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B. TECH. (HONS) INFORMATION & COMMUNICATION TECHNOLOGY

MAY 2012

Near-Field Communication (NFC) based virtual contact information exchange with on-the-go cloud storage.

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Mohamad Hakimi Asyraf bin Mohd Hanifah (12655) APRIL 2012

ABSTRACT

With a research-minded and end-user point of view and with the bibliographic overview, the article discusses on the idea on developing an information exchange application to enhance and improve the traditional method of information exchange, using mobile devices. The following journal have explained the hardware and supporting software which deliver a new adaptation of technological advancement, that eliminates the limitation of conventional method of personal information exchange.

With the new contactless information exchange and manager application, personal information data can be more securely transferred and stored, depending on user requirement. Not just that, the technology will also provide solutions to other related issues in regards to traditional personal information exchange method. Furthermore, the application will be made available on a smartphone, which is a mobile device that any business personnel will definitely have by their side.

We expect that the contact information exchange and interaction manager will become a standard tool that will be used globally and represent the users appreciation on technology development.

CERTIFICATION OF APPROVAL

Near-Field Communication (NFC) based virtual contact information exchange with on-the-go cloud storage

By

Mohamad Hakimi Asyraf bin Mohd Hanifah

Submitted in partial fulfilment of the requirements for
Bachelor of Technology (Hons)
(Information & Communication Technology)

Approved by,

_____

(Dr. Suziah Bt. Sulaiman)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
August 2012

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

_____

MOHAMAD HAKIMI ASYRAF BIN MOHD HANIFAH

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CHAPTER 1

INTRODUCTION

1.1 Background

Every time you got involve with something new, or get to attend a new event which you are not familiar, the most occurrence thing that will happen to you is meeting someone new, somebody who is you are not familiar with and you would like to get to know. This is exactly the situation which the research is based on, the medium of interaction and information exchange between new peers and how to simplify the process, and also to eliminate the potential issues.

Management of business cards and personal contact information are vital parts of every business-person's job. It is a long-standing tradition, worldwide, for business peoples and newly known acquaintances to exchange business cards upon their first or subsequent meeting. This business card will contain their personal details and information. Such as the giver's name, company affiliation (usually with a logo) and contact information such as street addresses, telephone number(s), fax number, e-mail addresses and website. To keep track of the contacts content, one must then enter the contacts input into other form of electronic management system or software, manually, and each one at a single time. Of course, it is tedious but there are no other ways to work that up, currently.

Commonly, business cards are printed on some form of cutout from printed papers. There are also special business cards that are made from plastic. Other extraordinary materials are metal, rubberized cards, rubber, magnets, poker chips, wooden nickels, and even real wood. For the most part those special material business cards are of standard format, sometimes with rounded corners. These new materials are popular among companies that wish a unique and eye-catching look. Does not matter what kind of business cards, types or even materials of the business card made of, a business card represent the stature and the identity of the user or the company it holds to.

Usually, a businessman will be keeping his/her own business card in order to give it up when one is requested. Also, this business person will also be asking other business person for the same figure, a business card. This figure of action and exchange between different personnel is traditional and is still being practiced method in the entire world. Logically, a business personnel will then not only be keeping his/her own business cards, but also keeping other business person business cards. To think of it, how exactly will a normal person, be keeping track on the exchanges made for a conference which probably will have thousands of contacts to be collect?

From my own experiences on attending various conference and social events, I always collect different kind of business cards from different kind of personnel, and from various related and unrelated industries. Of course, the process of collecting all the business cards might be tedious but still can be manage, but when it comes to keeping the business cards, there are whole lot new problem, where do I keep all these business cards safely and neat?. How about when we try to search specific business cards from a specific company and specific individual? The process of looking through the business cards archive will be a mess and problematic.

All in all, this current form of system of contact and personal information exchange, have a common flaws. The issues are on its physical form of information exchange. These physical forms of information exchange are exposed to different kind of abuse, harm and other overlooked and neglected arising matters. To avoid and fix these issues, a different kind of exchange medium will be look upon and applied. In this case, electronic communication and transactions method is the option.

1.2 Problem Statement

As stated earlier, the issue of current form of information exchanges lies in the physical form of the business cards. The future of information will be electronically stored and no longer be depending on any physical exchange between the users. Physical forms of information exchange are exposed to different kind of abuse, harm and other overlooked and neglected arising matters.

Physical business cards are exposed to the environment of which the users carry them to. Any form of business cards, depending on the materials, will somehow expose to the risk of disintegration and damage. These business cards will then be unusable and will no longer be able to serve it main purpose, convey personal information. Again, if the users need to obtain the information again, he/she will need to request the business card for another time. This will not be considered as suitable or appropriate for a professional, like a corporate business personnel (Dickinson, 1997).

Storing and keeping track of a lot of business cards will be a big mess. Business personnel will have a hard time to manually track each received card, and then manually enter each card details into another system just so it can be kept electronically. This will surely consume a lot of time, and also may cause error in registering the data (Gropper, 2005).

Usage of business card also exposed to security and privacy issue. Any business personnel will not want his/her contact and personal information to be deliberately revealed and disclosed to the public. Imagine that a business card which contain and belong to other high-positioned personnel in a company unintentionally falls to the hand of unintended person. This will then challenge a company reputation in holding personal information as an act of secrecy or company trade advantage (Giannulli, 2001).

Companies spent huge amount of money in the usage of business cards. Designing a business card will cost the company, and producing the cards in huge amount, for each of the company individual employee will cost a fortune. Different card materials, different finishing, different colors will require a different amount of cost.

To avoid and fix these issues, the whole method of information exchange must be enhance. A different kind of exchange medium will be look upon and applied. In this case, electronic communication and transactions method is the option.

Exchanging phone numbers and contact card can be a tedious task. Currently there is no easy way to do it so usually you will end up spelling your number to your new friend or business partner, while he/she types it into his/her phone. Then he/she will make a dummy call to you to check that the number was correct and so you get their number without having to type it. Exchanging numbers and contact cards could be much easier, faster and quicker by using Near-Field Communication (NFC) technology.

The electronic transaction will based on the Near-Field Communication (NFC) technology and will be able to provide the user with a more secure and reliable of information exchange. There will be no longer issues on tracking the business cards, storing the details and also privacy abuse.

Every business personnel must have a smartphone. The idea is to develop a solution to said problems, by adopting the Near-Field Communication (NFC) technology in the smartphone.

In conclusion, the end purpose of the project is to develop an Android-based system application. This system allows the consumer to adopt a more future-proof solution, and solving different kind of technology barrier from the previous system. This solution will in the end, will benefit the business personnel that relates with personal information exchange.

1.3 Objectives

The objectives of this project are:

1. To identify the issues with current contact information exchange.
2. To determine the information exchange requirement from the users.
3. To implement mobile phone Near-Field Communication (NFC) technology as a medium of contact information exchange and online storage.

1.4 Scope of Study

The scope of study will be on the current method of contact and personal information exchange between different people. What kind of problems that are faced by the users in exchanging personal information, and how often the transaction is occurs?

This study will also include the data on what details that is being involved in personal information exchange. Users must have their very own preferences in exchanging information. This will also include how the users want to protect their information and privacy issues.

For the purpose of this study, we will investigate on various research elements:

1. Near-Field Communication (NFC) technology in Android mobile Operating System (OS).
2. The traditional method of exchanging personal contact information.
3. Cloud hosting for virtual data storage.
4. Application of 'The Internet of Things' in mobile internet.

1.5 Significance of Project

The future of this system is to serves the consumers and business personnel in adopting contactless and electronic personal information exchange application in mobile devices. This will ensure a more secured information exchange for the users. In return, this will not just affects the business personnel, but also the company resources management.

CHAPTER 2

LITERATURE REVIEW

2.1 Near-Field Communication Technology (NFC)

Near-Field Communication Technology (NFC) is dubbed as the future of wireless communication technologies. This latest short-range wireless connectivity technology, offers safe yet simple and intuitive communication between electronic devices.

Users of NFC-enabled devices can simply point or touch their devices to other NFC-enabled elements in the environment to communicate with them, making application and data usage easy and convenient. With NFC technology, communication occurs when an NFC- compatible device is brought within a few centimeters of another NFC device or an NFC tag (Nikhila, 2011).

The big advantage of the short transmission range is that it inhibits eavesdropping on NFC - enabled transactions. NFC technology opens up exciting new usage scenarios for mobile devices.

