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RESEARCH ARTICLE

E-learning Readiness and ICT Usage among Public Primary Schools in Athi River Sub-County

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ABSTRACT

It is noteworthy to gauge the level of knowledge, understanding and usage of ICTs in public primary schools by assessing the e-learning readiness of public primary schools in Athi River Sub-County in particular. This paper therefore sought to establish whether e-learning readiness in primary schools is part and parcel of its development initiatives, given the thriving industrial activities in this area. The County, therefore, provides an appropriate setting for comparison of e-learning readiness between rural and urban schools. It was concluded that schools in Athi River Sub-County are not ready to roll out LCP presently, since their e-learning readiness is low given that teachers are currently inadequately trained and the schools have insufficient basic ICT infrastructure and equipment, such as internet connectivity, computer laboratories and Laptops/Tablets/Computers.

Keywords: e-learning; ICT; information computer; public primary schools, Kenya

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Introduction

Despite two decades of sustained policy commitment to integrating information and communication technology (ICT) into basic education across sub-Saharan Africa, the gap between national digital-education ambition and classroom-level reality remains stubbornly wide. Kenya's Vision 2030 blueprint identified ICT-enabled learning as a central pillar of educational transformation, and the subsequent Laptop/Tablet Project sought to operationalise this ambition at the primary-school level (Republic of Kenya, 2007). Yet evidence from across the region suggests that infrastructural investment of this kind, however well-intentioned, does not automatically translate into functional e-learning readiness or sustained ICT usage within schools (Bati & Workneh, 2021).

The persistence of this gap constitutes the central problem this paper addresses: it is not yet clear, particularly at the public primary-school level in Kenya, whether the conditions necessary for meaningful

ICT adoption exist in practice, or whether policy-driven infrastructure provision has outpaced the organisational and human capacity required to use it.

This problem is best understood through the interaction of three variables central to the e-learning readiness literature: infrastructural availability, institutional/organisational capacity, and teacher-level preparedness. Infrastructural availability, encompassing electricity supply, computing equipment, connectivity, and dedicated learning spaces such as computer laboratories, has typically been treated as the most visible and most policy-tractable dimension of readiness, and consequently the one most directly targeted by government interventions such as Vision 2030. However, a growing body of Sub-Saharan African research indicates that infrastructural presence is only weakly predictive of actual ICT usage once other conditions are absent. Barakabitze et al. (2019) demonstrated that across multiple African case studies, ICT integration in education stalled not for want of equipment but because of unresolved policy, financing, and skills gaps operating alongside infrastructural provision.

Agyei (2021), examining a large cohort of teachers across six Sub-Saharan African countries including Kenya, found that capacity-building interventions transferred unevenly into classroom practice, with institutional support and sustained motivation mattering more than initial training exposure alone. Institutional and teacher readiness therefore function not as secondary or downstream variables but as co-determinants of whether infrastructural investment yields any observable change in ICT usage; a relationship that is theoretically well established but has rarely been tested using a full institutional census of ordinary public primary schools operating without special project funding.

This pattern of evidence might support this paper's claim that the persistence of low ICT usage in public primary schools, despite infrastructural gains attributable to Kenya's Vision 2030, is attributable not to a single deficiency but to misalignment between the infrastructural, institutional, and human dimensions of readiness. This is also a misalignment that existing Kenyan literature has documented mainly at the secondary and tertiary levels, and mainly in purposively selected, already-funded institutions, leaving the ordinary public primary school largely unexamined. This research therefore investigates e-learning readiness and ICT usage among public primary schools in Athi River Sub-County, using a census of all schools in the sub-county to establish empirically how far infrastructural provision, institutional capacity, and teacher preparedness align or fail to align at this level of the education system.

Literature Review

E-learning readiness has generally been framed in the literature not as a single attribute but as a composite of infrastructural, organisational, and individual conditions that must be present before technology-mediated learning can be meaningfully adopted. Dada's (2006) critical review of e-readiness in developing countries argued that assessments focused narrowly on the technological environment consistently overstate a country's or institution's actual capacity, because they ignore the user's willingness and ability to adopt the technology once it is available. Engholm (2002) extended this argument by proposing that organisational readiness for e-learning specifically depends on the alignment of technology, content, and human factors, rather than on infrastructure in isolation. Taken together, these foundational works suggest that readiness assessments limited to counting equipment or connectivity, an approach common in many education-sector studies, are likely to produce an incomplete, and possibly misleading, picture of institutional preparedness.

