Personal Marketing Framework based on QR Code

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ABSTRACT

This paper will focus on the technique to build a responsive personal marketing framework for professional job seekers using Quick Response Code (QR Code). In today's demanding job market, every career-minded individual has to first promote their value and benefits to a prospective employer through tools like resume, portfolios etc. The cut-throat competition among job applicants to get a particular job has increased the thought of creating more formal, precise yet informative and interactive tools to attain the opportunity in the first place itself. A unique QR image will be generated each time consisting of URL, Contact information, details about research paper or projects, link to the LinkedIn profile, etc. which can be easily scanned using a QR Code reader with an embedded camera. Thus presenting the candidate to be more tech proficient in front of an employer and showcasing that extra information without being lengthy and informal. The objective of this paper will always aim for the study of the application of QR Code in personal marketing methods and to analyse its benefits. The paper also proposes a methodology for the development of a unique system which will help a job seeker to make a compelling digital presence.

KEYWORDS: Quick Response Code (QR Code), Barcode, Personal Marketing, Responsive, Recruitment, QR Code Reader, QR Code Analytics, Smartphone.

INTRODUCTION

In any recruitment process, the foremost task is to evaluate the profiles of prospective candidates and assess their skills and strengths to determine whether they are perfectly eligible for the position or not. Any kind of personal marketing methods like resumes, portfolios, Vcards, etc act as the initial step for a job seeker to present themselves as the best choice amongst the countless other applicants. Without a favorable first impression, an employer may not consider the candidate as a suitable one for the job on offer and proceed to other candidates who have showcased themselves in a better way.

Considering the rapid advancement of technology and increasing competitiveness in the professional sphere, job-hunters need to be unique in terms of marketing themselves for a particular opportunity by exhibiting all of their key skills in one go. Nowadays, professional candidates are more interested towards distinctive and unorthodox alternatives than the traditional formats while creating resumes, business cards, portfolios, etc. Bridging the gap between the offline and the digital world, QR Codes could become a significant tool for demonstrating that extra information such as research papers, app store links, and professional profile on websites like LinkedIn which is not possible to deliver through a printed resume, portfolios, cover letters or business cards.

Quick Response Code, popularly known as QR Code is a two-dimensional barcode containing data in the form of black and white modules that can be simply accessed by a mobile device's camera or dedicated QR Reader application software. Though these codes are widely used in various fields like marketing, social

http://dx.doi.org/10.19085/journal.sijmas040801

media, education, healthcare, product tracking, etc.; application of QR Codes in the recruitment sphere has not gained much acceptance. They are basically a form of barcodes. But the basic difference is that the barcodes are one dimensional i.e. the data can be stored in just one direction whereas QR codes are two-dimensional in which data is stored in both horizontal and vertical directions in the form of black and white square modules as it can be seen in Figure 1. Thus QR codes can store relatively more amount of data than normal linear barcodes. Also, QR Codes can store different kinds of data such as URL, audio, video, etc. That is why they are more preferred medium than the barcodes for storing information.
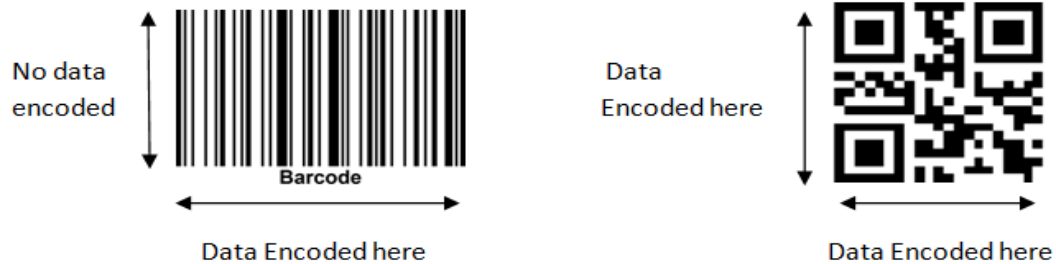
1. Data Holding Capacity of Barcode and QR Code

In order to help facilitating, the smooth transition of utilization of this emerging trend of QR Codes from the existing primitive alternatives, our paper proposes the development of a responsive personal marketing framework. The USP of this framework lies in the utilization of the QR Codes which provide a convenient way to add a variety of data including Text, Hyperlink, Contact Information, SMS/MMS message, Email (Send message) , audio/video etc.

The main focus of the study is on exploration and compilation of data and research regarding the benefits, methodology, and future scope of Quick Response (QR) codes in the Personal Marketing stage of the recruitment process. The proposed framework has the ability to bring about a change in the recruitment procedure and help millions of jobseekers leave an everlasting and individualistic impression on potential recruiters.

TERMINOLOGY

In this section basic terminologies has been discussed which are used in this paper.

A. *Personal Marketing*

Personal Marketing, also termed as Personal Branding is the practice of marketing in which a person (job-seeker) defines a plan consisting of creating a personal mission statement, analyzing the current situation as a job seeker, goals, objectives, opportunities, and a strategy for landing a job.

B. *Personal Marketing Tools*

The tools which help in strategising a personal marketing plan are termed as Personal Marketing tools. Some of them are Resumes, Cover Letters, Portfolios, Vcards, Professional websites and blogs, etc.

C. *Barcode*

A Barcode (or Bar Code) is an optical, one-dimensional, machine- readable, linear code represented some data in a pattern of parallel lines of varying widths and spaces. The data basically describes the object with which the barcode is attached.

D. *QR Code*

A QR Code, abbreviation of Quick Response Code is a two-dimensional, machine-readable, matrix barcode where data is encoded in both vertical and horizontal directions in the form of an image, consisting of black and white modules which represent the encoded data.

