

**THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES ON
PUBLIC LIBRARY SERVICES: A RESEARCH PERSPECTIVE ON CHALLENGES,
OPPORTUNITIES, AND FUTURE DIRECTIONS**

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Abstract

The growing integration of Information and Communication Technologies (ICT) has led to the transformation of the operational environment of the public libraries, redefining them as key community service institutions under the local government administration. This paper focuses on the impact of ICT on the delivery of public library services, highlights implementation challenges and discusses opportunities for governance-driven digital transformation. Using mixed-method design, quantitative data were gathered from library users and staff via structured questionnaires while qualitative data were gathered from interviews with administrators and local government officials. Data analysis was carried out using descriptive and trend analysis for quantitative data and manual thematic analysis for qualitative accounts using Microsoft Excel. Results show that ICT adoption has made significant contributions to access, efficiency of services, and user satisfaction, but some gaps have been noticed due to inconsistent funding, unbridled infrastructure as well as poor training to the staff. Libraries that receive relatively steady budget allocations and policy support are relatively more technologically prepared than those working on a fragmented administrative basis. Despite these challenges, the rise of digital literacy initiatives and models of collaborative governance offer promising opportunities for inclusive service innovation. Overall, technological library modernization based on ICT is a potential process to enhance the governance capacity of local authorities by facilitating transparency, accountability, and participatory access to information. The paper concludes that the policy coherence, institutional support and continuous capacity development at local government level, is essential to achieve sustainable ICT integration in the libraries.

Keywords: ICT, public libraries, local governance, service delivery, digital transformation

1. Introduction

The implementation of the Information and Communication Technologies (ICT) by the governmental institutions has become the defining feature of the twenty-first century government. Local governments everywhere in the world are resorting to use of digital tools to improve their accountability, transparency, and accessibility of services by their citizens. The most visible aspect of such digital shift is the community-based knowledge institution, which is a public library and is

subordinated to local governmental organization (Bah, 2024). Their development shows how ICT may redefine the classic administrative tasks and encourage the equitable access to information in decentralized systems of governance (Onunka et al., 2023). The increased role of ICT in the public libraries has made the libraries change their focus on book collections to digitally networked sources of knowledge. The libraries of recent times are offering online databases, e-learning tools and automated management systems that make the operations of the library more efficient and responsive to the services. These are tools which assist the larger agenda of local governments to envisage accessible and effective information ecosystems (Makinde et al., 2024). Digital cataloguing and automated lending, as well as data-based management, align the operations of the library with the modernization goals of administration and undergoes the gap between the development of technology and the interaction with the community. ICT also enhances the digital inclusion, by further reaching out to the marginalized population and incorporating the possibility of an ongoing learning process (Jinendran and Kumar, 2023).

The use of technological innovation in other sectors of the population also depicts how digital integration enhances the management of local services. The application of ICT to smart-water initiatives, city planning, and infrastructure monitoring has shown that ICT can bring efficiency and sustainability to the decentralized operations (Okoli and Kabaso, 2024; Papadonikolaki et al., 2022). In the same vein, the examples of the circular-economy activities, which are managed by technology, demonstrate that ICT facilitates resource optimization and policies based on data (Khan et al., 2022). These experiences introduce the need to know how the adoption of ICT in libraries translates to the same goals of responsiveness, participation and innovation in the same governance at the local level. Though these possess these benefits, there is still uneven implementation. The lack of digital infrastructure, low connectivity, poor funding, and poor administrative coordination are some of the challenges that many libraries are experiencing (Hazra et al., 2021). Fragmented ICT policies and organizational inefficiencies tend to limit the development of digital services, making them less effective (Ullah et al., 2023). Moreover, digital transition is challenging to sustain without stable governments that govern it (Ahmed et al., 2023). These issues highlight why there should be consistent measures which tie ICT investment to local administrative capability and human-resource enhancement.