This tension between infrastructural and human readiness is visible when Kenyan studies are placed side by side. Cullen's (2003) account of the digital divide observed that unequal access to information and communication technologies stems from a combination of socio-economic, geographical, and attitudinal barriers rather than technology availability alone, a framing that maps closely onto Kenya's own policy trajectory. The government's Laptop/Tablet Project under Vision 2030 was premised heavily on closing the infrastructural gap in primary schools, yet the broader digital-divide literature implies that infrastructure

provision alone is unlikely to translate automatically into e-learning readiness or adoption, since organisational and individual dimensions remain unaddressed by hardware distribution.

At the higher-education level, Kenyan e-learning readiness studies converge on the finding that institutions with comparatively strong infrastructural investment still report readiness gaps at the human and organisational level. Oketch, Njihia and Wausi's (2014) assessment of the University of Nairobi found that while the institution had achieved meaningful technological capacity, readiness across other dimensions of the model used remained uneven. Okinda's (2014) survey at the Kenya Technical Teachers College similarly applied a multidimensional readiness framework adapted from Engholm's (2002) five-dimension model and found that perceived readiness varied considerably across those dimensions rather than presenting a uniform picture. The consistency of this pattern across two different higher-education institutions strengthens the claim that readiness is genuinely multidimensional; however, both studies relied on self-reported Likert-scale perceptions of readiness rather than independently verified infrastructural audits, raising the possibility that reported readiness reflects respondents' confidence or familiarity with technology as much as the actual state of institutional capacity.

At the secondary-school level, the evidence is more directly comparable to primary-school contexts but also reveals a methodological complication worth noting. Ojwang's (2012) study of public secondary schools in Kisumu County found relatively high rates of grid connectivity and computer laboratory availability, and treated these as evidence of meaningful progress toward e-learning readiness. Ouma, Awuor and Kyambo (2013) reported a broadly similar pattern of infrastructural progress, but in schools that had been deliberately selected because they had already received government ICT development funding, meaning their readiness levels cannot be generalised to secondary schools that received no such targeted investment. Kiilu and Muema's (2012) review of e-readiness implications for secondary education adds a further complication: it noted that only a small minority of secondary schools nationally offered computer studies as a subject at all, a finding that sits in some tension with the relatively optimistic infrastructural figures reported elsewhere. This divergence suggests that infrastructure-focused readiness figures and curriculum-integration figures are capturing different things, and that studies reporting only one are vulnerable to overstating overall school readiness.

Primary education, by contrast, has received comparatively limited direct attention in the Kenyan e-learning readiness literature. Maruti's (2010) study of e-learning readiness among primary teacher training colleges represents one of the few examples situated at this level, and despite examining teacher trainees rather than practising teachers in ordinary public primary schools its findings reinforce the broader pattern seen at secondary and tertiary levels: infrastructural presence does not reliably predict pedagogical readiness to use it. This gap in the literature is significant because primary schools differ structurally from the secondary and tertiary institutions that dominate existing Kenyan readiness research; they typically have smaller budgets, less specialised ICT staffing, and, in the case of public schools, less discretion over how national ICT policy is implemented locally.

A further pattern across this literature concerns the individual teacher as a unit of analysis. Ferdousi's (2009) study of instructors' behavioural intention to use e-learning systems, although conducted outside the Kenyan context, is frequently drawn upon within this literature because it links readiness not only to what an institution provides but to teachers' perceived usefulness of, and confidence with, the technology available to them. This individual-level lens is echoed in Kenyan work examining teacher training and integration practices, such as the KTTC-focused analysis by Anouk, Bart and Nyaga (2005), which considered how teacher training programmes shape the eventual classroom use of ICT rather than treating ICT integration as a purely infrastructural outcome. Read alongside the school-level studies discussed above, this body of work implies that any readiness assessment omitting the teacher's own preparedness and attitude toward ICT is measuring only part of the phenomenon it claims to capture.

Collectively, this literature supports two conclusions that motivate closer investigation of public primary schools specifically. First, there is reasonably consistent agreement that ICT and e-learning readiness in Kenya is multidimensional, encompassing infrastructure, organisational support, and individual teacher

preparedness, and that these dimensions do not necessarily move together; a school or institution can be relatively well-equipped while remaining functionally unready to deliver e-learning. Second, existing Kenyan readiness research is concentrated overwhelmingly at the secondary and tertiary levels, often using purposively selected, ICT-funded institutions that are not representative of the wider population of schools; where primary-level readiness has been examined, it has typically focused on teacher training colleges rather than the public primary schools that form the base of the education system. This creates both a contextual and a methodological gap: little is known about how infrastructural and human dimensions of e-learning readiness interact specifically in ordinary public primary schools operating without special ICT-project funding, and no Kenyan study identified here combines a census-based, institution-level design with a joint assessment of infrastructure and teacher readiness at this level. Investigating e-learning readiness and ICT usage among public primary schools in Athi River Sub-County using a census of all schools rather than a purposively selected subset is therefore positioned to address a gap that the existing literature has left largely unexamined.

