

Evaluating the Current State of E-Learning at KeMU TVET Institute and Developing a Framework for Scalable, Inclusive Adoption

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Abstract

E-learning has revolutionized education worldwide, yet its adoption in Kenya's Technical and Vocational Education and Training (TVET) sector is hindered by infrastructure deficits, insufficient training, and policy gaps. This study evaluated e-learning adoption at the Kenya Methodist University (KeMU) TVET Institute across its Nairobi, Mombasa, and Meru Town Centre campuses. It developed a framework for scalable, inclusive implementation. Using a mixed-methods descriptive survey design, the research targeted 1000 stakeholders, including trainers, trainees, and administrators. A stratified random sample of 279 participants yielded a 95.7% response rate (n=267). Data were collected using questionnaires with both closed- and open-ended questions, and analyzed using SPSS Version 27 for quantitative data and NVivo 12 for thematic coding of qualitative responses. Findings indicated moderate e-learning adoption (42.1% integration rate), with significant disparities: Nairobi led with 64.3% LMS usage, followed by Mombasa (41.6%) and Meru (38.8%). Major barriers included infrastructure limitations (70.8%) and inadequate training (62.5%), while strong institutional commitment (78.3%) offered opportunities for progress. The proposed framework emphasizes infrastructure upgrades, comprehensive capacity building, and robust policy development to overcome barriers and ensure equity. Recommendations include enhancing connectivity in peripheral campuses, implementing tailored training programs, and establishing clear e-learning policies to support sustainable adoption, aligning with Kenya's Vision 2030 and digital education objectives.

Keywords: *E-learning adoption, TVET institutions, Kenya Methodist University, Digital education framework*

1.0 Introduction

The use of Information and Communication Technologies (ICTs) in education has completely transformed teaching and learning practices globally. In general, e-learning is now a central component of contemporary education delivery, providing flexible, learner-centered models that transcend spatial and temporal boundaries (Kebritchi et al., 2020). In Kenya, the Technical and Vocational Education and Training (TVET) sector is pivotal to national development by delivering skills aligned with economic and social priorities, such as Vision 2030 and the Big Four Agenda. However, the takeoff of e-learning in TVET institutions remains low. Challenges persist in infrastructure, pedagogical design, policy alignment, and sociocultural barriers, and institutions in rural and peripheral areas are severely affected by limited digital access and readiness (Ngugi & Mberia, 2022). Kenya Methodist University (KeMU) has invested heavily in digital platforms, training capacity, and learner support systems, and has thus achieved tremendous success in e-learning. However, the connected KeMU TVET Institute, located in Nairobi, Mombasa, and Meru Town Centre (Main Campus), still faces impediments to achieving maximum uptake. These include low trainer preparedness, limited trainee computer literacy, unreliable internet connectivity, and insufficient formal institutional support systems. These are manifestations of the overall systemic impediments to e-learning uptake in Kenya's TVET sector.

Empirical studies attest that while e-learning has the potential to enhance access, equity, and pedagogical quality, its success is often undermined by institutional resistance, inadequate ICT infrastructure, poor pedagogical design, and a lack of stakeholder engagement

(Nyerere et al., 2021; Wambugu et al., 2023). These challenges are compounded by the need for context-specific, inclusive, and scalable models that can facilitate institutional capacity building and align with both national and global education agendas. The COVID-19 pandemic also heightened this need by expediting digital learning efforts across Kenya, making it necessary for TVET institutions' adoption strategies to be timely and urgent.

Despite e-learning's potential to enhance access and quality in Kenya's TVET sector, there is limited empirical understanding of the determinants of e-learning adoption and scalability, particularly in multi-campus institutions such as KeMU TVET Institute. To address these systemic challenges and harness e-learning's potential, this study evaluates the current state of e-learning adoption at KeMU TVET Institute. It proposes a tailored framework to ensure scalable and inclusive implementation across its campuses.

Relevant Theories

This study is grounded in two theoretical frameworks that explain technology adoption in educational contexts. The Technology Acceptance Model (TAM), developed by Davis (1989) posits that perceived usefulness and perceived ease of use are fundamental determinants of user acceptance of information technology. In the context of KeMU TVET Institute, TAM provides a theoretical lens for understanding why trainers and trainees may resist or embrace e-learning platforms across the three campuses. TAM is particularly relevant for examining trainer preparedness, trainee digital literacy levels, and attitudes toward technology integration in TVET education. The model's constructs help identify critical factors

influencing acceptance decisions and guide the development of interventions that enhance both perceived usefulness and ease of use.

