



CERTIFICATE AUTHENTICATION SYSTEM USING QR CODE

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BORANG PENGESAHAN STATUS TESIS

JUDUL: CERTIFICATE AUTHENTICATION SYSTEM

SESI PENGAJIAN: 2014/2015

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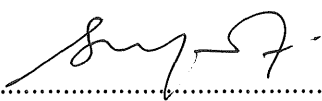
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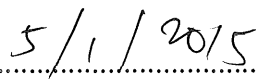
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ACKNOWLEDGEMENT

Special thanks to my beloved supervisor Puan Suryanti Binti Awang who gave me the opportunity to work on this interesting project. She sacrificed a lot of time to help me by guiding and supporting me in completing this project.

Apart from that, I would like to say thank you to my parent Mr. Chan Sun Sik and Mrs. Lai Khiun Yin, my both sisters Ms. Chan Min Nah and Ms. Chan Min Yen for supporting me, suggesting idea and helping me in the process of completing my task of project. Last but not least, thanks to all my friends especially Soh Zhen Xuan, Lai Chong Lan and Lau Chew Seng for helping me along the progress of this project. Thank you.

ABSTRACT

Due to the competitive situation in getting a good job, people tend to fraud their academic certificate. However, the origin authentication technique takes a long time to certify a certificate. Thus, in this paper, a certificate authentication system using QR code is developing for makeup easier way for authenticate certificate. This project is used SDLC to manage the development of system while QR technology is used to increase the usability and functionality of system. At the end of project, this system has effective reduction on the time taken for authenticate a certificate. By that, company does have a medium to check the originality of certificate easily.

Keyword: certificate authentication system, QR code

ABSTRACT

Oleh disebabkan keadaan yang berdaya saing dalam mendapatkan pekerjaan yang baik, ramai orang cenderung untuk penipuan sijil akademik mereka. Namun begitu, teknik asal sijil pengesahan mengambil masa yang lama untuk mengesahkan sijil. Oleh itu, dalam kajian ini, system pengesahan sijil menggunakan kod QR telah membangunkan untuk membuat cara yang lebih mudah untuk sijil sahkan ketulenannya. Projek ini digunakan SDLC untuk menguruskan pembangunan system manakala teknologi QR digunakan untuk meningkatkan kebolegunaan dan fungsi system. Pada akhir projek, system ini mempunyai pengurangan yang berkesan pada masa yang diambil untuk mengesahkan sijil. Oleh itu, syarikat mempunyai medium untuk memeriksa keaslian sijil dengan mudah.

Kata kunci: Sistem sijil pengesahan, kod QR

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays people obtain a certification as a proof that they have the knowledge in the related field. At present time, the companies process to certify a certificate take at least around 3 days [1]. However, some of the companies need a certificate for hiring but they take a shortcut without authenticating certificate with reason which the process needs take a long time. Apart from that, based on the research that has done state that the use of forged degree certificates in higher education has seen a rise in this last few years [2]. Due to that, in this project, a certificate authentication system using QR code will be developing to make people easier in authentication progress and help in solving the current issues.

On the other side, Quick Response Code (QR Code) system has become popular use in authentication method because it has fast readability and great storage capacity compare to other type of barcode. QR code is the trademark of a type of matrix barcode. It has error correction capability which is dirt and damage resistant and it also readable

from any direction in 360 degrees. The Quick Response aspects of the code make it a convenient way to serve up content to people on the go.

Hence, in this paper, it is proposed a QR code with certification method by cryptology. The effectiveness of the certification authentication system is ensured based on the information stored in the QR code generated that printed on the certification. A QR reader application can be appear to be essential because it needed to scan QR code in order to obtain the information that stored in the code which is able to checking the authentication of the certification.

1.2 Problem Statement

At the present time, for the consumer when they want to checking the authentication of certain certification, they need to authenticate the signature in that certification which takes up to at least 3 days for identification of signer due to process of authentication[1]. So, due to that, it has to led to produce research as authentication tools with the ability to help users. Besides that, we as a human may run away from mistake, not to mention in authenticate certificate especially for employer when hiring.

Apart from that, based on the research that had done the last few years have seen a rise in the use forged degree certificates in higher education [2]. In addition, companies need a certificate and cannot bother to go through the process of authentication of certificate, so they take a shortcut. This action has causes the population of unemployed person who is exactly own a certificate increase. At the same time, it is unfair for them who had work hard for many years to get a certificate compare to those who do not invest anything.

1.3 Objective

The general objectives of this project are as follows:

- i. To study the QR code technology for document authentication process
- ii. To develop a certificate authentication system using QR code
- iii. To evaluate the functionality of the document authentication system

1.4 Scope

- i. Target user
The target user of this system is the employers who will be the person to check authentication of certificate.
- ii. Certificate
The information of certificate of the first degree student will be use for data entry that store inside a database in specific website. Then the link of the data stored will be embedding into QR code.
- iii. Retrieves data
QR reader is use to scan and decode to retrieve the input data from that particular website.
- iv. Language
This system will be developing by using C# programming language.

1.5 Summary

Quick Response Codes have become a part of our daily lives. It has been used in local public area. The main aspect is that the potential of QR code use as additional features for verifying the validity and up to datedness of certification documents. Especially for the current issue such as forged certificate, QR code with degree certificate is the most effective way to reduce the forged certificate issue.

In this project, a system will be developing for storing data information in database in order to generate the link into QR code and embed in to the certificate. QR reader which can decode the code, can be used to get the original data from the link for verify information about the validity of certificate in real time.

By this help, the forged certificates, which have repeatedly been identified as cause of fraud, can now be easily detected. The involved distributors and employers can minimize their risk of becoming the victims of criminal activity. It is also to the benefit of inspection and certification bodies that can use the QR code technology to ensure that certificates issued by them are protected against forgery.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Encryption changes data or information that is normally plaintext through the usage of an algorithm so that someone must possess certain knowledge to access it. This special knowledge is normally called a key. For example, something is encrypted if someone must enter a password to access it. Quick Response codes (QR codes) can be considered as encrypted messages; after all no human eye is able to decode it. Thus, the functionality of QR codes is so versatile that they have been used by so many people for a myriad of reasons, and list only continues to grow and expand across a number of industries. They are not very common, since most QR codes are used in marketing, and the developers of those codes want them to be accessible by everyone.

In Japan, the immigration department has used encrypted QR codes on visas [3]. The secure QR codes can be made that make the scanner enter a password to be able to access the content. This is a good idea to make secure QR codes for people use in immigrations. This means other than the immigration department that for check in and out, people cannot see decode the QR code without the password. Obviously, the

security level of QR codes is very high although simple encryption systems may be involved.

Apart from that, applications that already exist are to use encrypted QR codes on products packaging, advertising, in show window display and more for business marketing. This application is built for customer guarantees that any copyrights to any components of products, designs, trademarks that are employed for inclusion in the custom QR codes are either owned by customer.

.In recent years, certificate authentication system using QR code was developed to increase the security of certificate. In this certificate authentication system, the information that encrypted in the QR codes needs to be decoded by using QR reader applications. Then the scanned QR code in the application are processed by using various techniques of image processing such as cryptography, morphological, stenography, image subtraction, watermark and etc to get the information of certificate from the QR code in order to check the authentication of cert. Then based on the information the authentication of certificate is checked.

2.2 Previous System

The project is mainly focus on the basic certificate authentication in QR code technology. The first previous system is according to the research Sir Revathi provides a new enhancing security in identity documents using QR code [4]. The main focus of this system is they want to use QR code to perform checking authentication of documents such as certificates. In this research it focuses on using personal detail information of an individual to embed into QR code. The personal detail information

such as the name of the person, date of birth, register number, and nationality which are used for generate the QR code.

In this system, there have few steps in encode procedure of QR code. Firstly, input data is encoded in according to most efficient mode and formed bit stream. The bit streams are divided into code words. Then code words are divided into blocks, and add error correction code words to each block. All these code words are put into a matrix and are masked with mask pattern. Finally function patterns are added into the QR symbol. A QR Code symbol is formed.

The second previous system is according to the latest product of Intact.Inc Company which is named as Easy-Cert (Ecert) with built-in authentication [5]. This system applies a certificate authentication system with QR code technology. In this system, it focuses on using image of the certificate to generate into QR code. Ecert system consists of two process which are sender process and receiver process.

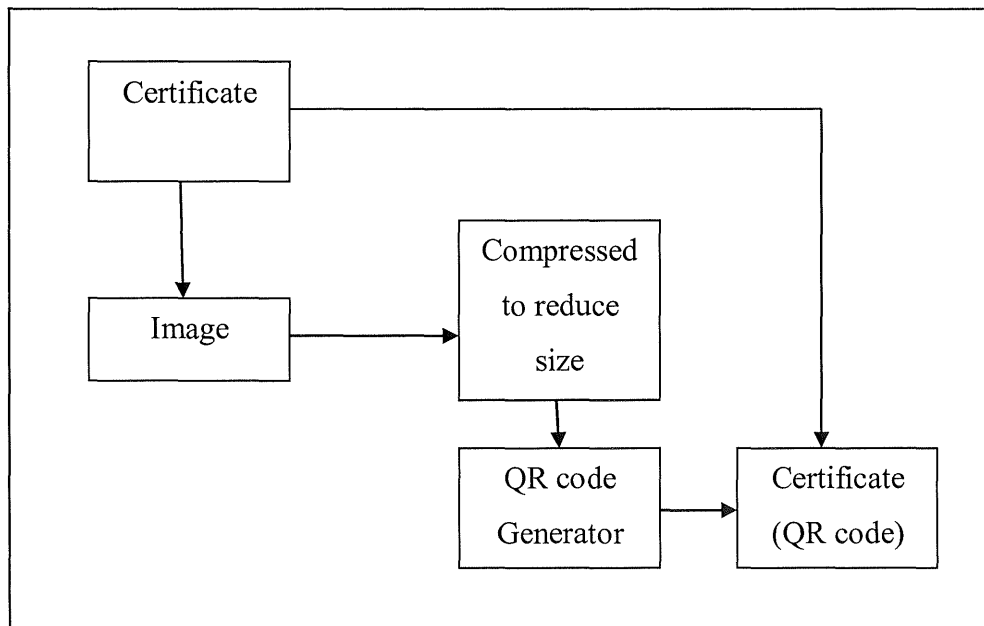


Figure 2.1: The simplified process of the sender

In the figure 2.1 above shows the simplified process of the sender in Ecert system. Firstly, the certificate is generated into image form such as JPEG and GIF. After that, the image of certificate is compressed to reduce size so that it can be stored in a QR code. Then the compressed image of certificate is encrypted to form QR code by using QR code generator. In the final step, the QR code is printed on to paper-based certificate after the QR code has been created.

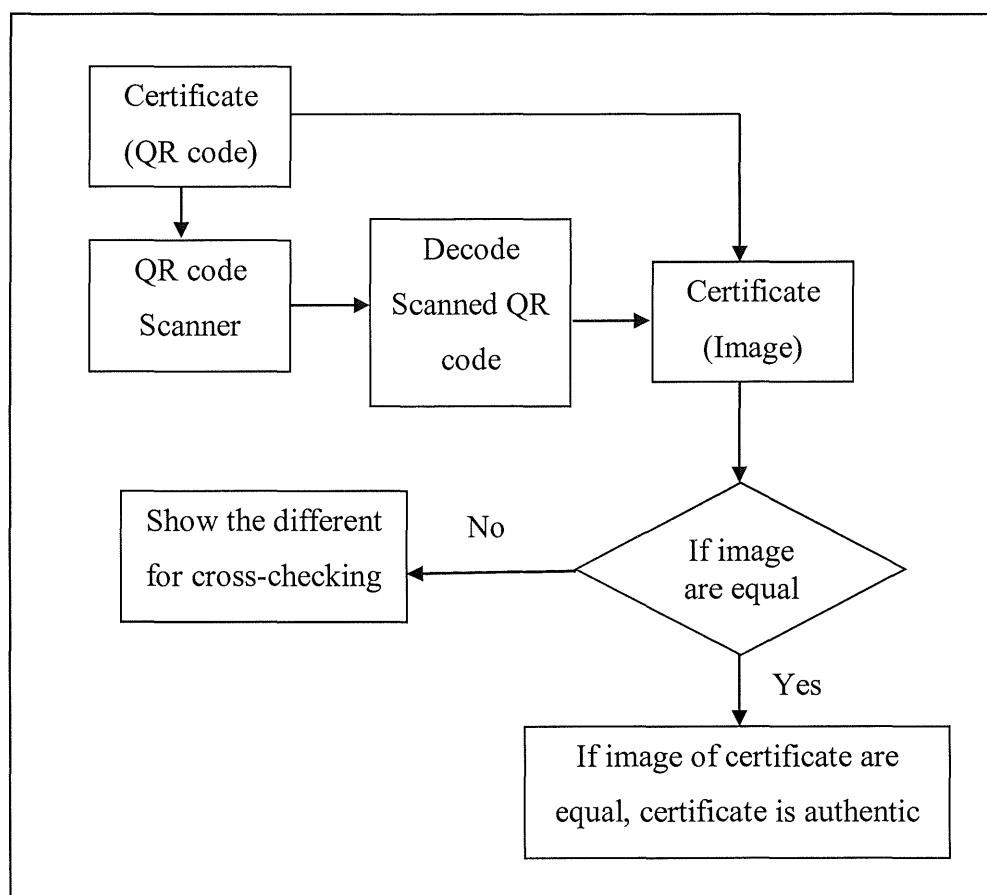


Figure 2.2: The simplified process of the receiver

In figure 2.2 shows the simplified process of receiver, when a receiver obtains the document from a sender, user may verify the authenticity of document by scanning the document and processing the image. In the first step, the verification process starts

with checking the integrity of the information stored in the QR code. Next, the information in the QR code that consists of the image of the certificate is compressed. After scanning the QR code and uncompressing the encrypted data, the certificate can be verified by comparing the image from the QR code and the hand-in certificate. Thus, if both values are identical, the certificate is valid.

The third previous system is according to the research of Kim and Jun, it applies method of QR code recognition, password method, existing user authentication technique and etc to develop a new user authentication technique. This research is proposed user authentication technique by using QR code which is able read by QR reader application on smart phones and transmitted into a server. The main focus on the research is to simplified and implement a more secure process of authentication and also contract to the disadvantages such as keyboard hacking which may occur in other authentication techniques.

2.3 Table Of Comparison

The table 2.1below shows the comparison between the three previous systems.

Table 2.1: The comparison of previous systems

Name of author	Name of system	Method used in system
Revathi M K (201	Identification Document with QR code	The personal detail information of individual embeds into QR code to identify the documents.
Intact.Inc	Easy-Cert (Ecert)	The image of the certificate

		compressed small size to encode 1 the QR code for authentication certification.
Kim and Jun (201	User Authentication System Using QR code Identifying Method	Password method is used to gene QR code for can user authentica purpose.

2.4 Certificate Authentication System Using QR code Technique

According to the previous system and research, the project is mainly focus on the basic QR code technology. Under the same techniques of QR code, the certificate authentication system with QR code also can be implemented based on these techniques specified shows in figure 2.3.

