

## QR Code Application for Hardware Devices

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### Abstract

There are numerous variations of QR code symbols, including logo QR codes, encrypted QR codes, and iQR Codes, so users can select one that best suits their needs. A QR code is used these days in a variety of application streams linked to marketing, security, academia, etc., and is rapidly gaining popularity. More people are becoming aware of this technology and using it appropriately daily. With the increase in smartphone users, QR codes are becoming more and more popular, and they are quickly gaining widespread acceptability. The lab is a location with a variety of tools available for programming tasks. The already-created records have been manually entered using Word or Excel. For laboratory inventory, Quick Response (QR) codes are recommended. The goal of this research is to create a tool that will help the lab staff in the IT and computing department's lab. The application will go through lab testing and is supported by responsive web and Android technologies. The results show that the automated system is more effective than the manual one.

**Keywords:** Android technologies, quick response, web technology, equipment inventory, QR code

### INTRODUCTION

“Quick Response” or QR codes are 2D matrix codes that are created with two requirements in mind: they must hold more data than 1D barcodes and they must be rapidly deciphered by mobile devices like smartphones. High data storage capacity, quick scanning, omnidirectional readability, and many other benefits are all provided by QR codes, along with error-correction (so that broken code can still be properly read) and a variety of variations.

A lab is the place where all the equipment needed for programming jobs is stored. Missing reports because of a manual lab can lower the quality of a facility. In this research. It is advised to carry out laboratory inventory utilising Quick Response (OR) codes. A two-dimensional or matrix bar code known as a QR code can hold data and was developed to be scanned by smartphones. The information encoded could be text, a URL, or some other kind of data, and it is made up of square-shaped black

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modules on a white background all over the place. More and more people are using mobile phones with cameras integrated into them to read QR codes, which are growing in popularity. OR codes were created by Toyota's Denso division. In 1994, the Toyota business Denso Wave created QR codes, which were initially used for inventory control in the manufacturing of vehicle parts. Today, QR codes are used in a wide range of other sectors, such as entertainment, in-store product labelling, and mobile applications. Users can create and print their own QR codes for use by others on websites and programmes that generate OF codes. While processor decodes the data from the QR code, the encoder process for data creation and encoding.

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These days, Quick Response (QR) codes seem to be everywhere. They can be seen on advertisements in magazines, websites, product packaging, and other places. Since mobile phones have become a necessity for everyone, using QR codes is one of the most intriguing ways to link customers to the internet digitally. The increased usage of smartphones is driving up demand for specialised applications, including barcode scanning software. There are many barcode scanners available, however many have security and privacy flaws.

### LITERATURE SURVEY

The article presented by Tiwari discussed on QR code technology, including its advantages, potential uses, and effects on the marketing and technological landscapes. Originally created for inventory monitoring purposes, QR codes are now used in a wide range of new industries including marketing, advertising, secure payment systems, and the education sector [1].

The danger of missing notebooks, which results in missing lab work inventory evidence, is one of the flaws of the manual system. Naturally, the work by Rochmawati *et al.* [2], in their article, suggested using Quick Response (QR) codes to carry out laboratory inventories [2]. The application makes use of the Bootstrap framework, which provided responsive web design. The framework enabled mobile phone access to the application. Based on platform size, monitor screen orientation, and user behaviour, this framework can adapt to the environment. The outcome is anticipated to simplify the Department of Informatics Engineering's laboratory inventory process.

In the article by Sutheebanjard and Premchaiswadi, the authors offered a method for producing QR codes that allows users to type text into a web browser and produce the QR code [3]. To create a user interface for a web browser and encode data in a QR Code symbol, a Drupal module was utilised in conjunction with the well-known libqrencode C package. Single and multiple lines of text were used in the experiment in both Thai and English. The outcome demonstrates that all QR encoding outputs were created successfully and accurately.

Barcode technology is thought to be the key to giving computers the ability to update information and obtain administrative control. Truth tables and examples have been used to demonstrate the most used barcode symbologies. It has been covered how to create barcode labels using different techniques and the different types of contact and noncontact barcode readers. In-depth discussion is given in the article presented by Sriram *et al.* regarding the various applications for barcodes, including automated storage and retrieval systems (AS/RS) [4]. For better understanding, sample barcodes created on a laserjet printer and utilised in AS/RS inventory control are provided.

