

ABSTRACT

Quick Response (QR) code is one such technology which can cater to the user demand of providing access to resources through mobile. The main objective of this article to review the concept of Quick Response Code (QR code) and describe the practice of reading and generating QR codes. Research paper attempt to the basic concept, structure, technological pros and cons of the QR code. The literature is filled with potential uses for Quick Response (QR) codes in the library practices like e-resource management, library orientation, OPAC, Linking to electronic resources from within the library, information about library space, the library catalogue, etc. Paper also attempts to identify the example set by different library to use successfully QR code as a comprehensive tool for the library system.

KEYWORDS: QR Code, QR code generator, Process, Library Information Services, cons and pros, OPAC; Mobile

INTRODUCTION

QR is a bi-dimensional code composed by black and white pixels into a squared matrix, containing information to be enjoyed with the help of smart phones or similar devices. Scanning the code, which is usually printed on newspapers, posters, or captions, and processing it with ad-hoc software, users can obtain additional information and data on objects or services without extra searches. Considering the widespread circulation of mobile devices (such as smart phones) among users, many libraries are experimenting the usage of the QR to deliver library services in a friendly and quick way. The Library are using the QR code to give their users access to guides, manuals, library map, audio and video files [1].



Figure 1. QR Code. Scan or input the URL (<http://www.iiserb.ac.in/library>) to view the IISER Bhopal Library homepage

CONCEPT OF QR CODE

A QR code is the abbreviation for quick response code, which is a machine readable optical label with information on the associated item or product. In barcodes, information is coded in one direction or one dimension only. On the other hand, in a two dimensional code, which the QR code is, information is coded in two directions: horizontally and vertically. It can be read easily and is capable of holding a great deal of information [2]. QR codes are ubiquitous as marketing and information-provision tools. They appear on products ranging from candy bars to laundry detergent, on T-shirts and soft drink cups, in magazine advertisements, and elsewhere. Libraries and academic institutions have started to place these small codes on websites, in print literature, and in other physical locations where they may entice patrons and visitors to seek additional information about programs or services. The first object of implementation of QR codes as a means of connecting course content of the resources available with library sector [3].

EXAMPLES OF QR CODES IN LIBRARY

There are several reasons to believe this may be the time to prepare for mainstream use of QR codes in the library information services, and for any academic institutions to start implementing this technology. The number of smart phones and Internet-enabled cell phones user in this country is increasing rapidly. Marketing data says we should expect smart phones to be in the hands of half of all India in few years. QR codes are a convenient way to add the virtual to the physical—to provide useful content, often at the time of need. QR codes are also gaining traction in much of India. QR codes are a low-threshold technology. Low-cost, easy to implement, and easy to use, they are a technology that provides a lot of bang for the buck [4]. In this section we are illustrated some examples of QR code practices by the libraries as given below.

