

APPLICATIONS OF QR CODE TECHNOLOGY IN THE 21ST CENTURY FOR PROVIDING EFFECTIVE LIBRARY SERVICES IN ACADEMIC LIBRARIES

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Abstract: The technology for QR codes is identical to that for barcodes. Delivering messages to end users is made easier with the help of QR code technology, which can handle information in both horizontal and vertical directions. Also covered are several easily navigable, free internet resources for creating and decoding QR codes. The main focus of this research paper is on how academic libraries can use QR Code technology in the twenty-first century to provide effective library services. Since mobile technology has advanced, information can now be accessed instantly, from anywhere, at any time. Technology advancement and innovation have always played a major role in defining the range of services that libraries provide. One technology that can be used with a smart phone is the QR code. Libraries are the main organizations that use QR codes to advertise their services. These days, a lot of libraries use QR code technology to give users rapid access to their resources.

Key words: QR Code Technology, ICT, Smart-Phones, Mobile phones, Library Services.

1.0 Introduction

QR code stands for Quick Response code is QR code. Software that reads QR codes can easily decipher this two-dimensional bar code. It was first made available in 1994 through the Denson Wave, a Toyota Motors division. Mobile phones and other devices with QR code reader capabilities can read QR codes. One of the most useful gadgets that people use on a daily basis is the mobile phone. Voice communication is the primary use of mobile devices. In addition to providing voice communication capabilities, these devices provide their users with various services. Now-a-days there is an enormous selection of inexpensive mobile phones with various features. In addition to supporting Windows or Android, they feature cameras. The idea of a library has evolved with the introduction of ICT. Libraries are acquiring magazines, CDs, DVDs, e-journals, and other media. These days, libraries offer RFID-based circulation systems, online services, and reference services.

Recent years have seen the adoption of QR codes by European nations for their current library systems. Technology capable of providing the user with information encoded in a code is known as a QR code reader. When a smartphone's camera scans a two-dimensional image known as a Quick Response Code (QR Code), an image, video, or text is displayed or a webpage is opened. Compared to standard barcodes, QR codes are capable of holding much more data. A V-card, an SMS message, a URL, a phone number, or any other text can be contained within a QR code.

Applications of information and communication technologies in libraries and information centers nowadays have a big impact on resource management, features, and service quality. Over time, an academic library's primary responsibilities have changed, including processing, storage, retrieval, distribution of information, and resource selection and collection. Top devices for academic libraries are what librarians and information scientists should use to minimize gaps and promptly provide accurate information to those in need. It is highly probable that this technology will be easy to use, approachable, and straightforward in attracting customers and delivering information to them. The QR Code contains a hyperlink that gives customers access to information quickly and efficiently by converting communication from a physical to a virtual format. In terms of providing

instruction, marketing their services, and connecting patrons with financial supporters to provide information about library materials, Quick Response codes have the potential to drastically alter and improve library services.

2.0 Review of Literature

Kadli (2020) conducted research to explore the uses of QR Codes, one of the new, affordable, and mobile-based emerging technologies. Additionally, he examined the critical function of QR codes and how they quickly improve library services. **Dani (2020)** discussed about how the existing library management system was processed to create a smart system that uses QR codes. This study primarily focuses on the value of QR Code-based library management systems, which are effective and dependable for librarians, staff, and students. These systems also function in real time and are simple to use, which lessens the burden on librarians by enabling them to track the number of books overall and the books that are available for loan, as well as the ageing analysis of each book. **Gopale (2019)** investigated with the goal of examining some beneficial uses for QR codes in libraries. It also describes how QR codes might be implemented in library services, outlining both their benefits and drawbacks. Hand trend access resources, which can be accessed with just a code scan, are regarded as a knowledge treasure trove due to their rich and high-quality information resources that are freely available to the academic user community. **Bellary (2018)** emphasized the field of library and information science's change management. His primary area of interest is new technologies that the center must implement in order to save users' valuable time and deliver efficient services. **Dyade (2017)** provided a framework to define the primary goal, which is to review the idea of QR codes, their technological advantages and disadvantages, their structure, and their customer-based engagement in media such as newspapers, magazines, libraries, public ads, business advertisements, food and drink items, restaurants, clothing stores, social network applications, businesses, and public government activities. **Parabhoi (2017)** conducted research to investigate the applications of QR codes, particularly in libraries. The way that information is handled in libraries has to change in response to this new technology. **Mishra (2017)** provided a framework for characterizing QR Code as a comprehensive tool for library system available to user community. **Singh & Nikandia (2017)** Mobile technologies and QR codes are examples of new communication tools that are revolutionizing daily information retrieval, interaction, and search processes. **Fasae and Adegbilero-Iwari (2015)** asserts that few people are considering the possible implications of the widespread use of sophisticated devices for their user community, particularly with regard to how they will use digital information resources. **Ann (2014)** The Walker study, whose author highlighted the QR code's connection to databases and discussed the significance of iPads and QR codes in libraries, is supported by this study. Walker, **Molly Bernhart (2014)** discussed about the significance of QR codes, which are thought to be the means of tying physical services and marketing to mobile devices' access to internet resources. **Iranna (2013)** carried out executed QR codes consist of two-dimensional matrix barcodes. With the release of smartphones and other web-capable mobile devices, the use of QR codes for business and commerce has steadily increased over the past ten years. This paper explains how QR Codes can be used in information dissemination and resource management to guarantee optimal resource utilization. **Haworth & Williams (2012)** The study offers some insightful viewpoints on how to use QR codes to increase accessibility, but it was primarily concerned with implementation and only included broad observational data. **Raman, Pushkala and Kokonya Jacklyne (2012)** examined how consumers between the ages of 18 and 35 used QR codes. The researchers discovered that people are still using QR codes as a novelty and downloading them out of curiosity. **Hicks & Sinkinson (2011)** discussed about the difficulties in using QR codes in the library, including user education and awareness. Data was analyzed to find out how frequently a QR code was scanned, whether or not QR codes were being used, and which ones were the most widely used. **Coleman (2011)** examined the cutting-edge technology used in academic libraries, which can improve those institutions' reputations as user-focused, cutting-edge centers of learning and exploration. **Pamela (2011)** A study of mobile technology is defined as the use of handheld information technology artifacts, which include devices, software, and networking services for communication, interface, and applications. **Walsh (2010)** focuses on a 2009–2010 study conducted by the University of Huddersfield, which installed QR codes in its libraries, polled patrons about their awareness of the codes, and monitored usage. **Walsh (2009)** who reveals that QR codes, which are increasingly common in libraries and library catalogs, can be used by mobile devices to link to the internet or mail clients.