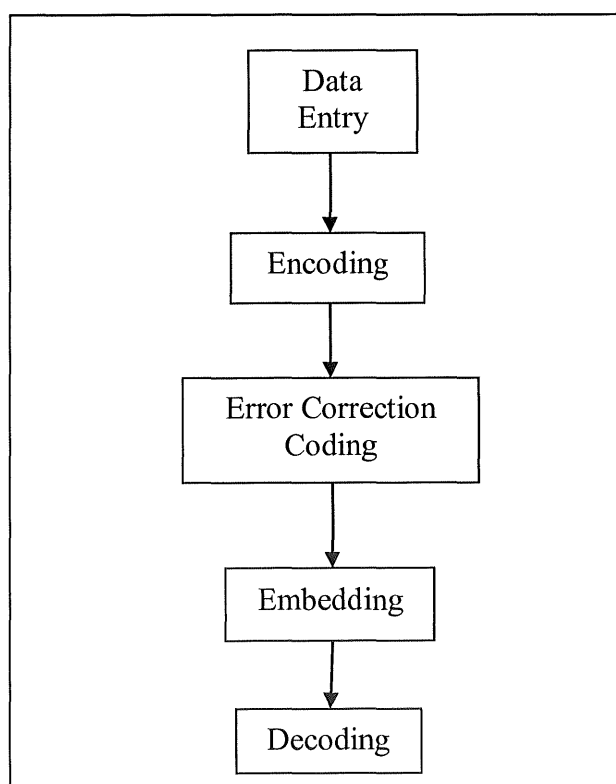


Figure 2.3: Flow chart of QR code technique

2.4.1 Data Entry

Data entry is the process of entering data into a computerized database or spreadsheet. It can be performed by an individual typing at a keyboard or by a machine entering data electronically. Data entry technique is used in certificate authentication system to insert data of certificate and save into database as record.

2.4.2 Encoding

The data encoding mode is designed to create the shortest possible string of bits for the characters that used in that mode. Different method used by different mode in order to convert input data into a string of bits. There were several steps in data encoding process for data information of certificate shown as figure 2.4.

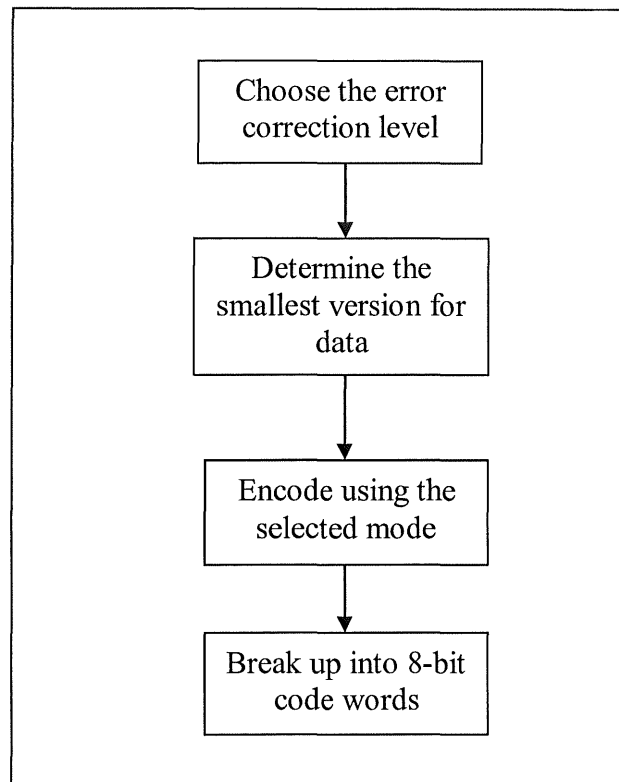


Figure 2.4: Flow chart of data encoding process

2.4.2.1 Choose the error correction level

Before the data encoding process begin, an error correction level is selected to create error correction code words based on the encoded data. By this, error correction code words able to correct the error if QR code reader did not read the data correctly.

2.4.2.2 Determine the smallest version for data

Different versions of QR code have different sizes and capacity which is depending on the mode in use. In order to determine the version of data, the number of characters to be encoded will be count and the smallest version that has desired error correction level. However, the higher error correction level needs a higher capacity. QR code has the limit for the capacity which is version 40 with error correction level L as the maximum capacity.

2.4.2.3 Encoding using the selected mode

Each encoding mode consists of 4-bit mode indicator and must have to start with appropriate mode indicator for mode being used for the bits that come after it. Different mode has different way to encode the data information for certificate.

Table 2.2: Table of Mode Indicator

Mode Name	Mode Indicator
Numeric Mode	0001
Alphanumeric Mode	0010
Byte Mode	0100
Kanji Mode	1000
ECI Mode	0111

2.4.2.4 Break up into 8-bit code words

After obtaining a string of bits that consists of the mode indicator, data is encoded, it may be necessary to add 0s and pad bytes because the specification require of QR code that the bit string must completely fill the total, capacity of QR code. If the bit string is shorter than the total number of required bits, a terminator of up to four 0s will be added to the right side of string. On the other hands, terminator will also add four 0s to the end if bit string is more than the required bits. After that, first pad the string on the right will add with 0s to form a multiple of 8 for number of bits in string.

2.4.3 Error Correction Coding

After create the string of data bits that represent the data for certificate, the string data bits will be generate error correction code words using Reed-Solomon error correction which is non-binary cyclic error-correcting codes. By comparing both data code words and error correction code words, the error on data reading can be correct.

Next, the bits are placed in QR code matrix after generating and arranging data code words and error correction code words in correct order. QR code matrix required specific function patterns which are to ensure the QR code scanners can correctly identify and orient the code for decoding. The function patterns are such as finder patterns, separators, alignment patterns, timing patterns and dark module.

Certain patterns in QR code matrix are difficult for QR code scanner to read correctly. Thus, QR code specification defines 8 mask patterns which QR code according to a particular pattern. In order to counteract this, the best mask pattern has to

be determined which is differentiating the dark and light modules. At final step, after adding format and version information to QR matrix, the output for the final QR code is done.

2.4.4 Embedding

The final output for QR code will be embedding into the bottom edge of certificate. The encoded data of QR code for each certificate is different. Thus, the authentication can be done by using QR reader application to read the encode data from QR code.

2.4.5 Decoding

QR reader application is available in smart phone with operating system such as android, iOS, Windows and BlackBerry. The target user of the certificate authentication system with QR code can use QR scanner decode the QR code. The encoded data in QR code can obtain to perform the checking authentication of certificate.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, it will discuss about methodology and technique to develop the certificate authentication system using QR code. In order to develop this system, all the phases in Software Development Life Cycle (SDLC) are followed. All the methods and techniques involved also described in this chapter.

3.2 Software Development Life Cycle

Software Development Life Cycle (SDLC) is the process that applies to the information system development projects in order to ensure that all functional and user requirements goals and objectives are met. The SDLC provides a structured and standardized process for all phases of any system development effort.

In this thesis, SDLC is used for development of certificate authentication system using QR code. The process of SDLC is requirements, analysis, design, development and test. Figure 3.1 shows the following phases of SDLC.

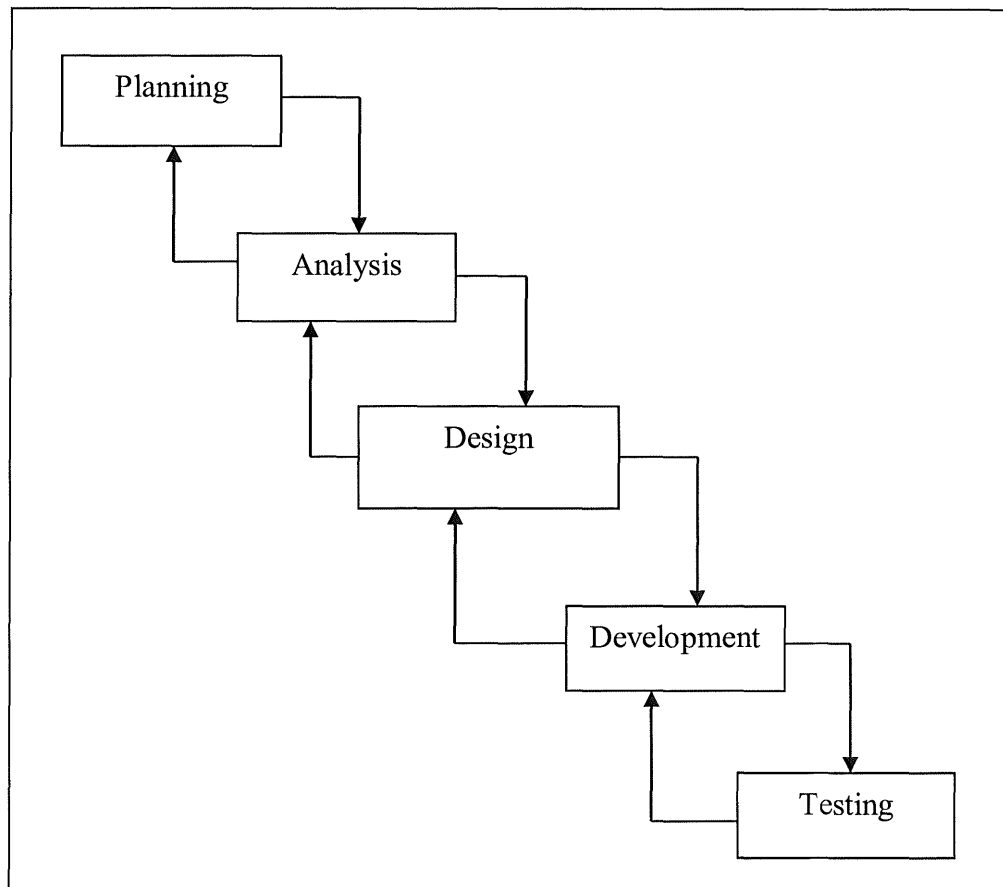


Figure 3.1: The flow of Software Development Life Cycle (SDLC) Model

The process flow is beginning with planning, followed by analysis, design, development and testing. For each phase in the process in SDLC are allowed to be migrated back to the previous phase.

3.3 Planning

In planning phase, a plan for the development of certificate authentication system using QR code has to be setting out. In this phase is also to determine all goals and the requirement from target user of this system. In this phase, observational technique is used to find out the specification and behavior of the system that needed to be developed. In order to improve the authenticate certificate system, it has refers to the previous system to get the idea of development for the system.

Table 3.1: Observation requirement from existing systems

Name of author	Name of system	Requirements
Revathi M K (2013)	Identification Document with QR code	Ease of use – The design of the system has to be easy to use and user-friendly for user to insert the personal detail information.
Intact.Inc	Easy-Cert (Ecert)	Portability – The device used to authenticate certificate has to be portable which user can easy to carry.
Kim and Jun (2011)	User Authentication System Using QR code Identifying Method	Phone online – The device used to authenticate certificate has to connect into internet when identify the password insert user.

By comparing the current existing certification authentication system using QR code as mentioned in previous chapter, there are few specification and behavior of system that need to be fulfilled as show in Table 3.1 .Besides that, each of the previous system has the similar specifications. Thus, the requirements of the system are as follow.

- a) Ease of use
- b) Portability
- c) Phone online
- d) Security

3.4 Analysis

In this phase, all the listed out requirement of the system is being analyzed. From the previous phase, there are several requirements that identified for this system. They are:

- a) General requirement for system
- b) Hardware requirement
- c) Software requirement

3.4.1 General requirement for system

The general requirements for the system are:

- a) Ease of use
- b) Portability
- c) Phone online
- d) Security

3.4.1.1 Ease of use

The design of the system has to be easy to use and attractive for user such as good-looking and simple web applications, user-friendly and consistent interface which are needed. In this system, a few of interface design rules that need to be applied in order to improve the design of the interface for this system. The interface design rules are such as Shneiderman's Eight Golden Rules, Graphical User Interface Design and also Jacob Nielsen Ten Heuristic of Usability which are all about the guideline to increase the usability of system. The details about the interface design rules are described in the interface design section.

3.4.1.2 Portability

The target user of this system does not need to type anything in computer or mobile when checking authentication of certificate. By using any QR reader application in smart phone, the encoded data will be presented to the user in the screen of mobile for authentication.

3.4.1.3 Phone online

The target user will be able to authenticate the certificate using smart phone when this is connected to the network to reach the server. Once user scan the QR code, a link is obtained from the decoded QR code and linked to the authorized webpage. By connected to the internet, the authorized webpage is displayed the retrieved full information of student from database server.

3.4.1.4 Security

The secure of authenticate certification should be considered in order to protect the validity of the certificate. The QR code has to be unique so that people are not able to forging the QR code. A unique link is generated which is to retrieved student information based on student ID from authorized webpage. From that, the unique link is not be able to duplicate for other students use.

3.4.2 Hardware Requirements

The table 3.2 below concludes hardware which is suitable used when develop the certificate authentication system.

Table 3.2: Hardware requirements

Hardware	Description
Personal Computer	Workspace with: <ul style="list-style-type: none"> • Windows 7 • Pentium Dual-Core • 2GB of RAM • 300GB Hard Disk Space
Smart Phone	Workspace with: <ul style="list-style-type: none"> • Camera • Android version 2.3.3 and above • Wi-Fi or mobile networks

3.4.3 Software Requirements

The table 3.3 below concludes software which is suitable used when develop the certificate authentication system.

Table 3.3: Software requirements

Software	Version
Microsoft Visual Studio	2010
QR Code Reader	2.1.5

3.5 Design

After the analysis phase is completed, the design phase takes place which involved in developing the prototype. The design of the system should be a plan for implementing system based on analyzed requirement from the previous phase.

3.5.1 General Framework

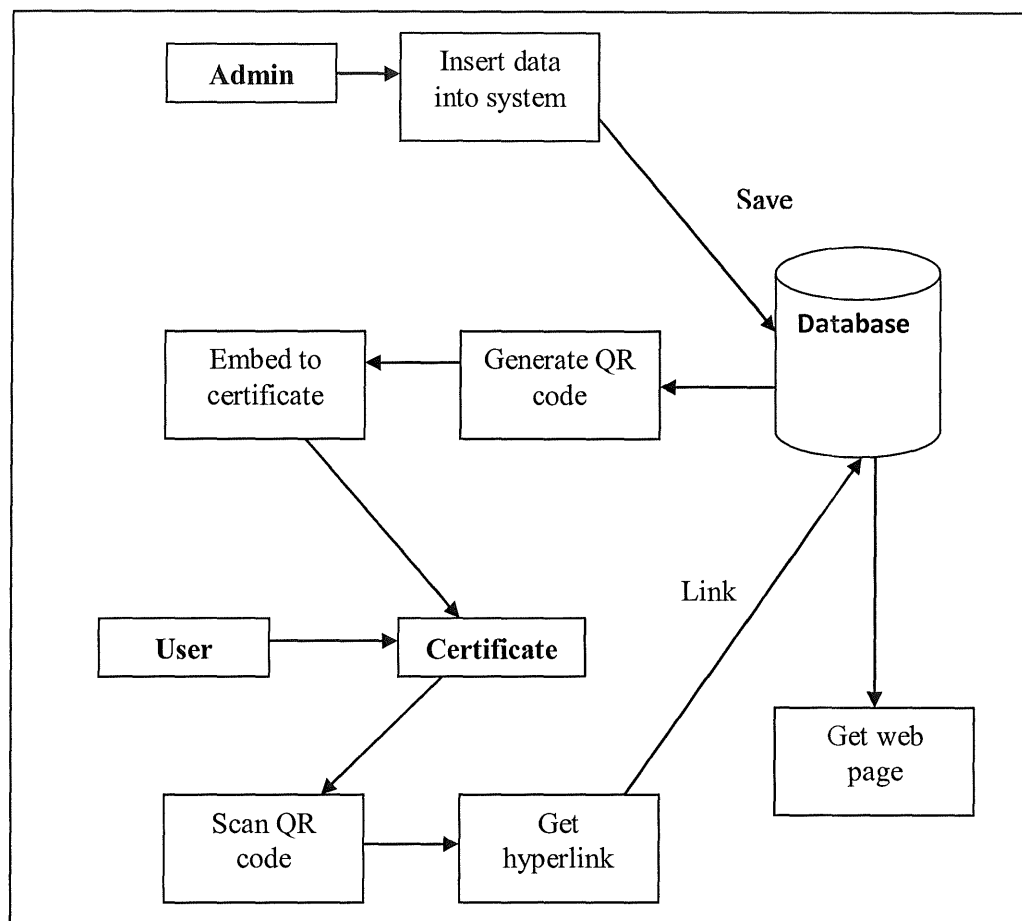


Figure 3.2: General framework

In figure 3.2 above shows the general framework of the whole authenticates certificate system for both admin and user. Firstly, admin has to insert the information of student to save into the database. Then the QR code will be embedding into the certificate. User authenticate certificate using any QR reader application to decode the QR code in order to get the hyperlink. By this, user able to obtain the information of student from database through the hyperlink obtained. By comparing the information from webpage and certificate, the authentication of certificate can be done.