Near-Field Communication Technology can be used for different kind of purposes, just exactly like any other contactless and wireless technologies are. The only different, which can also be an advantage is that NFC allow two-way communication between endpoints (Dan, 2011).

The three main concepts that widely discussed and promote by the worldwide online community are sharing, pairing, and transaction.

2.1.1 Transaction

Transaction is of course the main highlight of the three. NFC technology has long been discussed as to be replacing the current contactless payment system and e-credit transactions. A smartphone with an NFC chip could very easily be configured to work as a credit or debit card. Just tap your phone against an NFC-enabled payment terminal,

and transaction completed. In terms of transaction, there are more applications of NFC technology can be done.

Exactly as what the current contactless technology like Radio-frequency Identification (RFID) technology can do, NFC can do the exact same thing. NFC devices can be configured to work as a student matric cards, library pass, room keycard or maybe even driving licenses (Clark, 2010).

2.1.2 Sharing.

The only thing required to allow sharing between NFC devices is to establish NFC communication between the two NFC enabled smartphones. Technically in NFC, files are sent without any connection and so it doesn't require device searching and pairing process and its complete zero configuration solution for transferring files and folders. Although, there are certain limitations of this technology as its still under development and better results can be expected in near future, this technology works for devices which are located in lesser distance say 1cms to 4 cms and the data transfer rate is very slow (Dan, 2011).

2.1.3 Pairing

NFC can be work as an intensive wireless protocol, to create a bridge between NFC-enabled devices so it can be interconnected. For example, just tap your NFC-enabled smartphone to a compatible wireless headphone with NFC-enabled chip; you can create a connection just like how a Bluetooth technology works.

How about the idea of printing your pictures, wirelessly? Simply just tap a NFC-enabled device to be paired with a compatible printer, and NFC able to send the information from your device directly to be printed by the printer.

2.2 NFC Tags and stickers

One of the key elements of NFC, Near-Field Communication technology is the ability for NFC enabled devices to be able to be touched onto passive "NFC tags." This facility of NFC technology is a key enabler for many applications.

NFC-enabled device does not just able to communicate between other NFC-enabled devices, but also communication is also possible between an NFC device and an unpowered NFC chip, called a "tag". An NFC tag consists of integrated circuitry containing the information that is to be exchanged. These unpowered NFC "tags" are able be read by NFC devices, which also means that it is an alternative to a one-way communications. For example, an NFC tag can be formatted so that it can store certain information (Nikhila, 2011).

NFC tags are passive devices that can be used to communicate with active NFC devices (an active NFC reader/writer). The NFC tags can be used within applications such as posters, and other areas where small amounts of data can be stored and transferred to active NFC devices. The stored data on the NFC tag may contain any form of data, but common applications are for storing URLs from where the NFC device may find further information. In view of this, if only small amounts of data may be required, NFC tags may be used (Hendrington, 2011).

There's a whole set of different data types you can store on an NFC tag. The actual amount of data varies depending on the type of NFC tag used - different tags have different memory capacities. For example, you may choose to store a URL (web address) or a telephone number. A standard Ultralight NFC tag can store a URL of around 41 characters, whereas the newer NTAG203 NFC tag can store a URL of around 132 characters. (Forum, 2012)

Usually, this information is stored in a specific data format (NDEF - NFC data exchange format) so that it can be reliably read by most devices and mobile phones (Kil˚as, 2009).

2.3 Android-powered NFC Devices

Currently there are a lot of NFC-devices in the market, with different price ranges. The only difference between the devices is the environment that the NFC device is working on. For example, Nokia has been using NFC technology on its Symbian Operating System, and now, Google has implanted NFC capability into its Android Mobile Operating System.

The first Android-powered NFC smartphone is the Google Nexus S. With the launch of the phone back in 2010, Google also announce the support for NFC to be the next generation focus of development (Raphael, 2010). Started with the release of the Android Gingerbread 2.3.3 Operating System, Android is fully ready to support NFC ecosystem. Google also release its developer kit for NFC, included with the necessary Application Programming Interface (API) (Perez, 2010).

2.3 Cloud hosting for virtual data storage

Cloud computing is the name of the technology when a user or clients able to access the applications and required services online, through the internet (Carr). Basically, cloud computing is being used for three major purpose, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). The one that will be used in this research will be based as Software as a Service (SaaS). The Software as a Service (SaaS) that we will be using is from SalesForce.com.

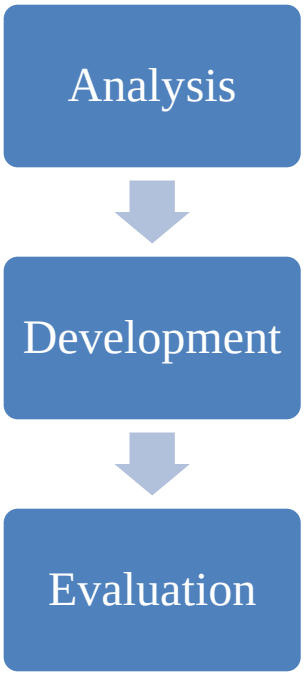
CHAPTER 3

METHODOLOGY

The research in general, is to identify the issues with current contact information exchange, and overcome issues that are related to the exchange of personal information. In order to express how the future system should be develop and solves any arising issues, investigations must be conducted to identify how peoples prefer to do personal information exchanges, what they think about contactless technology, and how often they use a contacts management system. Not just that, since the technology will involve mobile devices, we also need to understand how big the influence of mobile devices such as a smartphones in target group daily activities.

- To identify the issues with current contact information exchange.
- To determine the information exchange requirement from the users.
- To implement mobile phone Near-Field Communication (NFC) technology as a medium of contact information exchange.

The whole research is divided into three stages processes where it is thoroughly planned and conducted.



Methodology Figure 1

- Analysis – Requirement and result processing.

  The technology background and study elements will be compiled together as a literature review. From that, an analysis requirement will be concluded and be projected as the data and information that will need to be gathered.

  Information to be collected such as user issues on the current system, and also the frequency occurrence of the issues.

  The data and figures obtained in the data gathering will be compiled and projected. The analyzed will be compared and sort depends on the priority of the system. With the analyzed data, we should be able to identify and rank the importance issues that need to be solved.

  The chosen solutions will then be selected based on the previously done research and literature reviews. The selected solution will be compared and tailored to suit with user needs and environment.

- Development – System design and prototyping.

The design phase determines how the system will works in the system environment. In this case, how the system work with the smartphone and able to get the result as expected. For example, the transaction between the NFC-enabled smartphone must not take time longer than 2 seconds to establish a connection, and another 2 seconds to complete data transfer.

The application must also tackle the issue that was analyzed in the research done. The prototype must be able to be used in the user preferred environments, based on what have been concluded in the analysis stage. For example, the use will required the information exchange to safe and secured, with that, a safety and protection algorithm from information theft must be implemented.

- Evaluation – Reviews and reports.

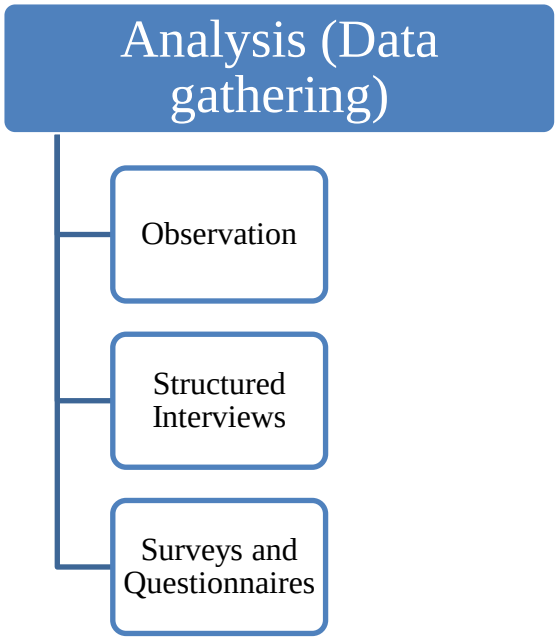
  In this phase, the prototype developed from the development stage will be evaluated by the target audiences, which are the business personnel and professionals. Any evaluations and comments for the audiences will be taken as future planning of product enhancement and technological improvement.

  In this phase also, the overall project plan will be reviewed on the clarity of project purpose, the project timeline and the requirements related to this area of research. Reports at every stage of the research will be concluded and the findings will be delivered.

