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Adoption of radio frequency identification technology in university libraries

A Kenyan perspective

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Abstract

Purpose – The purpose of this paper is to investigate the adoption of radio frequency identification (RFID) technology in handling and supporting information services and activities in Kenyan university libraries.

Design/methodology/approach – The study utilized a survey research design to collect data, ideas, opinions, views and suggestions from the respondents drawn from various university libraries in Kenya. Collecting data and getting in-depth information from the respondents was done using a web-based structured questionnaire, document analysis and participant observation.

Findings – The findings from the study show that few university libraries in Kenya are using radio frequency identification technology to handle and support information services and activities. The study also found various problems hindering the adoption of the technology, such as a lack of information communication technology (ICT) policies, lack of a business approach, limited market opportunities, lack of lobbying or negotiating skills, inadequate funding and budgeting, and lack of ICT competencies and skills. The study recommends that library ICT professionals, information professionals and other stakeholders should make tireless efforts to implement and use RFID technology with the view to building, strengthening, improving and supporting information work and activities in university libraries.

Research limitations/implications – The study involved RFID technology, a relatively new and emerging innovation in university library and information systems, especially in the Kenyan context. The study also involved university libraries in Kenya that provide and support the fundamental functions of their respective universities.

Practical implications – Fundamentally, library ICT professionals, information professionals and other stakeholders need to take appropriate measures to address issues affecting the use of RFID solutions. There is a need to empower university libraries and information professionals with the right mix of ICT knowledge and skills necessary in the modern information environment.

Social implications – Across the world, university libraries are increasingly adopting and implementing RFID solutions in order to handle and support information work and activities. Of critical importance to the discussion is the extent to which university libraries in Kenya are using this technology to handle and support information work and activities effectively and efficiently. Proper management of library operations and services is necessary in university library and information systems.

Originality/value – The focus of the study was to assess the extent to which university libraries in Kenya are adopting and using RFID systems in information work and activities. This research is useful in providing a point of reference for university libraries and information professionals, increasingly going for similar solutions in Kenya and Africa in general.

Keywords Radio frequencies, RFID technology, Adoption, Academic libraries, University libraries, Libraries, Kenya

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Introduction

Globally, the developments of ICT systems are rapidly becoming the vital and core component for conducting and transacting business in organizations. At present, business organizations including universities are increasingly going for ICT-based solutions so as to provide and improve on the delivery of quality services to customers. For universities, this implies a change in management to the adoption of intensive ICT-based solutions that serve the needs and desires of customers, i.e. solutions that are market-oriented and business-driven. Similarly, university libraries are also adopting and implementing intensive ICT-based solutions to manage and handle information processes and services. In particular, university libraries are increasingly adopting radio frequency identification (RFID) technology, mainly to improve the efficiency of information services and increase quality services. This is in line with the fourth law of library and information science, which states "Save the time of the users". The application and use of RFID solutions in the information environment is slowly changing as more library and information systems adopt the technology. Historically, the dispensation of RFID systems in the information environment is not new, although many university library and information systems in Africa and Kenya in particular have not really yet embraced this technology.

University libraries provide one-stop access to information resources and services that support teaching, learning, research and community services in universities. These libraries are mass centers of information, knowledge and communication services that support the core functions of their respective universities. In university libraries, the vital strategic resources are information and knowledge, upon which the success and continuity of academic programs are built. As modern knowledge hubs and knowledge base nets, university libraries need to manage and handle information and knowledge services effectively and efficiently. Fundamentally, university libraries are social institutions of knowledge and intellectual development. The main purpose of university libraries is to ensure proper management of library and information services in meeting the needs and demands of the customers.

In modern knowledge and learning environments, university libraries have to look for creative solutions in order to be relevant to the needs and demands of customers. RFID technology is rapidly becoming the backbone of quality delivery of information, knowledge, communication, management, education and research services in university libraries. The technology provides integration, real-time accessibility and quality delivery of information services. Unfortunately, there are concerns that RFID systems providing solutions to information management practices in university libraries are not widely adopted within the Kenyan context. The present study investigated the adoption of RFID technology in managing and handling information services and activities in university libraries in Kenya. Finally, the paper provides relevant information regarding RFID applications in university libraries.