3.5.2 Framework flow chart for creating QR code

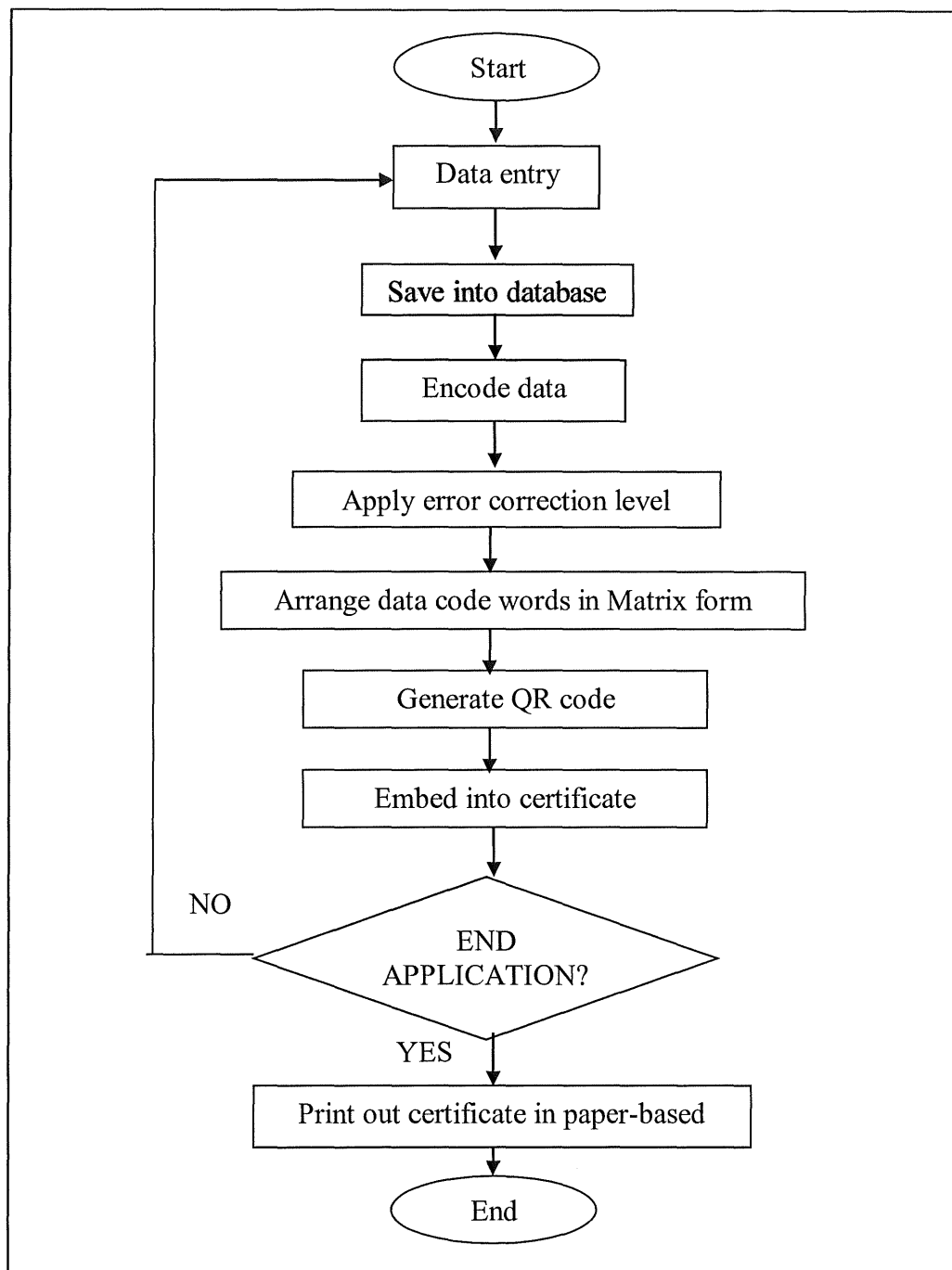


Figure 3.3: Framework flow chart for admin

Based on the figure 3.3, it shows the framework low chart for admin in certificate authentication system using QR code. Each step is going in sequence in order to generate QR code for certificate authentication.

Firstly, the input data for the data entry will be saved into database and sent into perform the encoding data process. The error correction level for the QR code that generated will be selected. After that, the version of the input data will be discovered in order to create the string of data bits in which depends on the mode indicator selected. Then the data bits will be break up into code words. By arranging the code words according to QR matrix form, the QR code will be done generating.

At last, after the data has been encoded will be generate in QR code, then the generated QR code embeds into the certificate and printed out in paper-based. The user of this system can continue to insert another data or execute the system by exit the application.

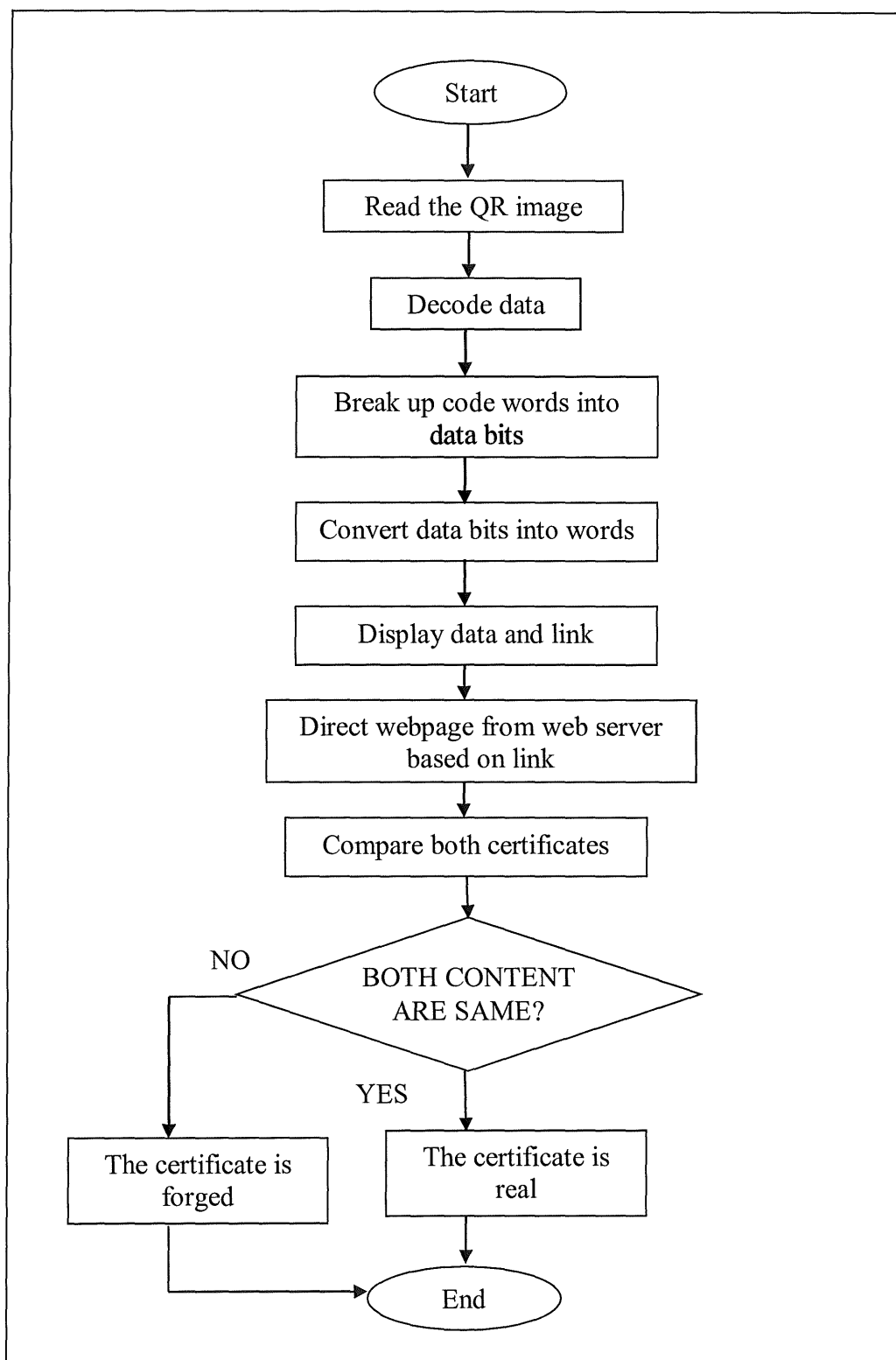


Figure 3.4: Framework flow chart for user

In figure 3.4 shows the framework flow chart which is a collection activities to be executed in the system. This framework flow chart also describes the activities of the system on mobile in sequence.

The QR image will be scan into the mobile by using any QR reader. Then the QR reader will decode the data to get the hyperlink from it. The decoding data process will goes by breaking up the code words from the QR code into data bits and convert into words. Through the hyperlink, it will direct a webpage from the authorized web server. The certificate from the web page will be display out for user to compare both certificates.

Therefore, by comparing the details for both certificates, user can check the whether the paper-based certificate is real or forged. The authentication of certificate is done.

3.5.3 Context Diagram

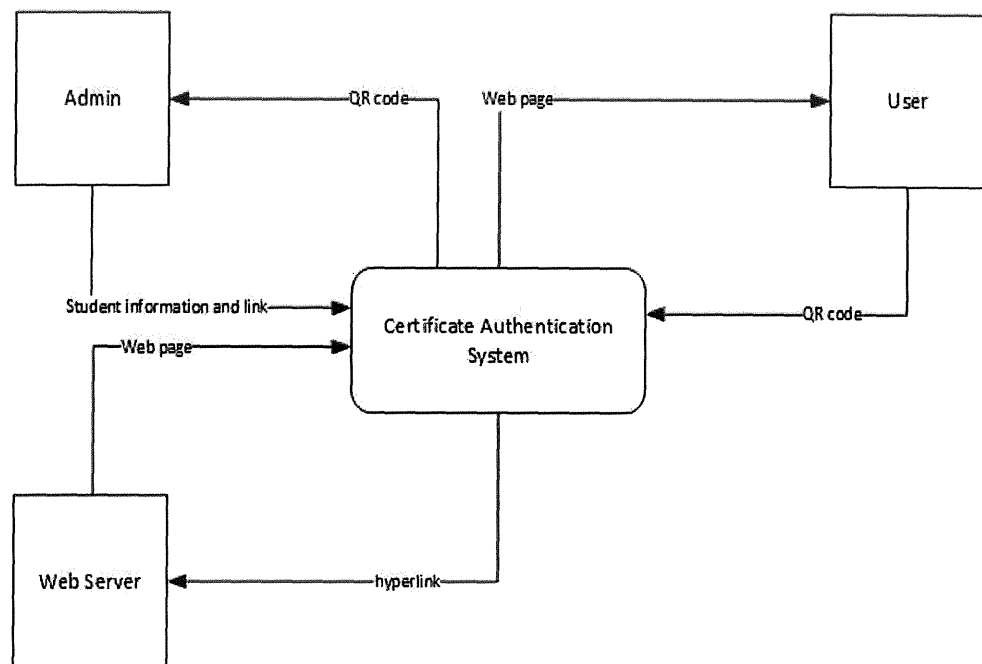


Figure 3.5: Context Diagram

In the figure 3.5 above shows the context diagram of the system which describe the interactions between external sources and the system. The external sources are included admin, the target user and also web server. The admin will be insert the student information and link into the system in order to generate the data into QR code. Target user can authenticate the certificate by scan the QR image in the certificate to get the hyperlink from the QR code. The hyperlink will through the authorized web server to direct the web page back to user in order to continue the authentication process.

3.5.4 Data Flow Diagram

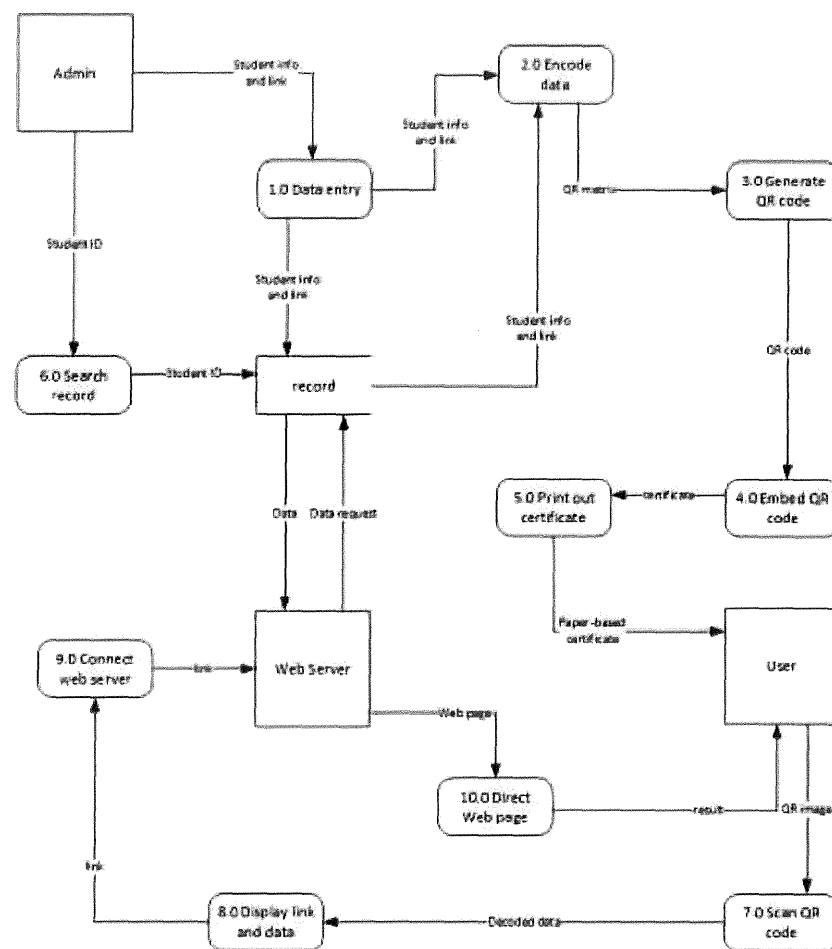


Figure 3.6: Data Flow Diagram level 0

In the figure 3.6 above shows the data flow diagrams level 0 of the system which describe and depict all the involved components interact in the system. Firstly, the input data for the data entry will be saved into database and sent into perform the encoding data process in order to generate QR code. Then generated QR code embeds into the certificate and print out. If necessary, admin is also able to update and edit the previous data from the record database to generate QR code. Apart from that, user is able to scan QR image from the paper-based certificate in order to decoded data. A hyperlink that gets from the decoded data will be connects to the authorized web server to request the

data from database. Based on the ID requested, the data of student will send out to the web server from the database. From there, it will direct the webpage back to the user. Authentication of certificate can be done by comparing the information of certificate from the authorized web page and the paper-based certificate.

