«Letter to Editor»

Quick Response Code Applications in Library and Information Centers

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Abstract

Barcode is a graphical representation of data on a surfacethat can be read by a machine. Unlike old barcodes, matrix barcodes can store all kind of information in a 2-dimensional pattern. Recently, installing barcode reader applications on mobile phones, has enabled them to read barcodes. Quick Response Code is a two dimensional barcode with several features, it can be scanned and transferred by a smart phone, log in users to a website, start a phone call, and confirm a library card. These codes can be used in libraries as paper-free labels, library ID cards, and for acquiring information from a librarian, library instruction, and also for marketing. The current paper, which applies library study for gathering data, is a review of QR code development history, its structure, capabilities, benefits, challenges and its applications in library and information centers.

Keywords: quick response code, mobile phone, library, information centers

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To the editot

Pulliam and Landry (2011) in a study titled "Tag, You're It! Using QR Codes to Promote Library Services" suggested implementing QR code in library marketing. They pointed out that a revision and alteration was vital in the interactions between users and librarian and that novel QR code technology could be applied when users training is provided (1).

Walsh (2011) in his study titled "Blurring the Boundaries between our Physical and Electronic Libraries: Location-Aware Technologies, QR Codes and RFID Tags" investigated the application of technologies such as GPS, QR codes and RFID tags in personalizing learning environments in academic libraries. He studied the use of QR codes at the University of Huddersfield, and investigated how the QR codes were received by the users. He also outlined the other technologies used elsewhere and reported the academic literature. He concluded that although location-aware technologies were being used, they were impractical for most libraries. Instead, one could use QR codes (which have significant barriers to their use) or preferably RFID tags (already widely used for other purposes) to create smarter libraries (2).

Jackson (2011) in his study titled "Standard Bar Codes Beware—Smartphone Users may Prefer QR Codes" outlined free production, ease of data access, and compatibility with most smart phones as the features of QR codes. His article discusses the growing popularity of these codes and the reasons, application of QR codes in law libraries and legal professions, and how they may be used by librarians in the future to increase the added value through professional marketing and library services and by providing easy access to information from library resources (3).

Whitchurch (2011) in his research titled "QR Codes and Library Engagement" suggested some methods to increase students' interaction with libraries through the use of QR codes and successful implementations of them on library-oriented wikis. He expressed that implementation hurdles are manageable and include producing and designing the codes, locating them effectively and having access to compatible hardware through smartphones since students ownership of smartphones is rising rapidly (4).

Stainthorp (2010) in a research titled "Tech Tips for Libraries: QR Codes" explains the application of QR codes technology in academic libraries in providing additional information on services and resources for users (5).

History of QR Code Genesis

In 1970, IBM developed UPC symbols consisting of 13 digits of numbers to enable automatic input into computers. These UPC symbols are still widely used for Point of Sale (POS) system. In 1974, Code 39 was developed which could encode (symbolize) approximately 30 digits of alphanumeric characters. Later, in the early 1980s, multistage symbol codes such as Code 16K and Code 49 were developed

which could store approximately 100 digits of characters. As informatisation rapidly developed in the recent years, requests mounted to find symbols which could store more information and represent languages other than English. To enable this, a symbol with even higher density than multistage symbols was required. As a result, QR Code containing 7,000 digits of characters at maximum including Kanji characters (Chinese characters used in Japan) was developed in 1994 (6) by one of the Toyota branch office. Generally, QR code is a much faster method for data scanning than the other methods. These codes are used from industrial assembly lines to marketing, and are also installed on the label, exhibits, business cards, flyers, etc., in countries such as Japan, Korea, Europe and the Middle East (7).

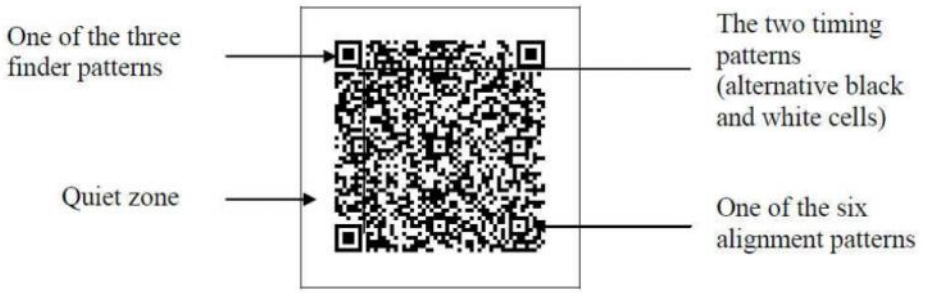
QR Code Structure

QR codes were developed in by Denso Wave, a Toyota subsidiary as a matrix code to maintain information in two vertical and horizontal dimensions. QR codes were introduced freely as a method for qualifying shelving in production units in 1994. These codes are in line with the international standard of ISO/IEC18004, although it does not support all existing smartphones. The aforementioned standards increase the number of producers and readers of QR codes and also make them compatible with each other, although one must consider the possible problems of these standards in smartphones. QR codes features include high reading speed, data storage and transfer, 360 degree readability, resistance to contamination and defects and adding up to 16 symbols to the structure (2).

The QR code typically appears as a small white square with black geometric shapes, colored and even branded QR codes are now being used, though. QR codes can hold much more information than a regular barcode. The information encoded in a QR code can be a URL, a phone number, an SMS message, a V-card, or any other type of texts. They are referred to as QR (Quick Response) because they allow the contents to be decoded at a high speed (8).