Literature review

In developing countries, RFID technology is emerging as one of the modern Information 2.0 systems increasingly being adopted and implemented in library and information establishments to increase the efficiency and quality of the delivery of information services to customers. Waddenkeri (2006, pp. 558-9) observes that:

> [. . .] among the various technologies, the radio frequency identification seems to be dominating in the information industry as a means to improve efficiency in library activities

and services. In fact, this is one of the significant technologies of the new millennium that has invaded the libraries. Today the RFID technology has become integral part of many business industries, software companies and information industries in the world.

Radio frequency identification is an exciting and fast-growing technology for increasing efficiency and improving profitability, and is an important area of study in today's information environment (Madhusudhan, 2010, p. 149).

Historically, the RFID system began during the Second World War in the 1940s, when initially the system was used to locate and distinguish friendly aircraft from enemy ones. With time the system spread to other business industries such as manufacturing firms and livestock (Waddenkeri, 2006). After realizing the advantages of RFID technology, libraries are considering it as a productive tool for flow management rather than barcodes and other identification technologies (Koneru, 2004, p. 413). RFID technology is sparking interest in the library community because of its applications, which promise to increase efficiency and productivity and enhance user satisfaction (Biswas and Paul, 2010, p. 6). In Waddenkeri's (2006, p. 1) view, RFID-based systems move beyond security to become tracking systems that combine security with more efficient tracking of materials throughout the library, including easier and faster charge and discharge, inventory and materials handling. Writing in 2004, Kern stated that RFID systems had been in use in libraries for five years for book identification, for self-checkout, for anti-theft control, for inventory control, and for sorting and conveying of library books and AV materials (Kern, 2004). He noted that these applications could lead to significant savings in labor costs, enhance customer service, reduce book theft and provide a constant record update of media collections (Kern, 2004).

In the twenty-first century, RFID technology is emerging as the innovative solution for managing information operations and services in university libraries. In Waddenkeri's (2006) highlights, RFID is a form of identification that involves the use of small electronic devices that consist of a small chip and an antenna. The system consists of various technologies including radio frequency based and microchip technology. Additionally, in order to ensure adequate security of information resources the RFID tags are affixed in materials with a property sticker. The antenna is used to read the tags and manage the various library functions. The various components of the system include automatic self-return, self check-out, security, conversion, staff service station, inventory and docking or server. Kern (2004) describes the components and technical features of a modern RFID library system in order to provide a guideline for the evaluation of different systems.

In view of the above discussion, RFID technology is an innovative and smart system for handling and supporting information processes and services in libraries. The technology is used in libraries to automate library operations and services, including check-in, check-out, inventory control and self-management (Biswas and Paul, 2010; Koneru, 2004). The RFID system interacts with an integrated library management system to enhance and support efficient library operations and services (Yu, 2007). On the other hand, Butters (2007) provides an overview of the perceived threats of RFID systems in libraries, probes their technical feasibility and presents a clear picture of what may and may not be done by libraries to mitigate the risk that actually exists. Current RFID standards are also examined in the context of privacy and their limitations are weighed. Mehrjerdi (2011) in his review of the fundamentals of RFID systems, also identifies risks, as well as key benefits and uses.

The case for RFID applications in Kenyan university libraries

RFID technology has been around for about 60 years (Howard and Anderson, 2007). Globally, cases of implementation and use of RFID systems have been more pronounced in developing countries such as the USA, the UK, Germany, Japan and China. Leeds Library and Information Service in the UK, with a user community of 761,100 residents, 53 static service points, six mobile libraries, an online collection of 730,000 holding records, 100,000 active borrowers and over four million annual visits, decided to adopt and implement a RFID system so as to relieve frontline staff from manual, basic transactional tasks, thus giving them more time to attend to the public. The Library was guided by the principle of the use of self-service in other aspects of modern life like the supermarket checkouts[1]. It is estimated that over 30 million library items worldwide now contain RFID tags[2].

