Evaluating the Use of Quick Response (QR) Code at Sulaimani University Libraries

Ako Muhammad Abdullah[*], Roza Hikmat Hama Aziz
Computer Science Department Faculty of Physical & Basic Education Sulaimani University,
Kurdistan Region, Iraq

Abstract— Quick Response codes or QR codes are two-dimensional barcodes that can be scanned by mobile phone with embedded camera. In the automatic identification fields QR code has been widely. These codes can be used to provide fast access to URL, an SMS message, a phone number, a V-card, or any text and QR codes can hold much more information than a regular barcode. The information encoded in a QR code images. In education as the movement of using QR codes is still in its infancy whenever the number of smartphones and Internet enabled cell phones in this country is increasing rapidly, librarians are able to use QR codes to promote services and help library users find materials quickly and independently. The aim of the study is to investigate the potential role of QR code for the management library university to do that this study has been divided into two parts. At the first part we have investigated the quality of QR code images to evaluate the performance of QR code images when different types of methods were applied to QR code images such as Histogram Equalization, Noise Generation, Filter Blobs, Color (RGB) Bayer Filter, BP Quadrilateral Transformation and Perlin Noise. The experiments show that the QR code images can be scanned in different conditions by mobile devices and it is possible to scan correctly and get all information that is stored in the images. At the second part we have conducted with the survey to analyze the use of QR code technology and assess the interesting of it among undergraduate students at the Library University.

Keywords— Quick Response (QR) Code, Two Dimensional Bar Code, Recognition, Mobile Phone

I. INTRODUCTION

In recent years, various bar code symbols have been developed rapidly with the development of the internet technology. Especially one dimensional barcodes are extensively utilized as immediate purchase at department stores and supermarkets. The barcode technology develops depending on computer industry, advanced communication technology and photoelectric sensor technology [1]. To denote more information regarding modem commodity is required the barcode in limited geometry space in order to meet every type of market demand. The appearance of two-dimensional barcode surmounts many limitation of one-dimensional barcode and two-dimensional barcode image has ability to store more information than traditional barcode [2]. Nowadays, Quick Response (QR) codes as known the technology of two dimensional barcode that has been applied widely in Japan and gradually emerging around the world while in our country it is just used not long ago and the movement of using QR codes is slow and still in its infancy. There are differences in some crucial skills between the foreign and domestic two dimensional barcode because QR code is able to express Kurdish character information, it is fit for being utilized in our country.

QR codes were invented by the Denson Wave- Toyota Motors subsidiary in 1994 [3]. It is readable by moderately equipped mobile phones with cameras and QR scanners. Two dimensional barcode has the ability to embed a piece of long multilingual text, an automate SMS message, a linked URL, a business card or any information. Coupled with moderate equipped mobile devices, QR Codes can connect the users to get the information quickly and easily [4]. With smart phones, users can be sent the SMS message directly or they can save the contact information onto the address book easily and users also can be visited the Website linked by the URL quickly. In addition to the QR code technology has been provided good features such as high speed scanning, large storage capacity and small printout size, dirt and damage resistance. QR codes can literally hold any kind of information [9]. In education, we believe that the movement of using QR codes is slow and still in its infancy. A few researchers are excited about the technology and found the use of QR codes in education. The purpose of the research is to investigate the use of QR code to hold and encode detail information related to the books at the library in the QR code symbol without using database.

This study will also investigate the recognition of QR code symbol, which is carried out various conditions on the QR code symbols such as Histogram Equalization condition, Noise Generation Additive and Salt-Pepper, Color (RGB) Bayer Filter-GRBG and BRGB, BP Quadrilateral Transformation, Filter Blobs and Perlin Noise. All to identify the potential role of QR code symbol in read and decode it by mobile device or iPad. Finally, we will carry out a survey to identify the use and interesting QR code for students at the library. Moreover, through this research we will understand why the technology has a slow pick-up in education? Are students aware of the full potential of this technology at the University of Suliamani in Kurdistan Region Government - Iraq? The rest of this research is organized as follows: in section 2 presents a background and literature review. Section 3 the results of investigations are presented and discussed. The last Section presents conclusion.

