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Application of Barcode Technology in Landmark University Centre for Learning Resources, Omu-Aran Experience

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Abstract

The main objective of any library for adoption of barcode technology is to improve library operations reducing workplace injuries, and improving services for library users. This study therefore examines application of barcode technology in landmark university centre for learning resources, Omu-Aran Experience. The study identified four research objectives. The design used for this study was case study research method. The population for this study comprises of all the library personnel with status ranging from professional to non-professional. The total population of the library staff was twenty (20). The whole 20 staff were used. The questionnaire was tagged "Application and Use of Barcode in Center for Learning Resources," (AUB-CLR). AUB-CLR was divided into five section.The data collected through AUB-CLR Questionnaire was analyzed using IBM-SPSS version 20.0. Descriptive statistics was used to present the data for better clarification and detailed descriptions were given where necessary. The finding of the study reveals that one of the factor affecting the use of barcode technology in Center for Learning Resources are constant lookup of database which is always necessary due to the fact that barcode doesn't save data of the book nor the system status; the finding of the study also reveals that 100% of the respondents believe that they are using barcode technology in their library due to its accuracy, speed, efficiency, time saving, and quality of library service. The paper concludes with few recommendations that include the use of Smart Barcode labels with both accession and call numbers in Landmark University Center for Learning Resources. It also recommended that institution logo should be printed on it. The library can indicate ownership and possession of material that can help security officials identify material borrowed from the library and help them prevent loss especially when material is stolen, these labels provide crucial evidence of the Library ownership.

Introduction

Landmark University (LMU) is located in Omu-Aran, Kwara State in Nigeria. It is a Private Christian University. It was founded by Dr. David Oyedepo who also is the Chancellor in 2011. The current Vice Chancellor is Professor Adeniyi Olayanju. The university motto is "Breaking New Grounds" and its website is http://lmu.edu.ng/. According to the Chancellor, Landmark University is a product of divine revelation. A proof which is believed to be evident in the peaceful ambiance around the campus characterized by a cool windy and friendly weather which supports the agrarian mission of the university; historical best time for ultra-modern infrastructure growth that rhymes and foster academic progressions in all disciplines, especially agriculture; and the inherent attractions of international best-rated scholars/academia who wield same visions and work in oneness toward its fruition. Among the ultra-modern infrastructure is a magnificent library known as Center for Learning Resources (CLR) that provides information needs to the community user for teaching, learning and research purposes (http://lmu.edu.ng/).

Barcodes have found varieties of applications in different fields, including libraries and information centers. Bar coding though relatively an old technology is one of the important steps in library automation and is still not widely used in libraries in Nigeria. Although the first commercial implementation of bar coding was for grocery distribution in 1970, the use of bar codes has grown enormously since (Milne, 2013). Barcode are useful at all stages of various operations; accurately identifying materials, tracking work in process, managing inventory, directing library circulation operations, and providing lifetime identification for materials and security. The benefits are enormous such as accurate information, real-time visibility, and a highly productive work force.

Computer technology has helped libraries to perform their jobs efficiently and to the ultimate satisfaction of their users. Computers have revolutionized the work culture of modern day libraries. The growth in number and variety of computer-based technologies are playing important role in the efficient working of a library (Vasishta & Dhanda, 2010).

Automating the library material handling process allows librarians to spend more time with the clientele, thus, increasing the 'user satisfaction'. Library automation is nothing but the use of automatic and semiautomatic data processing machines to perform traditional activities

such as acquisition, cataloguing, circulation (Patil, Wadekar, Chikate & Joshi, 2006). It also means the application of computer and telecommunications technology to bibliographic control, database access, resource sharing and other electronic communication or transmission for the purpose of improving and enhancing services to library users (Erie 1 BOCES, 2012). The growth in the sheer mass of published information to be handled has also been offered as an explanation for the increased activity in library automation. Libraries use ICT to manage communication facilities, housekeeping operations, user's services, standardization and extension of library activities (Bhangu, 2013)

A barcode is a machine-readable representation of information that is formed by combinations of high and low reflectance regions of the surface of an object, which are converted to 1s and 0s. This definition includes both one-dimensional and two-dimensional barcodes (Kato, Tan & Chai, 2010). Barcode stored data in width and spacing of printed parallel lines. In other words we can say that barcode are series of black and white bars arranged in a pre-defined form to represent known coded information. A linear barcode is a binary code (1s and 0s). The line and space are of various thicknesses and printed in different combinations (Singh & Sharma, 2007).

