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ICT INFRASTRUCTURE STRATEGY ON THE PERFORMANCE OF PRIVATE UNIVERSITIES IN KENYA

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ABSTRACT

This study examined the influence of Information and Communication Technology (ICT) infrastructure strategy on the performance of private universities in Kenya. The study was guided by strategic management theories, particularly the Resource-Based View (RBV), which posits that digital capabilities constitute strategic resources that can enhance organizational performance. A descriptive and explanatory research design was adopted, targeting faculty, administrative, and ICT support staff in private universities. Stratified random sampling was employed, yielding 237 valid responses. Data were collected using a structured Likert-scale questionnaire and analyzed using SPSS. Binary logistic regression analysis revealed that ICT infrastructure strategy had a strong, positive, and significant influence on university performance ($B = 3.135$, $Wald = 61.753$, $p < .001$). The model demonstrated substantial explanatory power (Nagelkerke $R^2 = .677$) and high predictive accuracy (92.4% overall classification accuracy). The odds ratio ($Exp(B) = 22.995$) indicates that a one-unit increase in ICT infrastructure strategy increases the likelihood of high university performance by approximately 23 times. The study concludes that robust ICT infrastructure such as high-speed internet connectivity, digital resources, and reliable online platforms significantly enhances academic, operational, and financial performance. The study recommends sustained and strategic investment in ICT infrastructure to strengthen digital delivery, research productivity, and administrative efficiency in private universities in Kenya.

1. INTRODUCTION

Digital transformation has become central to higher education performance, particularly in the wake of remote working, blended learning, and technology-mediated academic services. In Kenya's private universities, ICT infrastructure plays an essential role in enabling online teaching, digital assessment, virtual communication, and administrative automation. University performance today is increasingly dependent on robust ICT systems, including high-speed connectivity, secure networks, reliable learning platforms, and digital support systems.

Despite its strategic importance, many universities struggle with inadequate bandwidth, outdated infrastructure, or insufficient digital support. Existing studies highlight ICT as a driver of educational outcomes and operational efficiency, yet evidence remains limited in the Kenyan private university context. This study therefore examined the influence of ICT infrastructure strategy on the performance of private universities in Kenya.

2. EMPIRICAL LITERATURE REVIEW

Existing literature consistently demonstrates that ICT infrastructure is a critical driver of organizational and institutional performance across sectors. Studies in developed economies show that strategic ICT investments enhance operational efficiency, decision-making speed, and institutional competitiveness (Henderson et al., 2023; Anser et al., 2021). Advanced digital infrastructure, including cloud computing, real-time data analytics, and integrated administrative systems, has been associated with improved productivity and performance outcomes in higher education institutions.

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Empirical evidence from emerging and middle-income economies further confirms the importance of ICT infrastructure in supporting institutional development. Research across Asia and Africa indicates that robust digital infrastructure facilitates online learning, improves research productivity, and enhances service delivery, although benefits are often constrained by inadequate broadband access, high costs, and limited institutional capacity (Kurniawati, 2022; Teferra, 2022). Studies focusing on digital learning environments highlight that ICT resources positively influence student engagement and learning outcomes, yet often neglect faculty productivity and administrative efficiency as dimensions of institutional performance (Hanaysha et al., 2023; Fitria, 2023).

Within the African context, several studies report uneven ICT adoption in private universities due to financial constraints, policy inconsistencies, and disparities between urban and rural institutions (Wainaina & Ndungu, 2021; Akinyemi & Banda, 2023). Research in East Africa demonstrates that universities with stronger ICT infrastructure experience higher student retention and improved online learning outcomes, but these studies rarely assess the broader organizational performance implications, including administrative efficiency and strategic outcomes (Kariuki & Njoroge, 2021).

In Kenya, existing studies show that ICT adoption enhances student engagement and faculty research productivity; however, smaller private universities face sustainability challenges due to limited financial resources and inadequate institutional support (Njenga & Kimani, 2022; Mutua & Wambua, 2023). While these studies provide valuable insights into ICT use and barriers, they largely focus on instructional effectiveness or adoption challenges rather than empirically examining the direct influence of ICT infrastructure strategy on overall university performance.

Overall, the reviewed literature underscores the strategic importance of ICT infrastructure in higher education but reveals a significant empirical gap in the Kenyan private university context. Specifically, there is limited quantitative evidence linking ICT infrastructure strategy to comprehensive institutional performance outcomes. This study addresses this gap by empirically examining the influence of ICT infrastructure strategy on the performance of private universities in Kenya.

2.1. Research Objective

To determine the influence of Information Communication Technology (ICT) infrastructure strategy on performance of private universities in Kenya

2.2. Hypothesis

H_0: ICT infrastructure strategy has no significant influence on the performance of private universities in Kenya.

3. METHODOLOGY

The study adopted a descriptive and explanatory research design. The target population comprised 36 private universities in Kenya, from which 33 universities were selected for the study. The unit of analysis consisted of 9,512 staff members, including university administrators, faculty members, and ICT support staff.

A stratified random sampling technique was employed to ensure adequate representation of the different staff categories. The sample size of 384 respondents was determined using the Yamane (1967) formula, based on the total population of 9,512. From this sample, 237 valid responses were obtained and used for analysis.

$n = \frac{N}{[1+N(e^2)]}$ Where: n = required sample size, N = population size, e = margin of error (0.05).

Using Yamane's formula: $n = \frac{9512}{[1+9512(0.05^2)]}$; $n \approx 384$

Data were collected using a structured questionnaire measuring ICT infrastructure strategy and university performance. Instrument validity was established through expert review, while reliability was assessed using Cronbach's alpha, with coefficients exceeding the acceptable threshold of 0.70.