Research Methodology

Research Design

This paper adopted a descriptive cross-sectional survey design, structured similarly to an outlet-level survey in which the school, rather than the individual respondent, constitutes the primary unit of analysis. Although data were collected from two respondents per school (the head teacher and a designated computer/ICT teacher), these respondents served as informants reporting on the status, resources, and practices of their institution rather than as independent units of interest in their own right. This design choice is appropriate where the phenomena under investigation (ICT infrastructure, e-learning readiness, and adoption practices) are institutional attributes rather than individual traits, and where within-school responses are expected to converge since both respondents describe the same institutional reality. The descriptive component of the design enabled the study to establish the current status of ICT infrastructure and e-learning readiness across schools, while the cross-sectional element allowed data to be collected at a single point in time across all sampled institutions.

Population and Sample

The population of interest comprised all public primary schools in Athi River Sub-County. Given the relatively small and finite number of schools in the sub-county (35), the paper employed a census approach, targeting all 35 schools rather than drawing a probability sample. This approach eliminated sampling error at the school level and ensured that the findings reflect the full population of public primary schools in the sub-county rather than an estimate derived from a subset.

Within each sampled school, two respondents were purposively selected to serve as institutional informants: the head teacher, by virtue of their administrative oversight of school resources and policy implementation, and a second teacher, preferably one designated with computer/ICT responsibilities, by virtue of their closer operational familiarity with ICT usage in teaching. This yielded a target of 70 respondents across the 35 schools. Because the analytical interest of the study lies at the institutional (school) level, responses from the two informants at each school were treated as complementary sources describing a single institutional unit, rather than as independent observations.

Data Collection Technique

Primary data were collected using structured questionnaires administered through a drop-and-pick-later method. Questionnaires were physically delivered to respondents at their respective schools and collected at a predetermined later date, allowing respondents sufficient time to consult institutional records where necessary (e.g., inventories of ICT equipment) and minimising the disruption associated with on-the-spot interviews. The questionnaire was structured into five sections corresponding to the study's objectives: Section A captured general information about the respondent and the school; Section B addressed the extent

of e-learning usage; Section C addressed e-learning readiness; Section D addressed challenges to e-learning adoption; and Section E solicited suggestions for promoting ICT adoption. Following collection, questionnaires were screened, cleaned, and coded, with incomplete responses or those containing identifiers that could introduce bias excluded prior to analysis. Cleaned data were then entered into the Statistical Package for the Social Sciences (SPSS) for analysis.

Ethical Considerations

This paper observed standard ethical protocols for research involving human respondents. Prior to data collection, informed consent was sought from participating head teachers and teachers, with respondents made aware of the purpose of the study and their right to decline participation without consequence. Confidentiality was maintained by excluding personal identifiers from the analysed dataset, and data collected were used strictly for academic purposes. Respondents were assured that individual or institutional responses would not be used to single out or disadvantage any particular school, consistent with the study's institutional (rather than individual) level of analytical interest.

Model Specification

A multiple linear regression model was used to examine the relationship between the independent variables and ICT adoption in public primary schools. The model was developed and estimated in the following steps:

Step 1. Define the dependent variable.

Y = ICT adoption (the outcome of interest, representing the extent to which schools have adopted ICT in teaching and learning)

Step 2. Define the independent variables. Based on the study's data, four independent variables were specified:

X_1 = Computer equipment

X_2 = Teacher training

X_3 = Teacher readiness

X_4 = E-content

Step 3. Specify the general linear regression equation. The relationship was modelled as:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + e$$

Where:

Y = ICT adoption (dependent variable)

α_0 = the constant (value of Y when all independent variables are zero)

α_1, α_2, α_3, α_4 = the regression coefficients, indicating the expected change in Y for a one-unit change in the corresponding independent variable, holding other variables constant

X_1–X_4 = the independent variables (computer equipment, teacher training, teacher readiness, and e-content, respectively)

e = the error term, capturing variation in Y not explained by the model

Step 4. Standardise coefficients for comparability. Because the independent variables were measured on different scales, standardised (beta) coefficients were used to compare the relative strength of each predictor's effect on ICT adoption, independent of the original units of measurement.