E. *QR Code Reader*

QR Code Reader can be defined as the application software used for accessing the information encoded in a QR Code by the process of scanning.

F. *QR Code Analytics*

QR Code Analytics is termed as the overall data statistics determined through tracking of QR Codes to identify the device from which the QR Code has been decoded, geographic location and also the time during which it was scanned. It also demonstrates the traffic generated i.e., the number of visitors and requests.

LITERATURE OVERVIEW

Denso Wave, a Toyota subsidiary company in Japan developed the first ever two-dimensional QR Codes in 1994 for using them as a fast and convenient means of tracking vehicle parts during the manufacturing process. After its successful application in the automotive industry, other industries also began implementing this efficient technology. The QR code first became commercialized in 2011 when the telecommunications industry picked up on the trend. Today the mobile Smartphone is the biggest driver of QR code commercial popularity (Probst and Brokaw, 2012).

The timeline of the evolution of QR Code technology has been summarised below:

- 1988 – The first Two-dimensional Barcode was developed by Intermec Corporation.

- 1994 - Masahiro Hara from Denso Wave designed the Quick Response Code for use in the automobile industry to track the vehicle manufacturing process.

- 1997 – QR Code was standardised as AIM (Automatic Identification Manufacturer) to be used in the Automatic Identification Industry.

- 1999 –The Japan Industrial Standards accepted QR Code as a standard two-dimensional code. Also, the Japan Automobile Manufacturers Association's EDI standard transaction forms used it as a standard 2D symbol.
- 2000 – QR Code was standardised by ISO (International Organization for Standardization) as one of its international standards.
- 2004 – To fulfil the need for smaller sized codes, Micro QR Codes were released and was accepted as a JIS Standard.
- 2008 – IQR Codes with large coding capacity but smaller footprints were released-. It also allowed the use of rectangular code modules.
- 2010 – The first QR code scanner and reader applications software were introduced for different Smartphone platforms in the US.
- 2014 –To supplement the design and structure of QR codes, a new variant of QR Codes named Frame QR was released. It is a combination of illustrations and images.

QR Codes are one of those inventions that have become a primary tool in the fields of manufacturing, warehousing and logistics, freight tracking, healthcare, retailing, life sciences and office automation. Now with the explosive growth of smart phones, the QR Code is also being used in mobile marketing and

advertising campaigns as a fast and effective way of connecting with customers and providing end-user content, including Web links, mobile coupons, airline boarding passes, etc (QR Code® Essentials, 2011).

One of the most popular mobile payment applications, Paytm has introduced a dedicated scan button in the navigation bar on the home screen to provide the best QR Code scan experience for decoding both the Paytm and non-Paytm QR Codes generated using open standards. The users can use the Paytm app to scan to read any message, browse any website link, pay for a purchase and browse products of a merchant without having to install yet another standalone QR Code app (Paytm Blog, n.d.). These 2D barcodes have also been implemented in the unique identification proof of Indian individuals, namely, Aadhar Card to verify whether the card is original or not. This code contains all the information of the card holder in electronic form (Aadhar Card, n.d.).

Slowly and steadily, this technology is leaving its mark in the recruitment world too. Many IT companies such as TCS, Tech Mahindra and Cognizant Technology Solutions are using QR Codes as digital signatures to differentiate their original job offer letters from the counterfeited ones. These codes are printed on the letters and when scanned can be decrypted only by the company. They are used as a reliable method of authentication and thus make the job letters more secure. Also, it is used as a tool to provide detailed information about the career prospects of an organization. Though it is not a new trend, still the advantages of QR Codes have not been utilized much in the Recruitment Sector. While there are many research studies based on the application of QR Codes in marketing, payment authentication etc, the use of QR codes in Recruitment area has not been addressed yet in any academic study.

POSSIBLE BENEFITS AND CHALLENGES OF QR CODE

The personal marketing is a strategically designed plan in which a person determines his/her individual characteristics. He/she becomes the product (service) to be marketed to the customer, the business firm or organization doing the recruiting. A complete self analysis concerning personal objectives, characteristics (product strategy), salary and fringe benefits (price strategy), geographic location (place strategy), and contacts with the company through cover letters, resumes and interviews (promotional strategy) is a second essential part of the personal marketing strategy (Thistlethwaite, 1979).

As new technologies are rising expeditiously, it has become a sort of necessity and also a challenge for fresher as well as experienced working professionals to regularly update their resumes and portfolios to create an admirable first impression. There is a constant pressure for everyone looking for an opportunity to establish superiority over other contenders in this era of fiercely competitive job sphere. QR Code is one such technology which has gained a huge amount of commercial popularity due to growing use of Smartphone devices and can prove to be beneficial if used smartly and effectively.

A. Advantages

Connecting the static printed portfolios to dynamic online content, QR Codes as a personal marketing has numerous benefits to both job seekers and hiring managers, with a distinct technological ability to speedily provide more information to a hiring manager who is impressed with a candidate. These benefits have been summarized in the below points:

- These 2D Barcodes leave a good impression on the hiring managers as they make a person appear as tech-savvy and willing to embrace emerging technologies. It helps in getting the recruiting manager's attention which is the crucial first step in getting hired.

- The employer can instantly access the additional information which in turn boosts the candidacy of an applicant. For example, if there is a job vacancy for a social media position in an organisation and the applicant has any account on a particular social media website like Twitter and LinkedIn, then in that case the employer can easily assess his/her skills with a minimum amount of effort.

- Furthermore, the candidate can also receive text notifications or email alerts to monitor scans performed on the QR Code, including the number of scans and geographical points of origin. This feature helps to gauge interest of an employer.

While having a QR Code as career branding mechanism can be advantageous for both the job seeker and the employer, the traditional rules still apply. Using these codes can't help in overlooking spelling mistakes, incorrect formatting, grammatical mistakes or misinformation.

