Business Cards Management System

With QR Technology (Mobile Application)

BY

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ABSTRACT

Business Card Management System aims to provide an environment for mobile users to manage their business cards. Functions of the Business Card Management System include business card storage, view business card, search business card, and exchange business card with third parties and providing updated information. Several useful features also includes in the System such as direct call or SMS from the system's Contact List.

One of the primary features of the mobile system is that it support synchronize update of card information or details added by the user. This feature can help the user to avoid having out-dated information.

The system will involve Quick Respond (QR) Code technologies as one of the media to exchange or share contact with third parties. The system has a server component to update changes of the contact made by the owner of the cards.

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LIST OF ABBREVIATIONS

<u>H</u>

HCCB   High Capacity Color Barcode

<u>I</u>

IDE   Integrated Development Environment

<u>M</u>

MMCC   Mobile Multi-Colour Composite

<u>N</u>

NFC   Near Field Communication

<u>O</u>

OS   Operating System

<u>R</u>

RFID   Radio Frequency Identification

<u>Q</u>

QR   Quick Respond

<u>S</u>

SQL   Structured Query Language

Chapter 1: Introduction

1.1 Project Background

Business cards had been used as a popular way to exchange contact information since 17th century in Europe. The first generation of business cards were used as an announcement cards when there was arrival of prosperous or aristocratic people to their area. In 19th century, Business cards had become a popular "social cards" in the upper middle class circle, which created the very first impression of individuals. (Science and Lifestyle 2012)

After a few generations, business cards had become a very popular method to exchange contact information in every industry. The modern business cards are not only provides the name of the card holder, his or her title, company information and contact information, but also includes basic professional data such as nations academic degrees and honours. (Science and Lifestyle 2012)

Although business cards are widely accepted as the media to exchange information, but it still have to be improved and enhanced due to its limitations. The limitations of business cards are discussed in the following section.

1.2 Problem Statement

The first issue arising from traditional business cards are on the utilization of the content of business cards. Traditionally, storing of information from business cards into phone or computers are done manually by typing all the information one by one. It is a bit tedious and error rates often increase due to typo and misreading of card.

Even without storing the information into phone or computers, another issue would arise when user needs to get the information from a particular business card. He or She needs to search for the card from a large amount of business cards which will be a tedious process.

Moreover, the nature of business cards is difficult to keep or store, it increases the chances of losing the cards. Hence, losing of cards causes the loss of information as well. Besides, traditional business cards are hard to retrieve and track when there are in large amounts. The use of business cards is very common in every industry. An individual would share at least 5 cards in an official meeting. This shows that the use of business cards is actually not eco-friendly.

Last but not least, contact information on business cards are normally demanded only when necessary. Normally business party conduct each other rarely as well as when contact is necessary. This indicates that the information printed on business cards will not be the latest information since the information might be out-dated as time goes by. Therefore, this might not meet the objective of exchanging contact information.

1.3 Project Objectives

This project aims to enhance the traditional Business Card and make it more effective and compatible with the current technology. The digitalization of information will be done by implementing the QR codes.

QR codes are serving as a media to store information and exchange information with other parties. This project is also aimed to reduce the time of storing and retrieving the information on business cards.

This project is not only to increase the effectiveness of business card but also aims to ensure the accuracy and reliable of the information, where all the information provided is always up to date. Synchronized update of individual's information can be provided which are not available in using the traditional business cards. This will enable the owner of the digital card to dynamically update his or her information without worrying his or her acquaintances not getting the updates.

1.4 Project Scope

A novel ways to enhance traditional business cards is to interact with mobile application. This project develops a mobile application to solve the limitation of using the traditional business cards.

Scope of this project includes a system that is able to change information into digital format. This shall occur by having Quick Respond (QR) Code to represent the cards information in digital format. The digitalized information is able to extract directly into the mobile devices.

In addition, this project also provides a server part that is able to store all the business cards information. Furthermore, it could allow synchronize of information through the server.

1.5 Impact, Significance and Contribution

In recent years, a lot of studies regarding the use of mobile applications to overcome the limitations of business cards have been established. This shows that society are concerning on the issues of current business cards system.

Digitalized business cards are not totally new in the market. However, the issues of out-dated contact information in business cards are yet to be solved. This is one of the major problems of business cards. To ensure that the users can reach the intended person to be contacted, information on business cards need to be updated.

The contribution of this project is to provide a new version of business cards distribution which can change the way of human communicating with each other and to provide a proper business card management system. This can help thousands or even millions of people from various industries that have their business cards on hand to connect each other easily with a mobile device. Furthermore, this will be the next evolution of business cards which best meet the objective of having business cards which is to get reliable information and contact whenever needed.

1.6 Background Information

Starting from the new evolution of smart phone, people are getting more and more relying on their mobile phone. The used of QR code are also getting more compatible with the mobile phone which has a QR code scanner installed.

QR code, is a two dimensional symbol created in 1994 under the name of DENSO. QR code has high capacity encoding of data compare to the traditional barcode. Instate of storing average 20 digits with the traditional barcode, QR code have better performance by encoding up to 7,089 characters in single symbol. (Qrcodeguide.org, n.d.)

In year 2002, the QR code started to be integrating in mobile phone which utilized the embedded camera. It is an easier ways to distributes and exchange information in digital form by scanning the QR code.

Chapter 2: Literature Review

2.1 Types of Barcode

The type of barcodes that has been reviewed includes traditional 1-Dimentional (Linear) barcode, High Capacity Color Barcode (HCCB), Mobile Multi-Colour Composite (MMCC) barcode and Quick Response (QR) code.

1-Dimentional (Linear) barcode is a black-and-white striped codes which being widely used and printed on most of the customer product as a Universal Product Code. Linear barcode can use to represents simple information such as product code, but it is not sufficient to store complicated information. (Ong, Chai & Rassau 2011)

Figure 2.1.F1 1-Dimensional (Linear) barcode

(Siong Khai Ong, Chai, D., Rassau, A 2011)

High Capacity Colour Barcode (HCCB) technology was invented by Microsoft and marked as Microsoft Tag. HCCB enhance 2-Dimentional barcodes up to 8 different colours used. HCCB used the thicker black boundary at the bottom of HCCB to identify and acts as an orientation landmark, for easy location. HCCB is able to support up to 2,000 binary bytes, or 3,500 alphabetical characters.

However the main limitation of HCCB is the related to the fragility of the detection and alignment mechanisms. (Grillo, Lentini, Querini & Italiano 2010)

Figure 2.1.F2 Example of HHCC

(Ong, Chai & Rassau 2011)

Mobile Multi-Colour Composite (MMCC) barcode is also known as a 2-Dimention Barcode which involved the use of colour to expand its capacity. MMCC with the words Mobile, it is mainly designed to use with the camera in the mobile device. However, MMCC codes do not support error correction whereby the encrypted information will not be accurate when the code is distorted or damaged. (Ong, Chai & Rassau 2010)
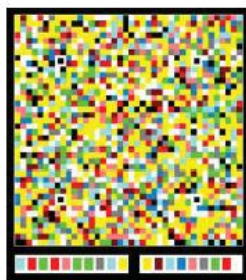
Figure 2.1.F3 Example of MMC barcode

(Ong, Chai & Rassau 2010)

Quick Response (QR) code is a type of 2-Dimentinal barcode which was invented in year 1994 under Denso-Wave. QR codes improved the reading speed of traditional 1-Dimention barcode. (Rouillard 2008) .A QR codes are basically a combination of function graphics and encode region. (Liao, Huang, Wang & Zhou 2010)

The QR codes are designed with the 3 clear position patterns. These 3 position patterns are important for easy location and also allow the QR code to scan in any degree. Compare to the linear barcode which has limited capacity, QR code provides greater capacity that can support up to 7089 numeric characters and 4296 alphanumeric characters. Moreover, barcode are commonly not readable when the code is dirty or damaged. In QR codes, it has the ability for error correction where data are still able to restore even though some parts of the code are not readable. (Sutheebanjard, Premchaiswadi 2010). These are the reasons for the popular used of QR codes in carrying information.

Figure 2.1.F4 Example of QR code

(Ong, Chai & Rassau 2010)

In case of implementing barcode technology with the Business cards, HCCB and MMCC are not suitable because of the use of colour. Different device might have different colour balance which will eventually affect the result of the decoding process. Besides, these two barcode technology are easily distracted by the external environment which include light condition. Although the QR code increases its side when the data store increases, but it is still sufficient for storing information or data on a business cards. The faster respond time of QR codes also matches the requirement in exchanging information of business cards.

2.2 Encoding and Decoding of QR codes

QR codes are popularly used in interacting information with the smart phone device in recent years. Many researches have been done regarding to the QR Code generator and scanner.

Generating or encoding QR codes through the web browsers that facilitates user to convert and encode their information into a QR codes are already available in the market. The QR codes can be generated by using some open source software includes Libqrencode, Drupal and Ubuntu. Genarated or encoded QR codes can be easily obtained with those QR generator engine on web, but this method is only able to perform in the web browser with the internet connections. (Sutheebanjard, Premchaiswadi 2010)

Besides encoding QR code through online web services, the proper steps in QR encoding are also reviewed. The first step of QR code stacked encoding is to select the appropriate version of QR code.

