

EFFECTS OF TECHNOLOGICAL CHANGES ON LIBRARY OPERATIONS AND SERVICES AT EGERTON UNIVERSITY LIBRARY

KIPLAGAT S.,¹ MAGUT H.²

¹Egerton University, KENYA

²University of Eastern Africa Baraton, KENYA

Correspondence: kiplagatsally@gmail.com

Abstract

The introduction of Information and Communication Technologies (ICTs) has caused notable alterations in operations and services provided by libraries. This has brought up a number of managerial and technical problems that, if left unchecked, could affect information management. The study's goal was to evaluate how technological advancements have affected library operations and services in order to provide a framework for managing technological advancements in libraries as they relate to Egerton University's information management procedures. The study to track the technologies that Egerton University Library had implemented, identify technological advancements and their effects on staff competencies, services, and library operations, and suggest a framework for integrating new ICTs into service management. The Information Technology Infrastructure Library (ITIL) was chosen by the study as its theoretical foundation. The research was conducted using a case study method within a qualitative paradigm. Fifty (50) responders, including professional and paraprofessional library staff as well as four (4) employees from the Procurement and ICT departments, were chosen using the purposive sample technique. Face-to-face interviews were used to gather data, which was then thematically analyzed. The study found that the advantages of adopting technology far outweighed the drawbacks. Thus, technological advancements and modifications cannot be evaded by any organization/institution and more so libraries and information centres worldwide.

Keywords: ICT, Academic Libraries, Library Operations and Services, Technological Advancements, E-Waste Management, Egerton University

1.0 Introduction

Academic libraries are vital to society and universities alike. Krubu and Osawaru [1] described academic libraries as those that are primarily housed at and provide services to postsecondary institutions. Their goal is to back the parent institution's teaching, learning, and research endeavors. Their collections are curated to cater for the needs of both current and prospective clients. They process, organize, evaluate, store and disseminate information to users. These libraries offer their patrons a variety of services, such as circulation and reference services and access to OPAC, multimedia services, electronic resource services, searching and retrieval services as well as customer services.

Information technologies (computing and communication technologies) have enhanced functions of academic library, especially in relation to information processing, organization, storage, and analysis techniques and collection development strategies. Krubu and Osawaru [1] declared that "a variety of technologies are currently being adopted by libraries to support its operations but these technologies affect management of information." Thus, positive and negative effects are felt by libraries due to technological changes. Positively, technology adds value to library functions and operations, promotes effectiveness and saves time [1]. However, libraries face challenges of e-waste management, storage space, cost issues and newer skills needed to operate the ever-changing body of technology. Smith [2] asserted that ICT has a profound impact on all areas of academic libraries. He further noted that libraries are no longer custodians of information materials but providers of information. Technology has thus created these dynamics changing the way current libraries provide services.

According to Borgman [3] the emphasis of utilizing technology in libraries has over the past 40 years changed from addressing local issues to addressing global issues. These objectives advanced through three incremental steps before reaching the current phase of addressing system and service interoperability, which includes improving internal operations' efficiency and facilitating access to nearby and external resources.

Information technology advancements, particularly the digital initiatives, have thus had a major impact on library services and operations and over the course of the previous five years, advanced quickly, creating large capacities for resource storage, high-speed network facilities for information retrieval, and portable devices with wireless access and mobile technology for easy information usage [4]. Other notable developments in IT include replacement of text-oriented search engines for web interfaces by visual search engines focused on images and a range of social network applications.

Libraries are impacted by these new technologies in every way, including handling information retrieval, organization, organization, storage, manipulation, and user distribution. According to Krubu and Osawaru [1] information management procedures in libraries are being reshaped by ongoing technological advancements computing, communication, and mass storage.

