

**Examination Result Retrieval via
Short Messaging Service (SMS)**

By

Wan Faziatul Amira Bt Wan Mohd Salleh

Dissertation submitted in partial fulfillment of
the requirement for the
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Universiti Teknologi PETRONAS
Bandar Seri Iskandar,
31750 Tronoh,
Perak Darul Ridzuan

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Information System Program
Universiti Teknologi PETRONAS
In partial fulfillment of the requirement for the
BACHELOR OF TECHNOLOGY (HONS)
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Approved by,

(Mrs. Hasiyah Mohamed @ Omar)

**UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
JUNE 2004**

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.

WAN FAZIATUL AMIRA BT. WAN MOHD SALLEH

EXAMINATION RESULT RETRIEVAL VIA SMS

ABSTRACT

Short Message Service (SMS) provides a mechanism for transmitting short messages to and from wireless devices. Therefore, the aim of this project is to develop a system that has capability in handling the University of Technology PETRONAS (UTP) examination result request from the students. Currently, two methods used for the students to retrieve their exam result which are through mail and online. Failed to retrieve exam result via mail always occurred. By using Internet application, it requires the student presence or the availability. Besides, busy network traffic affects student difficulties in accessing the page. Five phases used to develop this project. There were initiating and project planning, data gathering and analysis, developing, testing and result analysis.

The evaluation of this prototype has been categorized into two, user perception and system developer perception. From the result derived from the user perception, 81.67% of respondents agree this system is easy to monitor and efficient. Therefore, this exam result retrieval will use the functionality of SMS in order to deliver examination result to UTP's student. As a conclusion, this project is successfully develop and provide one of the most convenient method for the student to retrieve the result as most of the students do have a mobile phone with SMS capability.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Mobile or wireless technology has provided an alternative method for people to communicate with each other. It is convenient for users to access any information with mobile devices.

Short message service (SMS) is an example of an application of wireless application principles. It is a globally accepted wireless service that enables the transmission of alphanumeric messages between mobile subscribers and external systems such as electronic mail, paging, and voice-mail systems.

(K. Subrahmanyam, 2002)

SMS provides a mechanism for transmitting short messages to and from wireless devices. The service makes use of a Short Messaging Service Center (SMSC), which acts as a store-and-forward system for short messages. The wireless network provides the mechanisms required to find the destination station(s) and transports short messages between the SMSCs and wireless stations. In contrast to other existing text-message transmission services such as alphanumeric paging, the service elements are designed to provide guaranteed delivery of text messages to the destination. Additionally, SMS supports several input mechanisms that allow interconnection with different message sources and destinations. SMS also guarantees delivery of the short message by the network. Temporary failures due to unavailable receiving stations are identified, and the short message is stored in the SMSC until the destination device becomes available.

Most mobile devices are fitted with Subscriber Identification Module (SIM) cards, to store all the messages. For a device to utilize SMS, there must be SMS-enabled and the mobile device must be connected to one of the Global System for Mobile (GSM) network.

The main concern of the project is to apply the functionality of SMS in order to provide a better solutions in sending students' results. A thorough research has to be carried out prior to a presentation of the product prototype at the completion of the project. Understanding the principles and functionality of the SMS is crucial in order to develop this application.

GSM modem is required in developing the application for retrieving examination result, via SMS. It must be connected to a computer server to enable the system connected to the GSM network send SMS. Siemens TC35i is the proposed solution because it is compatible and also due to its small lightweight design and low power consumption, TC35i is the ideal and cost efficient solution. It supports a wide range of many to many applications and a reliable method for controlling the terminal and the application.

This project will handle examination result requests from students. The students will request their examination result from their mobile phones. The request, will be handled by a system through Short Messaging Service Center (SMSC) and GSM Modem.

1.2 PROBLEM STATEMENT

Two methods frequently used for students to get their examination results are through (i) regular mail sent by faculty administration office and (ii) online web-based application. Through regular mailing, student potentially would not receive their results if the administration would not update students mailing address n regular. By using the web based application, it would require student presence or the availability of a computer

with internet connection and computer with network connection may not be all the time with the students. Besides, the network traffic encounters several problems when too many students log on to the server at the same time. Busy network may cause some students having difficulties in accessing the page, hence slowing down data retrieved. With SMS result retrieval, it would be a relief as most students nowadays do have a mobile phone with SMS capability. This solution will be one of the convenient methods for the students to retrieve their result.

Currently SMS has been commercialized and a lot of applications have been developed using the SMS technology. Commercialization that has been made is quite costly to the mobile phone users whereby each SMS to be sent and received will be charged around RM0.50 to RM3.00 per SMS. With examination result retrieval via SMS, SMS technology is utilized us in a proper way and the transmission of the data will only be charged at a normal rate that will not be a burden the students in terms of costing.

Table 1.1: Example of SMS Charging

Service	Send per SMS (RM)	Receive per SMS (RM)
International Islamic University of Malaysia (IIUM) Exam Result Retrieval	0.10-0.20	1.00
Universiti Putra Malaysia (UPM) Exam Result Retrieval	0.10-0.20	0.60
Universiti Utara Malaysia (UUM) Exam Result Retrieval	0.10-0.20	0.75
Multimedia University (MMU) Exam Result Retrieval	0.10-0.20	0.50
Explorace TV3 SMS Contest	0.10-0.20	1.00
NTV7 WowTV SMS Chat	-	0.50
e-Life with Ai Ling Mono Ringtone	0.10-0.20	1.50
e-Life with Ai Ling Poly Ringtone	0.10-0.20	3.00
Hotlink Graphics	0.15	1.50

1.3 OBJECTIVE OF THE PROJECT

- 1 Understand the functionality and the mechanism of SMS and exploit this functionality to design an efficient system in order to provide the best suggestion in retrieving exam results.
- 2 Using mobile phone as an extension of the computer and giving the students much more convenient way in retrieving their results.
- 3 Able to produce a prototype capable of delivering results via SMS on request from students.

1.4 SCOPE OF STUDY

This project would study the drawback of current result retrieval and how SMS-based retrieval could complement the existing system. A system capable of delivering examination result via SMS on request from the student would be developed. As an example for the SMS requests, if a student sends his or her students identification number (ID) to the server SMS station, the server would reply the student's results via SMS.

Nowadays, mobile phone is essential for most of people in order for them to connect and communicate to each other. This mobile phone is equipped with SMS, allowing messages to be received and sent with inexpensive method of communication and instant message delivery. Using this solution is more convenient as it will send the results instantly soon after results have been uploaded to database controlled by admin at UTP.

CHAPTER 2

LITERATURE REVIEW

2.1 SHORT MESSAGE SERVICE (SMS)

The SMS is a service enabling mobile phones to send and receive text message. The SMS can comprise of words, number and alphanumeric combination. SMS was developed when it was incorporated into the Global System for Mobile (GSM) digital mobile phone standard.

SMS is a globally accepted wireless service that enables the transmission of alphanumeric messages between mobile subscribers and external systems such as electronic mail, paging, and voice-mail systems. (K. Subrahmanyam, 2002)

SMS provides a mechanism for transmitting short messages to and from wireless devices. The service makes use of Short Messaging Service Center (SMSC), which acts as a store-and-forward system for short messages. The wireless network provides the mechanisms required to find the destination station and transports short messages between the SMSCs and wireless stations. In contrast to other existing text-message transmission services such as alphanumeric paging, the service elements are designed to provide guaranteed delivery of text messages to the destination. Additionally, SMS supports several input mechanisms that allow interconnection with different message sources and destinations.

A distinguishing characteristic of the service is that an active mobile handset is able to receive or submit a short message at any time, independent of whether a voice or data call is in progress. SMS also guarantees delivery of the short message by the network.

Temporary failures due to unavailability of receiving stations are identified, and the short message is stored in the SMSC until the destination device becomes available. SMS has become an integral part of people's lives both business and personal aspects.

2.2 BENEFITS OF SMS

The benefits of SMS to subscribers center around convenience, flexibility, and seamless integration of messaging services and data access. From this perspective, the primary benefit is the ability to use the handset as an extension of the computer. SMS also eliminates the need for separate devices for messaging because services can be integrated into a single wireless device—the mobile terminal. These benefits normally depend on the applications that the service provider offers. At a minimum, SMS benefits include the following:

- Delivery of notifications and alert
- Guaranteed message deliver
- Reliable, low-cost communication mechanism for concise information
- Ability to screen messages and return calls in a selective way
- Increased subscriber productivity

More sophisticated functionality provides the following enhanced subscriber benefits:

- Delivery of messages to multiple subscribers at a time
- Ability to receive diverse information
- E-mail generation
- Creation of user groups
- Integration with other data and Internet-based applications

The benefits of SMS to the service provider are as follows:

- Ability to increment average revenue per user (due to increased number of calls on wireless and wireline networks by leveraging the notification capabilities of SMS)
- An alternative to alphanumeric paging services, which may replace or complement an existing paging
- Ability to enable wireless data access for corporate users
- New revenue streams resulting from addition of value-added services such as e-mail, voice mail, fax, and Web-based application integration, reminder service, stock and currency quotes, and airline schedules
- Provision of key administrative services such as advice of charge, over-the-air downloading, and over-the-air service provisioning
- Protection of important network resources (such as voice channels), due to SMS' sparing use of the control and traffic channels
- Notification mechanisms for newer services such as those utilizing wireless application protocol (WAP)

All of these benefits are attainable quickly, with modest incremental cost and short payback periods, which make SMS an attractive investment for service providers.

2.3 GROWTH OF SMS

Today the cellular telephone is no longer just a medium for making calls or communicating with one another. The phenomenal growth of the digital cellular phone is due to its ability to fulfill not only the need to communicate with one another but also the need for information.

Technological development in mobile communications has meant that the cellular telephone can now offer to users various new multimedia services and applications, one of which is the SMS or Short Messaging System.

The popularity of the SMS as a new media form is the triumph of the consumer and is also seen as positive news for other wireless technologies as it shows that people are changing their view of what a cellular telephone can be used for and are exchanging information in the form of text.

As of June 2002, there were 1.03 billion mobile subscribers worldwide, an increase of 22% over the 846 million users a year earlier. In addition, for the first time in June this year, the total number of cellular telephone subscribers in the Asia Pacific region at 379.94 million surpassed Western Europe's 290.35 million subscribers.

SMS traffic worldwide recorded a total of 24 billion SMS messages sent per month by May 2002, as compared to 20 billion during the same period in May 2001. It is forecasted that the total volume of SMS sent for the year 2002 will be approximately 36 billion. With the trend in declining voice margins and average per user revenues, some leading cellular operators in the world are said to derive 10% to 20% of their revenues from SMS.

In Malaysia, the growth in SMS traffic has also been phenomenal. This high growth in SMS traffic in the country is boosted by the number of mobile phone subscribers in Malaysia, which has grown significantly to the current total of more than 9 million in 2003 (and a penetration rate of more than 35% of the population). It is also indicative of the public appetite for more sophisticated communications and multimedia services.