Coding capability need to be considered and smallest number is chosen for information accommodation. The original information is divided into blocks. The size of each blocks are depends on the medium size and the amount of information according to the selected QR version earlier on. Each block is then encoded with the segmentation process. The Stacked encoding output completed where specific bar code output composed according to its application scenarios and environment. (Xiao, Yang & Luo 2011)

For segmentation decoding, digital image processing method is implemented to obtain the better result of image by noise reducing. Each individual barcode in the image are identified by the location before being organised and merge with the QR code decoding algorithm. After all these process, the original document is restored and ready for the next steps. Geometric characteristic of the targeted area in Binary image is easier to obtain after noise reduction. Edge detection is the carry out to determine the specific location of a single barcode. Nation standard reference decoding algorithm is then identify and restore the original information. (Xiao, Yang & Luo 2011)

2.3 Android Platform

Android is an open source mobile platform developed in year 2007 by Open Handset Alliance under Google, Inc. Android structure can be divide into several level which includes kernel and low level tool, native libraries, Android runtime, framework layer and application layer. The following Figure descripts the structure of Android in graphical manner.
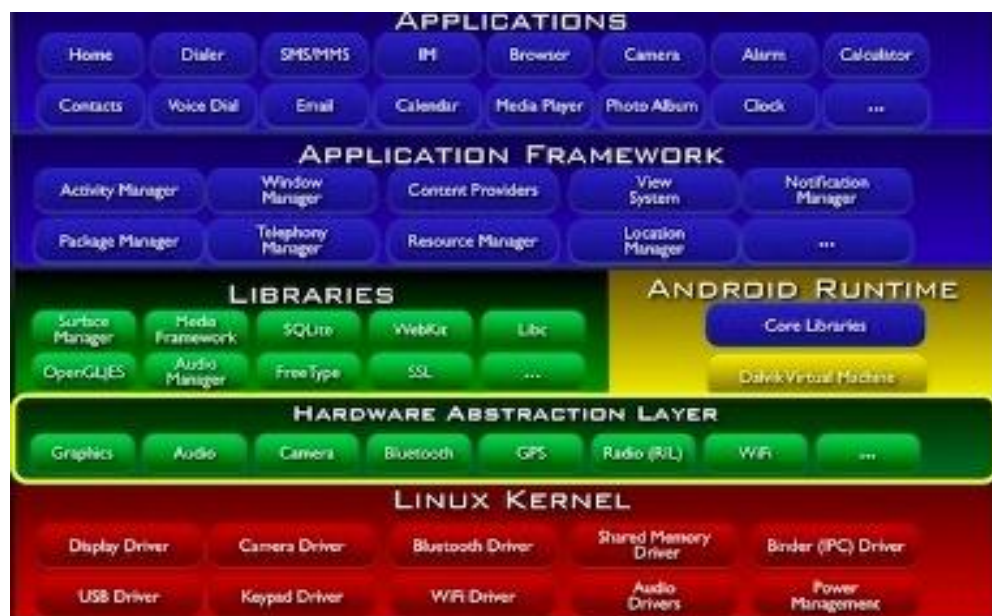

Figure 2.3.F1 Android Architecture (Soulbuzz.net 2010)

Focus on the concern in the application development, Java language was the programming language involved. In Android, developer are given full access to some selected framework APIs used by the application based. Reuses of resources are encouraged in this architecture to allow developer to make use of those capabilities.

Libraries C/C++ was included in Android and open to the developer by the Android framework. Moreover, C standard library implementation, libraries for media, graphics, 3D, and SQLite are also included. (Anand, Kumar & Murthy 2012)

The class of Android platform are well design with consistency and predictability. High resource management and documentations encourages developer to develop applications on Android which is much more easy and reachable with the help of resources. (Anand, Kumar & Murthy 2012)

2.4 Related Work

The problems of Business cards have been realized by researchers and lots of research has been carried-out to resolve those problems. However, the limitations of business cards are still exist.

The used Mobile Multi-Colour Composite (MMCC) code in reading the contact information on the Business Cards is also proposed by Ong, Chai & Rassau, (2011).

The advantages of using MMCC codes in storing information of business cards are basically similar with using QR code. It provides easy reading of accurate information in a short period of time. However, MMCC has a risk on reading the code since it involves more colours used. The more the number of colour used might result in wrongly decode the symbol. Moreover, the used of MMC code are not as portable as QR code since the reading of the code are required internet connection. On the other hand, QR code reader do support portable database which allows user to obtain information of line.

Previous work such as Bin, Zhang &Yang (2011) also comes out a management system to overcome the problems of Business card in retrieving and searching. This paper proposed a management system which requires a scanner device to scan the information in the cards and use the web as the interacting media to search and retrieved information. The advantage of this paper was the associative contact search which supports search by association of contact leveraging memory cues. But in the aspect of capturing the information from business cards, the proposed method was using a device to scan the business card.

This may say as the limitation of this paper where using an external device to scan information are not so convenient and user friendly.

Beside 2-dimention barcode and scanner, build-in camera in mobile device also uses to capture and store business cards as proposed in Hua, Liu, Zhang & Wu (2006).In this paper, it suggested to use Camera as a scanner for the business card where to capture and rectified the business cards. One of the major problems of this method is the information provided in the business cards are still presented in the image form where user are required to manually key in the data whenever they need. Besides, inappropriate way of holding the cards while scanning might block some of the important information on the cards.

2.5 Review on Existing Mobile Applications

Numerous existing systems regarding the similar issues of business card are available in the markets. This shows that the problems and limitations of traditional business cards are concerned by the society. From the huge number of existing applications, two was selected to review in the following subtopics namely Card Shake and CamCard.

2.5.1 Card Shake

Card Shake is a free application which allows user to create and exchange their digital business card by Bluetooth. It is available in Apple Store and moving towards Android platform. It has more than 100,000 active users all over the world since year 2010.

Card Shake allows user who do not have a real business card to create their Avatar E-Business Card. Beside filling relevant information, it also allows user include their photo and also picture of the real business card. Card Shake support exchange of business card with others by Bluetooth.

After exchanging cards, tags can be added to each contact person for easier searching and categories. Text messaging, calling, map navigation, SNS, and connection to web sites are also supported in this application, for example, user can directly click on the Call button to call the contact person. User also can add a short memo on each contact person for future information. Import or export address book from user contact list or Microsoft outlook also allowed.

Although it supports much useful function in enhancing limitation of Business Card, however it has some limitations. Card Shake has to be installed in both devise then only allows exchanging contact information. This makes the application not flexible enough to tolerate.

Another condition must be satisfied before exchange contact is both devise must with the same OS platform, this limits the user flexibility on exchanging contact information from Android to other OS platform, such as Iphone. (Play.google.com 2012)

Furthermore, Card Shake do not support dynamic changes, user are allows to update their information easily using the application, but updated information will not automatically send to other user which sharing contact information. This may cause loss of contact with other user if the contact information has been changed.

2.5.2 CamCard

Cam Card is a Business Card reader and also acts as a business card scanner. It has more than 5,000,000 users all over the world. CamCard enhance business card limitation by capture and recognizes business card information, contact information is then saves to Card Holder or user's address book.

User are required to capture the image of the Business card, CamCard are will be extract directly from the business card. CamCard ables to Recognize 16 languages including English, Simplified Chinese, Traditional Chinese, Korean, Japanese, French, and so on.

For new user who does not have a business card, CamCard provides several templates to create e-Business Card from information provided. User can choose to create a card manually or import a contact from phonebook, a card will be created automatically.

After saving contact information, user allows to store their cards in Cloud securely provided by CamCard to serve as a private backup. Because of the use of Cloud, data can be restored if accidentally deleted by user. Not only restore, user allows to manage and synchronize cards across multi-devices with the Cloud Sync.

CamCard allows user to create creation and recognise QR Code and share cards with QR Code. Card Exchange process will be more convenient with the use of QR code, email and SMS.

Contact information can be exported to Excel and vCard formats. Search functions are well supported. Upon exchanging contact, similar to CardShake in previous section, it also allows user to enter short memo to keep some short notes. (Play.google.com 2012)

CamCard provides many functions and features that impress user, however it have its limitations too. As tested with several business cards, results show that the information extract from the cards might not be accurate due to some of the external factors. Some factors will influence the result of extraction such as physical damage on the cards, resolution of the image, lightness, mixture of the colour on the cards and so on.

Furthermore, instance updating information also not supported in this application. Updated information are not manage to update the other user who sharing contact. Again, loss of contact might happen.

2.6 Near Field Communication (NFC) Technology

Near Field Communication Technology with the short form of NFC, is a form of contactless communication between mobile portable devices such as tablets and smart phone. NFC rely on contactless communication which allows sending information without touching both devices but only wave the smartphone over the NFC capable device. It is a subset of Radio Frequency Identification (RFID) but enhanced its security with a shorter communication range with the effective distance within 4 to 5 centimetres and uses encryption when sending sensitive information. (Near Field Communication. 2011)

NFC is very much emphasis on security issue. NFC Forum which founded in year 2004 by Sony, Nokia and Philips come out a series of strict standards that must meet by the manufacturers when designing NFC compatible devices. This enhances its security level and yet remains easy-to-use with different versions of technology. NFC is becomes a popular payment and data communication methods in parts of Europe and Asia, and is continuous spreading throughout the United States. (Near Field Communication. 2011)

NFC allows communications between active devices and passive devices or peer to peer communication between active devices. Active devices could be the NFC compatible device and NFC tag is one of the examples of passive devices.

Smart poster which embedded with NFC tags is one of the examples which provide information but do not retrieve anything from the reader. (Near Field Communication. 2011) On the other hand, sending and receiving information could be done in communication between active devices.

The first NFC-compatible cell phone is Nokia 6131. After years, more and more specifications emerged and continuous enhancement finally Android come out its first NFC phone in year 2010 named Samsung Nexus S.

Not only payment, but NFC also provides a new platform for information exchange. It also benefits for both businesses and individuals since it is integrated credit cards, subway tickets, and paper coupons all into one device which provide a faster communication channel and conveniences. (Near Field Communication. 2011)

NFC has high potential to become a biggest trend in information exchange. It provides a faster, easier, more secure transactions and options in exchanging information. It is more versatile compare to QR Codes.