3.0 Structure of QR Code

QR Code is basically consists of 3 squares out of 4 corners of the symbol and zones. Position pattern confirms that it is a QR Code, and this is further supported by various segments that are located.

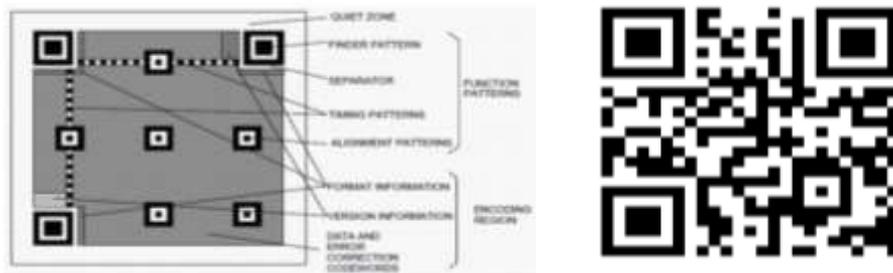


Fig: Structure of QR Code

Source from http://www.onbarcode.com/qr_code/

3.1 Separators: which separate the position pattern of the cells from the rest of the data.

3.2 Timing patterns: These are positioned alternately between two patterns to slow down the incoming code timing. This pattern is essentially used as the black and white central correspondents for each cell.

3.3. Alignment pattern: The QR Code's align pattern is utilized when scanning the code with a camera to fix any confusion that may have arisen during photoshoots. Correcting the distortion of the symbol is the primary function of the central correspondent part.

3.4 The data zone: The portion of the QR Code that stores encoded data before it is changed into 0s and 1s and then white and black cells is known as the data zone.

3.5 The Quiet zone: There is a minimum 4-bit margin surrounding the code. Every symbol is free to exist in this area. Additionally, keep the QR code symbol for the outside area separate.

3.6 Version Information: Versions of the QR Code that reformat data aid in data restoration and error correction, but the code itself is distorted. It is close to being divided, and the scanners read it quickly while decoding.

3.7 QR Code Data Characters per Symbol

- Maximum QR Code symbol size, in Version 40 and error correction level (L):
- Numeric data: 7,089 characters
- Alphanumeric data: 4,296 characters
- Byte data: 2,953 characters
- Kanji data: 1,817 characters

