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Technical and Infrastructural Preparedness on ICT Adoption by Tutors in Public Technical Training Institutions in Kenya

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Abstract: ***This study examines the technical and infrastructural readiness of public Technical Training Institutions (TTIs) in Kenya in adopting Information and Communication Technology (ICT). Guided by the Diffusion of Innovation Theory, the research utilizes a cross-sectional descriptive and explanatory design based on a positivist paradigm. A total of 383 tutors and principals from 24 public TTIs participated in the study through structured questionnaires. The results indicate that both technical and infrastructural preparedness significantly influence ICT adoption. The study recommends targeted tutor recruitment, continuous ICT training, and sustained investment in infrastructure to promote technology integration in teaching.***

Keywords: ICT adoption, technical readiness, infrastructure in education, public technical training, Kenya education policy

1. Introduction

Information and Communication Technology (ICT) is recognized as having the potential to improve all aspects of a social-economic and cultural way of life [3]; [4]. In many respects, it has become a key driving force behind operations for organizations, society, and individuals. Industrial sectors that have adopted technology record growth in communication, production as well as revenue [5]. ICT is an umbrella term that encompasses all technologies used for information communication. [2] ICT involves the use of computers, the Internet, and other telecommunication technology in every aspect of human communication. [12] furthermore defines ICT as those tools necessary in processing and communicating information by means of electronic devices such as computers, cameras, and telephones. The researcher defines ICT as the processing and sharing of information using diverse electronic devices. In this study, ICT is used as an umbrella term that includes all technologies used for the manipulation and communication of information.

ICT adoption has been an important research topic in the Information Systems arena for the reason that technology uptake and use are critical to organizational success. Of particular interest to this study is the adoption of ICT in the education subsector specifically in higher education. Ministry of Higher Education, Science, and Technology has noted that ICT adoption is low in institutions of higher learning despite its push for ICT adoption [10].

For ICT adoption to be possible, certain preparedness factors have to be in place. Firstly, institutions must have a skilled group of users and technicians who are technically prepared to support the use of ICT because they possess the right technical know-how. Kenya along with other nations has consistently initiated programs that are directed toward preparing tutors to adopt ICT in their day-to-day teaching practices. In line with this, United Kingdom (UK), Singapore, China, Australia, and European Union (EU), and Africa have established programs that aim at equipping tutors with appropriate ICT skills that would promote the adoption of ICT during the teaching processes [7].

1.1 Statement of the problem

Technical training is critical for the development of skilled personnel required by industries as evidenced by Kenya Vision 2030 which demands competent middle-level professionals to be trained to drive the economy. Technical Training Institutions have a central role in actualizing economic growth in the country by imparting the required technical skills to learners. Instead of this, training services delivered by these institutions must foremost be of high quality and widely accessible to increase the productivity and competitiveness of graduates. It is also expected that technical institutions produce graduates who are competent and prepared to immediately use ICT when they enter the job market in their respective fields because information communication technology permeates all areas of the economy. In order for the above to be actualized, tutors must be prepared to adopt Information Communication Technology in Technical Training Institutions.

However, despite the critical role played by technical training institutions in human resource development coupled with the benefits offered through the adoption of ICT, it is noted by MoHEST's TVET Policy of 2012 that TTIs have not fully adopted ICT as expected [10]. Several aspects of preparedness have been documented by studies as having an influence on ICT adoption in institutions of higher learning. For instance, [15] did a study on E-learning readiness among public Primary Teacher Training Colleges in Kenya. According to the study, tutors lacked adequate skills to use technology in teaching: an indication that they were not technologically prepared to roll out E-learning in colleges.

While some technical training institutions were reported to have Internet access, it was not always available to everyone. According to the report, ICT connectivity is a priority issue that needs to be addressed. ICT adoption was also reported to be greatly hampered by the absence of an enabling environment with tools, structure, and policies. The survey estimated that 15% of technical training institutions did not have the prerequisite requirements for using ICT to deliver coursework. From this revelation, it is evident that both technical and infrastructural preparedness are concerns amongst TTIs: a situation that needs further investigation to fully comprehend the influence.

This study sought to fill the existing knowledge gap by assessing the influence of preparedness on ICT adoption by tutors in Public Technical Training Institutions in Kenya. The study particularly focused on how different determinants such as technical and infrastructure preparedness influenced ICT adoption by tutors in these institutions.

1.2 Research Hypothesis

[1] **H_{o1}:** Technical Preparedness has no significant influence on the adoption of ICT by tutors in Public Technical Training Institutions in Kenya.
[2] **H_{o2}:** Infrastructural Preparedness has no significant influence on the adoption of ICT by tutors in Public Technical Training Institutions in Kenya.

