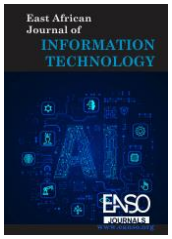

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Original Article

Compliance with Information and Communication Technology (ICT) Standards in University Libraries in Uganda

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ICT compliance, University libraries, Uganda, e-resources, Digital Infrastructure, NCHE standards.

ABSTRACT

This study assessed the compliance of Information and Communication Technology (ICT) services in Ugandan university libraries with national and international standards, using a mixed-methods design, juxtaposing the quantitative data obtained from library users and staff (n=433) in 12 universities with qualitative data from interviews, observations, and document reviews. Partial successes were recorded in forcing ICT acceptance on libraries, with libraries offering access to e-resources (mean=4.02) and to operational systems (mean=4.16), with libraries still facing challenges with the availability of computers (mean=2.48), slow Internet services (mean=2.69), limited off-campus access (mean=3.50), and inadequate training of users (mean=3.18). The study concludes that while basic ICT services exist, lapses in compliance are triggered by inadequate funding, lax policy implementation, and technological inefficiencies, calling for infrastructural overhauls, strengthened training provisions, implementation of cloud solutions, tightened ICT policy, and additional manpower to bring Ugandan university libraries to a global rank and promote academic excellence.

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INTRODUCTION

The study on Compliance with Information and Communication Technology (ICT) Standards in University Libraries in Uganda aims to investigate the level of compliance of academic libraries in Uganda with ICT standards considered crucial for the facilitation of digital resource management, digital service delivery, and digital user accessibility in an ever-growing digital academic world. With the rapid evolution of ICT in education, the libraries have to comply with international and national standards such as those put forth by the International Organization for Standardization (ISO) and the National Information Technology Authority Uganda (NITA-U) for faster information retrieval, security, and interoperability of the systems (NITA-U, 2023; ISO, 2021). Some of the studies show ICT infrastructure gaps, lack of funding, and too little training for staff as implementation barriers faced by academic libraries in Africa (Okello-Obura & Magara, 2022; Kabaale & Chisita, 2023). This research looks at the levels of ICT adoption, identifies core institutional and technical challenges, and investigates how non-compliance impacts service delivery. By assessing policies, infrastructure, and workforce readiness, the study provides evidence-based recommendations to improve the ICT standardisation of university libraries in Uganda in line with global best practices for digital transformation support in higher education (Tusubira & Mulira, 2023; Aharony, 2022).

Background to the Study

Adoption of ICT standards (ISO/IEC 27001) to information security and GDPR to the data protection in university libraries can guarantee the effective management of the digital resources (CILIP, 2018; Crawford, 2021). As opposed to Uganda as a developing country, which has to live with the challenges of primitive infrastructure, poor financing, and poor knowledge of ICT that discourage compliance with global standards (Agyekum & Filson, 2022), countries like the UK and the US, which are developed, have already created high-level resource sharing systems through the usage of MARC standards (Crawford, 2021). This study examines the level of ICT compliance among the university library settings in Uganda and at what level there are lapses in the system attributed to technological inefficiencies, policy inefficiencies, and training gaps, which are some of the barriers to complete ICT mainstreaming. In comparing these with national (NCHE) and international standards, the study aims to offer viable suggestions on how the gap can be bridged and bolster outputs in digital services provision in academic libraries in Uganda.

Africa shows unequal progress in ICT endeavours within university libraries at the regional level. South Africa may achieve digitisation projects and an integrated library system through various developments (Ocholla & Shongwe, 2021), yet most countries like Uganda have been clobbered with ageing infrastructure, limited internet access, and poor cybersecurity measures (NCHE, 2018/2019). Some institutions have, indeed, adopted open source systems like KOHA, but due to a lack of funds and technical expertise, compliance remains patchy (Gracy, 2020). This regional divide, therefore, accentuates the need for directed investments into digital infrastructure and capacity-building initiatives to reduce disparities and provide equal access to academic materials.