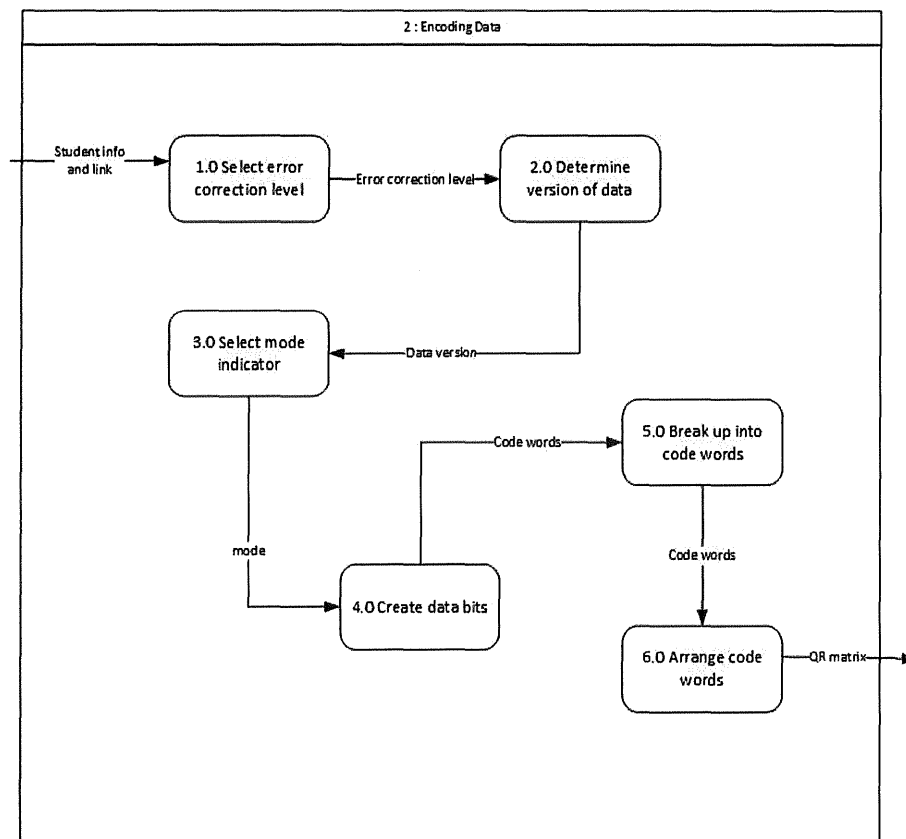


Figure 3.7: Data Flow Diagram level-1

In the figure 3.7 above shows the data flow diagrams level 1 of the system which describe and depict all the involved components interact in the system. This diagram shows the encoding data process that taken when encode the input data from data entry. The error correction level for the QR code that will be generated will be selected. Next, the version of the input data will be discovered in order to create the string of data bits in which depends on the mode indicator selected. Then the data bits will be break up

into code words. By arranging the code words according to QR matrix form, the QR code will be done generating.

3.5.5 Entity Relationship Diagrams

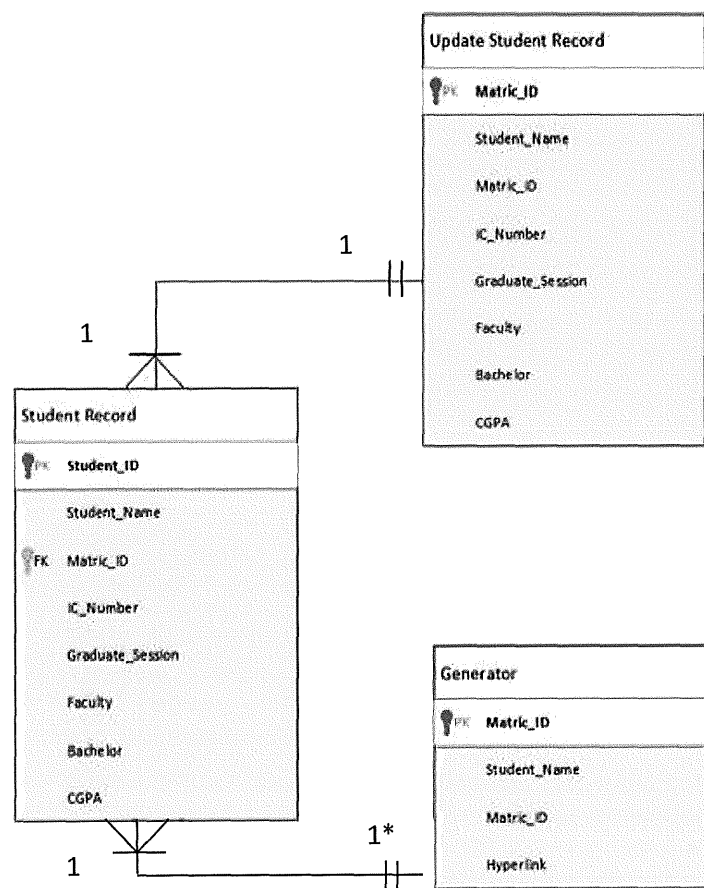


Figure 3.8: Entity Relationship Diagram

In figure 3.8 shows the entity relationship diagram of the database in certificate authentication system using QR code. One QR code can only be generated by one student information while the information of student can be generated to many QR code. However for the update student records which relate with the Student Record database, it is one-to-one relation.

The student record database is to save the input data during the data entry which included student information details such as student name, metric id, identity number, graduate session, faculty, bachelor and CGPA. Besides that, admin is able to search the student record through search student info interface which is related to update student database. Admin can search the particular student by insert the metric id then the rest of information details will be appears if the metric id is exist in the database record. However, the generator database is for the generate QR code interface which will generate the input data into QR code. The input data that will be generating into QR code are student name, metric id and hyperlink while the filename is to rename the QR image in JPEG format.

3.5.6 Interface Design

This system interface design using Microsoft Visual Studio ASP.NET and layout combination elements are used to design this system interface in web form.

Based on the Shneiderman's Eight Golden Rules of Interface Design technique, a good interface has to be reducing short term memory load. It is because the limitation of human information process in short term memory. So for this system, the interface displays should be kept simple, multipage displays be consolidated, window-motion frequency be reduced, and sufficient time be allotted for codes and sequences of actions.

Apart from that, the target user in this system interacts with system by using buttons. Based on Graphical User Interface Design technique, if position of buttons placed at the bottom of the page, user has to scroll down before they click it. In fact, the buttons should be placed at the top of page so that it makes the user easier when using the system. This will apply into the system in order to make it easier for user.

Besides that, based on the Jacob Nielsen Ten Heuristic of Usability in interface design rules, it mentioned that consistency and standards is important for a good interface design. In this system, a consistent in language will be used to avoid user confused. Language such as English which is a multinational language that should be chooses because mostly people are understood.

The screenshot displays a web-based data entry interface for student information. At the top, there is a navigation bar with five buttons: 'Home', 'Student Data', 'Generate QR code', 'View Records', and 'Exit'. Below this, the main section is titled 'STUDENT DATA' and contains a sub-section 'Student Information'. This section includes several input fields: 'Full Name' (containing 'CHAN MIN TING'), 'Matric No.' (containing 'CD11046'), 'Identity Card/Passport No.' (containing '911218-12-5904'), 'Graduate Session' (containing '2014'), 'Faculty' (a dropdown menu showing 'Computer System & Software Engineering (FSKKP)'), 'Bachelor' (containing 'BACHELOR DEGREE OF GRAPHICS'), and 'CGPA' (containing '3.50'). At the bottom of the form is a button labeled 'Save and Generate QR code'.

Figure 3.9: Data entry interface

In figure 3.9 shows the interface for admin user to insert the information of student in the system. The data inserted will be saved into the database after insert all the data correctly and hit the button save. Then it will jump to the next page which is to generate the inserted data into QR code.

The menu bar is display in the top of the page. This interface consists of five text boxes which are student full name as identity card or passport, student metrics number, identity card or passport number, graduate session and also cgpa pointer. In order to prevent user error typing, admin is using drop down list to choose the faculty and program of student. Then, only a button on the bottom page for admin user to click in after insert all the student information correctly.

The screenshot displays a web application interface titled "STUDENT RECORDS". At the top, there is a horizontal menu bar with five buttons: "Home", "Student Data", "Generate QR code", "View Records", and "Exit". Below the menu bar, the main content area is titled "STUDENT RECORDS" and "Student Information". The form contains the following fields and controls:

- Matric No.:** A text input field containing "CD11046". Below it is a "Search Student" button.
- Full Name:** A text input field containing "CHAN MIN TING".
- Matric No.:** A second text input field containing "CD11046".
- Identity Card/Passport No.:** A text input field containing "911218-12-5904".
- Graduate Session:** A text input field containing "2014".
- Faculty:** A dropdown menu showing "Computer System & Software Engine".
- Bachelor:** A dropdown menu showing "Bachelor Degree of Graphics & Multir".
- CGPA:** A text input field containing "3.50".

At the bottom of the form, there are two buttons: "Edit" and "Generate QR code".

Figure 3.10: Update database interface

In figure 3.10 shows the interface for admin user to update the information of student in the database of system. Admin user is also able to update any information of student. The database will save the latest updated data. \

The student records page is similar to the student data page. The search text box and search button are provided in the top of the page which is for admin user to update the student information by searching the student ID. Edit button is for admin user to click in for update student information after edit student information. Reprint QR code into certificate function is provided in case admin user need to reprint the QR code

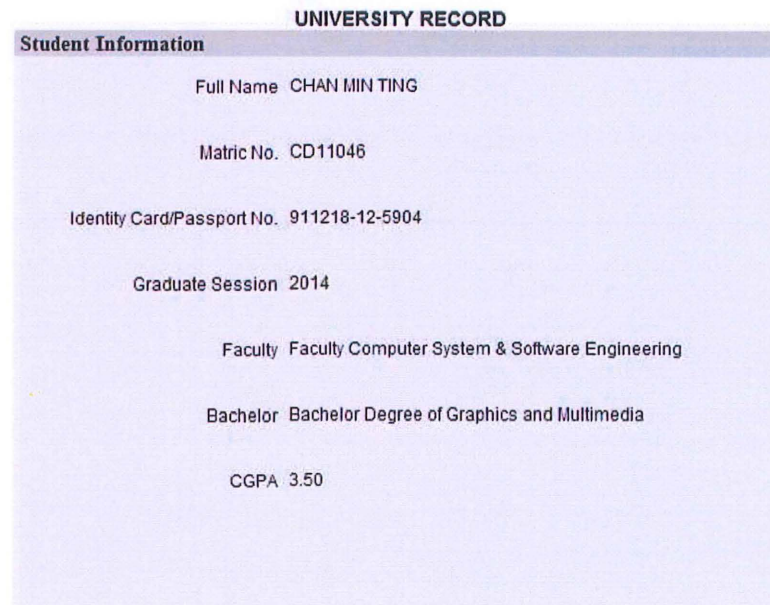
The screenshot displays a web application interface for generating QR codes. At the top, there is a navigation bar with buttons: Home, Student Data, Generate QR code, View Records, and Exit. The main content area is titled 'GENERATE QR CODE' and is divided into three sections:

- Student Information:** Contains four text input fields: Full Name, Matric No., Certificate Hyperlink, and File Name. Below these fields is a 'Generate Barcode' button.
- QRCode Properties:** Contains several settings:
 - QRCode Encoding: Auto (dropdown)
 - QRCode Version: Auto (dropdown)
 - Error Correction Level: L (dropdown)
 - Structured Append Supported: No (dropdown)
 - Structured Append Count: 0 (text input)
 - Structured Append Index: 1 (text input)
 - FNC1 Mode: Not Supported (dropdown)
 - Application Indicator: 0 (text input)
 - Extended Channel Interpretation: -1 (text input)
 - Process Tilde: No (dropdown)
- Barcode Image Style:** Contains settings for the image output:
 - Unit of Measure: Pixel (dropdown)
 - Bar cell module size: 5 (text input)
 - Left Margin: 10 (text input)
 - Right Margin: 10 (text input)
 - Top Margin: 10 (text input)
 - Bottom Margin: 10 (text input)
 - Resolution: 96 (text input) (DPI)
 - Image Format: PNG (dropdown)

Figure 3.11: QR generator interface

In figure 3.11 shows the interface for admin user to generate the information of student into QR code. The generate data will be based on the previous page student

information which is refer from the database. The certificate hyperlink will be automatic generated based on the number Id of the data in database. In this interface, admin user is able to rename the filename and also choose the option for the QR image to generate it later.



The screenshot displays a web interface titled 'UNIVERSITY RECORD'. Below the title is a section labeled 'Student Information' with a light blue background. This section contains the following details: Full Name: CHAN MIN TING, Matric No.: CD11046, Identity Card/Passport No.: 911218-12-5904, Graduate Session: 2014, Faculty: Faculty Computer System & Software Engineering, Bachelor: Bachelor Degree of Graphics and Multimedia, and CGPA: 3.50.

UNIVERSITY RECORD	
Student Information	
Full Name	CHAN MIN TING
Matric No.	CD11046
Identity Card/Passport No.	911218-12-5904
Graduate Session	2014
Faculty	Faculty Computer System & Software Engineering
Bachelor	Bachelor Degree of Graphics and Multimedia
CGPA	3.50

Figure 3.12: Information of certificate interface

In the figure 3.12 shows the interface for the end user in certificate authentication system. After user gets the hyperlink from scanning the QR code, the hyperlink will be connecting to the web server to retrieve data from database. The information of that student will be display out in the mobile screen as shown in figure 3.12.

3.6 Development

During this phase, the coding process will be done. All the developments of the implementation of QR code for certificate authentication system were developing using several hardware and software such as Microsoft Visual Studio 2010.

In this project, the QR technology is used which means the system is able to generate the QR code itself. The C# programming language and ASP.dll library is used for encode the link and draw out in QR code image.

In generating QR code process, there are consist of five steps which are data entry, encoding, error correction level, embedding and decoding. In data entry, student data is insert and stored into the database server. Next, the encoding process included the function pattern region, encoding region, choosing error correction level and masking pattern to generate the QR code. The QR code generated is embed into certificate and print out with the student name, student identity card or passport number, course program, class based on cgpa pointer and also date of printing. Lastly, decoding process can be perform using QR reader to decode the QR code based on threshold calculation for binarization method or mean block binarization method that QR reader used.

3.6.1 Encoding Data

In development process, the system needs to encode the inserted data in order to generate the QR code. Each QR code symbol version has the maximum data capacity according to the amount of data, character type and error correction level. Due to the

encode data for this system which is the URL address for the certificate, there are more modules are required to comprise QR code as the amount of data increase.

The following are the encodable character set in the system:

- Numeric data (digits 0-9)
- Alphanumeric data (digits 0-9; upper case letters A-Z; nine other characters: space, \$, %, *, +, -, /, :)
- Byte data (default: ISO/IEC 8859-1)
- Kanji characters

The version for the highest capacity QR code is 40-L which is known as version 40 with error correction level L while version 40-M, 40-Q and 40-H have lower capacity. In table 3.4 below shows that the capacities of all version 40.

