Library Automation Role of Barcode: An Analysis.

Dr. Abdul Musref Khan
Library Professional Staff
Central Library
Panskura Banamali College.
Panskura : Purba Medinipur
West Bengal : India

Abstract:

A barcode is a visual, machine-readable representation of data; the data usually describes something about the object that carries the barcode. Traditional barcodes systematically represent data by varying the widths and spacing's of parallel lines, and may be referred to as linear or one-dimensional. Later, two-dimensional (2D) variants were developed, using rectangles, dots, hexagons and other geometric patterns, although they do not use bars as such. Initially, barcodes were only scanned by special optical scanners called readers. Later application software became available for devices that could read images, such as smart phones with cameras. The utility of bar-coding for faster library transactions is time-tested, and more and more computerized libraries in our country are using this technology. The application of barcode technology in circulation system of a library and information technology is most successful due to its speed, accuracy and reliability. Bar-coding though relatively an old technology is one of the important steps in library automation and is still not widely used in libraries. This article covers various aspects of barcode technology and its application in libraries. The barcode was invented by Norman Joseph Woodland and Bernard Silver and patented in the US in 1952. The invention was based on Morse code that was extended to thin and thick bars.

Keywords:

Bar-coding, Keyboard wedge, Barcode Printers, Security Check, Symbolized.

Introduction:

Nearly every type of industry is using barcode technology to replace keyboard data entry because bar coding is much faster and more accurate than keyboard data entry. 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 bar code reader. 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. Nowadays bar-codes are cheap to print and the reading technologies are varied and reliable. Bar-coding is a computer aided process of generating codified information, which is subsequently printed on a predefined stationary, invariably on a self-adhesive label for several later applications. This technology plays a vital role in automating the functions of library, especially the circulation system.

Object of Bar-coding:

The main objectives of bar-coding documents in a library are:

- A) To achieve accuracy,
- B) Time saving of users,
- C) To reduce overall cost,
- D) To make stock verification an easy process,
- E) To improve operational efficiency.

Symbolized:

The mapping between messages and barcode is called a Symbolized. The Symbolized is a language used to represent or arrange the bars and spaces. It defines the technical particular type of barcode: the width of the bars, character set, method of encoding, checksum specifications, etc. The specification of an Symbolized includes the encoding of the single digit /character of the message as well as the widths details of a start and stop markers into bars and space ,the size of the quit zone required to be before and after the barcode as well as the compilation of a checksum. Since this arrangement can be varied to suit the different applications, there evolved a number of Symbolized over the years. There are more than tenth different coding Symbolized. Some of the popular Symbolized areas are as follows:

Picture: libraries International standard ISO/IEC 16390

Continuous Symbolized:

Linear Symbolized can be classified mainly by two properties: 1.Continuous vs. discrete.

2. Two-width vs. much width some of the common formats are:

A) Universal Product Code: US standard to encode only digits, UPC-A to encode 12 digits or UPC-E to encode 6 digits. It is the common code extensively used in retail trade. Its standardization in form organizations throughout the world to interpret the same data is its prominent advantages. It also uses the space efficiently to record the data. Its limitation is that it can only record certain length of numbers.

B) Interleaved 2 of 5 (I 2 of 5): Supports only numeric characters but can be used for variable length. It is very compact. But it can only record numbers. 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

C) Code 39 (Code 3 of 9): Encodes capital alphabets, numerical and few special characters Like $, +, %. Asterisk (*) must be used as the start and stop character.

D) European Article Number (EAN): European code to encode digits, available in two variations: EAN-8 to encode 8 digits and EAN- 13 to encode 13 digits.

E) Code 128: Encodes both the lower and the upper case letters, numeric and special characters found on the keyboard. It is a continuous alphanumeric Symbolized of variable length encoding full 128 ASCII character set. Every symbol starts and stops with a unique start/stop character.

F) Coda bar: Encodes only numeric and few special characters and is the most widely used coding format. Generally, libraries use this Symbolized to encode books and borrower cards. It is a discrete, self-checking numeric Symbolized including six other characters and four unique start/stop characters. Each character has three bars and four spaces. It encodes only numeric and few special characters and is most widely used coding symbolized. Generally libraries use this Symbolized to encode books and borrowers card.

G) Code 49: Code 49 is a first two-dimensional barcode Symbolized. It is a multi-row, continuous and variable length Symbolized encoding the full ASCII 128 character set. Each row is composed of 18 bars and 17 spaces. Each row contains a row number and the last row contains information regarding the row number in the symbol.