However, there are still some of the reasons for not implementing NFC technology in this project currently. First, not all Android devices are currently NFC-compatible; Samsung Galaxy Ace, Samsung Galaxy Y and Samsung Galaxy W are some of the example. It could be a future enhancement while all the devices are NFC-compatible, but implementing NFC now in this project will only limit the flexibilities of the applications. (NFC World. 2013)

Seconds, to enable communication between NFC devices or Tags, either the NFC is embedded inside the device or it can be installed via a SIM or microSD card. The cost of NFC SIM depends on manufacturer, average range from US$ 0.3 to US$ 1.0 per piece in large quantity. Implementing NFC technology in this project will add a significant cost compare to QR codes which is totally free. (NFC World. 2013)

Third, the effective distance of NFC is within 4 to 5 centimetres where QR code can be scanned from a distance, depending on the size of the printed code.

Hence, implementing NFC in this project might be the future planning and QR code is still the most suitable media for sharing information in this project. Figure below shows the comparison of NFC and QR Code with pros, cons and Ideal Use Cases.

Technology	NFC	QR Code
Pros	• Very natural to use. Touch is a very natural action. • Immediate response i.e. Touch and Go is possible. • Performing a "touch" does not require any education. Mostly anyone can do a "touch" (including toddlers) • Requirement of "proximity" i.e. within 6-10 cm's of a tag offers you inherent security, privacy. • Not subject to "lighting" conditions. NFC Tags can be used in "no light" conditions also. • Can be "hidden" from the eye sight i.e. it can be a "back stage" technology and does not interfere with visualization of an artifact.	• Almost Free (not exactly free but extremely cost effective). • Easy to create or produce. • Requires only a connected device i.e. phone or a PC. For paper format, requires a printer. • Distance is not an issue as Size & Shape can be varied. You can make them as big as you want. There are examples where a QR code is covering the entire building front. • No impact of environment i.e. presence of a "metal" surface or not. • No inventory management issues.
Cons	• Cost – Tags are still expensive as compared to "Free" option. • Fixed Size & Shape: Large Posters require more than 1 NFC Tags. • Procurement and inventory management issues associated with NFC tags. • Requires more than a PC & a Printer. Requires either standalone NFC readers/writers or NFC enabled phones to "read" or "write" the NFC tags. • Proximity or Distance: Requires Tags to be reachable i.e. reader must be inside the "reading range". • Tags come with a "read limit". For example, a million read for a tag. (I do not know what happens after the read limit. Guess, an experiment is needed) • Presence of "metal" surrounding may cause interference.	• Requires presence of a Bar Code Reader application on the device. • Requires "Enough Light" to be present near the QR code. • Requires users to be bit "steady" during the scan. • Requires "bit of action" on user's front i.e. take out the phone, launch the app, scan the code. • Prone to "liquid" or other "stains".
Ideal Use Cases	• Use cases which have requirements of "quick response" and "high value" information delivery attached to them. • Use cases where "time is of the essence" and visitors / users would like "instant gratification". • In short, use cases where the "cost" of NFC tags is justified. • Examples: Ticketing, Payment, Customer Suggestions, Real Estate, Retail, Medical etc.	• Use cases which are bit relaxed on "quick response" front and "cost" is a concern. • Examples: Marketing, Magazines, Education Books, News Papers etc.

Figure 2.6.F1 Comparison of NFC and QR Code. (Alok Patel. 2012)

Chapter 3: Requirement

3.1 Methodology

3.1.1 Methods and Technologies Involved

In this project, android platform is selected for the development of the mobile application. This project involved using Eclipse as the integrated development environment (IDE). For database, MySQL are selected to interact with the system. The server is running on Apache server.

The methodology selected to implement in this project is Prototyping, which is under Rapid Application Development. Prototyping methodology performs the analysis, design and implementation phase concurrently, and all the three phases are performed repeatedly in a circle until the system is completed. (Mbaknol.com, n.d.). A clear process flow was shown in the figure 1.
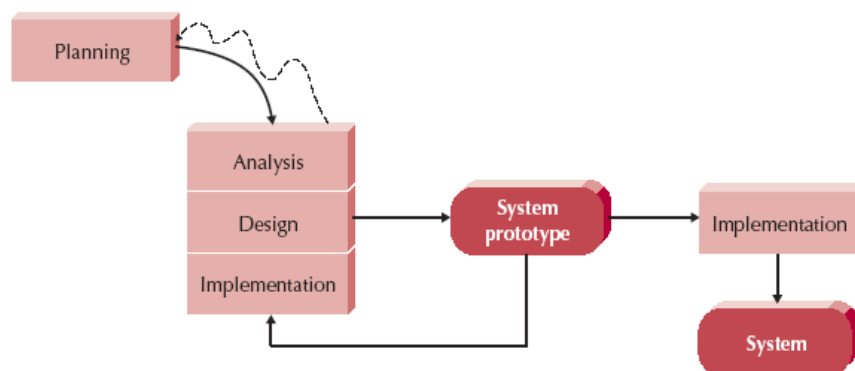

Figure 3.1.F1 Prototyping Methodology

(Dennis, Wixom & Tegarden 2010)

In the planning stage, scope of the project was defined as stated in the earlier part of this report. Some basic understanding and related studies has been done in this stage. Other than this, research on QR code, Business Cards, Android platform and Study on existing application been done to gather more information and knowledge on the related field to ensure the feasibility of the system to be implemented in the coming future. After research, the problems of existing application have been identified such as unable to ensure information reliability.

User's requirements are analyzed in the analysis phase by evaluating similar mobile applications available in the market. The flows of capturing and digitalized business cards are noted. The function, concept, logic, usability and many other factors are analyzed from these applications to obtain the basic requirements of the application. By evaluating the existing application, new requirements and the concept of new applications are investigated.

In the design phase, system specification is developed based on the physical design, architectural design, interface design, database and file design and also program design. User interface design are aim to provide simple and yet user friendliness interface to present information. Database design are develop according to the project needs in order to perform add, update, and retrieve information effectively. The flow of the application is designed including the interaction between application and the server.

The application or system is developed in the implementation phase. The logic of the applications is coded in the Java programming language. Repeated testing is conducted with random users. Analysis, design and implementation phase are repeated based on user feedback until the system is completed.

3.1.2 Implementation Issues and Challenges

The challenging part of this project is the interaction between the server and the applications to provide updated information of contact person in the sense of information reliability and accuracy.

The system needs to be able to provide updated information about the other user which is sharing the contact. This can ensure that whenever users wish to contact particular contact person, they can always reach them without facing the problem of loss of contact.

3.1.3 Timeline

The project duration was set to around 46 weeks until the end of Project II. The planning phase and analysis phase in this project was conducted starting from the beginning of the May trimester, 28th May until the end of the trimester. The design phase and implementation phase are completed in the end of May 2013 semester as stated in the Gantt chart in Appendix.

Each phase in the project cycle have at least a milestone to check on the progress of the project to make sure it is in the right track. Buffer time was set before the project dateline to reserve for uncertainty such as delayed tasks due to lack of resources or skills.

3.2 Specification

Unified Modeling Language (UML), a standard set of diagramming techniques is implemented in this project.

The use case diagram is used to capture and document the business requirement of the system. Whereas, sequence diagrams are used to describe both logical and physical interaction between objects by emphasis time based ordering behaviour of objects activities in a use case. The idea and concept of this project is represented in class diagram by clarifying the relationship between classes.

For database design, it is represented by Entity Relationship Diagram (ERD) to descript the relationship between entities. Last but not least, the user interface designs are represented in simple illustration in diagrams.

