



Adoption of Quick Response Code to Promote Library and Information Resources and Services

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ABSTRACT

Quick Response (QR) code is modern technology which can cater to the user demand of providing access to resources through mobile-phone. The main objective of this paper is to review the concept of QR code and describe the practice of reading and generating the codes. The paper attempts to the basic concept and structure of the QR code, types and forms of QR code, and, how to generate QR code.

ARTICLE INFO

Article History

Received: October, 2019

Received in revised form: Dec., 2019

Accepted: March, 2020

Published online: May, 2020

KEYWORDS

QR Code, Library Promotion, Mobile Library and Information Services

INTRODUCTION

QR Codes according to Ashford (2010) are a type of barcodes, appearing as a small white square with black geometric shapes, which are readable by device which has the QR code reader facilities like the smart-phones. Rouillard (2008) reports that QR codes were developed in 1994 by Denso-Wave, a Toyota Motors subsidiary, and were initially used for tracking inventory in vehicle parts manufacturing. Shin, Jung, & Chang (2012) explain that a QR code consists of black modules arranged in a square pattern on a white background. According to Jupiter (2011), the QR code was designed to allow its contents to be decoded at high speed. Ashford (2010) adds that QR codes can hold much more information than a regular barcode. The information encoded in a QR code can be a uniform resource locator (URL), a phone number, an SMS message, or any text. Melrose, Perroy and Careas (2015) observed that QR codes are popular because they have a higher data density than ordinary barcodes; can be used free of charge; have a data structure standard which is not a prerequisite for current usages; have an all-direction high speed reading capability; exhibit resistance to

distortion when used on curved surfaces; possess data restoration capacity because they are resistant to smudged or damaged symbols; and possess ease of encryption thus enhancing the confidentiality of data.

According to Ashford (2010) and Walsh (2010), QR codes are a convenient way to add the virtual to the physical so as to provide useful content, often at the time of need. The codes are a low-threshold technology which is low-cost, easy to implement, and easy to use. Their ease of use is such that they can prompt a mobile phone to display encoded text, go online to URLs, ring a phone number, start a text message or import contact details on a V-card. They are also decoded fast and save the user's time to obtain the information or help needed. QR codes have been used in various industries. One such use was reported by Rouillard (2008) who stated that McDonald's food chain uses QR codes to inform users about the nutritious value of its burgers. Forssman, Jordaan, Forssman, Jordaan, & Louw (2016) reported the use of QR codes to map a library/ archaeological site in South Africa. They concluded that the use of QR codes in library/ archaeological research enhances studies by improving the



accuracy of its records, and by posing an efficient alternative to conventional recording methods. They also identified the benefits that QR codes offer librarians/ archaeologists to include:

1. the ability to record information rapidly and reduce the occurrence of errors;
2. the availability of free code-generating and -recording applications;
3. the safe storage of data that is immediately loaded online or stored in the code itself;
4. a reduction in the amount of paper used in recording contextual information; and, importantly,
5. its ability to augment publications by allowing the reader to view additional or non-essential information, enhancing the content of research.

Similarly, Kwanya, Stilwell & Underwood (2014) suggest that libraries can use QR codes to direct users to library resources, instructional videos or useful web sites as well as applications or contact information from their mobile phones. Walsh (2010) explains that libraries can use QR codes to provide virtual reference services through SMS; directions to a physical library or virtual library tours; context-appropriate information resources; supplementary information; or to store information for future reference as well as other forms of user support at the point of need. QR codes can also be stored on library posters, bulletin boards, catalogues, staff directory pages, study room doors, receipts, magazines or business cards. Kwanya et al. (2014) argue that the use of QR codes removes the need of the user to memorise or type the URL of a resource. They explain further that the fact that QR codes are scanned using mobile devices, which are becoming steadily abundant in research and academic environments, also makes them handy for library and information centres clientele. QR codes

are considered suitable for marketing and promotion in libraries and other information centres.

In a related development Ashford (2010) declare that QR codes can be used in library exhibits to link to songs, videos, web sites, surveys, contests or other information that augments the exhibits; library stacks and end caps or magazine areas that point to online electronic holdings of print materials or related subject guides; resources which link to library audio tours for orientations; print hand-outs to link to additional information on mobile-friendly sites; text that loads the library's text message reference service and other contact information into the patron's phone; art shows or permanent art in libraries linking to the artists' web sites; catalogue records to offer patrons basic information about an item, including the location and call number; staff directory pages and research guides that go to mobile-friendly sites for later reference; audio book cases for author interviews or books for reviews; study room doors connecting to room reservation forms; and link to individual videos or YouTube playlists of videos.