B. Key Challenges

With the correct context and scenario, there is great potential for the future of the QR code—but without it, they are nothing (Probst and Brokaw, 2012). Despite having huge potential, adopting this technology as a personal marketing tool has some challenges too which has to be kept in mind before embedding QR Codes in professional portfolios.

- Theoretically, the process of scanning of QR image and decoding of embedded data is easy and direct but many people don't know the correct method and technicalities of scanning a QR Code. It is necessary to follow the step-by-step method for an efficient scanning process. Many are not yet aware about this 2D barcode which can lead to more confusion and chaos in the minds of a recruiter. So, the target audience should be such who is familiar with this technology and all the processes associated with it.

- Another challenge in QR code application is that all Smartphone do not have preinstalled QR Code scanning applications. Some Smartphone come with a standard bundle of apps that include a barcode scanning app, while others leave it up to the consumer to download their own apps at their own convenience—a hindrance that can only be overcome if the consumer chooses to download the barcode scanning app themselves (Probst and Brokaw, 2012). The information encoded in a QR Code should be valuable enough for a consumer (hiring manager) to make an effort to download a scanning application.

- Though it is very easy to connect the printed professional portfolios with the digital content through QR Codes, it is of no use if the related and right amount of information is not stored in those black and white modules or if it connects to a website that is unsuitable for browsing. This will eventually decrease the interest of a recruiter to scan QR Codes in the future. Recruiter's lack of interest in the embedded content is one of the challenges that any jobseeker must think upon before using it for personal marketing.

The challenge of adoption is only a hurdle standing in the way of QR codes. QR codes should not be discounted simply because of slow adoption or content issues. QR codes are without a doubt, a revolutionary tool with the ability to cross global and linguistic boundaries (Probst and Brokaw, 2012). Along with huge amount of advantages, there are many challenges too which a job seeker will have to consider for efficiently applying this new technology without creating any havoc in the minds of a recruiter.

OVERVIEW OF QR CODES

Abbreviated from Quick Response Code, QR Code is a larger set of machine readable two-dimensional matrix barcode. Defined by the ISO/IEC 18004 industrial standard, it contains data in both horizontal and vertical directions. A QR code consists of black squares arranged in a square grid on a white background, which can be read by an imaging device such as a camera, and processed using Reed–Solomon error correction until the image can be appropriately interpreted. The required data is then extracted from patterns that are present in both horizontal and vertical components of the image (En.wikipedia.org, n.d.)

2. Sample QR Code

A. Characteristics of QR Code

QR Codes have huge amount of features which make them a perfect choice to store large number of different types of data. To understand all its attributes in a better way, following points have been summarized:

- High data encoding capacity
  A single QR Code symbol can contain up to 7,089 numerals—over 200 times the amount of data as a traditional 1-D barcode (QR Code® Essentials, 2011). Maximum 4,296 alphanumeric characters and 2,953 bytes of binary data can be stored. Also, it can encode almost 1,817 characters of Kanji/Kana data type.

- Versatility
  QR Codes have the potential to store various categories of data. Numeric, Alphanumeric, Binary and Kanji are the four types of data encoded by these 2D barcodes whereas normal barcodes can store just text and numeric characters.

- Small in Size
  Unlike linear barcodes, QR Codes can encode information in both horizontal and vertical directions. When the number of data is same, the space of QR Code information storage only accounts for 25% space of the one dimensional barcode information storage (Qianyu, 2014).

- Restoration and error correction capability
  One of the most advantageous characteristic of QR Code is its Error correction capability. Even after the QR Code is damaged it can restore maximum data. Depending on the error-correction level chosen, a QR Code symbol can be decoded even if up to 30% of the data is dirty or damaged (QR Code® Essentials, 2011). When the image of QR Code is contaminated, the error detecting can focus on the place of correct information. Data can be recovered even though a part of the code is dirty and damaged in general situation (Qianyu, 2014).There are four different levels of error detection that can be chosen for the incomplete QR Code correction. In addition, the elements of considering an error correction level selection contain the size of QR Code, the performing situation, the real-estate it will have and the degree to what kind of environment can be controlled (Qianyu, 2014). Table 1 shows the four levels of Error correction.

SL. NO	Levels of Error Correction	Capacity of Error Correction
1	Level L	Approx 7% error correction
2	Level M	Approx 15% error correction
3	Level Q	Approx 25% error correction
4	Level H	Approx 30% error correction

Table 1. Error Correction Levels of QR Code

According to the levels of error correction, Level H has the highest capacity of error correction while Level L has the lowest capacity.

- Readability
Decoding data in QR Code is much easier. While scanning barcodes the position of the camera has to be accurate, otherwise, they will not scan which is not a matter of concern in the case of QR Codes. As the detection patterns are located in three corners of the code, they can be easily scanned from any distance and position.

B. Benefits of QR Code over Barcode

Bar codes have become widely popular because of their reading speed, accuracy, and superior functionality characteristics. As bar codes became popular and their convenience universally recognized, the market began to call for codes capable of storing more information, more character types, and that could be printed in a smaller space (Lotlikar et al., 2013). As a result, two-dimensional QR Code was invented to satisfy the needs and overcome the problems of traditional barcodes. Though the UPC barcodes are in application even today in all areas, QR code has some additional features that make it the modern and the forthcoming trend in the recruitment domain. These codes can entrench more than 350 times the information than a traditional bar code used at retail or grocery stores (Ceta, Patel and Sakaguchi, 2013). The more enhanced comparison of QR Code and Barcode on the basis of various attributes has been described in Table 2.