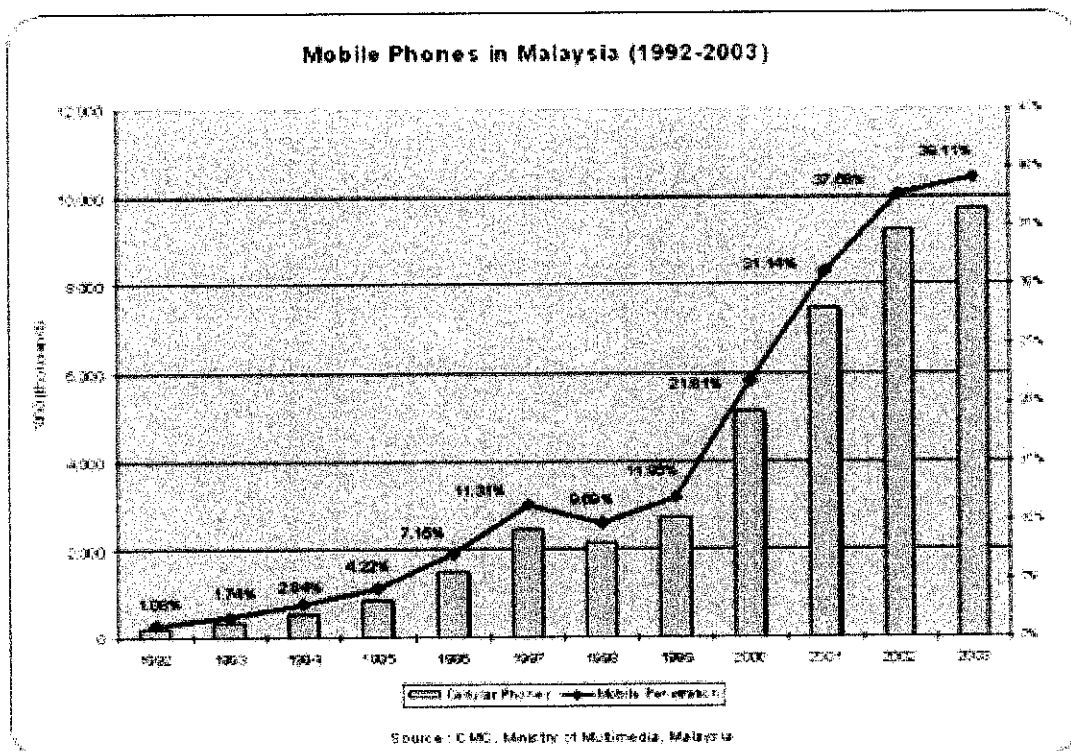


Figure 2.1: Mobile Phones in Malaysia (1992-2003)

(http://www.mobileexec.net/s_products/index.htm)

In 2002, total SMS traffic hitting 3.61 billion but in 2003, the total SMS in Malaysia hit 1.433 billion, with 15.9 million a day.

Table 2.1: Amount of subscribers for mobile operator in Malaysia

Mobile Operator	Subscriber Base	Monthly SMS Vol.	Est. Monthly Revenue
Celcom	2.212 million	135 million	> RM20 million
DiGi	1.400 million	70 million	> RM10 million
Maxis	2.700 million	80 million	> RM12 million
TimeCel	0.600 million	15 million	> RM2 million
TMOUCH	1.280 million	30 million	> RM4 million
TOTAL	8.192 million	330 million	RM48 million

Source : The Star, 10 August 2002

" ... by the year 2005, the mobile penetration rate in Malaysia will reach 53%."

ING Financial Markets Report.

2.4 NETWORK ELEMENTS AND ARCHITECTURE

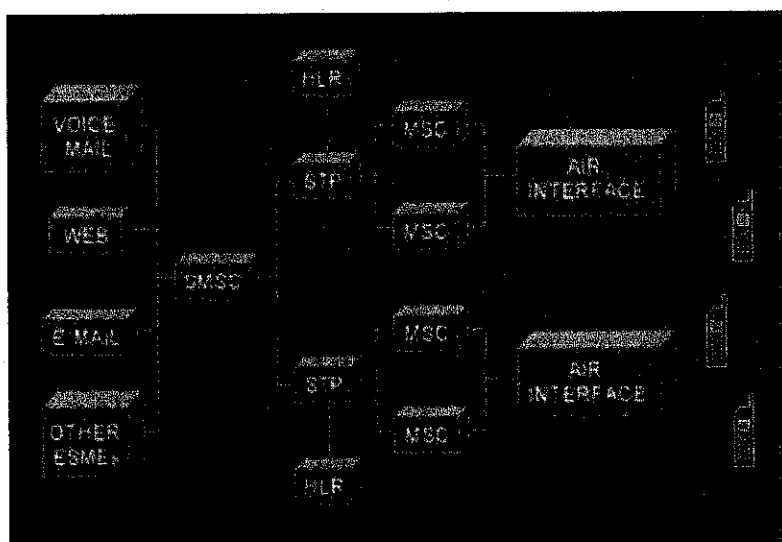


Figure 2.2: Basic Network Architecture for a SMS Deployment

(http://www.funsms.net.sms_tutorial.htm)

Refer to article from The International Engineering Consortium (IEC) in 2003, there are eight basic elements of network structure in SMS as depicted in Figure 1-1. The elements are :

ESME - External Short Messaging Entity: A device that may receive or send short messages. Receiving and sending short messages can be done by voice mail, web, e-mail and other mechanisms.

SMSC - SMS Center: A combination of hardware and software responsible for the relaying and forwarding of a short message between an SME and a mobile device. An

SMSC acts as a store-and-forward system for short messages.

The SMSC must have high reliability, subscriber capacity, and message throughput. In addition, the system should be easily scalable to accommodate growing demands for SMS in the network.

HLR - Home Location Register: A database used for permanent storage and management of subscriptions and service profiles. Upon interrogation by the SMSC, the HLR provides the routing information for the indicated subscriber. Also, if the destination station was not available when the message delivery was attempted, the HLR informs the SMSC that the station is now recognized by the mobile network to be accessible, and thus the message can be delivered.

VLR - Visitor Location Register: A database that contains temporary information about subscribers homed in one HLR who are roaming into another HLR. This information is needed by the MSC to service visiting subscribers.

STP - Signal Transfer Point: A network element that enables communication with the wireless network elements such as the HLR and the MSC.

MSC - Mobile Switching Center: Performs the switching functions of the system and controls calls to and from other telephone and data systems. The MSC will deliver the short message to the specific mobile subscriber through the proper base station.

Air Interface: The air interface is defined in each one of the different wireless technologies. These standards specify how the voice or data signals are transferred from the MSC to the handset and back, as well as the utilization of transmission frequencies, considering the available bandwidth and the system's capacity constraints.

The Mobile Device: The mobile device is the wireless terminal capable of receiving and originating short messages. In the past, these devices used to be digital cellular phones, but more recently the application of SMS has been extended to other terminals such as handheld computers and personal digital assistants (PDAs)

2.4.1 Successful Message Delivery Scenario

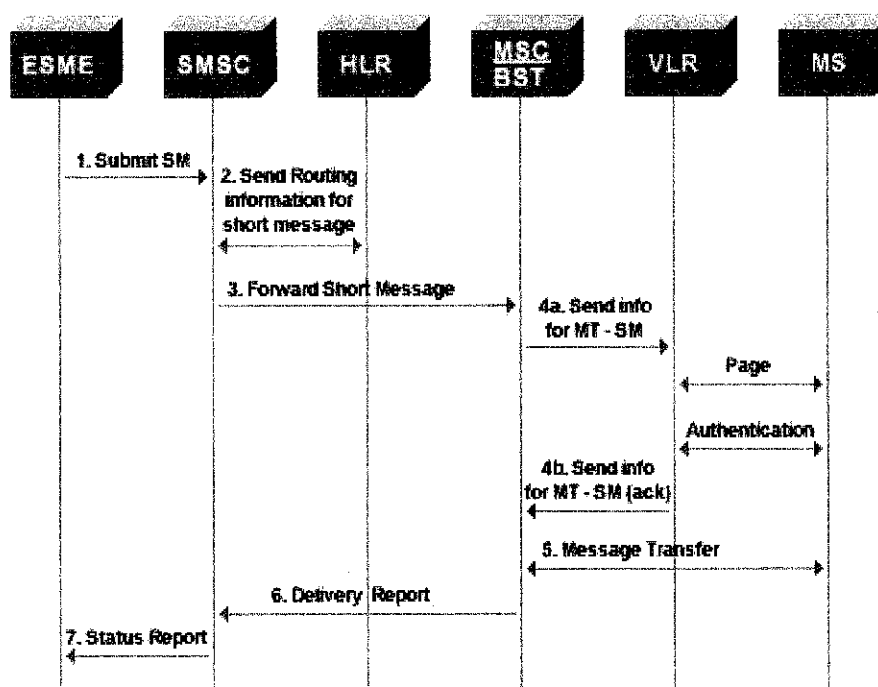


Figure 2.3: Successful Message Delivery Scenario

(Copyright © 2003 International Engineering Consortium)

The short message is submitted from the ESME to the SMSC. After completing its internal processing, the SMSC interrogates the HLR and receives the routing information for the mobile subscriber. The SMSC sends the short message to the MSC.

The MSC retrieves the subscriber information from the VLR. This operation may include an authentication procedure. The MSC transfers the short message to the destination MS (Mobile Station). The MSC reports to the SMSC about the successful delivery of the message. If requested by the ESME, the SMSC returns a status report indicating delivery of the short message. (Sagi Dudai, Noam Pettel & Adi Shulman, August 2003)

2.5 METHOD OF SMS SENDING WITH SMS

There are three methods that been used in developing the SMS application. There are sending SMS via SMS Gateway, GSM Modem and Bluetooth.

2.5.1 SMS Gateway

SMS Gateway is reliable for those who would prefer to develop their own messaging systems, or have existing databases and programs reliant on SMS.

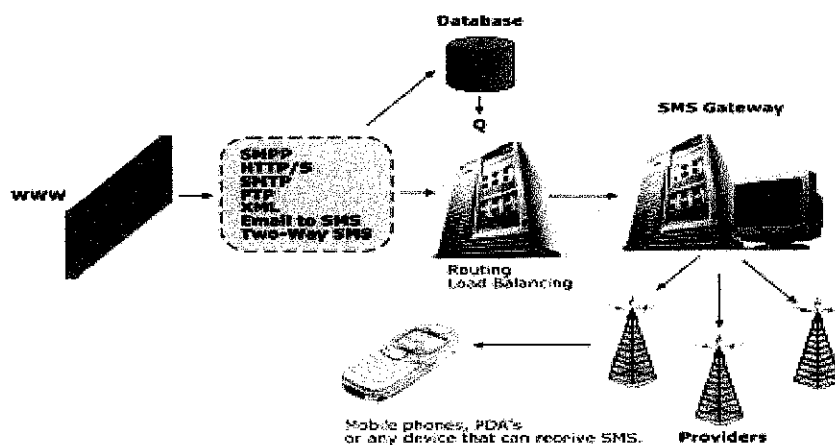


Figure 2.4: SMS Gateway Connection

(http://www.clickatell.com/brochure/products/developer_solutions.php).

SMS Gateway facilitates complete two way messaging capabilities over GSM network for Windows 95/98/NT/2000/XP based applications through the use of DDE, OLE Automation, MTP, POP3, HTTP, XML, and the Command Line Interface (CLI). SMS Gateway connects PC to a GSM handset via a PCMCIA “Cellular Data Card”, or specialized cable connected to a COM port, or Infrared.

SMS Gateway supports a powerful bidirectional HTTP based eXtensible Markup Language (XML) interface that enables easy integration with web-enabled environment, such as Active Server Pages and Java. It also includes set of management utilities including a HTML based diagnostic facility, generation of SNMP traps for significant events and comprehensive logging text file.

The gateway service allows corporate and enterprise servers to connect to the company which applies SMS Gateway to their Mobile Internet Platform for send and receive SMS. The gateway support BULK and PREMIUM SMS to all major mobile operators in Malaysia i.e. Celcom, DiGi, Maxis and TMTOUCH.

The gateway provides the necessary software components for applications to connect to Mobile Internet Platform (MIP) servers through industry standard network protocols like TCP/IP. The servers manage the business critical message queuing, switching from the applications to the mobile operators' SMS centers in Malaysia.

