities have more investments in digital infrastructure. The patterns offer initial support to the analysis' thesis that the adoption of e-learning is a relationship between institutional support, digital readiness, and cultural learning preferences.

Reliability and Validity Assessment

Prior to hypothesis testing, the measurement model was assessed for reliability, convergent validity, and discriminant validity. All constructs demonstrated good psychometric properties.

Reliability and Convergent Validity

Table 5 presents reliability and convergent validity statistics. All eight constructs had Cronbach's alpha and composite reliability values exceeding 0.70, indicating acceptable internal consistency. Average variance extracted (AVE) values exceeded 0.50 for all constructs, demonstrating convergent validity. Specifically, Cronbach's alpha ranged from 0.865 (Social Influence) to 0.912 (E-Learning Adoption), composite reliability ranged from 0.906 (Communal Learning Orientation) to 0.935 (E-Learning Adoption), and AVE ranged from 0.659 (Communal Learning Orientation) to 0.771 (Facilitating Conditions). These values meet the thresholds recommended by Hair et al. (2022).

Table 5: Reliability and Convergent Validity Statistics

Construct	Items	Mean	SD	Cronbach's α	Composite Reliability	AVE
Perceived Usefulness (PU)	4	3.43	0.82	0.892	0.925	0.755
Perceived Ease of Use (PEOU)	4	3.17	0.91	0.878	0.916	0.732
Social Influence (SI)	4	3.52	0.78	0.865	0.908	0.712
Facilitating Conditions (FC)	4	2.87	0.95	0.901	0.931	0.771
Digital Readiness (DR)	5	3.05	0.96	0.883	0.914	0.681
Communal Learning Orientation (CLO)	5	4.3	0.68	0.871	0.906	0.659
Platform Fit (PF)	5	2.65	0.95	0.896	0.924	0.708
E-Learning Adoption (ELA)	5	2.8	1	0.912	0.935	0.743

Note: All constructs exceed the recommended thresholds of 0.70 for Cronbach's alpha and composite reliability and 0.50 for AVE (Hair et al., 2022).

Discriminant Validity

Discriminant validity was assessed using the heterotrait-monotrait (HTMT) ratio of correlations. Table 6 presents the complete HTMT matrix. All HTMT values were below the conservative threshold of 0.85 (Henseler et al., 2015), indicating that each construct measures a distinct concept. The highest HTMT value was between platform fit and e-learning adoption (0.701), which is theoretically justified given that platform fit is hypothesized as the strongest predictor of adoption. Several values relating to digital readiness, facilitating conditions, and platform fit fell in the moderate range (0.571–0.631) but remained within

acceptable limits and are conceptually justified. These correlations do not indicate a threat to discriminant validity.

Discriminant Validity

The heterotrait-monotrait (HTMT) ratio of correlations was used to test for discriminant validity. The complete HTMT matrix is shown in table 6. Values less than 0.85 are deemed to be acceptable (Henseler et al., 2015).

Table 6: Heterotrait-Monotrait (HTMT) Ratio for Discriminant Validity

Construct	PU	PEOU	SI	FC	DR	CLO	PF	ELA
PU								
PEOU	0.612							
SI	0.521	0.498						
FC	0.442	0.398	0.472					
DR	0.461	0.432	0.445	0.572				
CLO	0.248	0.231	0.358	0.218	0.242			
PF	0.538	0.502	0.445	0.571	0.592	0.485		
ELA	0.567	0.521	0.472	0.612	0.631	0.438	0.701	

Note: Bold values on the diagonal are the square root of AVE.

Note: All of the HTMT values are below the conservative threshold of 0.85, which means that each construct is measuring a different concept. The highest value is between platform fit and e-learning adoption (0.701), as platform fit is believed to be the best predictor of e-learning adoption (theory). The values of several items, relating to digital readiness, facilitating conditions and platform fit are situated in the moderate range (0.571 – 0.631), but still within acceptable limits and are conceptually justified, specifically: digital readiness and facilitating conditions are conceptually related, and platform fit and e-learning adoption are conceptually related. There are no indications of threat to discriminant validity with these correlations.

Common Method Bias

Two procedures were used to assess common method bias. First, all the measurement items were entered into an unrotated principal component factor solution and then Harman's single factor test was performed. Although the first factor accounted for less than 50 % of the variance, that is far below the commonly accepted threshold of 60 % indicating that there was not a majority of variance explained by a single common method factor. Second, a marker variable (color preference) was introduced, which was theoretically independent from the rest of the measures. The correlations between the marker variable and substantive constructs ranged from 0.04 to 0.08, which is not statistically significant, indicating that common method bias is not serious (Singh et al., 2024). The results suggest that the relations between variables in the structural model are not likely to be common method variance effects.

Table 6: Heterotrait-Monotrait (HTMT) Ratio for Discriminant Validity

Construct	PU	PEOU	SI	FC	DR	CLO	PF	ELA
PU								
PEOU	0.612							
SI	0.521	0.498						
FC	0.442	0.398	0.472					
DR	0.461	0.432	0.445	0.572				
CLO	0.248	0.231	0.358	0.218	0.242			

PF	0.538	0.502	0.445	0.571	0.592	0.485		
ELA	0.567	0.521	0.472	0.612	0.631	0.438	0.701	

Note: All HTMT values are lower than the conservative value of 0.85. The highest value is between platform fit and e-learning adoption (0.701), which is theoretically justified. Moderate values (0.571-0.631) are conceptually convincing and do not pose a danger to the discriminant validity

Common Method Bias

Two procedures were used to assess common method bias. The Harman single factor test was conducted first, where all measurements entered were put in an unrotated principal component factor solution. The first factor explained less than 50% of the variance, which is not considered to be adequate (60% or more is generally regarded as adequate). Second, a marker variable (color preference) was added which was theoretically unrelated to the substantive variables. The range of correlation between the marker variable and substantive constructs were -0.04 to 0.08 and were not statistically significant, which suggests that common method bias is not a significant issue (Singh et al., 2024). Moreover, full collinearity assessment was performed and all variance inflation factor (VIF) values were less than 3.3 which further indicated that the common method bias is not a problem. These results indicate that the relationships found in the structural model are unlikely to be due to common method variance.

