

RE-ENGINEERING UNIVERSITY LIBRARY SERVICES WITH EMERGING TECHNOLOGIES IN KENYA: PROSPECTS AND CHALLENGES

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Abstract

The current wave of advancements in technology has significantly altered the quality of services provided by university libraries, as well as the expectations that society has of them. Consequently, if university libraries don't start utilizing emerging technologies to enhance delivery of information and services, they risk becoming obsolete in the twenty-first century. It is against this background that this paper examines prospects and challenges associated with use of emerging technologies by university libraries in Kenya. By studying emerging technologies and their application in university libraries, librarians in Kenya will be able to foster new ways of service delivery which will help them to maintain their competitiveness in drawing and retaining patrons. This article reviews previous studies, explores various emerging technologies available in Kenya, how they can be utilized by university libraries and the challenges arising from their implementation. Results show that there are many opportunities for improving service delivery in Kenyan university libraries through emerging technologies such as mobile technologies, Instant Messaging, QR Code, mobile Apps, among others. However, although Kenyan university libraries are making efforts towards adopting emerging technologies for service delivery, the rate of adoption is still slow, and the variety of technologies being adopted is still narrow in comparison to the options available. This has been attributed to challenges such as lack of ICT skills, limitation of funds, policies, support from top management, as well as power outage, poor attitude of library staff and poor infrastructure. The study recommends that university libraries in Kenya should adopt emerging technologies in order to deliver exceptional services. Additionally, training of library staff, improving ICT infrastructure and top organization support amongst other factors should be put in place in order to enhance adoption of emerging technologies.

Keywords: Emerging Technologies, Library Services, Library Automation, University Libraries

Introduction

University libraries gather, preserve, and make information resources available to students, faculty and staff, as well as other users, hence, they support their parent institutions' academic and research endeavors [1]. By supporting the institutions' research, teaching and learning, activities, they help the institutions achieve their mission and vision. Without libraries that are sufficiently stocked with print resources, Information and Communication Technology (ICT) along with its associated technologies, employees with adequate training and high quality information services that are in line with the needs of the patrons, the purpose of universities cannot be fulfilled [2]. The development of the Internet and associated technologies has resulted in a fundamental shift in how library patrons access information, interact with one another, and cooperate. Similar to this, the breadth and depth of what library patrons can do with new applications powered by Information and Communication Technology (ICT) are expanding daily [3]. This change requires librarians to gain skills in handling emerging technologies, information dissemination, scholarly interaction, and strategy creation [4]. As agents of change for modern and cutting-edge technology, librarians have always responded to new technologies that improve their products and services. This paper therefore highlights the various emerging technologies available in Kenya and the need for University librarians in Kenya to apply these emerging technologies to improve service delivery and documents the challenges associated with utilizing emerging technologies in Kenyan university libraries.

Need of the Study

It is important for university libraries to embrace emerging technologies in order to satisfy their patrons' expectations. Given the fast-changing technology landscape, Kenyan university libraries must adapt and change to enable them effectively manage the evolving needs and demands of their patrons. By implementing technologies university libraries will be able to keep

up with the most recent developments in the field to support research and maintain their competitiveness in keeping patrons abreast with emerging technologies.

Definition of Emerging Technologies

Emerging technologies are the new and inventive technologies that are either being developed now or are anticipated to be developed soon [5]. Such technologies are generally distinguished by their capacity to have significant impacts on industry and daily elements of life [6]. In the context of information science and libraries, emerging technologies are defined as technological advancements that have lately been found to be pertinent to library service delivery [6]. Several studies [7-11] have cited the examples of these technologies that can be used to support university libraries in service provision including Quick Response (QR), barcode technology, data mining, Artificial Intelligence (AI), web conferencing, cloud computing, virtual reality, robotics, social network websites technologies, semantics technologies, Radio Frequency Identification (RFID) technologies, institutional repositories, Library Mobile Apps, smart library research data management tools among others. According to these studies, there are a lot of new technologies that are useful for librarians, especially when it comes to assisting scholars. Technology is developing quickly, as noted by Moruf and Dangani [12], and potential users, like university libraries, can choose which ones to use. For this reason, it's critical to align the technology at hand with the pertinent services that libraries can offer researchers in the twenty-first century.