New technologies have widened the scope of ICT to include more than automation in terms of service delivery to intelligent interactive services. Virtual assistants and chatbots are becoming popular to customize the user experiences and simplify the service procedures (Følstad et al., 2021). AI systems that are generative like large language models enhance the processing of data, retrieval of information, and predictive management within public organizations (Ooi et al., 2025). Other systems such as GPT-based systems are similar digital models that provide new means of automating cataloguing and facilitating adaptive learning environments (Yenduri et al., 2024). These technologies have already been used to enhance the accessibility and self-directed learning in the education sector, and it is proposed that library systems can be enhanced similarly (Abd-Alrazaq et al., 2023). Nevertheless, the deeper the automation the higher the challenges are in terms of privacy, cybersecurity, and digital ethics and the need to have a more robust governance control (Giannaros et al., 2023). On the basis of these dynamics, the contribution of the ICT adoption to the current performance of the public libraries and the role of the local governance structures in this change are critical to be analysed. This paper is going to capture the impacts of ICT on library services and the opportunities and threats that it presents on services delivery and provide strategic direction on the sustainability of digital integration. The research assists in understanding that digital transformation is an environmental-friendly model of local governance in the embodiment of networks due to the manner in which the idea of local libraries is constructed as a local part of a local government.

2. Methodology

2.1 Research Design

The research design in the study is the mixed methods research design which is a combination of the quantitative research design and the qualitative research design in a bid to establish a holistic perspective of the issue of ICT adoption in the services of the public libraries. The quantitative component is a measurement of the effectiveness of the usage of information and communication technologies on the quality of the service, customer satisfaction, and efficiency. It lingers on numerical data which describes the degree of ICT assimilation in the normal library activities. The qualitative section will involve this addition to these findings and shall discuss the experience, perceptions and challenges of the administrators and policy implementers who have been in charge of managing ICT systems. The design adopted was identified as a result of the need to balance between empirical measurement and contextual knowledge and therefore enable more comprehensive examination of the role of ICT in governance practices and service delivery in the locally administered libraries.

2.2 Study Area and Population

The research is conducted in a sample of publicly owned libraries under the jurisdiction of local governments in which ICT adoption go directly through local service delivery. These institutions are important at the community level to aid literacy, lifelong learning and digital inclusion. The target population is composed of four key categories of members of the study population, including library users, library employees, administrative officers, and local government members who manage ICT or cultural initiatives. The users of the library give information on accessibility, ease of use, and satisfaction with digital services. Employees provide insights into technology preparedness and business difficulties. Local officials and administrators provide opinions on the government, the budgetary allocation, and policy integration. The participants in these varied groups will make the study inclusive of the service delivery as well as managerial aspects of the ICT integration within local library systems.

2.3 Sampling

A stratified and purposive sampling approach is employed in order to have representation of a diverse group of libraries and stakeholders. In the quantitative stage, about 200-300 participants will be picked up at random among the various public libraries to give statistically significant information regarding the use of ICT, accessibility to it, and satisfaction. This is a sufficient sample size to conduct a descriptive analysis and comparison within various administrative areas. In the qualitative stage, around 1015 key informants such as library directors, senior staff members, and municipal ICT officers will be selected purposely based on their expertise and participation in library governance. This is a stratum of random and purposive sampling that gives breadth and depth: quantitative findings depict the overall trends, whereas qualitative interviews demonstrate the structural and policy-specific complexities affecting the ICT adoption process in libraries.

2.4 Data Collection

An integrated and triangulated dataset is achieved by using three main sources of data collection questionnaires, interviews, and reviewing documents. The structured questionnaire will be used to collect the quantitative data in order to measure ICT access, the level of usage and the satisfaction of the user. To measure the trends, the instrument has closed-ended and Likert-scale items. To achieve further understanding of the governance practices, something known as policy framework and challenges faced in implementation, the qualitative data will be collected by using the semi-structured interviews which will be conducted with the library administrators and local government officers. Also, secondary data is sourced through document reviews, such as local government reports, and ICT policy documents as well as annual library statistics. All the tools are pilot-tested in order to be clear and consistent to make sure that questions are contextually relevant and that they are in line with

the purpose of the study. The variety of sources of data collected increases both the validity and contextual reliability of the research results.