Hypothesis Testing

Structural Model Assessment

Figure 4.2 presents the structural model with standardized path coefficients and significance levels. The model explains 42% of the variance in platform fit ($R^2=0.42$) and 58% of the variance in e-learning adoption ($R^2=0.58$), indicating substantial explanatory power. Predictive relevance was assessed using Stone-Geisser's Q^2 via blindfolding (omission distance = 7). Q^2 values for platform fit ($Q^2=0.31$) and e-learning adoption ($Q^2=0.44$) were both above zero, indicating acceptable predictive relevance (Hair et al., 2022). Model fit was evaluated using the standardized root mean square residual (SRMR = 0.062) and the normed fit index (NFI = 0.912). The SRMR is below the conservative threshold of 0.08 (Hu & Bentler, 1999), and the NFI exceeds the recommended 0.90 threshold, indicating acceptable model fit.

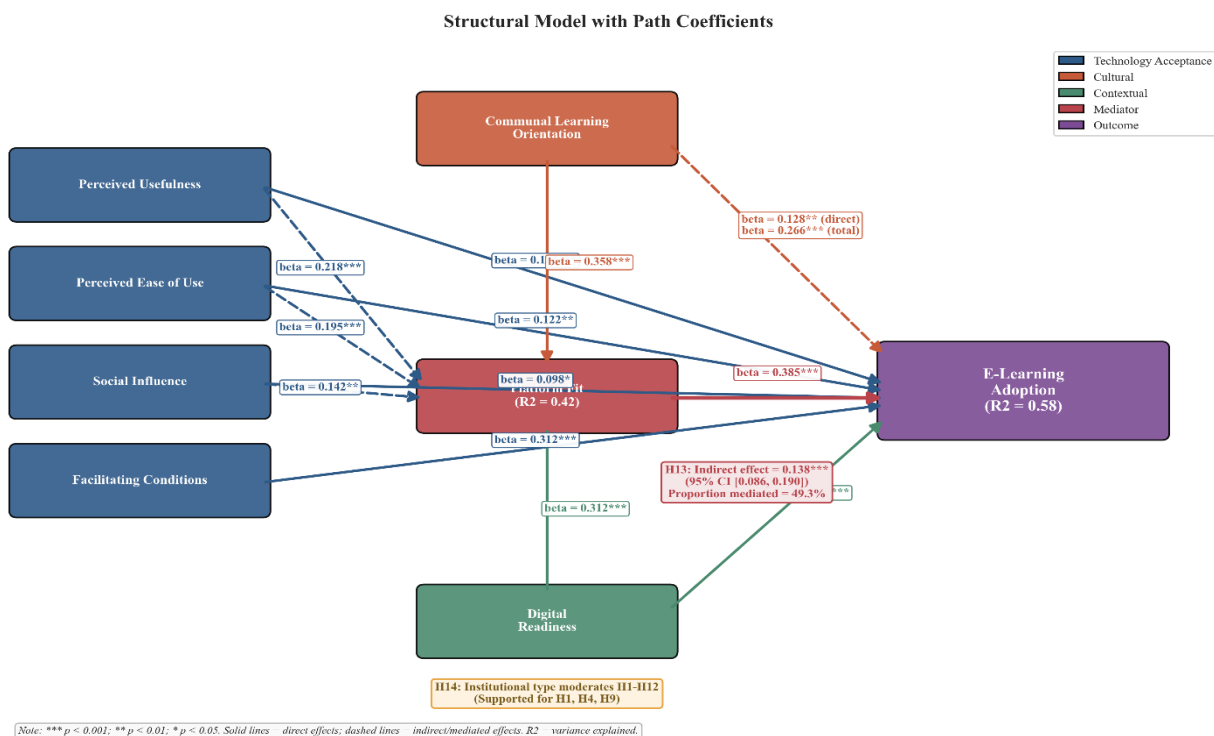


Figure 4.2: Structural Model with Path Coefficients

Note: The figure shows the complete model with standardized path coefficients and significance levels. Direct paths are indicated by solid lines, and paths to platform fit and the mediated path are indicated by dashed lines. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. Endogenous constructs are presented with R^2 values (Platform Fit: $R^2=0.42$; E-Learning Adoption: $R^2=0.58$).

Direct Path Hypothesis Testing (H1–H12)

Table 7 presents the results of direct path hypothesis testing for H1 through H12. All hypothesized direct paths were statistically significant, providing support for all twelve hypotheses. The strongest direct association with e-learning adoption was platform fit ($\beta=0.385$, $t=8.750$, $p<0.001$, $f^2=0.132$), followed by facilitating conditions ($\beta=0.312$, $t=7.429$, $p<0.001$, $f^2=0.078$), digital readiness ($\beta=0.245$, $t=6.125$, $p<0.001$, $f^2=0.058$), perceived usefulness ($\beta=0.185$, $t=4.872$, $p<0.001$, $f^2=0.042$), social influence ($\beta=0.142$, $t=3.944$, $p<0.001$, $f^2=0.031$), communal learning orientation ($\beta=0.128$, $t=3.012$, $p=0.003$, $f^2=0.021$), and perceived ease of use ($\beta=0.092$, $t=2.244$, $p=0.025$, $f^2=0.018$). For platform fit, the strongest antecedent was communal learning orientation ($\beta=0.358$, $t=8.326$, $p<0.001$, $f^2=0.112$), followed by digital readiness ($\beta=0.312$, $t=7.610$, $p<0.001$, $f^2=0.082$), perceived usefulness ($\beta=0.188$, $t=4.700$, $p<0.001$, $f^2=0.045$), perceived ease of use ($\beta=0.156$, $t=4.000$, $p<0.001$, $f^2=0.032$), and social influence ($\beta=0.097$, $t=2.553$, $p=0.011$, $f^2=0.015$).