3.2.1 System Design
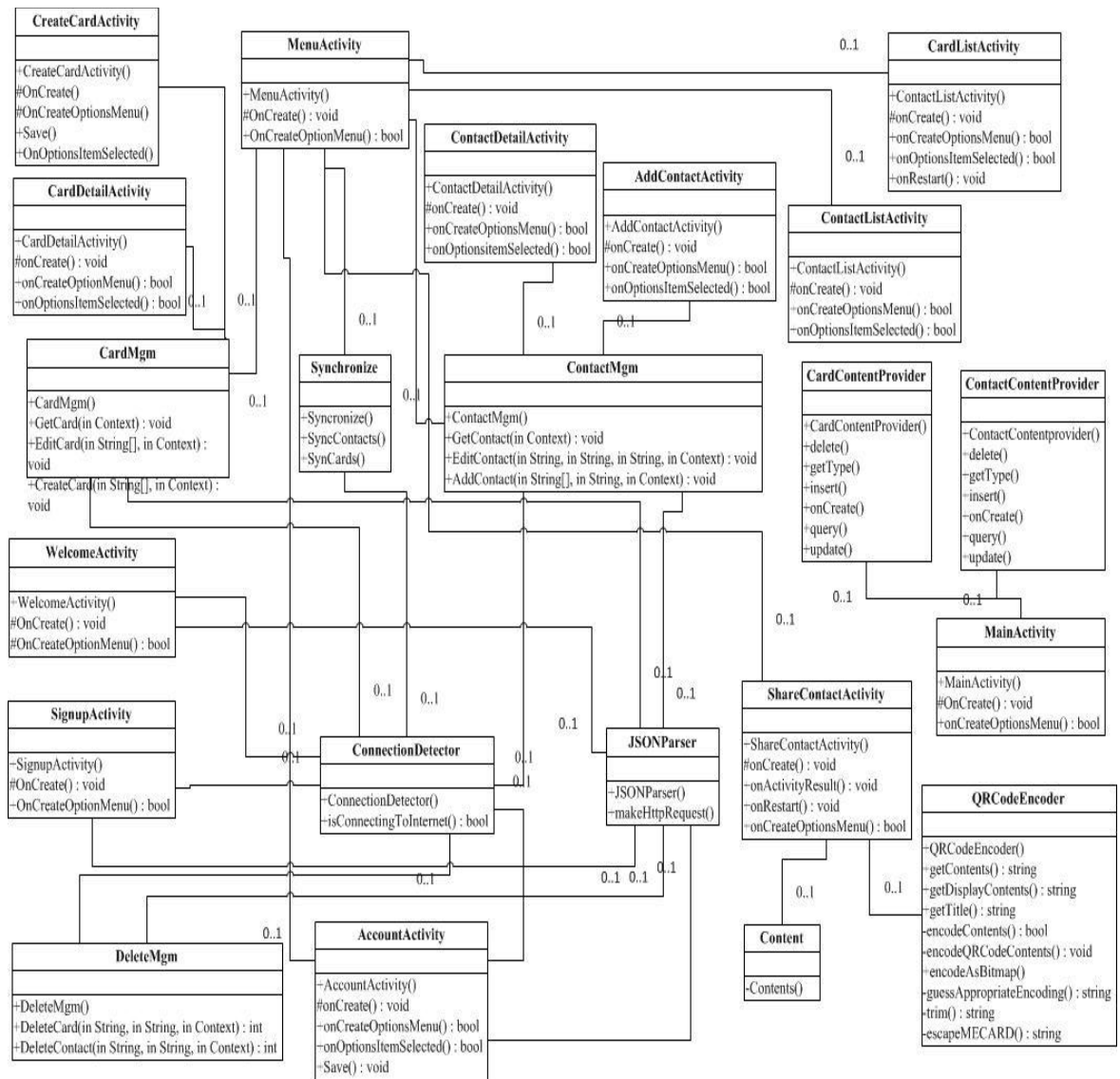
Figure 3.2.1.F1Class Diagram

3.2.2 Use Case Diagram

Figure 3.2.2.F1 Use Case Diagram

In this project, there are total 6 use cases involved. First, new user need to register a new account before they can access to the application. Upon registered, user are log in automatically to the system. After login, user is allowed to create their own business card, create QR code, add contact by scanning QR code as well as synchronize the system with server to get latest information.

3.2.3 Sequence Diagram

Sequence Diagram for Register Account
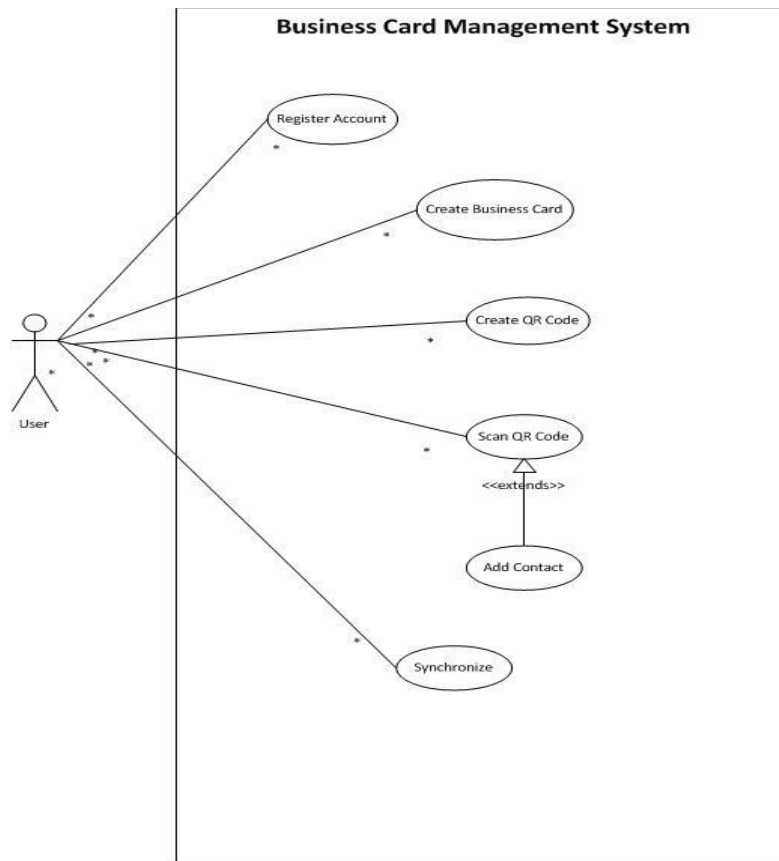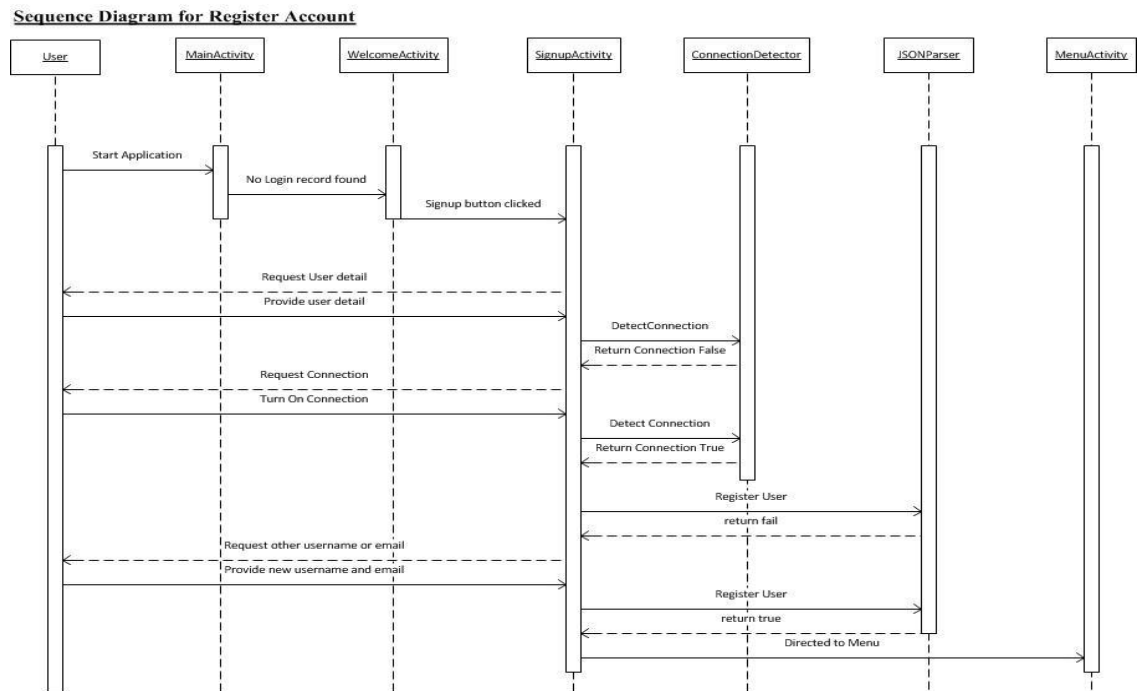

Figure 3.2.3.F1 Sequence Diagram for Register Account

Procedures:

1. User clicks the application icon and application activated.

2. MainActivity check for previous login history.

3. WelcomeActivity activated since no login history found.

4. User clicks on Register Button and enter to SignupActivity.

5. User fills in particulars and click for Register Button.

6. System detects available network connection by ConnectionDetector.

7. When connection exists, call JSONParser class to pass data to server and get response.

8. Registration completed successfully and user enters to main menu.

Sequence Diagram for Create Business Card
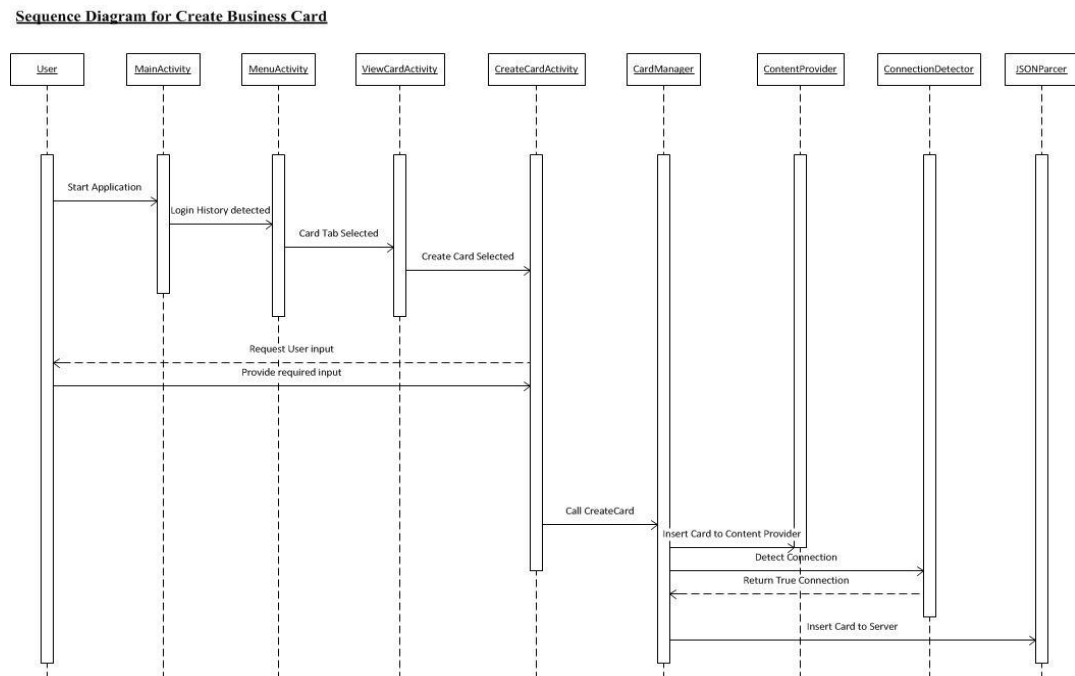
Figure 3.2.3.F2 Sequence Diagram for Create Business Card

Procedures:

1. User starts the application.

2. Login history found by MainActivity.

3. User select on My Card Tab.

4. User clicks on the phone's menu button and select Create Card.

5. CreateCardActivity activated and prompt for user details such as name, job title, company name and so on.

6. CreateCard method from CardMgm called when Save Button clicks.

7. Card stores in SQLite through ContentProvider.

8. ConnectionDetector check the availability of network connection.

9. When network connection detected, data are passed to server through JSONParser class. Card is saved in server database.