II.   BACKGROUND AND LITERATURE REVIEW

QR Codes, is a type of barcode, in recent years are appearing in Kurdistan Region Government (KRG) - Iraq. They are still largely unknown. It is important to understand when they can help our users and what they can do. A QR code is a matrix barcode readable by mobile phones and smartphones with cameras. They are sometimes referred to as the two dimensional codes, two dimensional barcodes, or mobile codes. On most phones that have been purchased in the KRG, it is necessary to download the free app (application) for reading the QR code symbols, although some phones have one preinstalled. Typically, the QR code appears as a small white square with black geometric shapes, although colored and even branded QR codes are now being used. A QR code has ability to hold more information than a regular barcode. The information can be encoded in a QR code symbols is a SMS message, an URL, a phone number, a V-card, or any text and it allows the contents to be decoded at high speed [5]. There are many reasons to believe this may be the time to prepare for the use of the mainstream of the QR codes in KRG, and for libraries and academic institutions to start implementing this technology. Rapidly, in this region the number of smartphones and Internet-enabled cell phones is increasing. According to marketing data we should expect smartphones to be in the hands of half of all KRG mobile users at the end of the year 2014. In 2009 the ECAR study of undergraduate students and information technology in USA found that 51.2 percent of respondents owned a mobile device has Internet service, and another 11.8 percent planned to buy one within the next 12 months . Although a number of students do not use these devices to access the Internet, partly due to the high price which can change quickly [6].

III.   USAGE OF QR CODE

In many countries QR codes are ubiquitous. They appear in store windows, billboards, on posters and buildings; they are on receipts, in doctor's offices, TV commercials, and on McDonald's wrappers, where the code is scanned for ingredients/nutritional content. Furthermore, QR codes have even embedded within gravestones by Japanese gravestone maker so that people can be found out more regarding the person buried there [7]. Essentially, QR codes are a convenient way to add the virtual to the physical to provide useful content, often at the time of need. In many of Europe countries QR codes are also gaining traction, where many cities, campuses and academic libraries have been exploring their potential. The "ACRL 2010 top ten trends in academic libraries" predicts "explosive growth of mobile devices and applications will drive new services." The widespread use of QR codes could surely be a part of that and QR codes are a low threshold technology, easy to use and implement, low cost [8].

Fig. 1 QR CODE SYMBOL ON THE MCDONALDS FOODS

A.   *Using QR Codes in Business and Industry Applications*

The increase of consumer exposure to QR codes has been hasty however consumer adoption has been relatively slow; many in part to marketers see QR codes as the innovation that can be easily operated with advertising campaigns and print base promotional medium. The rise of the QR code is enormous when looking at the magazine industry alone. In 2011, according to Nellymoser research, in the top 100 magazines over the course of 2011 there were 4468 QR codes printed within advertisements. As shown in Fig 2 below, the year started off with 352 QR codes in Quarter 1 (January through April) and the number of QR codes printed in the top 100 magazines had increased to 1899 by Quarter 4 (September through December), which is an astounding 439 percent growth in the magazine industry alone [10].
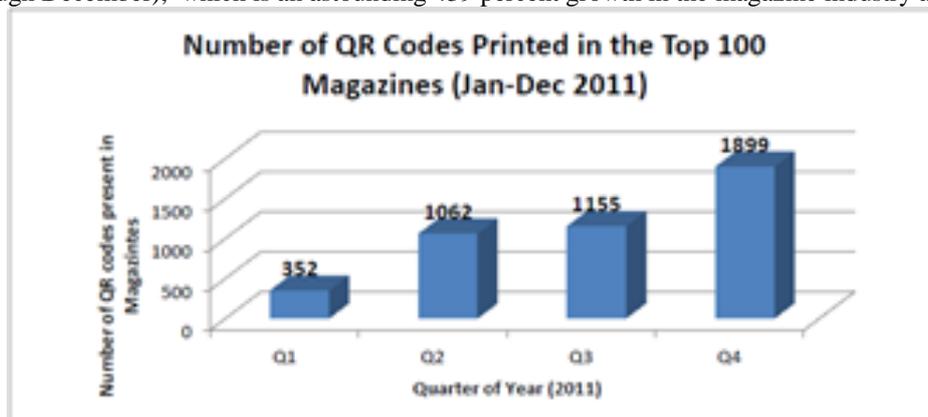

Fig. 2 THE NUMBER OF QR CODES PRINTED IN THE TOP 100 MAGAZINE (JAN, DEC 2011)

Regardless of the rapid growth and consumer exposure, many business journalists, media experts and tech bloggers are persuaded that QR codes are only a fad or just another example of 'shiny object syndrome' where a new technological advancement such as the QR code is released and marketers feel they have to jump onboard with the trend in order for their company to give off the "innovative impression" to both competitors and consumer [11]. Eventually, the innovations of the QR code will die down that have suggested by a number of researches and the next "big thing" in technology will enter the market and soon take over the QR code. Furthermore, a different opinion suggests that QR codes are actually the latest marketing trend, and for many businesses, remaining innovative is vital to remaining competitive in the industry. It is hard to make many solid arguments as to how a QR code would not be slightly helpful to a business, at least in a branding or imaging sense by an extremely easy generation processes, efficient cost structure and the ability to turn a simple poster into an interactive informational seminar or point-of-purchase location in a matter of seconds; especially for retailers, a well-designed QR code campaign can not only drive sales, but has the ability to provide customers with the information they need to make a buying decision.