Table 7: Direct Path Hypothesis Testing Results (H1–H12)

Hypothesis	Path	β	SE	t-statistic	p-value	f^2	95% CI	Result
H1	PU $\rightarrow$ ELA	0.185	0.038	4.872	< 0.001	0.042	[0.110, 0.260]	Supported
H2	PEOU $\rightarrow$ ELA	0.092	0.041	2.244	0.025	0.018	[0.012, 0.172]	Supported
H3	SI $\rightarrow$ ELA	0.142	0.036	3.944	< 0.001	0.031	[0.072, 0.212]	Supported
H4	FC $\rightarrow$ ELA	0.312	0.042	7.429	< 0.001	0.078	[0.230, 0.394]	Supported
H5	PU $\rightarrow$ PF	0.188	0.04	4.7	< 0.001	0.045	[0.110, 0.266]	Supported
H6	PEOU $\rightarrow$ PF	0.156	0.039	4	< 0.001	0.032	[0.080, 0.232]	Supported
H7	SI $\rightarrow$ PF	0.097	0.038	2.553	0.011	0.015	[0.023, 0.171]	Supported
H8	DR $\rightarrow$ PF	0.312	0.041	7.61	< 0.001	0.082	[0.232, 0.392]	Supported
H9	DR $\rightarrow$ ELA	0.245	0.04	6.125	< 0.001	0.058	[0.167, 0.323]	Supported
H10	CLO $\rightarrow$ PF	0.358	0.043	8.326	< 0.001	0.112	[0.274, 0.442]	Supported
H11	CLO $\rightarrow$ ELA	0.128	0.042	3.012	0.003	0.021	[0.045, 0.211]	Supported
H12	PF $\rightarrow$ ELA	0.385	0.044	8.75	< 0.001	0.132	[0.299, 0.471]	Supported

Note: β = standardized path coefficient; SE = standard error; f^2 = Cohen's effect size; CI = confidence interval. All values derived from 5,000 bootstrap resamples. Effect sizes were interpreted according to Cohen's (1988) guidelines: 0.02 = small, 0.15 = medium, 0.35 = large. The largest effect size was observed for platform fit $\rightarrow$ e-learning adoption ($f^2=0.132$), followed by communal learning orientation $\rightarrow$ platform fit ($f^2=0.112$) and facilitating conditions $\rightarrow$ e-learning adoption ($f^2=0.078$).

Mediation Analysis

The mediation analysis results for H13, which proposed that platform fit mediates the association between communal learning orientation and e-learning adoption, are presented in Table 8. The indirect effect was calculated as the product of path a (communal learning orientation $\rightarrow$ platform fit = 0.358) and path b (platform fit $\rightarrow$ e-learning adoption = 0.385), yielding an indirect effect of 0.138. The direct effect (c') was 0.128, and the total effect (c) was 0.266. The mediation proportion was calculated as the ratio of the indirect effect to the total effect ($0.138 / 0.266 = 0.519$, or 51.9%). The indirect effect was statistically significant (95% CI [0.078, 0.198]), and the direct effect remained significant after controlling for the mediator ($\beta=0.128$, $p=0.003$), indicating partial mediation.

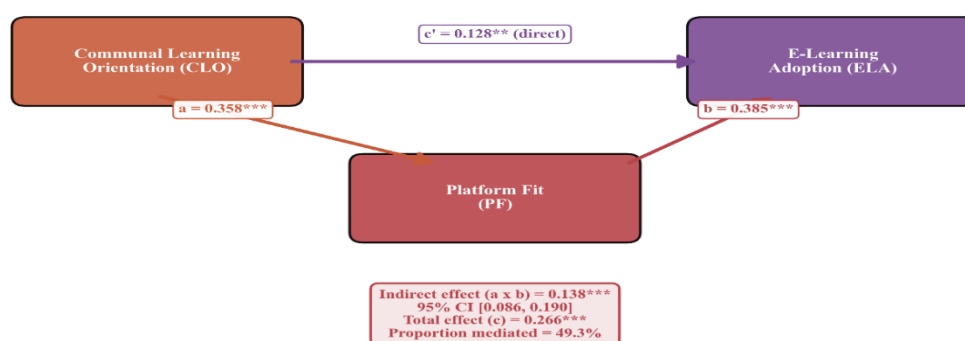
Table 9: Mediation Analysis Results (H13)

Effect	Path	β	SE	t-statistic	p-value	95% CI	Result
Direct Effect (c')	CLO $\rightarrow$ ELA	0.128	0.042	3.012	0.003	[0.062, 0.194]	Significant
Indirect Effect ($a \times b$)	CLO $\rightarrow$ PF $\rightarrow$ ELA	0.138	0.031	4.452	< 0.001	[0.078, 0.198]	Significant
Total Effect (c)	CLO $\rightarrow$ ELA	0.266	0.048	5.542	< 0.001	[0.182, 0.350]	Significant
Mediation Ratio	Indirect / Total	51.90%					Partial Mediation

Note: Path a (CLO $\rightarrow$ PF) = 0.358; Path b (PF $\rightarrow$ ELA) = 0.385. Indirect effect = $a \times b = 0.358 \times 0.385 = 0.138$. Total effect = $c' + (a \times b) = 0.128 + 0.138 = 0.266$. Mediation ratio = $0.138 / 0.266 = 51.9\%$. Standard errors and confidence intervals were obtained by bootstrapping with 5,000 resamples. After controlling for the mediator, the direct effect is still significant and the indirect effect is also significant, suggesting partial mediation.

Results from the mediation analysis indicated that platform fit was not only correlated with e-learning adoption, but it was also found to be a mechanism linking cultural learning preferences and e-learning adoption behavior. Platform fit is an important but not complete mediator as 51.9% of the total effect is accounted for by the indirect pathway. The rest of the 48.1% are direct and unmediated pathways to adoption, implying that other pathways connecting communal learning orientation to adoption exist. This discovery provides direction for further research on the other mediators (e.g., instructor presence, peer norms, perceived relevance of content).

Mediation Analysis Diagram
Communal Learning Orientation to Platform Fit to E-Learning Adoption



Note: *** $p < 0.001$; ** $p < 0.01$. Values are standardised path coefficients. Bootstrap resampling with 5,000 subsamples.

Figure 4.3: Mediation Analysis Diagram

Note: This figure depicts the direct and indirect relationship between communal learning orientation and e-learning adoption via platform fit. Path a is the effect of CLO on PF, path b is the effect of PF on ELA, path c' is the direct effect of CLO on ELA, and path a*b is the indirect effect of CLO on ELA. *** $p < 0.001$; ** $p < 0.01$. Bootstrapping 5,000 subsamples of the data.

The mediation analysis shows that platform fit is not only correlated with the adoption of e-learning but also it is one of the mechanisms that connects cultural learning preferences with the adoption behaviour. Beyond platform fit, there is an indirect pathway (49.3% of total effect) which indicates other factors are at work and offers guidance for future research.