2.5 Data Analysis

Analysis of the quantitative data is done using Microsoft excel with emphasis on descriptive and simple methods of analysis. Frequencies, percentages, and the mean values are some of the descriptive statistics that are determined to describe the extent of ICT access, use, and satisfaction among the library users. Correlation and trend analysis are applied to investigate the correlation between ICT utilization and the main outcomes that include efficiency, accessibility, and quality of the offered services. The findings are represented in the structured tables and graphs that give the clear and visual overview of quantitative patterns.

The qualitative data is examined through manual thematic method of interpreting patterns through the views of interviews and reviews of documents. To familiarize themselves with the data all the transcripts are read and the similar ideas identified and identified under thematic categories which include: infrastructure readiness, policy support, staff training, user engagement, and service impact. The coded data is arranged into a basic Excel-based list which allows comparing the themes of various groups of participants. In that way, convergence and divergence in the perspectives are identified, and the researcher is sure that the qualitative findings can be used to complement and elaborate the quantitative findings. Collectively, the two strands of analysis offer a combination of knowledge on the impact of ICT adoption on the performance and efficiency of libraries in terms of local self-government.

3. Results

The results present a comprehensive overview of ICT integration in public library services under local government administration. The findings are categorized as per five major areas namely adoption and usage, accessibility and satisfaction, infrastructure and administrative support, staff competence, and implementation challenges. The subsections present a summary of empirical findings gathered using the mixed-method method.

3.1 ICT Adoption and Usage in Public Libraries

Results indicate that ICT uptake by public libraries is on the rise although there is disparity between administrative jurisdictions. Most of the surveyed libraries indicated that they have some basic ICT facilities, such as desktop computers, internet access, and library management software. About 67% of the libraries actively apply ICT have been applied in the cataloguing, digital lending and record management, and 33% use mostly manual operations. The statistics also indicate that online catalogues (OPACs) and digital reference systems are especially becoming central in user interactions especially in cities where infrastructure is more developed.

Nonetheless, there are also major differences between urban and rural libraries. Irregular electricity supply, old hardware and low internet speed were also frequently reported in rural institutions which makes the use of ICTs difficult. One-third of the respondents reported the occasional power outages that abnormalize access to online systems and triggers the slowing of daily processes. Inadequate ICT capabilities of urban and rural libraries are compared in Figure 1, which indicates the technological gap. Table 1 is used to generalize the accessibility of ICT infrastructure at the sampled libraries.

Table 1. Availability of ICT Infrastructure in Public Libraries (n = 250)

ICT Facility	Available (%)	Not Available (%)
Computers for staff use	92	8
Public internet terminals	74	26
Library management software	68	32

Online Public Access Catalogue (OPAC)	61	39
Wi-Fi for users	57	43
E-resource subscriptions	46	54