A QR code is capable of holding 7,089 numeric characters, 4,296 alphanumeric characters, 2,953 binary bytes, 1,817 Kanji characters or a mixture of them. The data capacity is much higher than other 2D codes such as PDF417, Data Matrix and Maxi Code and it stores information in both vertical and horizontal directions. A QR code can be read from any direction in 360° through position detection patterns located at the three corners as shown in Figure 1. A QR code can be read even if it is somewhat distorted by either being tilted or on a curved surface by alignment or timing patterns. The error correction capability against dirt and damage can be up to 30%. A linking functionality is possible for a QR code to be represented by up to 16 QR codes at maximum, therefore, a small printing space is possible. The size of a QR code can vary from 21x21 to 177x177 cells by 4 cell-increments in both horizontal and vertical direction.

Data can be easily encrypted in a QR code to provide a confidentiality of information embedded in the code. It can also handle various languages. For examples, there are a number of standards adopted by Asian countries like GB/T 18284 by Chinese National Standard in 2000, KS-X ISO/IEC 18004 by Korean National Standard in 2002, and TCVN7322 by Vietnam National Standard in 2003(9).



Features and Merits QR Code

QR codes include several features and merits which make them ideal for using in organizations such as libraries and information centers. Some of these merits are as follows:

1. Large recordable data size. The recordable, or printable, the size of data is about tens of digits in barcode, while it is much larger in 2-dimensional code system.
2. Small area size. Comparing to barcodes, the size of 2-dimensional code can be so small that a small label can be printed and attached to the back of books.
3. Smartphone compatibility. These codes are readable by and displayable to mobile phones.
4. Error correction capability. 2-dimensional code is designed so that even if part of the encoded area gets dirty or somewhat distorted and thus impossible to read, the total information can still be recognized with error correcting algorithm.
5. Easy user access. The QR code could navigate users exactly to where they expect to go, such as a website or a phone number skipping the bother to type in or enter a wrong link or number.
6. Environment friendly. The environment impact is reduced by replacing magnetic card with recyclable plain paper.
7. Cost-efficiency. The cost of production and use of the codes in libraries is relatively low.
8. Versatility. The codes are available for different purposes such as printing, outdoor display and direct mail.
9. Independence of means. The codes are capable of being displayed on a variety of platforms and smart phones independent of models such as iOS and Android.
10. Measurement capability. The codes activities are traceable with web analytics and other measuring tools.
11. Applicability on library cards. With these codes, one can direct others to his webpage or

other websites such Twitter, Facebook, etc. (10-12).

QR code applications in libraries and information centers

Librarians and staff of a large university, small institutions, public libraries and museums provide useful ways for implementing QR both in traditional and online. In general the applications of these codes in libraries are as follows:

-Providing ready-to-use guidelines at required locations.
-Step by step guides for machines such as printers and copy machines.
-Providing a list of library guides on the subject of books on shelves.
-Showing the whereabouts of e-books on the shelves.
-Linking the user to digital libraries on campus.
-Offering services such as chat, instant messaging and mobile version of the electronic library catalog or database.
-Usable for services like ask the librarian, and in the traditional reference desk and all public access to computer stations.
-Usable in library tours.
-Providing maps of the library instead of a single map.
-Providing relevant reviews of library resources.
-Linking to a phone number shown on a web page without having to dial the number manually.
-Linking to the web page relevant to an event.
-Used for advertisement of services on public service desks such as circulation desk (8-12).

Difficulties of implementing QR codes in libraries and information centers

Implementing QR codes in libraries and information centers brings about some difficulties, some of which include:

1-Determining the place for attaching the codes in audio tours and other library resources.
2-Production and design of the codes. The design and production of a large number of codes is time-consuming.
3-Mobile model. Due to the diversity of smartphones used by students models compatible hardware and software are required to read the codes.
4-Education. Most library users are unfamiliar with QR codes and a link to the instruction page of the library is required (11).
5-Lack of writing ability. Compared to RFID codes, two-dimensional codes are only readable (8-12). In Conclusion In this paper all of the articles related to QR Code in libraries in Emerald, Springer, and Google scholar databases in 2011 – 2012 were researched using keywords such as “library” and “Quick Response Code”. The initial search retrieved 28 articles, 14 of which were selected for the final review after careful examination. In this paper, after a brief history of the QR codes, their structure, capabilities, benefits and applications in the libraries were investigated and the challenges on the way of their implementation were addressed.
Barcodes became widely used in libraries and information centers due to advantages such as speed, costs-efficiency in inventory control, ease of shelving procedures, and helping in control of the library management by computer

controlled circulation and assisting publishers and libraries in exchanging bibliographic information.

Despite the various advantages of conventional barcodes, they have limitations which encouraged the librarians to use a new generation of barcodes. Using QR codes along with the ability to create value-added has a low cost for the library and its users. On the other hand, one should consider that library users are busy people, and one of the key points in attracting them is providing them with needed information with greater ease and speed. These showcase the ease and popularity of the use of QRs in the libraries, however, as with any new technology, familiarity with the features of QR codes and applying them requires the users to be trained in their use. This is especially true in countries less familiar with these technologies, such as Iran and other third world countries. Thus the efficient use of QR codes in libraries is related to the familiarity of administrators, librarians and end users with the codes.

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