The use of QR codes in libraries has been reported by many studies. Walsh (2010) reports that at the University of Huddersfield in the United Kingdom, QR codes are used to deliver context appropriate help and information directly to the users at the point of need. The other libraries reported to be using QR codes include the University of Colorado at Boulder which is using QR codes on signage to link patrons to maps and instructions (Hicks and Sinkinson, 2011); the San Jose State University Library which is using QR codes to link to mobile versions of their websites (Oasay, 2011); the University of Miami Library is using the codes to support readers' advisory functions (Miami University Libraries, 2011); while Indiana University's Fine Arts Library is using QR codes in course syllabi to link to library resources



(MacDonald, 2012). Mohamed (2014) conducted a study at the University of Cape Town on the potential to use QR codes to support the delivery of information services to law students. The study revealed a lack of awareness of the value of QR codes among students and librarians. She recommended that libraries should be encouraged to experiment with QR codes to deliver services. In Nigeria, very few libraries according to Mohamed (2014) are utilizing the QR codes.

Although the use of QR codes was initially confined to Japan, its popularity is increasing by the day as the symbols appear in magazines, advertisements, product wrappings, t-shirts, passports, business cards and on subway billboards in many countries. In spite of its popularity, some challenges hamper its widespread use. Shin et al. (2012) explain that QR codes have limited interaction capacity. They also explain that the fact that QR codes can only be used on smart-phones somehow limits their use by persons who do not have smart-phones. Other challenges affecting the use of QR codes are identified by Walsh (2009) to include a lack of appropriate knowledge and hardware devices (smart-phones) to encode and decode QR codes effectively; lack of awareness of QR codes amongst librarians and users; and potential prohibitive data charges on users' mobile phones. QR codes have some data limits up to Maximum of 7089 Numeric character, Alpha-numeric maximum of 4296 character and Binary (8 bits) Maximum of 2953. A QR Code can be read even if it is tilted or distorted. The size of a QR Code can vary from 21 x 21 cells to 177 x 177 cells by four cell increments in both horizontal and vertical direction.

STRUCTURE OF QR CODE

QR Codes are actually black modules in square patterns on white background. QR Code consists of many areas that have specific importance. Each

QR Code symbol consists of mainly two regions: an encoding region and function patterns. Function patterns consist of the followings:

Finder Pattern

This pattern can be used for detecting the position of QR Code. The position, size and angle of the QR Code can be determined with the help of the three position detection patterns (Finder Patterns) which are arranged at the upper left, upper right and lower left corners of the symbol. The patterns can be easily detected in all directions.

Alignment Pattern

The alignment pattern consists of dark 5x5 modules, light 3x3 modules and a single central dark module. This pattern is actually used for correcting the distortion of the symbol (ISO/IEC, 2000). The central coordinate of the alignment pattern will be identified to correct the distortion of the symbol.

Timing Pattern

The timing patterns are arranged both in horizontal and vertical directions. These are actually having size similar to one module of the QR Code symbol. This pattern is actually used for identifying the central co-ordinate of each cell with black and white patterns arranged alternately.

Quiet Zone

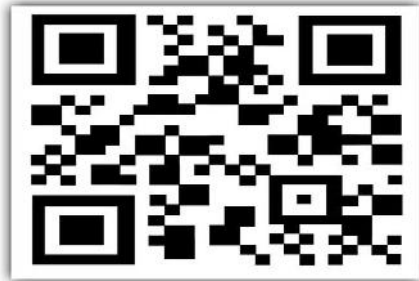
This region is actually free of all the markings. The margin space is necessary for reading the barcode accurately. This zone is mainly meant for keeping the QR Code symbol separated from the external area. This area is usually 4 modules wide (Yi, 2016).

Data Area

The data area consists of both data and error correction code words. According to the encoding rule, the data will be converted into 0's and 1's. These binary numbers will be then converted into black and white cells and will be

arranged. Reed-Solomon error correction is also employed here (Whitchurch, 2011).

Images of QR Code and Its Reader



(Fleishman, 2017)



(Giwa, 2019)

Types of QR Code

Two types of QR codes are identified; static and dynamic, where dynamic QR code is editable anytime even after printing.

Forms of QR

The following forms of QR codes were identified according. These are:

1. QR code model 1 and model 2,
2. Frame QR Code- This is more advanced type of QR code with canvas area where available space for inserting other thing for promoting as the librarian or information scientist wishes.

