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OPTIMIZING SERVICE DELIVERY IN TERTIARY INSTITUTIONS THROUGH ICT SUPPORT

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Abstract

This study examined the role of Information and Communication Technology (ICT) in enhancing service delivery in tertiary institutions. It argues that the quality of education in any country determined the quality of its workforce and the quality of services these workforce are able to deliver. Using a descriptive techniques approach, the research investigates the extent of ICT integration, its impact on administrative efficiency, teaching, and learning, and the challenges encountered in implementation. The population for the study comprised of 220 staff and students from Federal Polytechnic Bali and State Polytechnic Suntai, both in Taraba State. Chi-square on a 5-point rating scale was used to analyze the data. A significance level of 0.05 indicates a 5% risk of concluding that an association between the variables exists when there is no actual association and a t-test was used to test the null hypotheses at 0.05 level of significance. The impact of these interventions and supports on the quality of services provided by these tertiary institutions have not been assessed or evaluated to ascertain whether these interventions have translated into significant improvement in the quality of output by these institutions. Findings reveal significant improvements in administrative processes, academic resource accessibility, and stakeholder satisfaction due to ICT

Keywords: Infrastructure, Efficiency, ICT, Administrative, Support.

adoption. However, barriers such as inadequate infrastructure and training persist. Recommendations focus on strategic investments in ICT infrastructure, capacity-building programs, and robust policy frameworks to sustain improvements in service delivery.

Introduction

The increasing demand for efficient, accessible, and quality education services in tertiary institutions has prompted the adoption of Information and Communication Technology (ICT) to optimize service delivery. From enhancing academic functions to streamlining administrative tasks, ICT has the potential to transform tertiary education into a more dynamic, inclusive, and responsive system. This critical literature review evaluates current research on the role of ICT in optimizing service delivery in tertiary institutions, focusing on key applications, challenges, and gaps. It will also explore the extent to which ICT support can sustainably improve institutional processes and the student experience. One of the most significant applications of ICT in tertiary education is in academic service delivery. Online Learning Management Systems (LMS) such as Moodle, Blackboard, and Canvas enable institutions to offer online courses, blended learning, and interactive platforms for students and faculty (Bates, 2015). These platforms provide access to educational materials, quizzes, virtual lectures, and discussion forums, improving the flexibility and accessibility of learning (Kim & Bonk, 2019). The use of ICT for distance and online education has grown, with institutions increasingly offering Massive Open Online Courses (MOOCs) to reach a global audience (Siemens, Gašević, & Dawson, 2015).

A critical area where ICT is transforming service delivery in tertiary institutions is in student support services. ICT-enabled platforms allow institutions to offer services such as counseling, career guidance, and health support online (Arif, 2019). Virtual counseling services and AI-driven chatbots can offer students round-the-clock support, making it easier to access help without having to visit campus offices physically (Salama & Ameen, 2017).

Nonetheless, the use of ICT in student support services raises concerns about data privacy and the quality of support provided. As ICT systems collect and store sensitive personal data, institutions must implement robust cybersecurity measures to prevent data breaches (Renaud & Ramsay, 2018). Furthermore, while chatbots and automated systems can provide basic support, they may not be sufficient for students dealing with complex or serious issues highlighting the need for a mix approach that incorporates human and technological supports (Traxler, 2018).

ICT has significantly enhanced research activities in tertiary institutions providing tools for data analysis, access to vast databases, and platforms for collaborative work (Franklin & Lytle, 2015). Cloud computing and big data analytics allow researchers to process large amounts of data more efficiently, while digital libraries and online academic networks like ResearchGate and Academia.edu facilitate access to global research outputs (Van Noorden, 2014). Additionally, ICT-driven collaboration tools such as Google Docs, Slack, and Zoom enable researchers from different parts of the world to work together in real time improving greater collaboration and innovation. However, many researchers particularly in developing countries face limited access to ICT resources which included high-speed internet and research databases (Bunt-Kokhuis, 2014). Moreover, the increasing reliance on ICT for research raises concerns about the digital skills of staff and students (Thinyane, 2010). Interestingly, younger generations may be more adept at using digital tools, many older staff members require additional training and support to fully utilize ICT for research purposes (Salama & Ameen, 2017).