A few university libraries in Africa are using the system, such as the University of South Africa and the American University in Egypt. In Kenya, the use and application of RFID technologies is still prominent in commercial organizations, especially in well-established supermarkets. The development of university library and information systems in the country is almost approaching 50 years since independence. In recent times, RFID applications have spread to university library and information centers, which play crucial roles in knowledge creation and development. The United States International University library uses a RFID system, while the Catholic University of Eastern Africa is presently implementing the solution. In terms of technological innovation, Kenyan university libraries are far below the expectations of modern information requirements. RFID is a technology that is booming in libraries due to increased productivity in library processes and a possible increase in the security of items for loan (Madhusudhan, 2010, p. 155). In developing countries, the concept of RFID applications in libraries is still considered young, emerging, only of heard in workshops or at conferences, and its reality has to be realized in the years to come (Waddenkeri, 2006).

There are various reasons that motivate university libraries increasingly to go for RFID solutions. A number of authors (Biswas and Paul, 2010; Howard and Anderson, 2007; Madhusudhan, 2010; Waddenkeri, 2006) have advanced numerous reasons that make RFID systems attractive in library and information establishments. Factors central to the discussion include the need to handle and support information processes and services effectively, promote the knowledge society, greatly improve the efficiency of information services, enhance the management of information resources, increase the productivity of staff, provide quality services, and make information work and activities more convenient. These are discussed below.

Support information practices

In recent times, the information environment has witnessed the emergence of many modern information practices. The implementation of RFID technologies has led to shifts in how university libraries should handle and support information services. The role of university libraries in response to the needs and demands of customers is changing rapidly and becoming dependent upon technological solutions. The fundamental role of university libraries is to provide quality services to customers. This makes the demand for RFID systems a necessary requirement in university libraries. RFID systems provide alternative innovative methods to handle and support library operations and services through the automatic identification and tracking of

information resources and services including the self-issue and self-return of resources, thus, reducing queues at information service points or desks. This provides staff with the opportunity to offer other services such as teaching of information literacy and ICT skills.

Promote the knowledge society

The knowledge society has rapidly created emerging and new roles for university libraries in order to suit the needs and demands of customers who are technology savvy and who value a different kind of "information environment" than the traditional or classical one. Among the millennium development technologies useful in this environment is RFID technology. One of the biggest challenges for information professionals in Kenyan university libraries is to understand accurately the fundamentals of RFID systems that are useful in the modern knowledge society. In today's knowledge society, the most important thing is for university libraries and information professionals to implement RFID systems so as to enhance the delivery of quality services to customers.

Self-service and self-sufficiency

RFID systems allow a quick flow of information transactions in university libraries. The systems provide customers with the opportunity for self-service and self-sufficiency of information resources. In particular, the use of RFID systems in charging or discharging reduces the amount of time required to perform circulation operations, and significant time savings are attributable to the facts that information can be read from RFID tags much faster than from barcodes, and that several items in a stack can be read at the same time. Normally, the time savings are less for charging than for discharging because the time required for charging is extended by social interaction with the customers. With shifts to customer self-charging there is a marked improvement because the system eliminates the act of placing information materials within the designated template and processes several items at the same time. Most importantly, self-discharging services save the time of both staff and customers at service points, and increases satisfaction.

Asset or inventory management of resources

Accounting or taking inventory (stock) of information resources in university libraries is an important annual event. Manual stock-taking is practically impossible in academic libraries. With the help of the hand reader, information professionals can regularly do stock verification within the shortest possible time. Unlike the barcode reader, the personal digital assistant (PDA) based hand reader scans thousands of information materials lying on shelves without even a single one being pulled out. Data is then updated instantly on the server for stock verification with the database. The information provides a list of matched and unmatched items. The PDA is also useful in sorting shelves and searching for specific items. In addition, using wireless technology, it is possible not only to update the inventory, but also to identify items that are out of proper order. In addition, the security of information materials is enhanced with the use of RFID tags compared to the traditional electromagnetic strip. The tags also last longer than barcodes because nothing comes into contact with them.