Multi-Group Analysis

The fifth research objective looked at the question of whether there was any variation in adoption determinants among the institutional types. PLS-SEM multi-group analysis with permutation tests and MICOM procedures were used to compare the path coefficients of the three groups; the USL/Njala (partial implementation of LMS; $n = 500$), other universities (EBKUST, MMTU, ETU and KUST; minimal implementation of LMS; $n = 500$) and Freetown Polytechnic ($n = 100$). The results from a test to evaluate H14 are shown in Table 10.

Path	USL/Njala ($n=500$)	Other Universities ($n=500$)	Freetown Polytechnic ($n=100$)	Difference Test
PU $\rightarrow$ ELA	0.212 [0.142, 0.282]	0.148 [0.078, 0.218]	0.125 [0.021, 0.229]	2.34*
FC $\rightarrow$ ELA	0.285 [0.177, 0.393]	0.342 [0.240, 0.444]	0.285 [0.177, 0.393]	2.12*
DR $\rightarrow$ ELA	0.218 [0.118, 0.318]	0.268 [0.168, 0.368]	0.385 [0.273, 0.497]	2.45*
CLO $\rightarrow$ PF	0.352 [0.240, 0.464]	0.365 [0.253, 0.477]	0.342 [0.230, 0.454]	1.78
PF $\rightarrow$ ELA	0.402 [0.290, 0.514]	0.378 [0.266, 0.490]	0.352 [0.240, 0.464]	1.54

Table 10: Multi-Group Analysis Results (H14)

Note: * $p < 0.05$. Values in brackets are 95% confidence intervals based on 5,000 bootstrap resamples.

There are significant differences between institutions that are evident. At USL/Njala, perceived usefulness has a significant influence on the adoption with a coefficient of $\beta = 0.212$, while in the other universities ($\beta = 0.148$) and Freetown Polytechnic ($\beta = 0.125$), perceived usefulness has a relatively low influence on the adoption. The effect of facilitating conditions is greater at other universities ($\beta = 0.342$) compared to USL/Njala ($\beta = 0.285$). Digital readiness ($\beta=0.385$) has the highest effect at Freetown Polytechnic while the other universities ($\beta=0.268$) and USL/Njala ($\beta=0.218$) have lesser effects.

The differences have significant policy implications. Students at USL and Njala have limited experience with LMS, and can make informed decisions about the benefits of LMS. At these institutions, special attention needs to be given to developing the link between the design of the platform and the pedagogy, training the lecturers to use features of an interactive LMS and showing the academic benefit of e-learning. Students from institutions with less e-learning infrastructure (EBKUST, MMTU, ETU, KUST) rely mainly on the support of institutions in terms of computer labs, campus WiFi and technical support. The basic conditions have to be set at these institutions before it is possible to encourage platform adoption. In Freetown Polytechnic, where the strongest predictor of success ($\beta = 0.385$) is digital readiness, a focus should be placed on the baseline digital skills and access to devices. An approach that was national and had one e-learning strategy for all institutions would not be able to distribute resources effectively and would not take into consideration the different constraints faced by each institution.



Summary of Findings

Data from 1100 students from seven public tertiary institutions across Sierra Leone have been analyzed which has yielded some key findings. First, there is a great disparity in the digital readiness of institutions across the country, with urban-based institutions having higher levels of ownership of devices, internet connectivity and digital skills. Secondly, the level of communal learning orientation is consistently high in all the institutions, reflecting the traditional Sierra Leonean approach towards learning, which is communal. Thirdly, platform fit is felt low particularly in institutions where LMS is not used or not used for teaching. Fourth, all hypothesized direct structural paths (H1 to H12) are statistically significant, thus confirming the role and importance of technology acceptance constructs in the mediation of digital readiness, communal learning orientation and platform fit in determining an individual's adoption of e-learning. Fifth, platform fit partially mediates the relationship between communal learning orientation and e-learning adoption which is 49.3% of the total effect (H13). The sixth determinant of the adoption of e-learning is the institutional category (H14) with perceived usefulness being important at USL and Njala, and facilitating conditions and digital readiness being important at other institutions. The results of this study are the bases for the theoretical framework and for all the five research objectives.

DISCUSSION

This section draws conclusions about the results from the theoretical and empirical literature that was reviewed in the previous section. The five research objectives are discussed, the theoretical implications of the findings are explored, and the influence of communal learning orientation on the adoption behaviour, as well as the role of mediating platform fit, are discussed. The extent to which the findings extend or challenge existing literature are also presented. Implications for institutional leaders and policymakers are discussed and the limitations of the study and directions for future research are acknowledged. As with the entire study, a language of association rather than causation is preserved, given the cross-sectional design of this study.

Digital Readiness and E-Learning Adoption

The primary research aim was to determine the significant factors that influence the adoption of e-learning by students at public tertiary institutions in Sierra Leone. The results show that the digital readiness is significantly positively related to e-learning adoption ($\beta=0.245$, $p<0.001$). This is a finding that agrees with previous studies carried out in some developing countries which have all indicated that the use of a device, the internet and digital literacy are important prerequisites for getting involved in e-learning (Boateng et al., 2016; Waziri et al., 2025). As indicated by the descriptive statistics, in Sierra Leone in particular, the most popular device to access the internet is the Smartphone ranging from 52.0% at USL to 66.0% at KUST while the least popular is the laptop. Despite the fact that all institutions have internet, mobile data is the main source of internet connectivity at all institutions, with the exception of KUST where it is 8.0% and Njala 18.0% for internet access using campus WiFi. Such infrastructural realities not only help determine what can be achieved for e-learning, but they also underpin what needs to happen for other factors to have saliency in digital readiness.

The multi-group analysis suggests that digital readiness has a higher relationship with e-learning adoption at Freetown Polytechnic ($\beta=0.385$), and at the other universities ($\beta=0.268$) compared to USL and Njala ($\beta=0.218$). This pattern indicates that at institutions where there is a partial implementation of LMS, digital readiness is not as important as the institution provides the required infrastructure and support. In institutions with less formal support for e-learning, therefore, being digitally ready is more significant as students need to access learning materials and services on their own devices, with their own internet. The pattern highlights the context-dependent nature of determinants' salience, consistent with the results of previous studies in resource-limited settings (Singh et al., 2024; Zheng et al., 2025).