Table 3.4: The character capacities by version 40

Error Correction Level	Numeric	Alphanumeric	Byte	Kanji
L	7089	4296	2953	1817
M	5596	3391	2331	1435
Q	3993	2420	1663	1024
H	1057	1852	1273	784

The error correction of QR code has the capability to restore data if the code in the certificate is dirty or damaged. In the system, there are four error correction levels are available for users to choose when generate the URL into QR code. The four error correction levels are L, M, Q and H as shows in table 3.5.

Table 3.5: The table of error correction level

Error Correction Level	Error Correction Capability
L	Recovers 7% of data
M	Recovers 15% of data
Q	Recovers 25% of data
H	Recovers 30% of data

Level Q or H may be selected for factory environment where QR Code gets dirty, whereas Level L may be selected for clean environment with the large amount of data. Level M is the most frequently selected.

Besides that, the system has the settings for QR code size. The size of QR code can be set by setting the properties of the code width, height, left margin, right margin, bottom margin and top margin. Other than that, the resolution property also available which is using Dots per inch (DPI) value.

The image format can be change into several formats by set the image format property for QR code image type such as gif, jpeg, png, bmp and tiff. After the settings are done, the URL can be generating into QR code with the properties set. The QR code image will be show as figure 3.13.

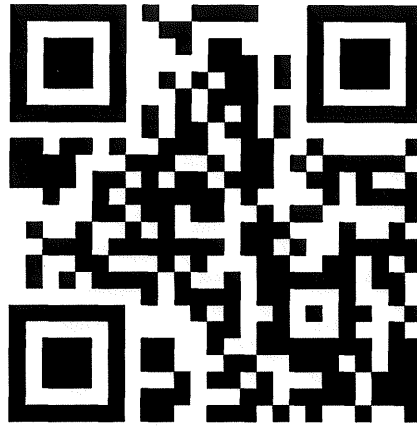


Figure 3.13: Image of QR code

3.6.2 Embedding QR code

In the system, Embedding QR code is a process of applying a QR code image into certificate which user need for checking the authentication. After the previous phase, Encoding Data has generated the URL of certificate into QR code; the image of QR code will be saved into a local folder image format. In order to place the QR code into the certificate, user has to browse the QR code image from the local folder and apply to the certificate. After QR code is placed, the certificate is ready to print out in paper.

3.6.3 Result

Result is the last phase for implement the certificate authentication using QR code. This phase is involving the process of checking the authentication of certificate. The checking processes of the certificate are as below:

- a) Scan the image of QR code using QR reader application
- b) QR reader analysis the information in QR code
- c) View the webpage of the URL from QR code
- d) Comparing the content of certificate from webpage and paper-based certificate

By using QR reader application, the certificate can be authenticating through the URL from QR code. The URL will be linked to the webpage of a real certificate. By comparing the information of certificate in that webpage and the paper-based certificate, the result of certificate authentication is checking.

3.7 Testing

Testing phase is the phase after doing the implementation phase. During this phase, the system is tested to ensure that the objective of the project is achieved or not.

The system program testing will begin by checking the function of the system. The testing should be discovering any errors from the system and proceed maintenance if necessary. The result will be compare to the expected result that as planned.

CHAPTER 4

IMPLEMENTATION

4.1 Introduction

In this chapter will discuss about the development of the system. The interfaces of the system and scripting techniques used will be explained in this chapter.

4.2 System Interface

Interface is considered as the main component in a system which is developed to ease the user in order to communicate and interact with the system. The interface of the system should be user friendly with a clear navigation tool, input and output and interactive which will attract attention from user. The interface of this system is attached in the Appendix section.

Universiti Malaysia PAHANG

KEMENTERIAN PENDIDIKAN MALAYSIA

MSC

CERTIFICATE AUTHENTICATION SYSTEM

Admin Login

Username

Password

[Log in](#)

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[Web hosting by Somee.com](#)

Figure 4.1: Home Page interface

In figure 4.1 shows the homepage interface of Certificate Authentication System using QR code. This page is for admin user to login where this system is only for admin.

Universiti Malaysia PAHANG

KEMENTERIAN PENDIDIKAN MALAYSIA

MSC

[Student Data](#) [Generate Code](#) [View Records](#) [Log Out](#)

STUDENT DATA ENTRY

Student Information

Full Name (e.g. AHMAD BIN ALI)

Matric No. (e.g. CD11048)

Identity Card/Passport No. (e.g. 911218125904)

Graduate Session (e.g. 2015)

Faculty

Bachelor

CGPA (e.g. 2.90)

[Save & Generate QR code](#)

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Figure 4.2: Data Entry Page interface

In figure 4.2 shows the interface for admin user to insert the information of student and the academic information in the database of system.

Universiti Malaysia PAHANG

KEMENTERIAN PENDIDIKAN MALAYSIA

Student Data Generate Code View Records Log Out

QR CODE GENERATOR

Student Information

Full Name LAI CHONG LAH

Matric No C011038

Link <http://www.c011040.com/001/014>

QR Code Properties

Encode Data Type UTF-8

QR code Size 100x100

Error Correction Level L

Generate

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Web hosting by www.scribd.com

Figure 4.3: QR generator interface

In figure 4.3 shows the interface for admin user to generate the information of student into QR code. The generate data will be based on the previous page student information which is refer from the database. The certificate hyperlink will be automatic generated based on the number Id of the data in database.



Figure 4.4: QR code interface

In figure 4.4 shows the interface after generate the information of student into QR code. The generate data will be based on the previous page student information which is refer from the database. The certificate hyperlink is automatic generated based on the number Id of the data in database.



Figure 4.5: The print preview

In figure 4.5 shows the print preview of the QR code with the student name, student matric ID, course subject and the result of the academic.



Figure 4.6: Information of certificate interface

In the figure 4.6 shows the interface for the end user in certificate authentication system. After user gets the hyperlink from scanning the QR code, the hyperlink will be connecting to the web server to retrieve data from database. The information of that student will be display out in the mobile screen as shown in figure 4.6.

4.3 QR Code Technique

The QR technology is used in certificate authentication system. The sizes of QR code are called versions, so the version of QR code in this system is 85 x 85 pixels (version 17) which is the suitable size for certificate. The error correction level of QR code is L which allows the code to be read even if 7% of it is unreadable.

There are four data modes that a QR code can encode which are numeric, alpha number, binary and Japanese (Kanji). The capacity depends on the version, error correction level, and the type of encoded data. The following are the steps on processing of generating QR code:

- I. Generate a binary string
- II. Error correction level
- III. Mask pattern
- IV. Generate QR code
- V. Add version information
- VI. Add data bits

4.3.1 Generate A Binary String

In order to generating binary string, first step is to encode the mode indicator. The mode indicator is a four-bit-string that represents the data mode. In the certificate authentication system, a link is generated which is an alpha numeric string, the mode indicator is 0010 and the length of the data is around 20 characters which is binary

10100. Thus, it is encoded using 11 bits, meaning it is padding with zeros becoming 00000010100. The final result will be 0010 00000010100.

To encode the alpha numeric data, it has to be break up the string into pairs of characters (link: ht, tp, :/, /u, mp, .s, om, ee, .c, om). For each pair of characters, take the ASCII value of the first character multiply it by 45, add the number to the ASCII value of the second character and convert the result into a 644-bit binary string. The figure 4.7 below shows the value of each alpha numeric in ASCII.

0 0	A 10	K 20	U 30	+ 40
1 1	B 11	L 21	V 31	- 41
2 2	C 12	M 22	W 32	. 42
3 3	D 13	N 23	X 33	/ 43
4 4	E 14	O 24	Y 34	: 44
5 5	F 15	P 25	Z 35	
6 6	G 16	Q 26	(space) 36	
7 7	H 17	R 27	\$ 37	
8 8	I 18	S 28	% 38	
9 9	J 19	T 29	* 39	

Figure 4.7: Figure of ASCII value

After that, the bits are terminated by make sure that it is the correct length. The QR code version 17 with level L error correction must have generated 5,176 data bits. If bit string is shorter than 5,176, then add up to four 0s to the end. Since the current string is 116 bits long, so the result will be 0010 00000010100 0000001100011010 000010100110010 0000011111100111 0000011110101101 0000001111110111 0000011101111110 0000010001001110 0000001010000100 0000011101101110 0000010001001110.

Lastly, it will delimit the string into 8-bit words which the data bits is break up the string into groups of 8 bits. If the last group is not 8-bits long, it will put it on the right with 0s.

4.3.2 Error Correction Level

QR codes are use Reed-Solomon error correction but first it requires the number of error correction code words that is needed to generate. In the system, the QR code is in version 17 with error correction level L. This combination requires 647 error correction code words. The message polynomial will be created by convert each 8-bit word from binary to decimal. The QR codes use a Galois field that has 256 elements, the numbers that dealing with will always be at most 255 and at least 0. The generator polynomial is always of the form $(x - \alpha) (x - \alpha^2) \dots (x - \alpha^t)$, where t is equal to the number of required error correction code words minus 1. Thus, in the system, there are 647 error correction code words, so t in this case is 646. After the result is calculated, it is convert to binary.

4.3.3 Mask Pattern

There are eight mask patterns that can be used to change the outputted matrix. Each mask pattern changes the bits according to their coordinates in the QR matrix. The purpose of mask pattern is to make the QR code easier for a QR scanner to read. Each mask pattern uses a formula to determine whether or not to change the color of the current bit. The figure 4.8 below shows the formula for mask pattern.

Mask Number	When to switch the bit
0	$(y + x) \bmod 2 == 0$
1	$y \bmod 2 == 0$
2	$x \bmod 3 == 0$
3	$(y + x) \bmod 3 == 0$
4	$((y / 2) + (x / 3)) \bmod 2 == 0$
5	$((y * x) \bmod 2) + ((y * x) \bmod 3) == 0$
6	$((y * x) \bmod 2) + ((y * x) \bmod 3) \bmod 2 == 0$
7	$((y + x) \bmod 2) + ((y * x) \bmod 3) \bmod 2 == 0$

Figure 4.8: Mask Pattern Formula

4.3.4 Generate QR Code

In order to generate a QR code matrix, start by making an empty matrix that is the correct size as specified in the version capacity of QR code. For a version 17 QR code, the QR code is in size of 85 x 85 matrixes. There are three position detection patterns that are always placed in the top left, top right and bottom right corners of the matrix.

All QR code must have a black pixel to the right of the top right pixel of the bottom left position detection pattern. The QR codes have timing patterns which are lines of alternating black and white pixels that go between the position detection patterns. Since the QR code is larger than version 2, it needed to add position adjustment patterns to the matrix. As an example, it should goes with 6, 30, 54, 78, and so on.

4.3.5 Add Version Information

The QR code that generated in the system is version 17; it will add version information bits to the matrix. These are placed to the left of the top right position detection pattern and above the bottom left position detection pattern as shows in figure 4.9 below.

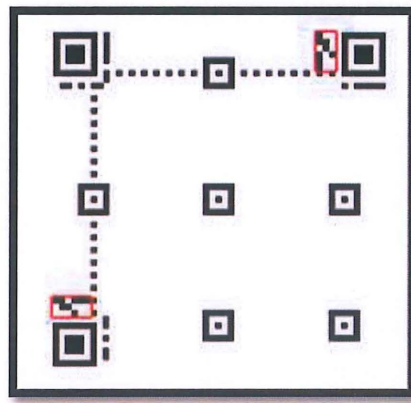


Figure 4.9: Add Version Information Bits

4.3.6 Add Data Bits

Last, the data bits are added in the QR code in a particular order which are upwards or downwards column. For upwards column, the two-pixel column continues to go upward, skipping any pixels that are already set, until it reaches the top of the QR codes. However, for downward column, once it reaches the top, a new two-pixel column starts, this time going downward.

4.4 Scripting Technique

The base scripting language used for the development of the project is .NET language and C# language. For database queries, MS SQL statement is used.

4.4.1 SQL statement using ASP.NET

In figure 4.8 below shows the coding for the SQL statement in ASP.NET. The system is connecting to the Student Record database by using SQL data source. SQL data source connect to the database in Somee.com which is a web hosting site as show in the Figure 4.10.

ASP.net

```
"Data Source=SQL5011.Smarterasp.net;Initial Catalog=DB_989050_StudentRecords;User id=DB_989050_StudentRecords_admin;Password=YOUR_DB_PASSWORD;"
```

Classic ASP

```
"Provider=SQLNCLI;Data Source=SQL5011.Smarterasp.net;Initial Catalog=DB_989050_StudentRecords;User id=DB_989050_StudentRecords_admin;Password=YOUR_DB_PASSWORD;"
```

PHP

```
mssql_connect('SQL5011.Smarterasp.net', 'DB_989050_StudentRecords_admin', 'YOUR_DB_PASSWORD');
```

SQL Management

```
Server Name: SQL5011.Smarterasp.net  
Authentication: SQL Server Authentication  
Login: DB_989050_StudentRecords_admin  
Password: YOUR_DB_PASSWORD
```

Figure 4.10: Connect database in Smarterasp.net

4.4.2 Retrieve data from SQL database using VB.NET

When page is load

- 7) Dim a as string
- 8) Get a query string request named "field1" as a
- 9) Dim conn as sql connection
- 10) Get a connection to the database to data source as SQL5011.Smarterasp.net, user ID is DB_9B9050_StudentRecords_admin and password is 12341234
- 11) Open the connection
- 12) Select the data from StudentRecord database
- 13) Loop through the data
 - a. Get the ID from the fields
 - b. Check to see if it's in the collection
 - c. If it is in the collection
 - i. Read the row of the data
 - d. If it is not in the collection, then display error message
- 14) Close connection

Figure 4.12: Pseudo code of retrieve data from SQL database

In figure 4.9 showed the code for retrieve data from SQL database. From the link in the encoded QR code, the full data information of student can be retrieve from the database by searching the student matric ID.

This project is using Somee.com as the web hosting site to control the system and database. It has provided a free domain link for the hosting webpage. In this project, as the aspx and aspx.vb files and database.mdf file upload into the hosting site, the url link is named as <http://ump.somee.com>.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Introduction

In this chapter will discuss about the expected result that should be obtained from the system.

5.2 Result

As the system is a fully web based system, it consists of mainly different types of web forms. At the end of this project, all the objective of the system is achieved. The system is capable to perform:

- I. Save information of student in database
- II. Generate information of student into a QR code
- III. Embed and print out the QR code, student name and ID into certificate
- IV. Retrieve student data from database by scan the QR code
- V. Able to edit, update and delete student from database

5.3 Test Result

The certificate authentication system is expected to execute as well with the proper error handling. In testing phase, the system is tested in order to get the output functionality. The results are as follow:

5.3.1 Test Data Entry Functionality

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MSC

Student Data Generate Code View Records Log Out

STUDENT DATA ENTRY

Student Information

Full Name: LAI CHONG LAN
(e.g. AHMAD BIN ALI)

Matric No.: CD11088
(e.g. CD11046)

Identity Card/Passport No.: 910504125432
(e.g. 911216125904)

Graduate Session: 2015
(e.g. 2015)

Faculty: Computer Systems & Software Engineering

Bachelor: Graphics & Multimedia Techno

CGPA: 3.21
(e.g. 3.00)

Save & Generate QR code

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Figure 5.1: Student Data Entry Interface

Table 5.1: Test Case Result (Test Data Entry Functionality)

Test case	Test step	Expected result	Actual Result	Pass/Fail
Check on response of insert all student data	1. Insert all student info 2. Click “save and generate QR code” button	The data inserted saved into database and passing the value of name and ID to the “GenerateQR.aspx”	The data inserted saved into database and passing the value of name and ID to the “GenerateQR.aspx”	Pass

Check on response without entering any data	1. Direct click “search and generate code” button without inserting student data	Error message shows “Please fill in all the information”	Error message shows “Please fill in all the information”	Pass
---	--	--	--	------

5.3.2 Test Student Record Functionality

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KEMENTERIAN PENDIDIKAN MALAYSIA
MSC
Higher Education

Student Data Generate Code View Records Log Out

STUDENT DATA UPDATE

Student Information

Matric No.