A bar code is a piece of Automatic Identification Technology (Auto ID) that stores real time data. It is a series of vertical bars or a graphical bar pattern which can, (depending on the width and pattern) encode numbers and letters in a format which can easily be retrieved and interpreted by a barcode reader. The symbology is a language used to represent or arrange the bars and spaces. It defines the technical details of a particular type of barcode: the width of the bars, character set, method of encoding, checksum specifications, etc. There are numbers of symbologies for barcode technology. At present there are over 100 different coding schemes / systems of barcode (Sarjiwan & Singh, 2011). The most commonly used symbologies are: Universal Product Code (UPC); Interleaved 2 of 5 (I 2 of 5); Code 39 (Code 3 of 9); European Article Number (EAN); CODE 128; Code Bar; Code 49. While choosing a symbology for library applications care is to be taken of developments in computer technologies and requirements of the library. Today, computers are alpha numeric, and as a part of basic computer technology, barcode should also be alpha numeric.

Bar-coding in the context of library applications can be described as a process of generating machine-aided and machine-readable unique and document specific code (Manjunath & Pujar, 2002). The code, which is invariably a unique accession number, when scanned, gets decoded and identifies a specific document in the database for circulation and stock verification related activities (issue, return etc.). Needless to say that there is an interface between the scanner and the library housekeeping software.

The circulation work in an automated library involves keying in a large amount of data. Sometimes, the library staff at the counter has to retype the same information due to error in data entry. A bar code reader decodes a bar code by scanning a light source across the bar code and measuring the intensity of light reflected back by the white spaces (Sarjiwan & Singh, 2011). Selecting the type of collection for bar-coding is an important consideration; in any library some collections are strictly meant for reference and such documents need not be bar-coded. Due to the low cost of barcode, automation identification (auto-ID) systems have been applied to various aspects of daily life. Bar-coding is recommended only for such libraries where transaction is very high or likely to be high in future. It may not be cost-effective in a small corporate library with few members and transactions (Manjunath and Pujar, 2002). They also opine that the implications of barcode technology are many. Bar-coding is recommended only for such libraries where transaction is very high or likely to be high in future. It may not be cost-effective in a small corporate library with few members and transactions. Against this background, this study examines **a**pplication of Barcode Technology in Landmark University Centre for learning resources, Omu-Aran experience

Statement of the Problem

Academic Library is a collection of resources made accessible to a defined community (students, staff, and researchers) for learning, teaching and research. Thus, the process of handling a library manually is very troublesome and clumsy. As regards to this point of view, the computerized system for handling the activities of library management provides a comprehensive way to lessen physical and complexity of the manual system, though, Academic libraries are faced with the responsibility of satisfying their users' information needs within the shortest time available.

The main aim for today's libraries in adopting Barcode technology is to improve library operations by increasing the efficiency of library transactions, reducing workplace injuries, and improving services for library users. One of the academic libraries in Nigeria using barcode is Landmark University's Center for Learning Resources (CLR). Barcode eliminates the possibility of human error; data obtained through barcode is available rapidly and accurately, though, they are inexpensive to design and print but promote better decision making. Despite the benefits of barcode in libraries, there are shortcomings: apart from the fact that they are inexpensive to design, having barcode does not guarantee effectiveness and efficiency of services rendered in Landmark University. There is a need to examine how the barcodes are being implemented for efficiency and effectiveness in the Center for Learning Resources. Therefore, the researchers intend to investigate the application barcode technology in Landmark University Center for Learning Resources, Omu-Aran, Kwara State.