REQUIREMENTS FOR SCANNING QR CODE

The following are essential for a successful QR code usage:

1. Smart phone with QR Code reader,
2. handy scanner/ fixed scanner,
3. Internet Facility and,
4. Printer

Merits of QR Code

QR codes present the possibility of meeting library users where they are and with the information they need, whether they are off-campus researching or lost in the stacks. Furthermore, they offer a low cost marketing tool easily distributed in a variety of formats and locations.

The followings are benefits of using QR codes in libraries and information centres:

1. It is available for free; one can create the QR code using free software.
2. It is very fast to access the information embedded with the code.
3. Easy to read the QR code.
4. The nature of QR code is versatility
5. High storage capacity of data
6. Small space required for print
7. Reading capability of QR Code from any direction
8. Capability to restore partially data or content of damaged QR codes
 - Simple implementation process and user friendly technology.

Demerits of QR Code Technology

Despite the benefits of QR code it has the following shortcomings especially in developing countries:

1. Students who do not own a web enabled mobile device will not benefit from the added value QR codes can provide.
2. There are also potential issues for people with special needs when using QR codes and mobile devices.
3. It takes time to scan the code embedded in the QR code



4. You need a QR code reader software
5. It needs an internet connection

HOW TO MAKE A QR CODE

The QR code creation process is pretty straightforward. Here seven stages on how to get started:

Step 1: Selecting a QR Code Generator

There are lots of QR code generators out there. The best one gives librarians and information scientists many options for using their QR code, and compatibility with most mobile QR code reader apps.

Best QR Code Generators

The following are QR code generating sites:

1. Free QR Code Generator by Shopify
2. Visualead
3. QR Stuff
4. QR Code Monkey
5. <http://www.GOQR.me>
6. <http://www.The-qr-code-generator.com>
7. <http://www.qr-code-generator.com>

Other things to look for when choosing a QR code generator are whether library or information centre can track and analyse performance, and if it allows librarian to design a code that's unique to his brand. Some QR codes, for example, display logos and other icons within the code that immediately tell people what information they will get from scanning it.

Step 2: Choosing the Type of Content Library or Information Centre is Promoting

First, the public relations librarian should select what type of content library want its QR code to show the person after they scan it. Librarians can choose from one of 10 types; URL, Vcard, Text, Email, SMS, Facebook, PDF, MP3, App stores or Images.

Step 3: Entering Data in the Form that Appears

Once the librarian selects the type of content he is promoting with this QR code, a field or form will appear where he can enter the information that corresponds with his campaign. If he wants his QR code to save contact information, for example, he will see a set of fields where he can enter the library's email address, subject line, and associated message.

Step 4: Consider Downloading a Dynamic QR Code

One significant drawback to making a QR code is that one cannot edit the data it contains once it is printed. But with dynamic QR codes, one can edit this data. With a free membership to QR code generators like <http://www.qr-code-generator.com>, librarian can print a dynamic QR code, scan it, and pull up an editable form where he can modify the data his clientele will receive when they scan the QR code themselves.

Step 5: Customization

The fun part of creating QR codes is customizing the design of the codes to library's brand. Want library's code to look like library's logo? Go for it. Want it to reflect library's website's design scheme? No problem using <http://www.qr-code-generator.com>, librarians can customize QR code by clicking the button to the top-right. Keep in mind not every QR code maker offers this design option, depending on the QR code librarian is looking to generate, he might find some tools limited in their functionality. Of course, library can customize its QR code further- adjusting the colours, adding a logo, creating social options, and more.

Keep in mind, however, that some customizations can make it more difficult for QR code scanning apps to properly read the code. It is a good idea to generate two versions of library QR



code -- one plain version and another with its preferred design.

Step 6: Test the QR Code to Make Sure it scans

Because a customized QR code can make it difficult for some mobile apps to "read," librarians should not forget to check to see if the QR code reads correctly, and be sure to try more than just one reader. A good place to start is the free tool 'Google Goggles', which takes a picture and then tells librarian what link or item it "reads from."

Another great free tool is QR Code Reader, which automatically takes librarian to whatever it "reads." Apple's Passbook also offers a built-in QR code reader on iOS 7, so librarian should test to make sure library's code is readable there, as well.

Step 7: Track and Analyse Performance

Just like any marketing campaign, librarians should follow up on any collateral or campaigns using QR codes to see whether they are actually working. How much traffic comes from each specific code? Are people scanning library code but not redeeming their offer once they get to the landing page? Or are they not even compelled enough to scan the library QR code?

Knowing this will help librarians troubleshoot and adjust their poorly performing QR codes to more closely mirror those that work well. It will be great if librarians include a tracking code on their URL so they can better measure performance.

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