Usually each transaction of SMS using SMS Gateway cost RM0.50 and SMS Gateway is largely more suitable to support a wide range of users and it is not suitable for education since the cost in developing it is too expensive.

2.5.2 GSM Modem

GSM Modem or phone connected to a PC serial port (or to a USB port with an appropriate modem driver). It can be a PC Card installed in a notebook computer, such as the Nokia Card Phone.

A GSM modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port on your computer. Phones such as the Nokia 7110 with a DLR-3 cable, or various Ericsson phones, are often used for this purpose.

A dedicated GSM modem (external or PC Card) is usually preferable to a GSM mobile phone. This is because of some compatibility issues that can exist with mobile phones. For example, if you wish to be able to receive inbound MMS messages with your gateway, and you are using a mobile phone as your modem, you must utilize a mobile phone that does not support WAP push or MMS. This is because the mobile phone automatically processes these messages, without forwarding them via the modem interface. Similarly some mobile phones will not allow you to correctly receive SMS text messages longer than 160 bytes (known as “concatenated SMS” or “long SMS”). This is because these long messages are actually sent as separate SMS messages, and the phone attempts to reassemble the message before forwarding via the modem interface.

2.5.3 Bluetooth

Bluetooth is a Chip technology enabling seamless voice and data connections between a wide range of devices through short-range digital two-way radio. It is an open specification for short-range communications of data and voice between both mobile and

stationary devices. For instance, it specifies how mobile phones, WIDs, computers and PDAs interconnect with each other, with computers, and with office or home phones.

It provides security for both stationary and mobile devices. The basic function is to provide a standard wireless technology to replace the multitude of propriety cables currently linking computing devices. Better computer system ability of the radio technology to network when away from traditional networking structures, such as a business intranet. Even better is the ability to network on an ad hoc basis. For example, imagine being on a business trip with a laptop and a phone. Bluetooth technology allows interfacing the two. Then, picture meeting a client and transferring files without cabling or worrying about protocols. (Heidi Monson, Dec 14, 1999)

2.6 PREVIOUS IMPLEMENTATION OF SHORT MESSAGING SERVICE

2.6.1 Implementation with SMS Gateway

The implementation of SMS Gateway is applied by Universiti Teknologi Malaysia (UTM) which comes out with a system to check examination results via SMS for their students and this application is developed by Init5 Sdn. Bhd., a company which has specialization in providing messaging products and services. Init5 has developed a server which downloads certain text database from the UTM's database. InIt5 form a direct inter link between its server database to a cellular mobile operators Short Messaging Service Centre (SMSC) which enable SMS messages to be dispatched and disseminated to UTM students who are the subscribers of the cellular mobile operator.

For examination results enquiry, the SMS provider downloads in text format, the required data fields from the UTM's database. Enquiries via SMS and mobile phones are made at the SMS Provider without affecting the UTM's database. The database at the

SMS Provider will be updated accordingly. Upon enquiry, the server would send an SMS message of the examination results to the enquirer. The duration between enquiry and answer usually takes about 10 seconds.

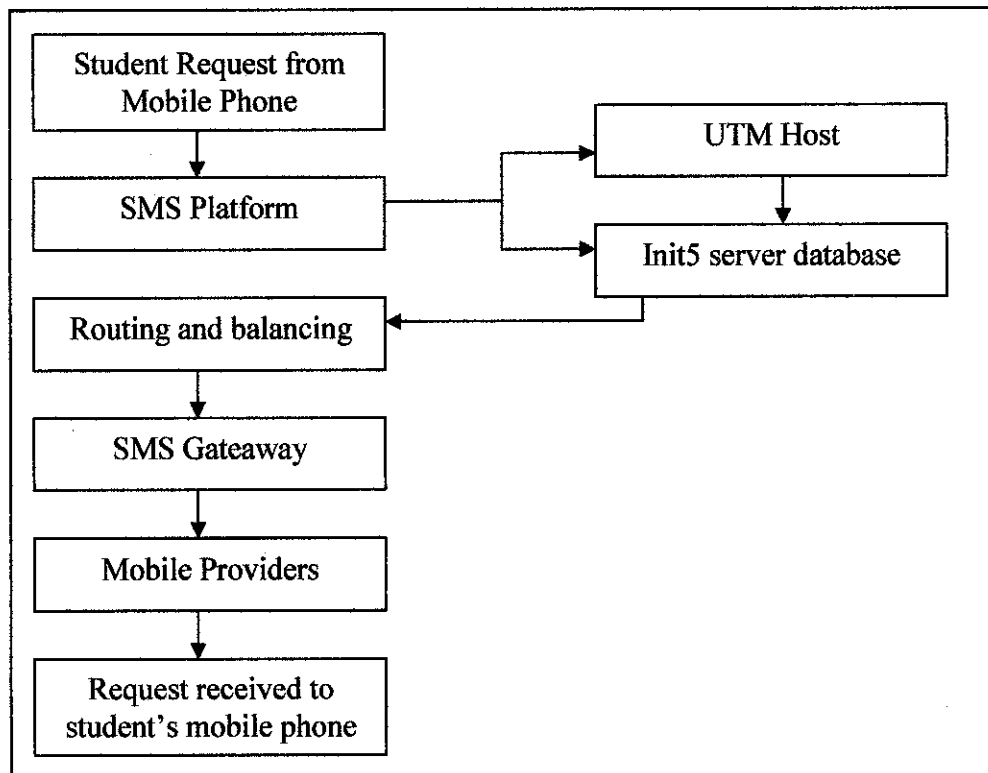


Figure 2.5: Flow Chart of UTM's Exam Result Via SMS

(Source : Init5 Sdn. Bhd)

The application architecture in developing the SMS Exam Result is using the following components.

- UTM Host

Fundamentally, the SMSP servers act as engines for receiving SMS requesting for information, besides pushing out SMS messages. The SMSP servers connected to UTM via TCP to enable access to the hosted database.

The database will be maintained at the UTM host, containing information to be retrieved. This includes students' information and any other data that are requested or sent out. The database exist independently from the central database in the organization.

- Cellular Mobile Operator (CMO)

The Cellular Mobile Operator provides the network infrastructure, specifically in the delivery of SMS to various parties. It enables the exchange of SMS between mobile users requesting for information and the database.

Below are the System Architecture For SMS Platform (SMSP)

- Database Server

The Server acts as a central depository for text data based on function to be used. The data contain specific information on the student's account. The data stores in the database are in three different format:

- *Edited Data* – data that is presently in the system and went through amendment process. This is the type of data that the server will continue to receive from the eFTP server.
- *Deleted Data* – data that have been deleted from the central database. This type of data would relate to the accounts of terminated UTM students or maybe those who graduated.
- *New Data* – data that to new account holders, those new registered students.

The integrity of these data would ensure that the UiTM clients will get the updated exam results.

- **Application Server**

The Application Server contains the application software which enables the entire SMS functions to be processed. The application processes every function for SMS broadcast and SMS response to enquiries. The component handles SMS requests made from the mobile phone and communicates with the Database Server to obtain the desired SMS message to be relayed to the requesting mobile phone.

- **SMS Gateway**

The SMS Gateway sends and receives SMS after being processed by the Application components. It enables any client application to provide any value added service for UTM students. This gateway will relay the SMS request to the application and send the information requested back to the mobile users.

2.6.2 Implementation with GSM Modem

The implementation of Exam Result Auto-Send Via Short Messaging Service (SMS) application is done by Loo Chi Li (2003) from University of Technology PETRONAS where the research on the basic functionality for the SMS connection has been done in order to provide the most suitable method for Exam Result Auto-Send with SMS applications. The prototype for this method has been developed via SMS system.

The project concerns on the way of delivering SMS to GSM network only, the library used for this prototype development depends on SMS library and GSM features. This project was developed using Visual Basic 6 and requires a GSM modem, a computer server and an ActiveXpert SMS and pager toolkit installed in the computer server.

A computer plays a role as a server, which has ActiveXpert SMS and pager toolkit installed and the application that has been developed is stored and created the computer server.

When user operates the computer server, it will connect to the GSM mobile phone through a data cable. The GSM mobile phone is connected to the GSM network and the message from the server will then be forwarded to Short Messaging Service Center (SMSC). The message from SMSC will forward the message to the recipients that are based from the database.

However, for testing purpose of this prototype, Loo Chi Li (2003) has replaced the GSM Modem with GSM mobile phone because GSM mobile phone has the same functionality of any of the GSM modems available in the market, as GSM mobile is embedded with GSM functionality.

Exam Result Auto-Send via SMS contains three forms.

- User Login

User login allows only the authorized users to log in order to operate the system since the database contains confidential data. It only limits three log in per session and if the entered password is wrong three times in a row, the system will automatically shut the system down the system to protect the database from unauthorized users.

- Result Checking

Result checking only allows the user to view students result and prohibit the user to do any changes or modify from the page. Exam result database is obtained from the exam unit, and the user for this system is not allowed to do any changes towards the

database. The main purpose for this is to ensure the correctness of the result before sending to the students' mobile phone.

- **Result Sending**

The authorized user will send the exam result through SMS to students by clicking the *Send* button from the system and this result will then be sent to the student registered mobile phone number.

The interface for this system is simple, user friendly and meets the requirements as it does not need more practical work to use the system. User can easily understand the functionality of this system.

2.6.3 Implementation with Bluetooth

The implementation of simple Short Messaging Service (SMS) application using Bluetooth is developed by Visual IT Company located in United Kingdom, that enables the user to write, send, receive and store SMS messages on Pocket PC by connecting to mobile phone via Bluetooth, Infra red or Cable. Users can write SMS messages on your pocket PC using the soft keyboard, character recognizer, transcriber or cut & paste text from other documents and this SMS application can avoid the tiresome use of user phone's keypad.

This application requires a pocket PC, XScale, MIPS, ARM or SH3 with 144k Memory and requires a compatible phone with IR Bluetooth or Cable connections.

Simple SMS has the ability to send and receive long messages. With this application users are now able to cut and paste any length of text into Simple SMS from any source on users Pocket PC and send it instantly and securely to someone else. If they

also have Simple SMS (or one of the new Ericsson phones) they will receive the complete text as one message.

Instantly recognize who sending a message. Fully integrated with the Pocket PC Contacts database. When composing a message user will be able to type in the recipients telephone number directly or select one of user Pocket PC contacts, it even allows user to display your contacts as First Name ? Last Name or Last Name ? First Name.

The benefits of using this application are :

- Sort messages on date or recipient.
- The ability to read unicode SMS messages.
- User can now quickly add all contacts from a pocket outlook category this enables user to set up distribution lists to send messages to.
- Menu bar buttons to quickly select common functions / views.
- Simple clear and effective screen layouts reflect what most users are familiar with i.e. New, Inbox, Outbox, Sent messages.
- Export all sent and received messages to a tab delimited text file for archive.