Self-management of resources
RFID systems help in self-management of information resources, in which case resources are located and shelved accurately, thus increasing staff and customer satisfaction. Once the sequence of information materials is defined, processed and stored in the system, it becomes very easy with the RFID hand reader to shelve the materials. In addition, it is possible to easily separate discharged information resources according to the rack number and location number.

Challenges facing university libraries

There are, however, a number of factors militating or hindering the adoption of RFID systems in Kenyan university libraries. These include lack of ICT policies, lack of a business approach, limited market opportunities, lack of lobbying or negotiating skills, inadequate funding and budgeting, and lack of ICT competencies and skills. These are expanded below.

Lack of ICT policies
Aligning university libraries with RFID systems in order to improve the delivery of quality information services is still one of the biggest challenges facing Kenyan information professionals. The lack of appropriate ICT policies to adopt and embrace modern technological solutions into mainstream information services hinders the development of RFID applications in university libraries. In addition, the policies to guide university libraries in regard to highly technological solutions are merely paper-based documents that are never implemented. In reality, more attention is given to policies that favor the acquisition of information resources at the expense of technological systems.

Lack of a business approach in information practices
Kenyan university libraries have not adopted modern information practices that are business-oriented. A business approach implies the use of modern information practices that help to provide and deliver quality services to customers. This includes responding to the needs, demands, desires and wisdom of customers through RFID solutions. RFID technology helps to enhance the role and image and adds value to university libraries in the delivery of quality services to customers. For Kenyan university libraries, it is business as usual since the customers will access and use information services irrespective of quality.

Limited market opportunities for RFID technologies
There is under-development of RFID technologies in university libraries as compared to commercial-based organizations. University libraries still maintain the classical or traditional approaches of handling and supporting information services that are largely manual-based with limited technological solutions. Limited marketing opportunities for RFID technologies in information work and activities in the country have largely left universities libraries behind the knowledge society, Millennium Development Goals, and modern information practices.

Lack of lobbying or negotiating skills among information professionals
For Kenyan university libraries and information professionals, the implementation and use of RFID systems are extremely very expensive projects. The procurement and

implementation of RFID solutions require huge financial resources and management support from the universities. During the procurement process there is a need for information professionals to lobby the management for support, since RFID solutions are never given top priority in universities. In most cases information professionals are never involved in procurement issues. More often, university libraries prefer to acquire printed information resources rather than risk investing in very expensive technological solutions. Information professionals concentrate mainly on information work and activities, while issues of lobbying or negotiating for RFID solutions are left to non-librarians. This makes information professionals custodians and keepers of printed information resources at the expense of RFID technologies. As a result, inadequate lobbying or negotiating skills among information professionals have led to the under-development of RFID applications in university libraries.

In addition, other general factors that have hampered RFID solutions in Kenya include inadequate funding and budgeting and lack of ICT competencies and skills. Inadequate funding and budgeting is the biggest single factor hindering the use of RFID technology in university library and information centers in the country. This is a major problem in developing countries where the cost of technological and communication infrastructure far exceeds the budgets allocated for library and information systems (Yu, 2008; Madhusudhan, 2010). Kenyan university libraries are operating in hard economic situations resulting in less funding and budgeting and fewer sponsorship opportunities. RFID technology components including equipment, readers and the sensors used to read information are very expensive to acquire. In Kenya (as elsewhere), university libraries face budget crunches, and therefore, consideration of RFID systems is not given top priority. The dwindling economic situation facing university libraries has affected the adoption of RFID technologies in the country. Similarly, using the system requires adequate training, experience and attitudes. Library and information professionals should be highly ICT compliant and reliant in order to manage and support the system effectively. In particular, library and information professionals lack the knowledge and skills that are crucial in the implementation of RFID technology. RFID solutions need financial resources, time and ICT manpower that are not easily provided in university libraries.