Objectives of the Study

The broad objective of this study is to examine the use and benefits of the application of Barcode technology in academic library. The specific objectives are to:

1. identify reasons that led to the use of barcode technology in the library system;
2. examine the level of use of barcode technology in library operations;
3. investigate the benefits of barcode technology to the services rendered by the library and
4. examine the challenges of barcode technology application in academic libraries.

REVIEW OF RELATED LITERATURE

The Concept of Barcode Technology

Barcode is series of bars and spaces arranged according to a set of rules that determines how data are to be represented. Different bars and spaces pattern are used to express different symbols. These symbols are only readable by a scanner. Barcode technology is an important identification tool that provides an accurate and timely support of the data requirement for proper management systems (Islam & Shuva, 2010). Barcode is an automatic identification technology. Bar code is a predefined format of dark bars and white spaces structured to contain a specific piece of information. It allows real-time data to be collected accurately and rapidly. Combination of barcode technology with computer application software improves performance, productivity and profitability (Goudar, 2015; Vadadoriya, 2015)

Singh (2014) describes bar code as a code in a printed form, which can be easily read by a machine connected to the computer and the codes in the labels can be stored in the computer database. The information or data is encoded using the width of printed bars, the width of spaces between bars and the relative positions of wide or narrow bars and spaces i.e. size is proportionate to the information available on the material (Vadadoriya, 2015).

Originally barcodes systematically represented data by varying the widths and spacing's of parallel lines, and may be referred to as linear or one-dimensional (1D). Later two-dimensional (2D) codes were developed, using rectangles, dots, hexagons and other geometric patterns in two dimensions, usually called barcodes although they do not use bars as such (Woodhouse, 2013). Barcodes originally were scanned by special optical scanners called barcode readers. Later applications software became available for devices that could read images, such as Smartphone with cameras (Vikasvini, 2016). The barcode technology originated out of the need of retail stores and big industries to track down their inventory errors in a faster way (Weightman, 2015)

Component of Barcode Technology

Bar code technology is one such technology being implemented in the libraries at an accelerated pace. Bar codes are self- contained machine-readable identification labels with information encoded in a series of black bars and white spaces of varying widths that represent digits and other punctuation symbols (Singh, 2014). These are readable only through a reader or a scanner.
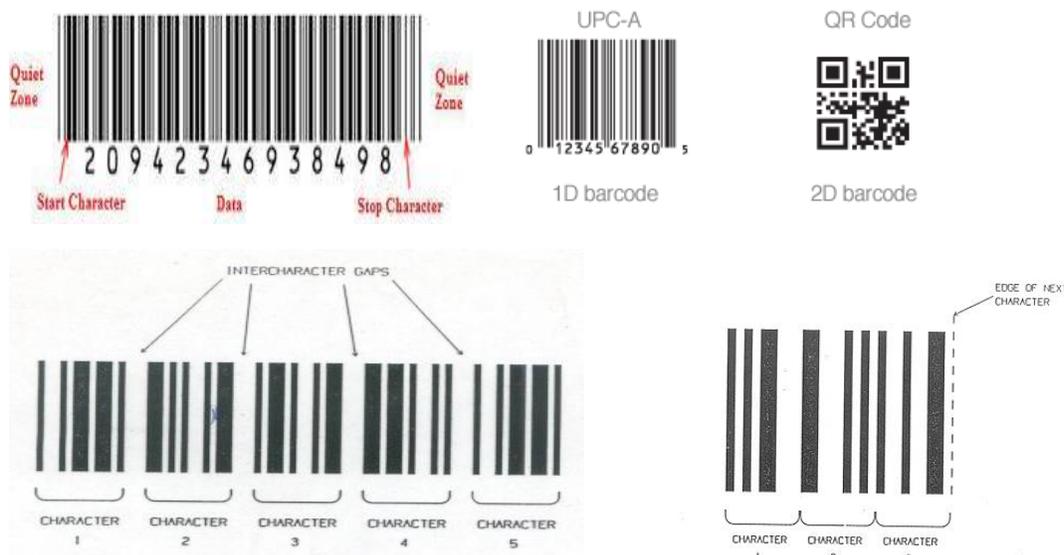
Discrete symbology   *Continuous symbology*

Figure 2.1: general barcode arrangement (Sources: Satyanarayana, 2008; Singh, 2014; Goudar, 2015)

Types of Barcode

One-Dimensional (1D) Barcode Types

One-dimensional, or 1D barcodes, systematically represent data by varying the widths and spacing's of parallel lines, and may be referred to as linear or one-dimensional. These include some of the traditional or most well recognized barcode types such as the UPC and EAN code types (Tackels, 2015).