However there are seeming inconsistencies in the idea of whether or not QR codes are maintainable long term, previous research has shown with each passing day that QR codes are continuing to rapidly gain user awareness and adoption. Scanning QR code increased by a rate of 4549% during one year, from January 2010 to January 2011 [11]. Additionally, the number of European smartphone users scanning QR codes increased by 96 percent in the past year to 17.4 million users in July 2012, representing 14.1 percent of the total smartphone audience. Smartphone users in Spain scanning QR codes increased by 9 percentage points to 16.0 percent, making it not only the fastest growing European market but also the second biggest market in terms of penetration. Germany ranked first by penetration of QR codes with 18.6 percent of the smartphone audience making use of the feature [12].

B. Using QR Code in Health

Within the health space QR codes can be implemented. Currently, for everything from patient education to medication adherence these codes are being used. Food and drink packages can now link to interactive calorie trackers and personal information about a patient's diet plan. Additionally, to drug interactions and prescription information as well as physician and pharmacy contact numbers QR code symbols attached to medication labels link. Furthermore, in the medical fields QR codes has the ability to help people get detail information regarding what hospitals have to offer and the care that they can provide and QR codes will be able to provide patients with additional information on their conditions and their treatments. Moreover, informational videos about the newest medical technologies, other health care facilities and clinics can be shown by QR codes. QR code also could be beneficial for individuals that have to wear medical bracelets. On the medical bracelet to learn of allergies, blood type, emergency contact, DNR, or other significant health information of the individual, EMTs or other emergency personnel can immediately scan the QR code. Last year the American cancer society utilize QR codes to promote its Making Strides for Breast cancer walk, honoring breast cancer survivors, raising awareness regarding the disease and helping to save lives. As part of the integrated campaign, QR codes were located on outdoor advertisements and took users to the event's mobile site. Individuals can get more information regarding the event, receive reminders about the walk or even generate email invitations for friends to encourage and promote participation from this web site. Furthermore, by providing information regarding donating to the society by using QR code the American cancer society made it easy to donate [13]. Nowadays, QR codes are a new technology within the health industry that is appearing in Kurdistan Region Government - Iraq such as using QR code by ministry of health in a medicine packages to show some information about name, importer, batch number and FDAS BRIT No of medicine, such as shown in Figure 3 also this technology can be seen in different fields in KRG that is helped users to access information very quickly. However, many people in KRG do not have any information about QR code whereas, some people have seen QR code on packages but they do not know how and why this technology is used.

Fig. 3 USING QR CODE IN MINISTRY OF HEALTH FROM KRG

C. Using QR Code in Education

In the field of e-learning the use of QR Code is still in the stage of infancy. Despite, Code in the field of education a few numbers of researches have been done about using the QR. in education the study of QR codes can be placed in the context of mobile learning and ubiquitous learning. Different perspectives can be described by mobile learning, also known as m-learning, considering that it permits people to learn without limiting of place [17] using mobile applications and wireless technologies. However, m-learning provides mobility, it is not context sensitive. In recent year, a new mode of learning mechanism have been appeared called u-learning is context aware and also provides anytime, anywhere learning by using various sensor technologies and mobile. A number of institutions and researchers have found interesting ways to apply QR-codes for the u-learning and m-learning process.

In UK, The University of Bath is the predecessor of applying QR-codes in education [4]. They have combined this technology in several aspects related with the learning process. For example, in the library they have used QR-Codes to provide information regarding the books. They have also developed an enhancement for Moodle which automatically includes the QR code for the page that has been printed. The URL of the page on that particular Moodle course in QR code symbols and around the campus QR codes can be found, on posters, on Websites and service blogs for bookmarking, in handbooks linking to activities, and in marketing materials from departments that They have added.

Fig. 4 A CATALOGUE SAMPLE FROM THE LIBRARY OF THE UNIVERSITY OF BATH

Furthermore, to submit their assignment Students of the faculty of Engineering and Design at Bath University require accompany with a cover sheet with the related QR Code. Figure 5 shows the submission student assignment sheet at the Bath University.
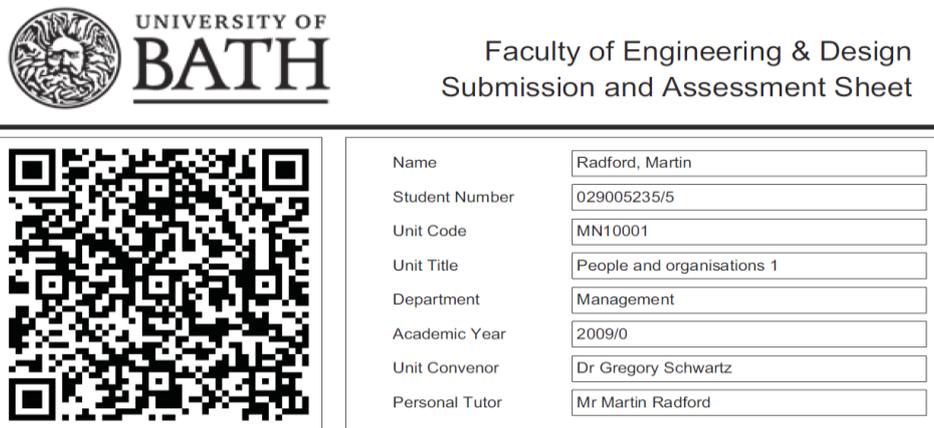
Fig. 5 A STUDENT ASSIGNMENT SUBMISSION SHEET FROM THE UNIVERSITY OF BATH

