



# Implementing Security of QR codes in Ecommerce application

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**Abstract:** This research take account of QR codes security mechanism in ecommerce application, its real time application in day to day life & research areas associated. With the technology of mobile phones constantly emerging, especially in the area of mobile internet access, QR codes seem to be an adequate tool to quickly & efficiently converse



URLs to users. It also allows offline media such as magazines, newspapers, business cards, public transport vehicles, signs, t-shirts & any other medium that may embrace print of a QR code to be used as carriers for advertisements for online products. QR code being so versatile because of its structural flexibility that it leads to so many diverse field for research such as increasing data capacity, security applications such as different kinds of watermarking & steganography as well. Several experiments have also been done for better recognition of QR code image which consists of scratch removal techniques. QR codes have capability to symbolize same amount of data within approximately one tenth space of a traditional barcode statistically. Information like URL, SMS, contact information & plain text may be embedded into two dimensional matrix. Moreover, with explosive increment of trend to utilize smartphones has played a significant role within popularity of QR codes.

## [1] Introduction

A barcode is an optical machine-readable exemplification of data relating to object to which it is committed. Primitively barcodes represented data by varying widths & spacing of parallel lines, & might be referred to as linear or one-dimensional. Later they evolved into rectangles, dots, hexagons & other geometric patterns in two dimensions. Albeit 2D systems use a variety of symbols, they are in general referred to as barcodes as well. QR code stands for Quick Response Code, Which is trademark for type of matrix barcode which was invented by Japanese corporation Denso Wave. QR code has a number of features such as large capacity data encoding, dirt & damage resistant, high speed reading, small print out size, 360 degree reading & structural flexibility of application. A QR code or quick response code, is a type of barcode that could be read using a bar code scanner. These scanners are commonly referred to as QR code scanners. The scanners are in form of apps for smart devices. These codes could contain encoded info such as website URLs, data, & text as well as pre-formatted SMSs among

other things. These codes originate from Japan where they were used by Toyota to track car parts. Today, all smart phones come with a QR code scanner to ensure that everyone using a smart phone could benefit from this technology. Today, QR codes are used by businesses & companies to reach out to their client base.

### Architecture of QR Code:

Data could be translated into QR code by any QR generator, many of which are available on lie for free. User's simply enter data converted in to secrete code electrically form.

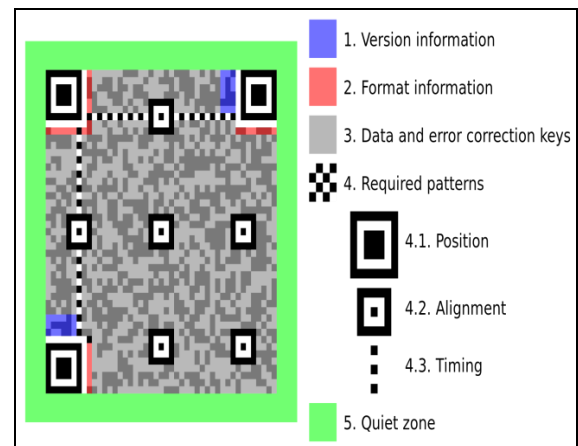




Fig 1 Shows architecture of QR Code



Fig 2 shows a man displaying a QR code as outdoor promotion.

A variety of out-of-home options could incorporate a QR Code. Among options are traditional billboards, transportation signage including trains, buses & airplanes, transportation related waiting areas such as subway stations, airport terminals, bus stop kiosks & guerilla marketing campaigns – including posters & stickers on almost anything, anywhere. QR Codes convey lots of information in a tiny design.

## [2] LITERATURE REVIEW

Research paper titled “**A Methodology to Conceal QR Codes for Security Applications**” by Akshay Choche & Hamid R. Arabnia tell us about Steganography, which is a technique used to conceal information in such a way that only communicating party would know about the existence of information. In their paper, Steganography is used to embed an encrypted QR Code into an image. The QR Code is encrypted using Triple DES algorithm in order to increase level of security.