Opportunities for Emerging Technologies in university libraries in Kenya

As new trends and technologies emerge, university libraries must constantly adapt [5]. Given that research and information management have been demonstrated to benefit from developing technologies, university libraries in Kenya have no option but to incorporate emerging technologies in their operations in order to improve service delivery [6]. Some of the key emerging technologies, along with some suggestions on how university libraries in Kenya can utilize them to improve their service delivery as discussed below.

1. Mobile Technologies

The rise in popularity of mobile devices like tablets and smartphones has had a noticeable effect on how people interact with and obtain information in recent years [5]. Consequently, university libraries have recognized the potential of mobile technologies and implemented the same to improve service delivery. The ability to access resources and services while on the go is one of the major benefits of mobile technologies for university libraries. In order to facilitate the process, numerous university libraries have created mobile applications that enable patrons to search library catalogues using their mobile devices, make book reservations, and access electronic resources. This has created an environment that allows convenience and accessibility of library services for people who have no time or means of visiting the physical library. Mobile technologies have also created new channels for interaction between university libraries and their patrons, in addition to improving convenience and accessibility. University libraries in Kenya can also use mobile technologies to provide access to electronic information resources. The library's OPAC can also be accessible over mobile devices which makes it easy to retrieve resources in the library. Similarly, they can use instant messaging such as WhatsApp to interact with users so as to share news, advertise events as well as provide reference services. Instructional materials such as tutorials or videos can also be shared with the patrons through mobile technologies.

2. Instant Messaging (IM) / Chat service

Instant messaging (IM) or Chat service is a method of text-based interaction between two or more people in real time. This provides instantaneous communication between a customer and a customer service provider [13]. Ayo-Olafare [14] noted that information centres are currently using IM such as WhatsApp to provide "real-time reference" services, enabling users to communicate in real-time with information providers, as if they were in a face-to-face reference situation. Moreover, information centres have added a static live chat widget to those sites

where users are most likely to require immediate assistance, including the library home page, catalog page, and research guides [15]. The libraries can thus utilize IM mobile applications such as WhatsApp to provide reference services, communicate with and send overdue and renewal notifications to patrons. Libraries can also use WhatsApp to create groups for patrons who share the same interests for the purpose of sharing information and collaboration. They can also include a chat box on their OPAC where users can instantly ask and get answers to questions regarding the library sources and services.

3. QR Code

This is a barcode with two dimensions that allows for fast access to material or information by scanning it with a smartphone or tablet [5]. There are several ways that university libraries employ QR codes to improve information access and user experience. One of the common usage of QR codes in university libraries is in accessing library resources quickly. For instance, physical books and library signage may have QR codes that, when scanned, provide users with additional details about the book or resource. The libraries can thus use QR codes to provide library orientation and tours, educate users on library resources and services and gather feedback as well as suggestions for improvements from the patrons.

4. Facial Recognition

This is a biometric technique that determines an individual's identity digitally by statistically measuring their facial traits [16]. The libraries can use facial recognition in place of the traditional user cards to identify patrons who walk into the library in terms of who they are, their residence, the books they have checked out, as well any books in their possession that may be overdue. Even though facial recognition makes daily living easier, there are serious security and privacy risks that may be of concern to patrons [17].

5. Mobile Apps

The number of people using mobile devices has sharply increased during the last few decades. This is because many individuals now rely heavily on smartphones to access the internet. According to Rehm and Uszkoreit [18], a mobile app is a software that is downloaded onto a mobile device and uses the touchscreen to deliver information and services. Enhancing access and convenience of library resources is possible with the aid of mobile applications. In addition, personalized services, such as recommendations and customized search results based on user interests and usage patterns, can be offered to users [19]. By doing this, patron engagement with the library increases and the entire user experience is enhanced. The libraries can also utilize mobile apps to enable users access information resources as well as provide services. Thus, Mobile apps such as Mpesa can also be used for payment transactions in instances where users need to pay overdue fines or pay for photocopying services.