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At the national level, the National Council for Higher Education (NCHE) of Uganda is charged with enforcing ICT use in university libraries in the form of a digitisation plan, criteria for digitising library resources, and arrangements for sharing those resources between libraries (NCHE, 2005). Unfortunately, hardly any compliant libraries exist, and the large majority of university libraries do not have secure cloud storage, effective data recovery systems, or policies aligned to the requirements of GDPR, thereby exposing their users to cyber risks (NCHE, 2018/2019). In addition, slow internet connectivity, inadequate numbers of computers, and scant staff training also work against digital transformation (Agyekum & Filson, 2022). These deficiencies create an acute need for this study, which seeks to establish the existence of ICT compliance levels at present, explore systemic gaps, and recommend actionable strategies with which to harmonise Ugandan university libraries with world and regional standards and in keeping with academic excellence and nurturing research innovation.

LITERATURE REVIEW

The role of ICT in university libraries has become a matter of overcoming barriers to access to information, better resource management, and service provision. Researches prove that the trend in Uganda shows some academic libraries installing and using ICT tools such as digital catalogs, institutional repositories, and automated library systems, while many still face the challenges of poor infrastructure, limited funds, and inadequate technical know-how (Okello-Obura & Magara, 2022; Kabaale & Chisita, 2023). Although the National Information Technology Authority Uganda (NITA-U, 2023) set standards for institutions to observe during digitisation processes, cybersecurity, and interoperability, adherence is irregular. Tusubira and Mulira (2023) observe that Uganda, as an example, notwithstanding the existence of policy frameworks, such as Uganda's National ICT Policy, there are several implementation gaps mainly because of poor funding and scarcity of skilled manpower. The National Council for Higher Education (NCHE, 2022) also notes in its accreditation reports that Ugandan universities lack the minimum ICT infrastructure to provide library services, and this prevents them in their abilities to accomplishing digital learning and research. In addition, Aharony (2022) explains that the absence of ICT standardisation will imply that university libraries will experience a deficiency in the management of digital resources, which will consequently have adverse effects on research and instruction.

International standards of ICT, such as ISO (2021), set the framework for digital preservation, security of data, and the quality of services and are therefore indelible in an academic library environment. According to research, however, the implementation of the standards is far below par in Uganda, mainly due to a low level of awareness coupled with institutional support (NITA-U, 2023; Okello-Obura & Magara, 2022). Some of the issues that especially interested the NCHE (2023) were the slow uptake of ICT in private universities, where automation of university libraries and user access to digital material were below desired levels. According to Kabaale and Chisita (2023), not many university libraries in Uganda are fully standardised with respect to ICT compared to those that are operating with partial systems. This puts users in a dilemma as there are problems in making it easy and convenient to access and retrieve digital resources, especially for students and researchers. Literature also points out that such an ICT upgrade would call for heavy investments in infrastructure, staff training on a sustained basis, and stringent enforcement of policies (Tusubira & Mulira, 2023). These problems are literally in immediate need of resolution in making Ugandan U-Libraries world-class and digital learning-oriented, as explicitly stated in the recent NCHE quality assurance reports (NCHE, 2023).

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METHODOLOGY

The study employed a mixed-methods approach under the pragmatic paradigm to evaluate the compliance of ICT services from Ugandan university libraries. Descriptive survey research design integrated quantitative data (433 library users and staff had filled in structured questionnaires sampled from 12 universities having systematic percentiles) with qualitative data (consisting of interviews with librarians, quality assurance officers, and NCHE personnel, observations, and review of documents). Multi-stage sampling techniques ensured that appropriate and contextually rich data were obtained; simple random sampling was used in the selection of library users, whereas purposive sampling was adopted for the selection of experts. Analysis of the quantitative data was performed using the Statistical Package for Social Science Version 27 (SPSS v. 27), focusing on descriptive statistical measures such as means and standard deviations, while qualitative data were analysed thematically. The study employed triangulation to address methodological limitations, like under geographic coverage and self-reporting biases.

Validity and Reliability

To safeguard validity, supervisors and experts had to review the research instruments for the Content Validity Index (CVI) to be computed for each construct, raising values anywhere between 0.625 and 1.000. Reliability was ensured using Cronbach's alpha coefficients, which showed an acceptable level of internal consistency for all the scales (ranging from 0.674 to 0.784). Pre-testing of the tools at a university that was not involved in the study (Kabale University) further helped in minimising measurement errors. Ethical clearance was sought and obtained from the UNCST, with appropriate procedures for seeking consent from respondents observed to ensure data integrity and confidentiality. Study limitations included a short duration and an incomplete sample; however, the study ought to gain credibility and generalizability from the meticulous research design.

