

**IMPLEMENTATION OF RADIO FREQUENCY IDENTIFICATION (RFID) INTO THE
MATRIC CARD TO FUNCTION AS E-WALLET**

by

JOANNA MICHELLE GILBERT

A project dissertation
in partial fulfillment of the requirement for the
BACHELOR OF TECHNOLOGY (HONS)
(INFORMATION & COMMUNICATION TECHNOLOGY)

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Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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Approved by,

ALIZA SARLAN

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.

JOANNA MICHELLE GILBERT

ABSTRACT

The implementation of Radio Frequency Identification (RFID) integrated into the Matric card as a payment card is to provide an effective and efficient payment system that will help the user which is the students of University Teknologi PETRONAS (UTP). This system will help to reduce transaction time during the purchase of goods and products. The application of the smart card act as a payment card in purchasing goods and products. Money is loaded into the card to enable payment method. The payment module is embedded into the matric card to make it convenient for the user and also to increase its functionality. This system emulates the conventional method of paying cash with using card instead while providing a satisfactory experience to its user and also to the cafeteria's and mini mart owners. The RFID technology is widely used in most universities for various purposes and payment system has been widely accepted by the population. The adaption of this technology is in line with UTP's vision and mission in creating a more technologically savvy University. Wireless technology has a long way to go in Malaysia and using it as smart cards are a step to the widely accepted usage. The adaption of this technology is in line with UTP's vision and mission in creating a more technologically savvy University. This project will act as a platform for further applications using RFID technology such as a photocopying card, door access card, attendance card entrance card and many more.

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TABLE OF CONTENTS

CERTIFICATION OF APPROVAL	i
CERTIFICATION OF ORIGINALITY	ii
ABSTRACT.....	iii
ACKNOWLEDGEMENT	iv
LIST OF FIGURES	vii
LIST OF TABLES	viii
CHAPTER 1: INTRODUCTION.....	1
1.1 Background of study	1
1.2 Problem Statement	2
1.2.1 Problem Identification	2
1.2.2 Significance of the project.....	4
1.3 Objective	4
1.4 Scope of Study	5
1.4.1 Technology	5
1.4.2 The relevancy of the project	5
1.5 Feasibility of the project.....	6
1.5.1 Technical feasibility	6
1.5.2 Economic Feasibility	7
CHAPTER 2: LITERATURE REVIEW	8
2.1 RFID Technology.....	8
2.2 Smart Card.....	9
2.3 Application of Smart Cards.....	10
2.4 E-Payment using smart card.....	10
2.5 Usage of smart card in higher learning institution	11
2.6 Security of smart card	13
CHAPTER 3: METHODOLOGY	14
3.1 Research Methodology.....	14
3.1.1 Prototyping Life-Cycle model	14
3.2 Planning	15
3.2.1 Project Activities	15

3.2.2 Project schedule milestone	16
3.2.3 Gantt Chart	17
3.3 Design.....	18
3.3.1 Requirement.....	18
3.3.2 System Architecture	19
3.3.3 Flow of the transaction	20
3.3.4 Requirement analysis.....	23
3.3.5 Use case and class diagram	26
3.3.6 Hardware and Software Specifications.....	29
CHAPTER 4: RESULT & DISCUSSION	32
4.1 Introduction	32
4.2 Result of the survey.....	32
4.3 Flowchart.....	35
4.3.1 Flowchart for payment transaction	35
4.3.2 Flowchart for reload transaction.....	36
4.3.3 Flowchart for shop registration.....	37
4.3.4 Flowchart for card registration	38
4.3.5 Flowchart for blocking the card.....	39
4.4 Screen Shots of the user interface.....	40
4.5 Testing.....	46
4.5.1 User Testing.....	46
4.5.2 Integration Testing.....	55
CHAPTER 5: CONCLUSION	56
REFERENCE.....	57
APPENDIX.....	58

LIST OF FIGURES

Figure 1:How RFID works	8
Figure 2: Contactless smart card.....	9
Figure 3: Contact smart card.....	9
Figure 4: Summary of applications.....	12
Figure 5: Prototyping Life-Cycle Model	14
Figure 6:Project schedule.....	16
Figure 7: Gantt Chart for FYP 1	17
Figure 8: Gantt Chart for FYP 2	19
Figure 9: Physical Architecture	19
Figure 10: Payment Process.....	191
Figure 11: Reload Process	22
Figure 12: Use Case Diagram of the system.....	26
Figure 13: Class diagram of the system.....	27
Figure 14: ERD for database.....	28
Figure 15: RFID reader.....	29
Figure 16: Barcode Scanner.....	30
Figure 17: Pie chart 1	33
Figure 18: Pie chart 2.....	33
Figure 19: Pie Chart 3	34
Figure 20 : Login Page.....	40
Figure 21: Main Page for Administrator.....	41
Figure 22: Card	41
Figure 23: Card Registration.....	42
Figure 24: Card Registration.....	42
Figure 25: Reload.....	43
Figure 26:Report	43
Figure 27: Payment	44
Figure 28: Item Registration	44
Figure 29: Register Item	45

Figure 30: Reports.....	45
Figure 31-43: Bar Charts	47-55

LIST OF TABLES

Table 1: Cost of Hardware.....	7
Table 2: User Requirements.....	18
Table 3: Functionality of the payment process	23
Table 4: Functionality of the reload process.....	24
Table 5: Functionality of the termination and registration process	24
Table 6: Functionality for the reports	25

CHAPTER 1

INTRODUCTION

1.1 Background of study

Higher learning institutions help develop intellectual minds for the growth and sustainability of the human race. University Teknologi PETRONAS (UTP) is in that race in developing such mind. Each semester the number of student in UTP is approximately 6,000 including undergraduates and postgraduate students finishing their Masters or PhD. They consist of engineering and computer science students. In order to be in par with other higher learning institution, UTP should integrate more advance technology in the campus. The student card/ identification (ID) card/Matric card that are used by students in UTP has very limited functionality and the technology used in the card is only the bar code system. Due to the increase number of student in UTP, the lines in UTP's cafeteria and mini mart are long during peak-hours. This is due to the lack of efficiency in transaction. There are many problems faced during transaction. This has caused slow transaction time thus reducing effectiveness. Furthermore, the rise in theft of money and the loss of student card in UTP is a concerning matter.

In this era of globalization, where technology plays a very important role in the everyday life of mankind, many impossible events have been turned to be a matter of the past since now nothing is impossible. One of the amazing inventions of all time is the Smart Card. To the naked eye smart card is actually a plastic card equal in size and shape to any credit card that is available in the market these days. However the technology behind has enable mankind to reach places that were once unimaginable. This is because it that contains an integrated circuit which is also known as the microprocessor and memory that is able to perform many functions such as storing information, used for transaction, it can also acts as a key for access control, biometric identification and many other functionality.

Integrated Circuit Cards @ Smart Card comes in two forms, one is through contact and the other is contactless. Contact smart card is easy to identify because of its gold connector plate although the ISO Standard defined 8 contacts, only 6 are actually used to communicate with the outside World. It has a contact area of approximately 1 square centimeter comprising several gold-plated contact pads (1992). These pads provide electrical connectivity when inserted into a reader which is used as a communication medium between the smart card and a host computer. Tis cards do not contain batteries since it is powered by the card reader. On the other hand, contactless Smart Card is just a plastic card without any gold plate since its integrated circuit is between the plastic cover of the card. Contac smart card technology also provides similar capabilities but does not have the Radio Frequency (RF) interface that allows contactless smart card to conveniently read at a short distance. Contactless Smart Cards are increasingly used as it enables fast, convenient transaction and its ability to form factors other than plastic card for example inside of a watch or other material.

The RFID integrated into the smart card will be used as a payment card in UTP's campus to buy goods and product from the cafeteria and mini marts. The card will be loaded with electronic cash that is used as virtual money for the exchange of goods. This will increase the functionality of the matric card from only as an identification card and library to also a payment card. This card will help to reduce theft of cash since there is no physical money to be stolen. It also helps increase transaction time since the user has to just show the card. The implementation of RFID into the matrix card will help UTP in the long run.

1.2 Problem Statement

1.2.1 Problem Identification

A few problems has been identified in regards with the situation that UTP is currently facing. A survey has been conducted that shows the problems(Appendix).

As student, we are entrusted with many task and responsibility and one of it is collect as much knowledge as we can for the real world later in life. We have many important things to do, place to be, dateline to meet, that we prefer if we can go through life in fast mode.

- In Universiti Teknologi PETRONAS, the queue in cafeterias and mini marts are often long. This situation is caused by many problems such as, no small changes by shopkeeper or the student itself and the transaction between student and shopkeeper is very slow.
- Moreover, now days one can't be too careful, since many has reported missing their wallet or money. According to the Security Department in UTP, the number of theft has increased since 2010 from one case to five cases in 2011. (Appendix)
- Universitit Teknologi PETRONAS has an age old problem, where most of the student's accommodations are further from the Automatic Teller Machine (ATM). This can be a problem to most of the student since majority of the student don't have transport. With this card, purchase can be done anywhere and anytime without the fear of no money and the trouble of cashing out money in the ATM.
- In Universiti Teknologi PETRONAS, the identification card that is used serves only one purpose that is as the identity of the student and to borrow books from the library. Many students do not appreciate their identification card as its sole purpose is to display the identity of student only. Many reported cases on lost Matric Card were recorded by the Security Department and new Matric Cards were produced. (Appendix)

1.2.2 Significance of the project

The use of RFID in the matric card will:-

- Be in line with UTP's Vision and Mission, to become a leader in technology education
- Reduce theft and loss of matric card
- Will increase the functionality of the matric card thus making it more valuable to students
- Decrease transaction time in cafeterias and mini markets
- Reduce time taken to travel to and from the ATM

1.3 Objective

- a) To study the feasibility of implementing RFID in students Matric card to be used as a payment system.
- b) To develop an e-wallet payment system for Universiti Teknologi PETRONAS's student, integrated into the Matric card to be used in mini marts
- c) To create a more technological savvy environment for the residents of Universitit Teknologi PETORNAS
- d) To provide a faster transaction in mini marts
- e) To increase the functionality of the Matric card by adding applications into the card

1.4. Scope of Study

1.4.1 Technology

Wireless technology is a branch of technology that is widely used by many. The method of communication that uses waves to transmit and receive data has made communicating hassle free. The absent of multiple wires and confusing entanglement has eased minds of the communication industry. It is a term used to describe telecommunication in which electromagnetic waves carries signal to paths of communication. This communication method uses low-powered radio waves to transmit data between devices. Radio waves are being increasing used many people all around the world.

Radio Frequency Identification (RFID) is type of wireless technology that transmit low radio signal which are received by antenna in cards. The RFID is integrated into the existing matric card where information of students are stored in the integrated circuit. Once good and products are purchased the card is reader and the electronic money is deducted from it. Each student will have their own matric card with specific bar code that is used to retrieve information from the integrated circuit. There is no necessity in carrying cash around and the increase functionality in the matric card will make student to appreciate it more. It will also decrease transaction time during purchasing.

This system is to be used in UTP's campus which involves the management of UTP, its student and also the cafeteria's and mini mart owner.

1.4.2 The relevancy of the project

This project will benefit many parties in many ways. Firstly,

- UTP will become a more technologically savvy university with the implementation of this new system
- Currently the matric has a very limited functionality. With this new system, it will increase its usefulness.

- Through this project future functionality that uses RFID can be added on to the card such as door access, attendance and many more.

1.5 Feasibility of the project

Basically this RFID integrated smart card will decrease transaction time thus making life move in the fast lane with the use of current technology. It will help manage time and money as well and also be a front liner in technological environment. Reports of loss card and theft of money will decrease with this system. In this project two types of feasibility is examined that is the technical feasibility and the economic feasibility.

1.5.1 Technical feasibility

Technical feasibility studies the ability of the technology, in this case the RFID technology integrated into the matric card, to be developed and implemented in UTP's campus.

- Size of the project

Since this project is mainly focused inside UTP, thus its size is comparatively small. There are approximately 6,000 students in UTP. Thus every student has to change their Matric Card to a smartcard. Every mini mart in UTP is be installed with card reader so that students are able to use the smartcard to purchase goods. UTP's database can be used since it is complete with student's information. The Finance Department should also be installed with card readers.

- User friendly

The matric card is given to new student upon entering the universities. Thus the Matric card is already integrated with RFID. The main users for this system are students also the mini mart owner. For students, the equipment such as the card reader and the computer system used for it is free. However, the management is in charge in buying card readers and the computer system for the mini marts to fully implement this system.

1.5.2 Economic Feasibility

Economic feasibility identifies the financial risk that comes with the project. To determine the economic feasibility, cost and benefits associated with the system should be taken into consideration. Moreover, calculating cash flow and the profit that is gained through the project should be identified

- Cost and benefits

Types of cost and benefits that is incurred in this project is development cost, operational cost, tangible and intangible benefits. Development cost is highly highlighted in this project. The expense that is incurred during the development of this project is the hardware such as the RFID card reader, bar code scanner and computer where necessary.

Item	Price
1. RFID Card Reader 	Product Code: RFID-IDR-232N Internet Price: RM 120.00 (1 to 9) RM 108.00 (10 to 49)
2. Card 	Product Code: RFID-TAG-125-CA Internet Price: RM3.00 (1 to 19) RM 2.70 (20 to 199) RM 2.10 (200 and above)

Table 1: Cost of Hardware

The operational cost incurred is minimal for maintenance and technicians for faulty system.

CHAPTER 2

LITERATURE REVIEW

2.1 RFID Technology

Radio-Frequency Identification or famously known as RFID is an electronic device that is embedded with a small chip and antenna which is capable of carrying 2,000 bytes of data or less. RFID provides a unique identification for objects that must be scanned to retrieve the identifying data. RFID is closely similar to the bar-code system, however, RFID uses frequency in transmitting data whereas bar-code uses line-of-sight to communicate (Puffebarger.E, 2008). Each RFID technology consist of antenna and transponders (eg. RFID cards) that carries data. A low power radio signal is transmitted through the antenna by the reader which is received by the transponders (eg. RFID card) via its own antenna. The frequency transmitted is also used to power the integrated chip inside the transponders. The RFID card will then converse with the reader for verification and the exchange of data. The data will then be sent to a controlling computer for processing and management

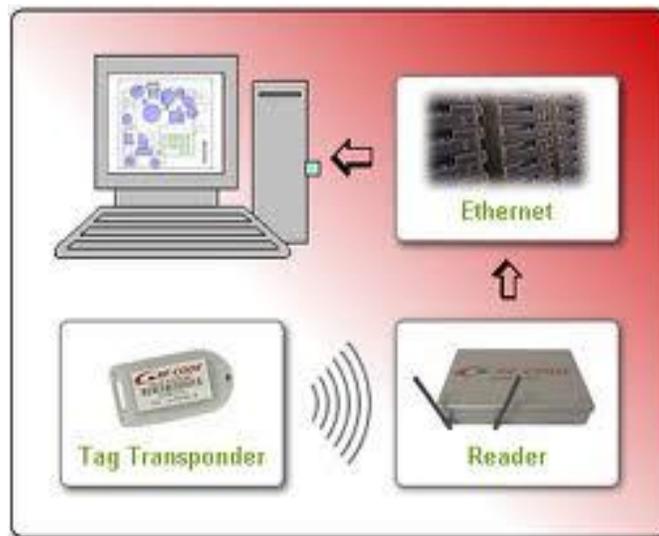


Figure 1:How RFID works

2.2 Smart Card

Smart card is a plastic card with a size of a credit card with an embedded microchip that can be loaded with data for electronic cash payments access to doors and other applications. The integrated circuit and the memory in the Smart Card, allows the storing and processing of information in the card. The smart card's intelligence is similar to a typical computer in its ability to process information. Its ability in providing different level of security ranging from simple access to complex data encryption is another success to the artificial intelligence processor in it. Smart Cards also offer virtually unlimited application possibilities.

According to M.Rouse, its storage capacity is a maximum of 32 kilobytes (KB) per card. It is adequate enough in storing personal information, for electronic money transaction, personal authentication, prepaid telephone, health care data and many other functionality (Rouse, 2006). Smart Card which is commonly known as Integrated Circuit Card (ICC), encompass all those devices where an integrated circuit is contained within an ISO 1 identification card piece of plastic. Based on De Clercq paper, the card is 85.6mm x 53.98mm x 0.76mm and is the same as the ubiquitous bank card with its magnetic stripe that is used as the payment instrument for numerous financial schemes. Integrated Circuit Cards @ Smart Card comes in two forms, one is through contact and the other is contactless (De Clercq,ns).

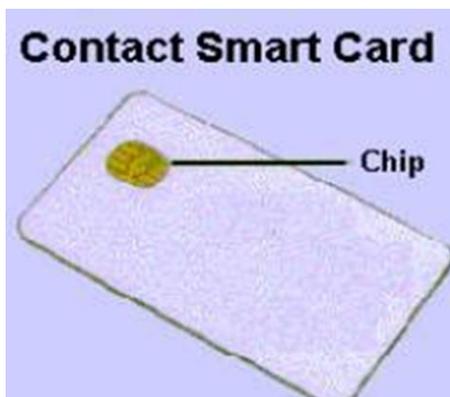


Figure 2: Contact smart card

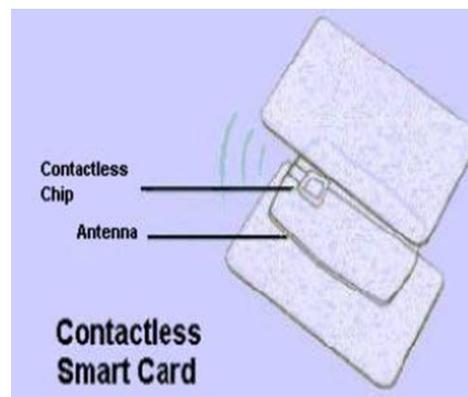


Figure 3: Contactless smart card

2.3 Application of Smart Cards

Based on MIT sources, smart card is a portable computational device with data storage ability. As such, they can be a very reliable form of personal identification and a tamper-proof, secure information repository. According to D.Sauveron, the main domains that are currently being used in smart card are:-

- The telecommunications industry, for example, with prepaid phone cards (such as phone cards which are classic memory cards with contact) or with SIM cards inserted in mobile phones;
- The banking industry with credit and debit cards (e.g.Europay, MasterCard, Visa) and electronic purses (e.g.Mone´o, Proton);
- The health care domain (e.g. the French card, called“Sesame Vitale”);
- The audiovisual industry with pay-TV;
- The identification industry (e.g. electronic passports, national ID cards);
- The transportation industry. It uses contact-less cards for public transport and concerning road transport it is used as a replacement of the common tachographs by digital versions on smart cards;
- The access control industry: access control to physical buildings more and more uses contact-less cards.