6. Social Networking service

This is a web-based software that makes it easier to build social networks virtually, for people who have shared interests and goals or who are intrigued about what others are pursuing [20]. Most of the social network services, according to Ayo-Olafare [14] are web-based interfaces that enable user communities to engage with one another by utilizing features such as messaging, chat, email, audio and video chat, blogging, discussion forums and file sharing among others. Faisal [21] further noted that the main reasons why information providers use social networking is to get in touch with the users at their convenience, market information resources and events, offer current awareness services and interact with users and obtain feedback. The libraries can also use social networking platforms like Facebook, Instagram, LinkedIn and Twitter to advertise services and resources including research guides, workshops, and new acquisitions. This would in turn increase user awareness and utilization of the library's resources. Additionally, they could use these sites to communicate with the patrons and respond to their

enquiries. Further, the libraries can advertise their resources and services as well as publish updates, event announcements, and daily news on these channels.

7. Big Data

This is a term used to refer to the massive volumes of structured and unstructured data that are produced in many fields [22]. Through the acquisition of insights into the behavior of users and their preferences, big data analytics can help university libraries improve their service delivery [5]. They can also use big data analytics to monitor the use of their resources such e- journals, databases and e-books in order to determine which resources are most popular, when they are most used, and what kinds of devices are using them. Additionally, by examining user behavior including their search terms, browsing habits, and usage of library resources, the libraries can find gaps in their collections and make well-informed judgments about procurement of the needed collection. Moreover, tailored recommendation systems that take in account the patrons' interests and usage patterns can be created by university libraries using big data analytics to propose appropriate books and articles to users.

8. Internet of Things (IoT)

This is a network of actual items such as cars, buildings, as well as other devices that have sensors, software, and connection that enables them to gather and share data [16]. These days, the most significant innovation for library services is the Internet of Things [5]. Libraries in Kenya for example can use Internet of Things (IoT) technology to provide orientation, as well as a virtual tour of the library to recently registered users where they can use a mobile app to download and watch a video tour that takes them through an overview of the library. To further assist users in retrieving resources they want, a shelf guide can be generated from their favorite list using Internet of Things (IoT) technology. The libraries can also automate regular chores like inventory management, book check-in and check-out, and cleaning schedules in order to free up library staff time for other duties. Last but not least, IoT technology can notify users of

accrued library fines, and let them make payments online without having to wait in queues in the library.

9. Block chain Technology

This is a decentralized ledger technology that removes the requirement for a centralized authority and enables safe and open transactions [5]. In essence, Blockchain technology permits members within a group to record transactions in a shared ledger, meaning that once a transaction is published, it cannot be modified while the blockchain network is in operation [23]. Blockchain technology may be used by libraries to manage digital rights and licenses for materials like e-books and e-journals. It can also be used to ensure long-term accessibility and preservation of electronic resources by creating unchangeable records of usage rights, ownership, and licensing. Furthermore, its powerful and decentralized storage networks can offer a visible and dependable audit record of preservation operations. Blockchain technology can also help the university libraries to simplify and lower transaction costs associated with interlibrary loans by enabling safe and transparent tracking of such activities. Additionally, it can be used to build decentralized platforms for university research sharing and open-access publishing.

10. Virtual reality

According to Avila [24], Virtual Reality (VR) is “a computer-generated simulation of a three-dimensional image or environment that can be interacted with by a person wearing specialized electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors, in a way that appears real”. Oyelude [25] further noted that this technology intends to give users the impression that they are actually present and are having a real time experience of what is happening. Virtual Reality can be utilized by university libraries in Kenya to help librarians with provision of information literacy training. Through virtual tours, librarians can show users how to navigate the space and virtually locate resources in the library. Varnum [26] asserted that

Virtual reality is one way to incorporate powerful computing technology into information literacy instruction since it utilizes an experiential learning approach in which students apply and conceptualize the material being taught through their own experiences.

11. Augmented Reality (AR)

This technology aims at enhancing the real environment with layers of digital data, or the real-time reality of the user with the goal of digitally integrating and expanding it [27]. Varnum [26] asserted that AR technologies have played a great role in taking university libraries from simple facilities where users can access materials, to transforming them into innovative spaces with a capacity for dynamic interactions and experiences. By integrating AR in university libraries in Kenya, patrons can engage in immersive and interactive experiences, including the generation of virtual tours and interactive maps that facilitate library navigation. Moreover, Augmented Reality (AR) can enhance the way that library resources are found and explored by allowing users to get additional information such as summaries, reviews, and related resources by scanning book covers or QR codes, hence boosting user interaction and helping users make well-informed decisions.