Full Name

Matric No.

Identity Card/Passport No.

Graduate Session

Faculty

Bachelor

CGPA

Delete Student Update Data Reprint QR code

Read database successful!

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Figure 5.2: Student Data Update Interface

Table 5.2: Test Case Result (Test Student Data Update Functionality)

Test case	Test step	Expected result	Actual Result	Pass/Fail
Check on response of edit and update data	1. Enter student ID 2. Click “Search” button to search student with student ID 3. Edit info 4. Click “Update Data” button	The data from database of that particular student is updated	The data from database of that particular student is updated	Pass
Check on response of reprint QR code	1. Enter student ID 2. Click “Search” button to search student with student ID 3. Click “Update Data” button	The system will pass the value of name and ID to the “GenerateQR.aspx” page	The system will pass the value of name and ID to the “GenerateQR.aspx” page	Pass

5.3.3 Test Student Search Functionality

The screenshot displays the 'STUDENT DATABASE RECORD' interface. At the top, there are logos for Universiti Malaysia PAHANG, KEMENTERIAN PENDIDIKAN MALAYSIA, and MSC. Below the logos are buttons for 'Student Data', 'Generate Code', 'View Records', and 'Log Out'. The main section is titled 'Student Information' and contains a 'Matric No.' input field with 'Search' and 'Show All' buttons. Below this is a table of student records.

ID	studentName	studentId	icNum	graduateSession	faculty	bachelor	cgpa
16	SITI BINTI AHMAD	CD11048	910504125432	2015	Computer Systems & Software Engineering	Software Engineering	3.47
17	AMY LIM	CB11098	910504125432	2015	Chemical & Natural Resources Engineering	Chemical Engineering Biotechnology	3.33
19	CHAN MIN TING	CD11048	911218125904	2016	Computer Systems & Software Engineering	Graphics & Multimedia Technology	3.33
22	LAI CHONG LAN	CD11088	910504125432	2015	Computer Systems & Software Engineering	Graphics & Multimedia Technology	3.21

At the bottom, there is a copyright notice: 'Hakcipta © 2014 Universiti Malaysia Pahang. Hak cipta terpelihar.'.

Figure 5.3: Student Record Interface

Table 5.3: Test Case Result (Test Student Search Functionality)

Test case	Test step	Expected Result	Actual Result	Pass/Fail
Check on response of search by entering a exist student ID	1. Enter student ID 2. Click "Search" button to search student with student ID	The data retrieved from database and displayed in textbox. A message label will show "Record retrieved from database successfully"	The data retrieved from database and displayed in textbox. A message label will show "Record retrieved from database successfully"	Pass
Check on response of search by entering a non-existent student ID	1. Enter student ID	No data retrieved from database	No data retrieved from database	Pass

of search by entering an inv student ID	2. Click "Search" button to search student with stud ID	database. A messag label will show "Re database NOT successfully"	database. A messag label will show "Re database NOT successfully"	
---	--	--	--	--

5.3.4 Survey

Other than testing the functionality of the system, a survey for testing the user experience is necessary in order to improve the usability of the system. This survey is using Google document to collect the response for user experience from the user. Since there are two different users in this system, there are two forms in this survey which are 5 people test for admin (staff of UMP) and 5 people test for end user (staff of company).

In figure 5.4 below shows the survey form for UMP staff which consists of 6 questions and the figure 5.5 shows the survey form for the company staff who will comment on system as the end user of system.

Certificate Authentication System Testing - Admin

Survey of user experience of system

1. Do you think the system is user friendly?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

2. All the button are functional.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

3. The system is interactive.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

4. The system have smooth flow from start to the end.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

5. The content of system is very useful.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

6. The interface of system is attractive.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

Figure 5.4: Survey Form for UMP Staff

Certificate Authentication System Testing - Company (End-user)

1. Do you think the system is user friendly?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

2. The content of system is very useful.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

3. The certificate authentication technique is effective.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Disagree

4. The system is needed in community.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

5. The system need more improvement.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly agree

Figure 5.5: Survey Form for Company Staff

Based on survey result for admin user, majority of the tester are strongly agree with the system is user friendly which 60% are. 40% of them are agreeing with the interactive of the system and buttons all are functional. However, 60% are agreeing with the system that has a smooth flow, useful content and attractive interface.

Apart from that, there is 80% of 5 company staff that complete this survey are agree that system is user friendly and has a useful content. 60% of them are agree with the certificate authentication technique is effective and the system is needed in community. 40% of them are commented that the system needs some more improvement.

In the table 5.4 below shows the result of the survey for admin user and table 5.5 shows for the end user.

Table 5.4: Result of Survey (Admin user)

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Do you think the system is user friendly	0%	0%	20%	20%	60%
2. All buttons are functional.	0%	0%	20%	40%	40%
3. The system is interactive.	0%	0%	60%	40%	0%
4. The system has smooth flow from start to end.	0%	0%	40%	40%	20%
5. The content of system is very useful.	0%	0%	0%	40%	60%
6. The interface of system is attractive.	0%	0%	40%	60%	0%

Table 5.5: Result of Survey (End user)

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Do you think the system is user friendly	0%	0%	20%	60%	20%
2. The content of system is very useful.	0%	0%	20%	60%	20%
3. The certificate authentication technique effective.	0%	0%	40%	60%	0%
4. The system is needed in community.	0%	0%	40%	60%	0%
5. The system needs more improvement.	0%	0%	60%	40%	0%

5.4 Discussion

In this section will be discussed about the result that obtained from the certificate authentication system using QR code. After obtained the result of testing the system, there were a few limitations and problems were found in this system.

5.4.1 Limitation and Problem

From the discussion, there are several limitations that may have an impact on smoothness of the system development, such as:

- a) Technical problem
- b) Software process

5.4.1.1 Technical Problem

In this project, the certificate authentication system is developing by using ASP.NET and the QR code reader as hardware to complete this system. It takes time to learn using this software and the way of implement it based on the development of the prototype. In the progress of developing this project, the experience of applying the algorithms may not sufficient to build up a system with fulfilling all those requirements.

Apart from that, the certificate authentication system using QR code is using a free web hosting site which is called Somee.com to control the interface and also the SQL database. The free web hosting package of Somee.com can be used to hosting this system for free with terms and conditions apply. The sequence of using this free web hosting site is that the website has to be visit by user at least 5 times a month otherwise it will be down from server. Besides that, the server connection for the hosting website was not stable and scalability, it takes some time to connect the database if there are a large number of people connect to this hosting site at a same time.

5.4.1.2 Software Process

Every phase that required in the software process needs a considerable time to accomplish. The development of this project may not too acquaint and merely a few experiences in developing the software process while developing other system.

CHAPTER 6

CONCLUSION

As conclusion, there are five chapters in this project. The first chapter is discussing about the introduction of the project, which includes problem statement, objectives of the project and scope project. There are three objectives; the first objective is to study the QR technology so that it is suit for applying the project. In this project, the process for authenticate certificate has to be study in order to get more understand about the system flow. Last objective is to develop the certificate authentication system by applying the QR technology on it.

On this project, previous systems are important for researching the idea of authentication methods used and technique applied. The researching helps in gathering all the necessary information for the development process on the system. Some research on the previous system about document authentication had been done as the case study on this project in order to increase the usability of the system. A comparison between the previous systems is also done to show the advantages and disadvantages among the systems so that the project in this time can be improve more.

Software Development Life Cycle (SDLC) model has used to planning the development progress of the project. Each phase of progress is in consequence flow while it can be reverse back to the previous phase. The process of the system development will be going on phase by phase until the system testing is done. Therefore, Certificate Authentication System is developed which helps to increase the authorization of certificate and also decrease the forged certificate used in community.

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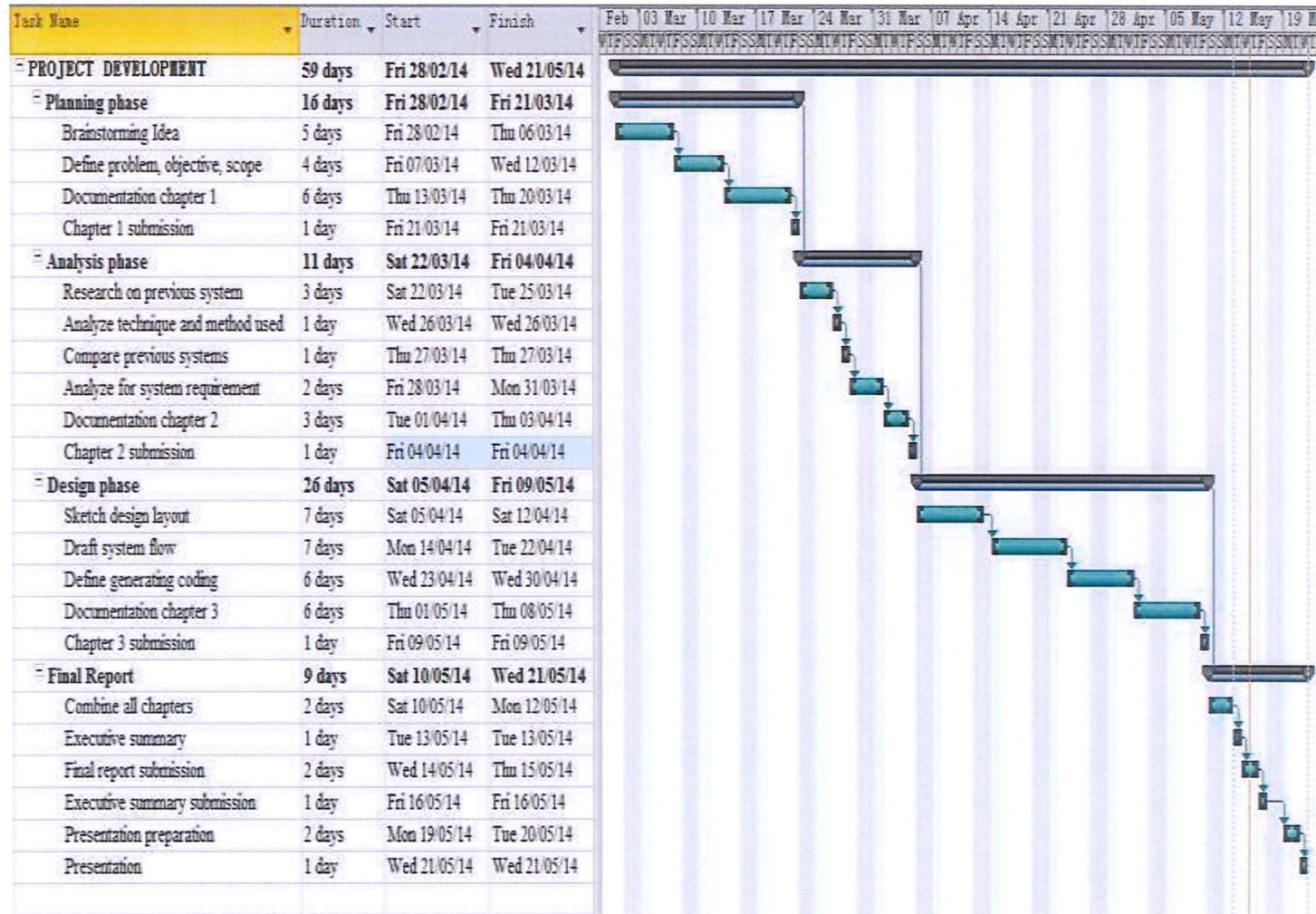
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<http://ieeexplore.ieee.org/xpl/articleDetails.jsp?reload=true&tp=&arnumber=6316569&queryText%3DQR+code+authentication>, (29 November 2011)

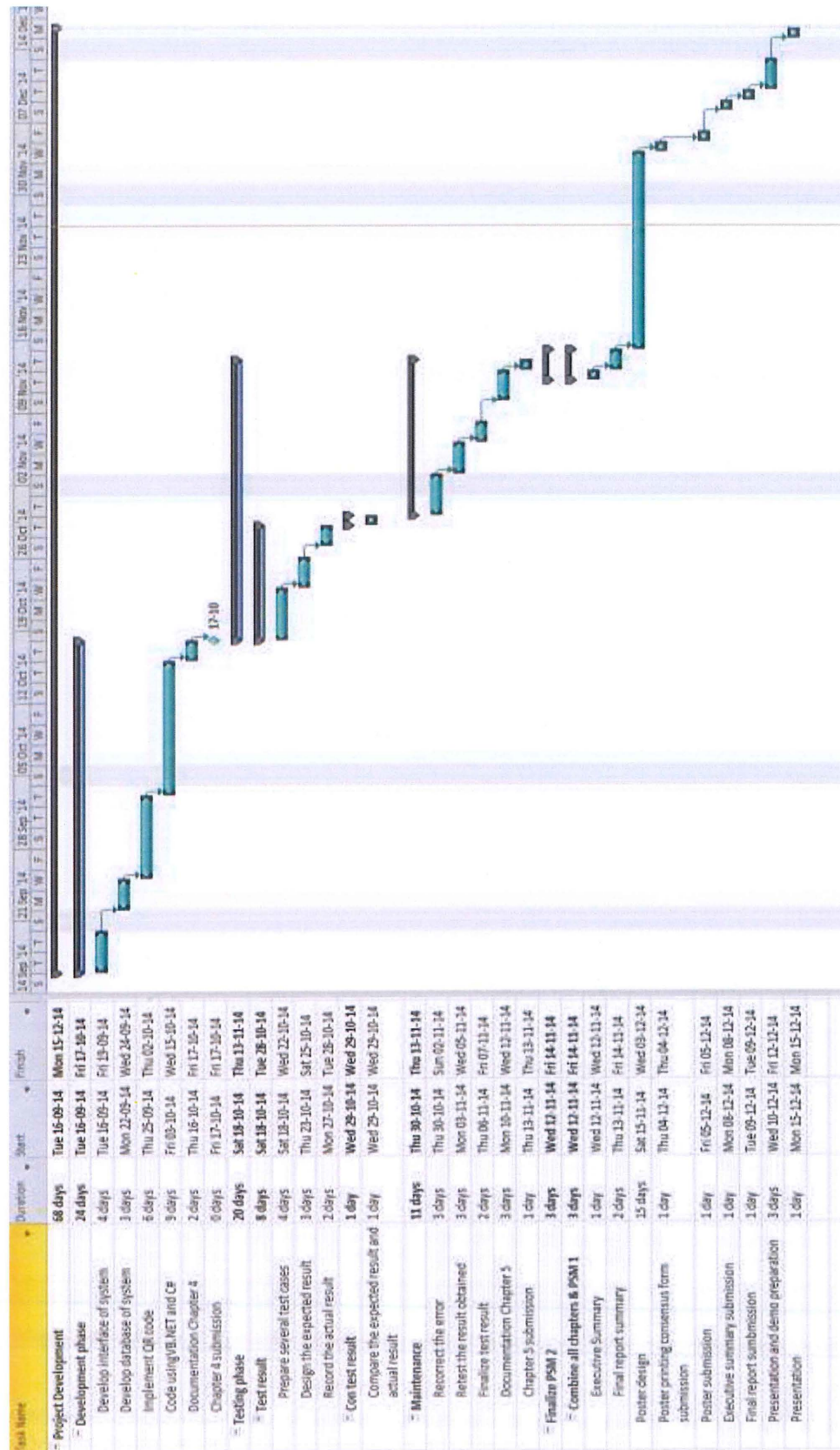
APPENDIX A

GANTT CHART



GANNT CHART: PSM 1

GANTT CHART: PSM 2



APPENDIX B

USER MANUAL

INTERFACE

I. Login page



The screenshot displays the login interface for the Certificate Authentication System. At the top, there are logos for Universiti Malaysia PAHANG, the Malaysian coat of arms, KEMENTERIAN PENDIDIKAN MALAYSIA, and MSC. Below these logos, the title "CERTIFICATE AUTHENTICATION SYSTEM" is centered. A grey bar labeled "Admin Login" is positioned above the login fields. The fields include "UserName" and "Password", each with a corresponding text input box. A blue "Log in" button is located below the password field. At the bottom, a copyright notice states "Hakcipta © 2014 Universiti Malaysia Pahang. Hak cipta terpelihara." followed by the text "Web hosting by Somee.com".