3.1 Project Activities

3.1.1 Analysis

In order to understand the issues of the study, we will conduct three analysis based on the research background provided from the literature review. The analyses to be conducted are sorted according to its relevancy and priority of importance.



Methodology Figure 2

- Observation

  Observation will be done in a controlled environment, whereby the focus of the analysis will be how two random people interact with each other at the moment when they are meeting and greet. The procedure is conducted to understand what information are usually being verbally exchange between the people, and also how they keep track of each other information.

  At the end of the controlled observation, the procedure will look upon what kind of physical data or contact information's that are exchanged. In this case, if there are any business cards or contact numbers being exchange, how exactly this data being exchange will be recorded as the conclusive data. How long of the time

taken for the information exchange to happen will also be another important data to be taken.

The respondents in the observation will include selected pairs, and also selected group of peoples. The purposes of this is to understand if numbers of peoples involve will relate to how the information exchange happens, and affect other various factors to be consider in the observation.

Respondents	**Verbal information**	**Business cards or contact numbers**	**Time taken for information exchange to happen**
Pair			
Group			

- Structured interviews

This interview will apply the method of thinking aloud. Selected number of respondents will be interviewed based on structured questions in regards to the research. This analysis will be based on two parts.

Part A: Demographic information.

These respondents will be selected based on their demographical backgrounds.

- Genders
- Age
- Profession

Part B: Experience of occurrence.

The interview questions will highlight on what issues that are always occurs to the respondents in regards of personal information exchange.

Set of questions:

Question 1: *How often do you attend a conference?*

In this question, we will be able to understand the basic need of the enhanced system, which the frequency rate of the following issues may, happens.

Question 2: *Do you have and use a business card?*

In this question, we will be able to verify the need of personal information exchange between peoples.

Question 3: *If you do have a business card, what kind of information do you have on it?*

In this question, we can verify the details that are conveyed in the conventional method of personal information exchange.

With the structured interviews, hopefully this will allows us to understand how the users approach the traditional system and what considerations the users keep in mind when using the system. During the test procedure the users are asked to verbalize and describe their thoughts, feelings while interacting with the previous system. The main advantage of this method is a better understanding of the user's thoughts and their focus issues to be solved.

- Questionnaires and surveys.

Questionnaires or surveys are conducted to gain quantitative analysis of the results. The surveys will be used as overviews of user priority and thoughts of the previous system, and their requirements. The surveys will be distributed to a controlled number and chosen respondents to ensure its relevancy and quality of the result.

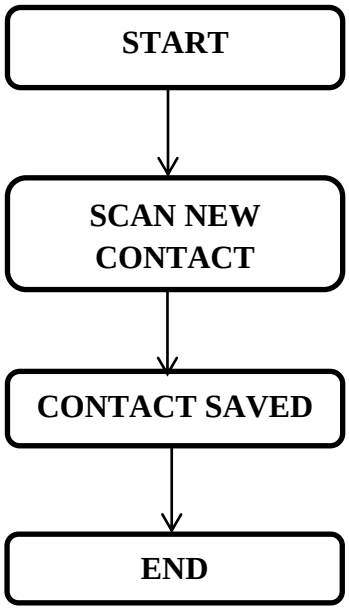
Questions	**Answers**
How often do you meet new peoples?	(Least) 1 2 3 4 5 (Very)
How often do you attend a conferences or events?	(Least) 1 2 3 4 5 (Very)
How important is business cards to you?	(Least) 1 2 3 4 5 (Very)
How often do you exchange contact information with others?	(Least) 1 2 3 4 5 (Very)
How difficult is it for you to keep other people's business cards?	(Least) 1 2 3 4 5 (Very)
Do you think having a business card is costly?	Yes / No
Do you think business card is a private?	Yes / No
Do you always have your smartphones with you?	Yes / No

The result of the surveys will be concluded as the statistics, and will be taken as the user requirement to be put as priority in the development phase. With the result of the surveys, we can maintain the user requirements and problem solutions at the highest priority and further understand the priority.

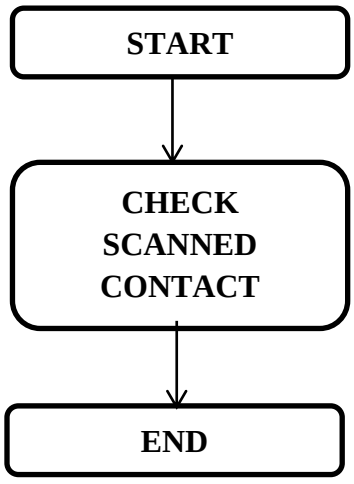
3.1.2 Process flowchart

Process flowchart is the determined process flow of the application, based on what the user requirements and what the user are able to do. The following flowcharts represent flow of control of the application.

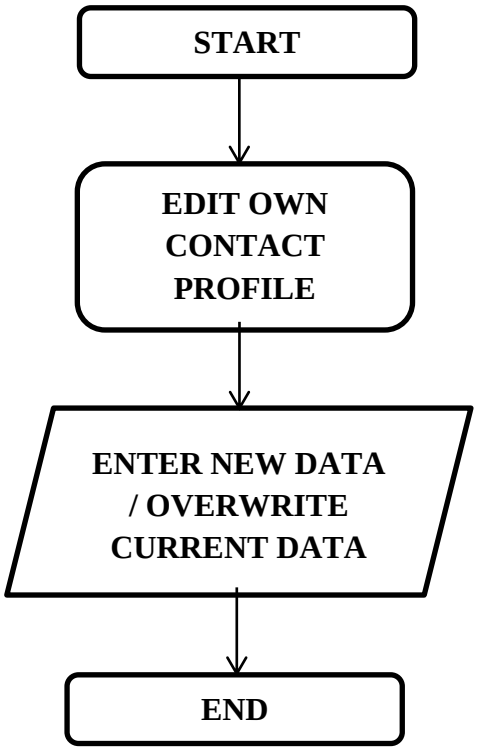
- Scanning new contact.