The overall approach presented in their paper could potentially be used for secure communication & even for embedding signature/copyright information into an image. Steganography is a technique used to conceal information in such a way that only communicating party would know about existence of information. The literally meaning of word Steganography is "covered writing".

Their paper provides a brief overview of Steganography & how it could be used to embed information into an image in an evident manner. The main focus of paper is to embed an encrypted QR Code into an image. Steganography uses a Cover Image is one that would have information embedded in it..

In 2014 Kinjal H. Pandya & Hiren J. Galiyawala brought out a research paper titled “**A Survey on QR Codes: in context of Research & Application**” which was about QR code being a type of matrix barcode, which was first designed for automotive industry by Denso Wave in Japan..

In a research titled “**Application of Quick Response (QR) Codes in Mobile Tagging System for Retrieving Information about Genetically Modified Food**” by Tan Shiang Yen, Long Yoon Foo & Roshan Idrus explain that purpose of their paper is to introduce an integrated mobile tagging system, which could be used by consumers to retrieve product information about Genetically Modified Food (GMF) products in market.

**Katharina Krombholz, Peter Fröhlich, Peter Kieseberg, Ioannis Kapsalis, Markus Huber & Edgar Weippl published a research paper titled “QR Code Security: A Survey of Attacks & Challenges for Usable Security”** in which they describe that QR codes are two-dimensional barcodes with ability to encode different types of information. **A research paper published by Mr. Abhishek Mehta on topic “QR Code Recognition from Image” focus on topic that of recognition of QR code, recognition from image & encryption or decryption information.**

## [3] REPORT ON THE PRESENT RESEARCH

The opportunity to put ones business & clients into action has increased manifolds using QR codes. 2D barcodes are giving smart-phone users direct access to products, services & information. This might be looking to re-order, to engage you



or just want more information. By simplifying process for a mobile user, person could hard link his/her business clients. QR (quick response) code scanning has increased by 1600% over last year. Around 68% are between ages of 25 to 55. As you could see from chart below, people are very interested in using QR codes for getting more information. You could use them to build your customer base & if used intelligently could help you create recurring consumers.



Fig 3 Shows a colorful & customized QR code issued by a company for promotions

### The Process of Virtual Shopping

The journey of virtual shopping begins with downloading company's app from smart-phone application store. After download is completed customer is asked to create an account for private use & provide his/her contact information. The contact information includes name of customer, mobile number, address, & email. The next step for customers is to search for their preferred item or product from nearest billboard. To purchase requested product, customer must scan QR code attached with product using company's app.



Fig 4 How It would be better than classical bar coding mechanisms

### Open Research Challenges

Despite fact that use of QR codes is gaining popularity, many users are still not able to distinguish between QR codes from trusted & un-trusted sources. One of main reasons for this is that users need to decode QR code at first in order to decide whether content is trusted because they are not human-readable. Even after decoding, users find it difficult to judge trustworthiness of an encoded URL. Therefore we identify major research challenges with respect to usability & security with QR codes & describe them in this section.

## [4] DEVELOPMENT TOOLS AND TECHNOLOGY

### Data Functions

QR code include **function patterns**. These are shapes that must be placed in specific areas of QR code to ensure that QR code scanners could correctly identify & orient code for decoding. The following image gives an example of what function patterns are & where they are positioned.

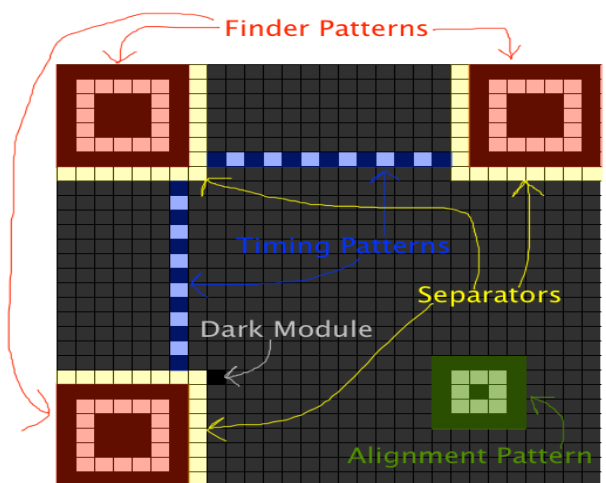


Fig 5 The **finder patterns** are three blocks in corners of QR code at top left, top right, & bottom left.