This shows the application that is found in smart card (Henry, 2001).

2.4 E-Payment using smart card

According to Newman,S and Sutter.G (2002) , the portability of a smart card as means of identification and electronic payment where it holds electronic coins for low value transactions either solely on the card or otherwise it is linked to a central database is becoming increasingly popular these days. Smart card that is integrated with a payment system acknowledges the need for easy “anytime, anywhere” access in order to achieve the mass take-up of smart cards that is currently lacking.(Newman.S & Sutter.G, 2002). Smart card has become a popular means of money transfer this day of electronic age. Many aspect of our everyday life is somehow

influenced by the use of smart card, such as in the transportation system, security system and many others. Conventional payment process involves a buyer-to-seller transfer of cash. A buyer withdraw money from his/her bank and transfer the money to the seller physically and the seller deposits the money into his/her account. In an electronic payment system money is transfer direct form the buyer to the seller's account. (Sing.S,2009). This show that electronic payment method is much more convenient than the conventional method of payment system.

2.5 Usage of smart card in higher learning institution

Smart cards are now widely used in most higher learning institution, whether in government institution or privately owned colleges. This is because the advantage of using an electronic device that enhances all the essential quality needed for fast and reliable transaction. Many higher learning institutions believe that in this way it will improve the capability of the institution. Recent study has shown that, tertiary intuition are using smart card which also acts as the identification of the students to store information of the student, thus helping to improve the storage of the data of the entire institute. The card also acts as an identification card, a means to borrow books from the library, e-purse and financial card that enables the student to apply for study loans.

Many universities have implemented this measure to ensure maximum usage of their ID card. The card not only store the information details of the students it also can hold money for on the desk transaction. In UiTM, rather than it being only a student identification card they have come up with. The smart card is used in the University's cafeteria where goods and food are purchased through the card. The smart card involve, UiTM as the owner, Bank Islam Malaysia Berhad (BIMB) as the financier and Modular Corporation as the developer

For UiTM the money is debited in the system by system administrators, which are usually, RM 4.00 per day or RM 60.00 for fifteen days. During purchase, the student will show their smart card where the barcode is scanned and their Personal Identification number is entered for security purposes. The information of the students is displayed on the screen ant the

attendance will key in the amount of the purchase and the amount is deducted. However, in this system, the money is deducted from the system and not the card.(Sivalingam,2010)

Based on the research conducted by the faculty of University Malaya, it showed that University Utara Malaysia (UUM) is using the smart card as their multi-purpose card catered to be used by the student and staff on UUM. Their smart card is used as the Identification card of students which store the personal information of the student, as well as other necessary information during emergency such as their medical record. The card is also used for the library system, where through the card they are able to borrow books and pay fine with it, it is also used as their medical card where all their medical history is stored in there. It also used for banking, transaction in Automatic Teller Machine (ATM) e-debit and MEPS cash. This shows how important smart card to the everyday life of student in Universities (Sivalingam,2010).

According to Sivalingam.M (2010,)Multimedia University has a more advanced smart card system since it is divided into two that is the financial application and the non-financial application. In it financial application , the smart card are used as electronic purse (e-purse) where student are able to purchase goods and services with it, the smart card can also be used as an ATM card to withdraw money and functionality in acting as an Touch N Go car is most impressive. For the non –financial part, the smart is used for access control to classrooms and labs, time attendance system, Parking management system and the ability to book facilities through the card. They also have other similar functionality to UUM such as the card also acts as the Identity card for the students (Sivalingam,2010)

University Utara Malaysia (UUM)	Multimedia University (MMU)
<ul style="list-style-type: none"> - Identity card - Library system - Medical system - Banking system - ATM card - E-debit - MEPS cash 	<ul style="list-style-type: none"> - E-purse - Touch N GO - Debit card - Door access - Time Attendance - Parking Attendance - Booking Facilities

Figure 4: Summary of applications

2.6 Security of smart card

Based on the paper, *Attacking Smart Card System: Theory and Practice*, smart cards are tamper resistant technology, where the intended functionality and the data held within such a device should not be undermined by tampering. Unfortunately, the token alone does not guarantee the security within the system. In incorporating smart cards into a system, attacks that apply to the security of the physical smart card token and the system as a whole should be considered. (Markantonakis.K, T. Michael, et al,2009). Moreover, the loss of the smart card with information in it will cause a heavy loss to the card holder since there is money stored inside it. It is human nature to misplace and lose things. In order to produce a more effective payment, barcode should be implemented onto the smart card for reading of the data and the data is then stored into the integrated circuit of the smart card.

According to Youssef.S.M, & M.S,Rana (2007), barcodes are used in many industrial area for identification and control purposes. A barcode is a machine-readable representation of information in a visual format on a surface (Sutton, 2002). Based on their research paper barcodes are read by bar codes readers called optical scanners. Barcodes a made up of a series of thick and thin parallel lines that are stamped on packages and now on cards.

University Teknologi PETRONAS has been using ordinary plastic card as the Identification card during their time in the University. However, the ID card that is used only serves as the Identification of the student.. Moreover, the bar code on the card enables the student to borrow book from the University library. That is all the function of UTP identification card.. Thus, to increase the functionality of the smart card, it is proposed that it also should be used as an payment card where student are able to purchase goods from the mart inside UTP.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

3.1.1 Prototyping Life-Cycle model

Prototyping models are used before a design or coding of an actual system can take place. The prototyping model begins with requirement gathering where the developers define the objectives, identify the requirements and outline areas where further definition is needed. (Pratiksyta, 2013) A prototype is built to understand the requirements of the clients. Through the prototype client will experience a close-to-real system. According to Park, Chae and Kang in their paper titled ‘The structured Prototyping Life-Cycle Model for Systems Development Management’, this will help them to understand the system better. It is more commonly used in large and complicated project. However, this model is used for this project because of the necessity of producing a prototype. Prototypes are not the completed version of the system and many other functionality is not built in the prototype. Steps in the prototype life-cycle model are planning, design, building of prototype, maintenance, engineering the product.

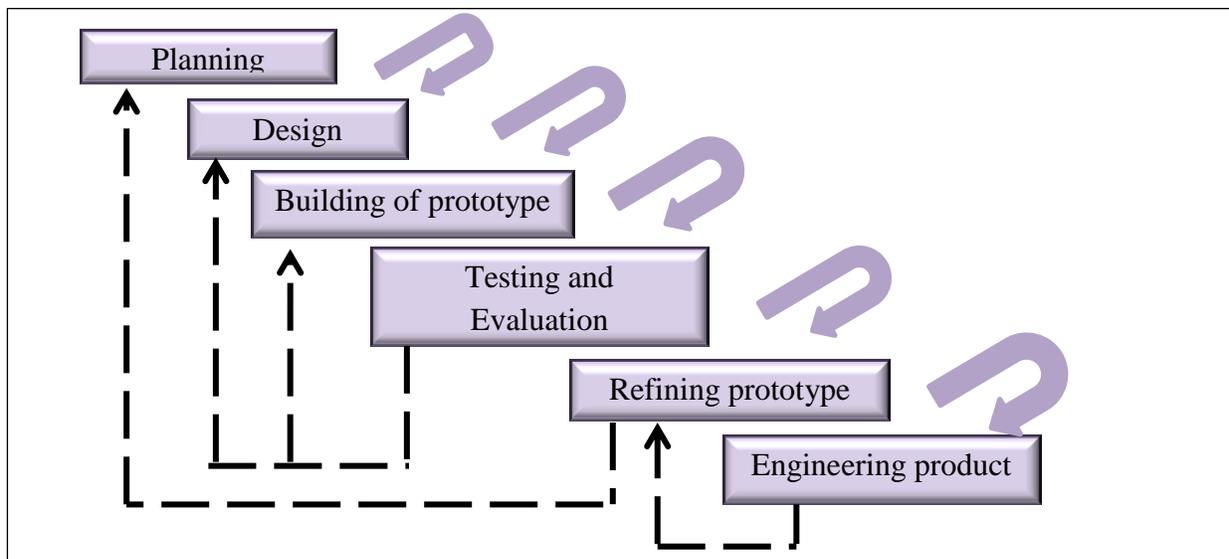


Figure 5: Prototyping Life-Cycle Model

3.2 Planning

Planning is the initial stage of the project where information s are gathered for analysis on the success and failure of the project if it is continued. The implementation of RFID into the matric card to be used as payment card needs thorough study since it involves many parties and cost of implementation. For this project, feasibility study was conducted to ensure that this project can be carried in the time frame mentioned with sufficient resources. In coming up with a prototype, the hardware and software required is available. Since this project concern the community in UTP, the testing can be done in campus ground. The proposal for the project was then approved by the committee after the review on the feasibility study conducted. Literature review was also done as mentioned above on previous similar implementation of the smart card as payment used in universities campuses.

3.2.1 Project Activities

In collecting information and requirement for this project, analysis on the problem faced by student in UTP was conducted. Data from the security office was collected to identify the number of theft and loss of matric card reported by students.

Survey were conducted by distributing questionnaire to students to receive their feedback on the current system used in UTP. The information collected is used to determine if the project is worth pursuing or otherwise. The participants were current students of UTP from various courses.

3.2.2 Project schedule milestone

Training activities	Week No/Date																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Initiation	✓	✓																										
i. Select project name	✓																											
ii. Develop project proposal		✓																										
iii. Submit project proposal for approval.			✓																									
Planning				✓	✓	✓	✓	✓	✓																			
i. Develop problem statement				✓	✓																							
ii. Define objective and project scope.				✓	✓																							
iii. Research on past similar projects					✓	✓	✓	✓	✓	✓																		
iv. Define and validate user requirement								✓	✓																			
v. Define suitable hardware and software								✓	✓	✓																		
Execution											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
i. Design the system											✓	✓																
ii. Develop the system											✓	✓																
iii. Tabulate the result and discussion											✓	✓																
Maintenance and Controlling																							✓					
i. Testing of the system																												
Closing																							✓	✓	✓	✓	✓	
i. Conclusion																							✓					
ii. Recommendation for future project																							✓	✓	✓	✓	✓	
iii. Presentation of project																											✓	

Figure 6: Project schedule

3.2.3 Gantt Chart

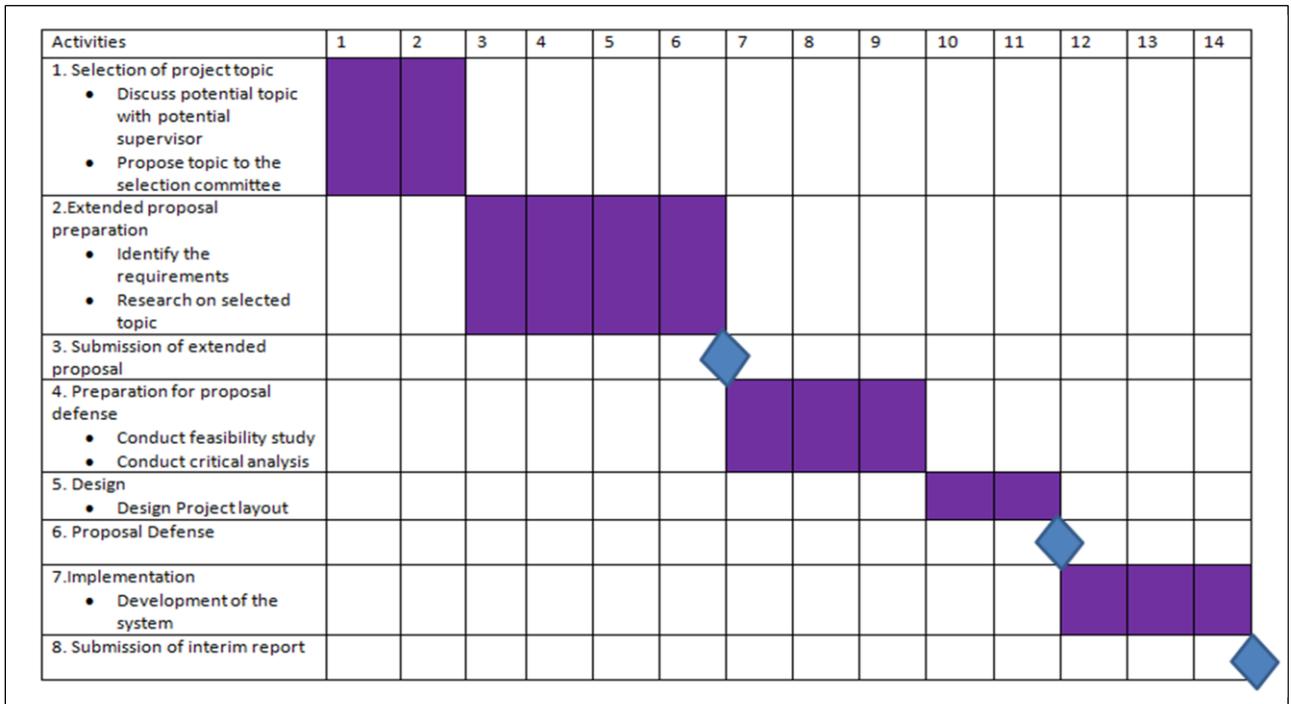


Figure 7: Gantt Chart for FYP 1

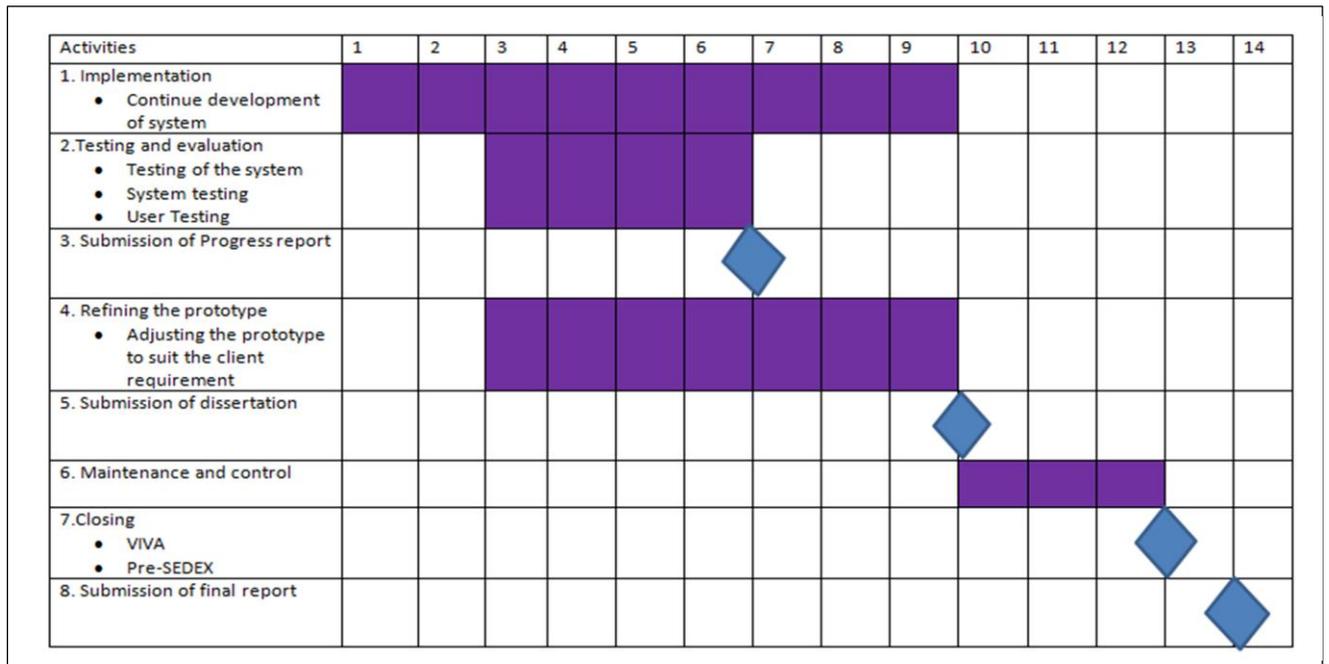


Figure 8: Gantt Chart for FYP 2

3.3 Design

3.3.1 Requirement

3.3.1.1 User Requirement

The user requirement outlines the requirements that the user expects in using this system. This e-wallet payment system has 3 main users that is the administration, the students and also the mini market owner. Below are the requirements of each user.

Administrator	Student	Mini market Owner
<ul style="list-style-type: none">a. Register the card to the systemb. Register new mini marts into the systemc. Terminate or block students cardd. Able to reload card for studentse. Have access to the sales report, the reload report and the terminated/blocked report	<ul style="list-style-type: none">a. Purchaseb. Reload card	<ul style="list-style-type: none">a. Use the card for paymentb. Register item to the inventoryc. Check sales report

Table 2: User Requirement

3.3.1.2 System Requirement

The system requirement outlines the needs of the system for this project. For this project, contactless RFID card is used. Since the objective is for fast transaction thus, contactless RFID card is a better choice. Moreover, the card can only be read from a short distance, thus students are aware if their card is being read or otherwise. Passive card reader is used to read the data from the card.