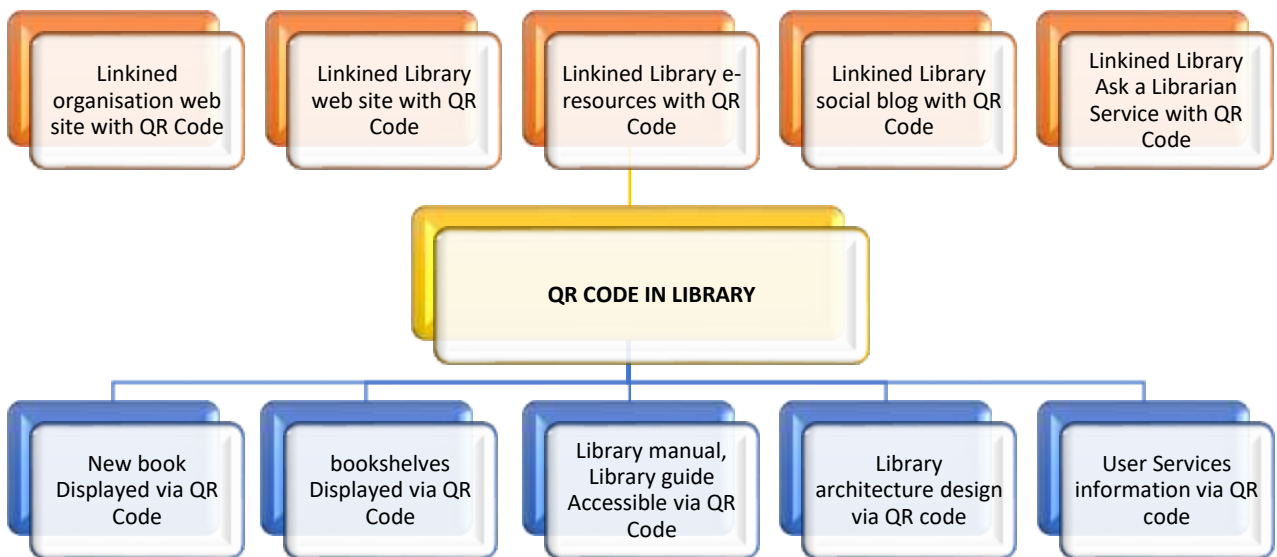


Figure 2. Some examples of QR code in Library practice

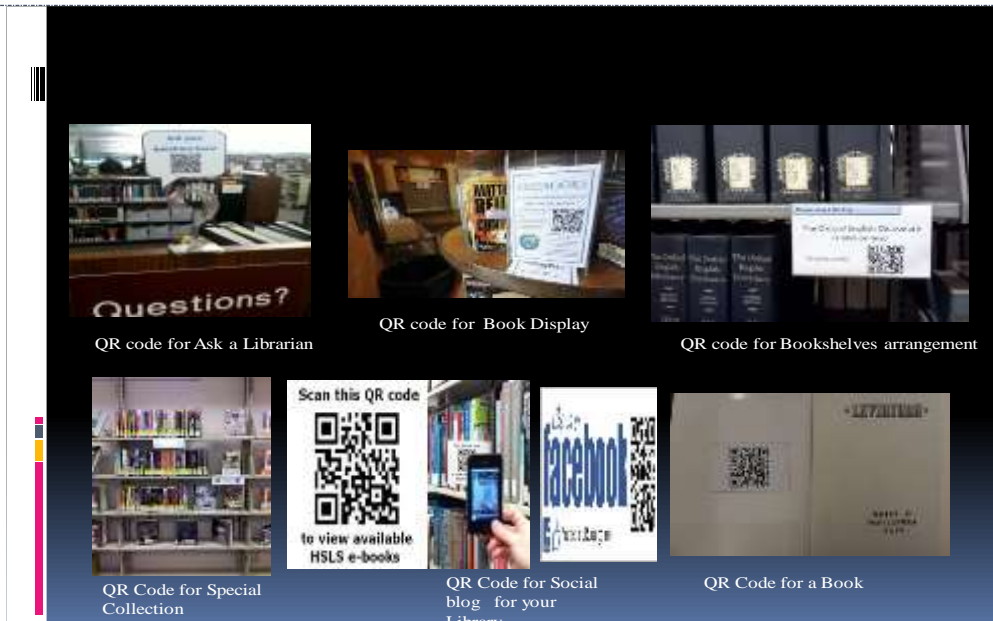


Figure 3. Libraries Using QR code in various section or services

A SHORT HISTORY OF THE QR CODE

The QR code system was invented in the year of 1994 by Denso wave. The main purpose was to track the vehicles at the time of manufacturing. Basically it was designed to obey the high speed component scanning. Even though initially it was using for tracking parts in manufacturing of vehicles, these codes are now used in larger context, Both commercial tracking applications and convenience-oriented applications focused at smart phone users[6].

Looking back on those days, Masahiro Hara in charge of the development of the QR Code then remembers that people who were developing 2D codes at other companies were all obsessed with packing as much information as possible into their codes [7].

Now in these days QR codes are used in displaying of text to the users, to add to vCard contact to the user's device, to open the uniform resource identifier, to compose an email or text message. Users can generate their own QR code, take a print and placed it in a public to access by the smartphone users, then that will encodes the image and fetches the information or link associated with that, then that accessed link will automatically connected to the web and fetches the related information.

STRUCTURE OF QR CODE

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

- [1] Finder Pattern
- [2] Alignment Pattern
- [3] Timing Pattern
- [4] Quiet Zone
- [5] Data Area

Fig.1 shows the structure of QR Code. The importance of each area is as described as follows Each QR Code symbol consists of mainly two regions: an encoding region and function patterns. Function patterns consist of finder, timing and alignment patterns which does not encode any data. The symbol is surrounded on all the four sides by a quiet zone border [8]. 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.