Further, technological changes have affected library activities and operations particularly in consortia and library collection expansion initiatives offering a chance to offer clients access to an abundance of digital based knowledge resources and value-added information services. In addition, libraries are utilizing contemporary technologies to automate basic operations, set up management information systems, create effective networks for resource sharing and library collaboration, and establish institutional repositories for sharing research output [5]. However, it has also brought with it difficulties like handling change and the rapid increase in electronic waste. Training expenses apply to both service providers and users. Thus, for library users to be proficient in using all available technologies, especially those related to information access and

management, information literacy training must be provided on a continuous basis. There are also expenses associated with buying equipment that eventually become obsolete as well as the burden of moving or transforming data from old electronic storage devices to current, emerging storage technologies. These technological advances however lead to rapid expansion of electronic waste and its consequences for the environment and public health.

Problem Statement

Libraries employ a range of technologies to improve the caliber and effectiveness of the services they provide. New technologies, however, have an impact on how libraries manage their information. The use of automated library management systems is rapidly replacing manual ones at the moment. These developments in technology impact every library procedure. For example, the evolution of storage devices has progressed significantly, transitioning from audio cassettes to flash drives, from CD-ROMs and floppy disks to technology related to cloud computing and digitization. Digitization has the potential to replace optical technologies like CD-ROMs in the near future. These changes pose challenges to libraries since they need to ensure constant transfer of stored information to new devices to avoid risk of losing data.

In addition, technological developments have increased library costs by necessitating purchase of new equipment and providing staff training on usage of emerging technologies for information management. Of concern too is the problem of e-waste management. Thus, most of the equipment upon being declared as obsolete are dumped in some rooms within the library potentially causing environmental and health problems.

Research Objectives

1. The study sought to investigate the information technologies adopted over the years, the factors that influenced their adoption and how application of these technologies have affected operations and services offered by libraries.

Literature Review

Information Technology Infrastructure Library (ITIL) Framework

Information Technology Infrastructure Library (ITIL) framework was created by the British Government's Central Computer and Telecommunications Agency (CCTA) in the 1980s and was applied in this study. ITIL is a set of guidelines that governs information technology best practices and serves as a foundation for providing IT services [6]. The framework is built upon the BS15000 British standard. According to Kisse [6], putting the ITIL framework into practice necessitates a high level of change management. The framework primarily addresses service support, which includes identifying and documenting IT configuration items as well as procedures for dealing with changes, issues, and incidents [6]. The factors to be taken into account are as follows:

- a) *Incident Management*: This explains how to restore normal operations as quickly after something has gone wrong. For example, instances where data or information was lost as a result of updating or introducing new technology. As a security precaution, such situations can be effectively handled by keeping a backup or operating a separate manual information management system.
- b) *Problem Management*: this entails two steps: first, determining the underlying causes of incidents that are reported to the service desk; and second, planning modifications to the IT infrastructure to stop the incidents from happening again. Problems encountered by customers are frequently revealed in a report on user surveys regarding the services provided by the library. When producing an update or releasing an information management system, such instances can be examined and suggestions for modifications to the IT infrastructure can be made.
- c) *Change Management*: Covers the methods and protocols needed to guarantee timely, effective, and regulated management of changes. It is imperative to form a committee to

oversee change management. This will guarantee that library policies and procedures are regularly discussed, enabling timely, effective, and regulated management of changes.

- d) *Release Management*: The process of organizing new releases should take into account both non-IT and IT requirements. Prioritization is crucial when implementing any new technology. Every time a new version is deployed, it is important to take into account both non-IT requirements, like personnel with the necessary training, and IT requirements, such infrastructure and pertinent configurations, to make sure all library functions and services function as intended.
- e) *Configuration Management*: The process of locating, managing, and keeping track of an item's or service's configurations. Maintaining documentation of all configurations of products and services for any technology purchased for pre- and post-problem solutions is crucial. This guarantees that there will always be a fallback in case of configuration issues.
- f) *Service Delivery*: Aspects of service transition are covered by the ITIL framework, which also examines whether the planned strategy can be successfully implemented and how the design delivers on it. The ITIL framework highlights change management as a crucial element. Any technology that is purchased has a specific goal in mind. For instance, the purpose of an integrated library management system is to offer many different services, such as circulation, OPAC, reservations, reminders, and fines administration, among others. Hence, even though the periods of change, any new technology should continue to provide the desired function.