Rogers' (2003) Diffusion of Innovations Theory offers complementary insights into how innovations spread through social systems over time. Rogers identifies five characteristics that influence adoption: relative advantage, compatibility, complexity, trialability, and observability. The theory's five adopter categories (innovators, early adopters, early majority, late majority, and laggards) provide a framework for analyzing inter-campus adoption disparities and for designing differentiated implementation strategies. Rogers' emphasis on compatibility suggests that e-learning innovations must align with existing institutional values, practices, and infrastructure capabilities to achieve successful diffusion.

“Conclusively KeMU should develop comprehensive e-learning policies that provide implementation guidelines, quality assurance, resource allocation, and accountability structures”

TVETA’s national baseline survey (April 2021) sampled 283 institutions and found that most had not embraced ODeL, citing inadequate ICT infrastructure and staff capacity. Oloo and Otieno (2022) studied 37 institutions and reported slow trainer acceptance, a shift to online delivery during COVID-19 (68.4% online), and a heavy reliance on Microsoft Teams (86.5%). These

empirical findings reinforce adoption barriers and trends in Kenyan TVETs (TVETA, 2021; Oloo & Otieno, 2022).

These theories provide a comprehensive framework for designing interventions that address both individual acceptance factors and the systemic diffusion processes required for scalable and inclusive e-learning adoption.

Research Problem

Despite continued demand for e-learning, its effective uptake in Kenya's TVET institutions remains limited. Efforts to introduce Learning Management Systems (LMS) and blended learning strategies have made little progress, largely due to systemic and institutional factors, including policy disconnects, inadequate training for trainers and trainees, insufficient infrastructure, and inadequate monitoring and evaluation systems (Otieno & Nyamboga, 2022).

At KeMU TVET Institute, despite being a progressive institution, the potential of e-learning to transform has not been fully harnessed. The primary issue is the lack of a distinct, adaptable structure to guide implementation across its three campuses in Nairobi, Mombasa, and Meru Town Centre. This deficiency prevents effective stakeholder engagement, content development, policy mainstreaming, and sustainability. Closing this gap requires establishing a purpose-driven, context-based structure to enhance e-learning adoption at KeMU TVET Institute and to support learning for use in other Kenyan TVET institutions.

Research Objectives

The overall aim of this study is to evaluate the status of e-learning adoption at KeMU TVET Institute and to lay a broad, scalable, and representative model for enabling its further

institutionalization at the Nairobi, Mombasa, and Meru Town Centre campuses.

The specific objectives are:

1. To assess the current level and nature of e-learning adoption in TVET-related programs at Kenya Methodist University.
2. To formulate a grounded framework that addresses barriers and leverages opportunities to advance e-learning in TVET.

Significance of the Study

This study contributes to the limited empirical research on e-learning adoption in Kenya's TVET sector, particularly in multi-campus institutional contexts. The findings provide evidence-based insights for institutional administrators, policymakers, and educators seeking to enhance the integration of digital learning. The proposed framework provides practical guidelines for resource allocation, infrastructure development, and capacity-building initiatives. Additionally, the study aligns with national education priorities by supporting Kenya Vision 2030 and the Digital Literacy Programme objectives, advancing the country's broader technological advancement agenda.

2.0 Materials and Methods

Research Design

The research employed a descriptive survey design with mixed-methods approaches. This design was suitable because it enabled the collection of both qualitative and quantitative data from a wide range of respondents across various campuses of KeMU TVET Institute. The mixed-methods design also allowed the

triangulation of results by combining numerical data with contextual data, providing a more holistic view of e-learning adoption.

Target Population

The study's target population included all stakeholders of the KeMU TVET Institute who directly or indirectly affect or benefit from e-learning adoption. These included trainers, who are responsible for designing and delivering learning content through digital platforms; trainees, as the end-users of e-learning platforms whose access, attitudes, and competencies are central to successful adoption; and administrative staff, who are involved in decision-making, policy formulation, resource allocation, and the provision of support services that facilitate e-learning. To ensure the findings reflected geographical diversity and institutional realities, the study covered all three campuses of the institution: Nairobi, Mombasa, and Meru Town Centre. From this large population, the study targeted 1000 individuals.

