Application of Barcode Technology in Library: Planning and implementation

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Abstract
Purpose: The main aim of the article is to create awareness among the librarians to use Barcode technology in the library.
Design: This article briefly discusses the description of the application of Barcode technology in libraries, its working mechanism and the advantages of this technology. It also tried to explore the technical aspects of Barcode technology in the library. Findings: Barcode technology is mostly used in the circulation system of a library and most successful due to its speed, accuracy and reliability. Though barcode comparatively an old technology is one of the significant steps in library automation and is still not widely used in libraries.
Value: Barcode is very cost-effective technology can be used by every library.

Key words: Barcode technology, Library automation

Introduction

Library is a treasure house of the ever-increasing universe of knowledge. Dissemination of knowledge in any institution is attained by means of study, teaching, research, publications and extension programmes. Irrespective of kinds of libraries such as academic, public and special library, users have to depend heavily on books, journals and other materials to update their knowledge. The use of computers in libraries and information centres is now comparatively common place in developed societies and the talk of day in developing societies like the one that we are in. The technology has performed all sectors of information knowledge industry, in which libraries are major partners. Computers play a primary role in library automation. Telecommunication, reprography and other technologies also play an equally important role because of the extent of support they offer to library automation.

Barcode have found varieties of applications in different fields, including libraries and information centres. In many countries barcode patterns have become a familiar symbol for general masses due to their appearance in all personal products, books, food and grocery packets, garments, other records, etc. As a part of library automation, the use of Barcode system in libraries is very great. The application of barcode technology in circulation system of a library and information centre is most successful due to its speed, accuracy and reliability.

Statement of the problem

Library and information centers are playing a vital role to disseminate the information providing books, journals and other non-book materials to its clients. The main problem in the library is inadequacy of efficient manpower. To solve this problem and provide the documents efficiently and quickly library automation is essential. Some techniques are to be use as a part of library automation to increase the efficiency of library transactions, reducing workloads of the library staffs, and improving services for library users. Data obtained through Barcode is available rapidly and precisely. Barcode reduces the possibility of human errors. Barcode is inexpensive to design and print. Despite the benefits of Barcode in libraries, there are also shortcomings. Barcode does not guarantee the effectiveness and efficiency of services rendered. Though Barcode is used in many sectors, this paper is limited to the library based use and services.

Objectives of the study

- To find out the areas in which the Barcode technologies are being used in the library,
- To identify the advantages of using Barcode technology in the library,
- To create awareness among library professionals about Barcode technology.

Methodology

This study is based on the practical use and effectiveness of Barcode technology in the library. It starts with some literature reviewing of the similar types of study. Later it elaborates about the technology, symbologies and mechanisms, basic requirements for the system, advantages and application areas of this technology in the library.

Literature review

Jeevan (2000) explained the application of barcode in IIT Kharagpur library as well as highlights its future applications. Islam and Shuva (2010) explores a survey of overall barcode technology, its uses, applications, merits, demerits in the 8 libraries in Dhaka. Tella (2010) elaborates the library activities where barcoding is applied to achieve greater efficiency and accuracy. Accession, Membership, Circulation and Stock Verification are the thrust areas for barcode application in the library. Rijal (2011) shown that the barcode plays a role of a bridge between the users and the libraries. Also found in his research that only limited numbers of libraries were using barcode technology. This limited is due to the lack of proper budget and computer infrastructure. Also recommend that the proper implementation of barcode technology take place with the use of suitable barcode system, scanning device of better quality and advanced software. Rahaman (2016) explained the application of three modern technology initiatives

in NIT Rourkela library i.e. Barcode, QR code and RFID were discussed. These are becoming very useful technology not only to serve the users' but for library security also. Fatima and Ansari (2017) tried to assess the impact of Barcode technology in seminar library and also point out that the users of the seminar library have been benefitted with the application of Barcode technology. Barcode technology has helped particularly in circulation and stock take process and it is cheaper and integrated with prominent library automation software packages. Chanda (2019) discusses the application of Barcode technology in libraries, its working mechanism and also the advantages and disadvantages of this technology. The paper also discusses the creation of Barcode with Glabels open-source software which is absolutely free of cost. From the literature review it is seen that Barcode is very cost-effective technology can be used by every library.

Barcode

A code is a combination of characters and numbers that represents an entity. Barcode can be defined as a self-contained message with information encoded in a series of black bars of varying breadths and white spaces between every two of them. There are many kinds of barcodes, but most of them represent each character by a different combination of wide and narrow bars. It provides ease of recognition by an optical device. These are read by a scanner, which sends messages to the computer that decodifies the number represented by the barcode. Barcode labels are the least expensive factor in library automation and the most significant factor to ensure efficient operation in the library.