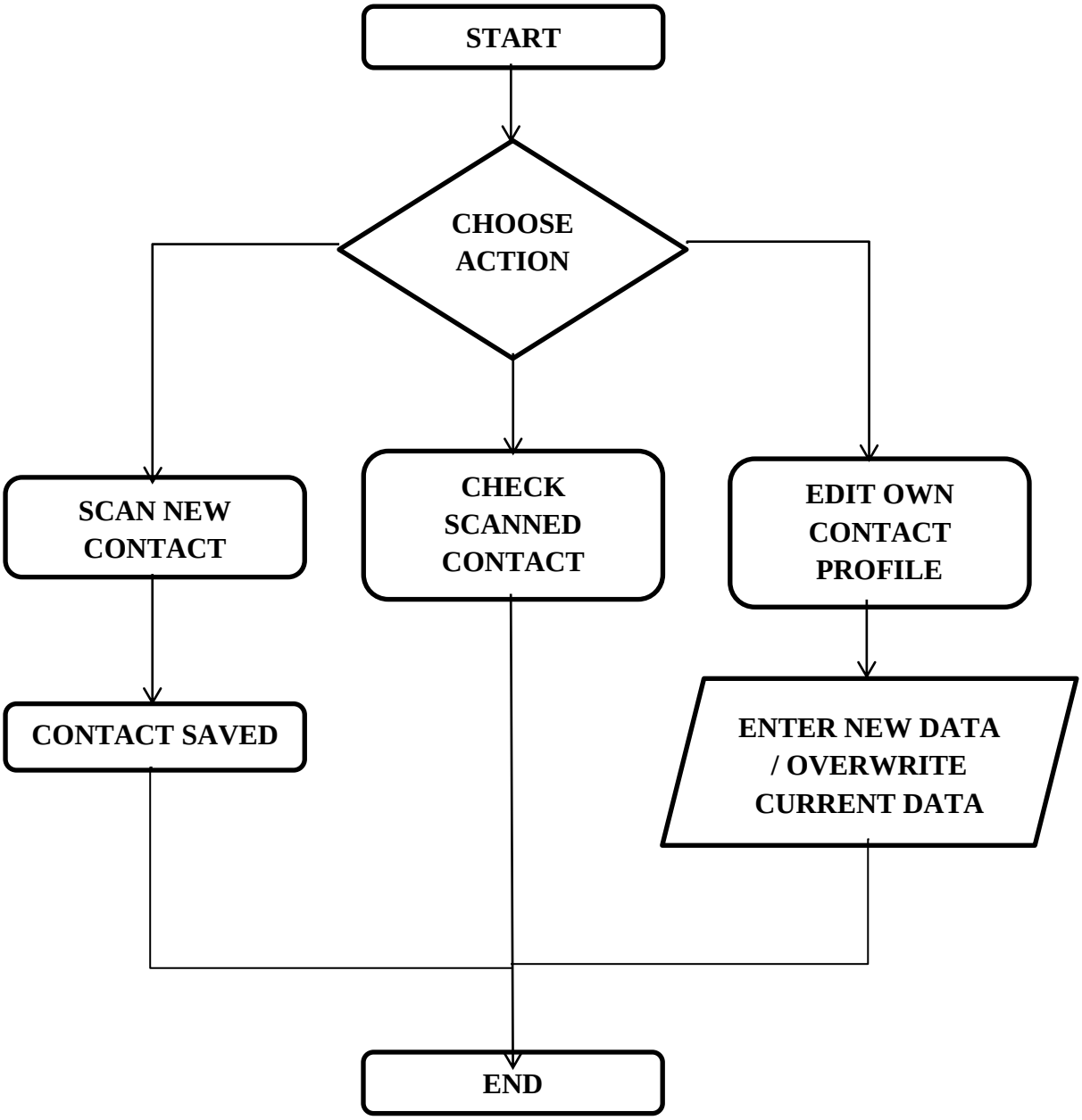
- Check existing contact



- Edit own contact profile



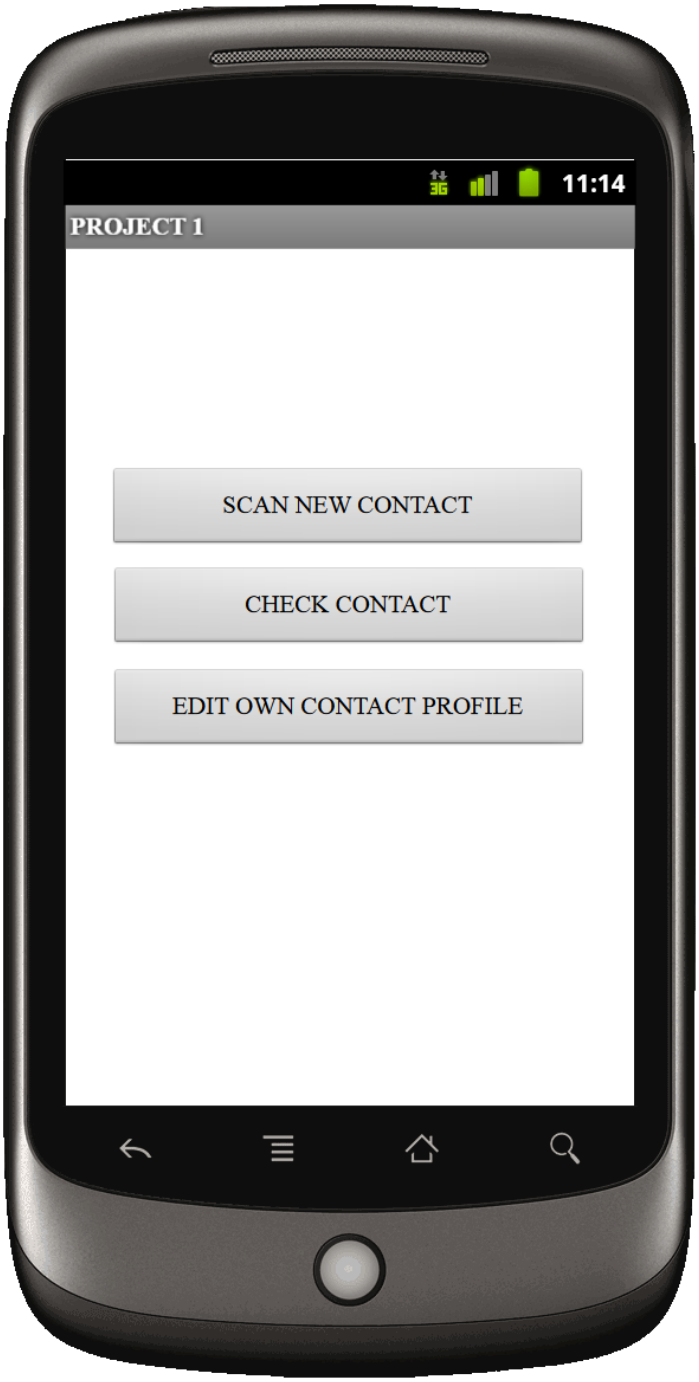
- Full activity diagram



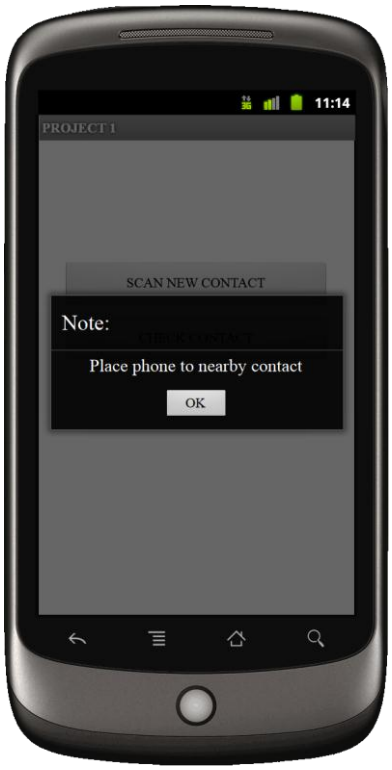
3.1.3 Design flowchart

The following will be the conceptual design flowchart, which will be used as the basic design on the prototype of the development phase. The end product of the real application will be portrayed in the discussion part.

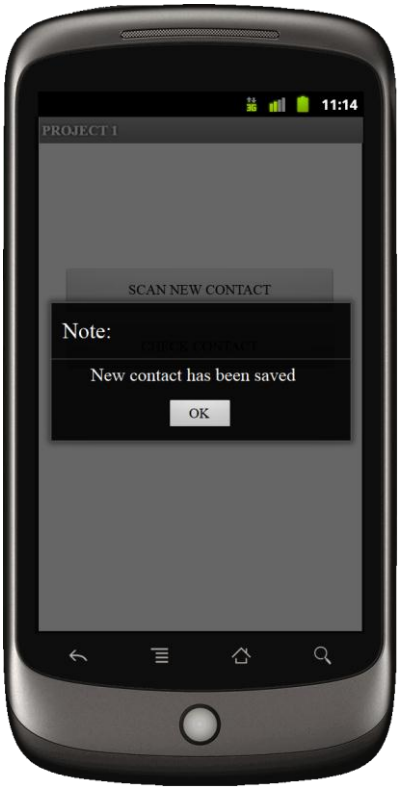
Home Screen



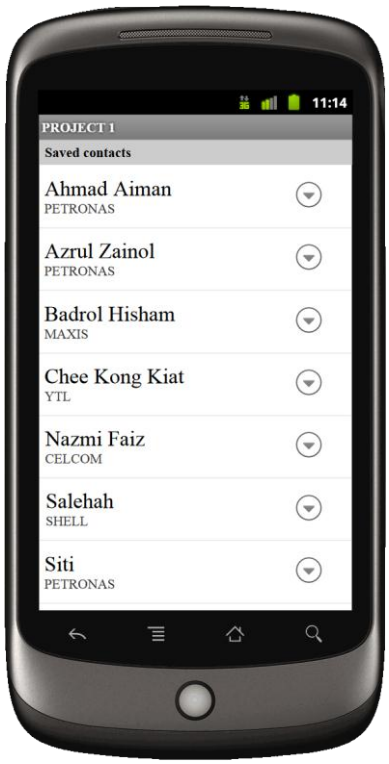
Home Screen – Scan New Contact



Home Screen – Scan New Contact – Saved Contact



Home Screen – Check Contact



Home Screen – Edit Own Contact Profile

3.2 Gantt Chart

Final Year Project Part I

Detail Week	1	2	3	4	5	6	7	8	9	10	11	12
Selection of Project Topic & Supervisor												
Submission of Proposal to research cluster												
Submission of Extended Proposal												
Research Class												
Conduct the survey												
Submission of Viva: Proposal defense and Progress Evaluation												
Submission of Interim Report												

Final Year Project Part II

Detail Week	1	2	3	4	5	6	7	8	9	10	11	12
Data extraction												
Project development												
Progress report												
Pre-Sedex												
Dissertation submission												
Viva												

3.3 Tools

3.3.1 Hardware

1. Near-Field Communication (NFC) enabled smartphone.
2. Near-Field Communication (NFC) sticker tags.
3. Microsoft Windows-equipped workstation.