12. Artificial Intelligence (AI)

This is a field of computer science that seeks to close the gap that exists between humans and machines. Its goal is to build machines that think or act like humans [5]. University libraries can leverage Artificial Intelligence to carry out tasks such as subject indexing, descriptive cataloging, reference services, shelf reading, technical services, collection development, information retrieval and trends in collection development, circulation statistics and patron usage. The libraries can also employ natural language processing algorithms, which translate user queries and return pertinent search results to enhance the search functionality in library databases. Furthermore, by responding to often asked queries, directing users to relevant resources, and offering crucial research support, AI-driven Chatbots can offer prompt and

effective customer care to patrons. AI can also be used by libraries to provide users with tailored recommendations depending on their search, borrowing, and reading histories.

13. Expert Systems

These are software programs designed to imitate the judgment of humans in a specific field [5]. They seek to address complicated challenges in a specific field by mimicking the decision-making process of an expert [28]. Expert systems can be used by the university libraries to offer users guidance, reference services, and answers to often asked queries. They can also assist in examination of user behavior, circulation, and library usage statistics in order to offer suggestions for collection growth. Moreover, they can assist the libraries in automating the process of cataloging and classifying library resources by discovering pertinent subject headings and class numbers based on the content of the resources. Additionally, by analyzing users' search terms and providing suggestions that are tailored to their requirements, Expert Systems can also be utilized to help users find relevant content. They are also capable of analyzing the state of library resources and suggesting the best conservation and preservation strategies.

14. Semantic Web

Semantic Web, which is an attribute of the Internet, is the capacity to exchange and reuse data across numerous systems, apps, and platforms [5]. It describes and presents data in a machine-readable format using a set of standards and technologies so that computers can comprehend and interpret the meaning of the data. This technology holds promise for revolutionizing university libraries' data management and sharing practices, fostering cooperation and interoperability, and improving student, faculty, and researcher experiences [5]. Adoption of the semantic web technology by university libraries in Kenya would help in standardization of description and organization of metadata and make it possible for them to handle and exchange metadata among many platforms and systems. Additionally, it would improve the university library catalogues' search capabilities by returning more precise and pertinent search results

depending on the context and meaning of the user queries. The semantic web can also be used by university libraries to improve the user experience by providing personalized suggestions depending on user preferences, interests, and previous search history.

15. E-resources

The term "e-resources" describes digital or electronic materials that are accessible online [5]. They include electronic books, electronic journals, online databases, audio and video materials, and other electronic resources that may be accessed online or through other electronic channels. In the recent past, there has been a high tendency of researchers making e-resources their first choice when it comes to seeking information resources for their research [6]. More often, university libraries acquire electronic resources to support instruction, research, and learning. Expanding e-resource collections to accommodate patrons' evolving requirements is a contemporary trend in university libraries [6]. University libraries can thus take advantage of the Open access (OA) to expand their e-resources collection so as to meet the increasing demand for digital content by the patrons. They can also increase the range of the e-resources provided to include interactive and multimedia content in order to enhance learning and research.

16. Data mining

One of the most helpful new technologies that information professionals can employ to create order in the chaotic world of information is data mining tools [6]. By offering insight into the makeup of database collections, data mining enables libraries to assist scholars in an efficient manner. Using data mining, university libraries can quickly spot new research trends and use that information to offer scholars current awareness services and targeted information distribution, sparing them a great deal of preparatory effort.

17. RSS Feeds

Really Simple Syndication (RSS), through a technology known as Extensible Markup Language (XML), enables a web site to list the most recent updates that have been released, such as lists of

new journal articles. It also enables anyone using the web to monitor fresh updates on their preferred website(s) [14]. RSS feed readers browse pre-selected websites in search of newly updated information before downloading it directly to the desktop of the user. Using this service, users can syndicate and republish information on the Web. University libraries can use RSS technology to send information on specific subjects to their users through their websites, podcasts and blogs or produce RSS feeds that users can subscribe to for information on new additions to collections, services, and subscription database content.