1.3 Significance of the Study

The research is important to several stakeholders within the education sector and even beyond; for example, educators, students, the government, academia, and practically any learning institution interested in adopting ICT. For educators, they can gain important insight into how the technical and infrastructural preparedness of institutions influences the adoption of ICT. The management of learning institutions can gain important insight into the status of preparedness in their institutions for the adoption of ICT. This information could help them to come up with better strategies aimed at promoting a healthy environment for the adoption of ICT in technical institutions. The Kenyan Government as it strives towards a successful devolved government can be enabled to understand how the policies such as those concerning ICT infrastructure, affect the adoption of ICT in learning institutions. This will inform the development of favorable policies that will encourage the adoption of ICT even in the remotest of areas. The study also adds to the existing body of knowledge on the adoption of ICT in learning institutions, particularly in public technical training institutions.

2. Theoretical Review

Diffusion of Innovation Theory (DOI) was developed by Rogers in 1962. It seeks to shed light on how, why, and at what rate new technology spreads throughout a selected group or social system. DOI is one of the oldest and most used social science theories available to researchers and is widely used in technology adoption research. Although DOI has been applied in numerous contexts, [15] quotes it as saying that "Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments". Sahin continues to say that most diffusion research centers on technology innovations and therefore Rogers often used the terms "technology" and "innovation" synonymously.

Chiefly DOI does not conceptualize adoption as a simple binary measure of either adopted or not adopted; however, it considers adoption as occurring in stages. Similarly, this study did not take a dichotomous approach to ICT adoption of either adopted or not adopted, rather adoption was viewed in terms of stages. Particularly the four levels were; no ICT adoption, basic ICT adoption, intermediate ICT adoption, and advanced ICT adoption [1]. DOI guided the study to investigate how technical preparedness, and infrastructural preparedness influence the adoption of ICT by tutors in public technical training institutions.

2.1 Conceptual Framework

The conceptual framework that follows presents the relationship between the study variables. The independent variables for the study were: technical, and infrastructure preparedness while the dependent variable was the adoption of ICT in public TVET institutions.

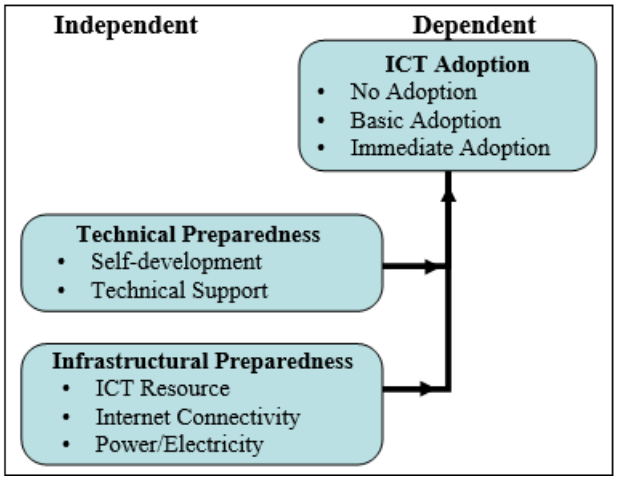

Figure 1: Conceptual Framework
Source: Researcher (2025)

3. Research Methodology

The study followed a positivism research philosophy as it endeavored to uncover fundamental truths about the influence of preparedness on ICT adoption. Positivism is regarded as a scientific approach because it uses highly organized, measurable methods and is based on approaches recommended by the scientific community [11]. In line with positivism research philosophy, all knowledge derived from the study was based on facts gathered directly from the field and measured empirically through the use of statistical analysis methods. The research design used by the study was a cross-sectional descriptive survey combined with an explanatory research design. The cross-sectional survey aspect enabled sufficient data to be observed and gathered at a point in time. According to [14] cross-sectional study design also allows the researcher to compare many variables at the same time.

The sample size in each Technical Training Institution was determined using the sample size determination formula below.

Sample Size Formula:

$$n = \frac{z^2 * p * q * N}{e^2 * (N-1) + z^2 * p * q}$$

The data collection instrument used for the study was through the use of a questionnaire containing both open and closed-ended questions. all variables were indeed reliable as they attained the recommended threshold of Alpha 0.7.

Primary data were cleaned and verified to eliminate respondent errors. Subsequently, coding was performed to condense extensive data sets into smaller analyzable units through the creation of categories and concepts derived from the data. Coding was done to translate question responses into specific categories. Coding was expected to enable the organization and reduction of research data into manageable summaries. The coded quantitative items were entered into SPSS for analysis.