SL. NO	Attributes	Barcode	QR Code
1	High Capacity	- One-dimensional - Capable of storing up to 20 characters	- Two-dimensional - Capable of storing up to 7089 characters
2	Data Reading	Can only be read horizontally.	Can be read horizontally and vertically.
3	Distortion Compensation	Cannot be read if it is distorted in any manner.	Can be read even if its image is on a curved or otherwise distorted surface
4	Size	Requires more space to hold a data and therefore it is large in size.	Can hold the same amount of data contained in a 1-D barcode in only one-tenth the space.
5	Error Correction	Error correction is not possible.	Data can be restored even if it is damaged or dirty depending upon the four levels of error correction

Table 2. Comparison between Barcode and QR Code

SURVEY STUDY OF QR CODES

The aim of this survey study was to examine the feasibility of the Quick Response (QR) codes in the context of Personal Marketing. The sole objective of this qualitative research was to explore whether the application of QR Codes can strengthen the process of personal marketing and hiring. A short digital survey was conducted in a questionnaire based format using Google Forms. The data was collected and stored in excel sheet using which the research findings was calculated in the form of graphs and charts. As not much research has been done on the application of QR Codes in recruitment, it was necessary to first get an idea about the awareness level, understanding and benefits of QR Codes through job seeker's and recruiters point of view.

A. Survey Questionnaire

The questionnaire covered the core aspects of QR Code and determined the views and opinions about QR code as a personal marketing tool. In accordance with the objective of the research study, the following research questions were designed:

1. Age
   - Below 20
   - 21-25
   - 26-35
   - 36-45
   - 46-55
   - Above 56

This question was formulated to determine the choices of different person related to different age groups. According to the variation in age, the views might differ. So, it was essential to know the age of all the people who participated in this survey.

2. Level of education
   - High School
   - Completed/Pursuing Graduation
   - Completed/Pursuing Post-Graduation
   - Others

As Education plays a vital role in understanding any new technology, this question was created to know the educational qualification of all the participants.

3. Profession
   - Student
   - Working Professional
   - Retired
   - Self-employed/Startup
   - Others

This question covers the professional background of all the participants. The mindset and requirements of a person changes as he/she is promoted to a higher level of work. Along with the student, working professionals and retired employees, self-employed/Startups were also included in the choice as in today's generation startups are the new driving force in the recruitment sector. Without analyzing their views this research study would not have generated a satisfactory result.

4. Are you familiar with QR Codes?
   - Yes
   - No

Though it is not a new technology, still many people are not much familiar with the features, benefits and applications of QR Codes. The awareness level of different categories of people about the QR Code was determined through this question.

5. In what fields have you used/seen a QR Code?
- Marketing & Advertisement
- Social Media
- Product Tracking
- Recruitment
- Others

QR Codes have been in application in various areas from the day it was invented. Marketing & Advertisement, Social Media, Product Tracking being the most applied areas of these 2D barcodes. As this paper focuses solely on using QR Codes as a personal marketing tool for enhanced recruiting, Recruitment as an area was also included to observe whether it has been employed in this sector or it is a totally new concept for the job world.

6. Do you use Smartphone?
- Yes
- No

Smartphone technology is the prime reason behind the success of QR Codes. Though today's world is Smartphone driven, still this question was added to perform a more detailed study on QR Codes.

7. Do you know how to scan a QR Code?
- Yes
- No

This question was designed to calculate the percentage of people who are able to perfectly scan a QR Code. Just being familiar about QR Code is of no profit if anybody does not have the correct idea of the scanning process. The digital content attached with the QR Code will have no value if someone does not know how to decode that content through scanning.

8. Have you used/seen a QR Code on Personal marketing tools like Resume, Business Cards?
- Yes
- No

This question was created to deduce the number of people who have already seen this technology on Personal marketing tools and also to measure the portion of people for whom this is an unfamiliar thing.

9. Do you think it would be beneficial to use QR Code on Personal marketing tools like Resume, Business cards, etc?
- Yes
- No

This question gets the views of people of different backgrounds to determine whether QR Codes on professional tools will prove to be a boon for the job seekers or not.

B. Data Collection

The data for this research was collected through a questionnaire based digital survey conducted by preparing a question sheet using Google Forms. The target audiences of this research survey were students, working professionals, self-employed/startups and retired people. The active link of the questionnaire was

sent to people belonging to each of the above mentioned categories. Overall, 200 samples of data were collected and stored in excel sheets. The maximum data was gathered from the age group 21-25 which mostly belonged to students and working professionals as it can be seen in Table 3. 66 samples of data were obtained from this age group which was the highest.

Age Group	No. Of Data Samples collected
Below 20	20
21-25	66
26-35	38
36-45	45
46-55	20
Above 56	11

Table 3. Total number of Data Samples collected with respect to different age groups

Almost, 24% of the data was acquired from students and 45% from working professionals. The percentage of Self-Employed/Start-ups was also quite good with 20% data generated from this group. 10% of them were retired employees.

Profession	No. Of Data Samples collected
Student	47
Working Professional	89
Retired	19
Self-Employed/Start-ups	40
Others	5

Table 4. Total number of Data Samples collected with respect to different professions.

With high participation of working professionals and start-ups, the data collection process was quite favorable. All of these data were used to analyze the findings of this research study.

C. Data Analysis

The outcomes of this research are a set of graphical representations in the form of charts. All the data collected was systematically distributed in the form of tables to further compute overall statistics of the questionnaire and to determine the findings generated related to respective research questions.

Survey Question: Are you familiar with QR Codes?