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 [9]. 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 bar code accurately. This zone is mainly meant for keeping the QR Code symbol separated from the external area [10]. This area is usually 4 modules wide.

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 [11].

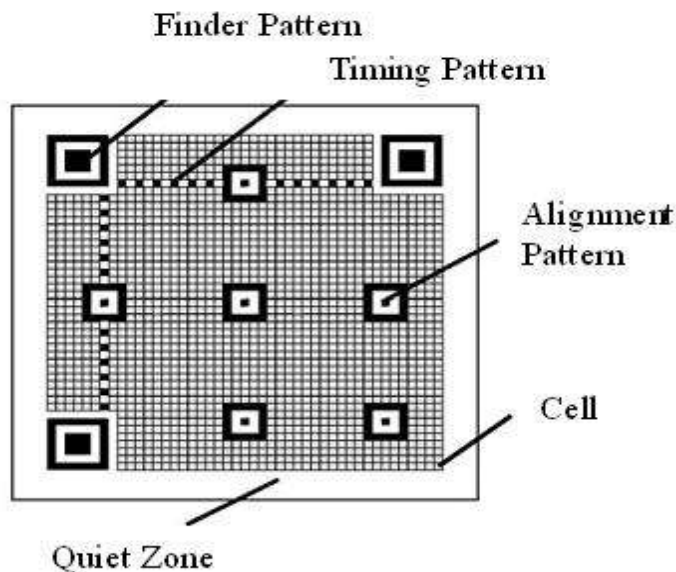


Figure 4. QR Code Structure

HOW TO GENERATE QR CODE?

Normally the process of QR code generation process and how to use it known as

- 6.1 QR Encoding (Generation of QR code)
- 6.2 QR Decoding (Accessing the contains information through QR code)

QR Encoding

The normal encoding of data is done through various steps such as [12]:

- 1) Analyse the data to be encoded. Convert the data to symbol characters. Find out the error correction and detection level.
- 2) Encode the data.
- 3) Error Correction Coding

4) Add reminder bits and data masking patterns.

5) Generate the format information and version information.

The entire process can be made clear with the help of the simple flowchart given below.