Sampling Procedure and Sample Size

The study used stratified random sampling to ensure adequate representation from each stakeholder group (trainers, trainees, and administrators) across the three campuses of KeMU TVET Institute. The population was stratified, and participants were randomly selected from each group to maintain proportional representation.

Using a 95% confidence level and a 5% margin of error, the sample size was calculated as:

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{E^2}$$

Where:

n = required sample size

Z = Z-value (based on the confidence level)

p = estimated proportion of the population (0.5 for maximum variability)

E = margin of error (expressed as a decimal)

$$n = \frac{1.96^2 \cdot 0.5 \cdot (1 - 0.5)}{0.05^2} = 384.16$$

Applying the Finite Population Correction (FPC):

$$n_{adjusted} = \frac{n \cdot N - 1}{N - 1 + n}$$

Where:

$n_{adjusted}$ = adjusted sample size

n = initial sample size (384)

N = Target population size

For a population size $N = 1000$:

$$n_{adjusted} = \frac{384 \cdot 1000 - 1}{1000 - 1 + 384}$$

$$n_{adjusted} = 278.3 \approx 279 \text{ participants}$$

Instrumentation

The questionnaire was the primary instrument for data collection. It was designed to capture quantitative and qualitative perspectives from trainers and trainees, the key stakeholders in e-learning implementation. The instrument included a mix of closed- and open-ended questions that elicited comprehensive data on demographic characteristics, ICT competence, and access to digital infrastructure. In addition to measurable items, the questionnaires also examined respondents' attitudes toward e-learning, their readiness to embrace technology, and the barriers they felt could hinder successful implementation.

Instrument validation and pilot testing

The questionnaire underwent expert review to

establish content validity. A pilot with a comparable cohort assessed wording, flow, and completion time, resulting in minor refinements. Reliability was assessed using Cronbach's alpha and item-total correlations.

Data Collection and Analysis

Data collection spanned four weeks across all three campuses. Ethical approval was obtained from the KeMU Research Ethics Committee prior to the commencement of fieldwork. Participants received detailed information sheets outlining the study's purpose, their rights, and data protection measures. Written informed consent was obtained from all participants before data collection. To minimize bias, anonymous self-administered questionnaires were used, prompts were prohibited, and routine checks flagged incomplete entries.

Questionnaires were administered during scheduled institutional meetings and training sessions to maximize response rates. The researcher visited each campus twice to ensure adequate coverage and address participant queries. Completed questionnaires were collected immediately to minimize loss and ensure data completeness. Follow-up visits were conducted to retrieve questionnaires from participants who needed additional time to complete them. Quantitative data from closed-ended questions were entered into SPSS Version 27 for statistical analysis. In contrast, qualitative responses from open-ended questions were transcribed verbatim into NVivo 12 for thematic coding using an inductively developed codebook derived from open coding of a pilot subset, refined via iterative memoing and consensus meetings, with intercoder reliability assessed (Cohen's $\kappa \geq 0.80$) before full coding (Braun & Clarke, 2006).

3.0 Results and Discussion

Response Rate and Demographic Profile

The study achieved a response rate of 95.7% (n=267) among the targeted sample of 279 participants across the three KeMU TVET

Institute campuses. This high response rate enhances the reliability and representativeness of the findings, exceeding the 80% threshold typically considered adequate for educational research (Creswell & Creswell, 2018).

Table 1

Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percentage
Campus	Nairobi	98	36.7%
	Mombasa	89	33.3%
	Meru Town Centre	80	30.0%
Stakeholder Group	Trainers	78	29.2%
	Trainees	156	58.4%
	Administrators	33	12.4%
Gender	Male	142	53.2%
	Female	125	46.8%
Age Range	18-25 years	119	44.6%
	26-35 years	87	32.6%
	36-45 years	46	17.2%
	46+ years	15	5.6%

The demographic profile shows balanced representation across all three campuses. The gender distribution was relatively balanced (53.2% male, 46.8% female), which is important for capturing diverse perspectives on technology adoption, as research has shown that gender can influence technology acceptance patterns in educational contexts (Tarhini et al., 2017). The age distribution skewed toward younger participants, with 77.2% under 36 years old, reflecting typical TVET demographic patterns

and suggesting potential advantages for e-learning adoption, given younger populations' generally higher levels of digital literacy (Prensky, 2001).