Generated Response:
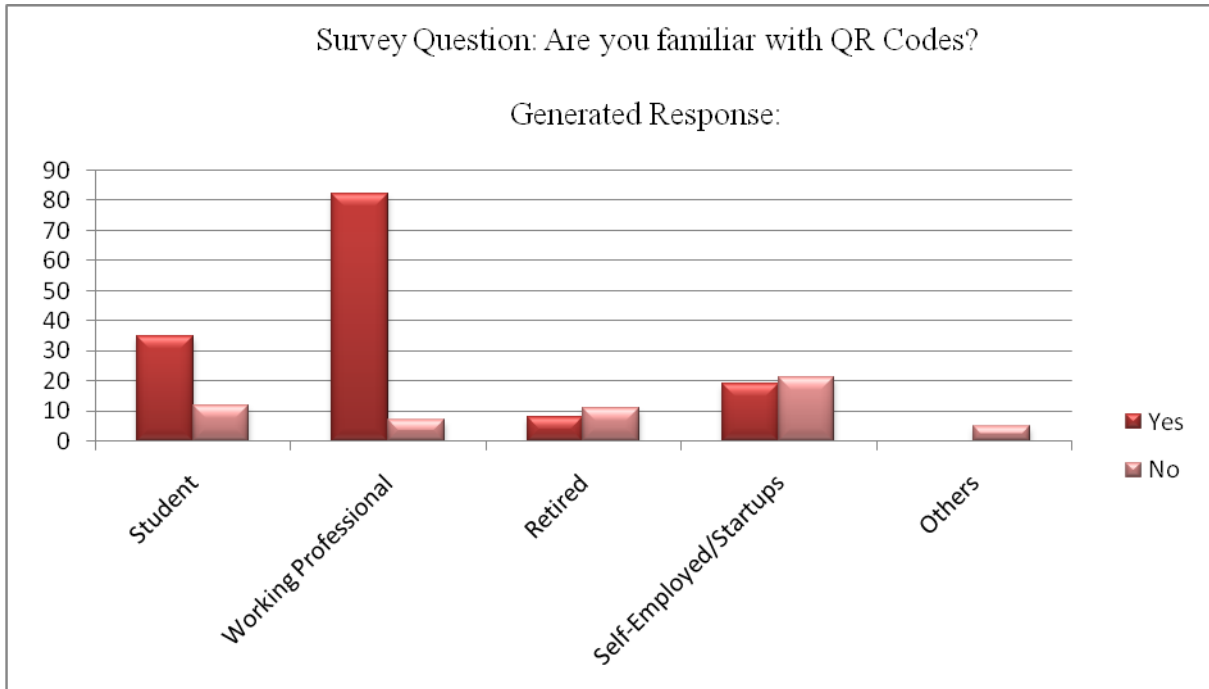
3. Data Distribution for the Survey Question 'Are you familiar with QR Codes?'
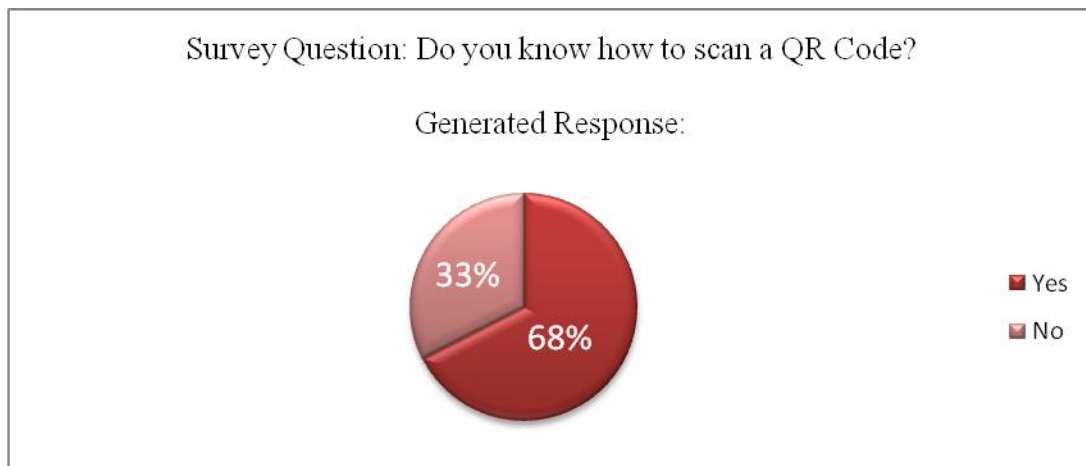
From the data distribution as illustrated in Figure 3, the inference can be drawn that the people from all professional backgrounds are familiar with the idea of QR Codes with some exceptions being present in each section. The working professionals have the highest awareness about QR Codes. The retired and self-employed group needs to be more aware about these interactive barcodes. Most of the job seekers are students and working people and In accordance with the figure, it can be derived that there won't be much difficulty in using them as personal marketing tools.

Survey Question: In what field have you used/seen a QR Code?

Generated Response:
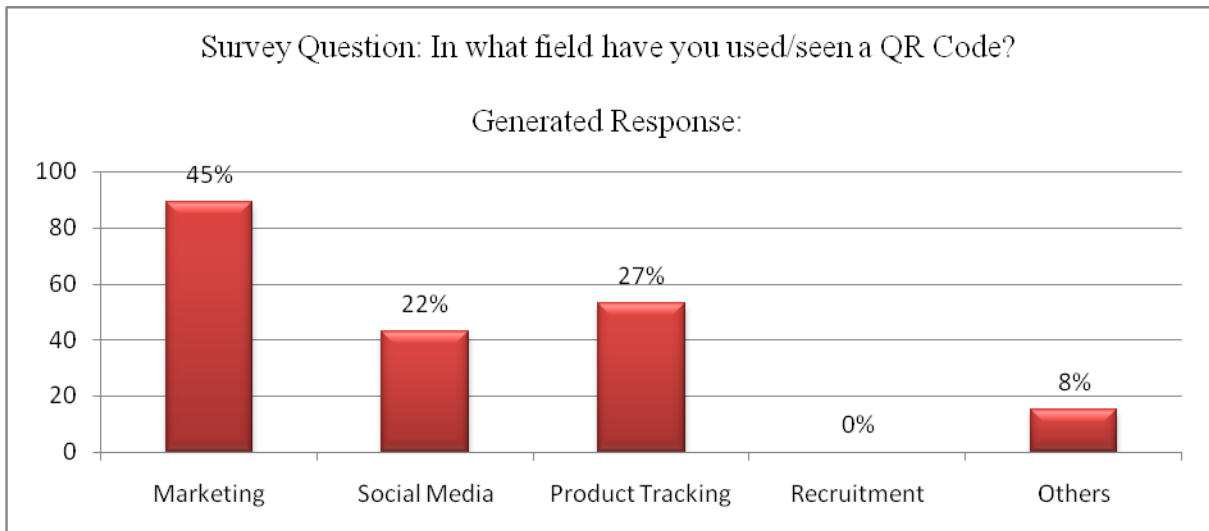
4. Data Distribution for the Survey Question 'In what field have you used/seen a QR Code?'