The study by Bala and Bicena looked at how achievements and opinions of undergraduate computing course students were affected by augmented reality and QR code integration [5]. 50 voluntarily enrolled students in the Near East University department of guidance and psychological counselling who were pursuing a required computer course made up the study group. In the study, an experimental research design was employed. Students were divided into two groups at the start of the term: an experimental group and a control group, each with 25 students. The first lecture included a pre-test for the two groups, was delivered using traditional means, and the first group was explained the definitions and uses of computer features. The second group was given an explanation of the three-dimensional images of hardware features in the hardware chapter of the computer course using augmented reality and QR technology in a lab setting with a computer, projection, and voice systems. All lectures were delivered in this manner until the end of the semester, with students using their own mobile devices to investigate computer hardware using QR code cards and augmented reality technology. A post-test was given to the experimental and control groups at the end of the term, and the experimental group also received a questionnaire regarding the application of augmented reality and computer hardware courses with QR

code integration. Results in this context demonstrated that integrating augmented reality and QR codes into computer hardware classroom applications has a positive impact on students' academic outcomes and their perceptions of the course. Based on the findings, it is anticipated that the methodology utilised in the study may help with the integration of technology into education, and that technology and education may therefore be able to support one another [5].

Wahsheh *et al.* present a thorough security and privacy analysis of 100 barcode scanner applications in the study [6]. Their investigation reveals that certain apps offer security features such as URL verification and the use of cryptographic techniques, while other apps ensure user privacy by providing least privilege permission lists. However, some apps cheat their users by offering poorer security and privacy protections than they advertise. Based on the actual security features they offer or on their level of popularity, they analysed 100 barcode scanner programmes. We deduced a set of guidelines for developers to follow to create usable, safe, and privacy-conscious barcode scanning programmes from the investigation. Authors also developed BarSec Droid as a proof of concept for barcode scanning based on them. The most well-known and secure QR code scanner app, DroidLa, was used as a comparison during our user experience testing of our app. The findings demonstrated that our app offers great properties, including usability, security, and efficacy.

Developers have been spurred on to create new mobile applications that function as barcode scanners by the proliferation of smartphones with sophisticated capabilities. Although there are several barcode readers, they still have security and privacy flaws. By examining their security, privacy, and usability aspects, we first give a thorough and methodical analysis of barcode reader programmes in the study. According to their characteristics, Yao and Shin divide these programmes into four groups: URLs security, Crypto-based security, Popular applications, and Save-privacy [7]. We also point out their flaws and offer design suggestions for practical, safe, and privacy-assured scanner applications. Yao and Shin created BarSec Droid, a proof-of-concept secure barcode reader Android software that takes advantage of some advantages of other programmes while also getting around some of their drawbacks [7].

## **PROPOSED SYSTEM**

Early phases of the design and reading of QR codes involve research and data gathering. At this stage, the project's primary focus is on determining how to leverage the QR Code library to generate QR Codes based on the user's location. Additionally, techniques for image processing that enable the recognition of QR Codes and that can be utilised to decode a QR Code's picture are being investigated during this phase. The QR Code image can also be subjected to the recognition procedure to unlock the data it contains.

### **Make the Scanner Read QR Code**

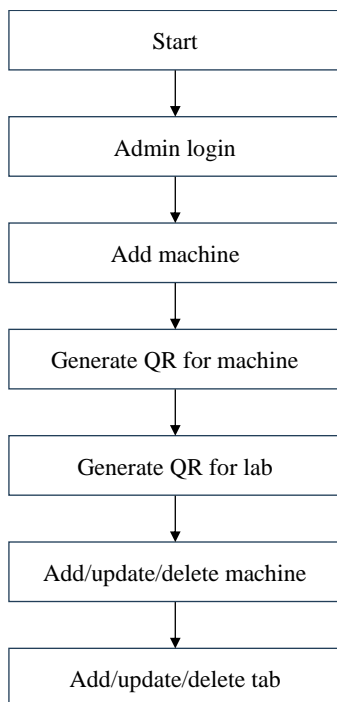
A design step for creating and scanning QR Codes was carried out using the data obtained during the earlier phase. The process of making and reading codes should include a QR Code Generator and Scanner. The QR Code method takes advantage of the internet. To ensure that the user may generate QR Code and scan QR Code by uploading the QR Code image to the application and collecting the information, the generating and scanning QR Code approach will be put into exercise when the development phase is complete.

Developers have been spurred on to create new mobile applications that function as barcode scanners by the proliferation of smartphones with sophisticated capabilities. Although there are several barcode readers, they still have security and privacy flaws. By examining their security, privacy, and usability aspects, Wahsheh and Luccio first give a thorough and methodical analysis of barcode reader programs in their study [8]. According to their characteristics, the authors divided these programmes into four groups: URLs security, Crypto-based security, Popular applications, and Save-privacy. They also point

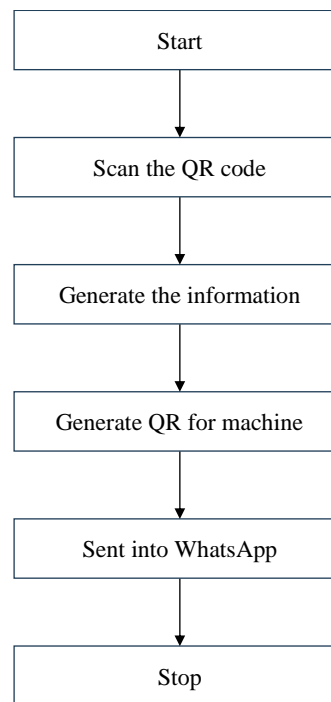
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## METHODOLOGY AND SYSTEM ARCHITECTURE

The section highlights the overall system work for both the Android system and the web system as shown in Figures 1 and 2.