Current E-Learning Adoption Levels and Inter-Campus Disparities

Assessment of e-learning adoption revealed significant variations across campuses and among adoption indicators.

Table 2

Current E-Learning Adoption Indicators across Campuses

Indicator	Nairobi	Mombasa	Meru TC	Overall
LMS Usage Frequency (Regular)	64.3%	41.6%	38.8%	48.3%
Digital Content Availability	71.4%	52.8%	47.5%	57.3%
E-Learning Integration in Courses	58.2%	35.9%	31.3%	42.1%
Trainer E-Learning Competency (High)	53.8%	32.6%	28.8%	38.4%
Trainee Digital Literacy (Proficient)	61.2%	43.8%	40.0%	48.3%

Overall, e-learning adoption was moderate

(42.1% course integration), with pronounced

inter-campus disparities. Nairobi consistently outperformed other campuses, with LMS usage 22.7 percentage points higher than Mombasa and 25.5 points higher than Meru Town Centre, reflecting the urban–peripheral divide (Porter et al., 2016).

To validate these gaps, chi-square tests of proportions confirmed that campus differences in adoption and LMS usage were statistically significant at $\alpha=0.05$; 95% confidence intervals for pairwise contrasts excluded zero, and effect sizes (Cramér’s V) indicated small-to-moderate practical significance. Representative contrasts

(e.g., 64.3% vs 38.8%) remained significant with Yates’ correction. Trainer competency (38.4%) signals an urgent capacity gap consistent with TAM’s emphasis on perceived ease of use (Davis, 1989). Trainee digital literacy (48.3% proficient) underscores the need for targeted supports, echoing barriers reported by Nyambane and Nzuki (2014).

Infrastructure Availability and the Digital Divide

Assessment of technological infrastructure revealed critical gaps affecting e-learning sustainability and equity.

Table 3

ICT Infrastructure and Resource Availability by Campus

Resource Component	Nairobi	Mombasa	Meru TC	Overall
Reliable Internet Access	87.8%	61.8%	53.8%	67.8%
Computer Lab Adequacy	76.5%	58.4%	51.3%	62.1%
Personal Device Ownership	83.7%	71.9%	68.8%	74.8%
LMS Technical Support	69.4%	44.9%	38.8%	51.0%
Digital Learning Resources	72.4%	51.7%	46.3%	56.8%

Infrastructure availability emerged as the primary determinant of e-learning adoption, consistent with Rogers (2003). To assess whether inter-campus disparities were statistically meaningful, descriptive results were complemented with inferential tests: chi-square for categorical indicators (reliable internet, adequate LMS support), one-way ANOVA for composite readiness scores, and Pearson/Spearman correlations linking infrastructure indices to adoption. The connectivity gap between Meru Town Centre (53.8% reporting reliable access) and Nairobi (87.8%) was statistically significant at $\alpha=0.05$, indicating a meaningful difference; LMS technical support also differed significantly (38.8% vs 69.4%). Correlation analyses showed a positive association between infrastructure

availability and adoption, consistent with Rogers’s diffusion thesis on compatibility (2003). These results mirror broader constraints across Sub-Saharan African institutions, where unreliable connectivity remains the chief barrier to e-learning adoption (Sanchez & Isaacs, 2011; Unwin et al., 2010). Despite relatively high personal device ownership (74.8%), BYOD strategies should account for device heterogeneity, data costs, and equity for the 25.2% without devices (Song, 2014).

Barriers, Cultural Resistance, and Systemic Challenges

Thematic analysis of open-ended responses identified five primary categories of barriers to e-learning adoption.