The ITIL framework establishes a standard approach for use inside IT, which helps to create a uniform level of process in the entire firm. Any organization, including libraries, can incorporate elements of the ITIL framework into their information management practices, such as management of software assets, license changes, financial matters and capacity management to determine how much a change will cost to implement. Because it offers change management solutions, this framework can assist libraries in effectively managing the impact of IT changes on information management practices.

Summary of Technological Advancements and their Impact on Library Services and Operations

Libraries today incorporate a wide range of technologies to enhance the services they provide. Each day brings new advancements that impact how information is organized and accessed within libraries, influencing not only administrative tasks and technical operations, but also the overall delivery of library services.

a) Library Operations

High-quality library resources and collections are essential for successful library operations. Darga and Hu [4] lamented at the numerous adjustments to the library's acquisitions budget allocation [4]. These adjustments include a decrease in funding for non-electronic/digital resources (books and printed periodicals) and an increase in electronic and digital resources (e-books and e-journal ordering). Online resources are also more widely available and are gradually taking the place of optical devices (CD-ROMs, DVDs). The modifications are intended to free up space for informational sections and student-serving learning zones, as well as the increase of multimedia resources in libraries. The Essential Electronic Agricultural (TEEAL) CD collection and other CD-based resources like AGORA, AGRICOLA, HINARI, MEDLINE, and CABI abstracts were replaced, among other things, by the sophisticated and preferred online e-

resources that Egerton University Library has adopted. Early versions of these early library systems, like CDS/ISIS or WINISIS provided by UNESCO, were also used. These early versions lacked online accessibility, had few modules, were not based on MARC records, and were not very advanced. The more recent library system generations are built around MARC data and interoperability, and they're all web-accessible.

Osinulu and Amusa [7] asserted that the cornerstone of library services is the collection of libraries because collections show how strong a service is. Academic libraries should have expansive, current, complete, and high-quality collections. These collections ought to satisfy the needs of users and complement the parent institutions' courses. Usability, comprehensiveness, diversity, and scale are the criteria used to evaluate the quality of an academic library's holdings. This means that the library must offer a wide range of reliable, current materials to fulfill its mission and the requirements of postgraduates, instructors, staff, and undergraduates. Additionally, the collections must meet the requirements outlined by national and international regulatory organizations, which can only be accomplished by utilizing modern technology.

Processing procedures in libraries have also been impacted by technological advancements. The necessity for conventional manual processing in libraries has decreased because of new information technology solutions. Digital and electronic resources alter workflows, procedures, and the skills and abilities needed by support workers and librarians. All of these modifications result in altered management and organization of libraries. For example, the AMLIB Integrated Library Management System (ILMS) has been implemented by Egerton University Library to replace its manual cataloging and classification procedures with automated systems. Staff members' time has been saved by technology, and workflow procedures have evolved to produce more accuracy, efficiency, and productivity. The technical processing processes are now able to achieve worldwide standards for cataloging and classification thanks to the new

technology introduced by the AMLIB. Online Z39.50 searching of databases and other libraries is available through AMLIB.

A number of libraries believe that digitizing a portion of their local holdings is a crucial operation. Although it is not yet ubiquitous, this method demands facilities and equipment that are uncommon in a number of libraries. Still, a few information centres have been able to launch similar initiatives. Currently, Egerton University Library is using Dspace software to digitize its journals, theses, dissertations, and archive documents in order to preserve the original materials while also improving the works' visibility and remote availability via electronic databases. Egerton University Institutional Repository (EUIR) was created as a result of this. The Library is also having issues with staffing levels and insufficient infrastructure.