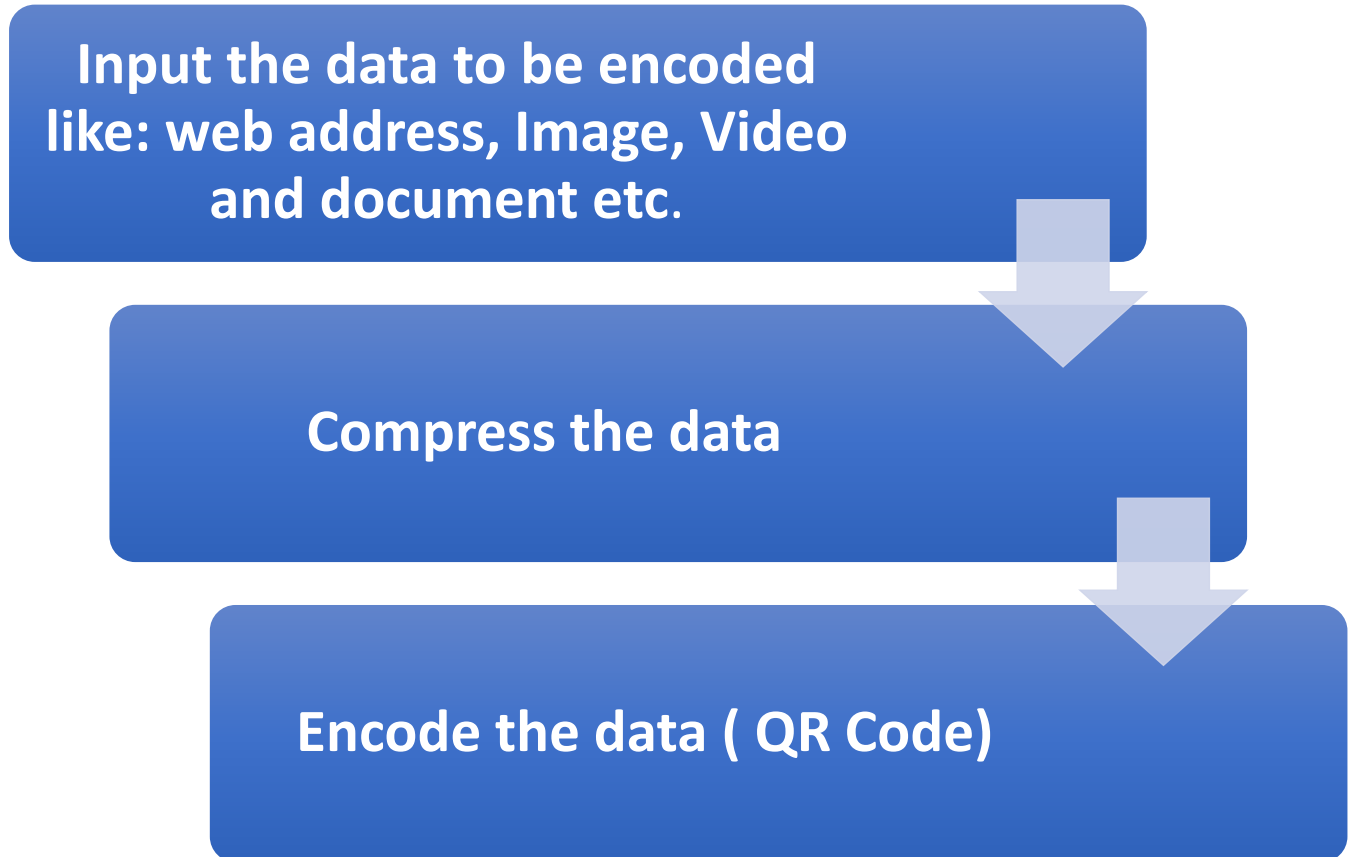


Figure 5. Steps for generating High-Capacity QR Code

QR Decoding

The process of scanning, decoding and reading out the content of a 2D barcode, such as a QR code, using a camera phone is known as mobile tagging.⁴ In order to read a QR code one must have a QR code scanner. Normally, QR decoding is done with the help of camera equipped mobile phones. Decoding process is just the reverse of the encoding procedure applied. We need to identify the quiet zone in order to decode the correct data. Alignment patterns help the decoding procedure by correcting the distortion of the symbol [12].

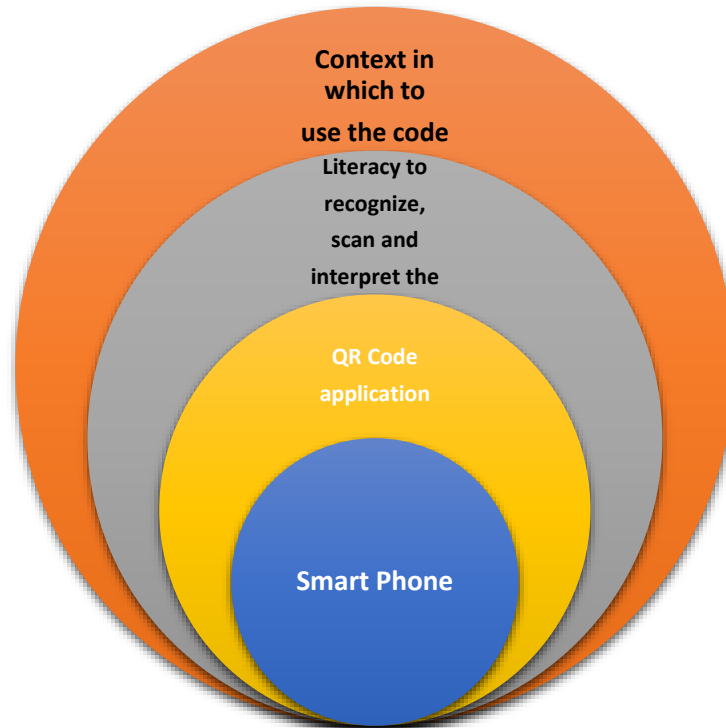


Fig.2. Overview of How QR code works

WORLDWIDE SCENARIO OF QR CODE IN LIBRARY:

There are several reasons to believe this may be the time to prepare for mainstream use of QR codes in the world, and for academic institutions and libraries to start implementing this technology. Libraries using the QR Code technology to integrate library some examples herewith.