Sequence Diagram for Create QR Code

Figure 3.2.3.F3 Sequence Diagram for Create QR Code

Procedures:

1. User starts the application and login to the application since login history found.
2. User enters the menu and click to Share Card Tab.
3. User selects a card to share from the drop down list.
4. Selected card passed to QRCodeEncoder to generate QR code.
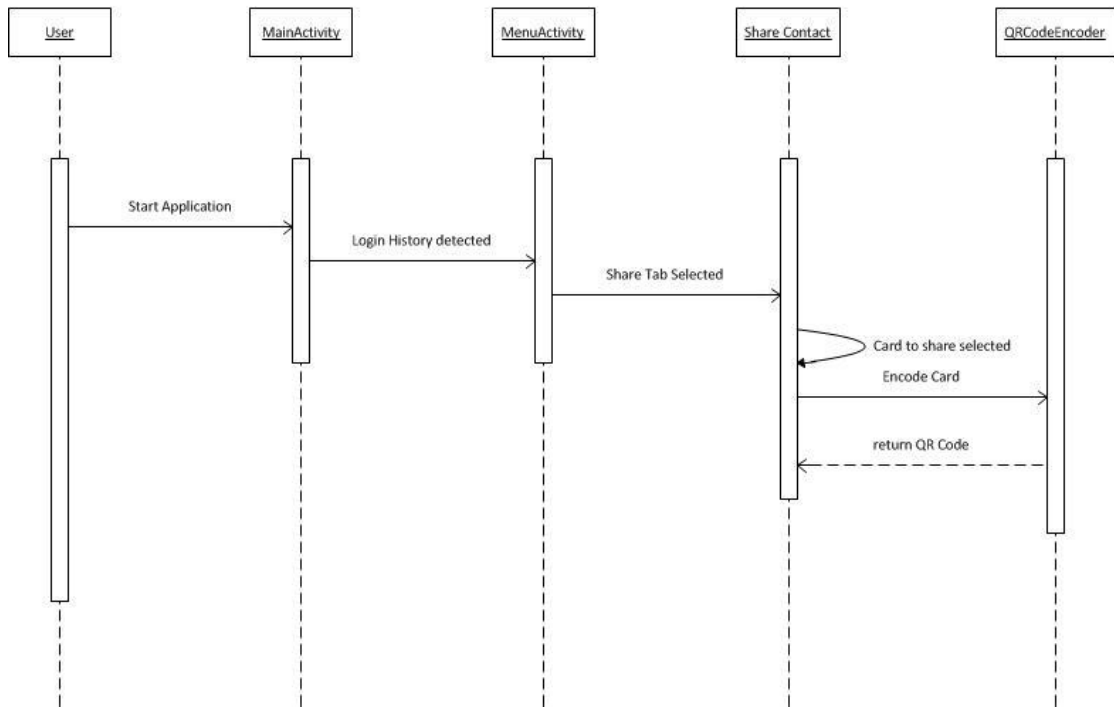5. QR Code is generated and display on screen.

Figure 3.2.3.F4 Sequence Diagram for Scan QR Code

Procedures:

1. User starts the application and login history detected by MainActivity.
2. User clicks on the Share Card tab from Main Menu.
3. User clicks on the Scan Card Button, QRCode Scanner activated.
4. User is required to scan a QR code.
5. Information is retrieved and extract by the scanner.
6. Information is passed to AddContactActivity and display in column respectively.
7. Add Button is clicks and AddContact method activated by ContactMgm.
8. Contact details are saved in SQLite through ContentProvider.
9. Network connection availability is check by ConnectionDetector.
10. When connection available, contact details are passed to server through JSONParser. Contact is saved in server database.
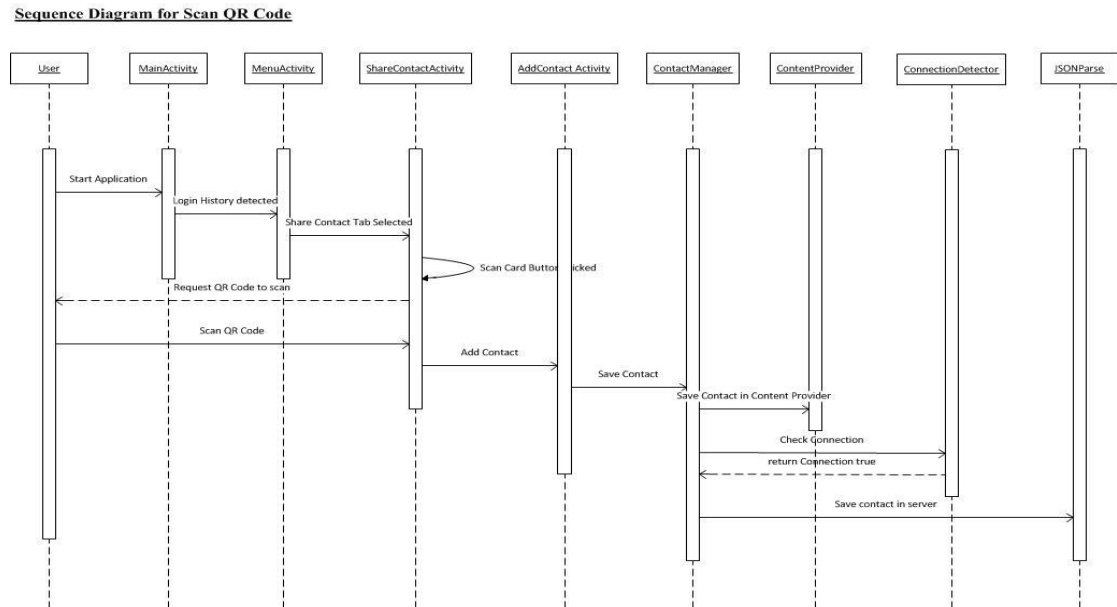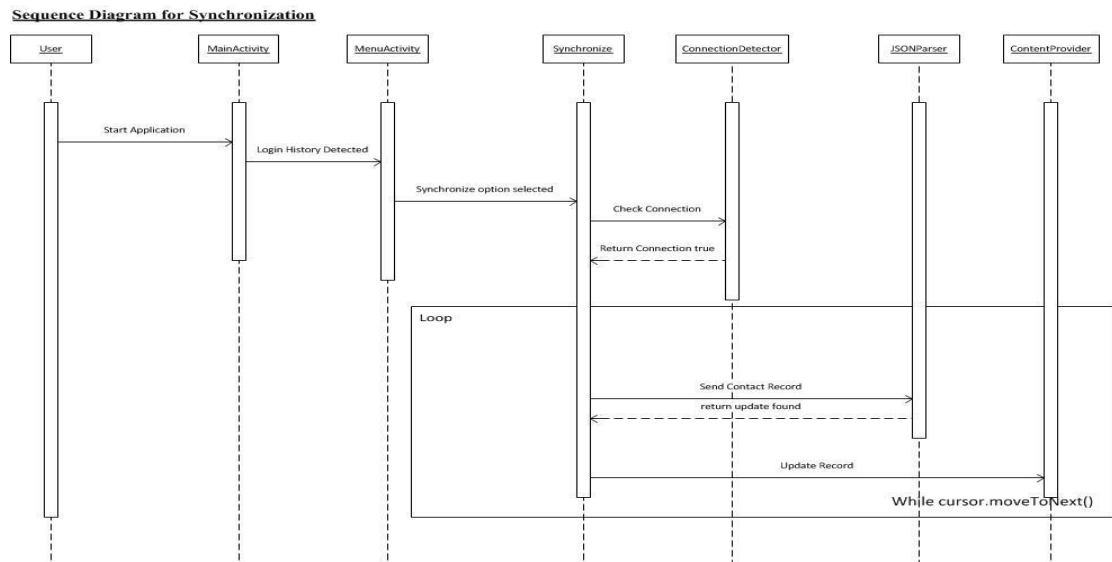
Figure 3.2.3.F5 Sequence Diagram for Synchronize

Procedures:

1. User starts the application and login history detected by MainActivity.

2. User selects the Synchronize from phone's menu.

3. ConnectionDetector check availability of network connection.

4. When connection detected, Contact record are send to server through JSONParser one by one by using loop.

5. Each contact is check with the server database to get any latest update.

6. If contact update detected, data in SQLite will also be updated to synchronize with the server database.

7. Meanwhile, user cards are also check one by one with server database to detect any update from user.

8. If update detected, data in server database will updated to match with the SQLite data from user.

Chapter 4: Database Design and User Interface Design

4.1 Database Design

The system does not have lots of processes; therefor it only contains 3 entities in the database. Following is the sample design of the database.
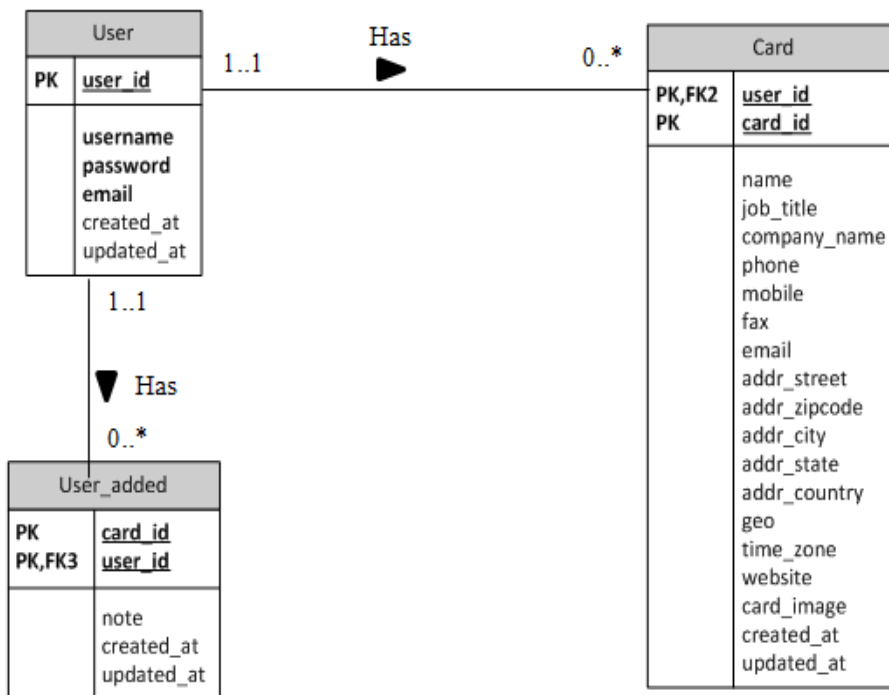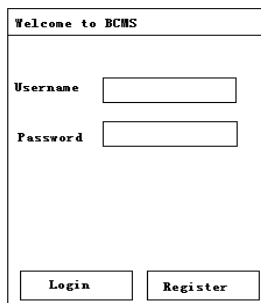
Figure 4.1.F1 Entity Relationship Diagram