3.3.2 System Architecture

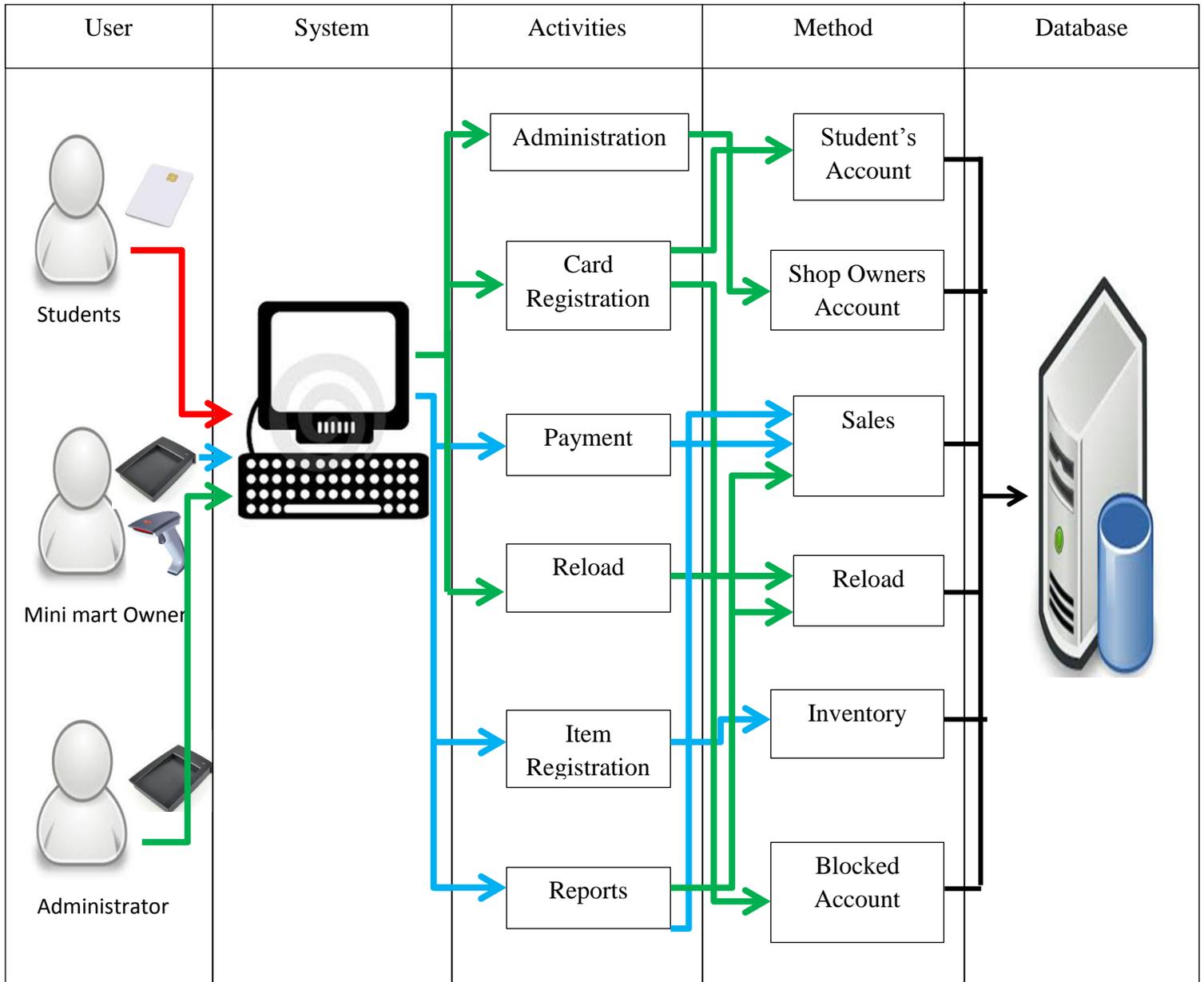


Figure 9: Physical Architecture

From the system architecture in figure 11, there are 3 main users to this system. Firstly is the students who holds the card. The students function in this system is to scan the card in order to purchase goods or for reloading the card. However the function of the mini mart owner and the administrator are much more complicated. The mini mart owner has 3 main functionality that is the payment function, the item registration function and the report function where they have access to their daily sales records. The administrator on the other has 4 main functionality that is the shop registration, the card's termination and registration function the reload function and also the sales report that shows the sales report form the mini marts, the reload records and the blocked cards. All the data and information are stored in the database which is connected via Universiti Teknologi PETRONAS intranet. Every data updated will be updated into the database.

3.3.3 Flow of the transaction

3.3.3.1 Payment Process

The inventory of the mini mart is updated frequently to register it item on the shelf thus the item can be found in the mini marts database. The student will then bring their chosen item to the counter, and the cashier will ring each item and the price of the item will be displayed on the computer screen. When the student wants to make a payment, he/she must show their smart card. The mini mart attendant will use the smart card reader to scan the card . Once the information related to the student appeared on the screen and it will automatically deduct the appropriate value from it. This student's card is only acts as a medium for payment because of the value is not deducted from the card, but from the system.

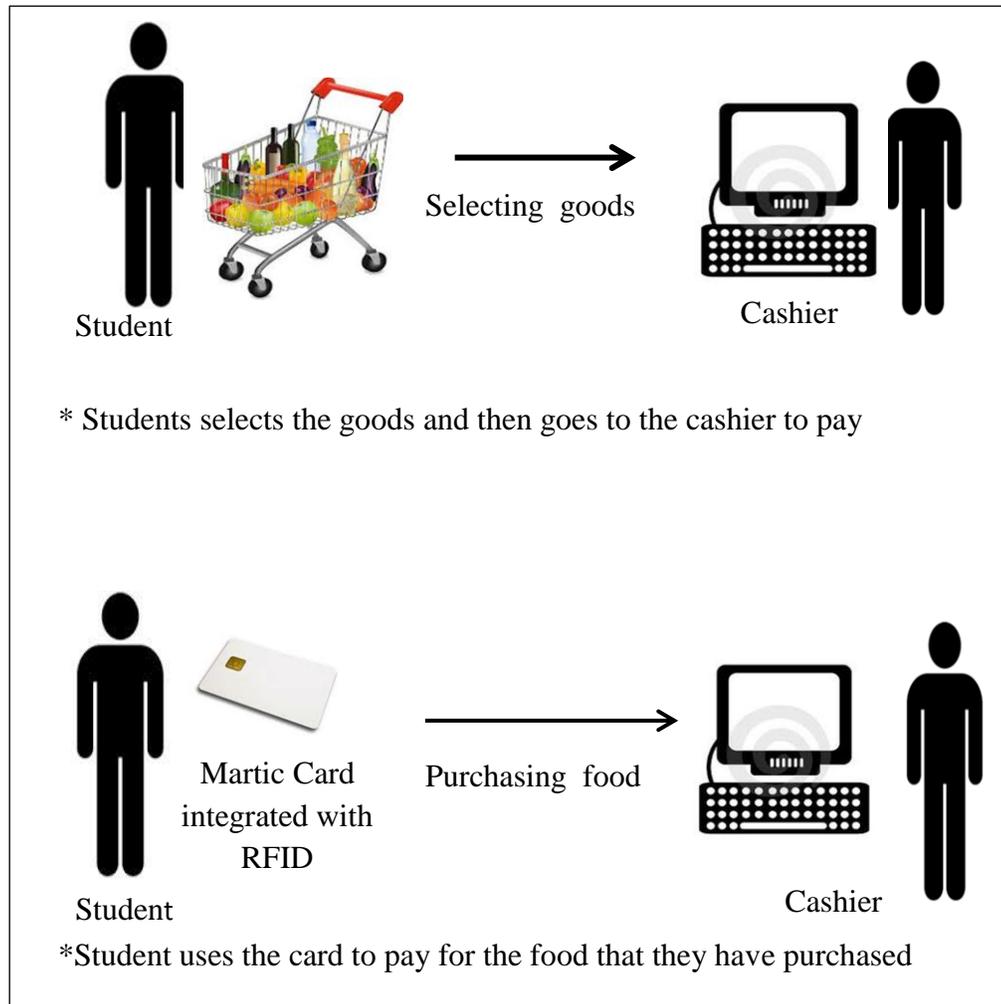


Figure 10: Payment Process

3.3.3.2 Reload Process

The reload process is done in the finance department through the administrator. Students goes to the finance counter and show their card for reload. They pay cash and choose the amount they want to reload into their card. The card is then scanned, and the reload amount is added to the previous balance and the current amount is displayed. The reload record will then be safe into the database for future processing .

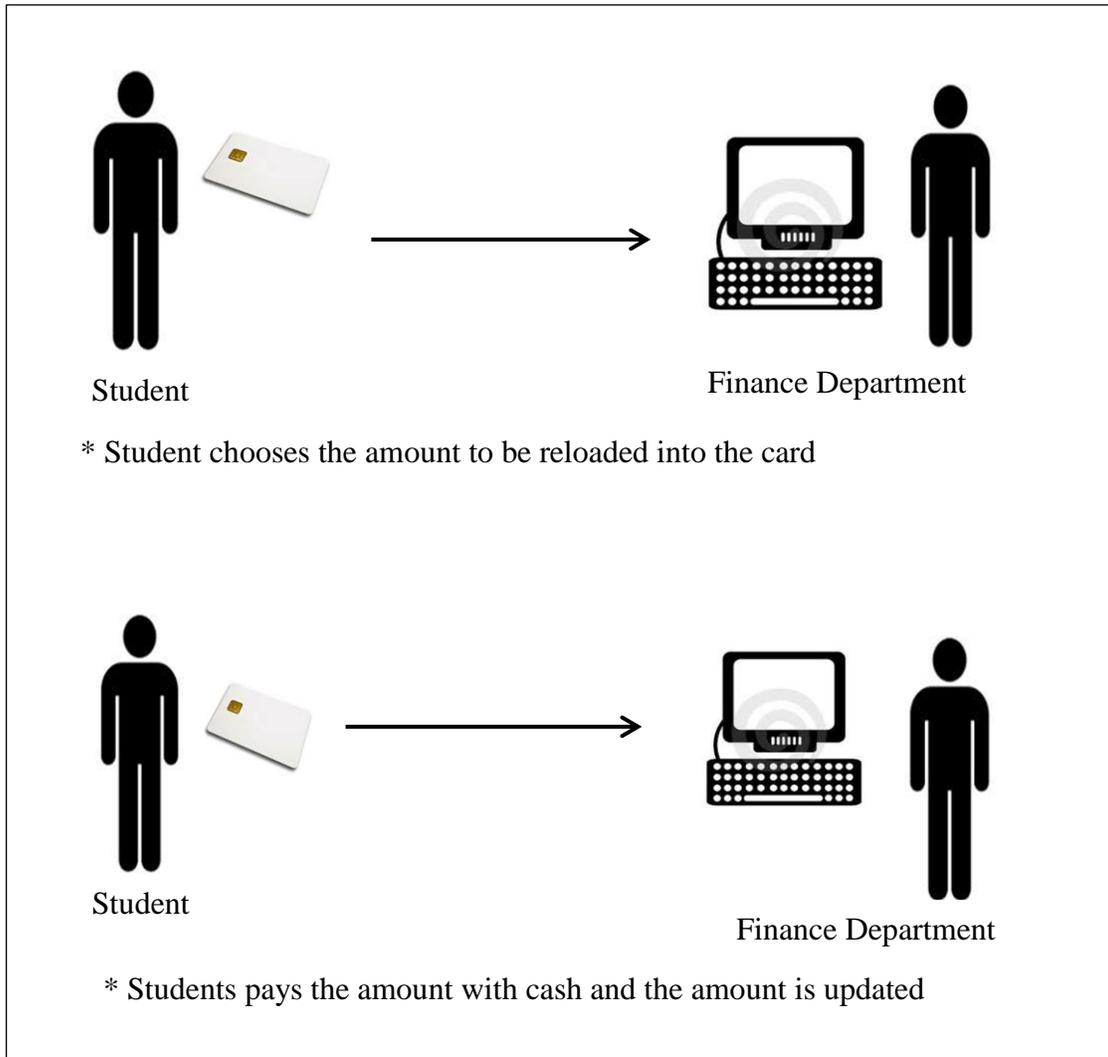


Figure 11: Reload Process

3.3.3.3 Registration and Termination process

In order for the data from the mini marts to be saved in the system, the mini mart is to be registered with the administrator so that they are in the system. Secondly, once the students has obtained their ID, the card is to be registered and reloaded with amount. The card ID including the matric ID and students name are lined together. If students has reported their card is missing, the card can be blocked so that no transaction can be made. The blocked card will then be stored into the database.

3.3.4 Requirement analysis

3.3.4.1 Functionality

The entire system is easy to understand through a glance. However, there are specific functionality that ensures the card serves its purpose in fulfilling its objective of effectiveness and efficiencies. Table shows the functionality of the card once the goods are scanned by the cashier:-

Functionality	Description
<i>Confirmation Function</i>	The total sum of products and good purchased is stored in a variable that will be used to deduct money from the card
<i>Card data retrieval (Read)</i>	Once the RFID card is read, the information in it is displayed including the current total. It checks to ensure that the current amount is more than the total price. If the current amount is lesser than the total price, message 'Low Credit' appears. Otherwise transaction continues
<i>Card data update (Write)</i>	The total price is deducted from the current amount and the balance is re-written back in to the database
<i>Confirmation of transaction</i>	The current balance in the card is then displayed with the users information

Table 3: Functionality for the payment process

The table below show the functionality of the during reload of the card

Functionality	Description
<i>Confirmation Function</i>	The reload option is chosen by the cashier

<i>Card data retrieval (Read)</i>	Once the RFID card is read, the information in it is displayed including the current total. The amount of reload is entered
<i>Card data update (Write)</i>	The amount entered overwrites the existing data in the database
<i>Confirmation of transaction</i>	The current amount is displayed with the users information

Table 4: Functionality for the reload process

The table below shows the functionality of the shop registration and the card registration and termination

Functionality	Description
<i>Shop Registration</i>	Each mini mart has their own username and password and level of access. Mini marts owner has access to their sales report
<i>Card Registration</i>	The card is registered into the system so that it can be used in mini marts to purchase goods.
<i>Card Termination/Blocked</i>	The card is blocked and terminated and cannot be used in any other mini marts.

Table 5: Functionality of the registration and termination process

One of the objective of this project was also to prevent theft. Thus, if the card is reported lost the administrator will be able to inactivate the card by changing the key ID used to connect to the database. This will ensure that the thief will not be able to use the money in the card and the amount lost can be retrieved since the data is stored externally.

The table below shows the functionality of the reports where record can be obtained

Functionality	Description
<i>Sales Report</i>	The records on the daily sales report is stored in the database and can be retrieved according to dates
<i>Reload Report</i>	The records on daily reload is stored into the database and can be retrieved according to dates
<i>Blocked Card Reports</i>	Card that has been blocked, are saved in the database for future record

Table 6: Functionality of the Report

3.3.4.2 Limitations

This project has its limitation in particular situation. Any person that possesses the card will be able to use it unless it is blocked. Moreover, there is no secondary authentication that confirms the person using the card is the real owner even though the personal information of the user is displayed. This problem can be addressed in the future.