Quantitative data were analyzed using both descriptive and inferential statistics. Descriptive statistics used included percentages, means, and standard deviation. The purpose of descriptive statistics was to describe data characteristics. Further regression analysis was used to infer meaning from the data [12]. On the other hand, content analysis was used to interpret meaning from the content of text data such as comments, categorize and analyze the type of data collected. Statistical Package for Social Sciences (SPSS) package was used to analyze the quantitative data. Tables, graphs, and charts were used to summarize and present the data.

The study used a multi-regression model to test the relationship between the variables as shown below.

$$Y_w = ß_0 + ß_1X_1 + ß_2X_2 + ε \ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where:
Y - Adoption of ICT in Public Technical Training Institutions
X_1 - Technical Preparedness
X_2 - Infrastructure Preparedness
$ß_0$ - Constant
$β_1$ and $β_2$ = Coefficients of predictor variables X_1 and X_2.
ε is the error term.

4. Research Findings

4.1 Technical Preparedness

The respondents were asked to rate how strongly they felt about statements related to technical preparedness in their institutions. Responses were recorded on a 5-point scale ranging from 'Strongly Disagree' to 'Strongly Agree'. The results are shown below.

Table 1: Technical Preparedness

	%						
Technical Preparedness	**SD**	**D**	**N**	**A**	**SA**	**Mean**	**S.D**
There is always a training that precedes introduction of new technology.	4.42	6.64	45.13	15.93	27.88	3.56	1.10
My institution regularly holds training on how to incorporate ICT in the class room.	6.70	10.53	33.97	22.97	25.84	3.51	1.18
I am very confident in using ICT.	2.17	5.22	25.65	26.09	40.87	3.98	1.04
I can easily access competent Institutional technical support.	1.72	11.21	24.14	26.29	36.64	3.85	1.09
Incorporating ICT in teaching is highly encouraged at this institution.	2.64	8.81	19.38	39.21	29.96	3.85	1.03
I have adequate training required to confidently use ICT.	1.74	8.26	21.74	51.30	16.96	3.73	0.90
Most of the institutional technicians are competent in supporting e-teaching.	4.76	9.09	38.10	37.66	10.39	3.40	0.96
The tutors are adequately equipped with relevant skills to support e-teaching.	6.09	10.00	46.09	27.83	10.00	3.26	0.98
There is enough troubleshooting information available to me.	5.19	19.05	44.16	23.81	7.79	3.10	0.97
There are adequate institutional technicians to set up and support teaching equipment in classrooms.	6.03	4.74	31.47	25.86	31.90	3.73	1.14
Aggregate Score						3.56	1.04

n= 233
SD=Strongly Disagree; **D**=Disagree; **N**=Neutral; **A**=Agree; **SA**=Strongly Agree; **S.D**=Standard Deviation

Source: Researcher (2025)

It can be noted that all mean scores in this section scored a value higher than 3.0. The results imply that on average, respondents were in agreement with the statements about overall technical preparedness.

4.2 Infrastructure Preparedness

The respondents were asked to rate how strongly they felt about statements related to infrastructure preparedness in their institution. The scale ranged from 1 to 5. On one extreme, '1' strongly disagreed with the statement while on the other extreme, '5' strongly agreed with the statement. The results are shown below.

Table 2: Infrastructure Preparedness

	%						
Infrastructure Preparedness	**SD**	**D**	**N**	**A**	**SA**	**Mean**	**S.D**
The institution always provides access to adequate ICT resources.	2.58	6.87	22.75	45.49	22.32	3.78	0.96
The most common communication method in the institution is through e-mail.	5.17	8.19	28.45	34.91	23.28	3.63	1.09
Projectors are always available in the classrooms.	7.33	18.97	21.55	12.50	39.66	3.58	1.37
The institution regularly suffers from intermittent power supply.	8.89	18.67	29.33	37.78	5.33	3.12	1.06
Working computer labs are rarely accessible at the institution.	18.06	19.82	28.19	12.33	21.59	3.00	1.38
The Internet connection in the institution is quite reliable.	7.39	9.57	22.61	27.39	33.04	3.69	1.23
Computers can easily be accessed at the institution at any time.	6.03	9.91	21.55	26.72	35.78	3.76	1.21
Printers are always available to print teaching materials.	4.00	8.44	30.67	32.89	24.00	3.64	1.06
Chalk is always used in most of the classrooms.	15.86	16.74	21.15	17.18	29.07	3.27	1.44
Photocopy machines are always available for photocopying teaching materials.	6.55	10.92	27.51	18.34	36.68	3.68	1.25
Aggregate Score						3.52	1.20

n= 233
SD=Strongly Disagree; **D**=Disagree; **N**=Neutral; **A**=Agree; **SA**=Strongly Agree; **S.D**=Standard Deviation

Source: Researcher (2025)

The mean scores for this section show that responses to statements pertaining to infrastructure preparedness scored values greater than 3.0. This implies that in general

respondents were in agreement with statements relating to infrastructure preparedness intheir institutions.