Likewise, Illinois University in USA have jumped on the QR code movement and ongoing using them to aid acclimate incoming freshman. Throughout the campus QR codes are scattered, and when a student scans one, they are taken to videos, campus maps, and other resources. Students can connect to the school's Facebook and Twitter by QR codes [15]. Additionally, teachers can generate their own individual QR code and send the code home with students that contain links to classroom goals, behaviour prospects and other relevant information. The teacher can even include sample questions the parent might want to inquire their child regarding the class, thus preparing the parent with the information she wants to have a discussion with their child regarding what they are doing in school. On back to school night or during open house, teachers might post QR codes through the classroom. Once a parent scans the code, they would be digitally whisked to explanations of the curricula being used or of student work displayed in the classroom. Sure, the teacher could accomplish all of this with print-outs, but scanning with a QR code is definitely more eco-friendly. [14]

According to H. Susono & T. Shimomura (2006) in Japan almost 100% of college students have mobile phones and they are commonly utilized for education purposes. In their work, to conduct surveys during class this with the intention of providing feedback to the teacher at the middle of a long class during 90 minutes the use of QR-Codes and mobile phones. With this project to answer a survey and choosing from different options students using their mobile devices and QR codes. The teacher can have immediate feedback in order to improve her/his class if wanted when students send the answer to a server. Another particular field in education where QR Code can be very beneficial is Outdoor learning; this is an education method that can be very effective for multiple areas. For example, Law & So (2010) using QR-Code in math and sciences trials has proposed. For this reason, on different locations QR codes can be placed outdoors and containing questions and students to read the questions in order to answer them use their mobile phones[4][16].

Moreover, C. Law & S. So (2010) who suggested using QR-Codes for an English listening exercise in the area of self-directed multimedia learning activities and can be also very useful for language. In this case QR codes holding links to websites for straight audio playback are located onto worksheets. The QR codes link directly to the web based audio depository prepared by the teachers [14]. T. Huang, H. Lin and P. Luarn introduced a research about in supporting QR codes with pocket PC to offer an environment of learning for students of primary schools for exploring issues of life sciences, the researchers carried out a pretest and post-test study and taken two groups of a student as a sample to see the effectiveness of the QR Code technology on the environment of learning. The authors found the QR Code technology has a significant role to change the methods of learning educations and an easier way to access information to students quickly [18].

IV. FEATURES OF QR CODE

The QR Code versions have ranged from 1 to 40 versions. Each version of the QR Code is different with its modules. Each module of the QR Code is appeared as the random patterns of black and white which contained in the square box. Also, the QR Code utilizes black patterns for standing the binary number '1' and uses the white patterns for standing the binary number '0'. Therefore, the biggest symbol of QR Code has the ability to hold much more data compare to a smaller QR Code symbol. Figure 2.4 displays the QR Code symbol versions. Thus, it is obvious that each version of the QR Code is extended to four additional modules on each side of the symbol of QR Code [19].
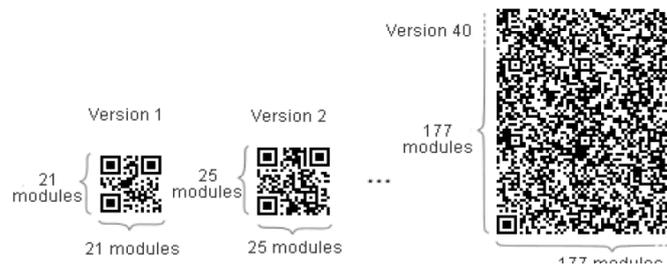

Fig. 6 THE QR CODE SYMBOL VERSIONS

The QR Code is a complete and perfect kind of two dimensional barcode theories. The symbol of QR Code can be classified into a number of parts as follows:
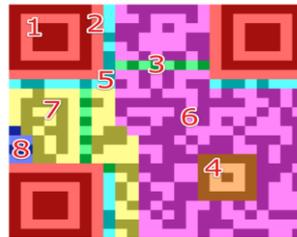