Basic Requirements for Barcode Application:

Implementing barcodes in library applications following hardware and software are required:

i)   Inventory Control,
ii)   Barcode Scanner;
iii)   Decoder;
iv)   Printer;
v)   Printing Software;
vi)   Communication Software;
vii)   Database of Library Holdings;
viii)   Library Software; and
ix)   Membership Database;
x)   Personal Computers.

Use of Barcode Scanners:

Barcode scanner is a device used to extract information optically from the barcode .Barcode scanners are of various types .These may be hand –held or fixed type. Barcode symbols consist of series of vertical dark bars separated by light spaces. When illuminated reflected light is detected by electro optical sensor .The intensity of reflected light from the dark bars is less than that of spaces (white lines) .Reflected light is converted into electronically voltage signals.

Picture: Hand Held Linear Scanners use

The decoder converts this data into the character data representation of the symbol's code. QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed in 1994 for the automotive industry in Japan. A barcode is a machine-readable optical label that contains information about the item to which it is attached. In practice, QR codes often contain data for a locator, identifier, or tracker that points to a website or application. A QR code uses four standardized encoding modes to store data efficiently; extensions may also be used.

Picture: QR code encoding Standard: ISO/IEC 18004

Picture: Libraries Use Barcode International standard ISO/IEC 16390

Different Type of Barcodes, Connecting the Scanner –Keyboard Wedge

1. Turn off power before connecting the scanner
2. Remove the keyboard connector from the PC.
3. Connect the cable's modular connector to the scanner.
4. Connect the male connector to the keyboard port in the PC and the female connector to the keyboard cable .You may need to use the Din/Mini Din adapter (included) to match your keyboard connectors.

Working of Barcode System:

Barcode technology works in the same way as a keyboard. As pressing a key sends a signal containing a character code to the computer, reading a barcode results in the same kind of signals being sent to the processor. The barcode, in effect, acts as a unique control number, which is associated with a record giving appropriate details of individual items. While scanning, the light is reflected from the barcode and the pickup 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.

Advantages of Using Barcode Technology:

Application of barcode technology is made in the libraries with a view to automate the data entry process of circulation system. The use of barcode technology increases efficiency and eliminates human errors as in case of manual data entry It Increases the speed of operation; It has got the following advantages:

i)   It Increased accuracy of data input (error free)
ii)   It Improves efficiency of the staff and quality of services;
iii)   Rapid access to total production costs
iv)   It Increased user satisfaction and hence improves the image of the library;
v)   Reliable statistics for Management Information System (MIS) and management
vi)   control;
vii)   Real time data collection
viii)   Aid effective management of resources and inventories
ix)   Highest degree of reliability;
x)   Saves the time of borrower;
xi)   Perfect entry and retrieval of data;
xii)   Labour savings by avoiding manual system
xiii)   Low labour cost
xiv)   Improves information availability and data integrity.

Printing of Barcode Labels:

The barcode labels require high quality if printing. Defects in printing will lead to wrong reading of data. It is of utmost importance that barcode labels have high-contrast, well dimensioned bars and spaces. Important considerations for printing barcode labels are that high quality paper, free from imperfections is essential.

Picture: Barcode Printer

Use of Barcode Technology in Libraries:

Barcode is coded information in the form of bars that can be read by a special type of image scanner (barcode scanner). Image scanner also called scanner converts any printed image into electronic form by shining light into the image and sensing the intensity of light reflection at a point. This device read barcode, which are patterns of printed bars that appear on the barcode labels pasted on the book. The barcode identify the book and the barcode reader /scanner emits a beam of light –frequently a laser beam- that is reflected by the barcode image by recognizing bars. The white spaces reflect light, which are translated into relevant signals for the computer to read, without the

risk of human error. After detector has identified the barcode, it converts the individual bar patterns into numeric digit-code that computer can understood.

Computerized circulation system and application of barcode:

Before discussing of barcode based circulation system, it is necessary to study the difficulties experienced in the manual system so that the usefulness of barcode technology can be appreciated: Some of the difficulties in the manual system area:

1. It is difficult to know the status of a particular book.

2. Providing reservation for books is a tedious job.

3. It is cumbersome to ascertain that to whom a particular book has been issued.

4.To provide a clearance certificate to a particular reader is quite difficult since the counter assistant will have to verify borrower's record and other documents to ascertain whether a particular book is pending against the borrower or not.