The **separators** are areas of whitespace beside finder patterns.

### INCRYPTION USING STEGANOGRAPHY

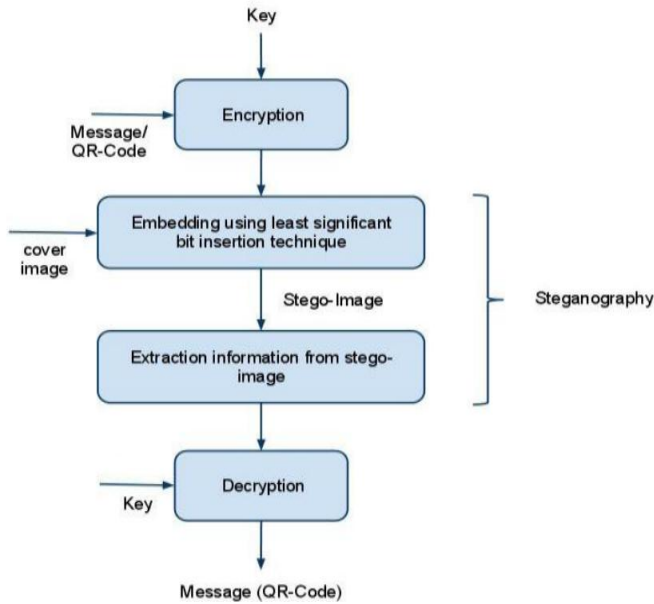


Fig 6 Steganography in QR Codes

### The Challenge

Despite fact that use of QR codes is gaining popularity, many users are still not able to distinguish between QR codes from trusted & untrusted sources. As results by Seeburger&Vidas suggest, scanning a QR code is not a safe practice. One of main reasons for this is that users need to decode QR code at first in order to decide whether content is trusted because they are not human-readable. Even after decoding, users find it difficult to judge trustworthiness of an encoded URL. Therefore we identify major research challenges with respect to usability & security with QR codes & describe them in this section

### Version 8 QR Code

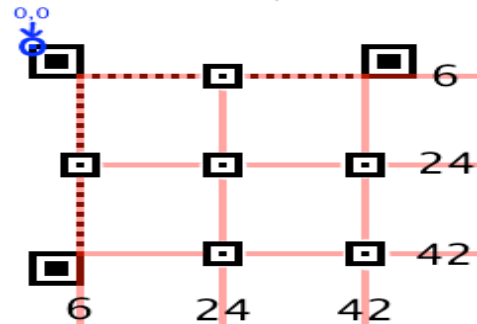


Fig 7 version 8 OR code

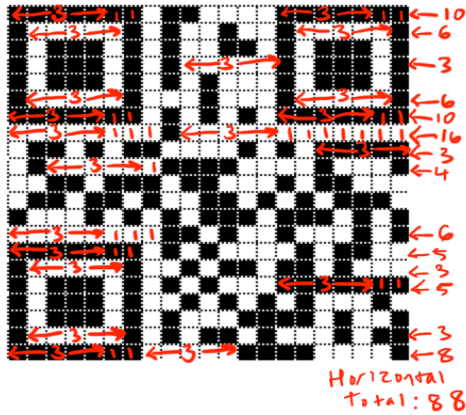
Error Correction Level	Bits	Integer Equivalent
L	01	1
M	00	0
Q	11	3
H	10	2

### [5] RESULTS AND DISCUSSION

We refer to black & white squares of QR code as **modules** rather than pixels. This is to differentiate between on-screen pixels & black & white squares of QR code. For example, a version 1 QR code is always 21 modules by 21 modules, even if it takes up 42 by 42 pixels on a computer screen, or 105x105, & so on.