Two-Dimensional (2D) Barcode Types

Two-dimensional, or 2D barcodes, systematically represent data using two-dimensional symbols and shapes. They are similar to a linear 1D barcode, but can represent more data per unit area. These include some newer barcode types such as the QR Code and PDF417 code types (Tackels, 2015).

Smart Barcode

Most bar code labels have a bar code number and the library's name printed on them. Smart barcodes have additional printed information on the bar code label. Usually this is the title of the work. Sometimes author, accession number and call number are printed on the label.

Dumb Barcodes

Dumb bar codes are generic; they do not identify any items title, call number or author. Generic barcodes only have the name of the institution or library that owns it. A dumb barcode can be affixed to any item during the bar-coding process. Linking a dumb barcode to an item may occur as the item is checked out, or when an item is catalogued in-house using MARC 21 format. Each MARC 21 record has a tag for entering an items barcode (Bilal, 2014).

Symbologies

The symbology is a language used to represent or arrange the bars and spaces (in other words, it is the mapping between messages and barcodes). It defines the technical details of a particular

type of barcode: the width of the bars, character set, method of encoding, checksum specifications, etc (Singh & Sharma, 2007). The specification of a symbology includes the encoding of the single digits/characters of the message, as well as the start and stop markers into bars and space; the size of the "quiet zone" before and after the barcode; and the computation of a checksum. The spaces and bars of a barcode are a simplified language (COBOL, BASIC and FORTRAN) that allow programmers to speak with computer (Barcoding Inc., 2017).

Since this arrangement can be varied to suit the different applications, there evolved a number of symbologies over the years. There are more than 100 different barcode symbologies. No single barcode can do it all and no barcode has a universal business application. That's why libraries must find the symbology that works best for their specific applications. Any way a modern scanner can automatically recognize and decode all the common symbologies. Some of the popular symbologies are as follows: (Singh & Sharma 2007; Dass & Singh, 2011, Barcoding Inc., 2017)

1. **Universal Product Code (UPC)**: It was the first barcode symbology widely adopted and extensively used in retail trade. Its standardization is in a form that allows many organizations throughout the world to interpret the same data and of prominent advantages. It also uses the space efficiently to record the data. Its limitation is that it can only record certain length of numbers. UPC is the US standard to encode only digits and its variation UPC-A to encode 12 digits or UPC-E to encode 6 digits. Foreign interest in UPC led to the adoption of the EAN code format, similar to UPC, in December 1976 (www.aimglobal.org)

2. **Interleaved 2 of 5 (I 2 of 5):** It is very compact. Supports only numeric characters but can be used for variable length. The code represents the number of even length. It is possible to scan only a part of the barcode and obtain something that looks like a valid result.

3. **Code 39 (Code 3 of 9):** It is alphanumeric and can represent even some special characters such as ' $ ',' / ', '. ', ': ', ' + ', ' – ', ' % ' and can enclose ' space '. The code can be of any length. It can enclose all the capital letters of the alphabets but lower case letters can't be enclosed and 10 digits. It can be extended to code all 128 ASCII characters by using a two character coding scheme.

4. **European Article Number (EAN):** The European Article Number is a superset of the UPC and encodes digits. It is available in two variations: EAN 8 to encode 8 digits and EAN 13 to encode 13 digits The EAN is only numeric but Code Bar is having facilities to enclose ' $ ', ' / ', '. ', ': ', '+ ', '– ', '% 'in addition to numerals. Code 48, which include alphabetic characters, are used by many American Libraries. There are two-dimensional barcodes also which can store large quantity of data in a small area.