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Malaysia Skills Development

CERTIFICATE AUTHENTICATION SYSTEM

Admin Login


UserName



Password


Log in

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II. Student data entry

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MALAYSIA**

**MSC**
Malaysia Skills
Mastery Centre

Student Data Generate Code View Records Log Out

STUDENT DATA ENTRY**Student Information**

Full Name

LAI CHONG LAN
(e.g. AHMAD BIN ALI)

Matric No.

CD11088
(e.g. CD11048)

Identity Card/Passport No.

910504125432
(e.g. 911218125904)

Graduate Session

2015
(e.g. 2015)

Faculty

Computer Systems & Software Engineering ▼

Bachelor

Graphics & Multimedia Techn ▼

CGPA

3.21
(e.g. 3.00)

Save & Generate QR code

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III. Student Data Update

The screenshot displays the 'STUDENT DATA UPDATE' web application. At the top, there are logos for Universiti Malaysia PAHANG, KEMENTERIAN PENDIDIKAN MALAYSIA, and MSC. Below the logos are four buttons: 'Student Data', 'Generate Code', 'View Records', and 'Log Out'. The main section is titled 'STUDENT DATA UPDATE' and contains a 'Student Information' form. The form fields are as follows:


STUDENT DATA UPDATE	
Student Information	
Matric No.	CD11088
	<input type="button" value="Search"/>
Full Name	LAI CHONG LAN
Matric No.	CD11088
	Identity Card/Passport No. 910504125432
Graduate Session	2015
Faculty	COMPUTER SYSTEMS & SOFTWARE ENGINEERING
Bachelor	GRAPHICS & MULTIMEDIA TECHNOLOGY
CGPA	3.21

At the bottom of the form, there are three buttons: 'Delete Student', 'Update Data', and 'Reprint QR code'. Below these buttons, a red message states 'Read database successful!'. At the very bottom, a small copyright notice reads 'malcpa © 2014 Universiti Malaysia Pahang. malcpa leipahang.'

IV. Student Record



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MSK

Student Data
Generate Code
View Records
Log Out

STUDENT DATABASE RECORD

Student Information

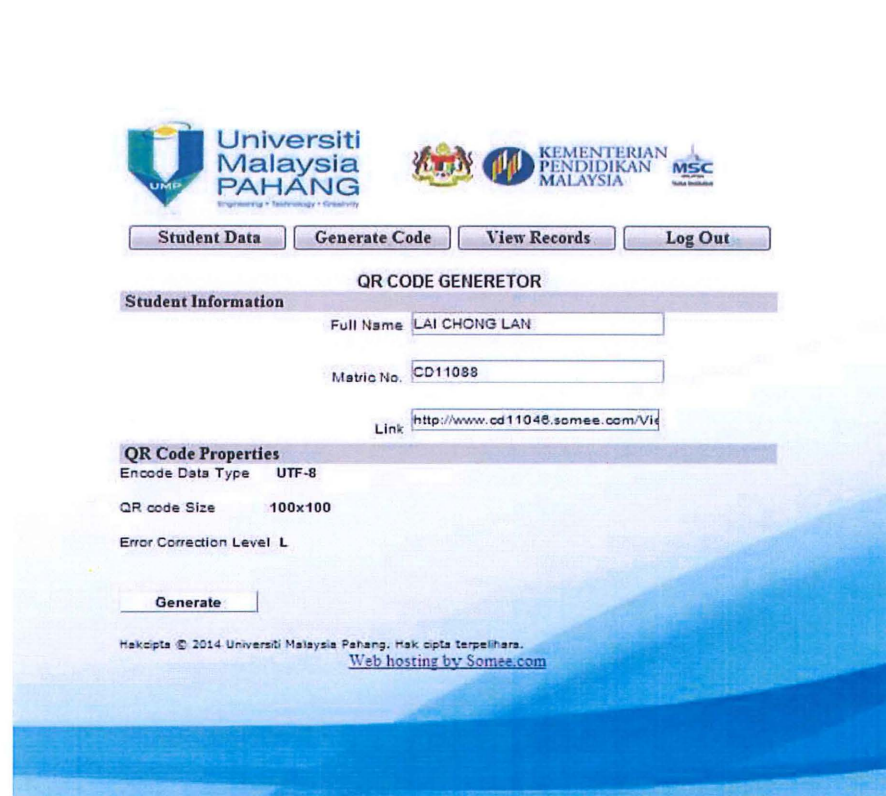
Matric No.

Search
Show All

ID	studentName	studentId	icNum	graduate Session	faculty	bachelor	cgpa
16	SITI BINTI AHMAD	CD11049	910504125432	2015	Computer Systems & Software Engineering	Software Engineering	3.47
17	AMY LIM	CB11098	910504125432	2015	Chemical & Natural Resources Engineering	Chemical Engineering Biotechnology	3.33
19	CHAN MIN TING	CD11046	911218125904	2016	Computer Systems & Software Engineering	Graphics & Multimedia Technology	3.33
22	LAI CHONG LAN	CD11088	910504125432	2016	Computer Systems & Software Engineering	Graphics & Multimedia Technology	3.21

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V. Generate QR code



The screenshot displays the 'QR CODE GENERATOR' web application. At the top, there are logos for Universiti Malaysia PAHANG, KEMENTERIAN PENDIDIKAN MALAYSIA, and MSC. Below the logos are four buttons: 'Student Data', 'Generate Code', 'View Records', and 'Log Out'. The main section is titled 'QR CODE GENERATOR' and contains two sub-sections: 'Student Information' and 'QR Code Properties'. In the 'Student Information' section, there are input fields for 'Full Name' (LAI CHONG LAN), 'Matric No.' (CD11088), and 'Link' (http://www.cd11046.somee.com/Vid). The 'QR Code Properties' section shows 'Encode Data Type' as UTF-8, 'QR code Size' as 100x100, and 'Error Correction Level' as L. A 'Generate' button is located below these properties. At the bottom, there is a copyright notice: 'Hakcipta © 2014 Universiti Malaysia Pahang. Hakcipta terpelihara. Web hosting by Somee.com'.

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MSC

Student Data Generate Code View Records Log Out

QR CODE GENERATOR

Student Information

Full Name LAI CHONG LAN

Matric No. CD11088

Link <http://www.cd11046.somee.com/Vid>

QR Code Properties

Encode Data Type UTF-8

QR code Size 100x100

Error Correction Level L

Generate

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VI. QR code



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KEMENTERIAN
PENDIDIKAN
MALAYSIA



MSC
Malaysia Skills Certificate

CERTIFICATE QR CODE

QR code



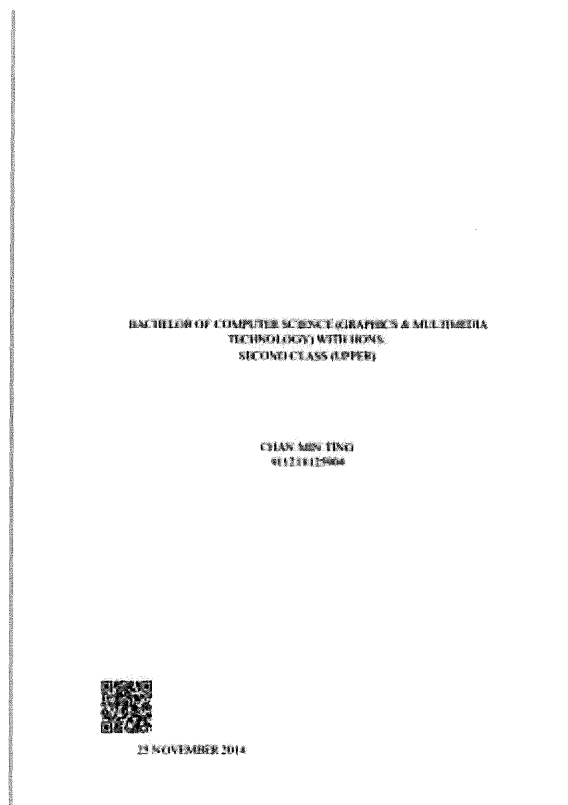
The student information is generated into QR code successfully!

Back

Embed

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VII. Print preview of certificate



APPENDIX C

SOURCE CODE

StudentData.aspx.vb

```

Imports System.Data.SqlClient
Imports System.Data

Partial Class StudentData
    Inherits System.Web.UI.Page

    Protected Sub button1_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button1.Click
        Response.Redirect("StudentData.aspx")
    End Sub

    Protected Sub button3_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button3.Click
        Response.Redirect("Record.aspx")
    End Sub

    Protected Sub button4_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button4.Click
        Response.Redirect("Default.aspx")
    End Sub

    Protected Sub Button6_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Button6.Click
        If name.Text = "" Or id.Text = "" Or ic.Text = "" Or Gsession.Text = "" Or
cgpa.Text = "" Then
            msg.Text = "Please fill in all the information!"
        Else
            Session("username") = name.Text
            Session("id") = id.Text
            Session("ic") = ic.Text
            Session("bachelor") = bachelor.SelectedItem.Text
            Session("cgpa") = cgpa.Text
            SqlDataSource1.Insert()
            Response.Redirect("GenerateQR.aspx")
        End If
    End Sub

    Protected Sub SqlDataSource1_Inserted(ByVal sender As Object, ByVal e As
System.Web.UI.WebControls.SqlDataSourceStatusEventArgs) Handles
SqlDataSource1.Inserted
        'Dim sID As Char = e.Command.Parameters("@ID").Value.ToString()

        Dim sID As String = e.Command.Parameters("@ID").Value.ToString()

        'Dim sID As Integer =
Convert.ToInt32(e.Command.Parameters("@studentList").Value)

        Session("idNum") = sID
    End Sub

```

```

Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load
    If Not IsPostBack Then
        ' Read sql server connection string from web.config file
        Dim sConstr As String =
ConfigurationManager.ConnectionStrings("StudentRecordsConnectionString").ConnectionS
tring

        Dim Conn As New SqlConnection(sConstr)
        Dim dt As New DataTable("tbl")

        Using Conn
            Conn.Open()
            Dim comm As New SqlCommand("SELECT ID,Name FROM Faculty ORDER BY
Sort", Conn)
            Dim da As New SqlDataAdapter(comm)
            da.Fill(dt)
        End Using

        factList.DataSource = dt
        factList.DataTextField = "Name"
        factList.DataValueField = "ID"
        factList.DataBind()
        factList.Items.Insert(0, New ListItem("--Select--"))
    End If
End Sub

Protected Sub factList_SelectedIndexChanged(ByVal sender As Object, ByVal e As
System.EventArgs) Handles factList.SelectedIndexChanged
    If factList.SelectedIndex > 0 Then
        Dim sConstr As String =
ConfigurationManager.ConnectionStrings("StudentRecordsConnectionString").ConnectionS
tring

        Dim Conn As New SqlConnection(sConstr)
        Dim dt As New DataTable("tbl")

        Using Conn
            Conn.Open()
            Dim comm As New SqlCommand("SELECT ID,Name FROM Course WHERE
FacultyID=" + factList.SelectedValue & " ORDER BY Sort", Conn)
            Dim da As New SqlDataAdapter(comm)
            da.Fill(dt)
        End Using

        bachelor.DataSource = dt
        bachelor.DataTextField = "Name"
        bachelor.DataValueField = "Name"
        ' Bind sql server data into the Dropdown List
        bachelor.DataBind()
    Else
        bachelor.Items.Clear()
    End If
End Sub

```

GenerateQR2.aspx.vb

```

Imports System.Data.SqlClient

Partial Class GenerateQR2
    Inherits System.Web.UI.Page

    Protected Sub Search_Click(ByVal sender As Object, ByVal e As System.EventArgs)
        Handles Search.Click
            Dim student As String

            Dim conn As SqlConnection = New SqlConnection("Data
Source=StudentRecords.mssql.somee.com;Initial Catalog=StudentRecords;Persist
Security Info=True;User ID=mavisc_SQLLogin_1;Password=hxq4e37qzi")
            conn.Open()

            SqlDataSource1.SelectCommand = "select * from StudentRecord where studentId
=" + id1.Text + ""
            Dim com As SqlCommand = New SqlCommand(SqlDataSource1.SelectCommand, conn)
            Dim reader As SqlDataReader = com.ExecuteReader()

            If reader.Read() Then
                name.Text = reader("studentName").ToString
                id.Text = reader("studentId").ToString
                ic.Text = reader("icNum").ToString
                Gsession.Text = reader("graduateSession").ToString
                factList.Text = reader("faculty").ToString
                bachelor.Text = reader("bachelor").ToString
                cgpa.Text = reader("cgpa").ToString
                Label1.Text = reader("ID").ToString
                student = reader("ID").ToString
                reader.Close()

                msg.Text = "Read database successful!"
                Session("student") = student
            Else
                msg.Text = "Read database NOT successful!"
            End If
            conn.Close()
        End Sub

        Protected Sub Button6_Click(ByVal sender As Object, ByVal e As System.EventArgs)
            Handles Button6.Click
                Session("username") = name.Text
                Session("id") = id.Text
                Session("ic") = ic.Text
                Session("bachelor") = bachelor.Text
                Session("cgpa") = cgpa.Text
                Response.Redirect("GenerateQR.aspx")

            End Sub

```

```

Protected Sub button1_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button1.Click
    Response.Redirect("StudentData.aspx")
End Sub

Protected Sub button3_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button3.Click
    Response.Redirect("Record.aspx")
End Sub

Protected Sub button4_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button4.Click
    Response.Redirect("Default.aspx")
End Sub

Protected Sub Update_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Update.Click
    SqlDataSource1.Update()
    msg.Text = "Data is updated"
End Sub

Protected Sub Button7_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Button7.Click

    SqlDataSource1.Delete()
    Response.Redirect("GenerateQR2.aspx")
End Sub

Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load
    Session("username") = name.Text
    Session("id") = id.Text
    Session("ic") = ic.Text