Fig. 7 STRUCTURE OF QR CODE VERSION 2

- **Finder Pattern (1):** The finder pattern section includes of three identical structures. Except the bottom right one, Finder Pattern is located in all corners of the QR Code. Each pattern is depended on a 3x3 matrix of black modules surrounded by white modules that are again surrounded by black modules. Furthermore, to recognize the QR Code and determine the correct orientation by decoder software the Finder Patterns allow decoder to do it.
- **Separators (2):** The white separators have a width of one pixel and improve the recognizability of the Finder Patters as they separate them from the actual data.
- **Timing Pattern (3):** Timing pattern is used to help identify the coordination symbol of the QR Code module in the application decoder. In other words, this part will be supporting the program of decoding for checking the location of each bit in code word, and allow them to the reunification of their values in a specific coordinates.
- **Alignment Patterns (4):** The decoder software is supported by Alignment Patterns to compensating for moderate image distortions. Alignment Patterns is not available in Version 1 QR Codes. More Alignment Patterns are also added with growing the size of QR code.
- **Format Information (5):** This section of the QR code symbol consists of 15 bits next to the separators and will be able to stores information regarding the error correction level of the QR code and the selected masking pattern.
- **Data (6):** The Data Pattern is the most important section of the QR Code symbol. Data is converted into a bit stream and then stored in 8 bit parts (called codewords)
- **Error Correction (7):** Similar to the data section, error correction codes are stored in 8 bit long codewords in the error correction section.
- **Remainder Bits (8):** Remainder Bits section consists of empty bits, when data and error correction bits cannot be divided into 8 bit codewords without remainder.

To improve code recognition by the decoder software data, the whole QR Code has to be surrounded by the so-called Quiet Zone, an area in the same color shade as white modules [20].

V. CAPACITY AND ERROR CORRECTION CODE

Several factors are affected on the capacity of a QR Code. Such as the chosen error correction level, the version of the code that describes its size (number of modules) and the kind of encoded data impact capacity.

- **Version:** Mainly in the number of modules the 40 different versions of QR Codes are available. Version 1 has a size of 21x21 modules and can store up to 133 data modules. Version 40 is the largest QR Code consists of 177x177 modules and can store up to 23,648 data modules.
- **Error Correction Level:** In QR Codes Error Correction is depended on Reed-Solomon Codes, a specific form of BCH error correction codes. Error correction levels of the QR code consist of four levels as shown in Table 1. The users can be chosen the error correction at creation time.

TABLE 1.QR ERROR CORRECTION LEVELS

Error Level	Error Correction Capacity
L	7%
M	15%
Q	25%
H	30%

When higher error correction levels are used to generate QR code increase the percentage of codewords used for error correction and therefore the amount of data that can be stored inside the code is decreased [21].

- **Encoded Data:** Different data encoding can be used by QR Code. Their complexity influences the amount of actual characters that can be stored inside the code. For example, Version 2 with lowest error correction level of QR Code can hold up to 77 numeric characters, but only 10 Kanji characters. [20]

VI. RESULTS AND DISCUSSION

There were three different methods used when compiling data and research for this study. First, literature reviews, articles, and previous studies performed on QR codes were examined from academic journals, trade publications, popular press publications, relevant subject matter blogs, previous studies performed on relatable subject matter. Each of this information assisted the study by providing a broad basis of background information, demographic and geographic data, general statistics, and also by expressing the popular media opinions on what effects QR codes are currently having in the world today. The second method used in this study, we have investigated the quality of QR code image by using eight different effects to identify the ability of QR code symbol which possible to read by mobile device or iPad when a part or all QR code symbol is affected by each method we have used. For this research, we have used the Visual Studio 2012 to create a QR code generator and change the quality of QR code symbol.

In the experiment, directly the original QR code image is generated from the encoder application that we have created as shown in Figure 8. In our system users can be generated the QR code image with different version size and types of error correction levels such as L, M, Q and H, as explained each level in previously section. In this study to evaluate the performance of QR code image, we have generated the QR code image with version 10 and chosen error correction level L (7%) due to this level has the lowest error correction and it is better to evaluate the performance of QR code image.
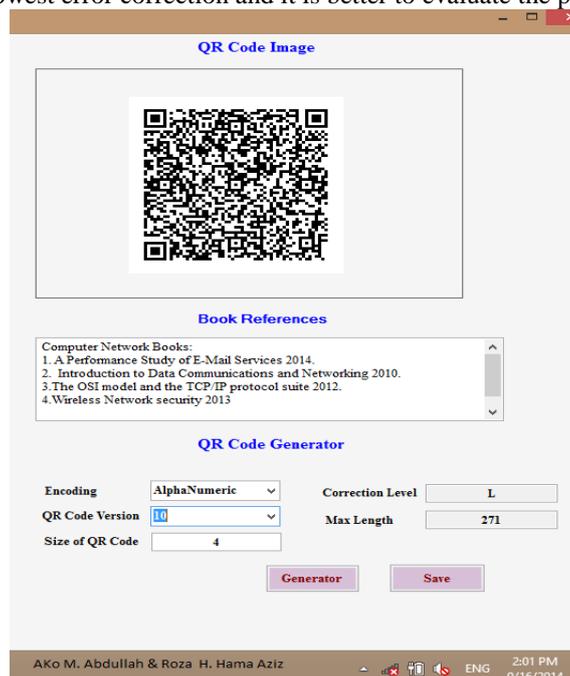