According to Okiy [8], electronic databases have thousands of e-books and digitized journals; therefore, libraries must provide users with a mechanism to find the finest ones. A significant initiative to provide free digital versions of African journal papers is African Journals Online (AJOL). For researchers in Africa, this online resource, together with JSTOR, provides a plethora of digitized peer-reviewed journal articles. Libraries in low-income African nations can access additional electronic databases, such AGORA and HINARI, by registering with an educational institution.

b) Library Services

Through application of library softwares such as AMLIB Integrated Library Management System (ILMS) used in Egerton University, library services can be significantly improved. In automated systems, services like document delivery to clients, current awareness services (CAS) and selective dissemination of information (SDI) can be more effective, efficient, and quick. Additionally, ILMS makes it easier for users to use Net OPACs, which improves search functionality and allows users to access information resources without being constrained by physical distance from the library.

Mohammed claims that the majority of the restrictions on accessing and using information resources and services have been lifted by the development of computer and electronic technologies. Currently, the "electronic word" residing as bits and bytes of computer memory has replaced the "written word" [9]. Ramesh [10] noted that the emergence of the Internet and new information technologies are transforming libraries, and virtual libraries may pose a danger to survival of traditional libraries. He went on to mention other media that are having a significant impact on libraries and information management, including online reference, chat rooms, discussion boards, email, voice mail, multimedia services, and bulletin boards [10]. In his summary of the remarkable advancements, Omekwu [11] states that "printed media has been invaded by hi-tech information systems.

3.0 Research Methodology

Data for this study was obtained from the Egerton University Library using a descriptive case study design. Employees from the ICT, procurement, and library departments at Egerton University made up the study's population. There were eighty-three (83) employees working in the Library system, comprising three library branches and a records center at the University Main Campus, Njoro. There were fifty-four (54) and thirty-eight (38) employees overall in the departments of procurement and information technology, respectively. Therefore, one hundred and seventy-five (175) staff members were the target population.

Two employees from the ICT Department, two (2) from the Procurement Department, and fifty (50) paraprofessional and professional staff members from the Library Department were chosen through the use of purposeful sampling. Therefore, the sample size was 54 respondents.

4.0 Findings

a) Technologies adopted

The first question was on the various technologies adopted over the years. When Egerton University received a variety of World Bank ICT equipment in 1999, the University Library gradually began using ICTs. Included in this equipment were Pentium II computers, scanners, plotters (750 HP), fax machines, bar code readers, file servers, DTP workstations, multimedia PCs, and various printers (HP-Laserjet, Line, Dot Matrix, Inkjet). Due to technological advancements, all of these donations have become obsolete and have either been lost, retired, or disposed of in the library store. The primary driver of technological changes, according to respondents, is technology obsolescence. Diskette ports were present in the World Bank gifts, and the floppy disks contained some data. Since the new computers did not have ports for diskettes, all the data on floppy disks was either lost or thrown away when they were replaced. In 2010, the Library made the decision to move to the integrated library management system, AMLIB, and deleted some information on indexed newspaper articles that had been stored on floppy disks.

Due to the University Library's obligation to adapt to the shifting needs of its users and the global advancements in information management, including collaboration in information sharing, cost sharing through consortiums, and accessibility with no constraints like time or space, the use of ICTs in the library was inevitable. The need to serve diverse users including Persons with Disabilities (PWDs) has led to adoption of ICTs to support their information needs. The University Library has acquired the Jaws software for the deaf and the handheld magnifiers for the partially blind. The Disability Mainstreaming Unit in the University provides other supporting equipment to the PWDs. ICTs have helped to create virtual campuses and libraries, which has increased student access and involvement. Other ICTs that have been adopted by the University Library include RemoteXs that has replaced EzProxy, Pentium IV computers which

have replaced Pentium II computers and Laser printers to replace the Dot Matrix and Inkjet printers.

The University Library has also adopted Electromagnetic (EM) Library Security System, Closed Circuit Television (CCTV), walk-through metal detector gates and smoke detectors to secure the information resources.