3.3.5 Use case and class diagram

3.3.5.1 Use case diagram for the RFID tag integrated into the Matric card

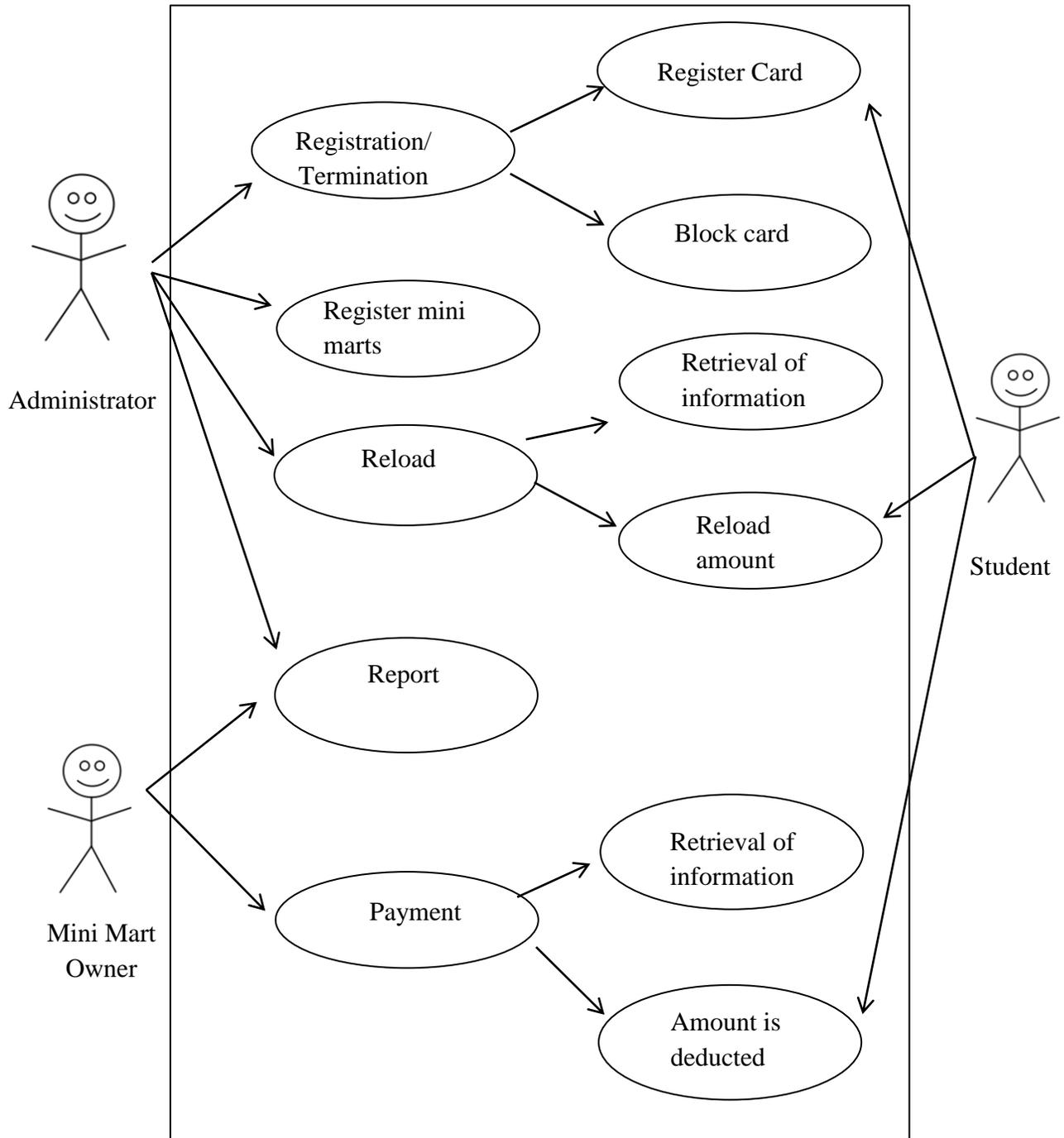


Figure 12: Use Case Diagram of the system

3.3.5.2 Class diagram of the system

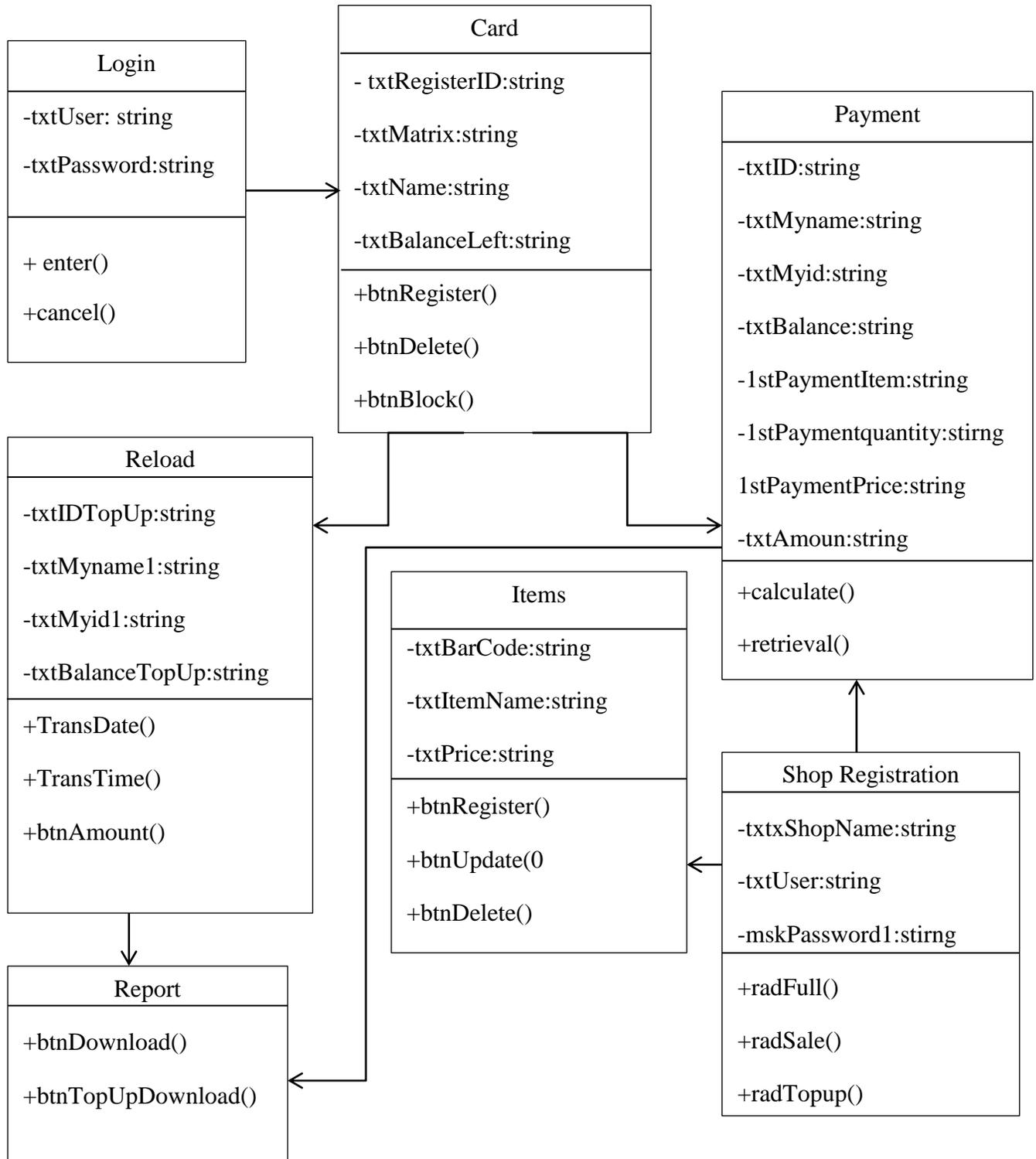


Figure 13: Class diagram of the system

3.3.5.3 Entity Relationship Diagram of the Database

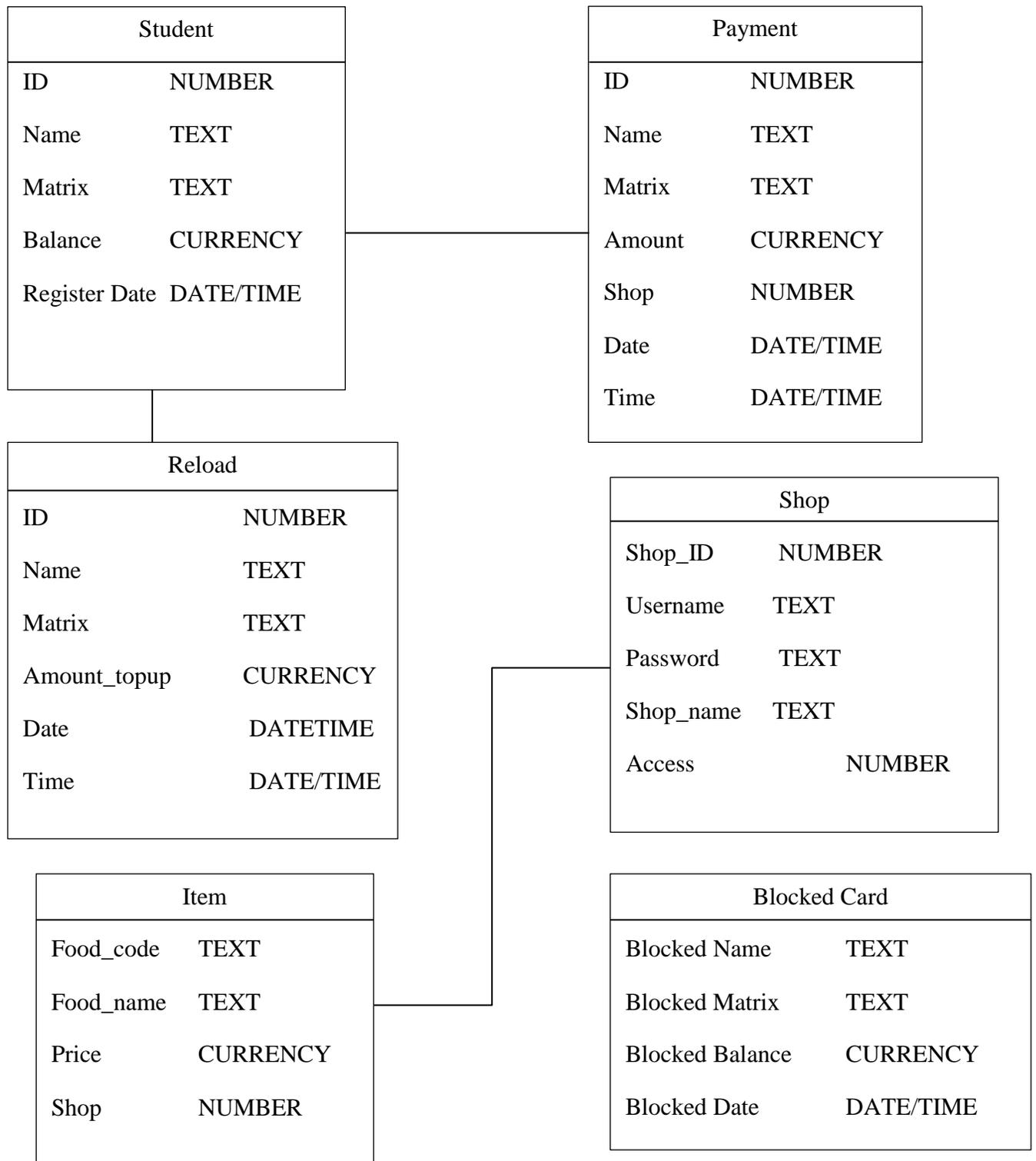


Figure 14: ERD for database

3.3.6 Hardware and Software Specifications

3.3.6.1 Hardware Specification

- RFID card

The RFID is integrated inside the matric card changing the normal matric card into a smart card. For the development of the prototype, RFID tag in a form of a card is used. There two important components in the RFID tags which are the integrated circuit (IC) where storing and processing of the Radio frequency signal and other function are conducted. The signal are modulated and demodulated in order to read the data sent or received. The antenna is used for receiving and transmitting the signal. For this project active RFID tags are used where there is battery and signal are transmitted once the reader is identified.

- RFID card reader

The card reader is used to send signal to the RFID tags. It emits radio wave to the tags and is responded by sending back data. The distance, orientation of the card reader and the tag placement on the card plays a role in which the data can be read or otherwise.



Figure 15: RFID reader

- **Barcode Reader**

The barcode reader is used to ring the goods that are purchased by the students. Each barcode is stored as inventory in the database and when the item is scanned, the barcode number, the item name and the item will be displayed. The line-of-sight needed by the barcode scanner is different from RFID signals. This scanner will speed up the process during transaction.



Figure 16:Barcode Scanner

3.3.6.2 Software Specification

- **Microsoft Visual Studio 2010**

.NET technology is used in developing the payment card application and Visual Basic(VB) is used. The BASIC programming language enables the development of the user interface for the payment card application in the smart card. Visual Basic's connection a the local database through the Open Database Connectivity (ODBC) makes it possible by creating Data Source Name (DNS)

- **Microsoft Access**

Microsoft Access is used as a database to store data based on the Access Jet Database Engine. Direct links can be connected to the data stored in pther application or database

- Microsoft Excel

It supports spreadsheets using grid cells arranged in rows and columns. Excel supports Visual Basic thus providing an easier manner of spreadsheet manipulation. Transaction report can be obtain through the excel spread sheet

CHAPTER 4

RESULT & DISCUSSION

4.1 Introduction

In this chapter will talk on the outcome on the research and analysis that has been done in the survey that was conducted. The flowchart on how the system is developed and the user interface that will appear during the transaction is also explained in this chapter.

4.2 Result of the survey

A survey was conducted on the opinion of the general public especially from the student of University Teknologi PETRONAS. This is survey was conducted online among my peers form University Teknologi PETRONAS. 50 students took part in this survey as a favor to complete my project on the importance of using smartcard in cafeteria and minimarts inside campus. The respondent was a mix gender of male and female and from various backgrounds. Since it will compromise my result, I took volunteers from different background and gender.

(Refer to Appendix for questionnaire)

Below shows the pie chart of the information that has been collected and the data was being analyzed.

i. Is the transaction too slow at the cafeteria and minimarts?

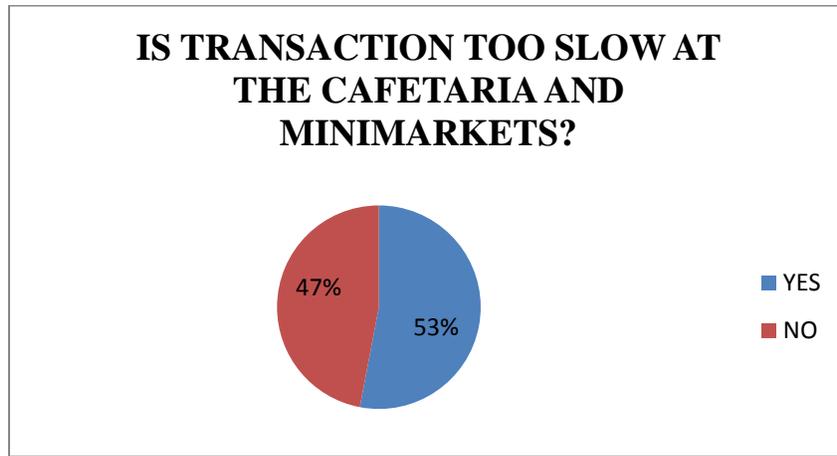


Figure 17: Pie chart 1

Based on the pie chart above it show that more than 50% of the participant agreed that the transaction in the cafeterias and mini mart are slow. This is because, at certain time of the day there are many student in these area purchasing goods. Moreover, some customer comes in with large notes and purchases good with low value and the cashier has to provide a large change back and this action takes time. Furthermore, the cashier don't have enough change for this large notes causing delay and long lines appears

ii. Matric card has very few function

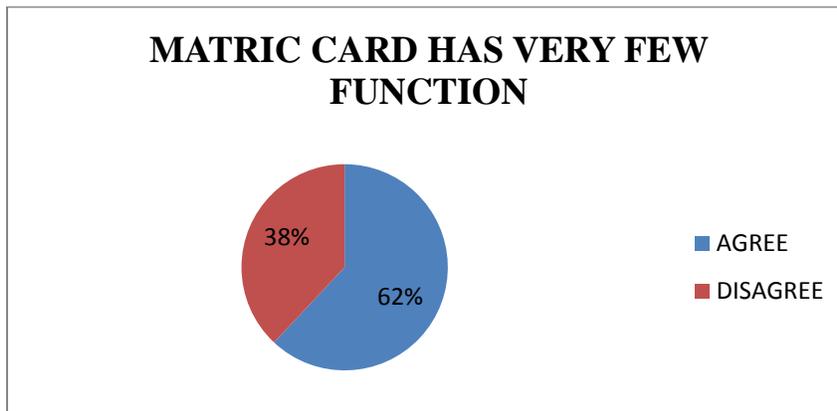


Figure 18: Pie chart 2

Figure show the graph on the opinion of the student about the functionality present in the current matric card. 38% of the participant who are UTP students disagreed that the matric card has few functionality but 62 %, the majority of the participants agreed that the matric card has very few functionality. The current matric is used as Identification and also as a library card. Thus, it has only two functions in it. Many students' underappreciate their matric card because of this thus misplacing them is very common.

iii. Change the Matric card to a smart card?

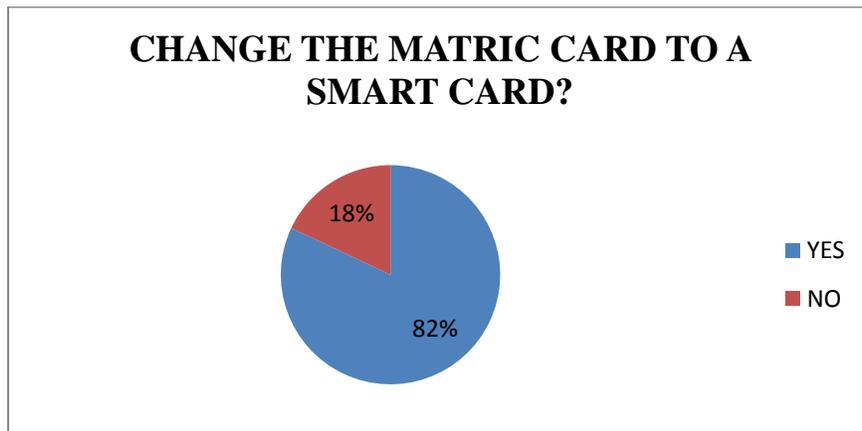
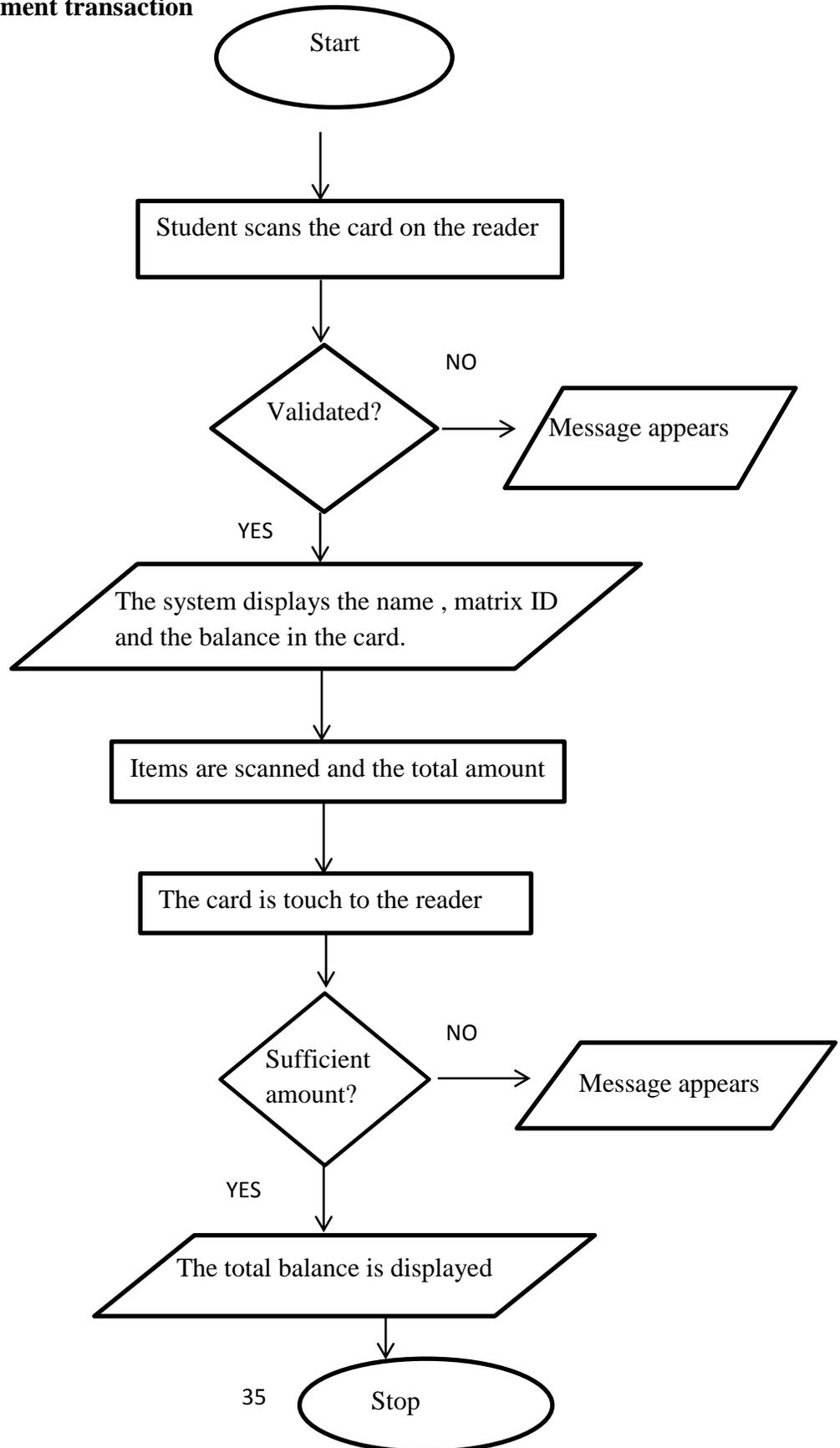