5. Charging and discharging of books are time consuming, as stamping of due / return date and the work of making other entries are to be carried out.

In a manual system it is difficult to ascertain whether a particular book is issued or not and hence reserving a book becomes a cumbersome job. Such problems do not exist with the computers. The database is always ready for any query. Thus, with ease, the entire operation can take place without any loss of information and control. One of the useful applications of barcode system is in the computerized circulation system. In computerized circulation system the borrower presents before the counter assistant his library card and the book(s) to be borrowed. The circulation assistant inputs the identity number of the borrower through keyboard and activates his database record. Depending upon permissibility the document's accession number is entered in the computer and the book is issued to the borrower. It is the computer software, which computes the due date for return, fine and makes reservations against books. Due to normal distribution system the charging and discharging of books is a time consuming process, as stamping of due dates and other data entry work have to be carried out. But in bar-coded environment, when a user goes to the circulation counter, the counter staff scans his/her identity card and activates the borrowing status. If the computer permits the borrowing facility, the document is scanned for accession number and is issued to the user without any delay.

Use of barcode system for Security Check:

The bar-coded identity card will also perform the security check at the gate and allow only authorized persons to enter in libraries. This is the checking system when a user leaves the library with the issued document. For this purpose, barcode technology can be effectively used and a terminal can be installed on the gate. Since charging/discharging is done online, the whole database is automatically updated. When borrower leaves the library, accession number of the document carried by the user will again be scanned at the gate. In case of issued document the computer will approve the exit. But, in case, someone is carrying a document that has not been issued, the computer will give an alarm and a message to the immediate effect.

Identification of membership at the gate:

We know very well that in libraries entry is restricted to their members only. Thus, a person is deputed on the gate as gateman or security guard to check identity cards of each person entering the library. If the members are provided barcode identity cards, then this checking becomes very easy. A barcode scanner is

installed at the gate of the library and every person entering the library has to place his/her identity card on the scanner. If the person is not a member of the library, the computer will give the alarm and thus restrict the entry and the identification of unauthorized entry will be made.

Use of barcode system for monitoring Attendance:

The barcode technology could be used for monitoring the attendance of the users. Under this process, the identity cards of the user have to be bar-coded with their library codes and a barcode scanner is installed at the gate of the organization. Every user has to get his/her identity card scanned at the gate while entering. The system will maintain the statistics of users of the library. Under the manual system most of the libraries maintain gate register wherein members are requested to enter his/her details and mark their signature as a proof of their visit to the library. It is time consuming and users show indifference towards entering their particulars. When users are provided with bar-coded identity cards, it is possible to overcome all these difficulties. Thus, user statistics are useful for various purposes, particularly for improvement in library services and control.

Issue of No Dues Certificate:

No dues certificate is issued when any member leaves the organization/institution and his/her membership is cancelled and the library issues no dues certificate. This process is time consuming and error prone in a manual system. In an automated system using barcode technology the member surrenders his/her identity card and the counter staff scan it. The automation package will search the database for any document issued in his/her name. If nothing is due, no dues certificate will be printed.

For Stock Verification and cross checking:

In this system every book in the library is bar-coded, stock verification of the books can also be easily performed with the help of barcode system. Stock verification and cross checking is a very tedious and time-consuming job in libraries. During stock verification the users are restricted to use the library facility. Here barcode technologies used very effectively, and it is quicker and error free. Under this process, all the documents in the library are scanned and data is gathered in the hand held terminal or in the computer. Once all the documents in the library are scanned with the help of barcode scanner, it is compared with the database of the total documents. If it does not tally, it will give the details of documents of which accession number has not been scanned. In this way number of missing books can be found out and print out for the same can be taken.

Conclusion:

Implications of automated and barcode technology is one of the best techniques to minimize the time taken at the circulation center. Bar-coding by itself is not system but an identification tool that provides an accurate and timely support of the data requirement for the sophisticated management systems. Barcode usage increases accuracy in the data collection, save time of the users and the staff and improves efficiency in various library operations. Every library needs the application of new technology to develop its existing methods. This time thus saved can be utilized for developing advance and additional techniques in the library. It minimizes errors and increases the efficiency at the circulation desk. It also reduces the operational cost by eliminating book cards and book pockets. Bar-

coded labels with both accession and call numbers on it can also be used as a book tag. Contribution of barcode technology with computer and application software improves performance and efficiency in various library operations.

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