Table 4
Identified Barriers to E-Learning Adoption

Barrier Category	Frequency	Percentage	Representative Quotes
Infrastructure Limitations	189	70.8%	"Unreliable internet makes online learning frustrating."
Inadequate Training	167	62.5%	"We lack proper guidance on using digital platforms."
Resistance to Change	134	50.2%	"Some trainers prefer traditional teaching methods."
Limited Digital Content	128	47.9%	"Course materials are not available in digital format."
Insufficient Policy Support	98	36.7%	"No clear institutional guidelines for e-learning"

Infrastructure limitations emerged as the most prevalent barrier (70.8%), reinforcing quantitative findings and underscoring the foundational role of technological resources. The high incidence extends beyond connectivity issues to encompass computer lab adequacy, availability of technical support, and hardware reliability.

The training deficit (62.5%) is equally critical to human capacity as technological infrastructure. This finding supports Davis's (1989) emphasis on perceived ease of use, as inadequate training directly increases perceived complexity, creating psychological barriers to adoption. Research in African educational contexts has consistently identified teacher training as a critical success factor for e-learning implementation, and inadequate professional development programs contribute to low adoption rates (Makokha & Mutisya, 2016; Tedre et al., 2010).

Cultural resistance to change (50.2%) reflects organizational dynamics that extend beyond individual attitudes to encompass institutional culture and professional identity. Rogers's (2003)

innovation diffusion framework explains this resistance through considerations of compatibility, as e-learning represents substantial departures from traditional teaching paradigms.

The policy gap (36.7%) indicates insufficient institutional frameworks to guide implementation, set expectations, allocate resources, and ensure accountability. Policy deficits create uncertainty about intellectual property rights, recognition of online teaching workloads, quality assurance standards, and entitlements for technical support (Marshall, 2010). This ambiguity discourages trainers from investing time and effort in developing digital content, thereby perpetuating adoption limitations.

Opportunities and Framework Development Priorities

Despite substantial barriers, respondents recognized significant opportunities to advance e-learning.

Table 5

Opportunities for E-Learning Enhancement

Opportunity Area	Support Level	Potential Impact Rating (1-5)
Institutional Commitment	78.3%	4.32
Government Digital Initiatives	71.2%	4.18
Stakeholder Willingness to Adopt	68.5%	4.06
Growing Digital Literacy	64.8%	3.94
Cost-Effectiveness of E-Learning	61.4%	3.87

Strong institutional commitment (78.3% recognition) provides a favorable foundation for systematic expansion of e-learning. This leadership support is critical for resource mobilization, policy development, and sustained implementation focus (Anderson & Dron, 2011). Alignment with national digital education initiatives (71.2%) creates opportunities to mobilize external support and leverage resources. Kenya's Digital Literacy Programme

and Vision 2030 technology integration priorities establish policy environments conducive to institutional e-learning investments (Farrell & Wachholz, 2003). Based on empirical findings, respondents prioritized five critical framework components necessary for scalable and inclusive adoption. Table 6 presents prioritization results reflecting stakeholder perspectives on implementation sequencing.

Table 6

Framework Development Priorities

Framework Component	Priority Ranking	Mean Score (1-5)
Infrastructure Development	1st	4.67
Capacity Building Programs	2nd	4.52
Policy and Governance	3rd	4.38
Content Development Support	4th	4.21
Monitoring and Evaluation Systems	5th	4.09

The prioritization reflects practical implementation realities, with infrastructure development ranked highest (M=4.67), confirming that technological foundations must precede pedagogical innovations. This priority aligns with Rogers's (2003) compatibility principle and research showing that attempting pedagogical transformation without adequate infrastructure leads to implementation failures that undermine future adoption efforts (Bates, 2005). Capacity building emerged as the second priority (M=4.52), suggesting stakeholder recognition that human resource development must accompany technological infrastructure. Policy and governance structures (M=4.38) ranked third, reflecting understanding that

sustainable adoption requires formalized frameworks that establish expectations and accountability (Marshall, 2010). Monitoring and evaluation systems (M=4.09), though ranked fifth, received strong absolute ratings, demonstrating stakeholder awareness that continuous assessment mechanisms are essential for implementation refinement and sustained quality assurance (Kirkpatrick & Kirkpatrick, 2006).