From the data distribution as illustrated in Figure 4, the inference can be drawn that Marketing and advertisement is the most popular field where QR Codes have been used. It can be seen that almost 45% of people are familiar with QR Codes as a marketing tool. Social Media and Product tracking are the next big

application areas of these codes. According to the figure, the recruitment sector is still deprived of the benefits of QR Codes. Though some examples of application are existing, the common people are not much acquainted with the employment of QR Codes in recruitment.

5. Data Distribution for the Survey Question 'Do you know how to scan a QR Code?'

From the data distribution as illustrated in Figure 5, the inference can be drawn that almost majority of the people know how to decode data from QR Codes through the scanning process with some exceptions being present in the older group.
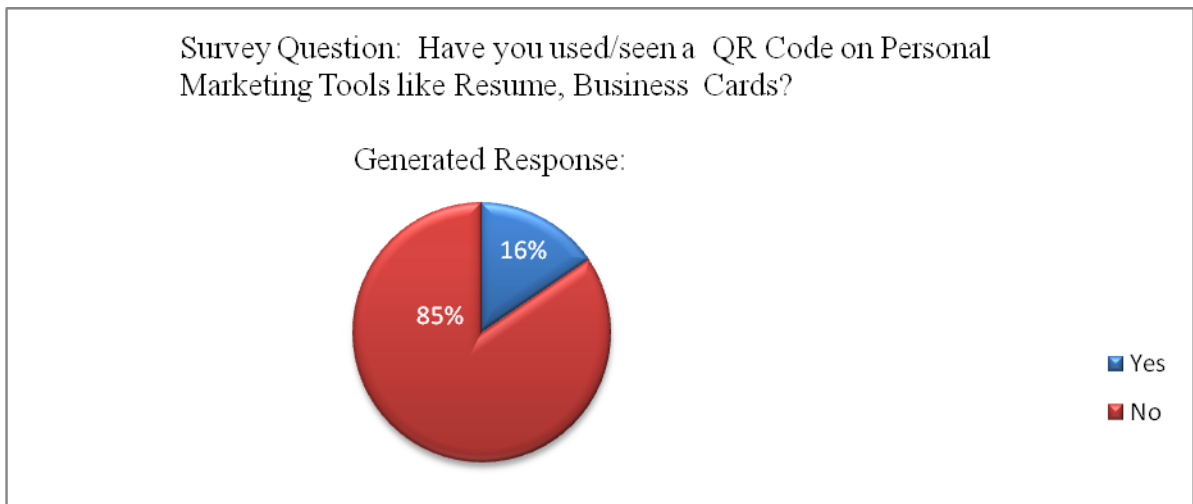
6. Data Distribution for the Survey Question 'Have you used/seen a QR Code on Personal Marketing Tools like Resumes, Business Cards?'

From the data distribution as illustrated in Figure 6, the inference can be drawn that majority of the people are unaware about QR Code on personal marketing tools. This shows that it has not been in practice yet and is almost a fresh concept to be explored.

7. Data Distribution for the Survey Question 'Do you think it would be beneficial to use QR Code on Personal Marketing Tools like Resume, Business Cards, etc.?'

From the data distribution as illustrated in Figure 7, it can be drawn that a good amount of people i.e. 90% think QR Code will prove to be beneficial if used on Personal marketing tools. The portion which thinks otherwise is very less so it can be thought of a favorable idea for blending recruiting and job finding.

Overall, it can be concluded that the results generated were satisfactory and were in accordance with this research study. QR Code in recruitment sector has a sound future if executed in a well-planned manner.

METHODOLOGY

This paper proposes a model to implement the QR Code technology as a personal marketing tool. The proposed system will help the user in generating dynamic QR Codes, transmitting them to prospective recruiters and examining the traffic generated on a particular content through QR Code analytics. The overall process of the proposed model has been summarized in the following steps:

Step 1: Authentication

A new user registers into the system. If an old user then simply login activity is performed. The user authentication takes place by verifying the login details from the pre-existing data.

Step 2: Filling Personal Information

The user selects the type of personal marketing tool like resume, portfolio, vcards etc and accordingly gives all the details required by filling the forms.

Step 3: Selection of Templates

After filling personal information, the user selects a template of his/her choice from the existing options.

Step 4: Encoding content into QR Code

The additional content which is to be embedded on the personal marketing tool is created and encoded into QR Code. The content can vary from simple website links to multimedia formats like audio, video, etc.

Step 5: Generation of QR Code embedded Personal Marketing tool

A responsive personal marketing tool with a QR Code attached to it is generated which the relevant additional content has attached to it.

Step 6: Transmission

The next step involves transmitting the QR code to the respective recruiters through online or offline methods.