4.0 Usage of QR Code

4.1 QR Code Uses for Interactive Marketing



Fig-2: QR Code Uses for Interactive Marketing

4.2 QR Code-Driven Gamification



Fig-3: QR Code-Driven Gamification

4.3 Streamline Payment Processes: Asia Pacific Mobile Payment Market size , 2019-2030

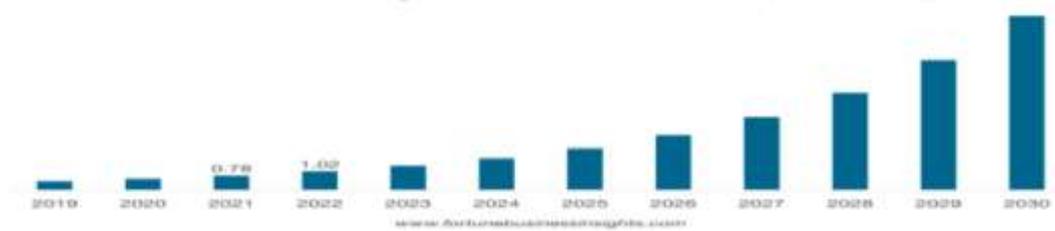


Fig-4: Asia Pacific Mobile Payment Market size , 2019-2030

5.0 Benefits of using QR Code technology

- It's fast
- User Friendly
- Store huge amount of data
- Use anywhere
- No specific skill is required
- No additional technology is required
- Use the Information later
- Anyone can generate it
- Increased customer satisfaction
- Personalized service
- Time Savings

6.0 Application of QR Code Technologies in libraries

Some of the important activities, QR codes are applied in libraries are as follows:

- SMS Alert and MOPAC
- E-mail and phone numbers
- Reference and Library Resources
- Wi-Fi access and Geo-location
- Link to website
- Link to library e- resources
- Linking from print to electronic journals holdings
- Providing an electronic alternative to physical books
- Promoting online audio visual materials
- Embedding video help
- Bringing external resources into library
- Events and URLs
- Twitter and tweets
- Easy access to previous year question papers
- Library Audio Tour
- Group study room scheduler
- Marketing /promotional material
- Finding appropriate help
- Taking the catalogue record with you
- Seat reservations Wi-fi proper utilization

7.0 QR Code and its use in various sectors

1. Health Care
2. Shopping and E-Commerce
3. Shipping and Logistics
4. Hotel, Tourism, and Airline
5. Entertainment and Event Management
6. Food and Beverage
7. Real Estate

8. Education
9. Agriculture Marketing
10. Online Business/offline
11. Bus Ticket System for Public Transport
12. Payment system
13. Temples/hundi
14. Banking
15. Invoices, Billing
16. Mobile Payments
17. Insurance

8.0 Generate QR Codes for...

- Website URL
- YouTube Video
- Google Maps Location
- Twitter
- Facebook
- Telephone Number
- Skype call
- Image File
- PDF File
- SMS Messages
- E-Mail Address
- Contact Details
- Digital Business Card
- Attendance Tracking
- Wi-fi login
- LinkedIn
- Instagram
- App store Download
- iTunes Link
- Dropbox
- Plain text

9.0 QR Code Generator Links

- Kaywa (<http://qrcode.kaywa.com/>)
- GoQR.me (<http://goqr.me>)
- QRMobilize (<http://qrmobilize.com>)
- QR Code and 2D Code Generator by Kerem Erkan (<http://keremerkan.net/qr-code-and-2d-code-generator/>)
- QR Stuff (<http://www.qrstuff.com>)
- MyQR (<http://myqr.co/>)
- Quickmark (<http://www.quickmark.com.tw/En/qrcode-datamatrix-generator/>)
- BeQRious (<http://www.beqrious.com/qrcode/create>)
- Bosqweb (<http://www.bosqweb.net/en/QR-code-generator>)
- QReate & Track (<http://app.qreateandtrack.com/#/create/event>)

10.0 Use of QR Code in Libraries

There are many libraries that have implemented QR codes; some notable libraries are listed below in India and overseas.

1. Central Library IISER, Bhopal
2. Indian Institute of Technology, Delhi
3. Savitribai Phule Pune University, Pune
4. Tezpur University Central Library, Nappam, Assam
5. Lafayette College Library, USA

6. Syracuse University Library, New York
7. Half Hollow Hills Community Library, USA
8. Contra Costa County Library, USA
9. Topeka & Shawnee County Public Library, USA

11.0 Conclusion

Libraries are regarded as knowledge treasures because of their rich and high-quality information resources, which are made available to the academic user community without charge. Libraries will employ mobile-based QR code technology in response to the growing popularity of mobile devices, in order to facilitate user community access to information resources. Every reader can obtain the information they need thanks to the strength and capability of contemporary technologies. Library patrons are growing more tech-savvy in this technologically. In India, more and more people are using QR codes, particularly for cashless transactions. These days, QR codes can be found in a variety of locations, including retail stores, magazines, newspapers, and cashless shopping. In order to provide value-added services, libraries must be able to change and adapt to new technologies in their operations and services. By using a QR code, the user would have simple access to the most important and up-to-date library information. In order to optimize the use of QR codes within the user community, library professionals need to plan user awareness campaigns, orientation programs, and so on. While there is no technology that QR codes cannot replace, they can improve user experience overall and change the way a user interacts with academic libraries, librarians, and the library collection.

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