Fig. 8 QR CODE GENERATOR

Furthermore, to evaluate the performance of QR code image a sample set of 80 QR code images were tested for each method. All QR code images are acquired by mobile phone with embedded camera. The mobile device was used to test QR code images has a resolution of 8.0 MEGA Pixels. The whole experiment has been assessed in a realistic environment and different types of techniques were applied to QR code images. In order to evaluate the performance of QR code images, these images were divided into five groups: the first group has Histogram Equalization condition; the second group has Noise Generation Additive and Salt-Pepper; the third group has Filter Blobs; the fourth group has Color (RGB) Bayer Filter-GRBG and BRGB; the last group has BP Quadrilateral Transformation and Perlin Noise. All types of techniques conditions were applied to QR code image as shown in Figure 5 (a, b, c, d, e, f, g, h).

According to the results we have obtained, the experiment results have shown that the QR code images can be scanned under different conditions. However, the QR code image recognition rate and executing time is different from groups. Table 2 shows the results achieved by the complete system for all the compared techniques that were applied to QR code images. The QR code recognition time is higher of the Noise Generation Additive technique, average (3100 ms) and the recognition time is litter in the Color (RGB) Bayer Filter- BRGB condition about average (200 ms). With the Perlin Noise and Histogram Equalization techniques the capture QR code image can be recognized slower and the recognition time increased. The five groups are the Blobs Processing- Quadrilateral Transformation techniques, so the recognition rate is the slowest, decoded QR image will cost average (700 ms). In a whole the experiment verified the QR code image can be scanned in different conditions by mobile devices and it is possible to scan correctly and get all information that is stored in the image.

TABLE 2.AVERAGE RECOGNITION TIME AND RATE

Techniques	Average Response Time on Decoding (ms)
Histogram Equalization	900
Noise Generation Additive	3100
Noise Generation Salt-Pepper	600
Filter Blobs	800
Color (RGB) Bayer Filter-GRBG	400
Color (RGB) Bayer Filter- BRGB	200
BP Quadrilateral Transformation	700
Perlin Noise	1100

(a)

(b)   (c)   (d)   (e)

(f)   (g)   (h)   (i)

Fig. 9 DIFFERENT TECHNIQUES WERE APPLIED TO QR CODE IMAGES

(a) Original QR Code Image (b) Histogram Equalization (c) Noise Generation Additive (d) Noise Generation Salt-Pepper (e) Color (RGB) Bayer Filter-GRBG (f) Color (RGB) Bayer Filter- BGGR (g) BP Quadrilateral Transformation (h) Filter Blobs (i) Perlin Noise

Third, to test the proposed research model an empirical study was conducted with undergraduate students from Sulaimani University – Kurdistan Region – Iraq to analyze the use of QR code technology and assess the interesting of it among students at the Library University, a questionnaire was designed to it. A paper-based survey collected data from Sulaimani University undergraduate students. Students received the surveys during one of their lectures and were asked to return them to the same lecture. The survey ran between 17th November 2013 and 14th April 2014 and each student scanned QR code symbol by mobile device. Participation was voluntary for all students. A total of 567 undergraduate students participated in this study. The students were selected randomly that belonged to the all departments of Suliamani University. The 203 males and 364 females had an age range of 18 to 24 years, according to this questionnaire 35.8% of the respondents were male and 64.2% were female as shown in Figure10.
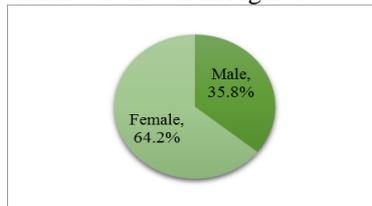