Name of the Library	QR Code in library practices
Boise State University's Albertsons Library	Uses QR codes to link to its mobile website in its blog and main Twitter page. There is also an informative research guide about QR codes--what they are, how they are being used in Albertsons Library, tips on creating effective codes, and recommended QR code readers/scanners.
Brigham Young University's Harold B. Lee Library	Uses QR codes for its library audio tour, for Group Study Room on-the-spot reservations (http://lib.byu.edu/sites/qrcodes/) and for event poster information download.
Half Hollow Hills Community Library	Uses datamatrix codes on end stacks to lead patrons to subject guides on the web.
ACU Library	Uses mobile tags in library exhibits to link to songs, videos, websites, and realtime searches of our library catalog. It's a good way to incorporate electronic media with physical items and to make the display more engaging.
Bath University Library	Library is adding QR codes to catalog records to offer patrons basic info about an item (including location and call number).
Biblioteca Rector Gabriel Ferraté. Universitat Politècnica de Catalunya (BRGF)	uses QR Codes to provide additional information on promotional posters and on the web pages, to provide username and password to users who subscribe to theCLIC Area service (a computer

	classroom), to generate reminders of reservations of the group study rooms library, to fill the suggestion forms or to enrich the contents of the library's jazz collection. Take a look at http://www.youtube.com/watch?v=OQj3kD0F2uI to know more about one of the QR applications at the BRGF.
Lafayette College Library	Used QR codes for their 2010 Open House event geared to first year students, "Where in the Library is Carmen Sandiego: An Interactive Mystery Game". Students had to collect QR coded-clues from librarians stationed throughout the library.
RMIT University Library	Used QR codes for a contest it was running.
Ryerson University Library and Archives	Using QR codes in its library catalogue and for downloadable audio tours.
Sacramento Public Library	offers a QR code to patrons that will load the library's text message reference service info into the patron's phone. The code can be found on the Text 4 Answers page of the library website and the library's blog. More info at The Civil Librarian .
University of Huddersfield Library	University of Huddersfield Library is using them for linking to text messaging reference service, videos, contact info, and, in the catalog records, providing basic info about items. See Andrew Walsh's presentation, "QR codes, text a librarian, and more..."
The San Diego State University Library	is using QR Codes in its library catalog, on staff directory pages and on research guides.
Emily Carr University of Art + Design Library	is using QR codes in displays and signage.
Contra Costa County Library	is using QR codes on popular books to recommend further reading.
George Fox University Libraries	are using QR codes on DVDs and audiobooks to point users to video trailers, on doors for room reservations and more - see our flickr set of examples
Syracuse University Library Learning Commons	is using QR Codes on their bookmarks, tabletop signs, and on the flyer advertising their virtual tour - see our set on Flickr
UC Irvine Libraries	is running a pilot with QR codes in the stacks. The Arts section directs QR code users to LC arts classification system to aid browsing the physical book collections. The Math section uses QR codes embedded in the stacks to direct users to the Springer mathematics ebook collections
Marathon County Public Library (MCPL)	Uses QR codes on posters and other print media to connect customers to search results for related items in the library catalog (i.e. for book clubs, author visits, etc. ... links to the item(s) in question)
Southwest Iowa Library Service Area (SWILSA)	has begun a "shared" list of readalikes for various popular authors. A sheet of codes, formatted for label stickers, is available to print and attach to shelves near those authors' books.
Tompkins County Public Library	is using QR codes to advertise its downloadable eBook service, themed booklists and its social networking sites. Our QR code guide contains basic information and examples of our work.

QR CODE HOW LIBRARY CAN USE?

QR Code Link to e-Contents

- Linking to the online surveys
- Linking to Library Contests
- On Library Stacks, Journal Areas that point to online electronic holdings
- Linking to Library Audio tour for Orientations
- Linking to Library Blog, Websites
- Linking to Digital Library
- Linking to Library Maps
- Linking to Library Wi-Fi Network etc.....

CONCLUSION

QR Code is an innovative technology for the libraries helps to the information professional to integrate bi-dimensional code composed of black and white pixels into a squared matrix, containing information to be enjoyed with the help of smart phones or similar devices. This research paper analyse structures of QR code and process how it is work? A library user can easily get information regarding library collection, e-resource, library web site, Web-OPAC in a user-friendly environment. Number of libraries adopted this technological code to spread information worldwide. Library information professional using this technology without any dependency. Many QR code generator also avilabe to generate QR Code for library collection, architecture design of library building, e-books, visiting cards, bookmarks, user manual or blog.

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