4.2User Interface Design
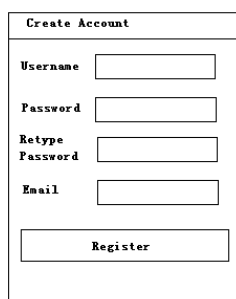
The figure below shows the layout design for Welcome screen. User will be directed to this screen when there is no login history found. User are require to fill in the username and password to login or click on Register button to direct to Register screen for new user.

Figure 4.2.F1 Welcome Screen

Next screen is the register screen which will be display when user select to Register Account in the previous screen. User needs to fill in the particulars as shown in Figure 4.2.F2. Username and email which already registered previously are not allows to register.

Figure 4.2.F2 Register Account Screen

When the user login to the application or successfully registered an account, Menu screen as shown in Figure 4.2.F3 will be display. Menu screen consists of 4 tabs includes My Contact, My Card, Share Contact and My Account. First tab that will be display in this screen is My Contact which is a list of contact that the user added previously.
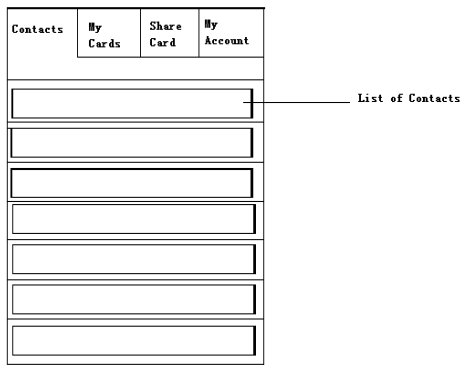
Figure 4.2.F3 Menu Screen

Similarly, My Card tab is a screen to display the list of card that is created previously by the user.
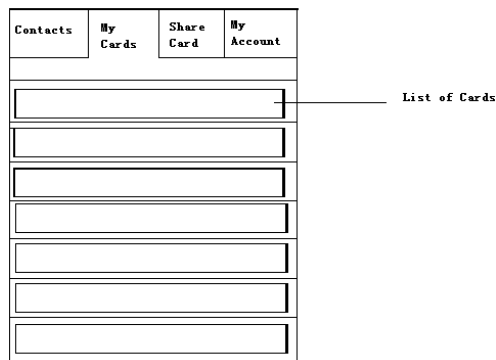
Figure 4.2.F4 My Card Screen

In Figure 4.2.F5 shows the interface design for Share Contact screen. User can click the tab to enter this screen to share their cards with others. Either select a card to share as a QR Code or click the Scan QR Code button to activate the scanner. When the user select a card to share, the information of that particular card will be encode to QR Code and display as shown as below.

Figure 4.2.F5 Share Contact Screen

The figure below shows the detail information of the user account which includes the username and email. User are allows to change their password by entering the current passowrd and new password. New password and retype password should be identical.

Figure 4.2.F6 Account Screen

Figure below shows the layout of Contact Detail Screen, this screen is displayed when user select a record to view in the previous My Contact list screen. The Call button besides the phone and mobile column is for user to directly navigate to dial the number and call the contact person. Beside call button, for geo, email and website, it also has a button for user to navigate to Google Map, Gmail or Web Browser.

For Create Card, Card Detail and Add Contact, the layouts are similar with Contact Detail, only Remark column are not applicable for Create Card and Card Detail.

Figure 4.2.F7 Contact Detail Screen

Chapter 5: Implementation

5.1 System Implementation

The implementation of this project with the specification discussed in previous section have 6 main functions includes Register Account, Create Business Card, Create QR Code, Scan QR Code, Add Contact, and Synchronize.

When the application being activated, the MainActivity class will be activate to identify whether the user has login to the application previously by checking the login history. The login history is stored in the system using shared preference. Below is the code to retrieve the information from shared preference.

```
//check the existence of login history from shared preference
prefs = getSharedPreferences(prefName,MODE_PRIVATE);
uid = prefs.getString("uid", null);
uname = prefs.getString("name", null);
pass = prefs.getString("pass", null);
email = prefs.getString("email", null);

if (uid != null){
    BCMSMenuActivity.lockAction = false;
    Intent j = new Intent(getApplicationContext(),BCMSMenuActivity.class);
    startActivity(j);
} else {
    //display welcome page is no login history
    Intent i = new Intent(getApplicationContext(), BCMSWelcomeActivity.class);
    startActivity(i);
}
```

Figure 5.1.F1 Retrieve login history from Shared Preference.

When there is no login history found, the system will direct the control to the WelcomeActivity class, else the system will direct the control to the MenuActivity class. The WelcomeActivity basically is prompt the user input username and password or user can click to register a new account.

Internet connection is required for register new account and user login to verify the user input. ConnectionDetector class is used to check the internet connection as shown as below.

```
/**
 * Checking for all possible internet providers
 * **/
public boolean isConnectingToInternet(){
    ConnectivityManager connectivity = (ConnectivityManager) _context.getSystemService(Context.CONNECTIVITY_SERVICE);
    if (connectivity != null)
    {
        NetworkInfo[] info = connectivity.getAllNetworkInfo();
        if (info != null)
            for (int i = 0; i < info.length; i++)
                if (info[i].getState() == NetworkInfo.State.CONNECTED)
                {
                    return true;
                }
    }
    return false;
}
```

Figure 5.1.F2 Connection Detector

When the user selected to register a new account, system would direct the control to the RegisterAccount class and prompt the user for some detail information of username, password, retype password and email. When user clicks on Register button, system is then will check the existence of username and email from the server so that the username and email will remain unique. Upon successful registration, user will be login to the system automatically and directed to the MenuActivity.

On the other hand, if user had registered an account before and when he or she enters the correct username and password in the WelcomeActivity class and click on Login Button, the user will be direct to the MenuActivity class.

All the user's contacts and cards will be retrieved from the server and store in the SQLite in the phone memory through content provider when user login. There are basically 2 content provider classes in this application which is CardContentProvider and ContactContentProvider. Each of these content provider class are served for card related and contact related databases respectively.

All the contacts relevant activities which involved retrieve, insert, update and delete activities in the ContactContentProvider are located in the ContactMgm class includes retrieving all contacts, add contact, delete contact and edit contact. Whereas for card related activities such as retrieving all cards create card and edit card are located in the CardMgm.

MenuActivity serve as the main menu of the application where it is a tab layout and contents 4 main tabs which are, My Contact, My Card, Share Card and My Account.

Once the user enters to the MenuActivity, the first tab will be the My Contact which is generated by the ConatctListActivity class. In this class, all the user's contacts will be retrieved from the ContactContentProvider by calling the GetContacts method in the ContactMgm. All the contacts are then generated into list view in the ConatctListActivity class. A search function is added to this view to allow quick search of contact for user. User can click to view the detail of each contact by clicking the respective contact person which will activate the ContactDetailActivity class.

ContactDetailActivity class are basically display all the details of a contact person by retrieving the details form the ContactContentProvider. User are allows to edit contact by adding a remark. Besides, user can also directly call the contact person by clicking the call button beside the contact number. Similarly, email, view map and browse website also can access through clicking the button beside respective fields. The edited information will be store only in the SQLite locally if no internet connection is detected, else it will also update to the server database.

When user clicks on the second tab in the MenuActivity, the CardListActivity will be activated. CardListActivity basically list all the cards' information from the SQLite in local through CardContentProvider by calling the method in CardMgm.

User can selects to add card by clicking the phone's menu button and select Add Card. The newly created card will be store locally and also in server database if internet connection present. Only cards which already exist in the server database are ready to generate QR code and share to others. Other than add card, user also allows to edit card, save, and delete the card in the CardDetailActivity which will be activated when user click on the respective card in CardListActivity.

For the Share Card tab, user are allows to generate the QR code for their card by selecting the card to generate. User also allows to scan others QR code by clicking the scan button, the phone's camera will be activated and retrieve the information from the code.

```
Button btnScanCard = (Button) findViewById(R.id.shareCard_btn);
btnScanCard.setOnClickListener(new View.OnClickListener() {

    public void onClick(View v) {
        Intent intent = new Intent(
                "com.google.zxing.client.android.SCAN");
        intent.putExtra("SCAN_MODE", "QR_CODE_MODE");
        startActivityForResult(intent, 0);
    }
});
```

Figure 5.1.F3 QR Code Scanner

After retrieving the information from the code, all the details will be shown in column by AddContactActivity. User can continue the add contact person process by clicking the save button. The newly added contact will be listed in the contact list by ContactListActivity after this.

When the user wishes to change his or her password, user may click the last tab of MenuActivity. In the AccountActivity, it will display the username and email of user according to the login history. In order to change password, user are required to enter the current password together with the new password and retype new password. The value for both new password and retype password should be identical.