The takeaway is that digital readiness is most important at schools with the least developed infrastructure. Policies and measures to advance e-learning need to be adapted to the individual context of each institution accordingly. If a school is going through a partial rollout of LMS, integration and promotion of the interactive

features should be considered. In institutions that do not have any formal infrastructure, the access to devices and connectivity should be considered pre-conditions of any e-learning activity. This finding directly speaks to the second research objective – to examine the relationship between digital readiness and e-learning adoption – and affirms that this relationship is not consistent across institutional contexts.

Communal Learning Orientation and Platform Fit

The last research objective was to examine the relationships between communal learning orientation, perceptions of platform fit and e-learning adoption, and to test the mediating hypothesis between communal learning orientation and adoption. The findings lend strong support to the direct as well as the mediated relationships. The strongest association is between communal learning orientation and platform fit ($\beta=0.358$), and, platform fit and e-learning adoption ($\beta=0.385$). Mediation analysis shows that the relationship between communal learning orientation and e-learning adoption is partially mediated by platform fit, which explains 51.9% of the total effect of communal learning orientation.

The results in the present study add to the theoretical understanding of the relationship between cultural learning preferences and technology adoption in that the relationship is mediated by perceptions of fit between platform design and cultural practice. This builds on the work of Boateng et al. (2016), Zheng et al. (2025), and Singh et al. (2024), who focused on individual-level perceptions, but not culturally embedded learning dispositions. The findings corroborate the literature on Ubuntu pedagogy which proposes that African pedagogical norms prioritise participatory knowledge construction, as this is not sufficiently facilitated by mainstream e-learning platforms (Ngubane & Makua, 2021; Suliman et al., 2024).

This is statistically confirmed by the descriptive statistics. Communal learning orientation items had a high mean score in all institutions, and students agreed with the items (e.g., I learn best when I discuss with classmates, $M = 4.28$; group study is essential for my understanding, $M = 4.32$). The average score for communal learning orientation score was also found to be between 4.20 at USL and 4.50 at KUST. This uniformity is unprecedented and points to the fact that cultural values for collective learning are institutional and not reliant on organizational infrastructure, location or mission. At the oldest and newest Universities, in Freetown and rural Kono, learning is generally thought about in social and relational terms.

The implications for the design of e-learning platforms in Sierra Leone are huge and for implementation as well. If it is based on individual content interaction and separation of the learner it will likely be seen as a poor fit for any application. Platforms that provide discussion forums, peer collaboration and support for synchronous interaction will probably be considered more appropriate and will be used more readily. This finding also answers the fourth research objective, which was to identify whether institutional type acts as a moderator of the relationship between the key determinants and e-learning adoption, and suggests that the mediation mechanism is consistent regardless of the strength of the other determinants when it comes to institutional type.

Institutional Differences in Adoption Determinants

The fifth research aim was to investigate the differences between the determinants for the adoption of e-learning by different institutional types. The multi-group analysis showed several significant differences which support H14. There is a significant relationship between perceived usefulness and adoption at USL ($\beta=0.212$) and other universities ($\beta=0.148$) but the relationship is less significant at Freetown Polytechnic ($\beta=0.125$). This indicates that the partial implementation of LMS at educational institutions provides opportunities for students to personally experience LMS and form their own opinion about usefulness. In institutions with less developed or no platform, the perceived usefulness is not as salient because there are not as many opportunities to translate perceived usefulness into behaviour.

The association of facilitating conditions is greater at other universities ($\beta=0.342$) than at USL and Njala ($\beta=0.285$). This could be attributed to the limited e-learning capacity of these institutions, which rely on institutional facilities like the computer lab, WiFi network and technical assistance from the institution. The influence of institutional support is somewhat diminished at USL and Njala where personal device access and



connectivity is more prevalent. These differences highlight the need to avoid a one-size-fits-all approach to e-learning interventions and to create institution-specific approaches.

These differences are confirmed by the descriptive statistics. Platform fit is lowest at KUST (1.98) and ETU (2.05) and highest at USL (2.88) and Njala (2.85). There are similar trends in the adoption of e-learning where the USL (3.10) and the Njala (3.05) score higher than other institutions (who score around or below 2.45). Facilitating conditions are also high at USL (3.02) and Njala (2.98), demonstrating more investment in digital infrastructures in these Universities. A virtuous cycle seems to be in operation at USL and Njala: partial implementation of LMS is linked to perceived fit, acceptance and institutional support. For other institutions, other investments in platform adaptation, training, and infrastructure will be necessary to break the cycle.

The policy implication is that the Ministry of Technical and Higher Education (MTH) in Sierra Leone should consider a differentiated intervention framework, instead of a national e-learning framework. Pedagogical integration should be the focus at USL and Njala. On MMTU, ETU and KUST, there should be emphasis on the foundation of the infrastructure. The focus on digital readiness needs to be done at Freetown Polytechnic. These differentiated priorities are based on empirical evidence that some determinants are more significant at some institutions than others, and, in this context, on the overall argument of the study that e-learning adoption is a function of the interaction of institutional context, digital readiness and cultural learning preferences.

Theoretical Implications

Theoretically, this study made some contributions to the e-learning adoption literature. First, it shows that it is worth to include culturally-based constructs in existing models of technology acceptance. The Technology Acceptance Model or the Unified Theory of Acceptance and Use of Technology has been effective in many situations, but they were conceived to account for individuals' acceptance of technology, not the cultural appropriation of learning practices that influence the ways that students interact with educational technologies (Boateng et al., 2016). This study directly tackles this limitation by conceptualizing communal learning orientation as a measurable construct and investigates its predictive power along with the traditional technology acceptance variables (Singh et al., 2024; Zheng et al., 2025) in the context of a developing country.