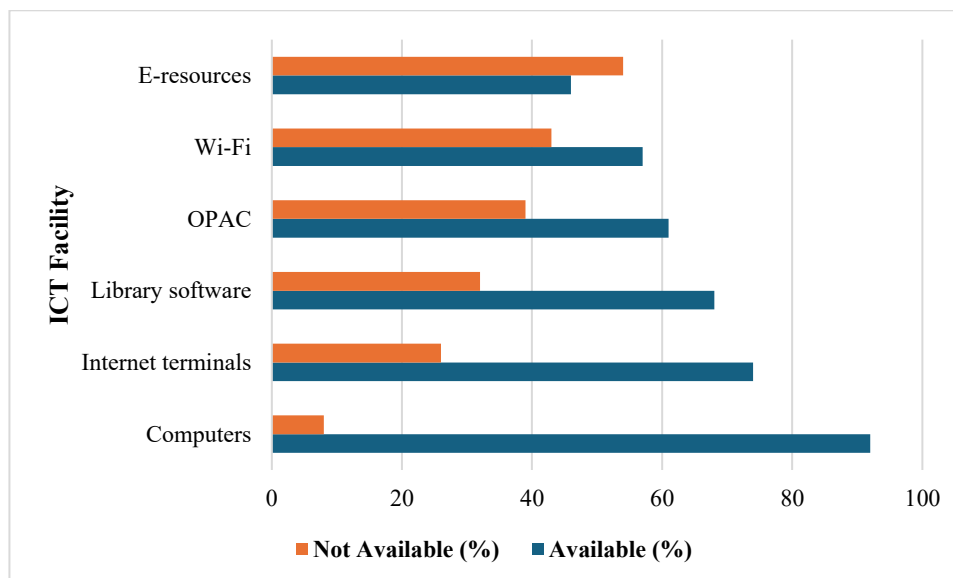


Figure 1: Availability of ICT infrastructure in public libraries

3.2 Accessibility and User Satisfaction

The reaction of the users indicates that access to library resources and user experience has improved significantly with ICT-enabled services. Three out of five, 70 percent, indicated that they were generally satisfied with digital systems, where they stated that it took them a shorter time to access materials and more convenience than the traditional services. The other 30 percent cited technical challenges like low internet connection, inadequate user instructions, and discrepancy in system maintenance as reasons of dissatisfaction.

The level of satisfaction was higher in urban libraries as 78 percent of the users reported that the digital services were met or even surpassed. On the other hand, libraries that are operational in smaller administrative regions were found to have lower levels of satisfaction, with most of them referring to issues of connectivity, as well as limited ICT awareness among the patrons. The level of user satisfaction regarding various services of ICT is described in table 2. Figure 2 also shows that most users found the online catalogues and access to e-resources as the most satisfactory ICT components, and internet connectivity is the least satisfied component.

Table 2. User Satisfaction with ICT-Based Library Services (n = 250)

Service Category	Highly Satisfied (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)
Online catalogue search	38	42	12	8
E-resource access	32	41	17	10
Internet connectivity	28	39	18	15
Staff digital support	30	43	16	11
Overall digital experience	36	40	14	10