Results and discussion of the findings

The main objective of this study was to investigate the use and application of RFID technology in university libraries in Kenya. The study adopted a survey research design. Data was gathered and collected using a web-based structured questionnaire and document analysis or a desk review guide. Data was collected from respondents drawn from the university libraries of the United States International University, Kenyatta University, the Catholic University of Eastern Africa, and Strathmore University. University libraries were involved because of their leading role in the creation and diffusion of knowledge and intellectual records. The results reveal that the use and application of RFID systems within the Kenyan context is still a preserve of the business organizations, especially supermarkets. The United States International University library is the only one using the system, although the module for inventory control and bookdrop boxes is not yet implemented. At the Catholic University of Eastern African library the system is being implemented in the new ultra-modern learning resource center. For the rest of the university libraries and information

professionals, a RFID system is still a new concept mainly associated with supermarkets.

Conclusion and recommendations

From the foregoing discussion, the following conclusion can be drawn. In the first place, RFID systems are emerging as fundamental tools for handling and supporting library and information services in the knowledge economy of the twenty-first century. With paradigm shifts to customer focus and services, it is important for university libraries in the country to implement RFID technologies. Customer self-service and self-sufficiency is paramount in the quality delivery of information services in university libraries. A RFID system is one of the millennium development technologies that is useful in automatic identification and tracking, stock management, theft detection and automatic sorting of library and information materials. In the literature, there is evidence of under-development of RFID technology in library and information establishments in Kenya, including university libraries. As a result, only one university library is using the system, while another is currently to implementing it. This implies that Kenyan information professionals in university libraries should make sincere efforts to source and acquire RFID systems. At the same time, the adoption of RFID technology in Kenyan university libraries is hampered by myriad problems, including lack of appropriate ICT policies, lack of a business focus in information work, limited market opportunities for RFID technologies, inadequate funding and budgeting, lack of lobbying or negotiating skills, and lack of ICT competencies and skills among information professionals. Most important, RFID solutions cannot be divorced from modern information practices of handling and supporting services in university libraries.

In the present knowledge economy, RFID technology is one of the fundamental tools for capturing and processing data and information in order to enhance the effective and efficient identification and tracking of library and information resources in university libraries. Across the globe, the system is widely used in handling library and information services. In Kenya, the use of RFID systems is a preserve of commercial organizations, especially supermarkets. The development of RFID systems in information work and activities in the country is virtually zero-rated. It is regrettable that library and information establishments in Kenya, including university libraries, are hardly using this technology to handle and support information services.

Kenyan university libraries should adopt and embrace RFID systems in order to provide quality information services to their customers. Outside the library environment, information professionals acknowledge and appreciate the use of RFID technology as exemplified in supermarkets. Response to customer needs, demands and desires is necessary in making university libraries the modern powerhouse for information, knowledge and communication services.

The implementation of RFID systems requires huge investment and support from parent organizations. Universities in Kenya should provide the necessary financial resources, including support from management. Usually, RFID initiatives are never given prominence in the discourse of library funding and budgeting in universities. Without sufficient financial resources it becomes quite very hard for university libraries to acquire smart technological solutions.

Information professionals must be leaders of technological change. There is need for information professionals to lobby the management of universities in regard to use of

RFID systems no matter the costs involved. In the twenty-first century, university libraries exist in a different information environment that needs a business approach in order to provide quality services to customers. RFID systems provide the end to the means to improve the efficiency of information services to customers and increase productivity among information professionals.

Notes

1. See www.talis.com/bridge/documents/Talis_Bridge_Pro_Leeds_Case_Study.pdf
2. See www.systemslibrarian.co.za/RFID.html

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