CHAPTER 3 METHODOLOGY

3.1 PROCEDURE IDENTIFICATION

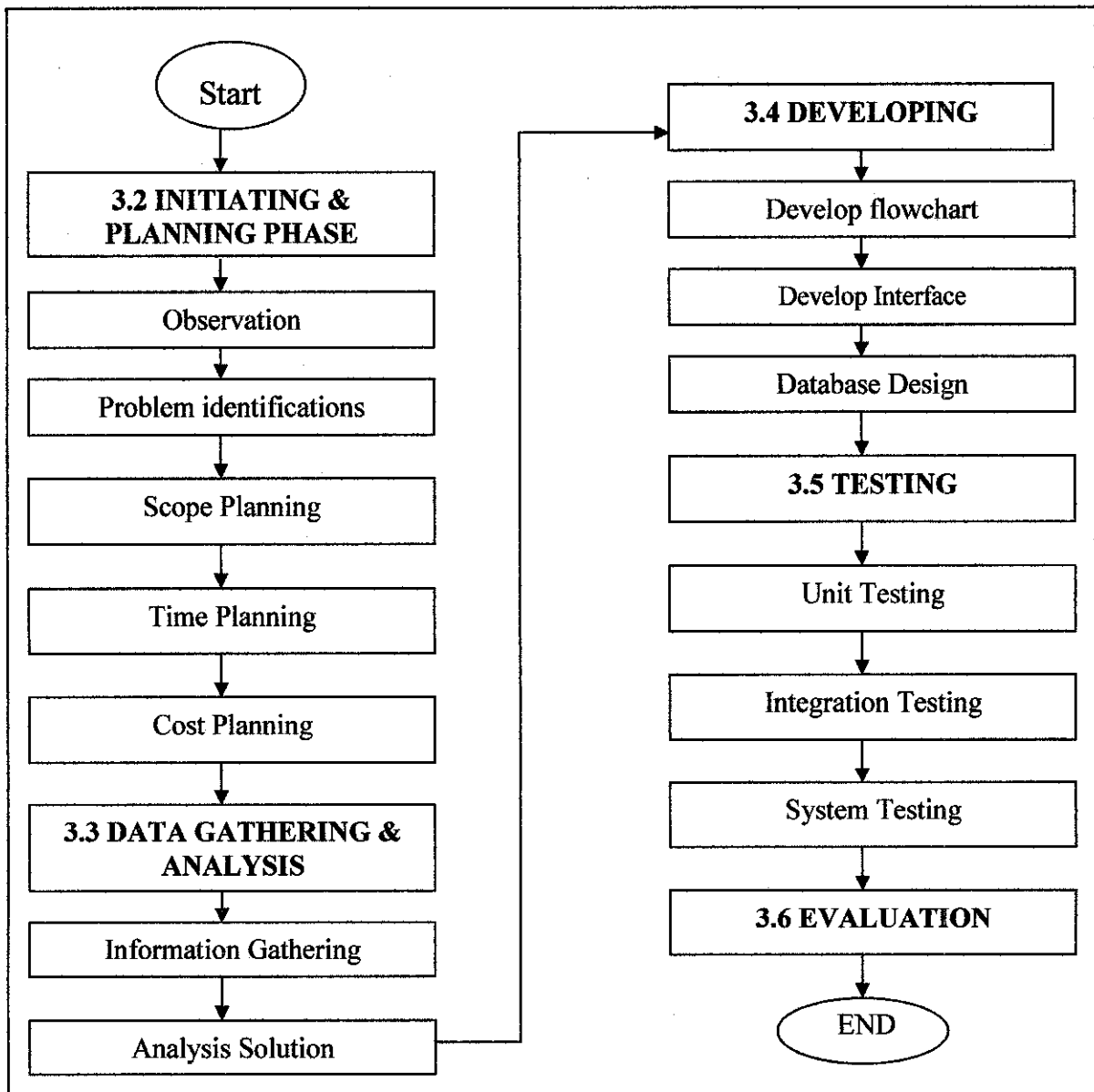


Figure 3.1: Flowchart of Procedure Identification

Figure 3.1 depicted the summarization of methodology phase. The first phase was Initiating and Planning Phase. In Initiation phase, (i) observation and (ii) problem identification have been used as a method. In planning phase, three steps involved that are Scope Planning, Time Planning and Cost Planning. The next phase was Data Gathering and Analysis. Data Gathering involved formal and informal interviewing, distributing questionnaire to targeted users, library and website research and literature survey. In Developing phase, four steps involved that are developing the system flowchart, determining the tools and equipments needed, developing the interface and database design. Three steps involved in Testing phase. The first phase was conducting the Unit Testing, followed by Integration Testing and System Testing. After all the phases have been completed, then Result Analysis has been conducted to evaluate the end product.

3.2 INITIATING AND PROJECT PLANNING

3.2.1 Initiating

Initiating is the process where the author recognizing and starting this project. It involves committing the next phase of the project. The output of initiation process is the key document for formally recognizing the existence and providing a broad overview of this project. The following method has been chosen in accomplishing the initiation phase.

- **Observation** - Observation has been done to see the drawbacks of current system on today method's of receiving examination result in UTP. Besides, the observation takes the advantages of using SMS either it can be applied as a new method of delivering the examination result. It is due to the popularity of SMS among Malaysian as the SMS is one of the inexpensive method of

communication. Also, the increasing number of mobile subscribers especially among students can be an advantage in applying SMS in retrieving examination result by UTP students.

- **Problem identification** – After the observation is done, the next step is to determine the real problem of current method for student's in retrieving their examination result. This phase is to identify the real problems that can be improved with proper solution in order to ease the student's interactivity towards the current system. Two methods used for students to retrieve results are either regular basis from the faculty administration office or with online web based application.

Through online system, the problems normally faced by the students is heavy network traffic because too many students log in at the same time. Besides, computers will not always be with the students all the time. By mailing, sometimes the result were not sent to where students currently reside.

3.2.2 Project Planning

Planning phase include devising and maintaining a workable scheme to accomplish the objective of the project. Project plan has several knowledge areas that relates to the project. The knowledge areas that are important in this project during planning phase are:

- **Scope planning** – Scope planning involves developing documents to provide the basis for future project decision including the objective of the project. Therefore through this scope planning, the problem statement, objective and scope of the project are stated.

Based on the problem statements, objective and scopes of this project, the author will concentrate in developing exam result retrieval via SMS through request from the mobile subscriber. To this, database is needed in order to record the important attributes that are needed in transaction either from the user to the system or vice versa.

GSM modem is required in connecting the computer server in order to enable the system connected to the GSM network for sending SMS. GSM modem will support a wide range of many to many applications and a reliable method for controlling the application. The GSM modem will be connecting to the GSM network, the message from the server will then forwarded to Short Message Service Center (SMSC). The messages from SMSC will forward the message to the destination recipients.

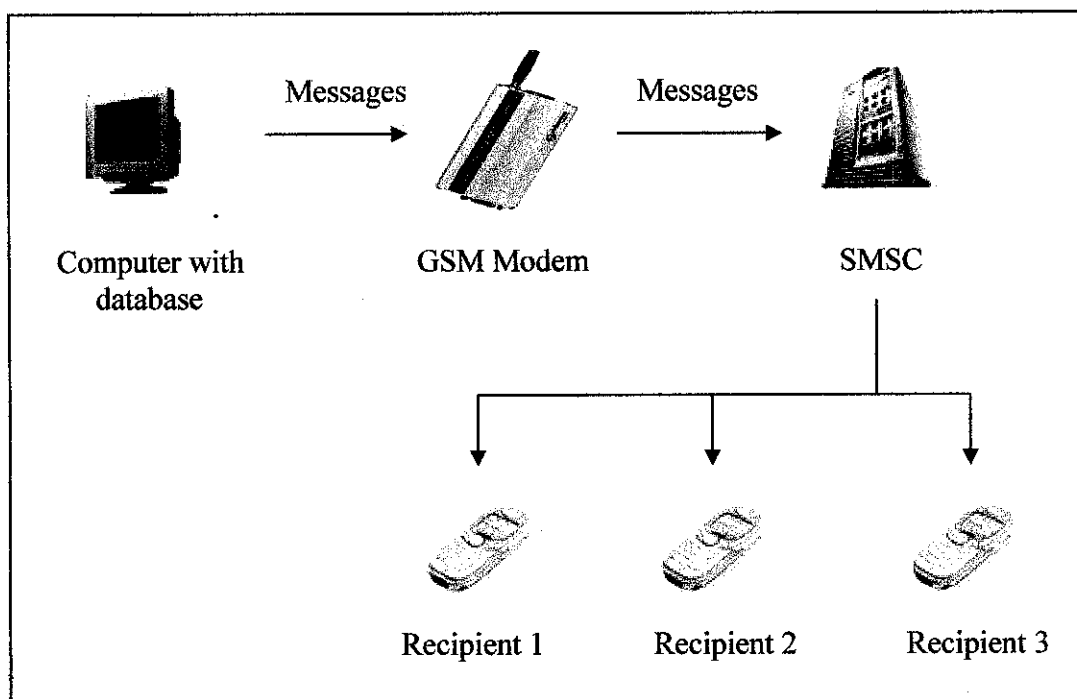


Figure 3.2: Overview of Architecture Exam Result Retrieval Via SMS

- **Time planning** – Time planning involved the process required to ensure timely completion of this project. Therefore, through time planning, Gantt chart has been created to ensure the tasks and project activities are performed during the specific time given. (see Appendices). Through Gantt chart, the author can identify the milestone – a significant event on a project with zero duration, the dependencies between tasks, clear summary of the tasks and the duration of each individual task.
- **Cost planning** – Cost planning involving the project’s budgeting is derived from the hardware that has been used. The cost is on the Siemens TC35i Terminal, embedded with the antenna, cable and power supply, and air-time credit of the Celcom and Hotlink Prepaid that has been used during testing phase.

3.3 DATA GATHERING AND ANALYSIS

3.3.1 Information Gathering

Information gathering is the process to obtain information in depth of what has been observed. This has been done by:

- **Interview** – Formal interview has been conducted with the expert in developing the SMS application in order to get better understanding in developing this project. Interviewing is a fact finding technique for collecting information in face-to-face or telephone discussion. Some interviews are conducted through email and instant messaging, too.

- **Questionnaire** – Questionnaire has been done to get the feedback from the targeted user towards the current system and future system to measure the variable of interest (see Appendices). The data obtained were more reliable and free from respondent bias. Also, it is easier to observe the targeted group of users of this system in order to obtain information. Seventy five questionnaires were distributed to UTP students but only sixty returned the questionnaire. This questionnaire has been divided into five sections. Section A contains the general questions about the exam result. Section B and Section C are to compare between two methods that have been practiced in UTP to deliver exam result to student. The two methods are mailing and web based application. Section D focuses on the suggestion of implementation of SMS result in UTP and Section E requires the respondents to rate the preferences of methods in delivering the exam result including the SMS method.
- **Library and Website Search** – Sources are from library and related websites found on Internet. By doing library and websites research, the author identified how such issues have been tackled in developing the similar project.
- **Literature Survey** – Gathered the documentation of a comprehensive review of the previous work done by the previous researcher related to this project. The documentations were gathered from the books, journal and articles founds in the Internet and library search. The purpose of literature survey is to ensure that no important variable that has in the past been found repeatedly to have an impact on the problem is ignored.

3.3.2 Analysis Solution

Based on information gathering, analyzing the solution has been done to propose the method to overcome the problems. A thorough step has been taken to elaborate and interpret the results of the project. In data analysis the author has two objectives: getting

a feel for the data and testing the goodness of data where the reliability and validity of information can be tested. The author acquires the feel of data by checking the central tendency and the dispersion and this is done through questionnaire (see Result and Discussion).

3.4 DEVELOPING

After analyzing the solution, the next stage is designing and developing the solution. Basically the author used this workflow in this phase

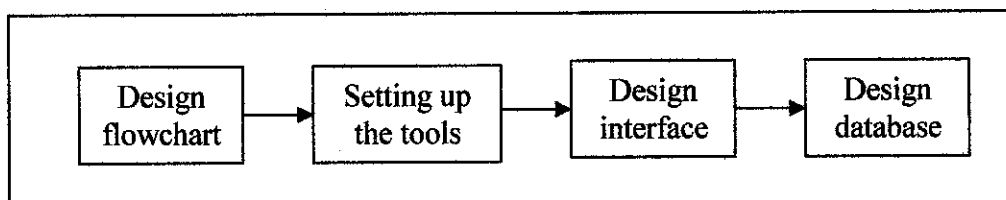


Figure 3.3: Flowchart of Database Design

3.4.1 Development of System Flowchart

The system starts when the administrator connects the GSM modem to the network. It starts operate when the system receive the examination result request. The flowchart has been divided into two where one is the system flow excluded the Help request and another flowchart is the Help workflow.