Advantages of barcode

Application of this technology is made in the libraries with view to automatic data entry process of circulation system. It has many advantages which are follows:

- Accuracy
- High speed
- Cheaper cost
- More timely information
- Minimum man power
- Better services
- Better retrieval process

Barcode offers the fastest and most accurate system of capturing and accessing information in a cost-effective way.

Benefit of using barcodes in library

The use of barcodes are lead to reduced staff workload, increased accuracy, improved circulation capabilities, faster check-in and check-out, easier sorting and inventory management. Barcodes are associated with item records in Library Management Software and can hold critical information such as item number, call number, copy and volume numbers as well as associated codes used in library. All this information can be held in one label and any of the information can be changed or updated without the need to re-label the collection. Once have barcodes on books or other resources, can quickly scan the barcode information into computer to help accurately track the resources.

Barcode symbology

The symbology is the language used to represent the code in a machine-readable form. The code represented by a combination of bars and spaces of varying width is called the barcode technology. There are many symbologies for barcodes. At present there are more than 60 different coding schemes of barcodes. There is no one symbology that is the right one for any organization. The 3 most commonly used symbologies are follows:

- **Code 39**: Code 39 is a common barcode symbology. It generally has less than 10 digits and also identifies the type of item, its code and the institution. Code 39 can include alpha characters, though it is not recommended.
- **Codabar**: Codabar is another barcode symbology commonly found in libraries. It has 14 digits including sequences that identify the item type, number and institution as well as a final check digit. An eye-readable form of the number is printed below the scannable number. Both Codabar and Code 39 can scan bi-directionally, meaning the barcode can be presented upside down or right side up.
- **Follett Interleaved 2 of 5**: Interleaved 2 of 5 (ITF) is a numeric only barcode used to encode pairs of numbers into a self-checking, high-density barcode format. In this symbology, every two digits are interleaved with each other to create a single symbol. If a number string containing an odd number of digits needs to be encoded, a leading zero must be added to produce an even number of digits in the Interleaved 2 of 5 barcode.

Care is to be taken while choosing a symbology for library applications, computer technologies and requirements of the library. Today's computers are alpha numeric, and as a part of basic computer technology, barcode should also be alpha numeric.

Types of barcode

Normally two types of barcodes are there, one is the linear barcode or 1D barcode and second one is 2D barcode. Linear barcode (Figure 1) is made by black vertical lines with white space. The height and width may vary but it specified and represents fixed information. This type of barcodes stores normally numerical data, and contains limited data. 2D barcodes (Figure 2) are made by either stacked linear bars or matrix symbol shaped in black and white cells. Any type of data can be stored in this barcode and contains a huge amount of information.

Figure 1: Linear Barcode


Figure 2: 2D Barcode

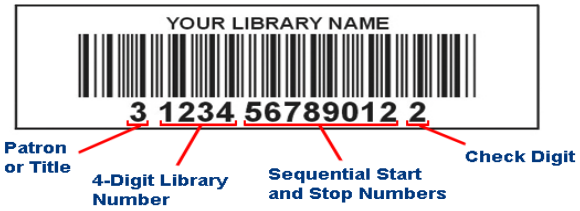
Anatomy of barcode

Patron or Title: Patron labels typically start with a "2" and item labels typically start with a "3".

4-Digit Library Number: A number that the library has assigned for specific location. It only applies to a 14 digit bar code.

Sequential Start and Stop Numbers: These are specific numbers assigned to either patrons or titles.

Check Digit: A result of a mathematical calculation that is applied to the end of each barcode. Automation software ensures that the data is being scanned and virtually eliminates input errors.



Important information to interpret the barcode properly

Most library automation software is compatible with standard barcode symbologies. Libraries may be required to use specific information that needs to be encoded within the barcode. In case of a book or document, accession number is unique and in case of a patron, library card number or ID is unique. So accession number and library card number are to be use for barcode in this case. Often special letters or numbers are necessary to designate barcode use, such as patron or title barcodes.

Mechanisms of barcode system

It works in much the same way a keyboard does. Like keyboard barcode scanner results in the same kind of signals being sent to the computer. While scanning, the light is reflected from the barcode and the pick up optical device receives less light from the dark bars than from the spaces between them. The signals received through this process are then converted into a form, which can be recognized by the computer.

The signals can enter the computer in one of the two ways: a. Barcode scanner can be directly plugged into one of the slots in the back of the system box and special software controls the process. b. Barcode signals can enter through the keyboard connection to the computer.