One of the most critical discussions in the literature is the concept of the digital divide the gap between those with and those without access to ICT. Selwyn (2020) argues that ICT implementation in tertiary institutions can exacerbate existing inequalities, particularly in regions where access to digital tools and reliable internet is limited. Studies in Sub-Saharan Africa show that a significant portion of students lacks the infrastructure necessary to benefit from ICT-enabled education fully (Kayembe & Nel, 2019). Even within developed countries, socioeconomic disparities affect students' access to technology and online resources (Rambe & Ng'ambi, 2014). To mitigate these

disparities, some scholars propose the concept of digital inclusion, which involves ensuring that all students have access to the necessary technology and training to participate in ICT-based education (Bunt-Kokhuis, 2014). This may involve initiatives such as providing students with laptops or mobile devices, expanding campus Wi-Fi, and offering digital literacy programs (Thinyane, 2010). While such initiatives can improve digital inclusion, they require significant financial investment, which may be challenging for under-resourced institutions (Ajadi, 2018).

ICT adoption in tertiary institutions is not merely a technological issue but also a question of institutional culture and change management. Studies by Czerniewicz and Brown (2014) show that resistance to ICT adoption often stems from organizational inaction where staff and administrators are reluctant to move away from traditional processes. Overcoming this resistance requires strong leadership and a commitment to continuous professional development (Salama & Ameen, 2017). Institutions must invest in training programmes that equip both academic and administrative staff with the skills they need to effectively use ICT tools (Franklin & Lytle, 2015). In addition, the success of ICT adoption depends on institutional policy. Ajadi (2018) emphasizes the need for clear ICT strategies that align with an institution's broader educational and operational goals. ICT initiatives may be implemented in an ad hoc manner, leading to inefficiencies and underutilization of resources, once such policies are not operationalized (Rambe & Ng'ambi, 2014). Effective ICT strategies should consider long-term sustainability, including ongoing maintenance, software updates, and staff training (Bunt-Kokhuis, 2014). On the basis of these data, the institution's baseline infrastructural capacity and availability need to be evaluated to identify areas of intervention. This paper focuses on the challenges of ICT adoption in tertiary institutions and suggest possible solutions to such challenges.

Despite the rapid advancement of ICT worldwide, many tertiary institutions face inefficiencies in administrative and academic services. Delayed processes, limited access to resources, and suboptimal communication channels impede their operational effectiveness. The purpose of this study is

to examine the integration of ICT tools in tertiary institutions to optimize service delivery, increase operational efficiency, and enhance the quality of education provided to stakeholders, which including both students, staff, and administrators.

Statement of the problem

Despite the rapid advancement of ICT worldwide, many tertiary institutions face inefficiencies in administrative and academic services. Delayed processes, limited access to resources, and suboptimal communication channels impede their operational effectiveness. This study aimed to address these challenges by evaluating how ICT can methodically enhance service delivery, identify barriers, and propose solutions tailored to institutional needs.

Objectives of the study

The purpose of this study is to examine the integration of ICT tools in tertiary institutions to optimize service delivery, increase operational efficiency, and enhance the quality of education provided to stakeholders, which including both students, staff, and administrators.

The specific objectives are to:

1. Assess the current level of ICT infrastructure in tertiary institutions.
2. Evaluate the integration of ICT in administrative processes within tertiary institutions.
3. Examine the extent of ICT integration in teaching and learning methodologies.
4. Identify challenges hindering the optimal utilization of ICT in tertiary institution service delivery.
5. Propose recommendations for enhancing the ICT support for improved service delivery.

Methodology

Design

A descriptive research design was adopted to assess ICT's impact on service delivery systematically.

Population

The population for the study comprised of 220 staff and students from Federal Polytechnic Bali and State Polytechnic Suntai, both in Taraba State.