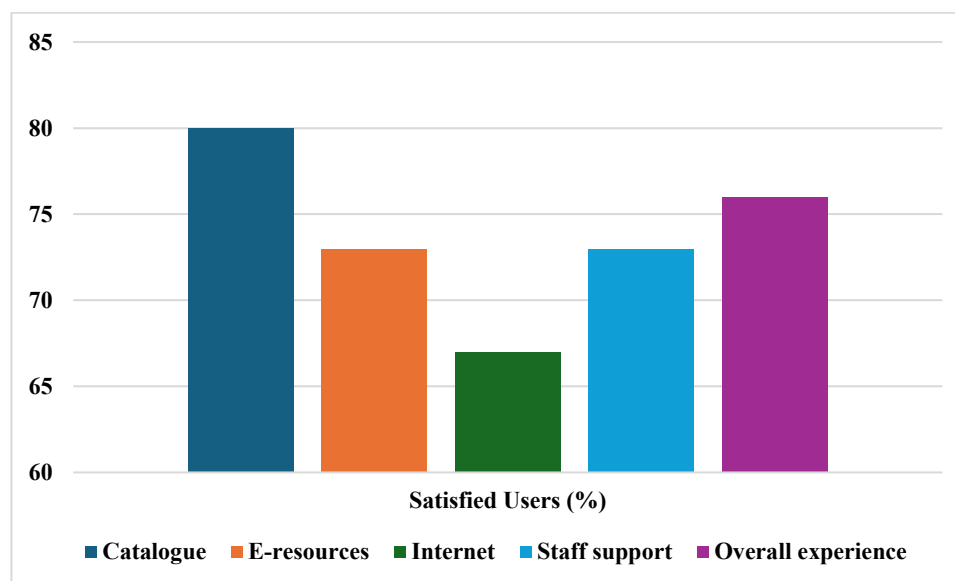


Figure 2: User satisfaction with ICT-based services

3.3 ICT Infrastructure and Administrative Support

The research results indicated extensive dispersion in the degree of infrastructural investment and administrative assistance that was offered by local governments. When 48 percent of libraries are regularly financed when it comes to maintaining their ICTs and updating their systems, other libraries are relying on the general grants or gifts of an intermittent character. Just 42% of the respondents stated that there was an existence of a local policy framework that facilitates ICT operations in their institutions. Libraries under large municipal councils had more developed ICT environments such as regular updates to the system and steady funding cycles. Smaller local authorities, on the contrary, did not have systematic ICT budgets, and their maintenance was slow and relied on outside partners. Such mismatch in administrative backing is a demonstration of the diverse financial and priorities of the local government units. Table 3 is a summary of the major funding sources and administrative provisions gathered by respondents. Figure 3 shows the percentage of libraries that have formalized ICT governance structures showing that not a majority are currently run on the basis of defined policy frameworks.

Table 3. Administrative and Financial Support for ICT Activities (n = 250)

Support Mechanism	Libraries Reporting Availability (%)
Annual government allocation	48
Project-based grants or donations	27
Institutional partnerships	15
No formal funding structure	10
Presence of ICT policy framework	42

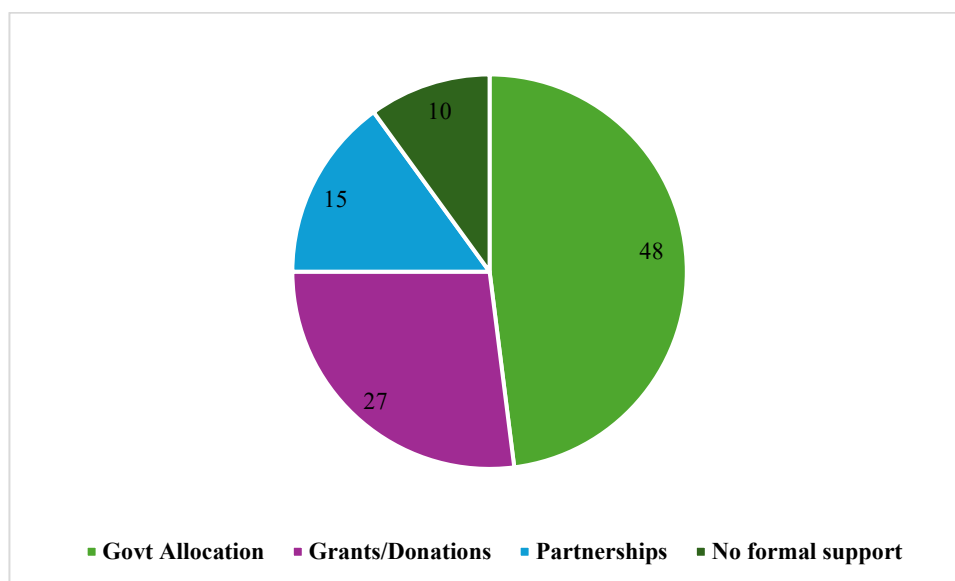


Figure 3: Sources of ICT funding and administrative support

3.4 Staff Competence and Training

The level of ICT proficiency among the staff was different depending on the frequency and quality of the training opportunities. Sixty percent of the respondents stated that they received formal training in ICT in the last three years, with most of them being trained on cataloguing software, digital archiving and information retrieval systems. Twenty eight percent said that they had learned it themselves or via peer cooperation, 12 percent had never received ICT training.