Figure 19: Pie Chart 3

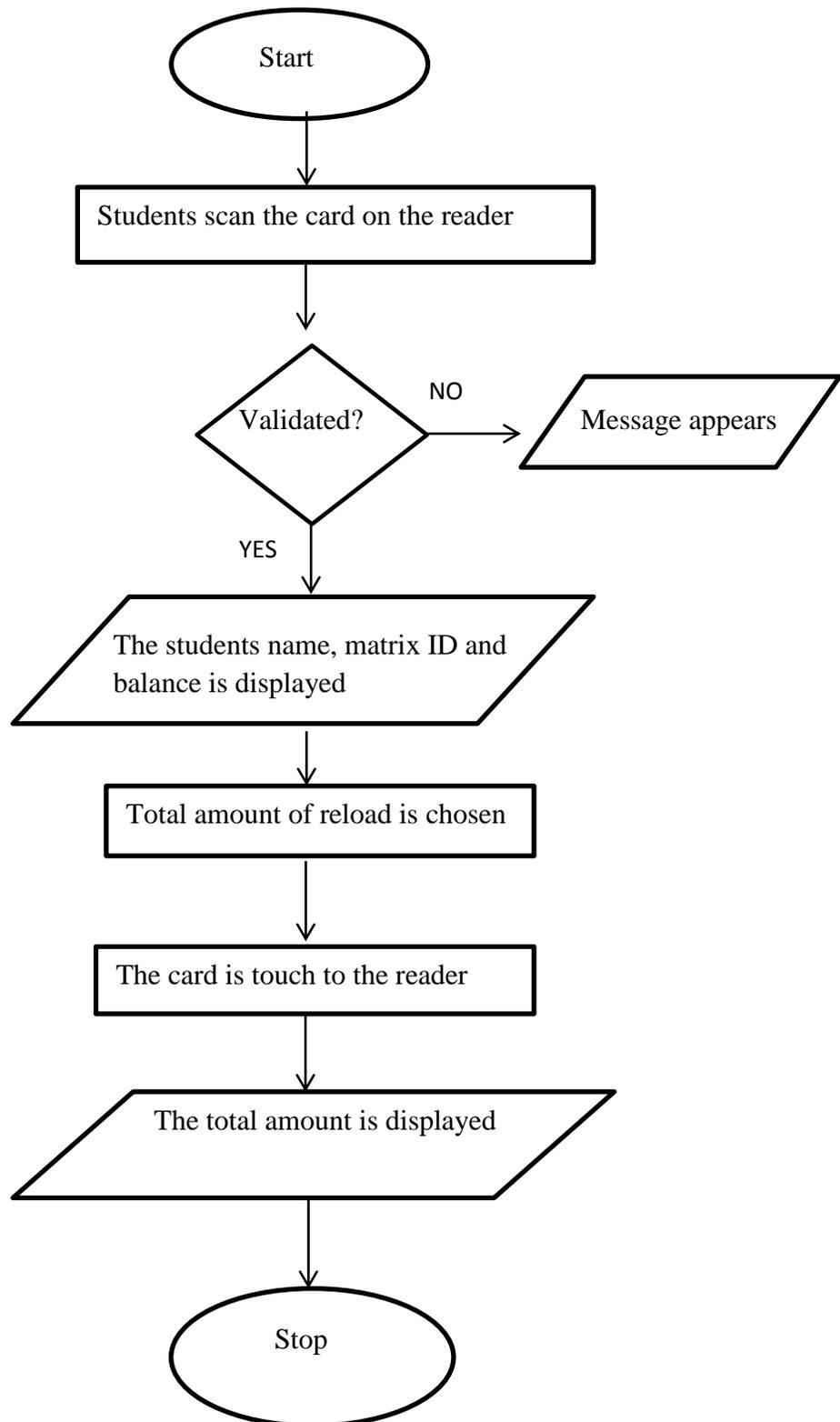
The pie charts show that there are problems faced with the current system. The majority agrees with the idea of replacing the current Matric card to the smartcard. This is because they believe in the smart card technology and this will improve the productivity of UTP. The student and the staff of UTP will acknowledge this change however slowly.

4.3 Flowchart

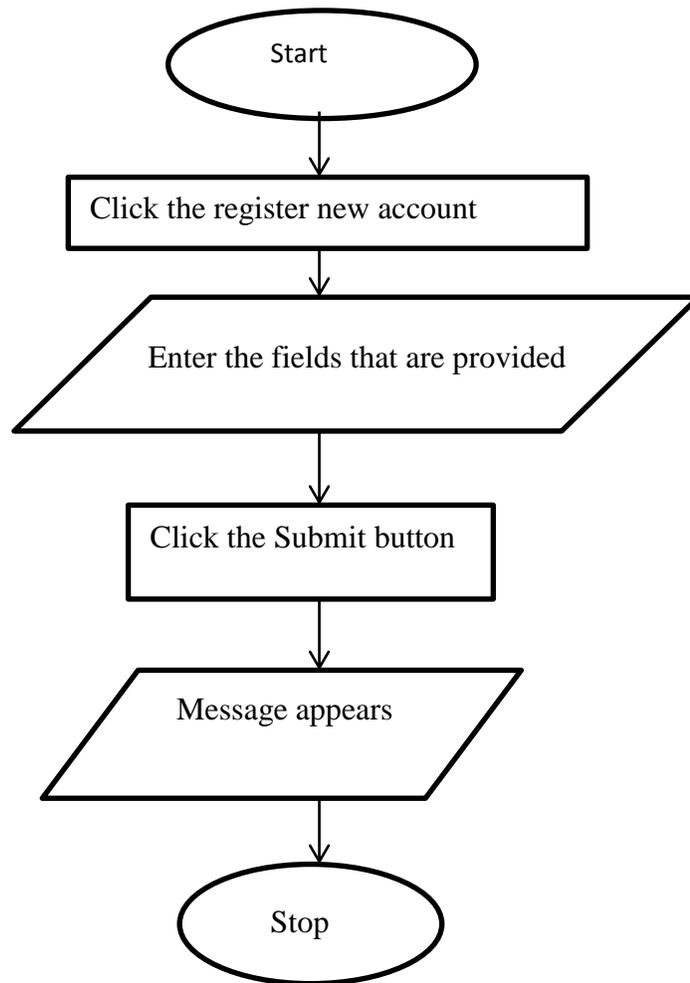
4.3.1 Flowchart for payment transaction



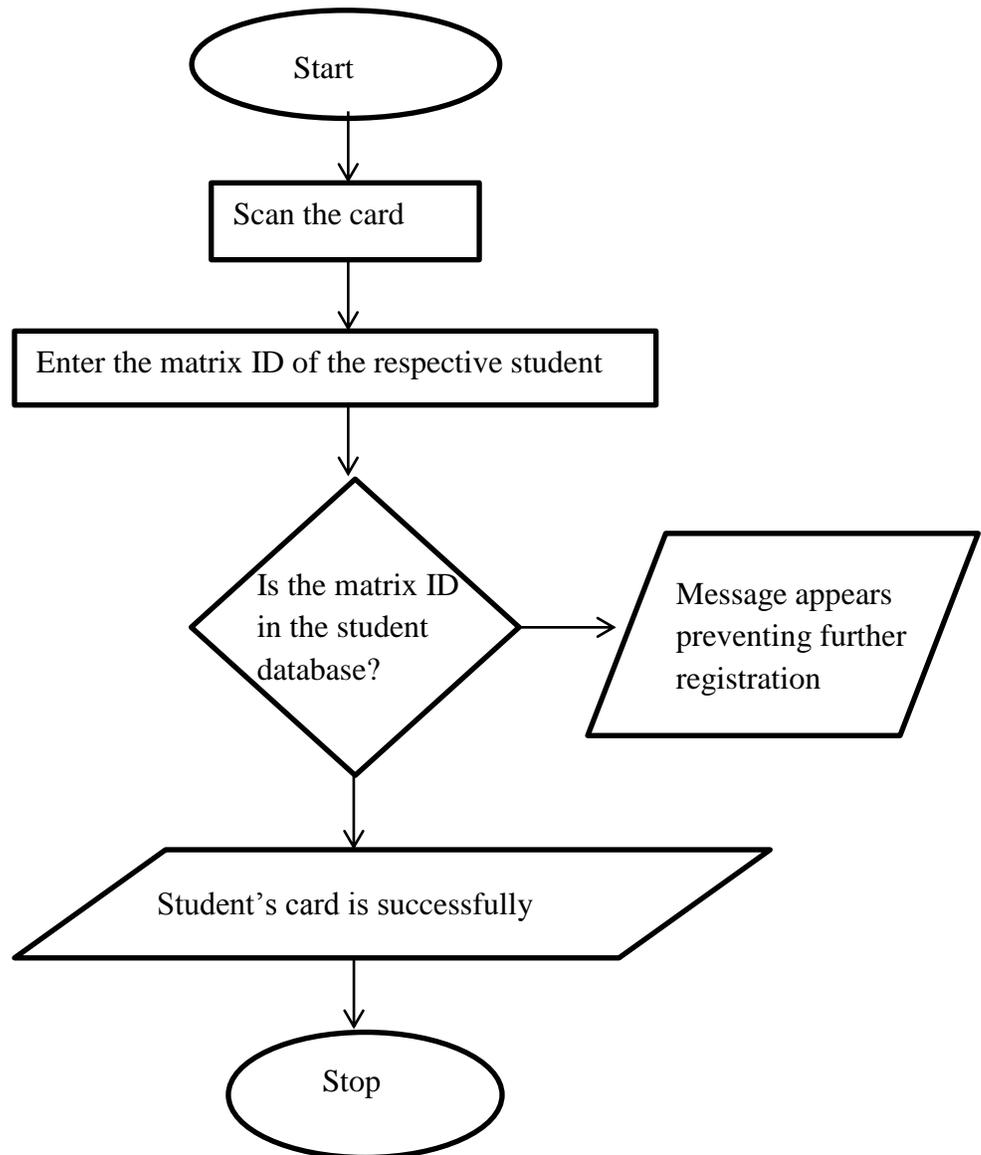
4.3.2 Flowchart for reload transaction



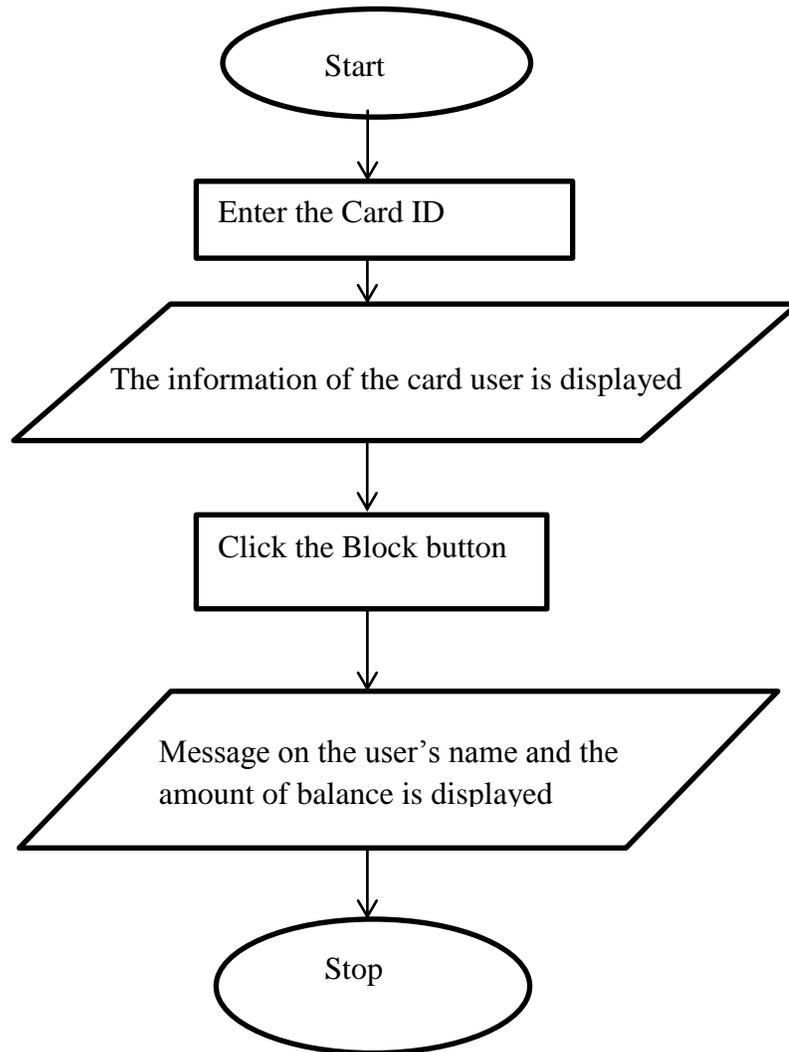
4.3.3 Flowchart for shop registration



4.3.4 Flowchart for card registration



4.3.5 Flowchart for blocking the card



4.4 Screen Shots of the user interface

4.4.1 Login Page

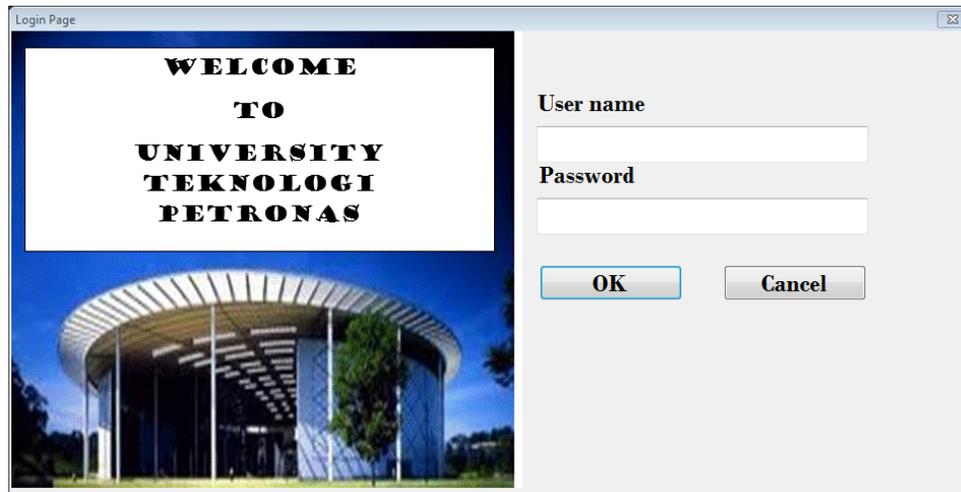


Figure 20: Login Page

Every store UTP will be introduced into the existing system that already in function. This application will be integrated in it. For the first page, it shows the Login form to enter the system. Every Mini mart has its password and username and level of access. The administrator also has their own username and password with different functionality

4.4.2 Administrator Main Page

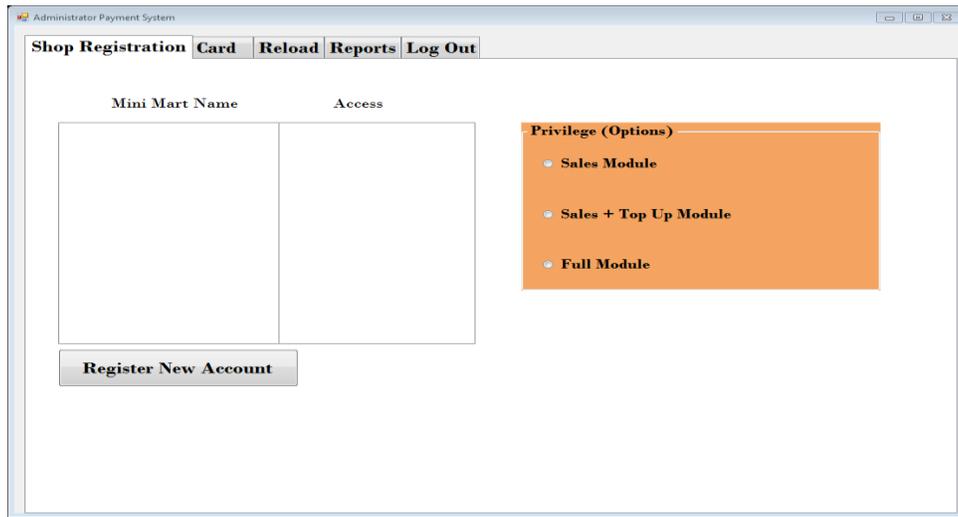


Figure 21: Main page for Administrator

This is the first page that the administrator will see once it has successfully login to the account.

4.4.2.1 Administrator Main Page Card

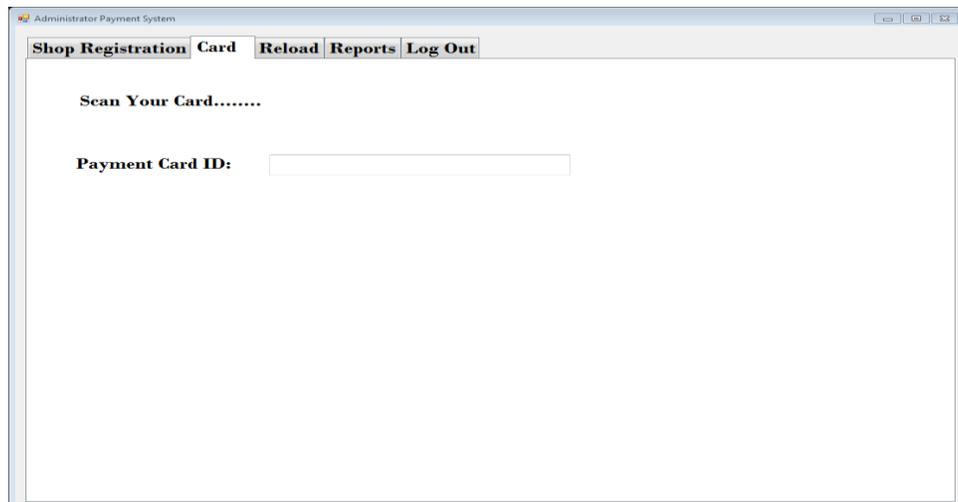
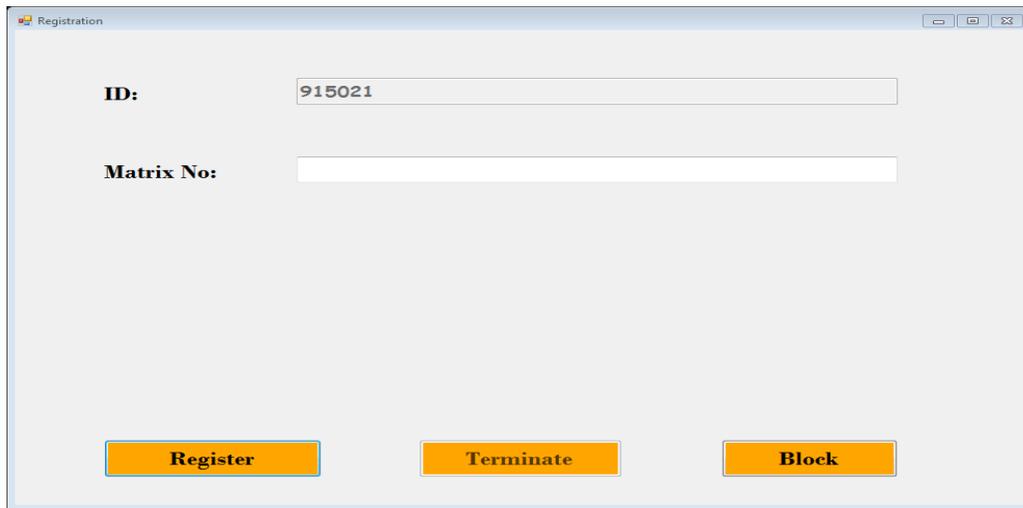


Figure 22: Card

This is the page that is seen when the 'Card' tab is clicked. The card's ID will appear when the card is scanned.