3.3.2 Software

1. Eclipse Classic 3.7.2.
2. Android Software Development Kit (SDK) Level 15.
3. Android Virtual Device.
4. Android Operating System version 2.3.2 (Gingerbread).
5. Pencil with Android diagram stencils.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Result

Results of the research project are based on the methodology part of the project paper. All the following data are extracted from the analysis that has been done during the data gathering phase in methodology.

There 3 different project activities that has been done in data gathering phase:

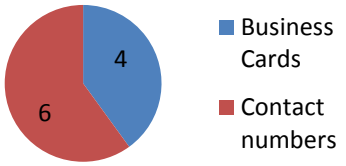
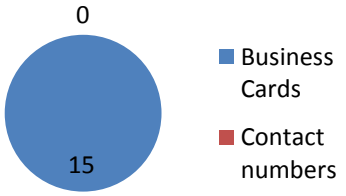
1. Observation
2. Structured interview
3. Surveys and Questionnaires

Observation

There are in total of 25 respondents that is being observed in this observation project activity. Some of the respondents are repetitive but are paired and assigned to different group or partners.

All respondents have various background and some are just selected random business personnel that are volunteering to participate when being introduced to the research project and its significance to them.

The types of respondents are divided to two division, pair and group. Only two people are recorded for each interaction in pair, while there are three to four person that are assigned to group. Few necessary details are collected from the interaction, namely the verbal information that being exchanged, was it business cards or contact numbers that is exchanged, and the time taken for the information exchange to happen.

Respondents	Verbal information	Business cards or contact numbers	Time taken for information exchange to happen
Pair	Greetings, name, occupation.		Average of 2~ minutes
Group	Greetings, name, occupation, address, email.		Average of 4~ minutes

There are five pairs, which involves 10 people that are being observed. The details that are exchanged as verbal information are their greetings, name and occupation. Two of the pair exchanged business cards, while the other 6 person only exchange contact numbers. The average time taken for the information exchange to happen is around 2 minutes.

There are five groups, which involves 15 people that are being observed. The details that are exchanged as verbal information are their greetings, name, occupation, address and email address. All of the members in the group only exchange information by using business cards. The average time taken for the information exchange to happen is around 4 minutes.

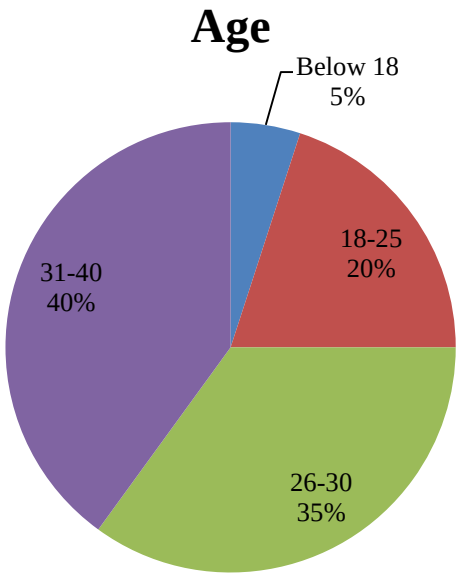
Also from the observations, it can be concluded that the more people involve during an interaction, more personal details are exchanged. When there are only two people involved, exchange of contact numbers are more slightly preferable compared to business cards, while when three to four people involved, exchange of business cards are totally more preferable compared to contact numbers.

Average time taken for information exchange to happen will also took longer time with more peoples got involved, average of 2 minutes for a pair, and an average of 4 minutes for group.

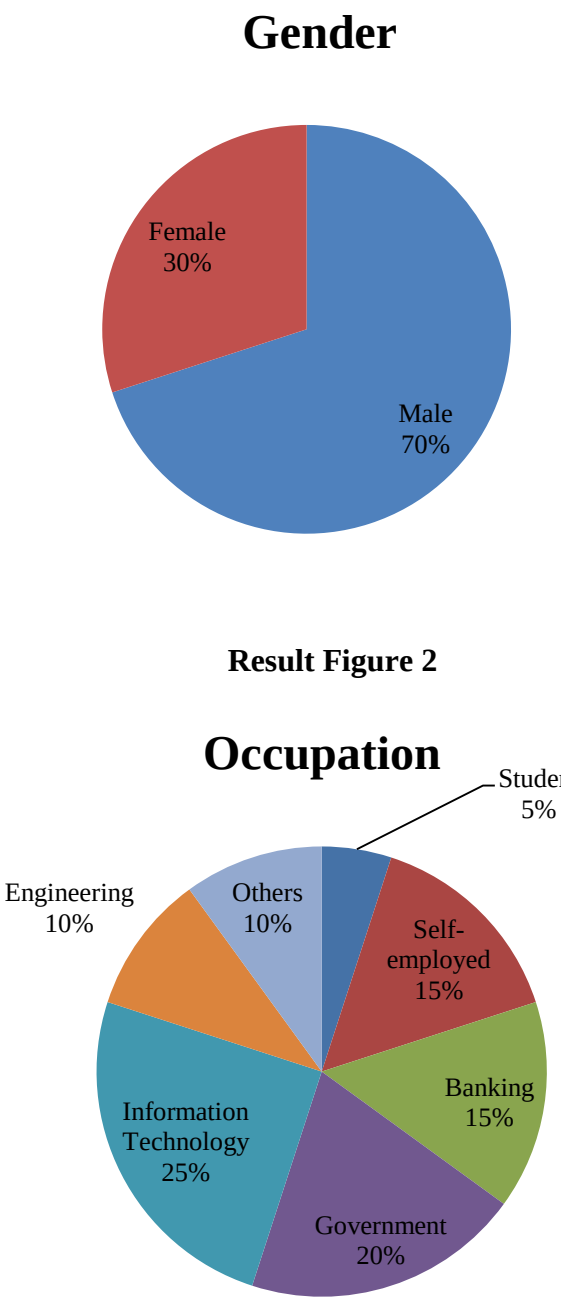
Structured Interview

The structured interviews are done with predetermined set of questions that was asked spontaneously to the respondents. The respondents are totally taken as anonymous responses and only details of demographical backgrounds are being noted. Total of 20 anonymous respondents are taken.

Part A: Demographic information.



Result Figure 1



Result Figure 2

Result Figure 3

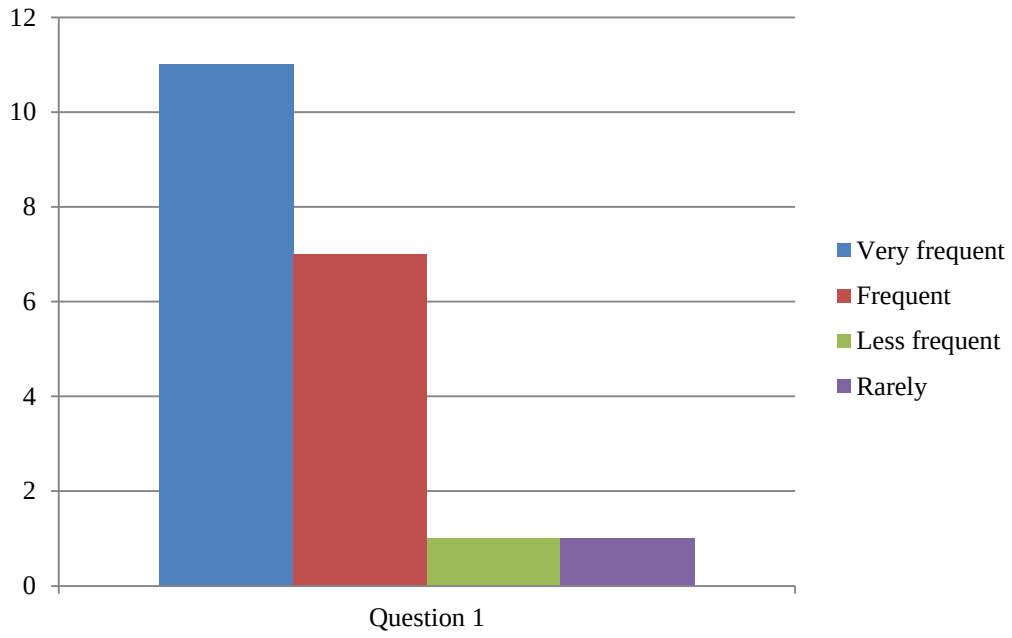
Part B: Experience of occurrence.