5. **CODE 128:** It is a continuous alphanumeric symbology of variable length encoding full 128 ASCII character set. Every symbol starts and stops with a unique start/stop character. Encodes the lower and the upper case letters, numeric and special characters found on the keyboard and will use the least amount of space for data of 6 characters or more of any 1-D symbology.

6. **Coda bar:** can encode the digits 0 through 9, six symbols (-:.$/+), and the start/stopcharcters A,B,C,D,E,*.N, OR T.   Encodes only numeric and few special characters and is the most widely used coding format.

7. **Code 93:** offers high information density for alphanumeric data than either Code 39 or code 128. Every symbol includes two check characters.

8. **ISBN (International Standard Book Number)**: ISBN barcodes are based on the EAN symbology. The ISBN numbering system predates bar-coding and was incorporated into the EAN system by the use of a "978" prefix. From January 2007, ISBN numbers became 13 digits long, rather than the previous 10 digits. Previously, the ISBN number was always prefixed with the digits "978" when applying the number to an EAN barcode. There will now be an added alternative ("979") prefix in order to expand the numbering system. This means that the full 13 digits must now be communicated. The change also required that the 13-digit number should appear above the barcode.

International Standard Serial Number (ISSN) is used worldwide for publication such as magazines. The International Article Numbering Association (EAN) and the International Centre for the Registration of Serial Publication agreed on the coordination of EAN and ISSN systems. The prefix "977" has been assigned to the ISSN agency for its exclusive use of coding periodicals and journals throughout the world (Kato, Keng & Chai, 2010).

Benefits of Barcode Technology on the Library Services

Barcode system is now being considered as an effective addition to support automation process. Barcode have distinct advantages over other techniques like manual data, magnetic stripes etc. In the effort to extend barcode technology to self-service stations, which is one major direction for achieving better efficiency in operations the experiences have been less satisfactory (Patil & et. al, 2006). Barcode is a well-established technology and all industries have reaped the benefits of this innovation. Barcodes are often overlooked as a method for cutting costs and saving time. It is a valuable and viable choice for libraries looking to improve efficiency and reduce overhead.

Islam and Shuva, (2010) list the following as the merits of using barcode technology in libraries.

1. **Increase the accuracy of service:** Use of barcode technology increases and ensures the accuracy of information services among the users. Barcodes eliminate the possibility of human error. The occurrence of errors for manually entered data is significantly higher than that of barcodes. A barcode scan is fast and reliable, and takes infinitely less time than entering data by hand.

2. **Economical:** it saves the money of the library as well as time of the professionals and the users. Since few information professionals are required to manage the information resources and to run the library properly, it is economical. The variety of finishes and materials are inexpensive to design and print

3. **High Speed**: use of barcode technology accelerates the functions and operations of the library and the users can get their services very quickly.

4. **Professional efficiency and quality of services:** barcode technology improves the efficiency of the information professionals and the quality of information services. Operational efficiency has improved a lot after using the bar code technology as bar codes permit faster recording of information form computer and bar code labels.

5. **Space Saved:** Barcodes are extremely versatile. They can be used for any kind of necessary data collection. This could include bibliographic or inventory information. The

space of preserving the borrower's card and the catalogue card can be saved through the use of barcode technology.

6. **Data Integrity:** it ensures data integrity and data consistency by making a sound relationship between resources database and the user database of the library. Data obtained through barcodes is available rapidly. Since the information is scanned directly into the central computer, it is ready almost instantaneously. This quick turnaround ensures that time will not be wasted on data entry or retrieval.

7. **Create positive user attitudes:** it creates and establishes positive user attitudes towards the information institution or library.

8. **Inventory control improves:** Because barcodes make it possible to track inventory so precisely, inventory levels can be reduced. This translates into a lower overheard. The location of library materials can also be tracked, reducing the time spent searching for it, and the money spent replacing materials(s) that is presumed lost.