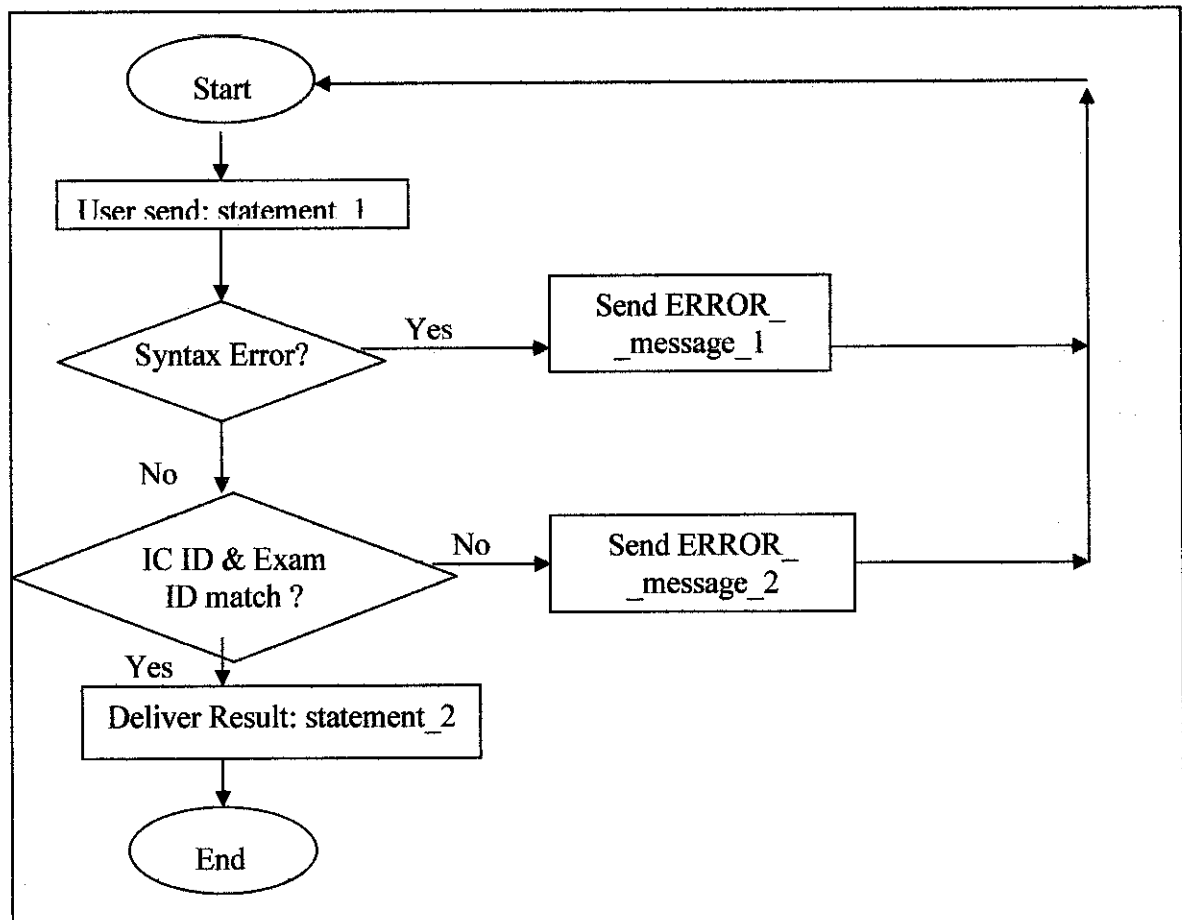


Figure 3.4: Flowchart of Sending the Examination Result

statement_1: (input request by the requester to retrieve exam result)

RESULT<space>StudentI_IC<space>Student_ID<space>Exam_ID

statement_2: (input received by the requester after the successful request)

Student_IC<space>Student_ID<space>Exam

ID<space>Subjects<space>Grade<GPA>CGPA>

Send_ERROR_message_1: (error message that will be sent back to the requester because of syntax error)

Input not valid. Type RESULT<space>Student_IC<space>Student_ID<space>Exam_ID and reply to +60125560136

Send_ERROR_message_2: (error message that will be sending back to the requester because of the Student_ID does not exist)

Sorry. Student ID does not exist. Try again and type

RESULT<space>Student_IC<space>Student_ID<space>Exam_ID and reply to +60125660136

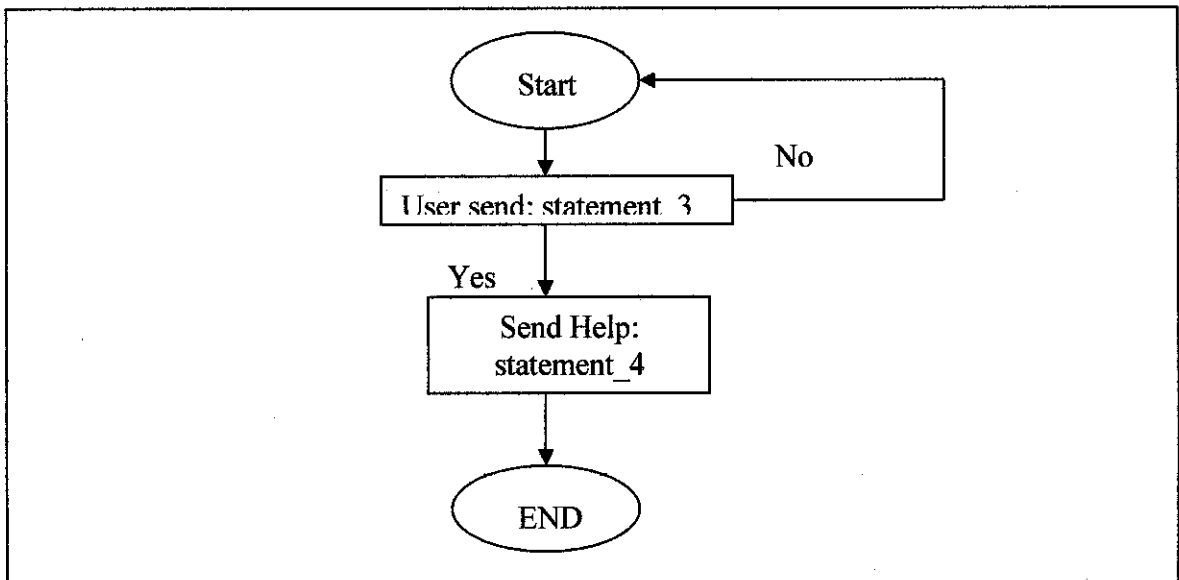


Figure 3.5: Flowchart of Sending Help for Examination Result

statement_3: (requester send HELP to the system)

HELP

Statement_4: (the system deliver HELP to the requester)

Type RESULT<space>Student_IC<space>Student_ID<space>Exam_ID and reply to +60125560136

3.4.2 Setting up the tools

Tools that have been used during the development of the project are:

- **Hardware**
 - Siemens TC35i Terminal (embedded with antenna, power supply and cable). It is designed for high-volume applications based on data, voice, SMS or fax. Due to its small lightweight design and low power consumption, TC35i is cost efficient solution for a wide variety of applications, ranging from POS/EFT terminals to telemetry and telephony.
 - Hotlink and Celcom SIM Card – Both SIM card is used during the testing phase. Hotlink SIM card is used inside the GSM modem to enable the system connected to the GSM network while Celcom SIM card is used for requesting exam result via SMS.
 - Computer

- **Software**
 - Microsoft Visual Basic 6.0 – Software that will be used for designing the interface and developing the SMS application
 - Microsoft Access – software that will be used in order to store the student's database that is related to exam result retrieval
 - Windows 98, 2000, XP or NT

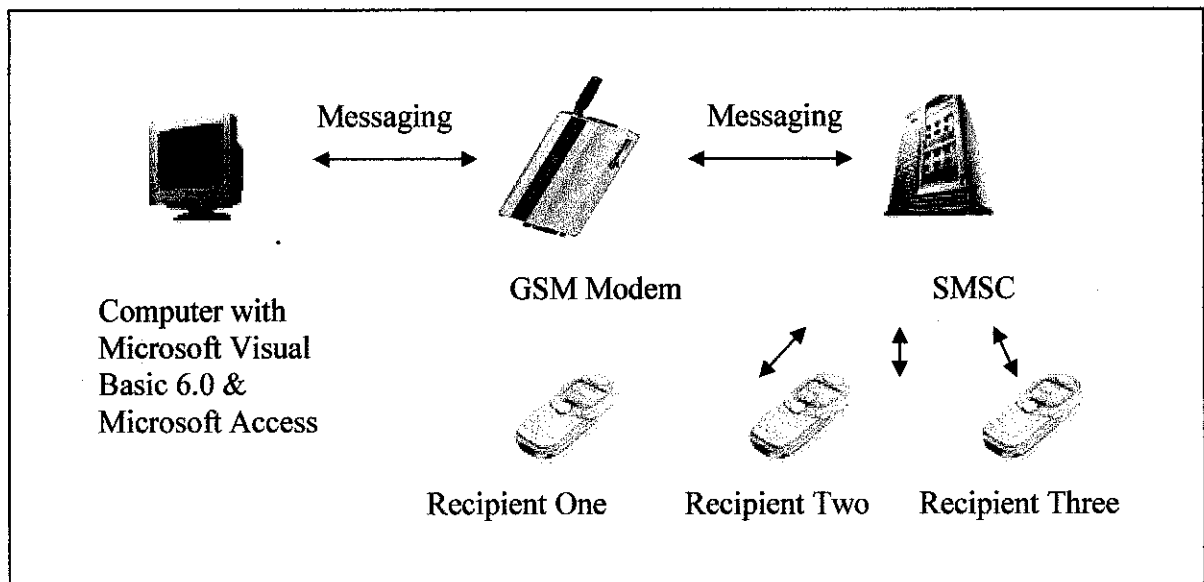


Figure 3.6: Tools used in Exam Result Retrieval via SMS

3.4.2 Develop Interface

Development of interface includes the connection to GSM modem and communication between the system and AT command. For testing purpose, View SMS is design to test the system in sending the result of SMS to the required destination.

In this development of Exam Result Retrieval via SMS, there are three main areas of development which involves:

- Administrator Log in
- GSM Setting
- Viewing SMS
- Communication with AT commands

The first step in accessing the system is to log in to the system. This Exam Result Retrieval via SMS allowing only authorized administrator to log in to the system. It is because the exam result is confidential. When user keys in the wrong password, a pop up message will appear on screen showing that the wrong password has been entered. This will protect any unauthorized user from accessing the system. The interface of the user log in is shown below:

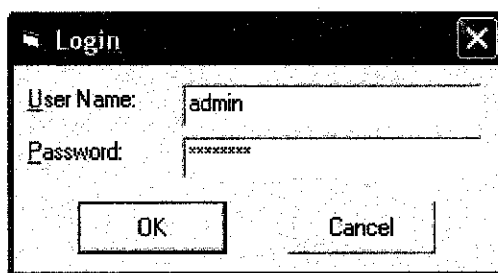


Figure 3.7: Administrator Log In Page

GSM Setting is the section where it shows the setting to the GSM modem in order to enable the system log in to the network. There are four categorized that the administrator needs to set up before connecting the GSM modem to the network. There are Communication Port, Bits per Second, Data Bits, Parity and Stop Bits.