18. Live streaming

Multimedia streaming refers to progressive transmission of multimedia files via a computer network, where the final user sees or hears the content as it is being sent by the distributor [14]. Given the availability of network infrastructure and computers to facilitate multimedia streaming, university libraries can leverage live streaming for online instruction by incorporating more interactive media facets. Through live streaming videos, new patrons can receive live orientation, user training sessions and demonstrations on how to utilize various information services such as online databases, online catalogues, discussions, events, and exhibitions. Further, university libraries can include live stream media as part of their collection in order to provide access to them as well as archive them. Applications for digital repositories and technologies for digital asset management make this possible.

19. Podcasting

Podcasting is a combination of the terms broadcasting and iPod, which is a well-known MP3 player manufactured by Apple Computer. This is the technique of recording audio digital media files for online distribution via RSS feeds for computer and portable media player playback [29]. Such feeds can be subscribed to by users, who would then have these files downloaded automatically into the tool they use to manage audio on their personal computers. A feed reader or aggregator that can read feed formats like RSS or Atom can be used to subscribe to, syndicate,

and automatically download new content from a podcast when it is added, setting it apart from other digital media formats [14]. Libraries can employ podcasts to supplement their programs for new patron orientation. They can also use them for information literacy, marketing information resources and provision of news about what is happening in the information centre. According to Kaushik[30], using podcasting technology to provide services in the information centres gives patrons another way to access ready-made content in a portable format that supports a mobile learning environment.

20. Vodcasting

Vodcasting is derived from two words, "video-on-demand" (VOD) and broadcasting. It is similar to podcasting. Ayo-Olafare [14] noted that Vodcasting is used to send video content, whereas podcasting is used to deliver audio files. Like podcasts, vodcasts can be listened to on a computer or a Personal Media Assistant (PMA). Vodcasts can be used by university libraries to give orientation tours and instruction on how to access online resources to patrons. They can also be used in promotion and publicizing of resources and services available in information centres.

21. Blogs

A blog is a type of website that is typically kept up to date by one person and with regular updates consisting of pictures or videos along with commentary and event descriptions [14]. Typically, reverse chronological sequence is used to present entries and are regarded as simple tools for publishing. They give a person or group of people the ability to publish information and leave comments on it [31]. Although most of the blogs are run by subject matter experts who are prepared to share their expertise, ideas and opinions with others, blogs can generally be thought of as online diaries. University libraries in Kenya can use blogs to promote and publicize information services, as well as for outreach activities. Through their blogs, university libraries can enlighten their users and provide information about events and new resources. Blogs can

also serve as a web interface via which users can access library materials and services offered by the library in addition to providing tools for offering Selective Dissemination of Information (SDI), reference services and Current Awareness Service (CAS) through development of subject-specific blogs.

22. Wikis

A wiki is a group of web pages that anybody with access to can edit or add to by using a streamlined markup language [32]. More often than not, wikis are used to build community and collaborative websites. They are similar to public web pages that anybody with a registered account may edit, add to, and publish content on [14]. Wikis can be used by university libraries as a platform for communication to promote social contact between the librarians and patrons. Within wikis, library staff and users can both exchange queries and information.

23. Remote Access

Remote access enables users to access a device or a network from any location. Through remote access, users have the ability to handle data and files saved on remote devices, facilitating continued collaboration and productivity from any place [5]. A virtual private network (VPN) that offers a secure connection between two devices is used for remote access via the Internet. In essence, the VPN works as a tunnel to maintain the confidentiality and continuity of traffic. Through remote access, university libraries in Kenya are able to have multiple users simultaneously access licensed information resources from anywhere at any time, which enables the user population of information centres to utilize electronic resources to the fullest. These libraries are currently using EZproxy, a URL-rewriting proxy server, as well MyLOFT app to provide remote access to their information resources.