9. **Barcodes provide better data:** Since one barcode can be used for inventory and pricing information, it is possible to quickly obtain data on both. Furthermore, barcodes can be customized to contain other relevant information as needed. They provide fast, reliable data for a wide variety of applications.

10. **Barcodes promote better decision making:** Because data is obtained rapidly and accurately, it is possible to make more informed decisions. Better decision making ultimately saves both time and money.

Barcode is inexpensive and user-friendly; Improves efficiency of the staff and quality of services; Increased user satisfaction and hence improves the image of the library; Reliable statistics for Management Information System (MIS) and management control; Elegance and aesthetics of the front office and its activities; Highest degree of reliability; Saves the time of borrower; Perfect entry and retrieval of data; Improves information availability and data integrity at low labor cost (IJISET, 2016).

Challenges of Application of Barcode Technology in Academic Libraries

The following points are considered as the constraints of application of barcode in academic libraries: (McCathie, 2004; Islam & Shuva, 2010).

'Line of Sight' is required: As barcodes require line of sight technology, i.e. it needs direct visible contact to reader. In order to read the barcode, the barcode scanner needs to be quite close; around not more than 15ft. Library materials must have barcode labels that are clearly visible to make scanning easy. This leads to an inherent hindrance as barcodes are susceptible to damage as it's applicable to the Landmark University resources centre.

Lack of consciousness among the users: The users may not press the barcode identity card on the scanner kept at the main gate of the library. One personnel has to be deputed at the gate for checking whether users are pressing their identity card on the scanner or not, should in case of violation of law. More so, If the barcode is used on chip, which gives the signals about unauthentic users, but the users may not obey it, in that case, one employee has to be there for instant checking.

Problems of Internet and Electricity: It is the main problem in Nigeria as electricity is off now and then, the internet is disconnected instantly. Therefore, the network systems and electricity problems decrease the efficiency of the system.

METHODOLOGY

The design used for this study is a case study research method. The reason for this method of research is to probes deeply and analyze in-depth the application. The population for this study comprises of all the library personnel ranging from professional to non-professional. The total population of the library staff is twenty (20). The breakdown is as follows;

Table: 1 Population of the study

Participants/ Respondents	Number of staff
Director	1
Readers' services	7
Technical services	5
Serial	2
Acquisitions	3
Security	2
Total	20

The sample size for this study according to table 1 above constitutes 20 library staff (librarians and library staff) representing 100% of the total population was selected for this study. Questionnaire was developed to collect quantitative data and it was distributed to the entire respondents that constituted a sample size of the study. The questionnaire is tagged "Application of Barcode Technology in University Center for Learning Resources," (ABTUCLR). ABTUCLR is divided into five sections which include section A, B, C, D and E. Section A is contains staff's demographic information; section B contains factor affecting the application of Barcode technology; section C contains Level of Use of Barcode technology; section D contains the benefits of using Barcode technology and section E consists of the challenges of Barcode technology Use

The data collected through ABTUCLR Questionnaire was analyzed using IBM-SPSS version 20.0. Descriptive statistics was used to present the data for better clarification and detailed descriptions were given where necessary.