The respondents observed that more frequent access to regular professional development was available in urban and central libraries, where professional ICT department is structured. The personnel in small-scale or rural facilities rely upon informal mentorship or online tutorials in acquiring skills. Another result of the analysis showed that there is a significant relationship between exposure to training and efficiency of the system: libraries that reported a greater exposure to training reported a more seamless operation of such system and fewer service disruptions. Table 4 summarizes the patterns of staff training and competency levels that are self-reported. Figure 4 shows the relative distribution of trained and untrained staffs according to the various administrative levels, with better concentration of the skilled personnel in the metropolitan libraries.

Table 4. Staff ICT Training and Competency Levels (n = 80)

Indicator	Percentage (%)
Received formal ICT training (past 3 years)	60
Self-taught or peer-trained	28
No ICT training received	12
Self-rated as proficient	52
Self-rated as moderately skilled	38
Self-rated as low-skilled	10

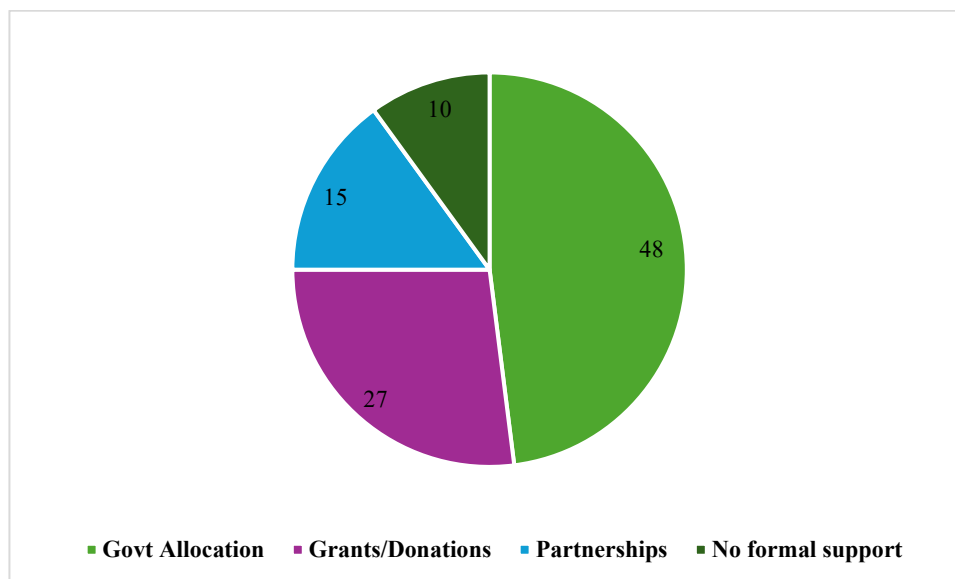


Figure 4: Staff ICT training participation levels

3.5 Implementation Challenges

Several limitations were found as obstacles to successful ICT adoption. The lack of funding (82%), poor internet connectivity (76%), and old-fashioned infrastructure (68%), were the most common problems. The lack of trained personnel (61 per cent) and slowing down of the procurement procedures (49 per cent) also constrained the efficiency of operations. A lesser percentage (40 percent) of them mentioned the lack of clear policy requirements as a barrier to sustainable ICT development whereas 22 percent expressed an issue of cybersecurity and oversight of electronic documents. Table 5 breaks down the challenges that respondents gave and shows the structural and logistical challenges faced by library administrations. As seen in Figure 5, the challenges that are reported most frequently are related to funding deficits and unreliable internet access, which are evidently the most widespread obstacles at all the surveyed institutions.

Table 5. Major Challenges in ICT Implementation (n = 250)

Challenge	Libraries Reporting Issue (%)
Inadequate funding	82
Poor internet connectivity	76
Outdated infrastructure	68
Shortage of skilled staff	61
Delayed procurement procedures	49
Lack of policy guidelines	40
Cybersecurity and data management issues	22