Network connection is required to perform this function in order to update to the server database.

Furthermore, user can get the latest information or update their latest cards by using the synchronize function. In the MenuActivity, when user clicks on the phone's menu button and select Sync, the system will activate the Synchronize class. Synchronize will check the present of the internet connection. This function required internet connection as well. By looping the record from the SQLite in the phone, it will compare with the server database by matching the date for latest update. Information will be updated for both user contacts and cards, any changes that have made previously in the application without internet connection will then be updated to the server through this synchronization.

5.2 Testing

Test case description:
To register new account in the application.

Pre-requisite:
1) Application has installed in the phone.
2) Wifi or Mobile Network is turned on.
3) Username and email do not exist previously.

Test Procedure:
1) Click on the BCMS icon to open the application
2) Select "Register" in the welcome screen
3) Fill in username, email, password, and retype password accordingly.
4) Click on Register Button

Expected Result:
1) User login to the application successfully and enter to the main menu screen.
2) Username and other details are stored in the user table in server database(MySQL)

Post Execution status: PASS
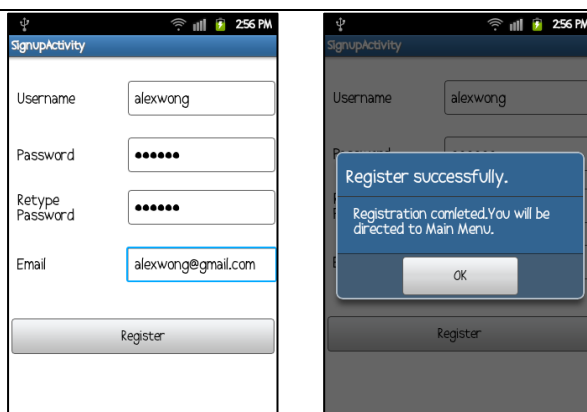
Figure 5.2.F1 Result of register new account

Test case description:
To create business card with network connection

Pre-requisite:
1) User has login to the application.   2) Wifi or Mobile Network is turned on.

Test Procedure:
1) Click on the BCMS icon to open the application   2) Click on the My Card Tab in the main menu   3) Select the Add Card option in the phone's menu.   4) Fill in particulars accordingly.   5) Click on Save in the phone's menu.

Expected Result:
1) Card saved save in the phone memory.   2) Card record saved in server database in card table.   3) Card displayed in the card list.   4) In Share Card tab, card is ready to share.

Post Execution status: PASS
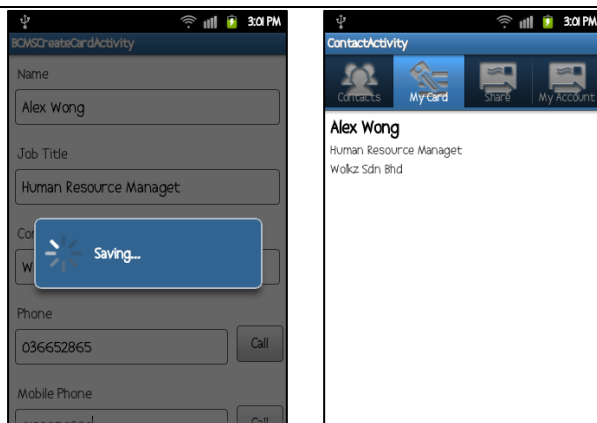
Figure 5.2.F2 Result of create business with network connection

Test case description:
To create business card without network connection.
Pre-requisite: 1) User has login to the application.   2) Wifi or Mobile Network is turned off.
Test Procedure: 1) Click on the BCMS icon to open the application   2) Click on the My Card Tab in the main menu   3) Select the Add Card option in the phone's menu.   4) Fill in particulars accordingly.   5) Click on Save in the phone's menu.
Expected Result: 1) Card saved save in the phone memory.   2) Card record not found in server database in card table.   3) Card listed in the My Card.   4) In Share Card tab, card is not ready to share.
Post Execution status: PASS
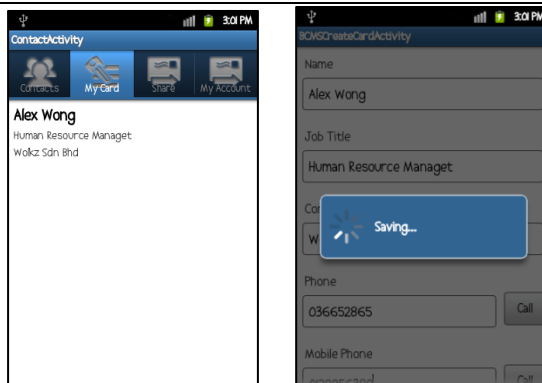
Figure 5.2.F3 Result of create business card without network connection

Test case description:
To create QR code in the application.
Pre-requisite:
1) User has login to the application.
Test Procedure:
1) Click on the BCMS icon to open the application
2) Click on the Share Card Tab in the main menu
3) Select card to share in the drop down list.
Expected Result:
1) QR code display on the bottom of the screen
Post Execution status: PASS
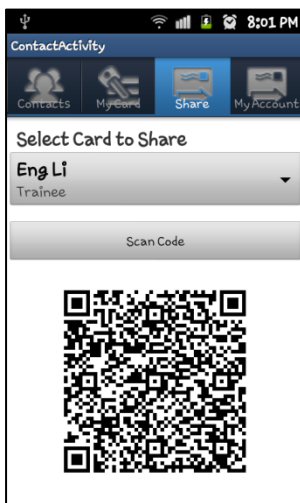
Figure 5.2.F4 Result of create QR Code

Test case description:
To scan QR code in the application.
Pre-requisite: 1) User has login to the application.

Test Procedure:
    1) Click on the BCMS icon to open the application.
    2) Click on the Share Card Tab in the main menu.
    3) Click on the Scan Card button.
    4) Scan the QR code.

Expected Result:
    1) QR code detected.
    2) Information retrieved correctly from the QR code.
    3) Information presented in the Add Contact Screen.

Post Execution status: PASS
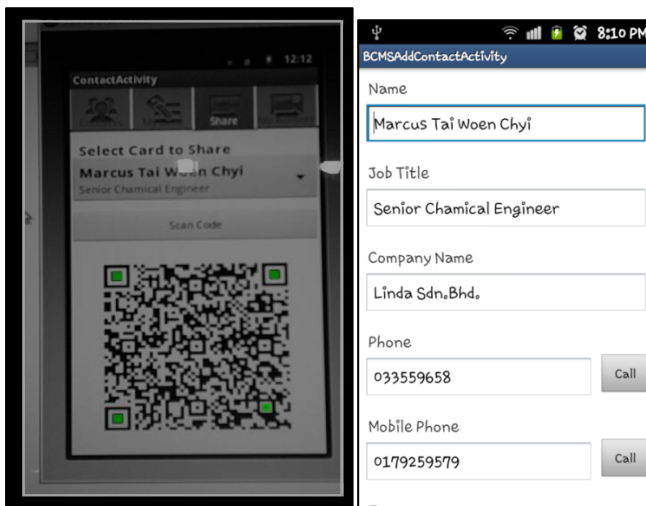
Figure 5.2.F5 Result of scan QR Code

Test case description: To add contact in the application with network connection.
Pre-requisite: 1) User has login to the application.   2) Wifi or Mobile Network is turned on.   3) User has scanned the QR code.   4) Contact is not added previously.
Test Procedure: 1) Click on the Add Contact Button in the phone's menu.
Expected Result: 1) Contact saved in the local memory   2) Contact saved in server database inside user_added table.   3) Contact listed in the My Contact tab
Post Execution status: PASS
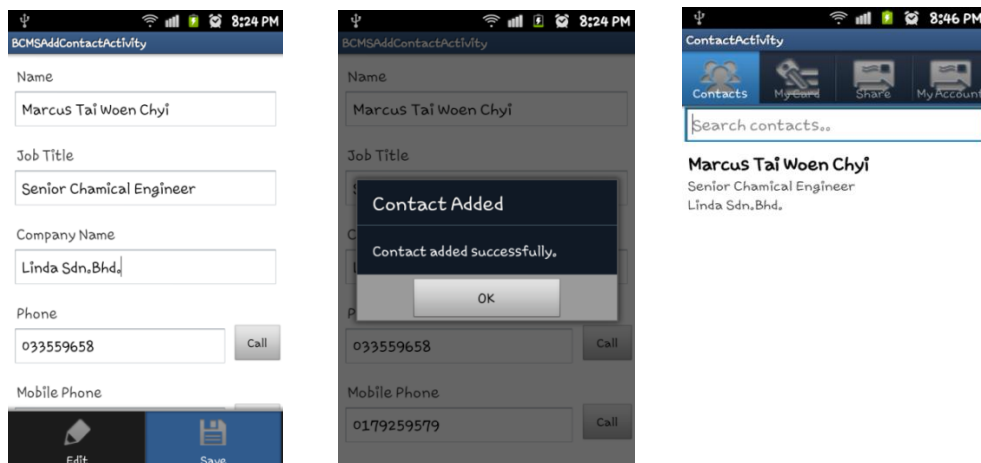
Figure 5.2.F6 Result of add contact with network connection

Test case description: To add contact in the application without network connection.
Pre-requisite: 1) User has login to the application.   2) Wifi or Mobile Network is turned off.   3) User has scanned the QR code.   4) Contact is not added previously.
Test Procedure: 1) Click on the Add Contact Button in the phone's menu.
Expected Result: 1) Contact saved in the local memory   2) Contact not exists in user_added table in the server database.   3) Contact listed in the My Contact tab
Post Execution status: PASS
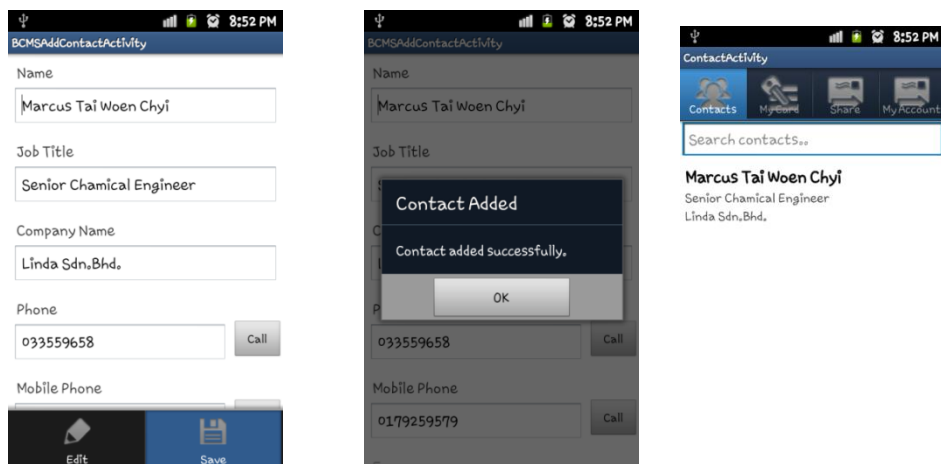
Figure 5.2.F7 Result of add contact without network connection

Test case description: To synchronize the contacts and user's card.