RESULTS AND DISCUSSION

The state Information and Communication Technology (ICT) Services in University Libraries

This library standard, as part of the second objective, is aimed at assessing the implementation of ICT services in university libraries to support library services. Through documentary review, questionnaire, and interview methods, the study findings have revealed that a library information system must be integrated within the campus-wide network to ensure seamless access to information. The library should offer access and delivery services, including inter-library loans and electronic data transfer via the internet and other technology mediums.

Qualitative Data from Interviews and Observations on the State of ICT Services

The research study assessment involved conducting qualitative interviews with the Head Librarians appearing in Table 1, along with direct observations of ICT resources and facilities. The study obtained vital information from Head Librarians regarding issues in system operations and implementation through formal interviews. ICT physical assessment was enhanced by qualitative information obtained in the course of library inspections. Moreover, the library is to develop and maintain ICT plans for the medium term and long term. The library should engage in projects that digitise physical collections to promote access and support for preservation. The library should also provide users and staff with the necessary equipment to access internal and external information. Additionally, the library shall facilitate collaboration links to information sharing.

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Table 1: Integrated Findings from the Interview and Observation on the State of ICT in the Library.

ICT Service/facility	Universities											
	A	B	C	D	E	F	G	H	I	J	K	L
ICT Library Systems	√	√	√	√	√	√	√	√	√	√	√	√
Available Computer Section	√	√	√	0	√	√	√	√	√	√	0	0
Limited computers	√	√	√	√	√	√	√	√	√	√	√	√
Available internet	√	√	√	√	√	√	√	√	√	√	√	√
Good internet speed	0	0	0	0	0	0	0	√	√	√	0	√
Use of the Koha system	√	√	√	√	√	√	√	√	√	√	0	0
Use of the Space system	√	√	√	√	√	√	√	√	√	√	0	0
Use of research support tools, e.g., Turnitin	√	0	√	√	√	0	0	√	√	0	0	0
E-resources available	√	√	√	√	√	√	√	√	√	√	√	√
E-resources available off-campus	√	√	√	√	√	√	0	√	√	√	0	0
Web portal	0	√	√	√	√	0	0	0	√	0	0	0
ICT Services for PWDs	0	0	√	√	0	0	0	0	0	0	0	0
ERP system	0	0	0	0	√	0	0	0	0	0	0	0

Source: *Field Data 2023*

Findings from Table 1, drawn from interviews with Head Librarians and direct observation, indicate that while most universities are commendable in their efforts toward the integration of ICT services in library operations, full adherence to NCHE standards has remained patchy.

To support the quality of ICT standards cited, a questionnaire with a Likert scale was distributed to the data is presented in Table 2 below.

Table 2: State of ICT Services in Ugandan University Libraries

ICT parameters	N	SD	D	NS	A	SA	Mean	Std. Dev
The library has built good ICT systems to support access to library services.	433	14(3.2%)	31(7.2%)	6(1.4%)	202(46.7%)	180(41.6%)	4.16	.991
The library has electronic resources to boost user learning and research while in and outside the library	433	20(4.6%)	31(7.2%)	32(7.%)	188(43.4%)	162(37.4%)	4.02	1.074
Electronic library resources can be accessed off campus	433	29(6.7%)	31(7.2%)	56(12.%)	204(47.1%)	72(16.6%)	3.50	1.149
Library users have received training on using library electronic services.	433	16(3.7%)	133(30.%)	94(21.%)	139(32.1%)	51(11.8%)	3.18	1.104
The library has an online library catalogue used to search for books in the library	433	11(2.5%)	160(37%)	81(18.%)	105(24.2%)	76(17.6%)	3.17	1.179

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ICT parameters	N	SD	D	NS	A	SA	Mean	Std. Dev
The network in the library is good and saves users time in accessing library services	433	37(8.5%)	155(35.8)	5(1.2%)	185(42.3%)	53(12.2%)	3.14	1.264
The library has fast computers to enhance access to library services.	433	138(31.%)	52(12%)	28(6.5%)	175(40.4%)	40(9.2%)	2.83	1.465
The internet in the library is fast enough to support access to information resources in the library.	433	118(27.3)	122(28.2%)	12(2.8%)	137(31.6%)	44(10.2%)	2.69	1.416
The computers are enough for all library users to access library services.	433	90(20.8%)	173(40%)	70(16.%)	74(17.1%)	26(6%)	2.48	1.171
Grand mean	433						**3.2412**	**.61100**