Step 7: Decoding content from QR Code

The recruiter scrutinizes the professional portfolio of the user and also decodes the additional content by scanning the attached QR Code.

Step 8: Traffic Analysis

The user tracks the traffic generated on his/her QR Code to determine the reach of its personal marketing tool and the number of interested recruiters on his/her profile.
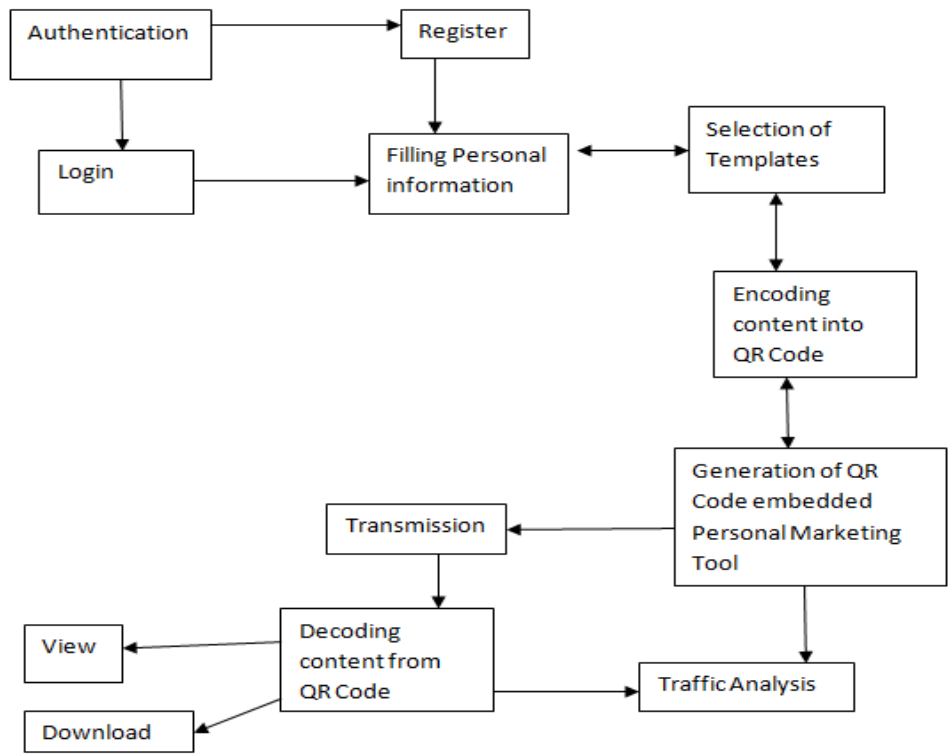
8. Block Diagram showing the methodology of the Proposed System

Experimental Result and Analysis

The performance of a QR Code based system is generally measured in terms of the generation time of different types of QR Code. The code which has the lowest generation time is considered to be the most efficient type of QR Code. An experiment was carried on to compute this efficiency. While QR Code creation, the time taken (in seconds) was calculated by encoding various kinds of data like bookmark, contact, email, text etc. The experimental result showed that the QR code which had geographic location embedded in it took the highest time to generate while the QR Code containing Phone number had the lowest generation time. Table 5 shows the different types of QR Code and their respective generation time.

Type of QR Code	Generation Time (in seconds)
Bookmark QR code	0.65474104881287
Contact QR code	0.76287412643433
Content QR code	0.70422315597534
Email QR code	0.53258705139160
Geo Location QR code	0.97506403923035
Phone QR code	0.49072408676147
SMS QR code	0.53340315818787
Text QR code	0.71067094802856
URL QR code	0.54027199745178
Wi-Fi QR code	0.69227886199951

Table 5. Types of QR Code and their Respective Generation Times
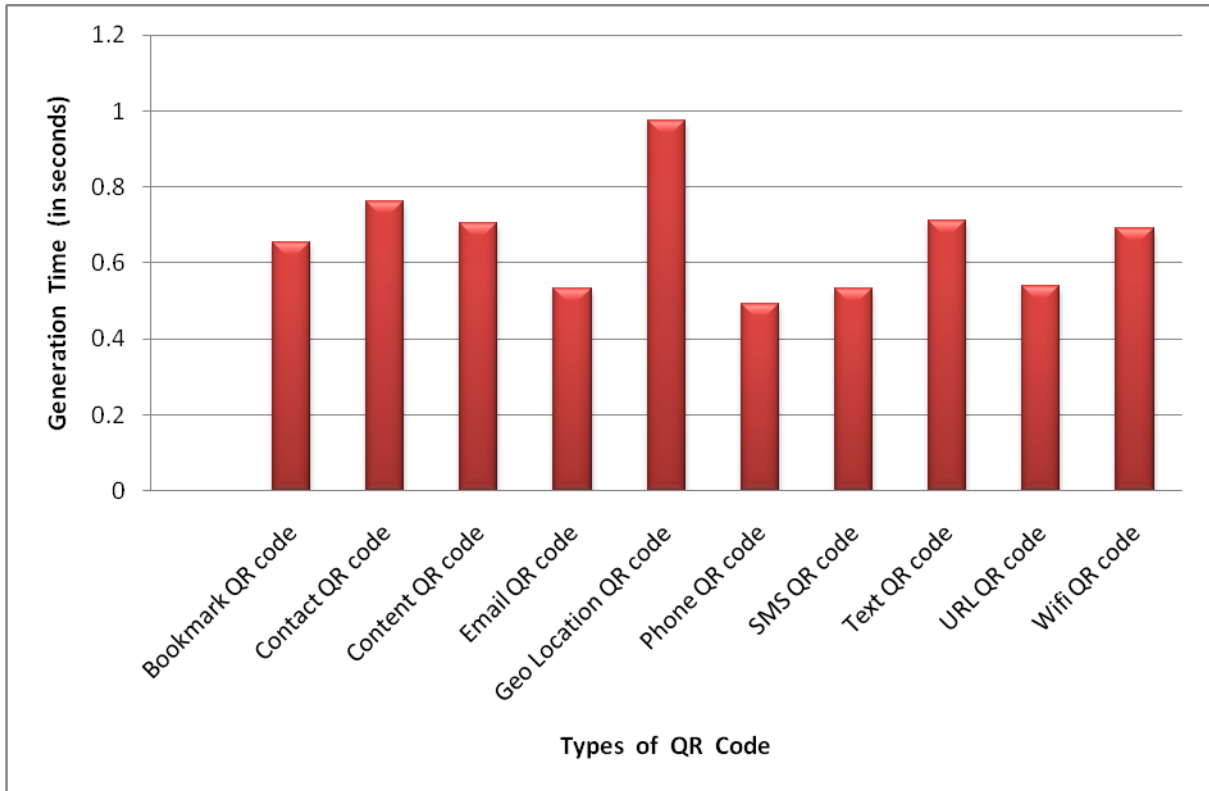
9. Graphical demonstration of the types of QR Code and their respective generation times.