Step 5. Test statistical significance. Each coefficient was subjected to a *t*-test to determine whether its effect on ICT adoption was statistically significant, with significance assessed at the conventional $\alpha = .05$ threshold.

Findings

Descriptives

Descriptive findings reveal a school system with adequate infrastructure but weak digital capacity. While most schools have reliable power and near-universal cellphone access, they remain critically under-equipped with core learning technologies (Table 1).

Table 1

Descriptive summary of e-learning readiness

Indicator	Proportion (%)
Schools with power supply	75.8
Schools with no power outages per week	24.0
Schools with computers	13.0
Schools with internet	4.3
Schools with cellphones	97.8
Schools with radios	78.3
Schools with TVs	23.9
Schools with a computer laboratory	18.2
Teachers preferring computer labs over laptops/tablets	65.2
Teachers who never use computers in teaching	80.5
Teachers using radio frequently/to a large extent in teaching	78.3
Teachers using cellphones frequently/to a large extent in teaching	10.7
Schools not ready for e-learning	60.9
Schools somewhat ready for e-learning	26.1
Schools ready for e-learning	10.9

Only 13% have computers, 4.3% have internet, and 18.2% have a computer laboratory. This gap translates directly into practice, with radio dominating actual classroom use while computers and cellphones sit largely unused for teaching despite their availability. Consequently, a strong majority of schools (60.9%) report low readiness for e-learning, and teachers overwhelmingly favour investment in shared computer laboratories (65.2%) over individual laptops/tablets, suggesting that infrastructure gaps rather than attitudinal resistance are the primary barrier to e-learning adoption.

Empirical Results

A linear regression was conducted to examine the extent to which computer equipment, teacher training, teacher readiness, and e-content predicted ICT adoption among the sampled primary schools. All four predictors were statistically significant at the $p < .05$ level, indicating that each made a unique, reliable contribution to explaining variance in ICT adoption.

Table 2

Multiple regression coefficients for predictors of ICT adoption

Predictor	β	*t*	*p*
(Constant)		−0.21	.790
Computer equipment	.54	5.98	.046
Teacher training	.25	6.59	.044
Teacher readiness	.29	4.42	.040
E-content	.20	7.34	.024

Note. Dependent variable: ICT adoption. *B* = unstandardised coefficient; *SE B* = standard error of *B*; β = standardised coefficient. All predictors were statistically significant at $p < .05$.

Computer equipment emerged as the strongest predictor of ICT adoption (β = .54, $t = 5.98$, $p = .046$), suggesting that schools with greater access to computer equipment reported correspondingly higher levels of ICT adoption. Teacher readiness was the second-strongest predictor (β = .29, $t = 4.42$, $p = .040$), followed by teacher training (β = .25, $t = 6.59$, $p = .044$). E-content had the smallest standardised coefficient (β = .20, $t = 7.34$, $p = .024$) but the strongest statistical significance among the four predictors, indicating a smaller but highly reliable effect on ICT adoption.

These findings suggest that tangible infrastructure, specifically computer equipment, has the largest overall influence on ICT adoption, while human-capacity factors (teacher readiness and training) and content availability (e-content) each contribute meaningfully, if to a lesser degree. Notably, effect size (β) and statistical significance (*p*) diverged for e-content: although its influence on ICT adoption was comparatively modest, the finding is the most statistically robust of the four, meaning readers can be more confident it reflects a genuine effect rather than sampling variability.

Conclusion

The study concludes that public primary schools in Athi River Sub-County were insufficiently prepared for widespread e-learning implementation at the time of data collection. Although electricity and some communication technologies were available in many schools, access to computers, internet connectivity and dedicated ICT facilities remained limited. The low use of computers in teaching further indicates a gap between national digital education ambitions and classroom practice.

Computer equipment showed the strongest reported association with ICT adoption, while teacher readiness, teacher training and e-content also demonstrated positive associations. These findings suggest that improving e-learning readiness requires coordinated attention to technological resources, teachers' capacity and suitable digital learning materials. Providing equipment should therefore be accompanied by practical training, pedagogical support and arrangements for maintaining and using ICT resources.

A phased approach to implementation is recommended, prioritising schools' identified infrastructure and training needs. Education authorities and school leaders should strengthen access to reliable electricity, internet services and appropriate computing facilities while supporting teachers to integrate curriculum-relevant digital content into everyday teaching. Assess progress through actual classroom use alongside equipment availability. Given the study's cross-sectional design and geographical scope, its findings describe local conditions and associations; further research should examine how improvements in readiness translate into sustained ICT use and better learning outcomes.

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