The following information was gathered and is shown on Table 1 in order to improve understanding of the first objective, which was to determine what factors affected technology adoption.

Table 1: Technology Adoption Influencers

S/No	Respondents' Sample Direct Quotes (Excerpts)	Implications (Motivating Elements)	Respondents (n)	%
1.	"...it's important to stay up to date with evolving technologies."	Keep pace with technology	29	57
2.	It is evident that there is a global trend toward the shift from analog to digital services and operations.	Adherence to current world trends	9	18
3.	"...the need for new electronic equipment to meet user needs and improve operations..."	Up to date technologies	7	13
4.	"...the requirement for new electronic equipment to enhance operations and satisfy user needs..."	Consortia and cooperative services and operations	3	6
5.	"...the need to serve diverse users including PWDs..."		2	4

6.	...information resources are expensive and they should be secured...”	Security purposes	1	2
	Total		51	100

The main motivation, according to thirty-two (63%; n=32) respondents, was staying up to date with emerging technologies. The global trend toward digitization (17%; n = 9), the need to improve operations (14%; n = 7) and the obligation to coexist with other university libraries (6%; n = 3) were additional motivators for the use of technology, as illustrated on Table 1.

Egerton University library has a strong desire to execute innovative technology in order to fulfill the evolving demands of its patrons. The library has consequently purchased new ICT hardware and software in order to provide access to electronic books and journals. According to one of the respondents, Egerton University has benefited from the consortium as a member of KLISC, receiving scientific data that is needed by its clients. The Online Public Access Catalog (OPAC), which allows users to view the library's collection and make reservations for loaned items, is another way that library users can currently access the collection.

The Library has thus been driven to implement novel technologies in order to facilitate execution of its functions, encompassing acquisition, categorization, and cataloging and has been able to handle important activities and reduce the workload of the Cataloguing/Classification section by utilizing the AMLIB. Technology has made communication between book vendors and the University Library relatively easier and less expensive.

The Library adopted modern technologies to support services and operations in order to co-share with other university libraries. According to Qutab et al [12], the goal of technology application is to guarantee that the majority of library users can quickly and easily obtain pertinent, accurate, and up-to-date information from both local and remote databases [12]. The

responders went on to say that "in order for libraries to function effectively in the modern era, manual processes or methods would have to give way to technologies (ICTs) and a computer driven environment and that libraries must take a more proactive response to ICT."

Implication of technology on library operations

The study's second objective was to determine how technology advancements might affect staff knowledge and abilities, library operations, and services. The results on the effects of technology advancements on information management procedures are shown on Table 2.

Table 2: Technology Developments' Effects on Library Services

Sample Direct Quotes (Excerpts) from Respondents	Technology advancements' effects on information management techniques
	<i>Beneficial Implications</i>
"With the use of technologies like copy cataloging, staff members can work quickly and efficiently, for example, in the classification and cataloging section."	Increased productivity and operational efficiency.
"..using a computer speeds up both lending and receiving."	Achievement of timely services
"University libraries work together and jointly acquire information resources through KLISC..."	Saving money on the purchase of information resources through consortiums, internet purchases, etc.
"Users of the internet can access a variety of information resources."	expanded access to a greater variety of materials, remote access, frequent updates on interesting subjects, etc.

"...automated sections use LAN technology to quickly and easily transfer information between sections."	Simple and quick data transfer between machines
"...every time a new technology is acquired, we receive training."	Enhancement of educational development
"...digitization of theses/dissertations is on-going..."	Digitization of local content
"...there are thousands of e-books and e-journals available, and they barely take up space on a desktop computer."	Conservation of library space
"Using email technology makes it convenient for the library and book suppliers to exchange information."	Quick and convenient information exchanges
"...teleconferencing technology facilitates professional idea sharing through group discussions."	access to knowledgeable and skilled people in a variety of industries;
"...ICTs have made it possible for Kenyan university libraries to work together to acquire electronic materials. (e.g KLISC)..."	Improvement of collaboration across geographic distances
"...The internet contains a wealth of information, including retrospective and archived information..."	Access to archived information worldwide;
"...the resources in the library are accessible to PWDs. ..."	The JAWS software for the deaf and the handheld magnifiers for the blind have supported the PWDs
	<i>Negative Implications</i>