4.4.2 Administrator Main Page- Card Registration



The screenshot shows a window titled "Registration" with a light gray background. At the top right are standard window control buttons (minimize, maximize, close). Below the title bar, there are two input fields. The first is labeled "ID:" and contains the text "915021". The second is labeled "Matrix No:" and is currently empty. At the bottom of the window, there are three yellow buttons with black text: "Register", "Terminate", and "Block".

Figure 23: Card Registration

The administrator enters the Matrix ID and the 'Register' button is clicked.



The screenshot shows the same "Registration" window. The "ID:" field still contains "915021". The "Matrix No:" field now contains "15108". A new field labeled "Name:" has been added and contains "Joanna Michelle". The "Balance Left:" field now contains "0.00". The "Register", "Terminate", and "Block" buttons remain at the bottom.

Figure 24: Card Registration

If the card has already been registered, this page will be displayed when the card is scanned.

4.4.2.3 Administrator Main Page-Reload

Administrator Main Page

Shop Registration Card Registration **Reload** Reports Log Out

Scan Your Card.....

ID: Payment Card ID: XXXXXX

Name: Matrix ID:

Balance Left:

RM 1 RM 5 RM 10

RM 50 RM 100

Figure 25: Reload

This is the reload page that is used to add amount into the card

4.4.2.4 Administrator Main Page – Reports

Administrator Main Page

Shop Registration Card Registration Reload **Reports** Log Out

Sales Report

From: Sunday, December 01, 2013 -

To: Sunday, December 01, 2013 -

Download

Blocked Card

Download

Reload Report

From: Sunday, December 01, 2013 -

To: Sunday, December 01, 2013 -

Download

Figure 26: Reports

This page show the reports that can be downloaded by the administrator.

4.4.3 Mini Mart Main Page

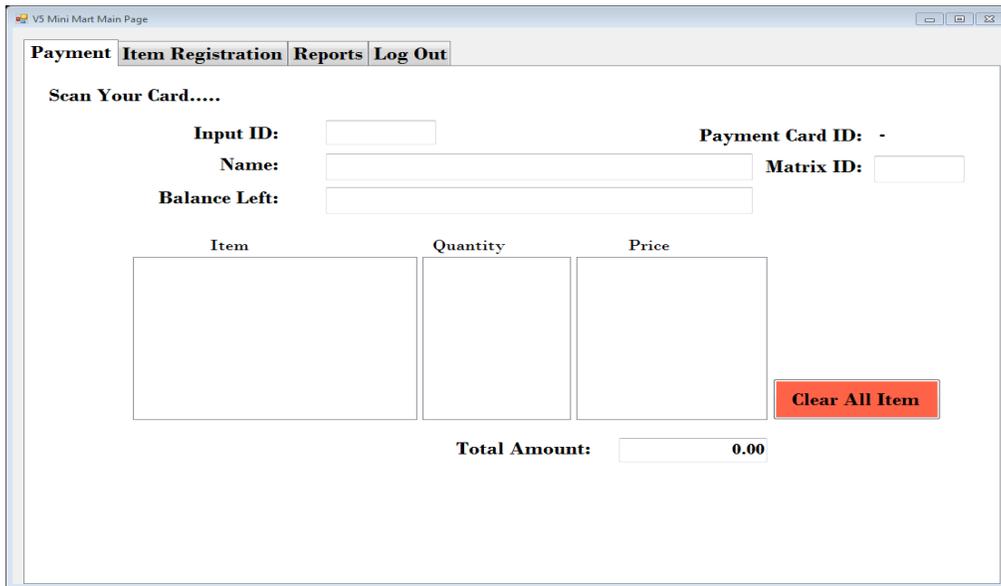


Figure 27: Payment

When the mini mart user enter their usernam and password this is the first page that appears

4.4.3.1 Mini Mart Main Page- Item Registration

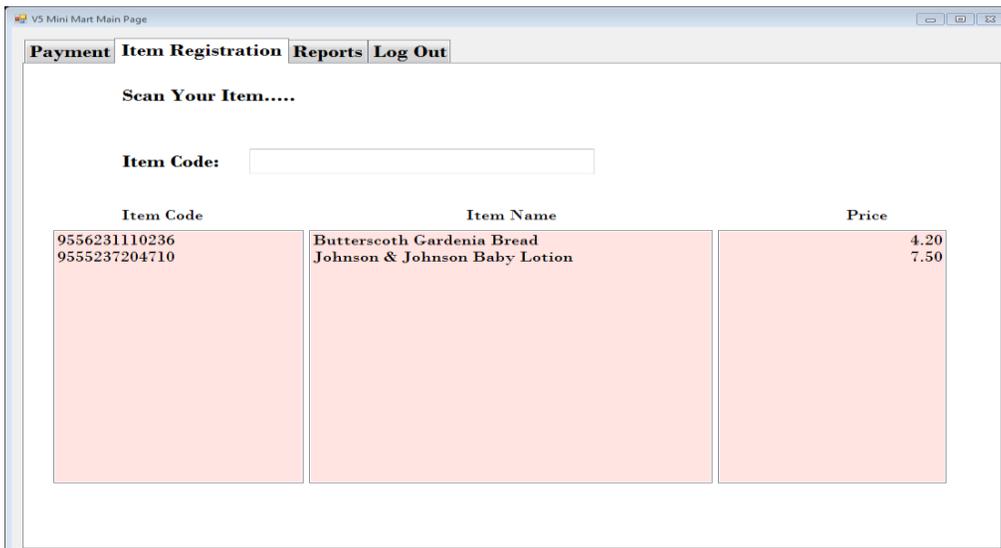


Figure 28:Item Registration

The inventory of the mini mart is registered in this page

Item Registration

BarCode/ Item ID: 9233432322212

Item Name:

Price:

Register Edit Delete

Figure 29: Register item

The system asks for the item's name and price

4.4.3.2 Mini Mart Main Page-Reports

VS Mini Mart Main Page

Payment Item Registration Reports Log Out

Sales Report

From: Sunday, December 01, 2013

To: Sunday, December 01, 2013

Download

Figure 30: Report

Compared to the Reports by the administrator, the reports for the mini mart is only the dales report

4.5 Testing

4.5.1 User Testing

There are 3 main users to my system that is the Administrator or also known as the Finance Department, the mini marts owners and also the students. Thus, User testing has been conducted with this 3 main user. Where the users were given the chance in using the system and their feedback was recorded. For the students and mini mart owners survey was conducted to analysis their result upon using this system. Whereas, interview was conducted on the administrator to obtain feedback on the system.

4.5.1.1 User Testing- Administrator.

An interview was conducted with a representative from the management, to obtain their feedback on the system. Since the Finance Department is also one of the user of the system, it is crucial in obtaining their opinion on the system. When asked the opinion on the e-wallet system, the representative at the counter was thrilled to be a part of the user testing. According to the representative, the system consist of all the essential components that is needed such as the registration of the card, the reload option so that the amount of the card can be reloaded for continuous use and printable reports for archiving. The user interface is simple and easy to be understood by any user. However, they background is dull and not attractive.

To the question, will this system help to solve the problems that Universiti Teknologi PETRONAs is facing such as slow transaction, theft cases, and little functionality on the Matric Card, she answered that it will eliminate the problem entirely but it will be a step toward it. Since many universities are using e-wallet system, UTP should also be on that track. It will however solve the little functionality of the Matric card and the theft cases since there is a functionality to block the card if it is reported stolen. She also pointed out that an automatic reload machine should be used to reload card since it's faster.

To the question on the information displayed in the system sufficient, she replied that it was sufficient. Too much information displayed will make the system slower and it will also be unnecessary. The reports that can be downloaded is also useful to the management since they are able to keep track of transaction and if there is any problems later, they can come back to the

reports. There was also a question on appropriation of the shop registration and the card registration, according to the representative, she said “ Yes, it is useful since there are new students every semester and if there are new mini marts to be open, the functionality will be useful.”

Based on the reply by the user, it can be concluded that, the system is fairly accepted by the management unit and the system is easily used by anyone since the friendly user interface is easily understood. There were a few caution highlighted regarding the security of the card. Suggestion were made that a pin number should also be used during accessing the card. The system is effective from the functionality highlighted such as the ability to block the card and also the reports that are generated. Overall, the system was acceptable.

4.5.1.2 User Testing- Mini Mart Owner

The other primary users to the system are the mini marts owners. For this testing, I have surveyed 3 mini marts owner that is in Village 3 mini mart, Village 4 mini mart and Village 5 mini mart. After showing them the system and a brief introduction on why this system was built, survey forms where handed out to be filled by the individuals. With a scale of 1 to 5, where 1 is Strongly Disagree , 2 is Agree, 3 is Neutral 4, is Disagree and 5 is Strongly Disagree. Below are the quantitative analysis on the survey.

- i. Do you agree if this system is implemented in Universitit Teknologi PETRONAS mini marts?

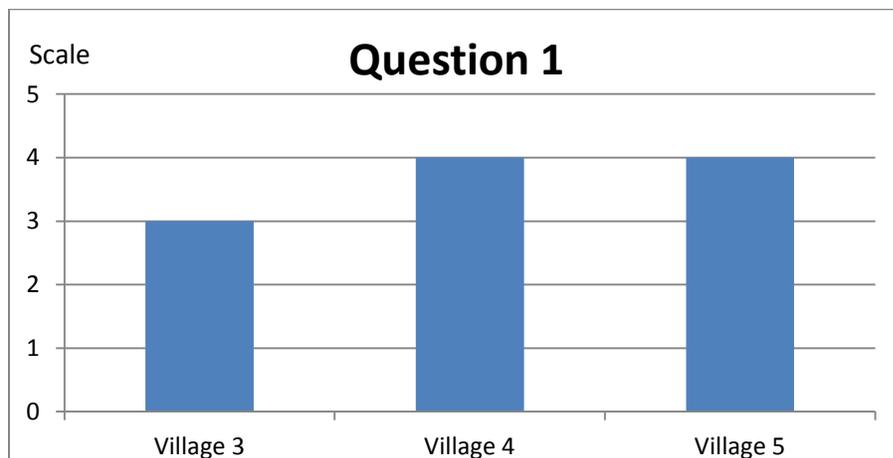


Figure 31: Bar Chart

The bar chart in Figure 31 shows that two mini marts agree that the system should be implemented in UTP. However, the other minimart owner was still skeptical.

ii. Is the system easy to use and understand?

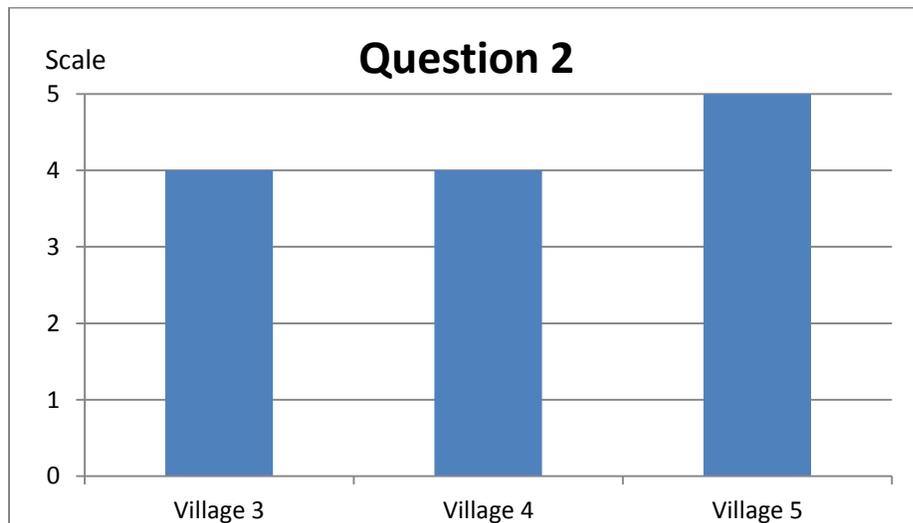


Figure 32: Bar Chart

The bar chart in figure 32 on the other hand shows the scale chosen by the mini mart owners. According to them they agree that the system is easy to understand and use.

iii. Is the transaction much faster with the use of the card to purchase goods?

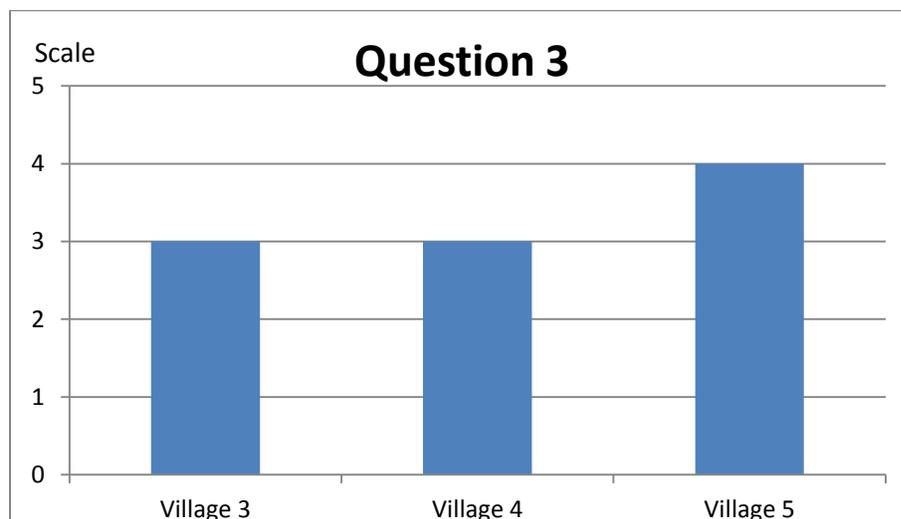


Figure 33: Bar Chart

The bar chart in Figure 33 show that, 2 mini mart owner is still on the bench regarding the change in transaction time when the card is used. However, the mini mart owner in Village 5 believes that by using the card transaction time will be faster.

- iv. During scanning the items, the information displayed is based on the inventory?

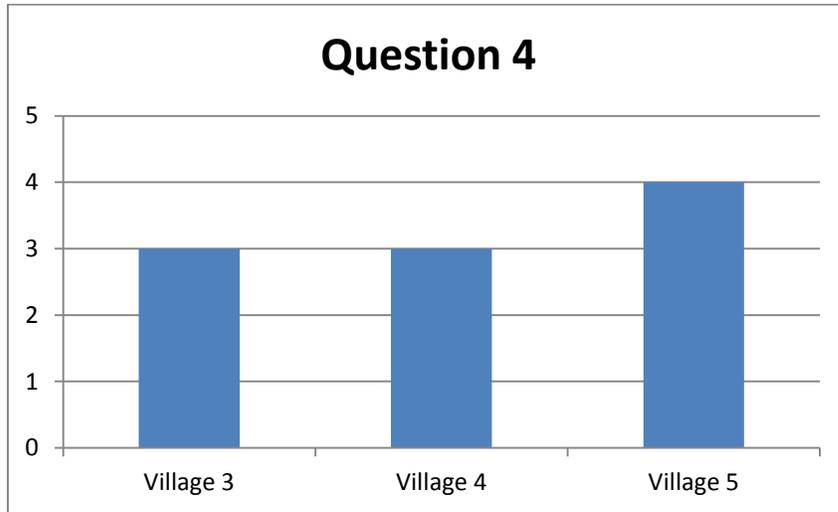


Figure 34: Bar Chart

The information displayed in the system is sufficient and appropriate based on the bar chart in Figure 34.

- v. The sales report generated show sufficient information on the current sales and the total amount for that particular day?

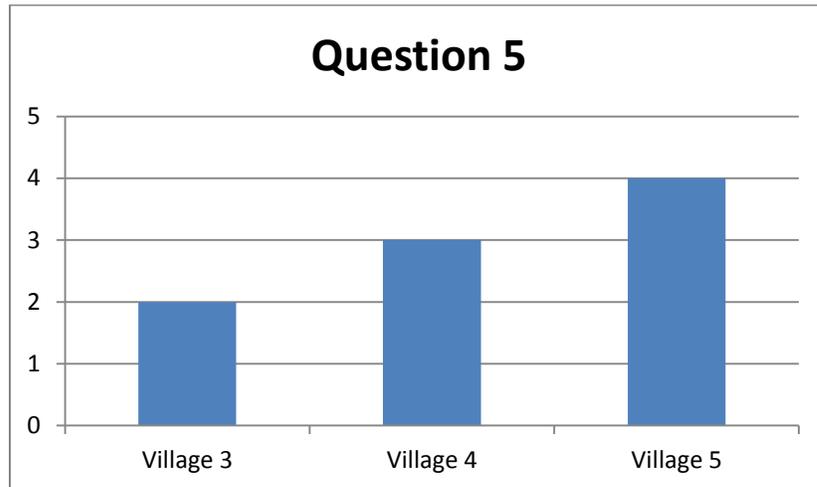


Figure 35: Bar chart

From the bar chart in Figure 35, 1 mini mart does not agree with the sales report generated as they feel that it violates their privacy on the goods that they are selling. On the other the other two mini marts agrees with the sales report generated

- vi. Does the system hangs frequently?