Analysis and Results

Data was collected from the sampled staff of Center for Learning Resources, Landmark University. The total of 20 copies of questionnaire was administered, 17 copies of questionnaire were returned and properly filled representing 85% of total population
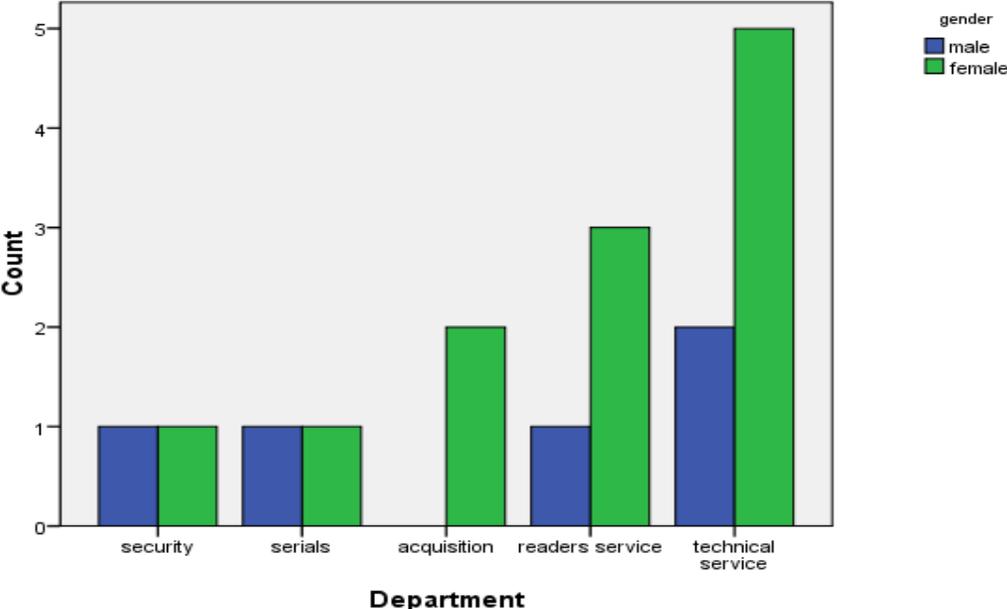
Gender Distribution of Staff

Figure 1: Departmental Gender distribution of Staff

Source: (Field Data, 2018)

Figure: 1 show there are more female than male in the gender distribution of staff according to departments in Landmark University Centre for learning resources, Omu-Aran

Table 2: Factors Affecting the Use of Barcode Technology

Factors Affecting the Use of Barcode Technology	SD	D	A	SA
Poor electricity affect the use of barcode technology	13(76.5%)	4(23.5%)	-	-
Poor internet affect the use of barcode	14(82.4%)	3(17.6%)	-	-
Inefficient software create problem for the use of barcode technology	13(76.5%)	4(23.5%)	-	-
It's impossible to use barcode without the database	-	-	3(17.6%)	14(82.4%)
Barcode hold a minimum amount of information	3(17.6%)	2(11.8%)	8(47.1%)	4(23.5%)

Source: (field survey, 2018)

Table 2 shows that 17(100%) of the respondents disagree that poor electricity affect the use of barcode technology, 17(100%) disagree that Poor internet affect the use of barcode, 17(100%) disagree that Inefficient software create problem for the use of barcode technology. Also 17(100%) agrees that it's impossible to use barcode without the database. 12(70.6%) of the respondents agree that barcode hold a minimum amount of information while 5(29.4%) disagree that barcode hold a minimum amount of information.

Table 3: Level of Use of Barcode Technology

Level of Use of Barcode Technology	Rare	Low	Moderate	Adequate
I use barcode for charging and discharging of books	-	-	2(11.8%)	15(88.2%)
I use barcode for document tracking	-	-	2(11.8%)	15(88.2%)
I use barcode for stock taking	-	-	2(11.8%)	15(88.2%)
I use barcode to prepare statistical report	-	-	-	17(100%)
I use barcode as security detector	-	17(100%)	-	-

Source: (field survey, 2018)

Table 3 shows that 17 (100%) of the respondents make adequate use of barcode for charging and discharging of books, document tracking, stock taking, prepare statistical report and 17 (100%) agrees that the level of use of barcode technology for security is low

Table 4: Benefits of Use of Barcode Technology

Benefits of Use of Barcode Technology	SD	D	A	SA
Barcode increases accuracy of library services	-	-	11(64.7%)	6(35.3%)
Barcode use cuts cost	-	-	5(29.4%)	12(70.6%)
Barcode increases professional efficiency	-	-	13(76.5%)	4(23.5%)
Barcode increases quality of library services	-	-	12(70.6%)	5(29.4%)
Barcode improve inventory control	-	-	-	17(100%)
Barcode saves the time of borrower	-	-	-	17(100%)

Source: (field survey, 2018)

Table 4 indicates that all the respondents (100%) agree that barcode increases accuracy of library services; cuts cost, increase professional efficiency, increase the quality of library services, improve inventory control and saves the time of borrowers.