```

GenerateQRversion2.aspx.cs

```

using System;
using System.Data;
using System.Configuration;
using System.Collections;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Web.UI.HtmlControls;
using System.Collections.Specialized;
using System.Text;
using System.Drawing;
using System.Drawing.Imaging;
using System.IO;

public partial class GenerateQRversion2 : System.Web.UI.Page
{
    protected void Page_Load(object sender, EventArgs e)
    {
        String username = (String)Session["username"];
        String stid = (String)Session["id"];
        String stic = (String)Session["ic"];
        String bachelor = (String)Session["bachelor"];
        String cgpa = (String)Session["cgpa"];

        name.Text = username;
        id2.Text = stid;

        if (name.Text != "" || id2.Text != "")
        {
            link.Text = "http://www.cd11046.somee.com/View.aspx?field1=" + stid;
        }
        else
        {
            Label1.Text = "Can not generate QR code!";
        }

        if (hfFirst.Value.Equals("true"))
        {
            hfFirst.Value = "false";
            barcodeImage.ImageUrl = "qrcode.aspx";
        }
        else
        {
            generateBarcodeImage();
        }
    }
}

```

```

StringBuilder builder = new StringBuilder();
for (int i = 0; i < values.Count; i++)
{
    if (i != 0)
    {
        builder.Append("&");
    }
    builder.Append(values.GetKey(i));
    builder.Append("=");
    builder.Append(HttpUtility.UrlEncode(values.Get(i)));
}

barcodeImage.ImageUrl = "qrcode.aspx" + builder.ToString();
}

private NameValueCollection createQueryString()
{
    NameValueCollection values = new NameValueCollection();

    values.Add("Data", link.Text);
    values.Add("Encoding", type.Text);
    values.Add("Version", ctrVersion.Text);
    values.Add("ECL", levell.Text);
    values.Add("EnableStructuredAppend", ctrEnableStructuredAppend.Text);
    values.Add("StructuredAppendCount", ctrStructuredAppendCount.Text);
    values.Add("StructuredAppendIndex", ctrStructuredAppendIndex.Text);
    values.Add("FNC1Mode", ctrFNC1Mode.Text);
    values.Add("ApplicationIndicator", ctrApplicationIndicator.Text);
    values.Add("ECI", ctrECI.Text);
    values.Add("ProcessTilde", ctrProcessTilde.Text);

    values.Add("UOM", ctrUOM.Text);
    values.Add("ModuleSize", ctrModuleSize.Text);
    values.Add("LeftMargin", ctrLeftMargin.Text);
    values.Add("RightMargin", ctrRightMargin.Text);
    values.Add("TopMargin", ctrTopMargin.Text);
    values.Add("BottomMargin", ctrBottomMargin.Text);
    values.Add("Resolution", ctrResolution.Text);
    values.Add("ImageFormat", ctrImageFormat.Text);

    return values;
}

protected void Button5_Click(object sender, EventArgs e)
{
    Session["link"] = link.Text;
    BarcodeLib.Barcode.QRCode barcode = new BarcodeLib.Barcode.QRCode();
    barcode.Data = link.Text ;

    barcode.ModuleSize = 3;
    barcode.LeftMargin = 0;
    barcode.RightMargin = 0;
    barcode.TopMargin = 0;
    barcode.BottomMargin = 0;

```

```

// save barcode image into your system
barcode.drawBarcode("QRcode.aspx");

// generate barcode & output to byte array
byte[] barcodeInBytes = barcode.drawBarcodeAsBytes();

String username = (String)Session["username"];
String stid = (String)Session["id"];
String stic = (String)Session["ic"];
String bachelor = (String)Session["bachelor"];
String cgpa = (String)Session["cgpa"];

Session["username"] = username;
Session["id"] = stid;
Session["ic"] = stic;
Session["bachelor"] = bachelor;
Session["cgpa"] = cgpa;
Session["lin"] = barcode.drawBarcode();

Response.Redirect("QRcode.aspx");

}
protected void button1_Click(object sender, EventArgs e)
{
    Response.Redirect("StudentData.aspx");
}
protected void button2_Click(object sender, EventArgs e)
{
    Response.Redirect("GenerateQR2.aspx");
}
protected void button3_Click(object sender, EventArgs e)
{
    Response.Redirect("Record.aspx");
}
protected void button4_Click(object sender, EventArgs e)
{

```

QRCode.aspx.vb

```

Partial Class QRcode
    Inherits System.Web.UI.Page

    Private Property Command1 As Object

    Protected Sub Button1_Click(ByVal sender As Object, ByVal e As System.EventArgs)
        Handles Button1.Click
            Response.Redirect("StudentData.aspx")
        End Sub

    Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
        Handles Me.Load

            Dim ans As String = Session("qr")
            Dim username As String = Session("username")
            Dim stid As String = Session("id")
            Dim ic As String = Session("ic")
            Dim bachelor As String = Session("bachelor")
            Dim cgpa As String = Session("cgpa")

            Image2.ImageUrl = ans
            Image8.ImageUrl = ans
            stname.Text = username
            stic.Text = ic

            If bachelor.ToString = "Software Engineering" Or bachelor.ToString =
"Graphics & Multimedia Technology" Or bachelor.ToString = "Computer System &
Networking" Then
                course.Text = "BACHELOR OF COMPUTER SCIENCE (" + bachelor + ") WITH
HONS."
            Else
                course.Text = "BACHELOR OF " + bachelor + " WITH HONS."
            End If

            If cgpa.ToString > 3.66 Then
                result.Text = "FIRST CLASS"
            ElseIf cgpa.ToString > 2.99 And cgpa.ToString < 3.67 Then
                result.Text = "SECOND CLASS (UPPER)"
            ElseIf cgpa.ToString > 2.32 And cgpa.ToString < 3.0 Then

```


View.aspx.vb

```

Imports System.Data
Imports System.Data.OleDb
Imports System.Data.SqlClient

Partial Class View
    Inherits System.Web.UI.Page

    Private Property dv As Collections.IEnumerable

    Private Property cmd As Object

    Private Property dr As Object

    Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
        Handles Me.Load
            Dim a As String
            a = Request.QueryString("field1")

            Dim conn As SqlConnection = New SqlConnection("Data
Source=StudentRecords.mssql.somee.com;Initial Catalog=StudentRecords;Persist
Security Info=True;User ID=mavisc_SQLLogin_1;Password=hxq4e37qzi")
            conn.Open()

            SqlDataSource1.SelectCommand = "select * from StudentRecord where studentId
=" + a.ToString + ""
            Dim com As SqlCommand = New SqlCommand(SqlDataSource1.SelectCommand, conn)
            Dim reader As SqlDataReader = com.ExecuteReader()

            If reader.Read() Then
                name.Text = reader("studentName").ToString
                id.Text = reader("studentId").ToString
                ic.Text = reader("icNum").ToString
                Gsession.Text = reader("graduateSession").ToString
                factList.Text = reader("faculty").ToString
                bachelor.Text = reader("bachelor").ToString
                cgpa.Text = reader("cgpa").ToString
                reader.Close()

                Label1.Text = "Authentication process is DONE!"
            End If
        End Sub
    End Class

```

Record.aspx.vb

```

Imports System.Data.OleDb
Imports System.Data.SqlClient
Imports System.Data

Partial Class Record
    Inherits System.Web.UI.Page

    Protected Sub button1_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button1.Click
        Response.Redirect("StudentData.aspx")
    End Sub

    Protected Sub button3_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button3.Click
        Response.Redirect("Record.aspx")
    End Sub

    Protected Sub button4_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button4.Click
        Response.Redirect("Default.aspx")
    End Sub

    Protected Sub search_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles search.Click
        SqlDataSource1.SelectCommand = "SELECT * FROM StudentRecord WHERE
studentId=' " + id1.Text + "' "
        GridView1.DataBind()
    End Sub

    Protected Sub button2_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles button2.Click
        Response.Redirect("GenerateQR2.aspx")
    End Sub

    Protected Sub showall_Click(ByVal sender As Object, ByVal e As System.EventArgs)
Handles showall.Click

```

Default.aspx.vb

```

Partial Class _Default
    Inherits System.Web.UI.Page

    Protected Sub Button1_Click(ByVal sender As Object, ByVal e As System.EventArgs)
        Handles login.Click

            If username.Text = "cd11046" And password.Text = "123" Then
                Response.Redirect("StudentData.aspx")
            Else
                msg.Text = "Please enter the correct Username or Password."
            End If

        End Sub
    End Sub

```

Web.config

```

<?xml version="1.0"?>

<!--
  For more information on how to configure your ASP.NET application, please visit
  http://go.microsoft.com/fwlink/?LinkId=169433
-->

<configuration>
  <connectionStrings>
    <add name="ConnectionString" connectionString="Data
Source=.\SQLEXPRESS;AttachDbFilename=|DataDirectory|\StudentRecords.mdf;Integrated
Security=True;User Instance=True"
      providerName="System.Data.SqlClient" />
    <add name="StudentRecordsConnectionString" connectionString="Data
Source=StudentRecords.mssql.somee.com;Initial Catalog=StudentRecords;Persist
Security Info=True;User ID=mavisc_SQLLogin_1;Password=hxq4e37qzi"
      providerName="System.Data.SqlClient" />
  </connectionStrings>
  <system.web>
    <customErrors mode="Off"/>
    <compilation debug="true" strict="false" explicit="true"

```

QRCode.aspx – Print Cert

```

<%@ Page Language="VB" AutoEventWireup="false" CodeFile="QRcode.aspx.vb"
Inherits="QRcode" %>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">
<head>
    <title></title>
    <style type="text/css">

        body {
            background-image: url('silver-light-blue-wave-abstract-backgrounds-
powerpoint1.jpg');
            background-repeat: no-repeat;
            background-attachment: fixed;
            background-size: 100% 100%;
            background-position: center;
        }

        td {
            color: #000000;
            font-family: Verdana, Arial, Helvetica, sans-serif;
            font-size: 11px;
            padding-left: 5px;
            padding-right: 5px;
        }

        .style1
        {
            font-size: medium;
            font-family: Arial, Helvetica, sans-serif;
            width: 298px;
            text-align: center;
            height: 77px;
        }

        td.Category {
            background-color: #D8D9DB;
            text-align: left;
        }

        .Tiny {
            color: #000000;
            font-size: 9px;
            text-align: right;
        }

        tr.Even {
        }

        .style4
        {
            width: 298px;

```

```

<script type = "text/javascript">

    function PrintPanel() {
        var panel = document.getElementById("<%=pnlContents.ClientID %>");
        var printWindow = window.open('', '', 'height=400,width=800');
        printWindow.document.write('<html><head><title></title>');
        printWindow.document.write('</head><body><div style="position:
relative;bottom: -38%; margin-left:10% ;margin-right:5% ;">');
        printWindow.document.write(panel.innerHTML);
        printWindow.document.write('</div></body></html>');
        printWindow.document.close();
        setTimeout(function () {
            printWindow.print();
        }, 500);
        return false;
    }

</script>
</head>

<body>
    <form id="form2" runat="server">

        <div style="display: none;">
        <asp:Panel id="pnlContents" runat = "server" Height="382px">
        <center style="height: 242px">
            <asp:Label ID="course" style="text-transform:uppercase"
runat="server"></asp:Label>
            <br />
            <asp:Label ID="result" style="text-transform:uppercase"
runat="server"></asp:Label>
            <br /><br /><br /><br />
            <br />
            <asp:Label ID="stname" style="text-transform:uppercase"
runat="server"></asp:Label>
            <br />
            <asp:Label ID="stic" style="text-transform:uppercase"
runat="server"></asp:Label>
        </center>

        <asp:Image ID="Image8" style="margin-top:40%" runat="server" />
        <br />
        <asp:Label ID="Label3" style="text-transform:uppercase; margin-left:10%"
runat="server"></asp:Label>

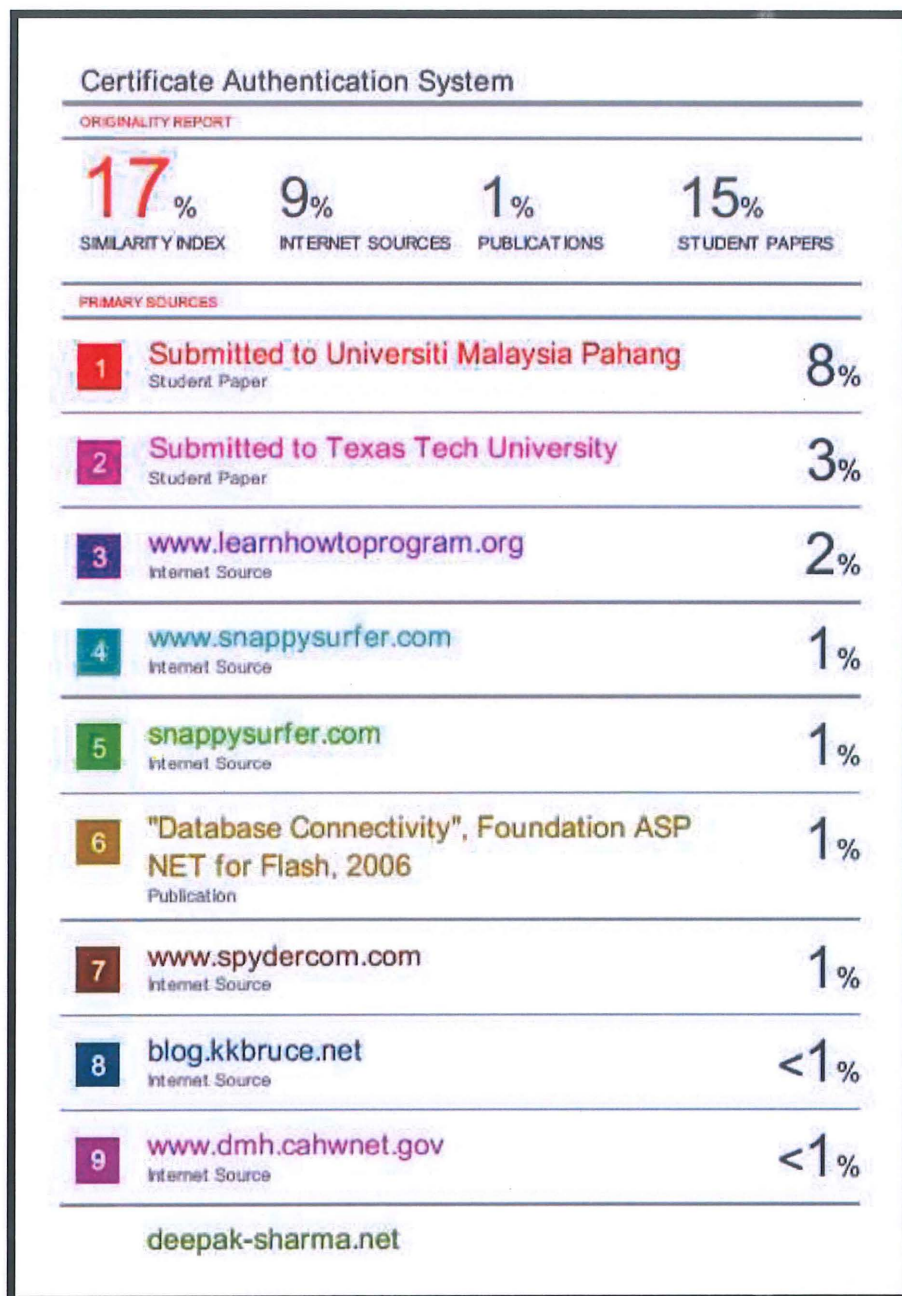
    </asp:Panel>
</div>

    <table align=center width="600px" border="0" cellpadding="1"
bordercolor="Gray">

```

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