Fig. 10 DEMOGRAPHIC INFORMATION – SEX

A number of questions were used to capture college student awareness, opinions, interesting and usage regarding QR codes at the Library. These questions were divided into three sections that have shown at the questionnaire. In the first part of the questionnaire QR code technology consisted of two questions that asked students "Do you know what a QR code is" and "Mobile phone ownership". Of the total participants, 22.8% reported "Yes "to the question these students have information regarding QR code and 77.2% answered "No." they don't have information about QR code, of these students who answered, "Yes,"64.2% were female and 35.8% were male as shown in Figure 11 & 12. According to the results that we have obtained it appeared that males were much more likely to know what a QR code was comparing to female. When answering the question of mobile phone ownership, this question is interesting to our research because smartphone mobile can support QR code Reader, 104 (28.9%) of all participants answered that they have smartphone mobile and results, shown in Figure 13 Mobile Phone Ownership; 403 (71.1%) out of 567 undergraduate students reported that they do not have smartphone mobile. They further indicated the reasons why they have not smartphone mobile we can say most of students cannot buy a smartphone mobile due to the price of these mobile expensive to them.
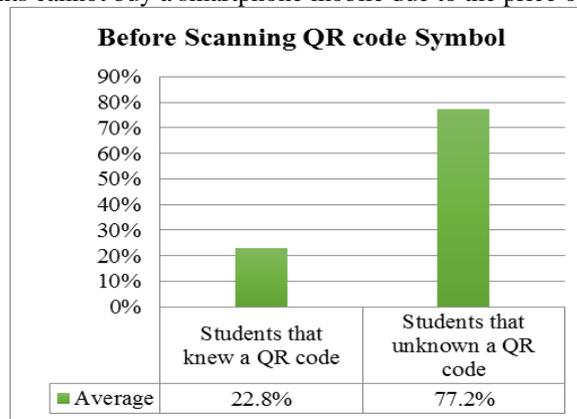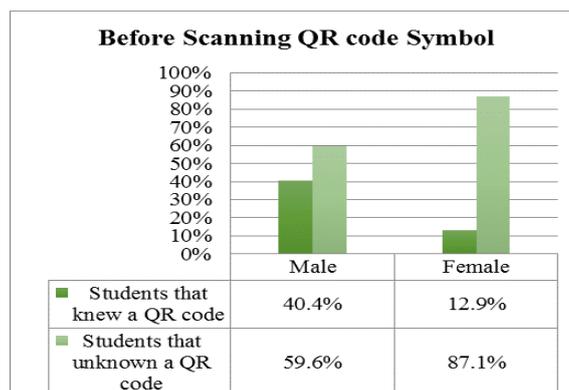

Fig. 11 BEFORE SCANNING QR CODE IMAGES

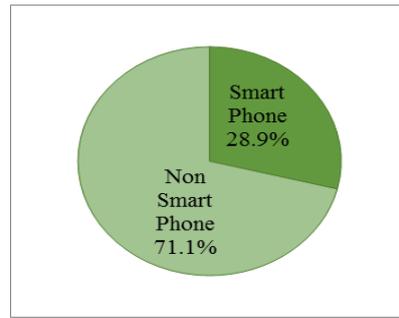Fig. 12 BEFORE SCANNING QR CODE IMAGES

Fig. 13 MOBILE PHONE OWNERSHIP

The next questions of the section three were consisted of four questions and asked the participants "Did you attempts to scan the QR code symbol with your phone or other device when you saw the symbol". 17.5% of participate answered "Yes" and 82.5% answered "No" as shown in Figure 14. The results presented show that among the current sample of 567 Sulaimani University students, it is found out that most of students do not attempt to scan the QR code symbol when they saw it.
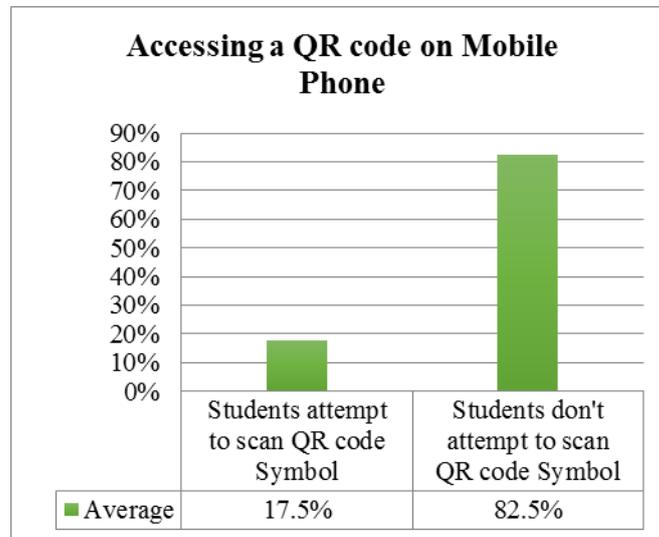