QR Code has a very unique feature of error correction by which the data embedded can be restored partially or fully even if the image is dirty or damaged a bit. This characteristic makes it a useful tool for personal marketing. QR Code has four different levels of error correction – Level L, Level M, Level Q, and Level H as shown in Table 1.

A short experiment was done to analyze this characteristic of QR Code. Four QR Codes of Version 3 were generated of different levels respectively. All QR Codes were encoded with LinkedIn URL - https://www.linkedin.com/in/khushbu-jha-56aa2a88/ as data. Firstly, the decoding time of all levels of QR Code having no damage was evaluated as shown in Table 6. Without any damage Level H QR Code had the lowest decoding time and Level L had the highest decoding time approximately. This time may vary depending upon the type of scanner, or the camera quality, etc.

SL.NO.	Error Correction(Levels)	QR Code(Version 3)	Decoding Time(Approx)
1	Level L		00:00:01.85

2	Level M		00:00:01.73
3	Level Q		00:00:01.69
4	Level H		00:00:01.25

Table 6. Decoding Time of different levels of QR Code having no damage.

All the four levels of QR Code were then separately analyzed by damaging them in centre, top and bottom respectively. The decoding time for different areas of damage for different levels was calculated. Table 7 shows the decoding capacity of Level L QR Code after being disfigured. When the area of damage was in the centre position, data could not be decoded. While in top and bottom position of damage, full data was restored though it took a large amount of time compared to normal decoding time.

QR Code (Version 3)	Area of Damage	Data Decoded (Yes/No)	Decoding Time (Approx)	Amount of Data restored (in Percentage)
	Centre	No	-	0%
	Top	Yes	00:00:09.67	100%
	Bottom	Yes	00:00:05.58	100%

Table 7. Decoding Capacity of Level L QR Code

In Level M QR Code, data was fully restored during each of the three areas of damage. Least amount of decoding time was in the bottom position and the centre position of damage took the highest amount of time to scan.

QR Code (Version 3)	Area of Damage	Data Decoded (Yes/No)	Decoding Time (Approx)	Amount of Data restored (in Percentage)

QR Code (Version 3)	Area of Damage	Data Decoded (Yes/No)	Decoding Time (Approx)	Amount of Data Restored (in Percentage)
	Centre	Yes	00:00:07.17	100%
	Top	Yes	00:00:05.47	100%
	Bottom	Yes	00:00:03.75	100%

Table 8. Decoding Capacity of Level M QR Code

The result for Level Q and Level H QR Codes were same as of Level M with only difference being in the decoding time. Compared to all other levels of error correction, Level H had the ideal performance in terms of decoding and data restoration.

QR Code (Version 3)	Area of Damage	Data Decoded (Yes/No)	Decoding Time (Approx)	Amount of Data Restored (in Percentage)

	Centre	Yes	00:00:04.25	100%
	Top	Yes	00:00:04.32	100%
	Bottom	Yes	00:00:04.09	100%

Table 9. Decoding Capacity of Level Q QR Code.

QR Code (Version 3)	Area of Damage	Data Decoded (Yes/No)	Decoding Time (Approx)	Amount of Data Restored (in Percentage)
	Centre	Yes	00:00:03.28	100%
	Top	Yes	00:00:04.17	100%
	Bottom	Yes	00:00:02.85	100%

Table 10. Decoding Capacity of Level H QR Code

As compared to traditional linear one-dimensional barcodes, QR Codes have the ability to store different types of data and also to decode the embedded data even if it is damaged. This makes them more efficient and beneficial to be used in Personal marketing tools as different categories of candidates will need to encode different kinds of data such as a candidate looking for a job in animation field can embed the video of his/her creation which a printed resume cannot show. Thus, application of QR Codes in Personal

Marketing can prove to be a very advantageous step for both the hiring manager and the candidate in any field of recruitment.

CONCLUSION

Though accepted in various other industries, QR Codes are still not in demand in the recruitment sphere. With QR Code becoming so popular and considering its numerous benefits over linear barcodes, it will be very useful for the job seekers if they use these two-dimensional barcodes as a personal marketing tool for showcasing that 'extra' information which a printed resume or business cards cannot contain and also for reflecting their technological awareness in front of the recruiters. It will also be advantageous for the recruiting companies to know more about their candidates which will further help them in selecting the best among many. Hence, the addition of QR Codes on these tools is an upcoming and innovative way for every job seeker to move away from crisis marketing to sustainable career branding to make them stand out from the rest. This paper concludes that with proper implementation, adequate awareness and effective planning, QR Codes as a recruiting tool will soon become a rising trend in the near future.

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