Automation in libraries requires that the barcode be incorporated on each reader's ticket or library card. A borrowers' file giving full details is to be prepared using the library automation software and the barcode number is to be attached in the borrower's records. Each item in the bibliographic file has its own unique barcode number. The barcode label is stuck in a convenient place such as opposite the due date label.

Basic requirements for the system

For implementing barcodes in library applications the following hardware & software are required:

- Computer
- Library Management Software
- Database of library holdings
- Database of library members
- Barcode generation software
- Barcode Printer
- Barcode label
- Barcode Scanner

- Decoder software to convert scanned data into ASCII character
- Laminators (Stickers, Lamination machine, membership card pouches, etc.)

Type of scanning devices

There are different scanning devices available, but few of them are discussed as follows:

- Bioptic Barcode Scanner
- Charged Coupled Device (CCD) Scanner
- Imager Barcode Scanner
- Laser Barcode Scanner
- Mobile Barcode Scanner
- Omni-directional Barcode Scanner
- Portable Barcode Scanner
- Ring Barcode Scanner
- Scanner scale Barcode Scanner

Form of barcode scanner

- Hand held Barcode Scanner
- Hands-free Barcode Scanner
- In-counter Barcode Scanner
- Pocket Barcode Scanner
- Presentation Barcode Scanner
- Sled Barcode Scanner
- Wand barcode scanner Barcode Scanner

Printing devices

For generating barcodes various printing technologies are available such as Dot Matrix, Direct Thermal, Thermal Transfer, InkJet and Laser Printer. But Laser printers are more capable of printing high quality labels. Fairly good quality labels can be printed through this technology at a cheaper cost.

Application areas in library

Main application areas of barcode technology in the library are as follows:

a. Accessioning: This is the initial phase whereby a newly acquired book is entered into the family of the existing books. Barcode printed in the book or other library materials may be used to check the data regarding the book i.e. Book title, author's name, etc. and then the book is sent for other works.

b. Membership: When new membership is given in a library, each member is given a unique number along with personal / official details of the person in the records. The details pertaining to membership i.e. membership cards, renewal of cards, keeping track of new members etc. are maintained. Therefore keeping track of the records of all the numbers barcode system is very useful.

c. Circulation: The circulation system, as a main function of a library is very specific, definable and allied to common business activities such as inventory control. Transactions to the users' are done very accurately, reliably and more speedily.

d. Stock taking & Stock Verification: There are various methods available for stocks taking or stock verification. The manual methods consume more time, and more staff members are to be involved. In computerized stock verification the accession numbers are to be keyed into the computers. Whereas barcodes are used for this purpose, the data entry is automatic, errorless, and saving in time is ensured.

e. Serial control: For it, the primary task is to be developing a database of periodicals and assign code numbers for each periodical being subscribed in the library. The database should be updated periodically. For each periodical, barcode should be created and pasted on the lower card in the Kardex system. When a particular issue is received, its respective barcode is scanned for the month and issue numbers. With the help of software, a print out list of issues of various journals not received should prepare and reminders should be sent easily and quickly.

f. Generating user's statistics: By barcode system, we can also effectively be applied for generating user's statistics in any time. But for this purpose members cards containing the barcodes be scanned with the scanner and statistics may be generated.

Strategies for implementation barcodes system

First have to generate the barcode by accession number at once and attach them to the books on the shelves. Print two copies of barcode for each accession number. One should be pasted in front and another in the end of the text. It is also possible to generate barcode by class numbers. Cello tape on the pasted barcode may be used for long life and durability. Daily return books are brought to a room where barcode work is carried out and only for these books barcode is pasted. This reduces chances of error to a minimum due to thorough checking and rechecking.

For the library patrons' barcode should be generated according to library card number or ID number. It would be better library card should be generated along with barcode. Only barcode may also be used in the separately printed library card.

Disadvantages of barcode technology in the library

Barcodes are more easily damaged, as the line of sight is needed to scan; the printed Barcode has to be exposed on the outside of the library materials. If a Barcode is ripped or damaged there is no way to scan the library materials, new barcode is required for the material.

Conclusion

Barcode technology is a boon for the library automation. Its application in a particular library should be well planned and thought of. Automation and networking of libraries are being done a view to effective and efficient services to its clienteles. A library is not fully automated, if the automatic method of identification is not included. Servicing and maintenance of the scanners should be taken care of. The application of barcode system is mainly suitable for circulation job of library. In addition, the job of library inventory and periodical control can also be effectively carried with the help of barcode technology.

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