Fig. 14 ACCESSING QR CODE ON MOBILE PHONE

The second question of the section three about "Does your device have a QR code Reader software application" 18.1% of all students responded "Yes," and 32.2% answered, "No" and 49.7% of all students answered "No Idea". It was indicated at the section three according to the results, we can say QR code technology is infancy in Kurdistan Region-Iraq as shown in Figure 15.
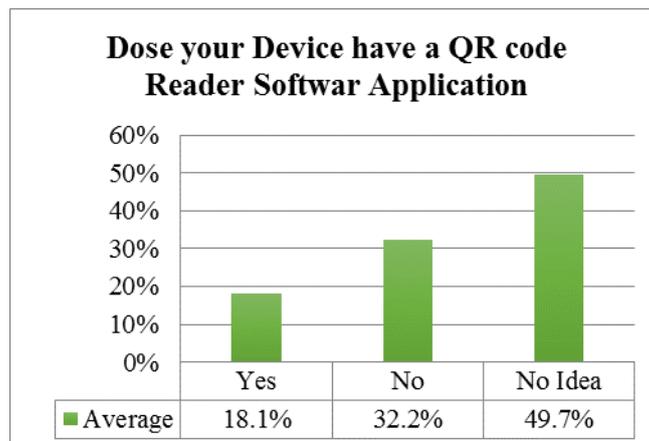

Fig. 15 MOBILE DEVICE HAS OR HAS NOT A QR CODE READER

The final question asked students "Would you like to see QR codes display at every Library" to rate the importance of QR code technology at the Library. 91.7% of the total participants responded "Yes" and believed that the QR code technology is a good way through which to get information regarding books at the library university because it allows information to be accessed anytime. Among the 8.3% of students answered "No" who did not think that using QR code technology is a good way to get information about books at the library and they don't like to see QR code at the library as shown in Figure16.
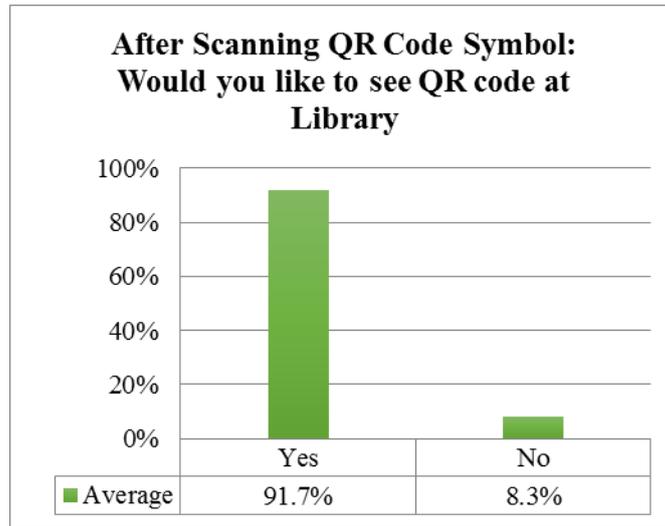
Fig. 16 AVERAGE TO SEE QR CODE LIBRARY

VII. RELIABILITY AND VALIDITY

The reliability of the research has been tested through the pilot study test by taking a sample size among of the participants after analyzing and re-testing the data by software named SPSS (Statistical Package of Social Science). The validity of data relies on some expert to verify the correct data and results. Furthermore, before the questionnaire has been carried out, it sent for some experts to check questions in the questionnaire.

VIII. ETHICAL CONSIDERATION

The participant's mystery and confidentiality kept to certain, also they have given more respects and morality by researchers also their responses were more acceptable exactly they were responding to the questions of the questionnaire.

IX. CONCLUSIONS AND FUTURE WORK

Nowadays, the mobile phone with camera embedded is getting more popular and mobile phone is getting more important and practical to recognition QR code symbol. The purpose of this paper is to design a library system combined with QR code application. To integrate this concept, we can assist students to read more information about books at the library conveniently. They can use their mobile phones to reach their reading habits will be stored within the QR code symbols.

The experimental results have verified the applicability of the proposed system. Our design can provide mobile phone users an efficient getting detail information regarding books at the library not the same as before. Furthermore, in this paper we have investigated the quality of QR code image by using eight different effects on the symbols to identify the ability of QR code symbol which possible to read by mobile device or iPad when a part or all QR code symbol is affected by each method we have used. The recognition test results indicate that the QR code symbol is robust to recognize by mobile device with embedded camera under different conditions. In second part of our study we have conducted with a survey to analyze the use of QR code technology and assess the interesting of it among students at the Library University, a questionnaire was designed to it. In conclusion, the survey findings show that QR codes are still very much an emerging technology with relatively low student awareness. However, there are some very encouraging signs in terms of the potential for students to access QR codes. It is clear that if QR code use is to be implemented across university libraries, there is a key role for an information hub that answers key questions in terms of what QR codes are, what they do and how to get QR code reading software onto a phone or other mobile device.

Our system can only be applied in a university library which blocks students to read information about books when they are out of the library. We think it will be different in the future. May be when a student is accessed the university website, the corner of the home page will show a QR code symbol. At the same time, the students can use their mobile phone to snapshot for the QR code with decoder application and read the information about books on the website and directly they can be ordered their favorite books online.

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