Sample and sampling Techniques

A stratified random sampling technique was used to select 220 participants, ensuring representation from administrative staff, teaching staff, and students of Federal Polytechnic Bali and State Polytechnic Suntai respectively.

Instrument used for data collection

A structured questionnaire guide were developed to collect data on ICT usage, its perceived effectiveness, and challenges faced. Comprehensive data were obtained from Federal Polytechnic Bali and State Polytechnic Suntai, both in Taraba State.

Questionnaire

The questionnaire used was grouped into five (5) categories. The first category sought to assess the current level of ICT infrastructures in the two tertiary institutions and consisted of 10 closed ended questions. The second category comprised ten closed ended and two open ended questions where respondents were asked to provide information regarding the ICT in administrative processes within their institutions. The third category consist of ten closed and two open ended questions which sought to assist in determining the extent of ICT integration in teaching and learning methodologies. The fourth category aimed to assist in identifying the challenges hindering the optimal utilization of ICT in tertiary institution's service delivery and it consisted of ten closed ended and four open ended questions.

Administration of questionnaires

About 220 questionnaires were prepared and distributed within the two targeted institutions and prior to the distribution of the questionnaires, the

researcher sought approvals from the management of the institutions. The questionnaires were given to respondents to respond and in some cases the respondent is being asked questions and the researcher filling the questionnaires on their behalves.

Data Analysis: Quantitative data were analyzed using statistical tools such SPSS, employing descriptive statistics and Chi-Square and draw meaningful conclusions.

Results: The results of this study were based on the stated null hypothesis

Research Questions

4Research Question 1: Are the components of ICT uniformly adopted across different tertiary institutions?

Table 1: First Hypothesis

O	E	E^2	(O - E)	(O - E)^2	(O - E)^2/E
100	78.5	5402.25	21.5	462.25	5.888535032
50	78.5	5402.25	-28.5	812.25	10.34713376
10	78.5	5402.25	-68.5	4692.25	59.77388535
95	78.5	5402.25	16.5	272.25	3.468152866
80	78.5	5402.25	1.5	2.25	0.02866242
100	78.5	5402.25	21.5	462.25	5.888535032
140	78.5	5402.25	61.5	3782.25	48.18152866
70	78.5	5402.25	-8.5	72.25	0.920382166
100	78.5	5402.25	21.5	462.25	5.888535032
40	78.5	5402.25	-38.5	1482.25	18.88216561
60	53	2809	7	49	0.924528302
50	53	2809	-3	9	0.169811321
10	53	2809	-43	1849	34.88679245
60	53	2809	7	49	0.924528302
70	53	2809	17	289	5.452830189
75	53	2809	22	484	9.132075472
50	53	2809	-3	9	0.169811321
60	53	2809	7	49	0.924528302

60	53	2809	7	49	0.924528302
35	53	2809	-18	324	6.113207547
20	20.5	420.25	-0.5	0.25	0.012195122
20	20.5	420.25	-0.5	0.25	0.012195122
30	20.5	420.25	9.5	90.25	4.402439024
20	20.5	420.25	-0.5	0.25	0.012195122
25	20.5	420.25	4.5	20.25	0.987804878
10	20.5	420.25	-10.5	110.25	5.37804878
10	20.5	420.25	-10.5	110.25	5.37804878
30	20.5	420.25	9.5	90.25	4.402439024
10	20.5	420.25	-10.5	110.25	5.37804878
30	20.5	420.25	9.5	90.25	4.402439024
10	22	484	-12	144	6.545454545
50	22	484	28	784	35.63636364
20	22	484	-2	4	0.181818182
15	22	484	-7	49	2.227272727
15	22	484	-7	49	2.227272727
10	22	484	-12	144	6.545454545
0	22	484	-22	484	22
25	22	484	3	9	0.409090909
20	22	484	-2	4	0.181818182
55	22	484	33	1089	49.5
10	26	676	-16	256	9.846153846
30	26	676	4	16	0.615384615
130	26	676	104	10816	416
10	26	676	-16	256	9.846153846
10	26	676	-16	256	9.846153846
5	26	676	-21	441	16.96153846
0	26	676	-26	676	26
15	26	676	-11	121	4.653846154
10	26	676	-16	256	9.846153846
40	26	676	14	196	7.538461538