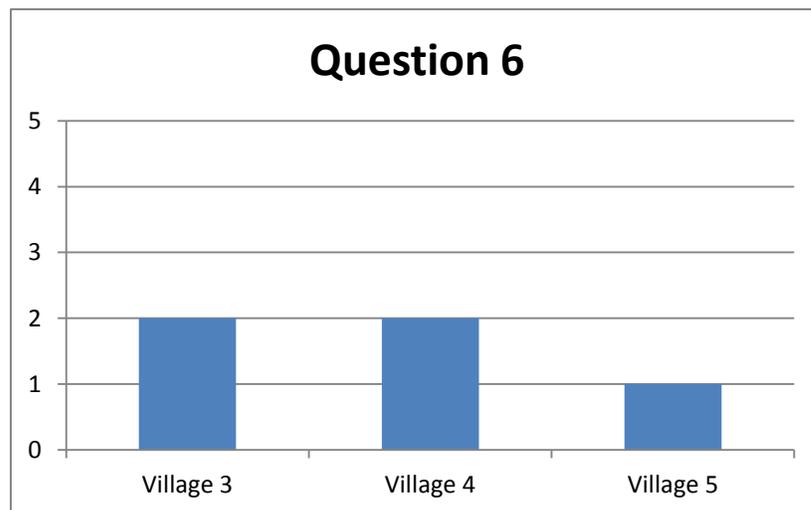


Figure 36:Bar Chart

The bar chart show that the system does not hang and function smoothly

In conclusion, there are 3 aspect that can concluded from the charts above that is the acceptance of the system, the efficiency of the system and the reliability of the system.

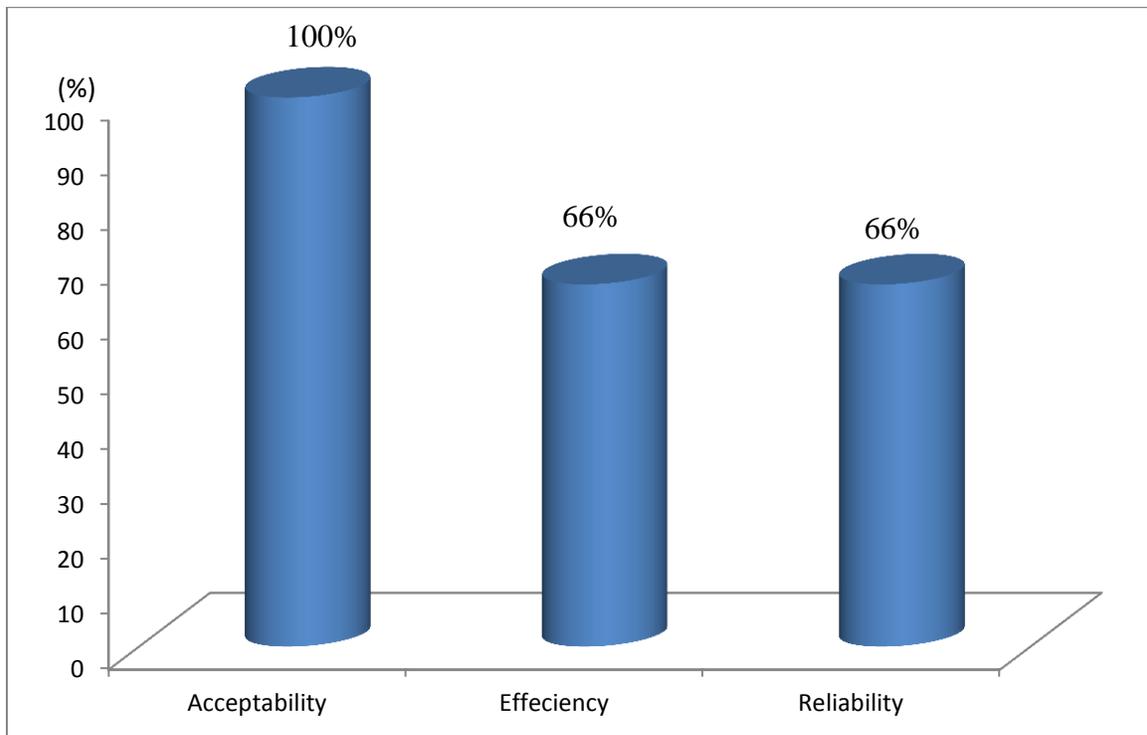


Figure 37: Bar Chart

From the bar chart above , it show that the system is accepted by the public, it is efficient in its functionality and it can be reliable. However, there was some suggestion by the mini mart owner in regards with the card security.

4.5.1.3 User Testing- Students

The secondary user to this system is the students as they do not use the system directly. However there are the reason the system was developed. 10 students were used in this survey to test the system from the perspective of the students. With a scale of 1 to 5, where 1 is Strongly Disagree , 2 is Agree, 3 is Neutral 4, is Disagree and 5 is Strongly Disagree.

- i. Do you agree if this system is implemented in Universitit Teknologi PETRONAS mini marts?

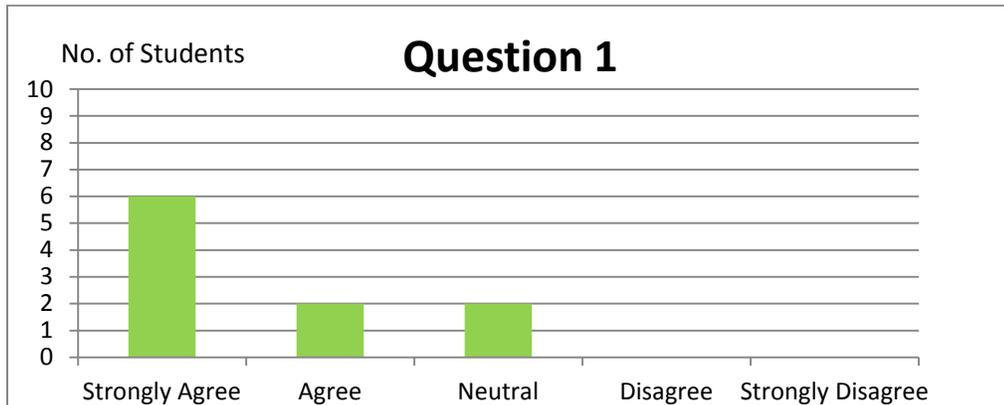


Figure 38: Bar Chart

This bar chart show that 8 students agree on the implementation of this system in Universiti Teknologi PETRONAS. There were still students skeptical on the implementation of this system.

- ii. The information displayed once the card is scanned is satisfactory?

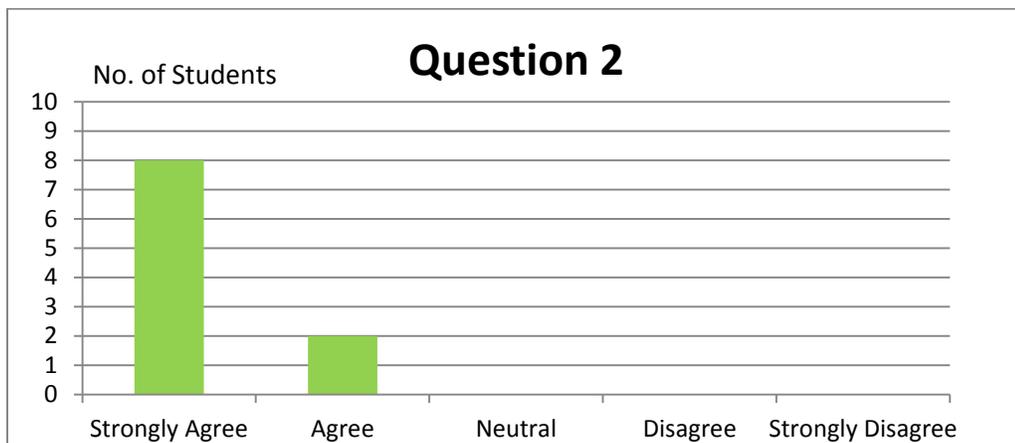


Figure 39: Bar Chart

This bar chart show that all the students are satisfied with the information displayed on the screen.

iii. Is the transaction much faster with the use of the card to purchase goods?

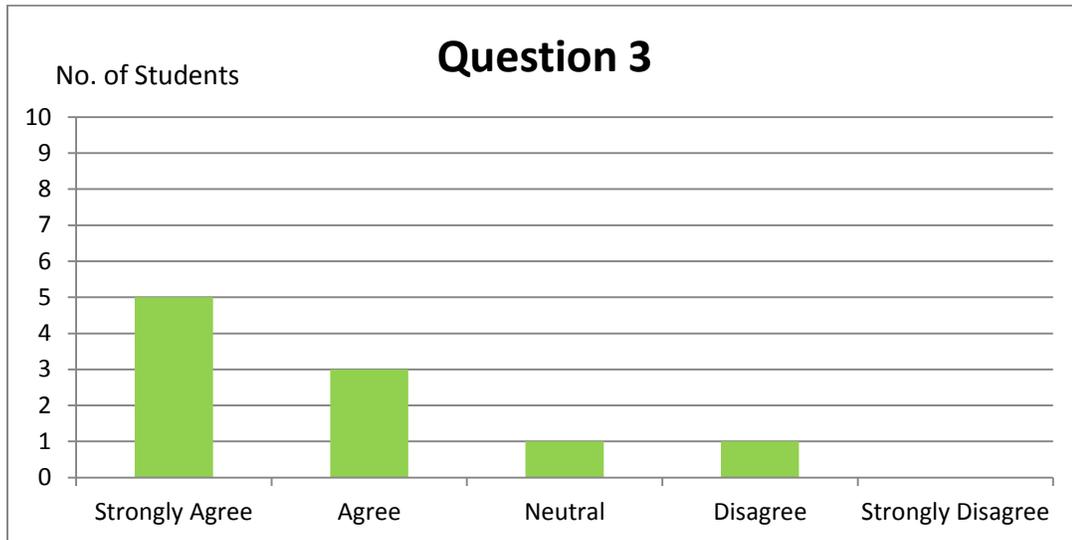


Figure 40: Bar Chart

This bar chart shows that more than half of the students agree that the transaction is much faster using the card. However, there were some who disagreed that the card speeds up the transaction.

iv. Does the blocking of the card help if the Matric card was reported lost?

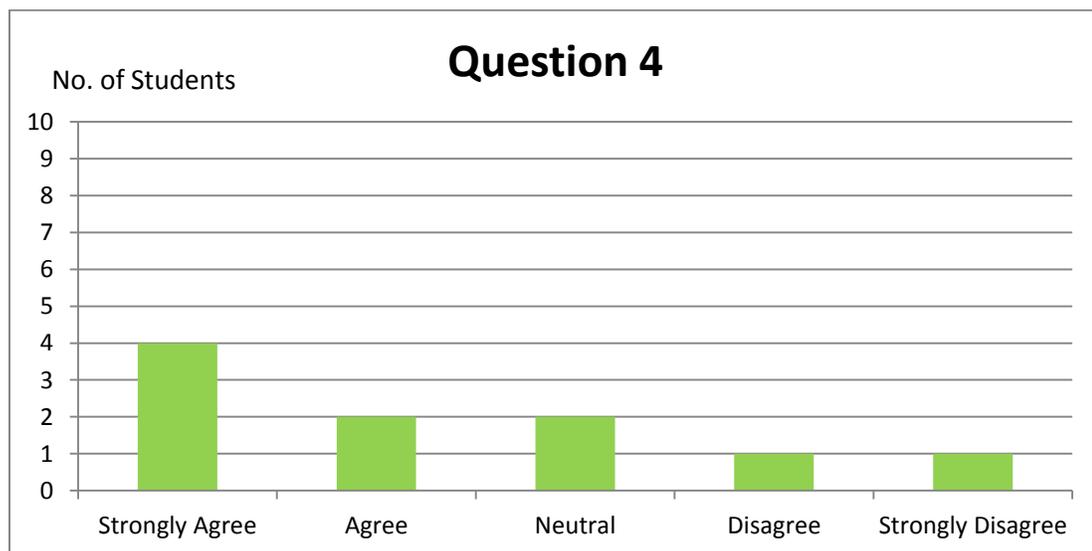


Figure 41: Bar Chart

Students were divided on this subject. However, most of them agreed that by blocking the card, loss of money can be avoided.

- v. Is the balance displayed once a payment or reload process correct

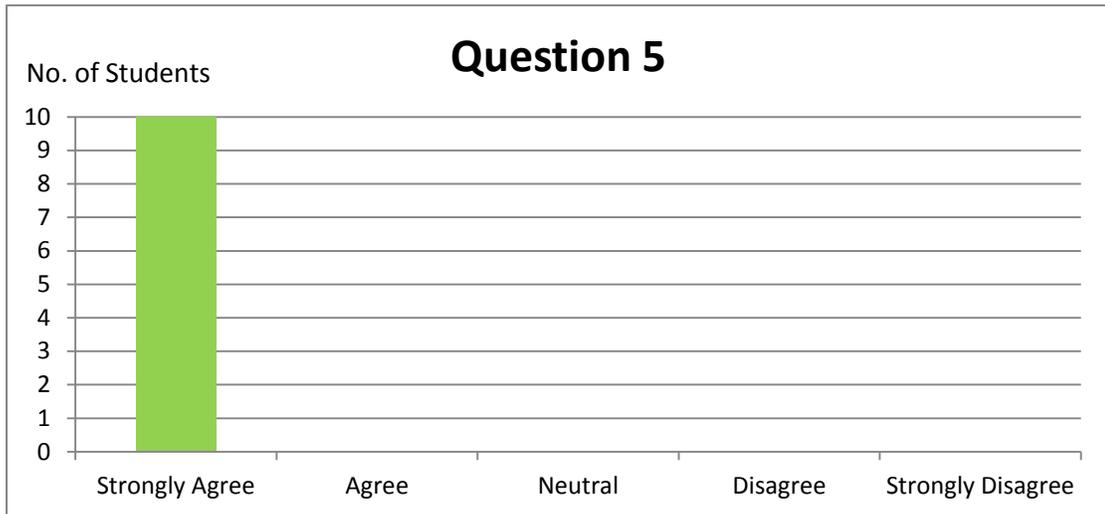


Figure 41: Bar Chart

According to this bar chart, all the students agreed that the balance displayed is correct based on the total amount purchased minus the previous balance.

- vi. The added functionality to the Matric Card makes it more valuable to students?

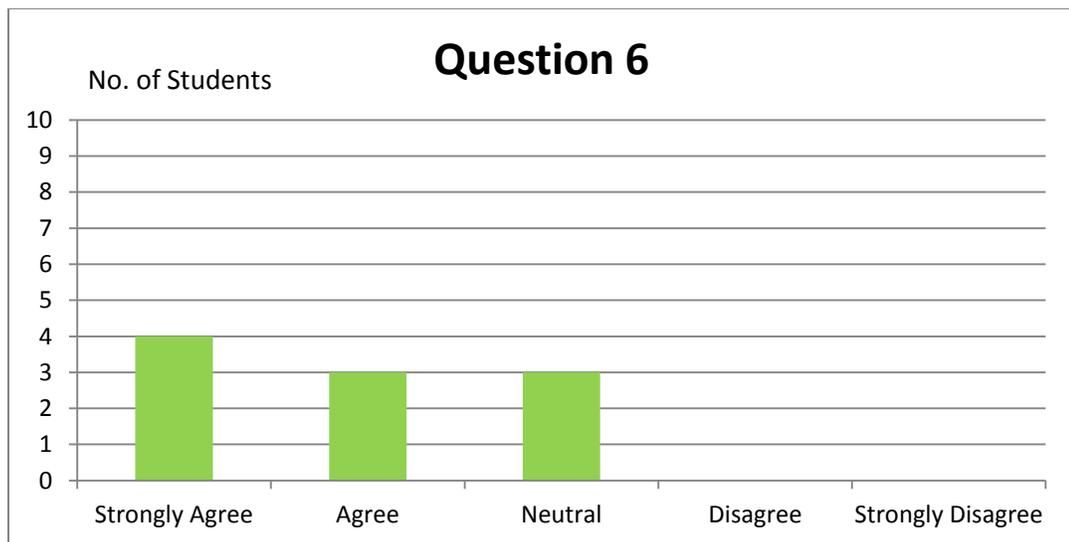


Figure 42: Bar Chart

From the chart, majority of students agree that the added functionality makes it more valuable to students.

In conclusion, there are 3 aspect that can concluded from the charts above that is the acceptance of the system, the efficiency of the system and the reliability of the system.

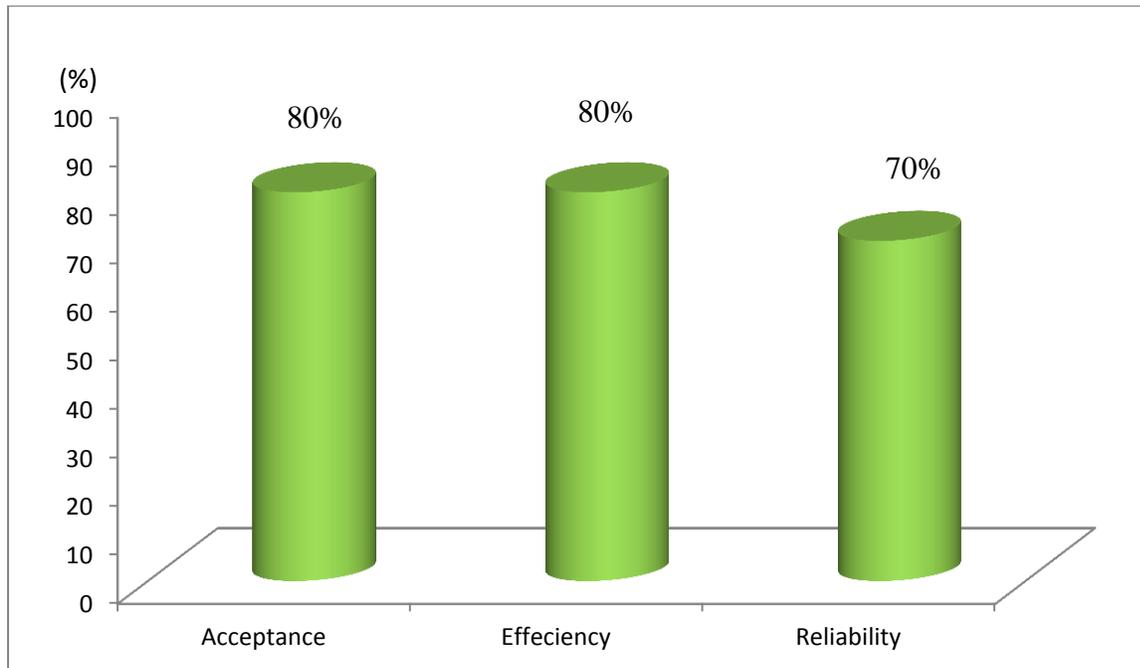


Figure 43: Bar Chart

In conclusion, according to the survey conducted with the students of Universiti Teknologi PETRONAS, majority of them agreed that the system is reliable, acceptable and efficient. However, based on their comments/suggestion, there are some improvements that can be looked into. Such as the security of the card is still questionable. This can be analyzed further in future.