Pre-requisite:
 	
     1) User has login to the application.
 	
     2) Wifi or Mobile Network is turned on.

Test Procedure: 1) Click on the Synchronize option in the phone's menu.

Expected Result:
 	
     1) Contacts updates are detected and download from the server to phone memory.
 	
     2) Cards updates are detected and saved in the server database.
 	
     3) My Contact shows the updated contact list.
 	
     4) All the user's cards are available to share in Share Card Tab.

Post Execution status: PASS
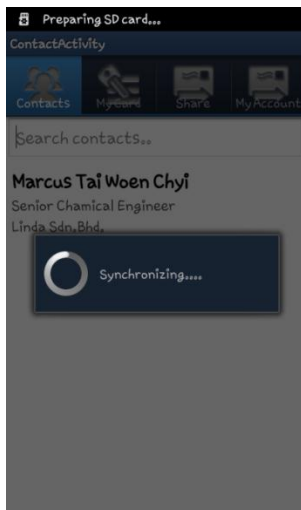
Figure 5.2.F8 Result of Synchronization

Chapter 6: Conclusion

This project contributes in providing effective solutions to current business card system. The process of business card exchange, cards storing, retrieve information as well as get the latest updated information has become very easy and convenient with this application.

By using the current mobile technology and network technology, this project has created a new era of digital business card. Not only digitalize the business card, but also proposed the idea of keep updated and contact with everyone in future. Changes are easily updated and without fear of losing contact with others. The life cycle of traditional business card are extended and only will be terminated when user decided to delete the particular cards permanently.

This project served the idea of connection people with a single piece of QR Code. Thus, it improve the current business card system by overcome its limitations and provides reliable information to the users.

This project is proposed to overcome the problem of existing business card system and provide reliable information whenever they need. With such objective and capabilities, this business card management system has higher potential in replacing existing business card system and becomes the most reliable business tools for business people.

It might be the new generation of business card which are not only digitalize the business card but also provide synchronize updates.

6.1 Main Features

This project basically involved the QR code technology in sharing business card digitally. User can easily create their digital business card and generate the QR code based on the information provided. Moreover, QR Code scanner also included to scan the QR code from other user to get their contact.

Besides, editing of card information also allowed for user to update their latest contact information without worried the loss of contact with others. The synchronize function also included in this project to provide the updated information to user.

In addition, user can easily retrieve all the contact information by login to the system with their account. Even the losses of mobile phone will not stop user from sharing contact with others.

6.2 Issues in Development

There are some issues arise during the project development. First is to analyse and to study the limitation and threat of the existing system that related to business card. Analytical skills and observation skills are needed to truly understand the information from various sources.

Second is to configure the Android application development environment. It takes time to install the Eclipse, MySQL, XAMPP and Android SDK. The most important is to communicate between the application and able to access the server database.

Next is to implement the ZXing library. ZXing library is a 1-Dimentional and 2-Dimentional barcode image processing library which allows the scan and decode of QR code. Not only to implement the library, but also learn to use the functions of the library.

Besides, in order to implement the SQLite in Android devices, more samples are reviewed and experimented including the sample from Android SDK to fully understand the flow of logic. Moreover, the procedure to set up the permission for internet access, camera and Content Provider also studied.

Throughout the project development, debugging skills is very important in identify the causes of the errors especially for logic errors and runtime errors. By testing the system again and again, more understanding and knowledge are gain from the previous failure. These experiences help to debug the project effectively.

6.3 Constraints and Future Enhancement

There are still room of improvement in this project. Some of the limitations need to be improved in the future. Currently the application limit both parties must install the application in their mobile phone in order to fully utilized the storing, retrieving and connecting functions.

This would limit the user form sharing his or her business card with others which are not the user of the application. To enhance this limitation, the application should support sharing cards using vCard and any other widely used format.

Besides, images are still not fully supported in this application, only image URL are presented. Some future improvement shall be done to support image in this application such as photo of card's owner, company logo, and so on to present graphical information.

Furthermore, this project is currently supported in Android platform only. It could be implemented in other platform in future such as iOS and web in order to increase the accessibility of the information.

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<u>Appendix A : Gantt Chart</u>

Appendix A: Gantt Chart

ID	Task Name	Duration	Start	Finish	Predecessors
1	1 Planning	16 days	Mon 28/5/12	Fri 15/6/12	
2	1.1 Identify Problems	12 days	Mon 28/5/12	Mon 11/6/12	
3	1.2 Research on Topic	3 days	Tue 12/6/12	Thu 14/6/12	
4	1.2.1 Study about QR Code	3 days	Tue 12/6/12	Thu 14/6/12	2
5	1.2.2 Study on Encoding and Decoding of QR Code	3 days	Tue 12/6/12	Thu 14/6/12	2
6	1.2.3 Study on Related Work	3 days	Tue 12/6/12	Thu 14/6/12	2
7	1.3 Develop Gantt Chart	1 day	Fri 15/6/12	Fri 15/6/12	4,5,6
8	2 Analysis	56 days?	Sat 16/6/12	Wed 22/8/12	
9	2.1 Review on Existing System	4 days	Sat 16/6/12	Wed 20/6/12	
10	2.1.1 Review CardShake	2 days	Sat 16/6/12	Mon 18/6/12	7
11	2.1.2 Review CamCard	2 days	Mon 18/6/12	Wed 20/6/12	10
12	2.2 Define User Requirements	2 days	Thu 21/6/12	Fri 22/6/12	11
13	2.3 Research on required skills and knowledge	2 days	Sat 23/6/12	Mon 25/6/12	12
14	2.3.1 Study on Android Platform	2 days	Sat 23/6/12	Mon 25/6/12	12
15	2.4 Develop concept of project	5 days	Tue 26/6/12	Mon 2/7/12	14
16	2.5 Develop preliminary report of project	17.5 days	Tue 3/7/12	Mon 23/7/12	15
17	2.6 Revise and refine documentation on planning and analysis	12 days	Tue 24/7/12	Tue 7/8/12	16
18	2.7 Develop Final Report for Project 1	12 days?	Wed 8/8/12	Wed 22/8/12	17
19	3 Design	71 days	Thu 23/8/12	Tue 20/11/12	
20	3.1 Acquire skills and knowledge	28.5 days	Thu 23/8/12	Fri 28/9/12	
21	3.1.1 Acquire knowledge on Developing Android Applicati	14 days	Thu 23/8/12	Tue 11/9/12	18
22	3.1.2 Acquire knowledge on Server Side programming	14 days	Wed 12/9/12	Fri 28/9/12	21
23	3.2 Develop Physical Design	0.3 mons	Sat 29/9/12	Sat 6/10/12	22
24	3.3 Develop Architectural Design	6.5 days	Mon 8/10/12	Sun 14/10/12	23
25	3.4 Develop Interface Design	7 days	Mon 15/10/12	Tue 23/10/12	24
26	3.5 Develop Database and File Design	7 days	Wed 24/10/12	Thu 1/11/12	25
27	3.6 Develop Program Design	1.3 wks	Thu 1/11/12	Fri 9/11/12	26
28	3.7 Develop System Specification	8 days	Fri 9/11/12	Tue 20/11/12	27
29	4 Implementation	107.5 days	Tue 20/11/12	Thu 11/4/13	
30	4.1 Construction and Programming	51 days	Tue 20/11/12	Tue 29/1/13	
31	4.1.1 Develop User Interface	25 days	Tue 20/11/12	Fri 21/12/12	28
32	4.1.2 Develop background programming	26 days	Fri 21/12/12	Fri 25/1/13	31
33	4.2 Perform Internal Testing	10 days	Sat 26/1/13	Fri 8/2/13	
34	4.2.1 Testing on Functionality	5 days	Sat 26/1/13	Fri 1/2/13	32
35	4.2.2 Testing on user friendliness	5 days	Fri 1/2/13	Fri 8/2/13	34
36	4.3 Enhance System based on Evaluation	14 days	Sat 9/2/13	Wed 27/2/13	35
37	4.4 Perform Testing with Targeted User	12 days	Thu 28/2/13	Fri 15/3/13	
38	4.4.1 Testing on Functionality	6 days	Thu 28/2/13	Thu 7/3/13	36
39	4.4.2 Testing on user friendliness	6 days	Fri 8/3/13	Fri 15/3/13	38
40	4.5 Collect Feedback	5 days	Sat 16/3/13	Thu 21/3/13	39
41	4.6 Project Completed	0 days	Thu 11/4/13	Thu 11/4/13	40

Appendix A: Gantt Chart