24. Cloud Computing

Cloud computing is built on web technologies thus it is a service offered over the Internet or a network, where a server is connected to a large number of computers [33]. All of the machines

linked to that server location can use the apps, which are installed on a remote server. Therefore, not every application needs to be set up on a single machine. Platform as a Service (PAAS), Software as a Service (SAAS) and Cloud as a Service (CAAS) are the service paradigms for cloud computing. In order to share scholarly material university libraries can adopt Duraspace, DuraCloud which offers open-source repository solutions for information centres like DSpace and Fedora Commons which are well known for IR solutions. They can also utilize Google Apps such as Gmail, Google Docs, Google Sites, Google Video, and others which are as a result of Google cloud computing project for communication. Libraries can also offer orientation and information literacy classes to their patrons using sved videos, presentations, and files in the cloud.

25. Assistive Technologies

Assistive technologies are electronic solutions that enable individuals with disabilities to access and fully utilize ICTs [34]. According to Midhula and Sudhier [35] access to information sometimes poses a challenge for individuals living with disabilities, and libraries can now be equipped with the newest technology and gather, store, and distribute information to these users in their preferred format. Various assistive technologies are required for different types of disability, for instance, in order for users with visual impairments to make efficient use of printed and digital information materials, they need assistive technology devices, such as computers with screen readers such as Nonvisual Desktop Access and Job Access with Speech (JAWS), screen magnifiers, and voice recognition software, to make efficient use of information [36,37]. Libraries can also provide videos with captions for the hearing-impaired users. Thus, academic libraries should be places that promote inclusion and equitable access for everyone, regardless of physical abilities, by adopting inclusive policies, having trained staff, and embracing assistive technologies [38].

Challenges of Emerging Technologies application in university libraries in Kenya

Despite the advantages of using emerging technologies, research indicates that only few Kenyan university libraries have made significant efforts to provide library and information services that utilize several of these technologies. Several studies [39–44] indicated that university libraries in Kenya have adopted emerging technologies such as Web 2.0 tools, cloud computing, mobile technologies, digital libraries and Internet of Things for provision of information services. This implies that the university libraries are taking steps to leverage emerging technologies in provision of information services. However, the rate of adoption remains slow and the breadth of emerging technologies being utilized is restricted in comparison to the available options. Several factors have been identified as the root cause of this situation, some of which are discussed below.

1. Lack of Technological Literacy

Technological literacy comprises the librarian's ability to consistently use relevant technological tools to manage, assess, and create or produce information that can satisfy or respond to user queries [45]. The university library has become an excellent opportunity for tech-savvy librarians due to the advent of advanced technologies and a range of library materials that are in digital formats [44]. A study by Musangi et al [43] revealed that majority of Kenyan university librarians depend on their academic training to provide library services. Because of this, their knowledge and skills, which were derived from the coursework they completed for their bachelor's or master's degree, are insufficient for usage with emerging technologies. Furthermore, the study established that very few librarians had received specialized training on the new library services; the rest had either self-initiated the training or had received it as an after-sale benefit for the product or service that the library had purchased. This presents an unending risk to Kenyan university libraries' ability to properly integrate and use emerging technologies in provision of library services.

2. Poor Attitude of Library Personnel

A key component of the library is its staff. Thus, the personnel at the library have a significant impact on whether the library succeeds or fails [45]. Since libraries are service-oriented organizations, they cannot use emerging technologies if librarians have a negative attitude towards them. A study by Rajab and Ogalo [46] revealed that most of the librarians in Kenya have technophobia, hence, they do not consider using emerging technologies in university libraries as a viable choice. One internal deterrent to librarians becoming proficient in technology is technophobia, which has prevented them from acquiring the knowledge necessary to employ emerging technologies [47] Rajab and Ogalo [46] further noted that Technophobic librarians still prefer to provide services manually, which takes time and may waste patrons' time and schedule of activities.

3. Inadequate Funding

The financial burden of acquiring and using cutting-edge technological equipment in university libraries presents management with financial impossibilities [45] because libraries depend on funding to function efficiently yet universities have historically viewed their libraries as either non-generators of revenue or as mere spenders of same. As a result, there has been prevalent reductions in budgets for Kenyan university libraries [44]. This lack of funding has forced these libraries to concentrate on finding ways to generate their own funds. Considering the fact that the quality of technological tools provided in university libraries in Kenya is partly a function of the quantum of funds available, insufficient funding is one of the main obstacles to utilization of emerging technologies in these libraries.