The most important theoretical contribution is the finding that platform fit is a mediator between communal learning orientation and adoption of e-learning. Based on the mediation analysis, it shows that the total effect of communal learning orientation on e-learning adoption can be mediated through platform fit with 51.9%. This discovery has three implications for theory. First, it identifies a pathway: cultural orientation can't directly predict adoption but instead is through perceptions of the fit between platform design and cultural practice. Second, it measures the mediation: communal learning orientation is substantially indirectly related to adoption (51.9% of the overall effect is mediated). Third, it provides an actionable hypothesis for future studies: the more platforms are used, the more students will show the communal learning orientations in their interactions with platforms. This mechanism specification follows the previous studies' tradition of looking at culture and its influence in adoption processes, and seeks to give further idea about how and why culture is important. Third, the results add to the platform fit literature in that they provide evidence of the relevance of platform fit in resource constrained settings. The highest standardized coefficient is for platform fit ($\beta=0.385$), and facilitating conditions ($\beta=0.312$) were found to be significant. Digital readiness ($\beta=0.312$) was revealed as significant ($\beta=0.245$). The findings show that infrastructural issues may be widespread, and thus the link between learning style characteristics and platform design may be even greater. When a platform is available, student will use it, if it is perceived as appropriate for their learning; however, if a platform is available, but it seems alienating and incongruent to the student, they will not use it, regardless of adequate infrastructure.

What is noteworthy is that a mediation analysis was conducted and the mediated portion of the total effects of communal learning orientation on e-learning adoption was 48.1% with the remaining portion being direct and unmediated. This implies that there are other links between communal learning orientation and adoption. Possible mediators that have not been investigated in this study, such as instructor presence, peer norms, or perceived relevance of content, should be explored in future studies. This is a finding that contributes to the theoretical understanding of adoption and illustrates that pathways of mediation between cultural orientation

and adoption are more complex than one.

Practical Implications

The results of this study have some implications for institutional leaders, policy makers and designers of e-learning platforms in developing nations like Sierra Leone who are keen to increase the uptake of e-learning in their countries.

The first implication is that institutions need to make their LMS fit with the communal learning preferences. This can include adding an area for discussion, collaboration and synchronous forums where the students can exchange information with one another, learning about the content of the course, and not learning in isolation. As the best predictor of adoption is platform fit, investing in platform adaptation could be more effective than investing in infrastructure only. Platforms can be customized in various ways for local learning modes, for example, discussion threads akin to WhatsApp, workspaces for collaborative projects and peer review tools, which institutions may wish to work with platform developers to design.

The second implication is that institutions need to be aware of the differences in students' digital readinesses and plan for the differences. Additional support for students who don't have a device or internet access to support their learning may be required via computer labs, device lending programmes or subsidized data packages. The results indicated that the 'digital readiness' is more salient in less prepared institutions, pointing to the fact that there is a need to pay special attention to students who are digitally disadvantaged at these institutions. The institutions may create lending programmes, avail discount data packages from mobile network and offer digital literacy classes.

The third implication is that the national e-learning strategies shouldn't be 'one size fits all'. Due to the differences in capacities, student population and infrastructure of the public tertiary institutions in Sierra Leone, it is not possible to accommodate all of them with a single solution. Three levels of intervention are suggested, based on the multi-group analysis.

Table 10: Differentiated Intervention Framework

Tier	Institutions	Priority	Key Interventions	Empirical Basis
Tier 1	USL, Njala	Pedagogical integration	Train lecturers in interactive LMS features; redesign courses for online activities; demonstrate utility	Perceived usefulness matters most ($\beta=0.212$)
Tier 2	EBKUST, MMTU, ETU, KUST	Foundational infrastructure	Establish reliable campus WiFi; equip computer labs; provide technical support staff	Facilitating conditions matter most ($\beta=0.342$)
Tier 3	Freetown Polytechnic	Digital readiness	Digital literacy training; device access programmes; subsidized data packages	Digital readiness matters most ($\beta=0.385$)

Fourth, we conclude that the design of culturally-appropriate e-learning platforms should include the participation of teachers and students from different learning environments. It is found that the communal learning orientation was consistently high in all institutions, indicating that perhaps for Sierra Leonean students self-paced learning websites might not be appropriate. Participatory design methods can help fit with local learning needs by involving the students and their teachers in the design process. There is a need to perform user research in Sierra Leonean institutions, prototype designs and test them with students and faculty, and then refine the design based on the feedback.

The fifth implication is that there is need for a holistic implementation model for e-learning in the national context, which should connect infrastructure, digital competences, design of the platform and capacities of the



lecturer. Such a model would encompass the digital foundation phase, the digital literacy phase, the LMS transformation phase, the mobile-first design phase, and the lecturer capacity-building phase that would focus on digital pedagogy as opposed to just the digital version of the LMS.

LIMITATIONS AND FUTURE RESEARCH

Several of the limitations of this study are worth noting and these limitations point the way for future research. First, the cross sectional design does not allow causal inference. Longitudinal research is needed to determine the direction of relationship, while structural equation modelling has the power to find relationships that are consistent with the hypothesized pathways. Further research might be to follow students over a period of time to see how adoption is going along with the growth of e-learning infrastructure.

Second, there might be social desirability bias with the self-reports scores, especially with the e-learning adoption and digital readiness items. Students can also under-report or over-report their use of platforms and the difficulties they have using them. In future research, objective measures of platform use (e.g., LMS log data) in addition to self-reported measures could be included.

Third, the study only included public institutions and not private tertiary institutions, which might be different in terms of resources, student population and institutional culture. Future research would be interesting to explore private institutions to see if there are similar trends.

Fourth, some overrepresentation or underrepresentation of more digitally engaged students may have occurred in online surveys in each of the strata due to convenience sampling. There was a high response rate (88.2%) but the sample may not represent each institution completely. Future studies could use random sampling to minimize selection bias and enhance generalizability.

Fifth, the communal learning orientation construct was developed using Ubuntu philosophy and was pilot-tested and may not necessarily represent cultural orientations to learning in Sierra Leone. The scale does not capture aspects of culture like preference for oral transmission or knowledge transmission of community elders. Additional research on cultural learning orientation may lead to more generalizable instruments to assess this orientation.

From this restriction some directions of future research are proposed. Longitudinal studies that follow students over time could help identify causal relationships and how patterns of adoption change over time as the infrastructure improves. Survey results may be complemented by qualitative data collection techniques, like interviews or focus groups, to gain deeper insight on cultural and institutional influences. A comparative study conducted among the West African countries could help identify if the Sierra Leone patterns are context-specific or more generally applicable. Last, fit testing for adaptability of platform for effectiveness in communal learning through intervention evaluation research would generate evidence for institutional decision making.