Computer needs to communicate to the GSM modem. The two likely methods are to use the ports available. There are two kinds of port that is serial port and parallel port. In this project, serial port is been used and the options is range from 1 to 4. 1 and 2 is the connection to internal device and 3 and 4 is the connection for the external device. Internal modem is used to test the AT commands with the system by using the Hyper Terminal before using the GSM modem. Bits per second (bps) is the number of bits transmitted every second, used as a measure of the speed at which the GSM modem can

transfer data. For Siemens TC35i Terminal, 9600 bits per second is used to transfer the data.

Data bits are the number of bits in a word. Siemens TC35i Terminal use eight bits to represent a single data character.

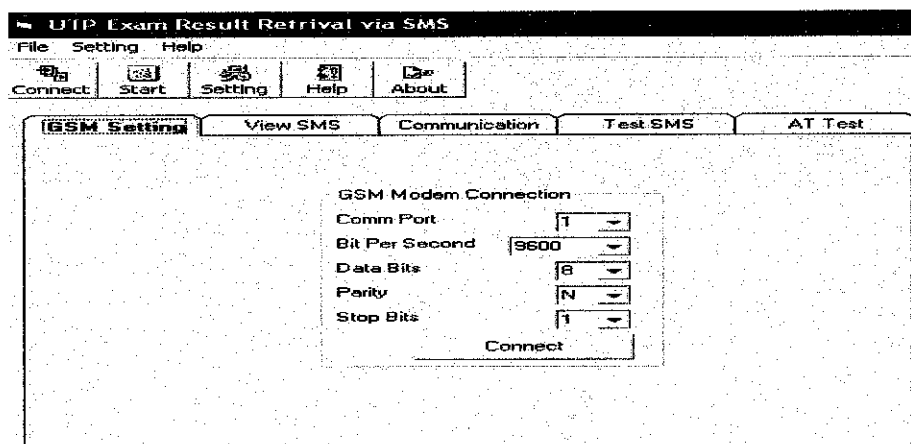


Figure 3.8: GSM Setting Page

Parity controls how Siemens TC35i Terminal checked for errors. For Siemens TC35i setting has been set to None because it used more reliable and sophisticated method for error checking

Table 3.1: Several settings for parity

Setting	Operation
Even	Set the parity bit to 0 or 1 to make the number of 1 bits even
Odd	Set the parity bit to 0 or 1 to make the number of 1 bits odd
None	Send no parity bit
Mark	Set the parity bit always to 1
Space	Set the parity bit always to 0

Stop bits specifies the number of stop bits that define the end of a character:1, 1.5 and 2. For Siemens TC35i Terminal it used 1 as the stop bits as it is the default value.

Viewing SMS is to show the Index that the system is reading before delivering any message. It reads starting from Index 01 and ups to Index 20. Each of the messages will automatically be deleted from the Index after the system has read the request. For examples, the system received six messages at one time, therefore it starts reading from Index 01 to Index 06. But when the system reads Index 03, the system suddenly receive one message and this message has been slot into Index 01. The system continues operates the message until Index 06 and when it finish then only the system reads the new Index 01.

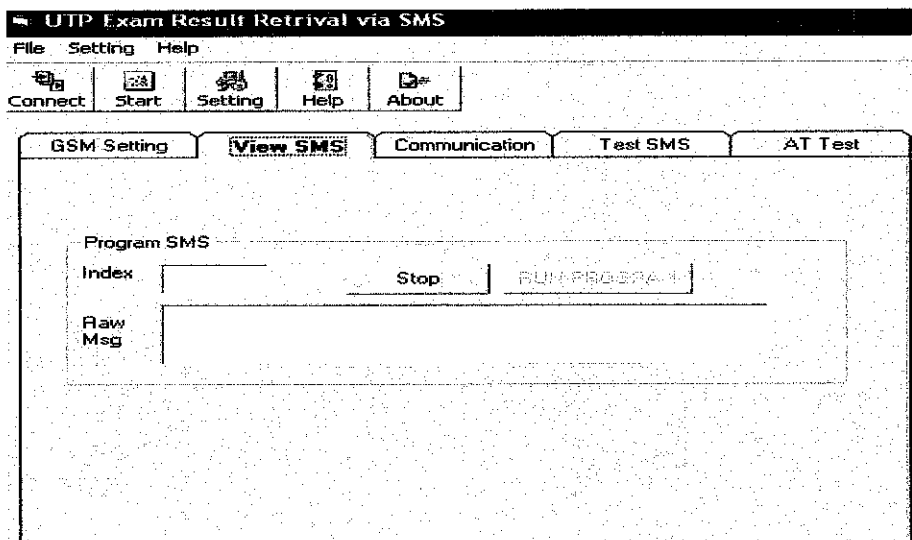


Figure 3.9: Viewing SMS Setting Page

Communications button show all the AT commands that has been used during the execution of the program. It shows the communication between the GSM modem and the system.

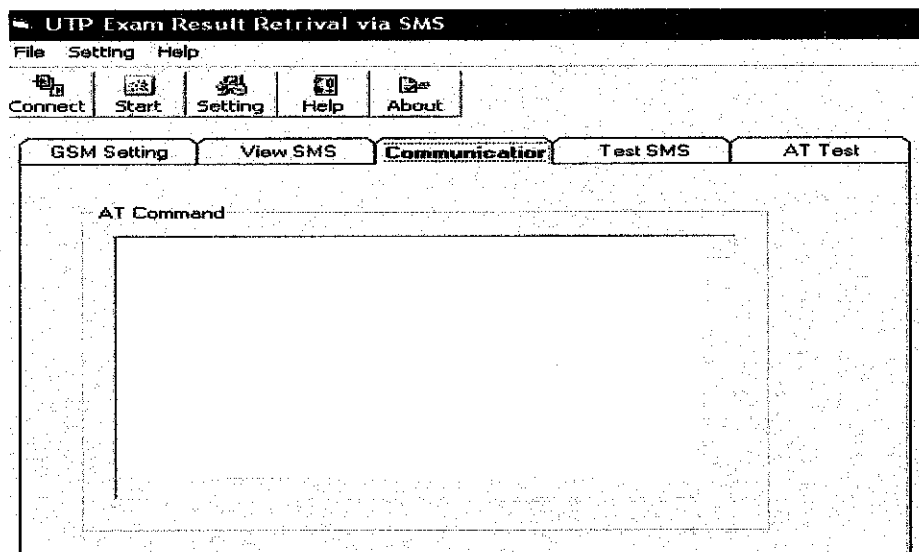


Figure 3.10: Communication of AT Command Page

3.4.3 Database Design

Database design focuses on the attributes that is important to represent the exam result to students. Three tables has been designed to construct the flow of the database. The tables are the result, SMSIn and SMSOut.

ID	IC	GPA	Exam_ID	Subject	CGPA
1111	800118045693	3.25	8866	SSB5073 A- SWB3212 B+ STB5013 B STB5033 A STB5012 B+ STB4423 A- STB3434 B SWE	2.89
1234	123456789012	3.52	1234	SSB5073 A- SWB3212 B+ STB5013 B STB5033 A STB5012 B+ STB4423 A- STB3434 B SWE	2.56
2222	222222222222	3.14	7777	SSB5073 A- SWB3212 B+ STB5013 B STB5033 A STB5012 B+ STB4423 A- STB3434 B SWE	2.98
3333	333333333333	2.65	8888	SSB5073 A- SWB3212 B+ STB5013 B STB5033 A STB5012 B+ STB4423 A- STB3434 B SWE	3.89
4444	444444444444	2.85	9999	SSB5073 A- SWB3212 B+ STB5013 B STB5033 A STB5012 B+ STB4423 A- STB3434 B SWE	3.22
5555	555555555555	2.1	1010	SSB5073 A- SWB3212 B+ STB5013 B STB5033 A STB5012 B+ STB4423 A- STB3434 B SWE	3.55

Figure 3.11: Table of Result

The table of the result as shown in Figure 3.11, is based on Academic Central Service, the important attributes being Student ID, Exam ID, Identification Card (IC), Subject's result, GPA and CGPA of the students. The attributes derived from this table is the

output when delivering the result for the student. Students must enter the correct Student's IC, Student ID and Exam ID in order to get retrieves the result from the system.

Result : Table			
	Field Name	Data Type	Description
PK	ID	Text	Student ID - primary key
	IC	Text	Student IC
	GPA	Text	GPA
	Exam_ID	Text	Exam ID
	Subject	Text	Subject taken by students
	CGPA	Text	CGPA

Figure 3.12 Database Scheme of Result Table

Table of SMSIn is to record the SMS that has been received by the system. It is automatically updated after the system has read the Index. SMSIn has four attributes that are the Student ID, SMS, Number and Time.

SMSIn : Table				
	ID	SMS	Number	Time
	1934	RESULT 82129	0123556063	1245
	1967	RESULT 82111	0123456334	1312
	1972	RESULT 82092	0126978233	1334
	1986	RESULT 82131	0164712434	1201
	1988	RESULT 82022	0197119479	1230

Figure 3.13: Table of SMSIn

SMS record the information from the message that has been requested by the requester, Number record the phone number of the requester while Time is time when the transaction is occurs.

SMSIn : Table			
	Field Name	Data Type	Description
PK	ID	Text	Student ID
	SMS	Text	SMS request from the requester
	Number	Text	Phone Number
	Time	Text	Time

Figure 3.14: Database Scheme of SMSIn Table

Table of SMSOut is to record the SMS that the system has delivered to the requester. It automatically update the database whenever the system has sent the message. It consists of the same attributes in SMSIn but it have new attribute Status. Status is to record the status of the request message.

SMSOut : Table					
ID	SMS	Number	Time	Status	
1934	RESULT 82129	0123556063	1245	Delivered	
1967	RESULT 82111	0123456334	1312	Delivered	
1972	RESULT 82092	0126978233	1334	Delivered	
1986	RESULT 82131	0164712434	1201	Delivered	
1988	RESULT 82022	0197119479	1230	Delivered	
*					

Figure 3.15: Table of SMSOut

SMSOut : Table			
Field Name	Data Type		
ID	Text	Student ID	
SMS	Text	SMS request from the requester	
Number	Text	Phone Number	
Time	Text	Time	
Status	Text	Record the status of the request	

Figure 3.16: Database Scheme of SMSOut Table

3.5 TESTING

After the development, testing has been done to test the proposed solution for evaluation. At this phase, debugging the program is important to get a good result before the products are ready for the target users. The author used this workflow in this phase

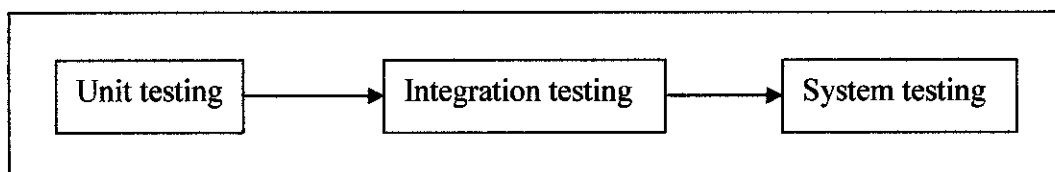


Figure 3.17: Testing phase

3.5.1 Unit Testing

A unit test is done to test each individual component, the program was developed in Microsoft Visual Basic 6.0 to ensure it is as defect free as possible. It is to identify and eliminate execution errors that could cause the program to terminate abnormally. The author has tested the program that interacts with other program and files individually, before integrating into the system.