**Figure 1.** Flowchart for QR-code generator.



**Figure 2.** Flowchart for android scanner.

## ALGORITHM DESIGN

The security, usability, and privacy concerns with QR codes are the main topics of Krombholz *et al.* [9]. The writers begin by looking at the 12 most popular QR code reader apps for Android, iOS, and Windows Phone in terms of privacy and security protection. The findings highlight the ineffectiveness of defences against malicious QR codes as well as the absence of privacy protection (sensitive data was communicated to third parties). The second section of the investigation uses an online questionnaire to gauge user understanding about QR code security. The results highlight the need for security upgrades in the QR code processing stage and highlight disparities between users from various European nations. To improve the usability and security of QR code scanners, the authors offer a series of design suggestions. The results demonstrated the effectiveness of the protection recommendations. The authors offer a prototype that verifies online material and uses digital signatures. The study by Krombholz *et al.* does not consider the anticipated size or time overhead of implementing digital signature systems and only analyses a small number of applications [9].

1. Entering data is the first step in this project; after doing so, create a QR code utilising all the data the lab assistant provides.
2. The user can scan the generated QR code.
3. This process demonstrates how rapid, easy, constantly accessible, and user-friendly the QR code technique is.
4. It takes as little as 3 sec to read a QR code, once printed.

## FIXING QR CODE ERROR

To read a symbol even if it is filthy or damaged, QR Codes use error correction to create a series of error correction codewords that are appended to the data codeword sequence. The Reed-Solomon codes, a popular mathematical error-correction technique, are utilised in the QR code to achieve strong error-correction capabilities. There are four stages of error correction, with the higher levels having a better capacity for recovery.

## RESULT AND DISCUSSION

### The Home Page

The home page of the presented study is shown in Figure 3.

### In Web Base, Add Lab

The accountable lab technician must use the labs on this website, the lab computer, and logout including the software lab, language lab, network lab, etc.

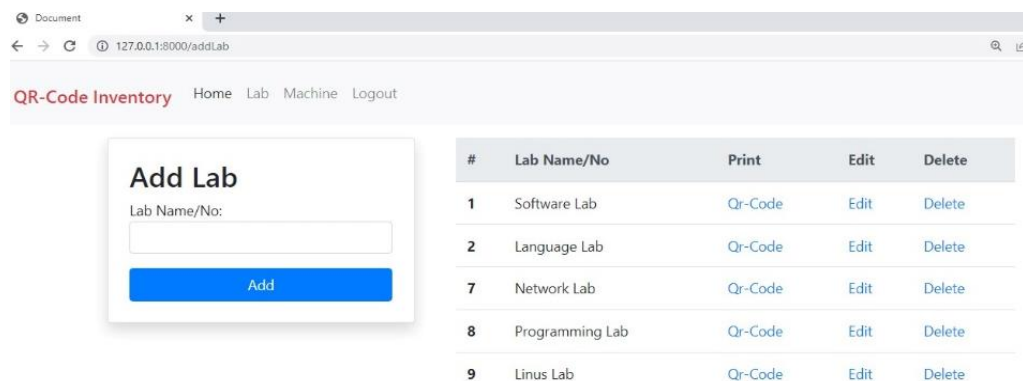


Figure 3. QR code inventory home.

### In Web Base, Add Machine

You must include machine-specific details on the page as shown in Figure 4, including the machine's hardware, IP address, and lab number, to identify the machine address.