4. Power Outage

This is related to brief power outages, particularly in the case of the electric supply [45]. One of the issues preventing emerging technologies from being utilized in Kenyan university libraries is an unreliable supply of electricity [39,48,49]. Continuous power supply is necessary for the

proper operation of facilities needed for utilization of emerging technologies. Usage of these technologies is thus severely hampered by lack of or irregularities in power supply.

5. Poor ICT infrastructure

ICT infrastructure comprises computers, networks, the internet, display screen technologies and accessories [50]. One of the main forces behind transformation of libraries is ICT infrastructure, which also contributes significantly to maintaining integration of systems and processes. As a result, the availability and integration of the necessary infrastructure facilitates the adoption of emerging technologies with amazing success [43]. Several studies such as [39,48,51] established that university libraries in Kenya did not have the required ICT infrastructure necessary for adoption of emerging technologies leading to the limited adoption of emerging technologies in Kenyan university libraries.

6. Lack of top management support

An organization's top management defines and directs the organization toward achieving its objectives [3,43]. Adoption of emerging technologies in university libraries is dependent upon the visionary leadership of the library and the support of university management. A study by Otiike and Barát [44] revealed that some university libraries in Kenya are not supported by the universities' top level management in their bid to adopt emerging technologies for service provision.

7. Lack of policy guidelines

Strong supporting policies are necessary for a robust ICT deployment, in addition to technical infrastructure hence there is need for institutions to develop comprehensive ICT policies [52]. A successful policy is one that the organization develops, shares, adopts collectively. Rules, regulations, and initiatives that take policy consideration have a significant impact on ICT components like funding and security, among other aspects. Several studies [40,44,48] established

that one of the reasons for slow adoption of emerging technologies in university libraries in Kenya is lack of policies to provide guidelines for adoption.

8. Lack of proper Library buildings

A number of buildings hosting libraries in Kenya were designed and built before the advent of ICT leading to challenges in deploying technology-based services. In terms of physical infrastructure, modern libraries do not only provide space for housing collection, reading space and staff offices but also needs to accommodate other facilities such as multimedia centre, training facilities equipped with modern equipment, discussion rooms among others. In some instances, libraries have failed to accommodate persons with disabilities due to lack of facilities such as ramps, lifts. Studies have shown that a number of libraries have not adequately catered for persons with disability [53].

9. Inadequacy of Library and Information Science Curriculum

Human resources play a critical role in successful implementation and deployment of technologies in libraries. Due to the dynamic nature of Information Technology requirements in a modern library, graduates from Library and Information Science (LIS) Schools need to be adequately prepared to handle the emerging trends. Rukwaro and Bii (54) noted that the curriculum in Kenya's LIS schools do not have sufficient information communication technology courses and hence affecting the ability of graduates to facilitate implementation of technologies in libraries.

Conclusion and recommendations

We are living in a time when hardware, software, and online technology is changing rapidly, and it seems like this change will only accelerate. This technological revolution has changed university libraries, creating new avenues for managing resources and providing information services. The latest technological trends covered in this paper, including mobile technologies, Instant Messaging (IM), social networking services, Internet of Things (IoT), facial recognition

and Artificial Intelligence among others, are turning university libraries into vibrant centres for learning and research. Although implementing these emerging technologies may be expensive, it is essential to meet user needs and stay relevant in the constantly shifting academic landscape. As a result, university libraries in Kenya must keep evolving and adapting to satisfy the constantly evolving needs and demands of lecturers, researchers, and students in the quickly changing technological environment. To make it easier to integrate and utilize emerging technologies in university libraries in Kenya, this paper makes several recommendations. First, the staff should be trained on emerging technologies. This will encourage them to accept and use emerging technologies by making them see these technologies as agents of library transformation. The university libraries also need to have adequate funds set aside towards integration of emerging technologies, the ICT infrastructure should be improved, policies on use of emerging technologies should be put in place, the library should get adequate support from top management, and the country's electricity supply ought to be improved by the government. In cases where this is not possible, universities ought to offer a backup power source to prevent blackouts and the subsequent effects they have on the usage of emerging technologies.

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