					885.8644027

Source: Field Survey, 2024

Using the $X^2 = \sum(o-e)^2/e =$ **885.86**

Degree of freedom df = V = k-1 k = 10 10 -1 = 9

Since the number of categories is ten (10) df where k = 10 and v = k - 1 = 10 -1 = 9. the critical value X^2 0005 for five degree of freedom is 885.86. thus since 885.86 > 16.92, we reject the null hypothesis and accept the alternative hypothesis which says There is a significant difference in the adoption of ICT components across different tertiary institutions.

Research Question 2

Question 2: Has the integration of ICT significantly improved the efficiency of administrative processes in tertiary institutions?

Table 2: Second Hypothesis

Observed	Expected	(O - E)	(O - E)^2	(O - E)^2/E
190	101.00	89.00	7921.00	100.90446
100	101.00	-1.00	1.00	0.0127389
95	101.00	-6.00	36.00	0.4585987
85	101.00	-16.00	256.00	3.2611465
170	101.00	69.00	4761.00	60.649682
90	101.00	-11.00	121.00	1.5414013
30	101.00	-71.00	5041.00	64.216561
90	101.00	-11.00	121.00	1.5414013
75	101.00	-26.00	676.00	8.611465
85	101.00	-16.00	256.00	3.2611465
10	52.50	-42.50	1806.25	34.080189
70	52.50	17.50	306.25	5.7783019
65	52.50	12.50	156.25	2.9481132
60	52.50	7.50	56.25	1.0613208
30	52.50	-22.50	506.25	9.5518868
65	52.50	12.50	156.25	2.9481132
20	52.50	-32.50	1056.25	19.929245

65	52.50	12.50	156.25	2.9481132
70	52.50	17.50	306.25	5.7783019
70	52.50	17.50	306.25	5.7783019
0	17.00	-17.00	289.00	14.097561
15	17.00	-2.00	4.00	0.195122
20	17.00	3.00	9.00	0.4390244
25	17.00	8.00	64.00	3.1219512
0	17.00	-17.00	289.00	14.097561
20	17.00	3.00	9.00	0.4390244
20	17.00	3.00	9.00	0.4390244
20	17.00	3.00	9.00	0.4390244
30	17.00	13.00	169.00	8.2439024
20	17.00	3.00	9.00	0.4390244
0	17.50	-17.50	306.25	13.920455
10	17.50	-7.50	56.25	2.5568182
15	17.50	-2.50	6.25	0.2840909
20	17.50	2.50	6.25	0.2840909
0	17.50	-17.50	306.25	13.920455
15	17.50	-2.50	6.25	0.2840909
70	17.50	52.50	2756.25	125.28409
15	17.50	-2.50	6.25	0.2840909
15	17.50	-2.50	6.25	0.2840909
15	17.50	-2.50	6.25	0.2840909
0	12.00	-12.00	144.00	5.5384615
5	12.00	-7.00	49.00	1.8846154
5	12.00	-7.00	49.00	1.8846154
10	12.00	-2.00	4.00	0.1538462
0	12.00	-12.00	144.00	5.5384615
10	12.00	-2.00	4.00	0.1538462
60	12.00	48.00	2304.00	88.615385
10	12.00	-2.00	4.00	0.1538462
10	12.00	-2.00	4.00	0.1538462

10	12.00	-2.00	4.00	0.1538462
				638.82884

Source: Field Survey, 2024

Since the number of categories is ten (10) where k = 10 and v = k - 1 = 10 -1 = 9. the critical value X^2 0.05 for ten degree of freedom is 638.83. thus since 638.83 > 30.14, we reject the null hypothesis and accept the alternative hypothesis which says The integration of ICT has significantly improved the efficiency of administrative processes in tertiary institutions

Research Question 3

Question 3. Are there significant challenges hindering the optimal utilization of ICT in tertiary institutions?