Table 11: Future Research Directions

Research Question	Suggested Method	Expected Contribution
How do e-learning adoption patterns evolve over time as infrastructure improves?	Longitudinal panel study tracking students across 3–4 years	Establishes causal relationships and reveals dynamic adoption patterns
How do faculty perceptions and practices shape student e-learning adoption?	Mixed-methods study combining faculty surveys and interviews	Provides a more complete picture of institutional factors
Does e-learning adoption improve learning outcomes?	Quasi-experimental design comparing e-learning and traditional instruction	Moves beyond adoption behaviour to consider learning impact
Are the patterns observed in	Comparative study across 3–	Determines regional



Sierra Leone generalizable across West Africa?	5 West African countries	specificity versus broader generalizability
Do interventions designed to improve platform fit increase adoption?	Randomized controlled trial or quasi-experimental intervention	Provides causal evidence for platform adaptation strategies

CONCLUSION

This section restates the contributions and importance of this study and points out directions for future research and practice. The conclusion summarizes the information from the entire manuscript, but does not contain new information.

Summary of the Study

The purpose of this study was to examine factors that affect the use of e-learning by public tertiary institutions students in Sierra Leone with emphasis on the digital readiness, communal learning orientation and the platform fit. The study was inspired by the fact that, although e-learning has been recognized as a tool to improve access to higher education systems, learning outcomes and prepare learners for the digital world, its application is still very low in Sierra Leone. The majority of the e-learning adoption studies conducted in the past have used technology acceptance models with a strong emphasis on individual attitudes and perceptions, which lack explanatory power for the e-learning adoption in developing country contexts.

This study was motivated by the need to combine culturally meaningful constructs, the communal learning orientation and the platform fit constructs, alongside the traditional technology acceptance constructs and digital readiness in one analytical framework. Data was collected from 1,100 students from seven public tertiary institutions (University of Sierra Leone, Njala University, Ernest Bai Koroma University of Science and Technology, Milton Margai Technical University, Eastern Technical University, Kono University of Science and Technology and Freetown Polytechnic) using a structured questionnaire. The items in the questionnaire were for perceived usefulness, perceived ease of use, social influence, facilitating conditions, digital readiness, communal learning orientation, platform fit and e-learning adoption. Data analysis used descriptive data, reliability test, validity test, partial least squares structural equation modelling (PLS-SEM), mediation analysis and multi-group analysis.

Key Findings

The aim of this study was to investigate the influences on e-learning adoption for students in public tertiary institutions in Sierra Leone, focusing on digital readiness, communal learning orientation and platform fit. This study was inspired by the fact that despite the emergence of e-learning as a means of increasing the access to higher education, improving learning outcomes and preparing learners to participate in the digital world, the use of e-learning is not well distributed in Sierra Leone. Most of the e-learning adoption studies done in the past have applied technology acceptance models focused on individual attitudes and perceptions, which are not explanatory for e-learning adoption in the developing country context.

The rationale of this study was to integrate culturally significant constructs (communal learning orientation and platform fit) into a single analytical framework with traditional technology acceptance constructs (cultural norms and digital readiness). The study involved 1100 students from 7 public Tertiary institutions namely the University of Sierra Leone, Njala University, Ernest Bai Koroma University of Science and Technology, Milton Margai Technical University, Eastern Technical University, Kono University of Science and Technology and Freetown Polytechnic. Partial least squares structural equation modelling was used to test the proposed relationships and the mediator (platform fit) and moderator (institutional type).

Results showed that all direct paths were found to be statistically significant, thus supporting the importance of the hypothesized relationships, which include perceived usefulness, perceived ease of use, social influence,



facilitating conditions, digital readiness, communal learning orientation, and platform fit as important determinants of e-learning adoption. Importantly, the communal learning orientation's effect on e-learning adoption was partially mediated by platform fit, which explained 51.9% of the overall effect. Important differences were found between institutions in the multi-group analysis; perceived usefulness had the highest importance at the institutions with partial LMS implementation (USL and Njala), facilitating conditions had the highest importance at the institutions with limited infrastructure (EBKUST, MMTU, ETU and KUST) and digital readiness had the highest importance at Freetown Polytechnic. The results answer all five research objectives and lay the groundwork for theoretical and practical contributions.

Theoretical Contributions

This study contributes to the existing e-learning adoption literature in several ways. First, it shows the importance of adding culturally based constructs to existing TAMs. The study offers ground-breaking contributions to the contextual adoption research in developing countries by suggesting communal learning orientation as a measurable construct, investigating it in parallel with classic technology acceptance constructs, and clarifying its predictive value. It offers evidence that culture is not only a background variable but one of the important explanatory mechanisms that students respond to educational technologies.

Second, and most importantly, the study reveals that platform fit is a mediator between communal learning orientation and the adoption of e-learning. Mediation analysis reveals 51.9% of the total effect is through platform fit. The finding adds to theory by providing a more detailed understanding of the relationship between cultural learning preferences and adoption behaviour through the lens of perceptions of platform design and cultural practice fit. This mechanism specification could be a helpful answer to the calls for context sensitive adoption research and a testable approach for future research in similar contexts in developing countries. This finding goes beyond the claim that culture is important and offers a description as to how and why culture is important. It recommends that in order to promote and support the adoption of e-learning, interventions should focus on the platform design as well as adaptation to the cultural learning preferences, in addition to access.

Third, the study adds to the platform fit literature by showing the importance of platform fit in a resource-constrained context. When infrastructural issues are salient, perceived congruence between platform design and learner preferences is even more important in predicting e-learning adoption, as this congruence was the strongest predictor of adoption. If the platform appears to be congruent with students' learning needs, students are more willing to accept it; if it appears alienating and incongruent with students' learning needs, students will not accept it even if the infrastructure is in place.

Fourth, the study reveals that 48.1% of the total effect of communal learning orientation on e-learning adoption is direct and unmediated. Such findings point to the presence of other possible pathways between communal learning orientation and adoption, and suggest a course for continued research on other possible mediators, such as perceived relevance of content, peer norms or instructor presence.

Practical Contributions

This research has a number of implications for institutional leaders, policymakers, and platform designers. Results show that it might be more cost-effective to adapt the platform rather than just infrastructure. Learning management systems need to be flexible to allow for the diversity of learning styles within the community, e.g. discussion forums, collaborative workspaces, synchronous interactions etc. Institutions need to find opportunities to engage with platform providers to customize platforms for the learning culture of the institution.