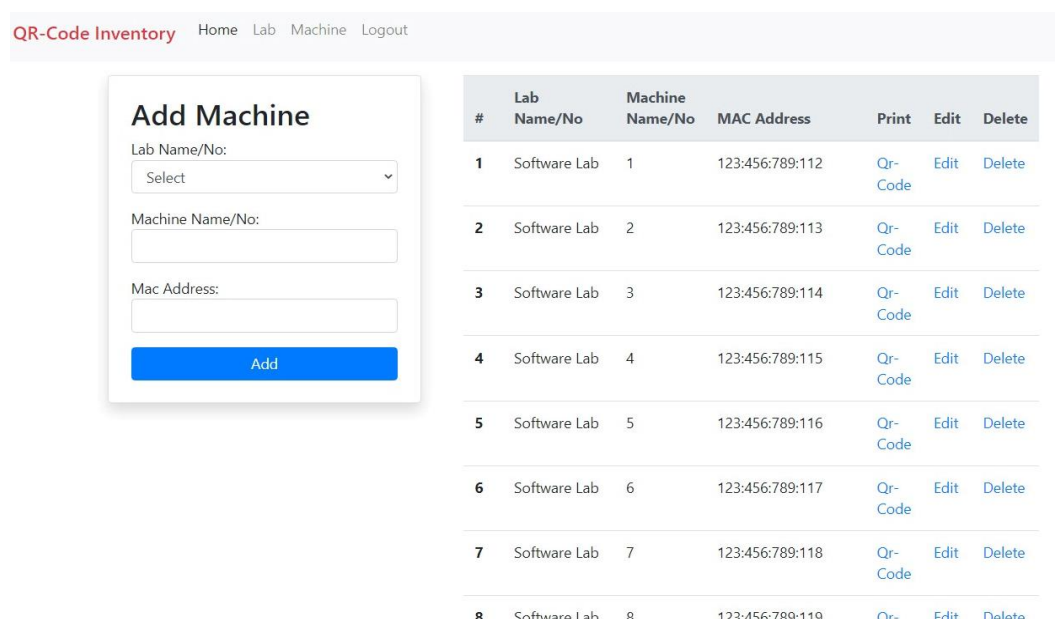


Figure 4. Add machine tab.

## QR CODE FOR ADDED LABS AND MACHINE

(Also based on web base)

You must also provide the hardware QR codes for all machines (Figure 5), which are based on the hardware that has been chosen.



Figure 5. QR codes verification.

## Generated QR Code in Android Base

(Android base)

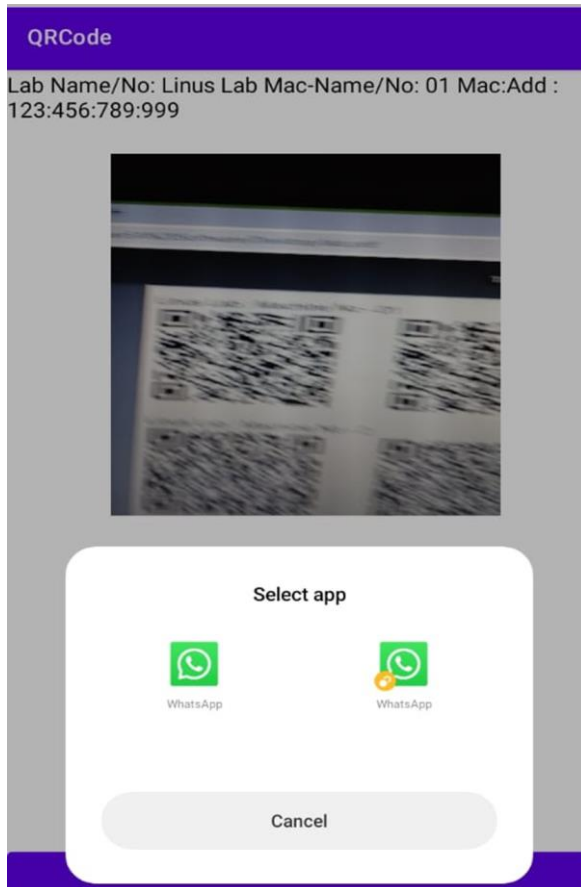
The hardware QR codes for every machine, which depend on the hardware that has been selected, must be submitted as well presented in Figure 6.



Figure 6. QR codes details.

### QR Code Share to WhatsApp

The Android platform can be used to generate QR codes as presented in Figure 7.



**Figure 7.** WhatsApp shared Output.

### CONCLUSION

The inventory needs to be used because the laboratory contains a lot of equipment. Until now, inventories have been manually added. The objective of this project is to create an app that makes it easier to take inventories in the lab of the Informatics Department at UNESA. Responsive web technology, which underpins this application, will simplify things since it can be seen on a mobile phone. In a testing lab, the software is put to the test. The results show that the automated system is more effective than the manual one.

### QR Code's Impact and Future Scope

High levels of adoption for QR codes are fast approaching. Every day, more and more people use and utilise this technology. The fact that marketers increasingly employ QR codes to connect with mobile consumers is one of the factors contributing to the QR code's explosive rise. In 2011–2012, QR codes initially appeared in marketing efforts. QR codes still serve as a market indicator today, despite the considerably low market penetration of smartphones and mobile internet. Americans were the most likely to have used the technology, according to a 2012 survey.

According to a survey by Pitney Bowes that included 2,000 Americans and 1,000 Europeans, US customers routinely scan QR codes across all delivery methods. According to comScore, there were 5.1 million QR code users in Germany, 3.3 million in the UK, and an additional 3.4 million in Spain as of July 2012.

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