4.3 Multi-regression Analysis

Table 3: Influence of technical and infrastructural preparedness on ICT Adoption Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
		B	Std. Error	Beta			
1	(Constant)	52.234	1.195		43.71	.000	
	Technical Preparedness	8.794	3.112	0.168	2.83	.005	1.353
	Infrastructure Preparedness	16.994	1.905	0.530	8.92	.000	1.353

Source: Researcher (2025)

The coefficient table estimated the equation

$$\mathbf{Y_w = 52.234 + 8.794X_1 + 16.994\ X_2}$$

The coefficients of the model imply that for every unit increase in technical preparedness (X_1), ICT adoption will increase by 8.794 units while for every unit increase in infrastructure preparedness (X_2), ICT adoption will increase by 16.994 units. Technical preparedness was found to be significant in the model ($t = 2.825$, $P = 0.005$), and infrastructure preparedness was also found to be significant in the model ($t = 8.921$, $P = 0.000$) therefore both independent variables were useful in predicting ICT adoption. These findings are consistent with the literature. For example, [9] found that personal, institutional, and technological factors were all influential in teachers' use of computer technology in teaching and learning. Personal factors included ICT competence and teacher ICT experience which were found to influence whether teachers were comfortable using ICT in teaching. Institutional factors included the availability of ICT equipment in schools while technological factors included technical support available in troubleshooting and fixing computer-related problems in the classroom. [6] The study revealed that teachers' computer skills bolstered their confidence in using technology consequently influencing their decision to adopt ICT. [8] Reviewed barriers to ICT adoption in education among developing countries where the findings pointed out lack of resources and ICT infrastructure as key factors hindering ICT adoption thus ICT infrastructure was found to influence ICT adoption.

4.4 Hypothesis Summary

Table 4: Hypothesis Summary

OBJECTIVE	NULL HYPOTHESIS	DECISION	CONCLUSION
1	**H_{o1}:** Technical Preparedness has no significant influence on the adoption of ICT by tutors in Public Technical Training Institutions in Nairobi County, Kenya.	Reject	Technical Preparedness was found to have significant influence on the adoption of ICT by tutors in Public Technical Training Institutions in Nairobi County, Kenya.
2	**H_{o2}:** Infrastructural Preparedness has no significant influence on the adoption of ICT by tutors in Public Technical Training Institutions in Nairobi County, Kenya.	Reject	Infrastructural Preparedness was found to have significant influence on the adoption of ICT by tutors in Public Technical Training Institutions in Nairobi County, Kenya.

Source: Researcher (2025)

5. Recommendations

Technical preparedness was found to be a positive and significant contributor towards ICT adoption. The policy implication here should start at the point of recruiting new tutors. Human resource managers should seek to recruit only those potential tutors with prior exposure to ICT-related in-service training. This will ensure that these individuals come into the institutions prepared to use ICT in the classroom. Continuous pieces of training will also be necessary to keep tutors abreast of emerging technology and new ways to incorporate ICT in learning. The training can be conducted by consultants or the institution can identify technology champions within the institutions who can mentor their colleagues in using technology. Managers also need to ensure that there exists enough technical support staff available to troubleshoot and address any hardware or software malfunction that goes beyond tutors' abilities. It has been noted that having competent technical support staff available at tutors' disposal drastically reduces anxiety about using technology in the classroom.

Infrastructure preparedness was also found to be a positive and significant contributor towards ICT adoption. The policy implication here is that institution management should be keen to continuously invest in their ICT infrastructure. Resources such as computer hardware and software should be made available and adequate to allow tutors to incorporate them into teaching. The ICT resources should, in addition, be kept up to date-and properly maintained so as not to frustrate users. Reliable internet connectivity in technical institutions is also important as it helps instructors communicate with students opening up a new pedagogical approach to teaching. Internet connectivity is also useful in conducting research as well as preparing lectures. The institutions should make internet access available to all tutors and provide both wired and wireless connectivity options. Since Kenya suffers from an intermittent power supply, institutions must ensure they have power backups through the use of generators and alternative energy as the ICT infrastructure is unusable without a dependable power supply.

6. Contributions of the Study to Knowledge

This study adds therefore adds significant value to the body of knowledge by focusing on the influence of preparedness on ICT adoption by tutors in technical institutions. It provides robust empirical data that can be generalized to other public technical institutions in the country. It sheds additional light on how certain factors, for example, technical preparedness and infrastructure preparedness, influence ICT adoption by tutors in these institutions.

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