5.0 Recommendations

Recommendations for Practice

The institution should prioritize infrastructure upgrades, particularly at the Mombasa and Meru Town Centre campuses, where connectivity

issues significantly hinder e-learning adoption. Investments should include reliable high-speed internet, adequate computer labs, and robust technical support. Infrastructure investment yields immediate returns through improved access, reduced digital divide impacts, and a higher-quality learning environment. Enhanced connectivity enables synchronous collaboration, multimedia content delivery, and real-time interaction, replicating the benefits of face-to-face engagement. To mitigate connectivity constraints during infrastructure improvements, hybrid solutions, including offline-capable LMS functionality and downloadable content repositories, should be deployed. Investments should follow a phased approach, addressing critical gaps first and establishing sustainable funding mechanisms for ongoing maintenance and periodic upgrades. Comprehensive infrastructure development positions the institution competitively within Kenya's expanding digital education landscape, attracts technology-oriented learners, and facilitates participation in national and international collaborative programs that require robust digital platforms. Infrastructure parity across campuses ensures equitable educational opportunities regardless of geographic location, supporting inclusive education mandates and social equity objectives.

Secondly, comprehensive capacity-building programs should be implemented. A systematic professional development strategy should address both technical and pedagogical competencies. Training programs should cover navigation of the LMS platform, digital content development, online assessment creation, virtual classroom management, and learner engagement strategies tailored to TVET education. Capacity building directly addresses the 62.5% training deficit, identified as the second-most prevalent barrier. Enhanced trainer competencies increase perceived ease of use, according to Davis's (1989) Technology Acceptance Model, thereby reducing resistance and accelerating adoption. Competent trainers design higher-quality online

experiences, improving learner satisfaction and educational outcomes. Differentiated training pathways that recognize varying levels of competency ensure appropriate support for all trainers. Establish peer mentoring systems and communities of practice to sustain capacity development beyond formal training sessions. Recognize capacity-building efforts through promotion criteria and workload allocations, incentivizing participation and skill application. Sustained capacity building creates institutional knowledge bases that transcend individual personnel, embedding e-learning expertise within organizational culture. As trainers develop advanced digital pedagogical skills, the institution becomes a regional center of excellence for technology-enhanced TVET education, contributing to sectoral advancement and positioning KeMU as a thought leader in digital vocational training.

Recommendations for Policymakers

Institutional E-Learning Policy Framework

The institution should develop comprehensive e-learning policies that provide implementation guidelines, quality assurance standards, resource allocation mechanisms, and accountability structures. Policies should address intellectual property rights, data protection requirements, accessibility mandates, learner support expectations, and recognition of digital teaching workloads. Formalized policies transform e-learning from an optional enhancement to a core institutional function, ensuring systematic implementation rather than sporadic adoption. Clear policies reduce ambiguity about expectations, resources, and support, encouraging trainers to invest in digital pedagogies. Stakeholders should be engaged through consultative policy development processes to ensure buy-in and contextual relevance. The institution should also establish policy review cycles to maintain alignment with evolving technological capabilities and pedagogical practices.

Robust policy frameworks position the institution for accreditation compliance as regulatory bodies increasingly mandate technology integration standards. Policies establish an institutional culture that values innovation, continuous improvement, and learner-centered approaches, attracting progressive faculty and forward-thinking students. Clear governance structures enable effective risk management for data security, ethical use of technology, and equitable access.

Recommendations for Future Research

Longitudinal Impact Studies

Long-term investigations should track e-learning adoption trajectories, assess intervention sustainability, and measure impacts on learning outcomes and institutional effectiveness. Longitudinal research provides evidence of causal relationships between interventions and outcomes, informing resource allocation decisions and policy refinement. Time-series data reveal implementation patterns, identify critical success factors, and highlight

sustainability challenges that require ongoing attention. An evidence-based understanding of e-learning impacts justifies continued investment, guides strategic planning, and contributes to the scholarly literature informing sectoral practices nationally and internationally.

Comparative Institutional Analysis

E-learning adoption patterns across multiple Kenyan TVET institutions should be examined to identify sector-wide trends, transferable best practices, and contextual factors affecting implementation success. Comparative analysis reveals whether KeMU findings generalize across institutions or reflect unique contextual factors, informing both institutional and policy-level interventions. Cross-institutional research identifies systemic barriers that require sectoral rather than institutional solutions. Comparative research builds evidence bases for national policy development, informing government investments in TVET digital infrastructure and establishing quality standards for technology-enhanced vocational education.

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