Source*:* *Field Data, 2023*

The study Findings of the interview/observation and questionnaire reveal a mixed condition of ICT integration in university libraries in Uganda. All 12 universities that were surveyed had some basic ICT infrastructure for the libraries, such as a library management system (Koha, DSpace), internet access, and e-resources. However, major shortcomings in quality service provision and access remain. Four universities only reported high internet speeds, which fits user ratings, where only 10.2% strongly agreed that the internet was fast enough. Although e-resources are largely available, off-campus access seems to be a problem for some, especially universities F, K, and L. Support tools like Turnitin are unequally distributed, and the ICT services for the disabled are available in only two universities, denoting inclusivity concerns. The fact that users give low ratings of the internet speed (Mean = 2.69) and computer availability (Mean = 2.48) also confirms these findings, showing that infrastructure deficits still exist. There are, however, progressive indicators of ICT adoption. Most respondents (88.3%) agreed or strongly agreed that their libraries have good ICT systems (Mean = 4.16), whereas more than 80% acknowledged the availability of e-resources (Mean = 4.02). Very few respondents, though, strongly agreed that they had received adequate user training (only 11.8%), whilst 35.8% disagreed that network reliability was adequate. So, the universities must work to improve the infrastructure as well as user training. For improvement in ICT services, these universities can look into investing in more bandwidth, increasing off-campus access to e-resources, conducting frequent training sessions, and ensuring inclusivity for persons with disabilities. If such gaps are addressed, the Ugandan university libraries will be much closer to attaining full compliance with the NCHE standards and improving their level of support to learning and research.

DISCUSSION

The study reveals that Ugandan university libraries have been relatively successful in adopting a basic ICT infrastructure. Every one of the 12 universities surveyed (A-L) has library management systems (Koha, DSpace), Internet connectivity, and e-resources provided, in tune with the global wave of digital library proliferation (Adamu, 2020; Olaifa, 2016). This supports the NCHE (2021/2022) report, acknowledging the progress in the ICT sector in Ugandan universities, notwithstanding the

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challenges. Most respondents (88.3%) agreed that their libraries have functional ICT systems (Mean = 4.16), reinforcing Bhangu's (2013) statement that "ICT infrastructure is paramount in any modern library." E-resources complemented that (Mean = 4.02), with great recognition that key academic materials have been digitised in universities A, B, C, D, E, G, H, I, and J, thus enhancing research support through ICT, as stressed by Aina (2014).

As much as progress has been made, the gaps are too glaring. Internet speed is an issue, with only universities H, I, J, and L reporting good connectivity, and the survey respondents rating it lowly (Mean = 2.69). This concurs with Kasozi's (2016) findings of bandwidth constraints among the Ugandan institutions. There was inconsistency regarding off-campus access to e-resources, particularly with universities F, K, and L, reinforcing Nsibirano and Ssewanyana's (2018) observation, which states that inadequate funding serves as a limitation to remote learning support. There were also shortages in computers (Mean = 2.48), which concurs with the 2021/2022 report from NCHE, alluding to student over-enrollment exceeding ICT resource provision. On the other hand, only universities C and D provide ICT services for persons with disabilities, thereby exposing other first-level gaps in inclusiveness. The deficiency also exists in training end-users, with only 11.8% strongly agreeing they receive adequate instruction; this further impairs actual ICT utilisation as given by Dada et al. (2019) in their review of African academic libraries.

Summary of Findings on ICT Integration in Ugandan University Libraries

The study revealed that all 12 surveyed universities have the implementation of basic ICT systems, which include library management software (Koha and DSpace), internet access, and e-resources, thus exhibiting minimum conformity with standards expected of digital libraries.

The findings revealed that internet connectivity is still a big challenge, with speed being rated as good only in four universities (H, I, J, L), while the other respondents have given a very low mean rating of 2.69 for quality.

The study findings revealed Disparities in e-resource accessibility were found, showing that whilst digital resources are generally made available, off-campus access is irregular and unreliable, especially for universities F, K, and L.

The findings reveal that hardware inadequacy has been persisting, with computers being terribly few in nearly all the institutions and receiving a distressing mean rating of 2.48 from users.

The study revealed serious inclusivity gaps came to the forefront, where the study found that only two universities provide ICT services for persons with disabilities.

From the data analysis, it appears enormous training gaps exist, with only 11.8% of users reporting that they were properly trained in the use of available ICT resources.