The interview questions will highlight on what issues that are always occurs to the respondents in regards of personal information exchange.

Set of questions:

Question 1: *How often do you attend a conference?*

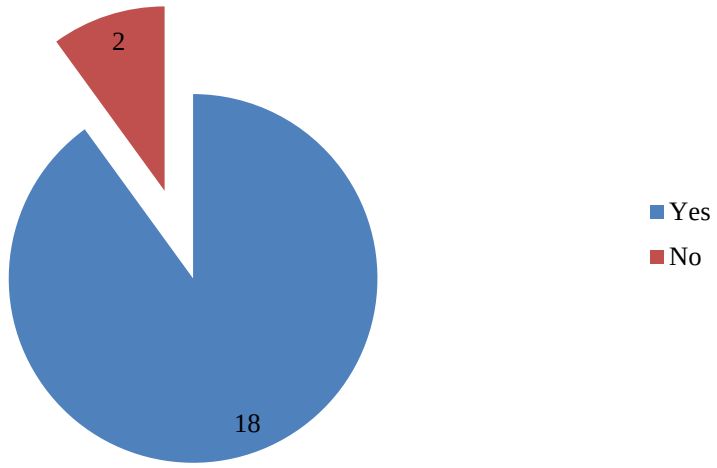
In this question, we will be able to understand the basic need of the enhanced system, which the frequency rate of the following issues may, happens.



Result Figure 4

Question 2: *Do you have and use a business card?*

In this question, we will be able to verify the need of personal information exchange between peoples.

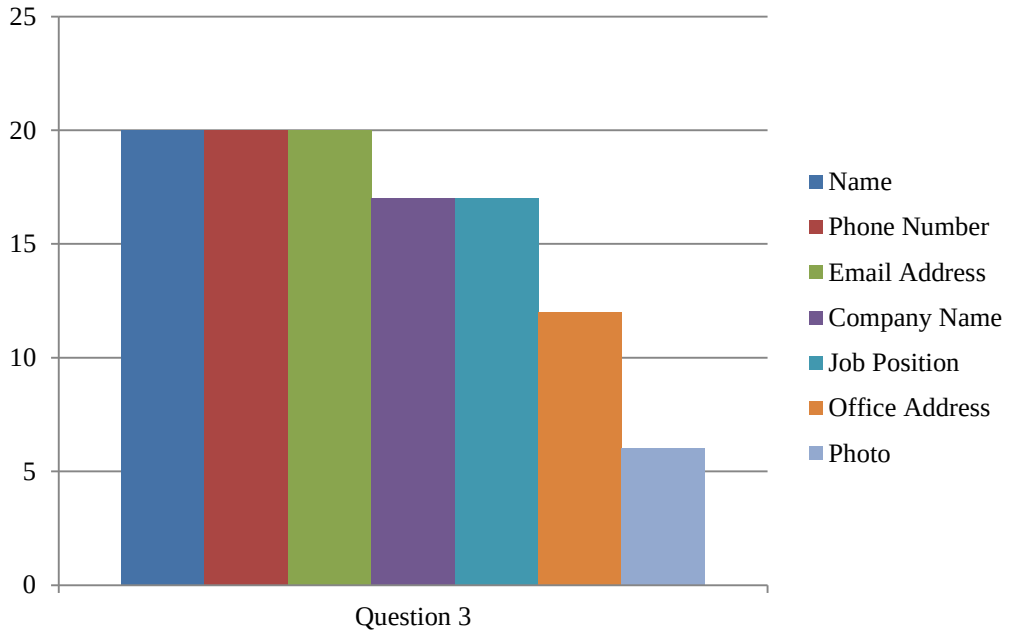


Result Figure 5

From Question 2, we can verify the validity of revamping the purpose of the research project, and the data projected a 90% approval to proceed with the application development.

Question 3: *If you do have a business card, what kind of information do you have on it?*

In this question, we can verify the details that are conveyed in the conventional method of personal information exchange.



Result Figure 6

From the data gained in Question 3, it can be concluded that Name, Phone Number, and Email Address are the most important data in any business cards and therefore must be put to high priority in project implementation.

Questionnaires and surveys.

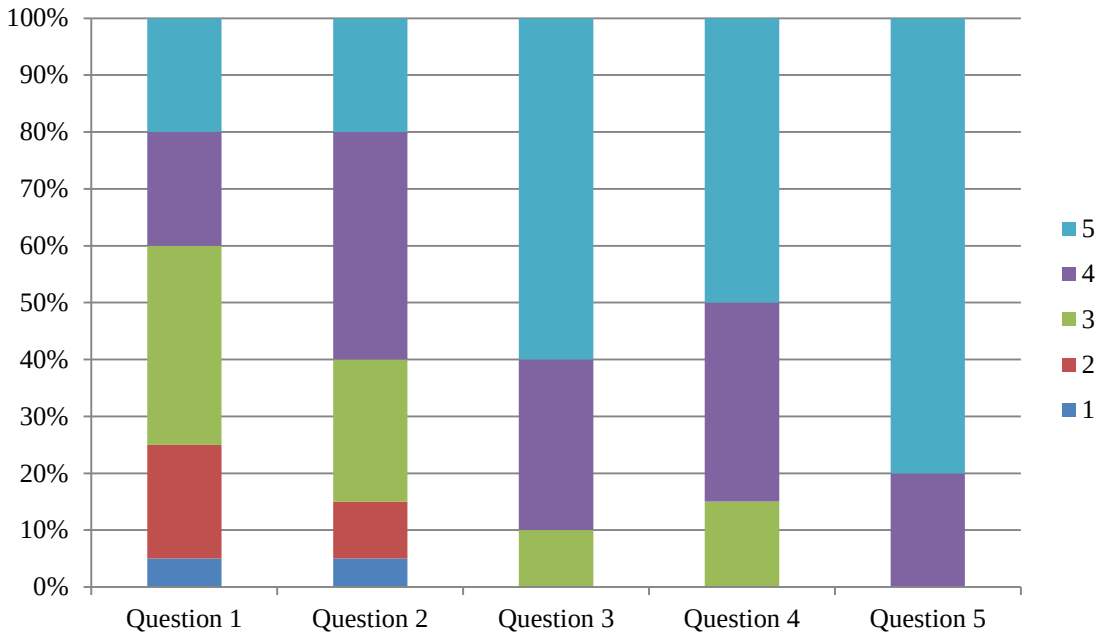
Questionnaires and surveys are being done to achieve quantitative analysis of the research project and helps in better understanding of the problems and project better objectives of the application development.

The surveys are distributed to 20 different individual who have background in corporate industry and professionals. All of the individual are potential future clients for the research project when it is done.

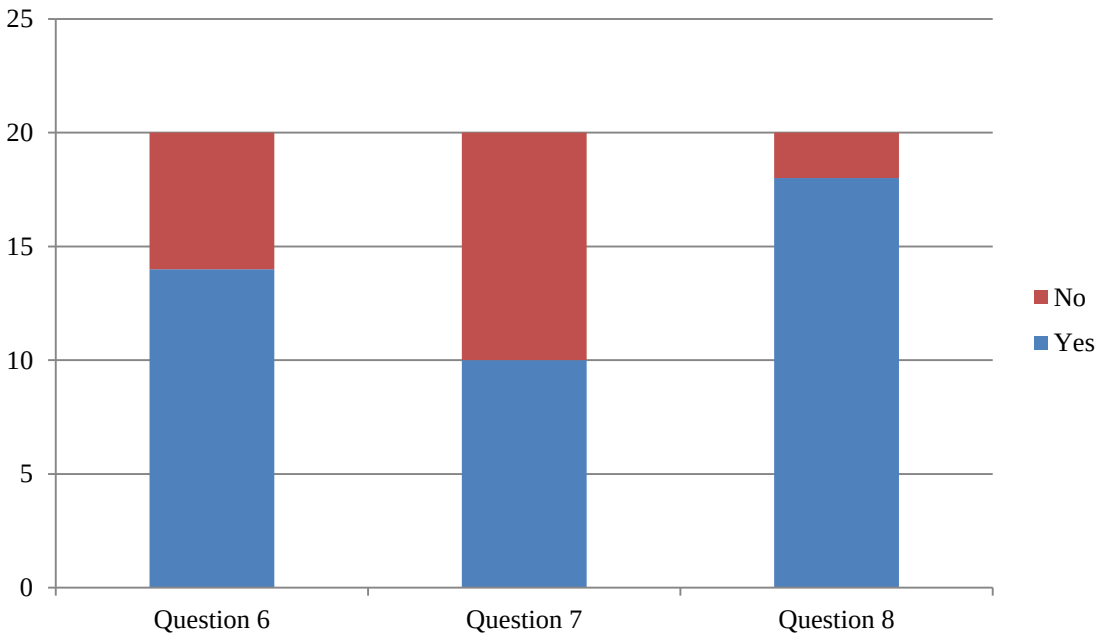
Attached below are the surveys:

No.	Questions	Answers
1	How often do you meet new peoples?	(Least) 1 2 3 4 5 (Very)
2	How often do you attend a conferences or events?	(Least) 1 2 3 4 5 (Very)
3	How important is business cards to you?	(Least) 1 2 3 4 5 (Very)
4	How often do you exchange contact information with others?	(Least) 1 2 3 4 5 (Very)
5	How difficult is it for you to keep other people's business cards?	(Least) 1 2 3 4 5 (Very)
6	Do you think having a business card is costly?	Yes / No
7	Do you think business card is a private?	Yes / No
8	Do you always have your smartphones with you?	Yes / No

Results from the surveys are projected in the diagram below:



Result Figure 7



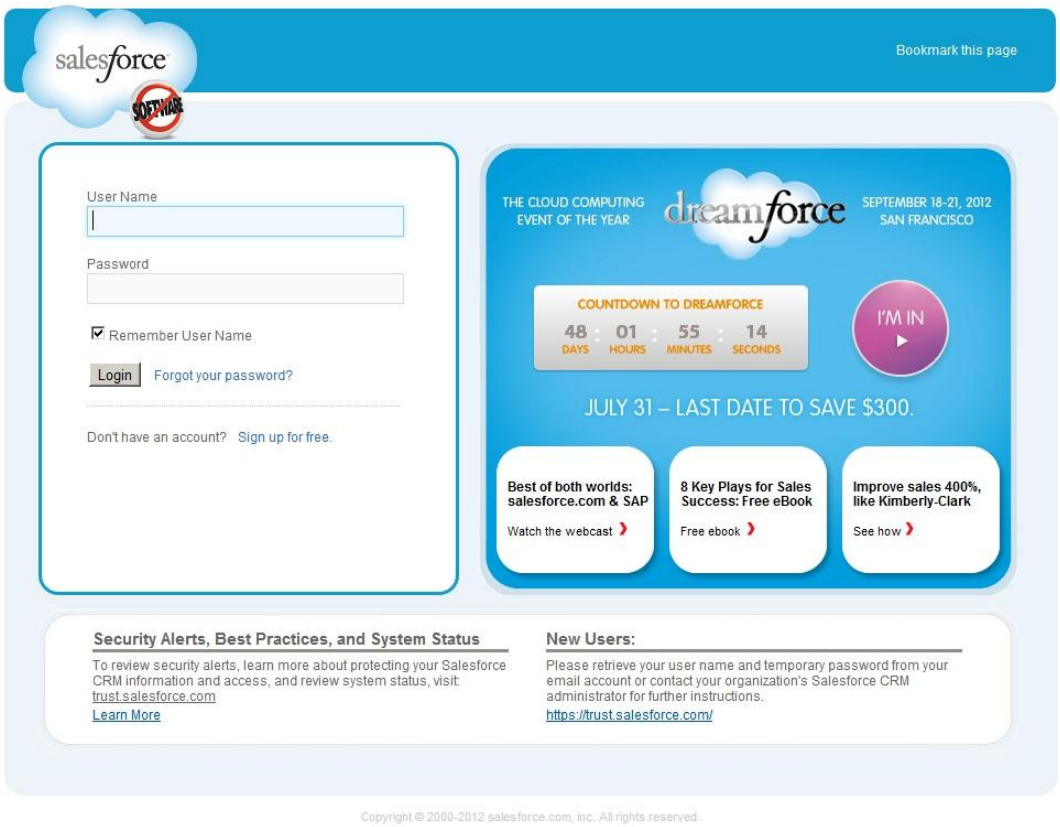
Result Figure 8

As per projected from the data, it can be concluded that the research project is a valid research and the outcome of the application development must focus on the system requirements and solving the problem statements.

4.2 Discussion

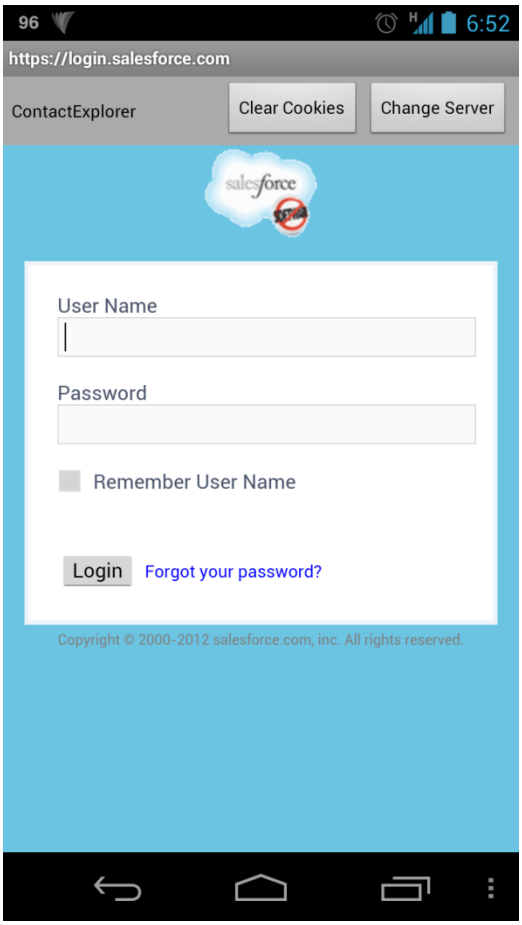
System architecture

The user must create an account with Salesforce.com since for the purpose of the research; the project will be using the limited time free-trial subscription for Software as a Service (SaaS) from SalesForce.

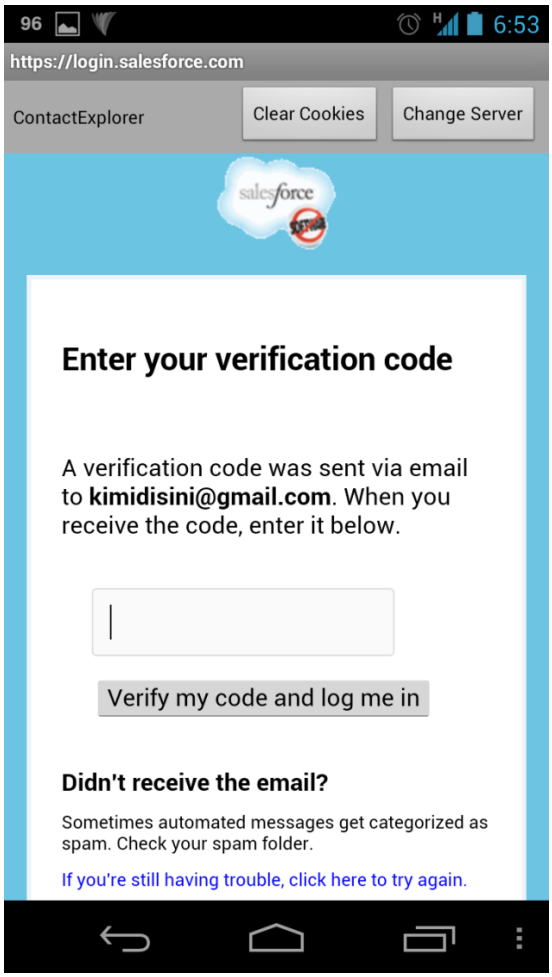


The NFC sticker tag will be formatted with contact details that are selected from the user mobile phone's phonebook. Once the NFC sticker tag have been formatted with the necessary data, which in this case the vCard (Virtual Contact) format, the application will read the data from the NFC sticker tag, and upload it to the cloud server.