Table 5: Constraints in Barcode Technology Application

Constraints in Barcode Technology Application	SD	D	A	SA
Barcode have less security	1(5.9%)	-	5(29.4%)	11(64.7%)
Barcode have no established standard for use in library	8(47.1%)	8(47.1%)	1(5.9%)	-
Barcode is expensive at initial start up	1(5.9%)	-	5(29.4%)	11(64.7%)
Use of barcode is affected by harsh environmental factors	1(5.9%)	1(5.9%)	13(76.5%)	2(11.8%)
Problems of software affect the application of barcode	13(76.5%)	3(17.6%)	1(5.9%)	-

Source: (field survey, 2018)

Table 5 indicates that 16 (94.1%) agrees that barcode have less security, 16 (94.1) disagree that barcode have no established standard for use in library, 17 (100%) agree that barcode is expensive at initial startup, 15(88.3%) agree that the use of barcode is affected by harsh environmental factors while 2(11.7%) disagree that the use of barcode is affected by harsh environmental factors and 16 (94.1%) disagrees that problems of software affect the application of barcode while 1 (5.9%) agree that problems of software affect the application of barcode.

Major findings of the Study

The findings of the study reveal that one of the factor affecting the use of barcode technology in Landmark University Center for Learning Resources is constant lookup of database which is always necessary due to the fact that barcode doesn't save data of the book nor the system status; therefore it's impossible to check the book without the database because, barcode hold a minimum amount of information This result is in variance with the result of the study of Islam and Shuva (2010) on Barcode technology and its use and applications: a study of selected libraries of Bangladesh.

The finding of the study also reveals that the respondents are using barcode technology adequately for charging and discharging, stock taking, document tracking, prepare statistical report but on a low side as a means of security in Landmark University Centre for learning resources. This result is in line with result of the study of Vasishta and Dhanda (2010) on transforming a traditional library to modern library using barcode technology: an experience of Central Library, PEC University of technology in Chandigarrh which list the area of use of application of barcode technology in the library system.

The finding of the study also reveals that 100% of the respondents believe that they are using barcode technology in their library due to its accuracy, speed, efficiency, time saving, and quality of library service in Landmark University Centre for learning resources. This result is in line with result of the study of Vasishta and Dhanda (2010) on transforming a traditional library to modern library using barcode technology: an experience of Central Library, PEC University of technology in Chandigarrh.

The finding of the study also shows that majority of the respondents agrees that barcode have less security, expensive at initial startup and harsh environmental factors affect the

application of barcode in Landmark University Centre for learning resources. This result is in line with the result of the study of Islam and Shuva (2010) an article on Barcode technology and its use and applications: a study of selected libraries of Bangladesh.

Conclusion

Landmark University Center for Learning Resources make use of barcode for charging and discharging of library materials, stock taking, document tracking, prepare statistical report and for security due to its efficiency, speed, quality of library services, improved inventory, accuracy and time saving despite the constraints of barcode having less security, expensive at initial startup and harsh environmental factors.

Recommendations

The following recommendations are made, based on the findings of this study:

1. The use of Smart Barcode labels with both accession and call numbers on it can also be used as a book tag in Landmark University Center for Learning Resources. It can have the parent institution logo printed on it. The library can indicate ownership and possession of materials, these labels help security officials identify material borrowed from the library and help them prevent loss. When material is stolen, these labels provide crucial evidence of the Library ownership. The benefit of automating is two-fold: time savings and increased accuracy.
2. 2D barcode replace the bars and spaces with dots and spaces arranged in an array or a matrix, the density of data within a given space can be increased in Landmark University Center for Learning Resources. This solves the problem of amount of information contained in 1D barcode symbology.
3. Combination of barcodes for identification, and some electromagnetic (EM) based antitheft system to improve the security of library materials in Landmark University Center for Learning Resources.
4. Adoption of bar-coded student library card i.e. membership ID and mounting of barcode scanner at the library entrance. Helps in taking accurate users statistics.
5. Implementation of self-service check Landmark University Center for Learning Resources is also recommended

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