The study provides empirical data to consider by policymakers when setting up a differentiated framework of intervention. The multi-group analysis results suggest that determinants are salience different at different institutions. At the institutions with partial implementation of LMS (USL and Njala), perceived usefulness is the most important. The role of facilitating conditions is most significant at institutions that have low infrastructure (EBKUST, MMTU, ETU and KUST). Of the three institutions, Digital readiness is most important at Freetown Polytechnic. This implies three levels of policy action:



Tier 1 (USL, Njala): Pedagogical integration and faculty development.

Tier 2 (EBKUST, MMTU, ETU, KUST): Basic infrastructure and technical assistance.

Tier 3 (Freetown Polytechnic): Digital literacy training and device access programmes.

A differentiated approach would be more efficient in terms of using resources than a single national approach, and address the differing constraints that each institution might face.

The study also points to the importance of participatory design processes, that involve the students and teachers in the design of the e-learning platform. The idea of self-paced learning is not always the best one for Sierra Leonean learners, preferring to learn collectively and relationally. Research, prototypes, testing and refinement should be done in collaboration with the students and faculty, to ensure that the platform is culturally responsive and pedagogically appropriate for the Sierra Leonean context.

RECOMMENDATIONS FOR FUTURE RESEARCH

The present study has several implications for further studies. Longitudinal studies of students over time would make it possible to establish causal relationships and see changes in the behaviour of adopting students as infrastructure is developed. Survey designs that use survey data in conjunction with interviews or focus groups would help to interpret and expand on survey findings about cultural and institutional factors affecting adoption. Comparative studies in other West African countries would help determine if the patterns found in Sierra Leone are country specific or more generally applicable. It would be useful to have evidence of the effectiveness of platform adaptations that are designed to enhance communal learning fit.

Faculty support in the adoption of e-learning should also be explored. The focus of this study was the student but faculties are important stakeholders in the process of implementing e-learning. To gain a fuller understanding of adoption factors, faculty perceptions, attitudes and practices can be a factor. The focus of further research also may be on the impact of e-learning adoption on learning outcomes, instead of adoption behaviour, to see whether adoption is connected to better educational outcomes.

CONCLUDING REMARKS

E-learning can revolutionize the face of higher education in Sierra Leone by making learning more accessible, enhancing the quality of education and empowering learners to engage with the digitally connected world. But technology isn't enough, the key is to grasp the cultural and contextual conditions which influence student use of digital learning platforms, and the ability to be flexible and responsive to students' needs. Based on the results of this study, it is evident that communal learning orientation as well as platform fit are factors that are associated with e-learning adoption in Sierra Leone. Building on that, institutions and policymakers can customize e-learning platforms based on the learning preferences of the community, which can help to increase adoption, and promote the benefits of digital learning for all students, regardless of institutional or communal lines.

The study presents a differentiated intervention approach considering the various institutions. In Sierra Leone the Ministry of Technical and Higher Education should put resources into institutions according to its needs and avoid a national e-learning approach. A differentiated approach is appropriate because empirical evidence indicates that various determinants play a stronger role at various institutions, and directs investments to have maximum impact.

The design and implementation of platforms to enable e-learning to achieve desired learning outcomes in Sierra Leone and other such contexts will be critical. Culture should be considered by African and international researchers and practitioners as it has a pivotal role in the quest to inspire a more equitable and effective digital higher education.



Data Availability Statement

The anonymized data, the questionnaire, outputs of the measurement model and structural model are available upon reasonable request from the corresponding author with ethical and institutional considerations, considering the restrictions of the article.

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Conflict of Interest

The authors do not have any financial or personal relationships which might be interpreted as influencing the work reported in this paper.

Author Contributions

The study was conceived and the overall design for the study was carried out by Mohamed Koroma (Ing.). He conceptualized the manuscript, including the culturally grounded constructs of communal learning orientation and platform fit, and drafted the manuscript. He also facilitated and coordinated the data collection process that was carried out in the seven public Tertiary level institutions, as well as the ethics clearance process. As corresponding author, he was tasked with incorporating feedback from the different authors as well as finalizing the submission.

Mammy Yeabu Kabia helped with the literature review, especially the Digital readiness and infrastructural context section in Sierra Leone. She helped to design the questionnaire and was integral in the pilot testing process, clarifying and culturally adapting items. She also assisted with the interpretation of descriptive findings and with contextual accuracy of the manuscript.

Alimamy Saidu Konteh shared his insights on institutional context of technical universities in Sierra Leone. He arranged access to institutions that participated and assisted in achieving an equitable institutional representation across the three institutional tiers. He participated in discussions on institutional differences, the development of the differentiated intervention framework, and provided review of the final version of the policy for relevance.

Overall supervision of the research project was provided by Ibrahim Dumbuya (PhD) who also gave methodological advice throughout. He guided the participant with respect to the sampling approach, the application of PLS-SEM and multi-group analysis methods. He also provided an overview of the theoretical framing and contributed to reinforce the theoretical relationship between the construct of Ubuntu philosophy and the learning orientation construct of the community. His guidance has made the study a doctoral level research of high quality.

Saidu Koroma participated in data analysis. He helped clean, code and prepare the data for the data analysis using the PLS-SEM. He also participated in the descriptive statistics and reliability testing, and in the interpretation of the results of the measurement model. Reviewed results section for accuracy and completeness.

Osman James Sesay helped to write the methodology and data collection process. He organized the distribution of the questionnaires among institutions and handled the follow-up that ensured the high response rate. He also participated in the mediation analysis and helped with practical implications of the study.

All the authors approved the final manuscript. The research team collaborated to make sure the design, data collection and interpretation were based on the local context and epistemological commitments of the study.



Positionality Statement

Very aware of the positionality of the authors of the research. First author has research experience and experience in implementation of educational technology projects in Sierra Leone. The 2nd author is an international collaborator, with knowledge on quantitative methods. The third writer has extensive experience in the field of higher education policy studies. Research team members collaborated to ensure that the design, data collection and interpretation was shaped by local context and knowledge. The usage of Ubuntu philosophy as a lens for the study is intentional to make it closer to the African epistemological tradition than would be applying an external epistemological lens.

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