Table 3: Third Hypothesis

Observed	Expected	(O - E)	(O - E)^2	(O - E)^2/E
50	53.00	-3.00	9.00	0.169811321
40	53.00	-13.00	169.00	3.188679245
50	53.00	-3.00	9.00	0.169811321
85	53.00	32.00	1024.00	19.32075472
50	53.00	-3.00	9.00	0.169811321
30	53.00	-23.00	529.00	9.981132075
20	53.00	-33.00	1089.00	20.54716981
90	53.00	37.00	1369.00	25.83018868
85	53.00	32.00	1024.00	19.32075472
30	35.50	-5.50	30.25	0.852112676
20	35.50	-15.50	240.25	6.767605634
30	35.50	-5.50	30.25	0.852112676
15	35.50	-20.50	420.25	11.83802817
65	35.50	29.50	870.25	24.51408451
25	35.50	-10.50	110.25	3.105633803
20	35.50	-15.50	240.25	6.767605634
30	35.50	-5.50	30.25	0.852112676

70	35.50	34.50	1190.25	33.52816901
60	35.50	24.50	600.25	16.9084507
20	21.50	-1.50	2.25	0.104651163
20	21.50	-1.50	2.25	0.104651163
20	21.50	-1.50	2.25	0.104651163
20	21.50	-1.50	2.25	0.104651163
25	21.50	3.50	12.25	0.569767442
25	21.50	3.50	12.25	0.569767442
20	21.50	-1.50	2.25	0.104651163
20	21.50	-1.50	2.25	0.104651163
20	21.50	-1.50	2.25	0.104651163
25	21.50	3.50	12.25	0.569767442
20	47.00	-27.00	729.00	15.5106383
90	47.00	43.00	1849.00	39.34042553
80	47.00	33.00	1089.00	23.17021277
100	47.00	53.00	2809.00	59.76595745
15	47.00	-32.00	1024.00	21.78723404
60	47.00	13.00	169.00	3.595744681
30	47.00	-17.00	289.00	6.14893617
30	47.00	-17.00	289.00	6.14893617
10	47.00	-37.00	1369.00	29.12765957
20	47.00	-27.00	729.00	15.5106383
40	42.50	-2.50	6.25	0.147058824
20	42.50	-22.50	506.25	11.91176471
30	42.50	-12.50	156.25	3.676470588
15	42.50	-27.50	756.25	17.79411765
10	42.50	-32.50	1056.25	24.85294118
40	42.50	-2.50	6.25	0.147058824
100	42.50	57.50	3306.25	77.79411765
100	42.50	57.50	3306.25	77.79411765
10	42.50	-32.50	1056.25	24.85294118
10	42.50	-32.50	1056.25	24.85294118

90	42.50	47.50	2256.25	53.08823529
				744.1440369

Source: Field Survey, 2024

Since the number of categories is ten (10) where k = 10 and v = k - 1 = 10 -1 = 9. the critical value X^2 0.05 for ten degree of freedom is 744.14. thus since 744.14 > 31.41, we reject the null hypothesis and accept the alternative hypothesis which says There are significant challenges hindering the optimal utilization of ICT in tertiary institutions

Research Question 4

Question 4. To what extent is ICT integrated into teaching and learning processes in educational institutions?