4.5.2 Integration Testing

(Refer to the index)

CHAPTER 5

CONCLUSION

The RFID technology integrated into the matric card and function as a payment card in UPT's campus creates a new frontier technologically in UTP's campus environment. This card aims to create a more efficient and effective system by offering a payment method that is fast and convenient to all user especially the student of University Teknologi PETRONAS. This payment method will help reduce congestion and long queues in this area thus providing a speedy experience to the users.

University Teknologi PETRONAS was established more than ten years ago and its time for it to be more technologically savvy in line with its vision and mission. By integrating RFID in to its student identification card, helps the University to run wirelessly. The ease-of-use of wireless technology helps make life simple and easier for its users. In the future, more functionality can be added to the card to increase its usefulness to the students. Such as, door-access card, attendance card, photocopying card and many more. The students identification card will become a card for everything, a card for all.

Since money is loaded into the card as a form of token, there is no necessity to carry physical cash around. This will help reduce theft in UTP that has been rising recently. Students can reload maximum amount of money into the card without the worry of it missing. However, students should take extra precaution on their card since now it carries money. The ability of the card to be blocked if it was reported missing is an advantage in preventing further damage to the situation.

The development of the system is still underway. Once the system is developed, system testing and user testing will be conducted to ensure that the requirement is fulfilled. The development of the system also include the database and its connection to.RFID is an old technology, however, with the clever use of it , it will bring useful advantage and benefit. Security is an important issue in this situation. Thus, proper management of it will be needed to prevent problem. The implementation of RFID as a payment system will provide many advantage to the future.

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APPENDIX



UNIVERSITI
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MEMORANDUM

To:	En Mustafa B Idrus , Senior Manager, Security Services, Universiti Teknologi PETRONAS		
From :	Ainol Rahmah Shazi Binti Shaarani Lecturer, Department of Computer & Information Sciences		
Reference:	Request for Information on Number of Lost Matric Cards and Number of Money Theft for the Past 5 years	Date :	23 rd July 2013

Dear Sir,

This is to certify that Joanna Michelle Gilbert (Matric No. 15108) is a student of Universiti Teknologi PETRONAS (UTP). She is currently pursuing her Bachelor's Degree in Information and Communication Technology in this university.

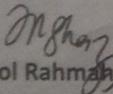
As a final year student, she is bound to complete her Bachelors Degree Research Dissertation in any relevant field of her study. Under my supervision, the student will be conducting a research on the topic of "SMART CARD AS IDENTIFICATION AND E-PURSE IN UNIVERSITY TEKNOLOGI PETRONAS CAMPUS." The objective of this project is to promote better appreciation of the Matric card better and also to prevent and reduce the number of theft and loss of money in the campus.

Hence, I am hereby seeking your kind cooperation to provide her with information on the statistics of the following :

1. The number of reported cases of lost matric cards and number of reported cases of money theft in UTP for the past 5 years.
2. The statistics on the number of reported cases of lost matric card and also the number of money theft and loss of money in campus for the last five years. This information is needed to prove the importance and the necessity of the project.

Thank you in advance for your kind cooperation.

Yours faithfully,


Ainol Rahmah Shazi Bt. Shaarani
Lecturer , Department of Computer and Information Sciences



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Questionnaire

Matric Card

1. Are you happy with the current use of the Matric Card YES NO
2. Do you think that the Matric card should have more function than what it is now? YES NO

Problem in minimarkets and cafeteria

3. During lunch hour, the long queue and slowly transaction frustrates you? YES NO
4. Do you have appropriate enough of change during this times? YES NO
5. Is the distance from your village to the ATM far? YES NO
6. Are you afraid to carry a lot of cash around campus all the time? YES NO
7. Do you agree in all purpose Matric card that function as your identification and also used as E-Purse? YES NO
8. Do you agree if the current Matric card is changed to a smartcard? YES NO

UNIVERSITI TEKNOLOGI PETRONAS

FINAL YEAR PROJECT

Interview Questions

Project Title: Implementation of RFID into the Matric Card to Function as E-Wallet

1. What is your opinion on this system?

2. If this system is implemented in Universiti Teknologi PETRONAS , will it help solve the problems that UTP is currently facing?

3. The information that is displayed, is it sufficient to the user?

4. Does the report record all the information that is required for future purposes?

5. The registration process for both the shop owner and student appropriate?

6. Is the blocking of the card help if the Matric Card is lost?

7. Is the system easy to use and understand?

UNIVERSITI TEKNOLOGI PETRONAS

FINAL YEAR PROJECT

Questionnaires

Project Title: Implementation of RFID into the Matric Card to Function as E-Wallet

1. Do you agree if this system is implemented in Universitit Teknologi PETRONAS mini marts?

1	2	3	4	5
---	---	---	---	---

2. Is the system easy to use and understand?

1	2	3	4	5
---	---	---	---	---

3. Is the transaction much faster with the use of the card to purchase goods?

1	2	3	4	5
---	---	---	---	---

4. During scanning the items, the information displayed is based on the inventory?

1	2	3	4	5
---	---	---	---	---

5. The sales report generated show sufficient information on the current sales and the total amount for that particular day?

1	2	3	4	5
---	---	---	---	---

6. Does the system hangs frequently?

1	2	3	4	5
---	---	---	---	---

7. Is there any comment/suggestion about the system?

8. The system is: *(Can check more than one box)*

	Acceptable		62 Reliable		Efficient
--	------------	--	----------------	--	-----------

UNIVERSITI TEKNOLOGI PETRONAS

FINAL YEAR PROJECT

Questionnaire

Project Title: Implementation of RFID into the Matric Card to Function as E-Wallet

1. Do you agree if this system is implemented in Universitit Teknologi PETRONAS mini marts?

1	2	3	4	5
---	---	---	---	---

2.The information displayed once the card is scanned is satisfactory?

1	2	3	4	5
---	---	---	---	---

3.Is the transaction much faster with the use of the card to purchase goods?

1	2	3	4	5
---	---	---	---	---

4. Does the blocking of the card help if the Matric card was reported lost?

1	2	3	4	5
---	---	---	---	---

5.Is the balance displayed once a payment or reload process correct

1	2	3	4	5
---	---	---	---	---

6. The added functionality to the Matric Card makes it more valuable to students?

1	2	3	4	5
---	---	---	---	---

7. Is there any other comment regarding the system?

8. The system is:(*Can check more than one box*)

<input type="checkbox"/>	Acceptable	<input type="checkbox"/>	Reliable	<input type="checkbox"/>	Efficient
--------------------------	------------	--------------------------	----------	--------------------------	-----------

Test Case				
Level of Testing	Integration Test		Total Test Case	34
Project Name	Implementation of RFID into the Matric Card to function as E-wallet		Passed	All
			Failed	NONE
Test Case ID	Function List/ Test Case Description	Feature to be Tested/Input Value	Expected Result	Status (Passed, & Failed)
Login Page				
Login_Page_01	Username	Enter the username	No warning appear	Passed
Login_Page_02	Password	Enter the password	No warning appear	Passed
Login_Page_03	Wrong username and password	Enter username and password that has not been registered then click 'OK'	Message appear "Invalid Password"	Passed
Login_Page_04	Wrong username and password	Enter username but password is not entered. Then click 'OK'	Message appears "No User name"	Passed
Login_Page_05	Button 'Cancel'	Click 'Cancel'	The Login page box disappear	Passed
Login_Page_06	Button 'OK'	Enter the correct username and password. Then click 'OK'	The Main page- Administrator/Mini mart opens	Passed
Main Page- Administrator				

MP_Admin_01	First Page	The first page that opens when the administrator uses the admin's username and password	The 'Shop registration' tab page	Passed
MP_Admin_02	Register new account	Click the 'Register New Account'	The 'Registration' page appears	Passed
MP_Admin_03	Fields	Enter all the fields and click 'Submit'	No warning appear.	Passed
MP_Admin_04	Retype Password	The password typed is not the same as in the 'Password' field	Message appear 'Password did not match. Please re-enter the Password'	Passed
MP_Admin_05	Access Options	Click on the radio button on the 'Access Option'	If one button is chosen the other buttons cannot be selected.	Passed
MP_Admin_06	Button 'Submit'	Click the button 'Submit' when one of the field is not filled	Message appears 'Please fill in all the details'	Passed
MP_Admin_07	Card ID	Scan the Card on the reader	The 'Payment Card ID' field is filled automatically with the card ID. Then the registration page opens up.	Passed
MP_Admin_08	Fields	Enter the fields in the 'Registration' page	No warning appear.	Passed
MP_Admin_09	Button 'Register'	Scan the Card on the reader	Message appears '(Students name) has successful registered'	Passed
MP_Admin_10	Button 'Terminate'	On a registered card, click the 'Terminate' button	Message appear '(Students name) has been deleted'	Passed

MP_Admin_11	Button 'Block'	On a registered card, click the 'Block' button	Message appears '(Students name) has been blocked'	Passed
MP_Admin_12	Reload	Click on the 'Reload' tab	The 'Reload' page opens	Passed
MP_Admin_13	Card ID	Scan the Card on the reader	The fields are automatically filled	Passed
MP_Admin_14	Reload amount	Click the amount and scanned the card again	The balance is added to the amount chosen	Passed
MP_Admin_15	Reports' Tab	Click on the 'Report' tab	The 'Reports' page opens	Passed
MP_Admin_16	Sales Report Download	Choose the dated and click 'Download'	Save the file in excel format	Passed
MP_Admin_17	Reload Report Download	Choose the dated and click 'Download'	Save the file in excel format	Passed
MP_Admin_18	Blocked Card Report Download	Click the 'Download' button	Save the file in excel format	Passed
Main Page-Mini Mart				
MP_MiniMart_01	First Page	The first page that opens when the mini mart user uses the username and password	The 'Payment' tab page opens up	Passed
MP_MiniMart_02	Card ID	Scan the Card on the reader	The fields are automatically filled	Passed
MP_MiniMart_03	Items	Scan the Item using the barcode reader	The table is filled with the item including its Name and price	Passed

MP_MiniMart_04	Total	The total amount	Displays the total amount of the item's price	Passed
MP_MiniMart_05	Card ID	Scan the card again on the reader using the same card ID	The balance in the card is deducted with the amount and the new balance is displayed	Passed
MP_MiniMart_06	Item Registration	Click the 'Item Registration' Tab	Opens up the 'Item Registration' page	Passed
MP_MiniMart_07	Register new item	Scan the bar code on the item	Opens the 'Registration' page for the item	Passed
MP_MiniMart_08	Fields	Enter the Item name and price. Click 'Register'	Message appears 'Registered'	Passed
MP_MiniMart_09	Fields	Do not enter any field or enter the 'Price' field with character	Warning message appear ' Please re-enter'	Passed
MP_MiniMart_10	Reports' Tab	Click the 'Reports' tab	Opens the 'Reports' page	Passed
MP_MiniMart_11	Sales Report Download	Click the Download button	Save the file in excel format	Passed
Log Out				
Log_out_01	Log out	Click the 'Log out' tab	Message appear 'Close the system?'	Passed
Log_out_02	Log out	Click 'OK'	The system closes	Passed

Overall Result	Remarks	
-----------------------	----------------	--

Prepared By:		Tested By:		Reviewed By:	
Signature:	Signature:		Signature:		
Name:	Name:	Joanna Michelle	Name:		
Date:	Date:	29-Nov-13	Date:		

Login Page

```
Private Sub OK_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles OK.Click

    If txtUser.Text <> "" Then

        If txtPassword.Text <> "" Then

            da = New OleDb.OleDbDataAdapter("SELECT*from tblShop where
            usernames = '" & txtUser.Text & "'", con)

            ds.Clear()

            da.Fill(ds, "tblShop")

            If password = txtPassword.Text Then

                MsgBox("Welcome, " & name & "!")

                Shop_ID = ds.Tables("tblShop").Rows(0).Item("shop_id")

                PaymentForm.Text = ds.Tables("tblShop").Rows(0).Item("shopname")
                & " Main Page"

                PaymentForm.Show()

                Me.Hide()

            Else

                MsgBox("Invalid Password")

                txtPassword.Clear()

            End If

        Else

            MsgBox("Invalid Password")

            txtPassword.Clear()

        End If

    Else

        MsgBox("No Password")

    End If

End Sub
```

```
Else
MsgBox("No User Name")
End If
End Sub
```

Payment Page

```
Private Sub PaymentForm_KeyDown(ByVal sender As Object, ByVal e
As System.Windows.Forms.KeyEventArgs) Handles Me.KeyDown

'TabControll1.SelectedTab = TabControll1.TabPages.Item("TabPage1")

If e.KeyCode = Keys.Enter Then

If TabControll1.SelectedTab.Text = "Payment" Then

If txtID.Text.Length = 6 And IsNumeric(txtID.Text) Then

lblID.Text = txtID.Text

da = New OleDb.OleDbDataAdapter("SELECT*from tblStudent where ID
= '" & txtID.Text & "' ", con)

ds.Clear()

da.Fill(ds, "tblStudent")

If ds.Tables("tblStudent").Rows.Count > 0 Then

txtMyname.Text = ds.Tables("tblStudent").Rows(0).Item("Name")

txtMyid.Text = ds.Tables("tblStudent").Rows(0).Item("Matrix")

Dim decbalance As Decimal =
CDec(ds.Tables("tblStudent").Rows(0).Item("balance"))

Dim decBalanceLeft As Decimal = decbalance -
CDec(txtAmount.Text)

If decBalanceLeft < 0 Then

txtBalance.ForeColor = Color.Red
```

```

txtBalance.Text = "Insufficient Amount - " &
FormatNumber(decbalance, 2)

Else

txtBalance.ForeColor = Color.Green

txtBalance.Text = FormatNumber(decBalanceLeft, 2)

If CDec(txtAmount.Text) > 0 Then

Dim cb As New OleDb.OleDbCommandBuilder(da)

ds.BeginInit()

ds.Tables("tblStudent").Rows(0).Item("balance") = decBalanceLeft

da.Update(ds, "tblStudent")

ds.EndInit()

```

Reload Page

```

ElseIf TabControl1.SelectedTab.Text = "Reload" Then

lblIDTopUp.Text = txtIDTopUp.Text

da = New OleDb.OleDbDataAdapter("SELECT*from tblStudent where ID
= '" & txtIDTopUp.Text & "'", con)

ds.Clear()

da.Fill(ds, "tblStudent")

If ds.Tables("tblStudent").Rows.Count > 0 Then

txtMyname1.Text = ds.Tables("tblStudent").Rows(0).Item("Name")

txtMyid13.Text = ds.Tables("tblStudent").Rows(0).Item("Matrix")

Dim cb As New OleDb.OleDbCommandBuilder(da)

Dim intTopUp As Integer

If btnOne.BackColor = Color.Aqua Then intTopUp = 1

ElseIf btnTen.BackColor = Color.Aqua Then intTopUp = 10

```

```

ElseIf btnFive.BackColor = Color.Aqua Then intTopUp = 5
ElseIf btnFifty.BackColor = Color.Aqua Then intTopUp = 50
ElseIf btnHundred.BackColor = Color.Aqua Then intTopUp = 100
End If

ds.BeginInit()

ds.Tables("tblStudent").Rows(0).Item("balance") =
CDec(ds.Tables("tblStudent").Rows(0).Item("balance")) +
CDec(intTopUp)

da.Update(ds, "tblStudent")

ds.EndInit()

txtBalanceTopUp.Text =
FormatNumber(CDec(ds.Tables("tblStudent").Rows(0).Item("balance"
)), 2)

If CDec(txtBalanceTopUp.Text) > 0 Then

da = New OleDb.OleDbDataAdapter("SELECT*from tblTopUp", con)

ds.Clear()

da.Fill(ds, "tblTopUp")

```

Register Page

```

Public Class register

Private Sub register_FormClosed(ByVal sender As Object, ByVal e
As System.Windows.Forms.FormClosedEventArgs) Handles
Me.FormClosed

        PaymentForm.txtRegister.Clear()

End Sub

Private Sub btnRegister_Click(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles btnRegister.Click

Dim check As Boolean = Validation()

```

```

Dim name As String = Check_student()
If check Then
If name <> "XXX" Then
da = New OleDb.OleDbDataAdapter("SELECT*from tblStudent", con)
ds.Clear()
da.Fill(ds, "tblStudent")
Dim AddRow As DataRow
AddRow = ds.Tables("tblStudent").NewRow
AddRow.Item("ID") = txtRegisterID.Text
AddRow.Item("Name") = name
AddRow.Item("Matrix") = txtMatrix.Text
AddRow.Item("Balance") = CDec("0.00")
AddRow.Item("Register") = Now().Date
Dim ca As New OleDb.OleDbCommandBuilder(da)
ds.Tables("tblStudent").Rows.Add(AddRow)
ds.BeginInit()
da.Update(ds, "tblStudent")
ds.EndInit()
MessageBox.Show(name & " have successfully register the card ID:
" & txtRegisterID.Text, "Register", MessageBoxButtons.OK,
MessageBoxIcon.Information)
Me.Close()
Else
MsgBox("This Matric ID is not recorded in student database")
txtMatrix.Clear()

```

```

End If
End If
End Sub

Private Function Validation()
If txtRegisterID.Text <> "" Then
If txtMatrix.Text <> "" Then
Return True
Else
MsgBox("Please enter the Matrix ID")
Return False
End If
Else
MsgBox("No ID is located")
Return False
End If
End Function

Private Function Check_student()
da = New OleDb.OleDbDataAdapter("SELECT*from tblPrism where ID =
'" & txtMatrix.Text & "'", con)

ds.Clear()

da.Fill(ds, "tblPrism")

If ds.Tables("tblPrism").Rows.Count = 0 Then 'It is not in
database prism, so cancel register

Return "XXX"

Else

Return ds.Tables("tblPrism").Rows(0).Item("Names")End If End
Function

```