The study findings have indicated there difference in perception revealed by the investigation; 88.3% of the respondents acknowledged the existence of ICT systems, while 35.8% of them also were not satisfied with their network reliability.

The research identified certain institutional weaknesses, with universities F, K, and L consistently ranking low in comparison with their counterparts in several ICT service areas.

The study findings confirmed that the training of users is indeed the missing link, as the observed heavy lack of training appears to have been restricting the effective use of the digital infrastructure currently in existence.

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CONCLUSION AND RECOMMENDATION

Conclusion

In conclusion, this study reveals that Ugandan university libraries have made commendable strides in asserting a basic ICT infrastructure of library management systems (Koha, DSpace), internet connectivity, and e-resources, thereby partially complying with NCHE standards and international standards of digital libraries. Ministries of higher education all over the world generally emphasise the mission, values, and objectives of the universities and their constituent colleges in establishing these standards in their digital library systems. However, such standards have been rather loosely defined and allow room for interpretation, which makes it difficult for one to ascertain the extent of compliance, for the same reasons those who defined the standards conceptualised them in the broadest of parameters. The findings reveal challenges with regard to internet speed (only 4 of 12 universities are above acceptable standards), off-campus and fair e-resources access (especially universities F, K, and L), availability of computers (with an average rate of 2.48), services for persons with disabilities (only in 2 institutions), and user training (11.8% satisfaction rate) - inadequate of the NCHE standards for comprehensive integration of ICT and international best practices as per frameworks such as IFLA's Guidelines for Digital Libraries. To ensure that the universities become fully compliant, priority must be given to strategic investments in bandwidth enhancements, equipment purchases, assistive technologies, and continual programs for user education, while aligning their development of ICT with NCHE's periodic benchmark assessments and internationally accepted digital library standards that consider not only the mere presence of infrastructure but quality and accessibility and actual utilization of ICT resources for learning and research outputs.

Recommendations

These recommendations of the study benefit the following university stakeholders;

University Administrations

The university administrations should prioritise a heavy investment in bandwidth structure to meet the NCHE and international standards of internet speed. They should dedicate budgetary amounts for periodic upgrades to computer labs since there is a critical shortage indicated by the low mean rating of 2.48, which should also accord with the standards for student-computer ratios. Furthermore, ICT competency programs must be made compulsory for all library staff and users, with at least 80% to be the target training coverage in line with international best practices for libraries.

Library Management Committees

All services of ICT shall be universally designed by the library management to cater to persons with disabilities as per the NCHE guidelines and international conventions. They also have to come up with robust 24/7 off-campus access solutions to e-resources, particularly addressing the loopholes in universities F, K, and L. An interim evaluation of the ICT service four times a year from a standard metric laid down by the IFLA and NCHE frameworks would guarantee consistent growth and adherence to standards.

National Council for Higher Education (NCHE)

NCHE ought to strengthen its enforcement mechanisms by specifying minimum standards for ICT to be included in accreditation requirements: internet speed, computer ratios, and assistive technologies. The elaboration of a national digital library strategy would give much-needed coordination that aligns institutional efforts with UNESCO recommendations. An alternative could be to set up an inter-university consortium for the joint licensing of e-resources to optimise cost and

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access, thereby implementing what has been successfully done in some developing countries.

Ministry of Education and Sports

The Ministry should establish a fund for ICT infrastructure targeted solely at university libraries to create a balance in existing resources within the library system. This would be undertaken in a cooperative venture with telecom regulatory bodies to seek concessions for educational bandwidth capable of taking institutions to international standards of connectivity. Further, the development of national guidelines for ICT competency certification of library professionals would standardise skills development in the body, drawing from IFLA frameworks.

Development Partners

International development partners should dispense technical assistance to bridge the digital divide in lagging institutions (F, K, L) through focused capacity-building programs. They should facilitate the development of open educational resources and institutional repositories compliant with international metadata standards for the final objective of resource sharing among institutions. Facilitate South-South collaboration of institutions that have successfully implemented ICT transformation programs for knowledge transfer.

These evidence-based recommendations give a holistic road map to full compliance with ICT standards of university libraries in Uganda. Their successful implementation calls for coordinated, multi-stakeholder efforts to address gaps that concern infrastructure quality, accessibility of services, and user competencies, which presently cripple the ability of libraries to support academic excellence fully.

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