Table 4: Fourth Hypothesis

Observed	Expected	O - E	(O - E)^²	(O - E)^²/E
105	91.50	13.50	182.25	1.9918033
110	91.50	18.50	342.25	3.7404372
100	91.50	8.50	72.25	0.7896175
120	91.50	28.50	812.25	8.8770492
70	91.50	-21.50	462.25	5.0519126
85	91.50	-6.50	42.25	0.4617486
80	91.50	-11.50	132.25	1.4453552
90	91.50	-1.50	2.25	0.0245902
75	91.50	-16.50	272.25	2.9754098
80	61.00	19.00	361.00	5.9180328
55	61.00	-6.00	36.00	0.5901639
50	61.00	-11.00	121.00	1.9836066
60	61.00	-1.00	1.00	0.0163934
65	61.00	4.00	16.00	0.2622951
60	61.00	-1.00	1.00	0.0163934
60	61.00	-1.00	1.00	0.0163934
65	61.00	4.00	16.00	0.2622951

60	61.00	-1.00	1.00	0.0163934
65	61.00	4.00	16.00	0.2622951
70	22.50	47.50	2256.25	100.27778
20	22.50	-2.50	6.25	0.2777778
15	22.50	-7.50	56.25	2.5
20	22.50	-2.50	6.25	0.2777778
10	22.50	-12.50	156.25	6.9444444
30	22.50	7.50	56.25	2.5
25	22.50	2.50	6.25	0.2777778
30	22.50	7.50	56.25	2.5
20	22.50	-2.50	6.25	0.2777778
30	22.50	7.50	56.25	2.5
25	15.00	10.00	100.00	6.6666667
10	15.00	-5.00	25.00	1.6666667
15	15.00	0.00	0.00	0
10	15.00	-5.00	25.00	1.6666667
5	15.00	-10.00	100.00	6.6666667
20	15.00	5.00	25.00	1.6666667
20	15.00	5.00	25.00	1.6666667
15	15.00	0.00	0.00	0
20	15.00	5.00	25.00	1.6666667
20	15.00	5.00	25.00	1.6666667
15	10.00	5.00	25.00	2.5
10	10.00	0.00	0.00	0
10	10.00	0.00	0.00	0
10	10.00	0.00	0.00	0
0	10.00	-10.00	100.00	10
20	10.00	10.00	100.00	10
10	10.00	0.00	0.00	0
10	10.00	0.00	0.00	0
10	10.00	0.00	0.00	0
10	10.00	0.00	0.00	0

10	10.00	0.00	0.00	0
			X^2 =	**198.86885**

Source: Field Survey, 2024

Since the number of categories is ten (10) where k = 10 and v = k - 1 = 10 -1 = 9. the critical value X^2 0.05 for ten degree of freedom is 198.87. thus since 198.87 > 42.56, we reject the null hypothesis and accept the alternative hypothesis which says ICT is significantly integrated into teaching and learning processes in educational institutions.

Research Question 5

Question 5: Will the proposed recommendations significantly enhance ICT support for improved service delivery in tertiary institutions?

Table 5: Fifth Hypothesis

Observed	Expected	O - E	(O - E)^2	(O - E)^2/E
110	97.00	13.00	169.00	1.742268
105	97.00	8.00	64.00	0.659794
115	97.00	18.00	324.00	3.340206
95	97.00	-2.00	4.00	0.041237
90	97.00	-7.00	49.00	0.505155
100	97.00	3.00	9.00	0.092784
90	97.00	-7.00	49.00	0.505155
85	97.00	-12.00	144.00	1.484536
80	97.00	-17.00	289.00	2.979381
100	64.00	36.00	1296.00	20.25
60	64.00	-4.00	16.00	0.25
65	64.00	1.00	1.00	0.015625
60	64.00	-4.00	16.00	0.25
70	64.00	6.00	36.00	0.5625
65	64.00	1.00	1.00	0.015625
60	64.00	-4.00	16.00	0.25
65	64.00	1.00	1.00	0.015625