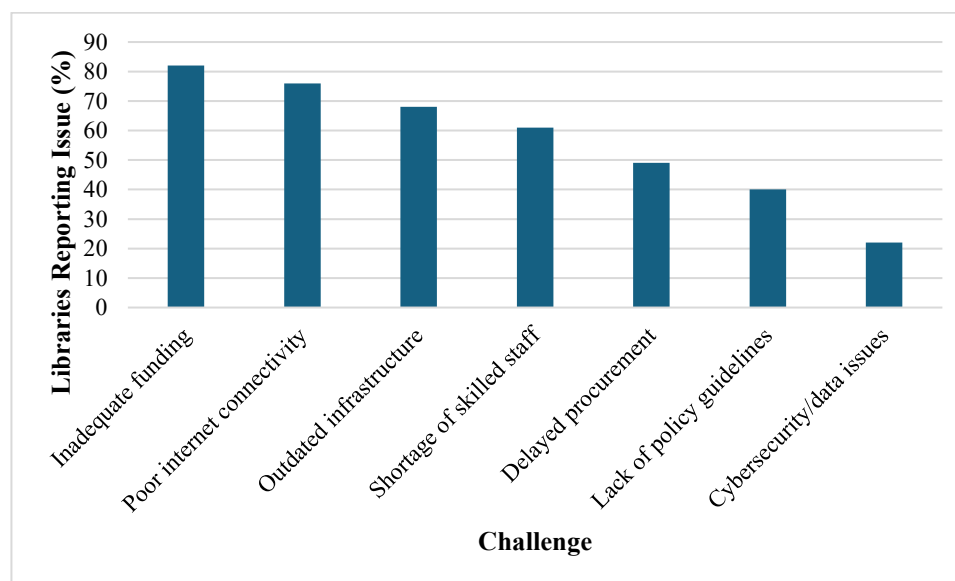


Figure 5: Major challenges in ICT implementation

In general, the findings indicate that the ICT integration in the public libraries controlled by local governments has achieved some quantifiable gains with the direct positive changes in accessibility and efficiency of the services. The extent of implementation is however very different in accordance with the availability of infrastructure, the administrative support as well as the capability of the staff. The libraries that have well organized ICT funding and staff that are trained have better digital performance indicators and those that have meager financial resources and technical knowhow have a time ahead with regard to operations. The findings offer factual grounds according to which the present state of ICT implementation in the systems of the public libraries would be understood and would form the basis of the further discussion and policy implications.

4. Discussion

The findings of the current research affirm that the Information and Communication Technologies (ICT) application in the public libraries have highly enhanced efficiency of operations and access to information resources although this adoption is not uniform among the administrative jurisdictions. Libraries that work within urban and municipally funded settings have more well-developed ICT infrastructures, broader access to digital services, and more regular systems upgrades than libraries in semi-urban or rural areas. Such deviations are reflective of broader structural inequities in local governance capacity in such a way that a funding differentiation and policy discontinuities affects the patron consistency of service modernization. This observation is linked to empirical findings that influence the outcomes of digital transformation in the institutions and indicate that technological availability is not so important as governance systems, institutional concerns, and policy compliance (Kim et al., 2021). The results, thus, demonstrate the importance of administrative commitment and financial control as prerequisites to effective introduction of ICT into library systems.

The correlation of user satisfaction, funds, and administrative support can be seen as one of the most remarkable details about the results. The libraries that have regular budgetary allocations and scheduled ICT maintenance schemes will perform better and be more reliable of the system. On the other hand, the ones that depend on the infrequent project funding or gifts are disrupted in their operation and are not able to keep the technological flow. These results are not an exception to the overall theory of the organization, which emphasizes innovation within the framework of the public institutions, as one of the outcomes of the strategic leadership, institutional entrepreneurship, and proactive administration (Ratten, 2023). The trends noted indicate that the local governments should

no longer rely on ad hoc projects, but institutionalize their ICT funding and control into their yearly administration systems to enhance sustainable digital developments.