Quantitative data were analyzed using descriptive statistics and logistic regression analysis. University performance was treated as the dependent variable, while ICT infrastructure strategy served as the independent variable.

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4. RESULTS AND DISCUSIONS

4.1. Response Rate

Questionnaires were distributed to 384 respondents across selected private universities in Kenya, consistent with the sample size determined in Chapter Three. A total of 237 completed questionnaires were returned and deemed valid for analysis, yielding a 61.7% response rate. This response rate is considered acceptable in survey research. (Mugenda & Mugenda, 2003) and (Babbie, 2015) note that response rates of 60% and above are adequate for analysis and reporting. Similarly, recent literature reports comparable response rates in education-related surveys, with studies achieving 60–65% response rates in professional and academic contexts (Wu et al., 2022). The U.S. National Household Education Surveys Program also reported a 60% screener response rate (NCES, 2022). Accordingly, the response rate attained in this study is sufficient to support the reliability and representativeness of the findings.

Table 1 Descriptive statistics for ICT infrastructure strategy.

#	Statement	N	Min	Max	Mean	SD
1	The university has a robust digital connectivity infrastructure that supports online learning and research.	2371.00	5.00	4.00	.808	
2	Broadband access is reliable and sufficient for remote teaching, research, and administrative tasks.	2371.00	5.00	3.36	.967	
3	Cloud computing services are effectively integrated into the university's operations.	2371.00	5.00	3.19	.908	
4	The institution provides adequate digital resources for faculty and students.	2371.00	5.00	3.02	.945	
5	Internet accessibility across different campus locations supports seamless remote work.	2371.00	5.00	3.01	.892	
6	The university continuously upgrades ICT infrastructure to support evolving digital needs.	2371.0	5.0	3.05	.935	
	Valid N (listwise)	237				

The results in table 1 indicate generally moderate to high levels of ICT infrastructure across private universities, with mean scores ranging from 3.01 to 4.00**.** The highest-rated item relates to robust digital connectivity supporting online learning and research (M = 4.00), while cloud computing integration and availability of digital resources recorded comparatively lower mean scores. The standard deviations suggest acceptable variability in respondents' perceptions. Binary logistic regression was employed to examine the influence of ICT infrastructure strategy on the performance of private universities in Kenya. University performance was operationalized as a binary outcome variable.

4.2. Model Fit and Explanatory Power

Table 1: Model Summary for ICT infrastructure

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	108.636[a]	.436	.677

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

The logistic regression model demonstrated strong explanatory power. The model yielded a −2 Log Likelihood of 108.636, indicating good model fit. The pseudo R^2 values were .436 (Cox & Snell) and .677 (Nagelkerke), suggesting that ICT infrastructure strategy explains between 43.6% and 67.7% of the variation in university performance. The Nagelkerke R^2 indicates a substantial predictive contribution by ICT infrastructure strategy.

4.3. Goodness-of-Fit

Table 2: Hosmer and Lemeshow test

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	8.508	5	.130

Model adequacy was assessed using the Hosmer and Lemeshow goodness-of-fit test. The results showed χ^2 (5) = 8.508, p = .130, indicating no statistically significant difference between observed and predicted values. This confirms that the logistic regression model fits the data well.

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4.4. Classification Accuracy

Table 3: Classification table for ICT infrastructure strategy

Classification Table[a]

Observed			Predicted Y: 0	1	Percentage Correct
Step 1	Y	0	43	7	86.0
		1	11	176	94.1
	Overall Percentage				92.4

a. The cut value is .500

The classification results, using a cut-off value of 0.50, show that the model correctly classified 86.0% of low-performing universities and 94.1% of high-performing universities, with an overall classification accuracy of 92.4%. This indicates a high level of predictive accuracy of ICT infrastructure strategy in distinguishing university performance levels.

4.5. Logistic Regression Estimates

Regression Coefficients of ICT

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	ICT Infrastructure	3.135	.399	61.753	1	.000	22.995
	Constant	-7.621	1.041	53.579	1	.000	.000

a. Variable(s) entered on step 1: X1.

The regression coefficients indicate that ICT infrastructure strategy is a strong and statistically significant predictor of university performance (B = 3.135, SE = .399, Wald = 61.753, p < .001). The corresponding odds ratio (Exp(B) = 22.995) implies that a one-unit increase in ICT infrastructure strategy increases the odds of high university performance by approximately 23 times, holding all other factors constant.

4.6. Hypothesis Decision for ICT Infrastructure variable

Since the p-value associated with ICT infrastructure is less than 0.001, the null hypothesis H01 is rejected. The study therefore accepts the alternative hypothesis H1, which states that ICT infrastructure has a statistically significant influence on the performance of private universities in Kenya.

5. DISCUSSION

The findings provide strong empirical evidence that ICT infrastructure strategy significantly influences the performance of private universities in Kenya. The large odds ratio suggests that universities with well-developed ICT infrastructure are substantially more likely to achieve superior performance outcomes. These results reinforce the Resource-Based View, which conceptualizes ICT infrastructure as a strategic asset capable of generating sustained competitive advantage.

The results are consistent with prior studies that link ICT capability to improved institutional efficiency, digital learning effectiveness, and organizational competitiveness. In the context of Kenyan private universities, robust ICT infrastructure enhances the ability to deliver online and blended learning, support remote academic work, streamline administrative processes, and improve institutional responsiveness.

6. CONCLUSION

The study concludes that ICT infrastructure strategy has a significant and positive effect on the performance of private universities in Kenya. Universities that invest strategically in ICT infrastructure are considerably more likely to attain higher levels of performance. These findings underscore the need for private universities to integrate ICT infrastructure planning into their core strategic management processes.

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