3.5.2 Integration Testing

Integration testing occurs between unit and system testing to test functionality grouped components. It ensures the subsets of entire system work together. It has done by testing two or more programs that depend on each other. For example the output between the connection to GSM modem and the program that enables the system to read the request SMS would ensure that the requested user gets the required information through this SMS application.

3.5.3 System Testing

System testing is done after the completion of integration testing, which involves the entire information system. A system test includes all typical processing situations. It is to perform a final test of all programs and verify that all system components are integrated properly and that actual processing situation will be handled correctly.

3.6 EVALUATION PHASE

Evaluation phase has been conducted after the testing phase is completed after the end product is developed. Three stages involved in this phase as shown in the figures below.

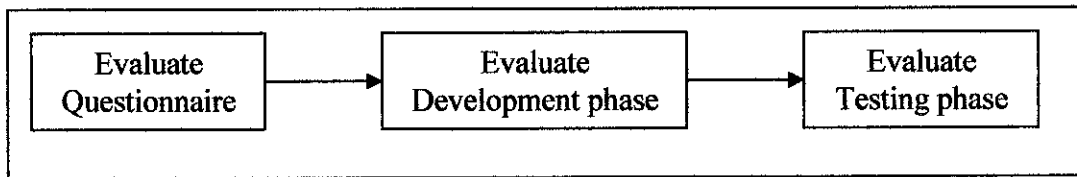


Figure 3.18: Flow of Evaluation phase

3.6.1 Evaluate Questionnaire

Questionnaire has been distributed to 70 UTP's student from first year student to final year students but only 60 questionnaires were returned. This questionnaire is to evaluate the two current methods (mailing and web based application) in delivering the exam results to student whether, there is a room for improvement of current method. To this, the SMS is the proposed solution. In order to generate this idea, one section in the questionnaire involved the idea of implementing the SMS for delivering UTP's examination result. From the results, 81.67% of respondents agree to implement SMS in delivering the exam result and 61.67% of respondents agree that SMS is the most preferable method in delivering the exam result.

3.6.2 Evaluate Development phase

User interface design is the main concern in this phase especially to make the system user-friendly and secure to the administrator in monitoring the system. It starts with the splash screen and the administrator needs to log in to the system. This is to ensure the security of the system to avoid an unauthorized person from accessing the system. After the administrator has successfully log in to the system, the user is directed to the main page.

The main page is user-friendly since it provides toolbar to guide the administrator. HELP button would help the administration and the administrator would just have to click the CONNECT button in GSM Setting Tab in order to RUN PROGRAM. Administrator would not have to spend much time to insert any command because the

RUN PROGRAM button would automatically runs the program and the administrator can just view what the program has done in Communication Tab. This would be handy the ease for the administrator to control and operate the system.

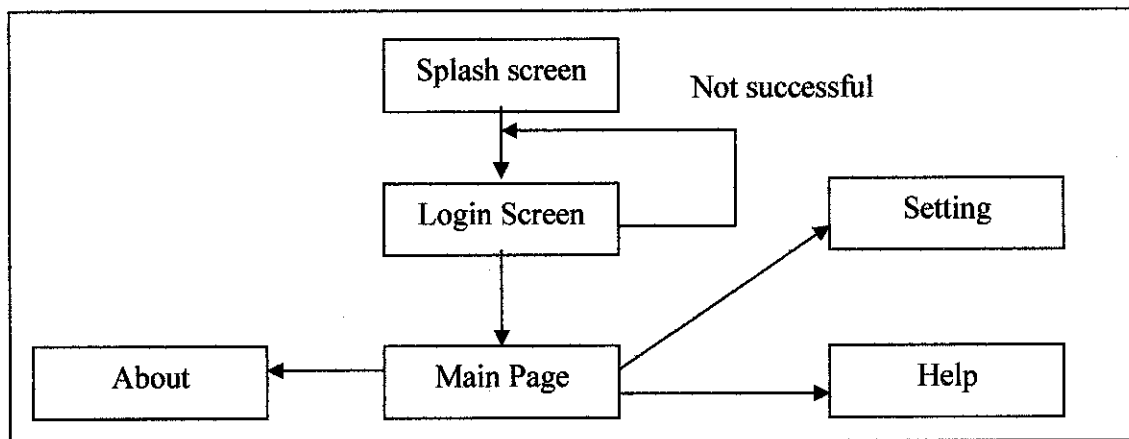


Figure 3.19: User Interface Design

3.6.3 Evaluate Testing

In evaluating testing phase, two groups of people have involved. The first group was the students who request for the exam result and the second group was the expert that evaluates the system. From students points of view, it is easy to request the result since they have the mobile phone and the SMS is not a new knowledge to them except for they have to wait for some time to get their result. The expert said that this system is user friendly and easy to maintain but the security of the system should be improved especially during the log in session because the student's result is very confidential Overall, both groups agree that this system is easy to use and should be implemented.

CHAPTER 4

RESULT AND DISCUSSION

4.1 QUESTIONNAIRE RESULT

The objective of distributing questionnaire is to get information on how good the current systems are in delivering student's exam result and to know their answers if SMS is should be implemented in delivering student's exam result.

The questionnaire is divided into five sections where each section has different purpose. Section A represents general question about the exam result. The first question is asking about the importance of exam result towards student and the second questions asking whether the current method in delivering exam result are efficient. The details of the result are shown below:

Table 4.1: Details of Result in General Section

Questions	Percentage (%)	
	Yes	No
Question 1 – Importance of retrieving exam result faster	96.67	3.33
Question 2 – Efficiency of current system	58.33	41.67

For Question One, it proves that it is important for students to retrieve exam result as soon as exam result are released.

For Question Two, although more students agree that they are satisfied with current method in delivering exam result but the results shown there is not much different

between students who agree that the system is efficient enough or not. Two methods are used in delivering examination result of UTP's student. The first method is by mail and the second method used website application.

The purpose in Section B and Section C is to compare between two current methods that are used in delivering examination result of UTP's student. Besides, these two sections require the respondents to state the problem(s) that they face in order to retrieve their exam result. The details of the result are shown below:

Table 4.2: Details of Results in Section B and Section C

Questions	Mailing (Percentage %)					Websites (Percentage %)				
	1	2	3	4	5	1	2	3	4	5
Q3 & Q5	15	51.67	30	8.33	1.67	0	6.67	75	18.33	0
Q4 & Q6	10	55	21.67	13.33	0	0	41.67	31.67	10	0

For these four questions, the author has used Likert Scale to examine how strongly subjects agree or disagree with statements on a five points basis:

1 – Not Satisfied At All 2 – Unsatisfactory 3 – Meet Expectation
4 – Good 5 – Very Good

The author has classified that 1 and 2 as negative perception, 3 , 4 and 5 is positive perceptions. These four questions are then depicted with the bar chart graph as shown below.

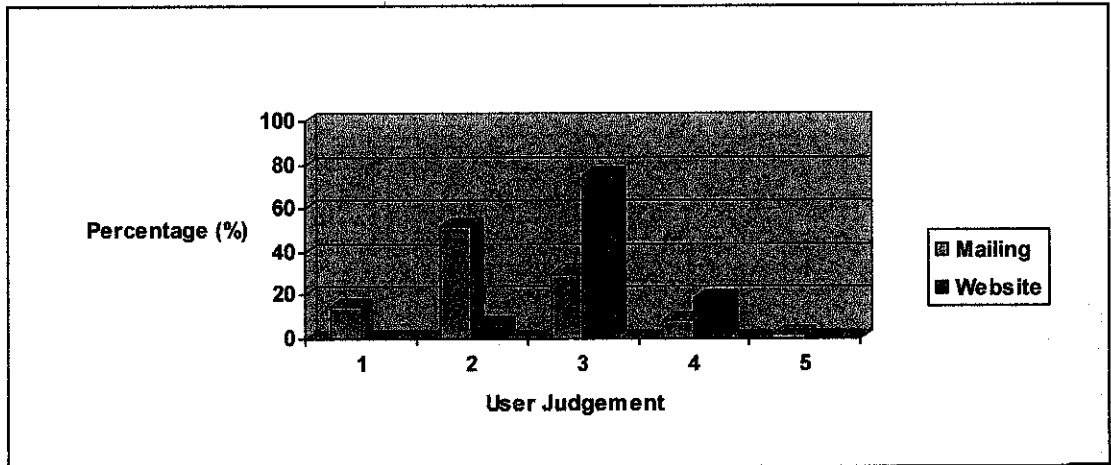


Figure 4.1: Details of Results for Ease of the Methods

From the result above, 83.33% respondents has positive perception and agree that currently, website is the best methods in delivering exam results compared to 40% respondents agree with the mailing system.

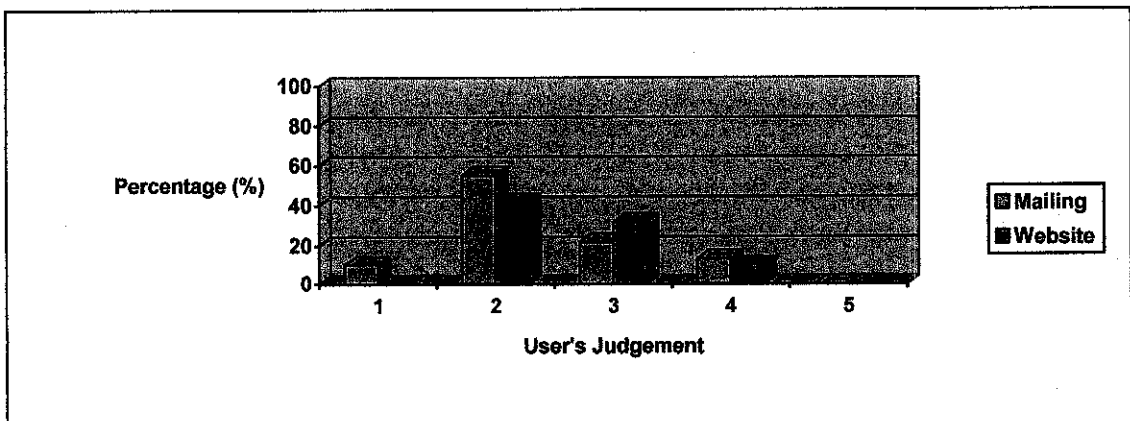


Figure 4.2: Details of Result for Level of Difficulties with Current Methods

Chart above is extract from Question Four and Question Six that based on level of difficulties in accessing the current methods. For these two questions, the author has asked the respondents if they having the problem(s) while retrieving the exam result

with these two methods. From here, 65% of respondents having problem in mailing system.

For website application, 41.67% of respondents having difficulties when accessing their exam result through website application.

Section D focuses on the Short Messaging Service (SMS). Four questions from Question Seven to Question Ten have been asked with the Dichotomous Scale. The details of the results are shown below:

Table 4.3: Details of Results in Section D

Questions	Percentage (%)	
	Yes	No
Question 7 – Own Mobile Phone	96.67	3.33
Question 8 – Agree if UTP implements SMS for exam result	81.67	18.33
Question 9 – Willing to spend money	78.33	21.67
Question 10 – SMS can improve current method	83.33	16.67

Question Seven proves that most of the students own a mobile phone while question Eight shows that 81.67% of respondents agree if UTP implement SMS application in retrieving exam result.

Question Nine asks the respondents whether they are willing to spend their air-time credits in order for them getting the examination results. 78.33% of respondents agree and willing to spend their credit in getting their results.

The purpose of Question Ten is to get the information whether the SMS application can improve the current methods in delivering examination result. 83.33% agrees that the SMS application can improve the current method.