The other critical dimension that arises as a result of the findings is connected with the skills and competencies of the library personnel. Although most of the surveyed staffs have been subjected to some kind of ICT training, the quality, frequency and continuity of these training are inconsistent. Smaller or less-funded libraries reported less access to training and had to resort to self-education or peer training. This result adds to the fact that competence of the staff is one of the determining factors of the functionality of ICT-driven services and that professional development is essential to the digital transformation (Mohammad et al., 2023). Libraries that lack the ongoing learning are likely to become technologically outdated and even dissatisfied by the users, despite the presence of infrastructures. As a result, the capacity-building programs should be institutionalized and partnerships should be established with the ICT training providers to enhance a technical base necessary to deliver services effectively.

In the analysis of the governance point of view, the results show that the implementation of ICT in the libraries of the general public is not only a technical change, but also a governance correction process. The statistics show that absence of elaborate policy frameworks constrain coordination between municipal ICT departments and library administrations. The result of this disintegration is irregular standards, overlaps and wastes in the systems. Other investigations of information governance indicate that digital innovation should be integrated into larger administrative units, particularly in cases where local government departments are regulators and providers of services (Bashir et al., 2023). The answer to the enhancement of interoperability and transparency and accountability in the management of the public libraries can thus be seen in the development of the standardized ICT governance models across the municipalities.

The entire policy implications of the ICT adoption within the local public organizations are also revealed in the paper. Absence of administrative directives and fragmented policy control is one of the impediments to effective implementation. The digital transformation plans on the hospitals and city levels implemented by integrating the ICT programs have the potential of harmonizing the objectives and allow the shared learning among the local agencies. The comparative research reveals that the coordination planning structures lead to the more sustainable results of library digitization and community-based information projects. The coordination of the policies would not only ensure optimization of the resources but also foster the collaborative acquisition, common training modules, and other activities of data protection within the library systems.

Finally, the findings lead to the emergence of the heightened degree of inter-institutional collaboration in the upkeep of ICT development. The number of partnering libraries with more digital ecosystems and innovative service delivery models than non-partnering libraries (with universities, local government ICT departments, or external development agencies) is high. This consequently contributes to the fact that collaborative governance is a viable type of approach to resource constrained local governments who might desire to upgrade the information services. Like the emphasis on collective responsibility and inter-sectoral cooperation in comparative scholarship, the two factors are crucial accelerators of digital innovation in the sphere of the public administration (Opele, 2023). One of the ways of encouraging sustainable modes of governance and upholding the mandate of the many public libraries as digitally empowered spaces of civic access and inclusion is by enhancing the partnership between the local government, the librarians, and technology.

On the whole, the discussion confirms that the process of ICT integration in public libraries is both an institutional and a technological process. It entails coordination among infrastructure, human capacity and policy structures. It is therefore the responsibility of local governments to ensure that ICT investment is more of a strategic governance activity as opposed to an administrative activity. Through the support of continuity in training, funding, and collaboration, the public libraries will

develop into tutors of participatory local governance spaces that bridge digital divides, improve information democracy, and play a direct role in the sustainable development of communities.

5. Conclusion

The present paper has discussed the role of Information and Communication Technologies (ICT) in the service delivery of local governments through the public libraries where the digital transformation has been found to have a great effect on the service availability, efficiency and interaction with the customers. Adoption of ICT, however, is not equal and predetermined by the gap in infrastructure, funding and administrative capacity. Digital performance is better in libraries that have well-trained personnel and those that have troublesome performance due to dearth of resources have poor performance and governance. These findings highlight the point that the adoption of ICT is not a technical enhancement but an institutional reform, which must be policy-consistent, long-term financially-backed and capability-based. This process is located at the center of the local governments, which can incorporate the ICT strategies into the higher levels of the development and ensure that the local libraries will become the inclusive digital services points. Other ways to work towards sustainability include improving inter-agency response, training of the staff and community involvement. On the whole, the ICT-based modernization of libraries has the potential to assist in participatory governance and information democratization. One of the fundamental values in making successful and flexible local self-government is well-known to policymakers as libraries must be viewed not as passive service providers but as active agents of local digital transformation.

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