65	64.00	1.00	1.00	0.015625
70	64.00	6.00	36.00	0.5625
60	19.00	41.00	1681.00	88.47368
15	19.00	-4.00	16.00	0.842105
15	19.00	-4.00	16.00	0.842105
10	19.00	-9.00	81.00	4.263158
15	19.00	-4.00	16.00	0.842105
20	19.00	1.00	1.00	0.052632
20	19.00	1.00	1.00	0.052632
25	19.00	6.00	36.00	1.894737
25	19.00	6.00	36.00	1.894737
25	19.00	6.00	36.00	1.894737
20	13.50	6.50	42.25	3.12963
10	13.50	-3.50	12.25	0.907407
10	13.50	-3.50	12.25	0.907407
10	13.50	-3.50	12.25	0.907407
15	13.50	1.50	2.25	0.166667
15	13.50	1.50	2.25	0.166667
15	13.50	1.50	2.25	0.166667
15	13.50	1.50	2.25	0.166667
15	13.50	1.50	2.25	0.166667
15	13.50	1.50	2.25	0.166667
15	6.50	8.50	72.25	11.11538
5	6.50	-1.50	2.25	0.346154
5	6.50	-1.50	2.25	0.346154
5	6.50	-1.50	2.25	0.346154
5	6.50	-1.50	2.25	0.346154
10	6.50	3.50	12.25	1.884615
5	6.50	-1.50	2.25	0.346154
5	6.50	-1.50	2.25	0.346154
10	6.50	3.50	12.25	1.884615
10	6.50	3.50	12.25	1.884615

5	6.50	-1.50	2.25	0.346154
				160.6348

Source: Field Survey, 2024

Since the number of categories is ten (10) where k = 10 and v = k - 1 = 10 -1 = 9. the critical value X^2 0.05 for ten degree of freedom is 160.63. thus since 160.63 > 21.67, we reject the null hypothesis and accept the alternative hypothesis which The proposed recommendations will significantly enhance ICT support for improved service delivery in tertiary institutions.

Discussion of Findings

The analysis of the research questions provides critical insights into the adoption, impact, and challenges of ICT implementation in tertiary institutions.

For **Research Question 1**, the calculated chi-square value of 885.86, significantly exceeding the critical value of 16.92, indicates a considerable variation in the adoption of ICT components across different institutions. This finding suggests differences in infrastructure availability, funding, and institutional importance, aligning with broader literature on uneven ICT implementation in education systems.

Research Question 2 reveals that the incorporation of ICT has distinctly improved administrative efficiency, as evidenced by the calculated value of 638.83 surpassing the critical value of 30.14. This result underscores ICT's role in automating processes, enhancing data management, and improving communication channels. However, the degree of improvement may vary based on the institution's level of ICT integration and training quality.

Regarding **Research Question 3**, significant challenges hindering optimal ICT utilization were identified, with the chi-square value of 744.14 exceeding the critical value of 31.41. These challenges include inadequate funding, limited technical expertise, and inconsistent power supply, resounding global challenges of ICT adoption in developing educational contexts.

For **Research Question 4**, the significant chi-square value of 198.87 compared to 42.56 confirms the substantial integration of ICT in teaching and learning

processes. This blend facilitates access to digital resources, interactive learning platforms, and collaborative tools, though the extent of integration may vary with institutional readiness.

Finally, **Research Question 5** reveals that the proposed recommendations—emphasizing infrastructure investment, capacity building, and policy frameworks—are expected to significantly enhance ICT support, as supported by the chi-square value of 160.63 surpassing the critical value of 21.67. This finding highlights the potential of targeted strategies to bridge existing gaps and optimize service delivery.

Conclusion

The findings reveal critical differences in ICT adoption and its multifaceted impact on tertiary institutions. While ICT significantly enhances administrative processes and teaching-learning outcomes, general challenges like resource constraints and uneven integration persist. Targeted interventions, including capacity building, improved infrastructure, and consistent funding, are crucial to overcoming these challenges and achieving equal ICT implementation. The proposed recommendations hold potential for addressing these issues and promoting improved service delivery through ICT.

Recommendations

To optimize ICT implementation and impact in tertiary institutions, equitable infrastructure development, regular capacity-building training, strengthened funding mechanisms, reliable power supply, integration of ICT in curricula, continuous monitoring, awareness campaigns, policy support, and collaborative efforts are crucial to minimize differences, improve teaching and administrative efficiency, and overcome total challenges effectively.

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