Five consecutive squares get a penalty of 3; Each consecutive square after that adds 1 to the penalty.



.Fig 8 Evaluation Condition #1

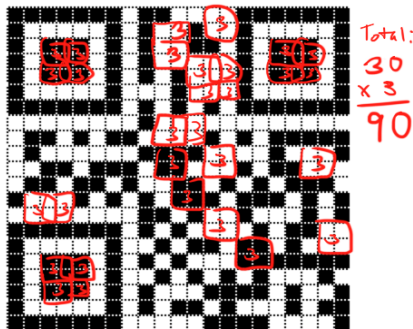


Fig 9 Evaluation Condition #2

### The Error Correction Bits

The first step to creating format string is to get two bits that specify error correction level in use in QR code.

Notice that numbers do not go in order of 0, 1, 2, 3 in table.

Table 1 The following table shows bit sequences for each error correction level.

### Dark Module

Every QR code must have a dark pixel, also known as a dark module, at coordinates (8, 4\*version + 9). That is, y coordinate of dark module is

version	1:	4*1	+	9	=	13
version	2:	4*2	+	9	=	17

$$\text{version } 3: \quad 4*3 \quad + \quad 9 \quad = \quad 21$$

and so on.

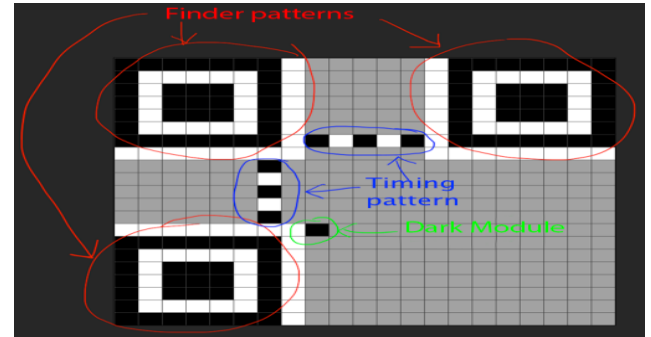


Fig 10 This means that dark module is always to right of top right corner of bottom-left finder pattern.

## [6] CONCLUSION

We have studied in detail what QR codes are & what are its fields of application. We have understood that QR codes have a very bright scope of work for future as it has a very wide area of application. QR code has an appealing factor to it what marketers worldwide are catching up to. It just started as a identification tool o assembly line of vehicles & today it finds its application in almost every aspect of life from branding to medical science, to education to promotion, from visiting cards to application forms etc. Since it could be encoded & could be password protected so developer could restrict type of users who could navigate to 'link' provided in QR code.

The company issuing QR code could also develop a data base of users that scan on to QR codes as QR scanners are linked to profile info provided by user in its OS of mobile handset. Hence it has a big statistical advantage over other technologies. Then we have also studied amount of data that could be stored in a QR code & methodology to store data in QR code. We have also seen that QR codes could be customised in any color scheme & therefore has an artistic value to it too. QR codes have numerous advantages & a few disadvantages. Most terrifying among them is that of Data Phishing. In this research, we provided a comprehensive



overview of state of art research regarding QR code security & usability. We identified most significant use cases & attack vectors associated with them. To do so, we conducted an extensive literature survey. In media, most commonly reported fraud conducted with QR codes as attack vector is social engineering & phishing in particular. QR codes have found their way from automotive manufacturing plants into our everyday smartphone usage. They are used in advertising, authentication & even for monetary transactions where sensitive data is transferred. However, very little research has been conducted in this field. Therefore, major goal of this work was to identify & systemize major research challenges in area of security & human-computer-interaction. Based on our systematization, we defined specific requirements to develop multi-layer guidelines as a first step toward development of a secure QR code processing environment.

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