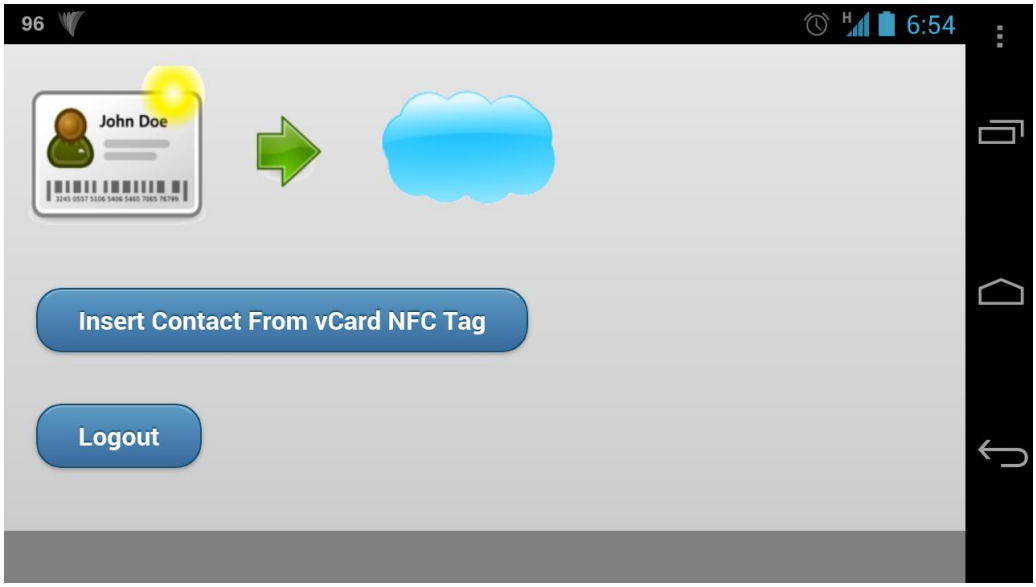
Below is the system flow of how the system application works:



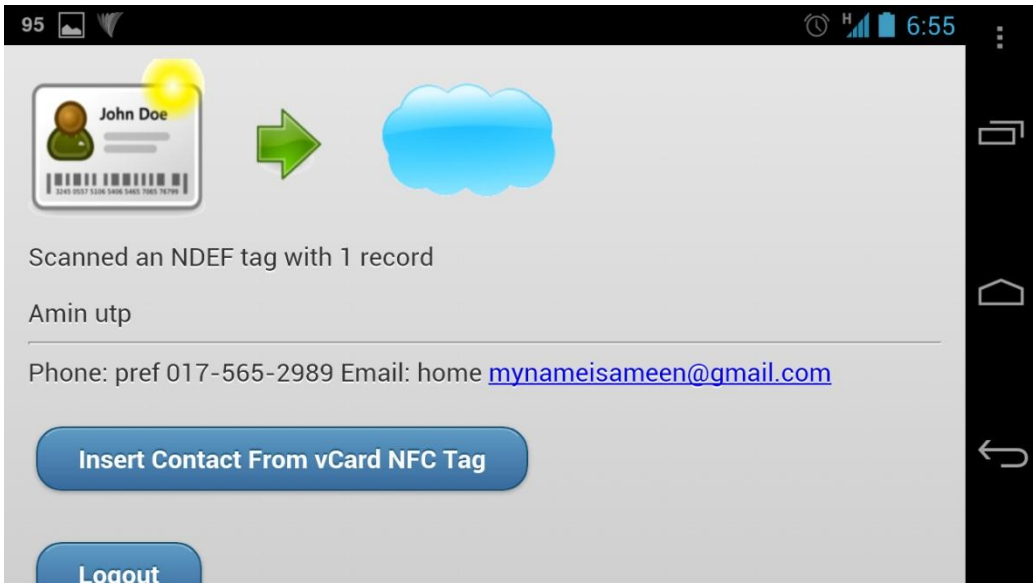
Discussion Figure 1: Login page to the Salesforce.com Software as a Service (SaaS) cloud computing.



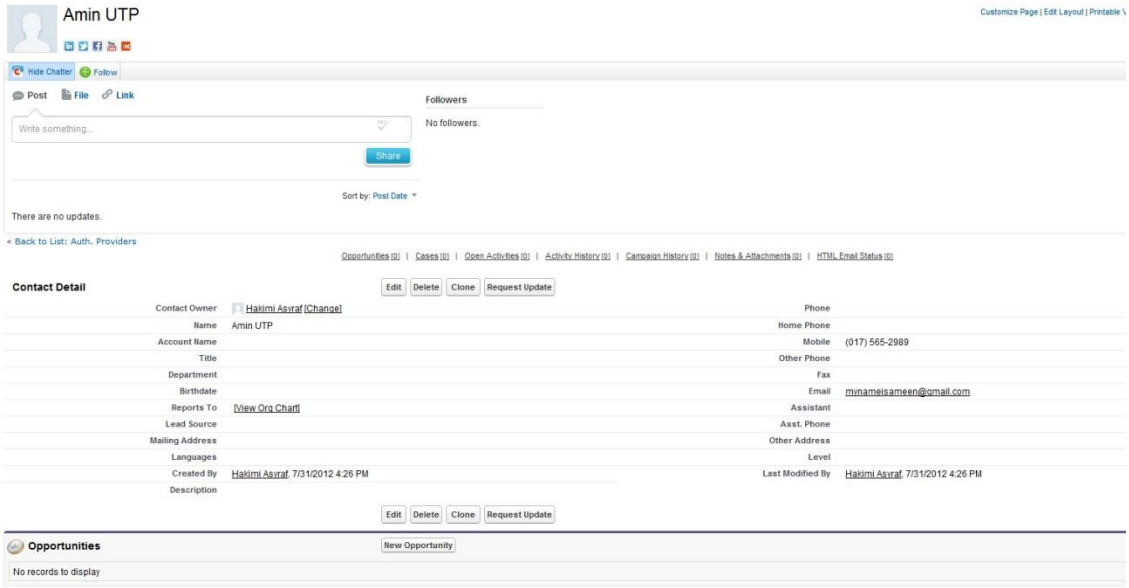
Discussion Figure 2: Verification code to the email for the application to work.



Discussion Figure 3: Home screen. (Tap NFC-enabled business card to scan)



Discussion Figure 4: Scanned content NFC-enabled business card. Click 'Insert Contact From vCard NFC Tag' to upload to SalesForce.com system.



Discussion Figure 5: Uploaded contact can be found online in SalesForce.com from your account dashboard.

CHAPTER 5

RECOMMENDATIONS AND CONCLUSIONS

5.1 Recommendations

Based on the few study and journals that has been referred, electronic personal information might be exposed to potential threat of privacy and information theft issues. Therefore, in future development the research must include the adjustment on the security and data protection. The major concern on the project is what if another user can replicate the user information; this will be counted an identity theft. Future plan to encounter this issue is to establish a data connection between the electronic personal information and the company database as a verification purposes.

Data eavesdropping can occur if the technology is abused. The recommended solution to this is to provide a digital signature to every data that is exchange between the users, so that before accepting or sending a personal information details, both party able to verify the exchange.

Since the NFC technology is not yet widely available to other mobile operating system, the application will be limited to high-end Android smartphones. By the time that the technology is adapted to more smartphones segments, the application will be made available to multi-platforms and provide a cross-platforms information exchange.

NFC technology will be the next big leap from all mobile devices manufacturer. Thus, making it the necessary feature to be in future mobile devices production and also in other mobile operating system, not just in Android.

With current development, the research project proposed that in the future, instead of still using plain business cards, NFC-enabled business cards must be more marketable and affordable to the wider market. NFC-enabled business cards and NFC-enabled mobile devices will be the future standards for any business personnel.

Product Figure 1

5.2 Conclusion

Through this research project, we intend to design and develop a prototype to enhance user experience in personal information exchange, and break the limit of conventional way of personal information exchange. The research is able to conclude that by adopting this application as a new technology, there are limitless opportunities to be explored in the context of information exchange. The Near-Field Communication (NFC) has been dub as the technology of tomorrow and more adaptation of the technology will be available in the upcoming years.

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APPENDICES

(Please refer to the next page)