“...our library budget increases in tandem with each new piece of technology that is bought.”	Budget increases for IT equipment, installation, upkeep, staff and user training and retraining, and recruiting new employees, consultants, and temporary project workers to execute the new technologies
“...The institution as a whole still lacks a sufficient ICT infrastructure, and the internet is inconsistent....”	Poor and inadequate ICT Infrastructure and facilities
“...When the manual library management system was replaced with an automated one, some data was lost....”	issues with data conversion, transfer, and security can result in information or data loss
“....The library management system's supplier provides haphazard training, each requiring extra funding. Some modules haven't been used to their full potential yet.”	A local computer/software market that is primarily exploitative and that provides inadequate after-sale maintenance and support;
“...The stability of the internet determines access to electronic resources.as opposed to print materials, which are a real, ongoing stock ...”	Absence of long-term physical collection
...the reason why AMLIB (library management system) updates take so long is because funding isn't disbursed on time.	Decision- and policy-makers' ignorance of the impact that information networks have on a country's industrial and economic growth
“...In our library store, we have a lot of outdated ICT equipment.”	Production of electronic garbage

Users were asked to share their thoughts on how technological advancements might affect the services and operations of libraries. As shown on Table 2, the study revealed that there are some positive outcomes as well as a few negative ones. However, there is need or libraries to adopt new technologies because the benefits much outweigh the drawbacks. Classification/Cataloguing operations and circulation services have benefited most from ICT application according to respondents who stated that the Library has raised its level of productivity and operational efficiency as well as timely services, as seen on Table 2.

The few unfavorable outcomes are controllable and consist of higher budgetary requirements, the possibility of data or information loss, and the need to improve staff members' abilities to handle technology advancements. Strategic management for university libraries has placed a strong emphasis on staff, automation, and effective use of new information technology, as noted by Hayes and Becker [13]. In addition to the timely services listed on Table 2, library management's attention has been needed to secure the necessary funding, hire the necessary staff, oversee the procedures involved in buying equipment and software, and allot the space and operating funds required to keep them. Technological advancements result in higher fiscal budgets since new technologies are more costly, particularly when outdated equipment needs to be replaced because it is incompatible. According to the study, since then, all of the Pentium II computers that the World Bank gave in 1999 have been replaced with newly acquired PCs with current technologies. Hayes and Becker [13] agree, noting that equipment and associated software, along with the information itself, will become more expensive. The publishers are not going to lower the price at which they disseminate content, and the producers of new software and technology devices are in the business to make money. There is need to allocate the requisite space and operational resources for their housing. x in addition to prompt services, as seen on Table 2.

Recommendations

Library ICT Policy

To address technological advancements and their associated impacts, including staff capacity management, license change management, software asset management, financial management, cost of implementation, and lifecycle configuration management, Egerton University Library should create a suitable ICT policy. The suggested strategy should provide seamless handling of technology advancements and be revised on a regular basis.

ICT Budget

The library must have a substantial ICT budget in order to enable effective automation and transformation in operations and service delivery. Application of technological breakthroughs should follow the constantly evolving norms and trends. Timely licensing, upkeep, and staff training on new and developing technologies of the library system would all be made possible by the availability of an ICT budget.

Staff Training

Staff members should get frequent training on developing technologies from the University Library. Training would guarantee that employees are confident enough to use new technologies, eliminating any indication of technophobia. Schedules for refresher training on the current ICTs, such as the library management system, should be followed, with a focus on the times when the system is updated or gets new releases.

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**AFRICAN JOURNAL OF SCIENCE, TECHNOLOGY AND ENGINEERING
(AJSTE)**

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