Section E used the Forced Choice method that enables respondents to rank the three methods that are mailing, website and SMS. The respondents have to rank in order of preference, assigning 1 for the most preferred choice and 3 for the least preferred. The detail of the result is shown below:

Table 4.4: Details of Result in Section E

Methods	Percentage (%)		
	1	2	3
Mailing	8.33	35	56.67
Website	30	38.33	31.67
SMS	61.67	26.67	11.67

From the results shown on the table, SMS is the most preferred by the respondents with the percentage of 61.67% of respondent followed by website application with 30% and mailing with 8.33% of respondents.

4.2 TESTING AND EVALUATION PHASE RESULT

Testing phase result involves two groups of users. The first group of users is the student who requests their exam result via SMS. The test is to show the availability of the student's presence. Ten students have been asked on the spot to request the exam result and eight of them have their mobile phone at that time. Eight of them are required to send the message at the same time. From the result, all of them received

their requested result but they have to wait for 10 seconds to one minute to receive the message from the system. This is because it is based on the network traffic and also depending on the queue at that time.

Two experts have been asked to test the system. The first expert is Mr. Emran Mohd Tamil, who has experience in modern programming, and the second expert is a student who has experience in SMS application for her final year project. Both of them have been asked to operate the program without any user manual. Both of them were confused on how to begin the interface, but the problem solved when they used the HELP button. Mr. Emran said the system is easy to maintain since the program runs automatically but he suggested to improve the security aspect. He commented that it should be a limit for the user to enter the log in system so that the system is secured from the unauthorized user.

4.3 DISCUSSION

Based on the finding derived from the questionnaire result and testing phase result, quick method is needed for students to retrieve their exam result since it is important for them to retrieve their result as soon as the result has been announced. This proves that the fastest method that students can access is one of the best methods in delivering examination result for UTP's student.

From the mailing method, respondents usually encountered several problems especially the mail did not reach to the destination and the result is very late when it reached to the destination. The terms late here is where they usually receive the message after they have come back to UTP. Note that, UTP exam result is announced during the semester break.

For the web based application, heavy network traffic causes the delay in accessing the web application. Once the connection got disrupted, the refresh button could not retrieve what have been keyed in. Another problem that the respondent have stated was, not all the time the students with their computer, therefore it is difficult for them to know their result as soon as the result is released.

It shows that mobile phone is always with the students compared to computer therefore SMS is not a new knowledge for the students. This proves the positive availability of the SMS towards the student and they welcome the development of this SMS application in delivering the examination result in UTP.

Students are now ready to go mobile as nowadays the SMS becomes an important element in communication as it offers instant messaging with low rates of cost. Plus, SMS will overcome the problems of the current examination results delivering system.

From here, SMS is suitable for new solution in delivering examination results of UTP's student. The other method should be continued as it offered variety and alternatives way for students in getting their examination result.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The author is satisfied with the project because the project could be completed as scheduled and valuable knowledge was gained on modem programming especially in understanding the concept of AT command. The author also has learned more about Microsoft Visual Basic 6.0 in depth especially in connecting the system with the database.

This report has covered the various steps involved in the creation of the SMS framework application including analysis, developing and testing. It also examined and discussed the SMS framework application as a whole, and measured it in terms of performance, efficiency and flexibility. The hardware needed for the Examination Result Retrieval with Short Messaging Service (SMS) involved costing in order to get the GSM modem. The goal of cost effective and time saving corporate communication has been achieved.

The author finds out that developing a system where the database is the most important elements in the success of a project desires a lot of commitments and discipline especially in generating and integrating the database together with the application. However, this method of result retrieval is a convenient and easier for the students since they can have the information of their exam result at earliest opportunity. Therefore, equipments availability, cost incurred, validity, reliability need to be considered before proceeding in developing the system.

5.2 RECOMMENDATION

5.2.1 Recommendation for System

There is a lot of additional work that could be carried out to enhance the usage of the project. It is very helpful if the real exam result database connects to the application. It is not easy to allow unauthorized person to access exam result database because the database is very confidential. However, it is an advantage to developers to have a real view on the real database method and approach.

The programming part should be enhanced in order to allow foreign student to request the examination result via SMS. Currently, this project focuses on the local student who has the identification card number.

More emphasis on security could have been put on. This could be carried out by encrypting and decrypting messages before sending the SMS. With the usage of encrypting and decrypting algorithms this could be done. This will ensure the security and the privacy of the message in delivering to the recipients. Another recommendation is it should be a limit for the person to log on to the system and if the limit has been exceeded, the system should be shut down in order to protect the confidentiality of the database.

5.2.2 Recommendation for UTP

There is plenty of room for UTP to improve the current system in conducting Final Year Project in order to produce the quality research and product. This course is

carried out only in fourteen weeks times. There is limited time to conduct full research and prototype product. It is good if the duration for completing Final Year Project be extended to two semesters. This will help the students give full commitment in doing research and developing better prototype.

IT Department should give the exact amount of cost that UTP or IT Department can support in order to help the students buying the hardware or software. This will not be a financial burden to the students in having a new hardware or software. Based on the author knowledge, currently the IT budget is under the responsibility of UTP IT Department and it is very difficult to consult about the budgeting for the final year student.

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**APPENDIX 1: FYP QUESTIONNAIRE :
PROVISION OF SMS TECHNOLOGY IN EXAM RESULT RETRIEVAL**

I am a Final Year IT student, doing my Final Year Project. This questionnaire is to help me in getting some responds from the users towards the acceptance of SMS Technology in UTP, especially in Receiving Exam Result. Please take a moment to fill in the questionnaire. Thank you.

SECTION A: GENERAL

Question	Yes	No
1. Is it important to retrieve your exam result as soon as exam result comes out?		
2. The current system (website and mailing) is efficient enough in retrieving your exam result		

SECTION B: WEBSITE

**1 = Not Satisfied at all 2 = Unsatisfactory 3 = Meet Expectation
4 = Good 5 = Excellent**

3. Website application – easy to retrieve exam result

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

4. No problem occurred during the transaction in retrieving exam result

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

If problem(s), can you state the problem(s)

SECTION C: MAILING

**1 = Not Satisfied at all 2 = Unsatisfactory 3 = Meet Expectation
4 = Good 5 = Excellent**

5. Mailing method – easy to retrieve exam result

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

6. No problem occurred during the delivering your exam result

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

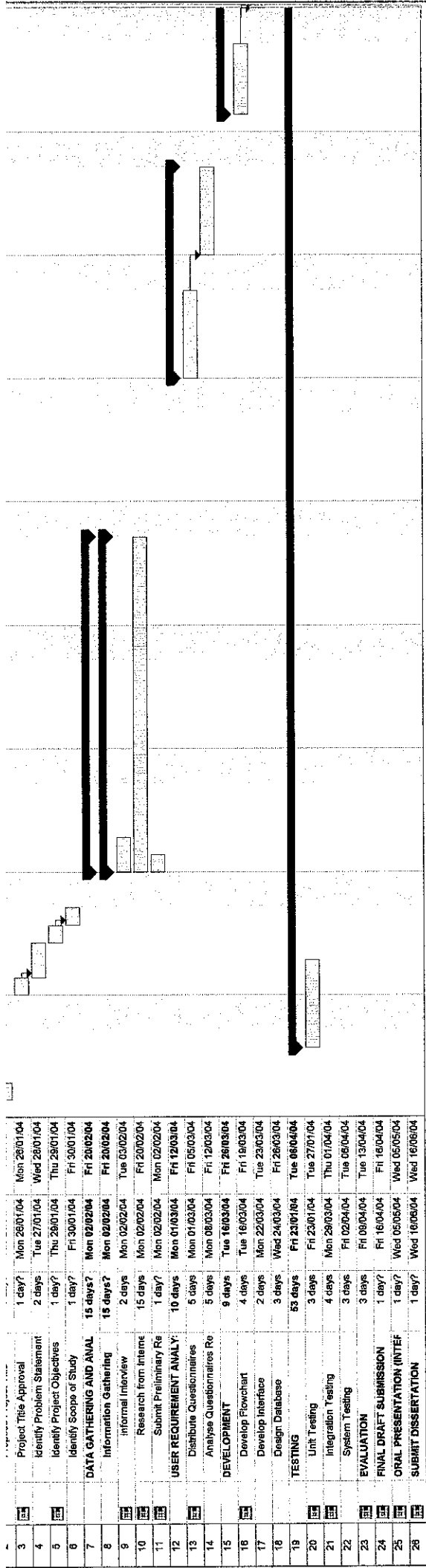
If problem(s), can you state the problem(s)

SECTION D: SMS

Question	Yes	No
7. Do you own a mobile phone?		
8. Do you agree if UTP wants to implement SMS application in retrieving exam result?		
9. Do you mind to spend your credit (rated RM0.10-RM0.20) in order to receive your exam result via SMS?		
10. Do you think SMS exam result can improve the current method in retrieving exam result?		

SECTION E: Rank the following method in retrieving exam result in terms of easier method for you. You should rank the easiest as 1, the next in importance is 2 and then 3.

<u>Method</u>	<u>Rank</u>
1. Mailing	<input type="text"/>
2. Website application	<input type="text"/>
3. SMS	<input type="text"/>



Project: EXAMINATION RESULT RET
 Date: Sun 08/08/04

Task Split

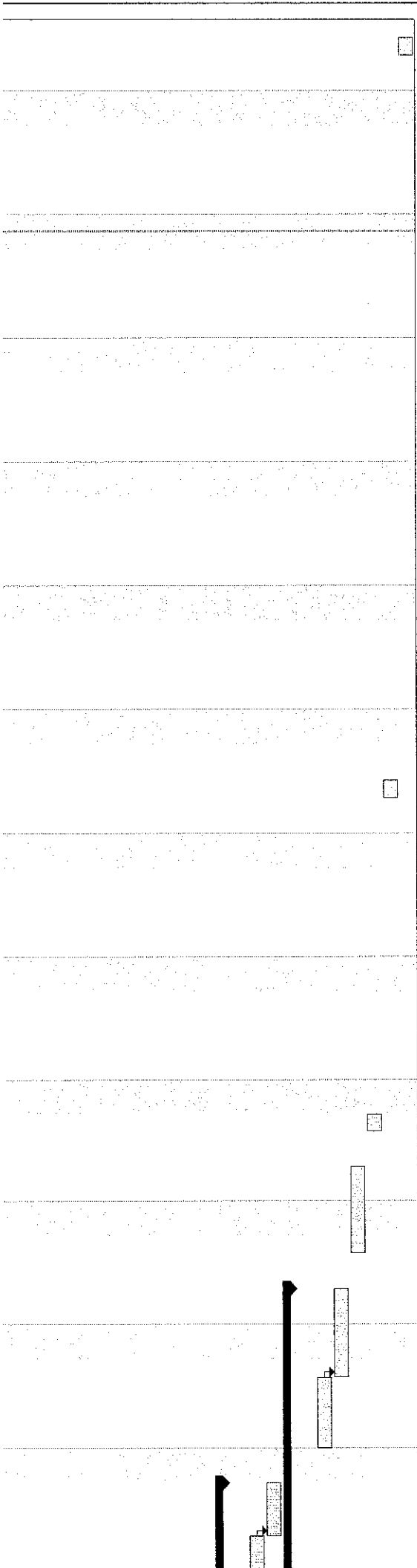
Progress Milestone

Summary Project Summary

External Tasks External Milestone

Deadline

Page 1



Project: EXAMINATION RESULT RET
 Date: Sun 06/06/04

Task
 Split

Progress
 Milestone

Summary
 Project Summary

External Tasks
 External Milestone

Deadline