CERTIFICATION OF APPROVAL

Smart Parking System: SMS Payment System Module

by

Muhammad Muzakkir Bin Aziman

A Project Dissertation submitted to the

Information System Programme

Universiti Teknologi PETRONAS

in partial of the requirements for the

BACHELOR OF TECHNOLOGY (Hons)

(INFORMATION SYSTEM)

Approved by,

_____

(Pn. Norshuhani Zamin)

Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

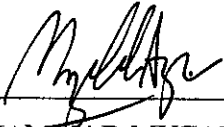JUN 2006

i

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.

MUHAMMAD MUZAKKIR AZIMAN

ABSTRACT

Shopping complex is a place where a lot of people gather; shopping for clothing, basic necessities, or everyday used materials. In order for the management side to facilitate such huge crowd, it is also important to have an efficient system to control flows of shoppers' car in the parking area and also the payment system.

Today, SMS is an extensively used service and almost everyone is able to use it. This has lead to an increasing number of applications using SMS as the interface to the user. Besides it has been used in other way to communicate with each other, SMS application also can be used to make our live easier. For example we can use SMS for paying parking or anything else. This thesis describes the implementation and experience with SMS payment system with focusing on using SMS application to pay for car-park fees. The main objective of this project is to test practical approach of the SMS application for the payment system at all steps.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1.1   Background of Study

Since the introduction of the GSM networks in 1992, SMS has been a service with an increasing interest. SMS is actually not designed for the success it is having today. The marketing guys within the standardization group could not see any use of a service, requiring that the user should press the same key several times to write a character. The only reason for SMS became part of the standard, was the technical guys wanting it for service messages and testing.

Today, SMS is an extensively used service and almost everyone is able to use it. This has lead to an increasing number of applications using SMS as the interface to the user. Besides it has been used in other way to communicate with each other, SMS application also can be used to make our live easier. For example we can use SMS for paying parking or anything else.

SMS Payment System is a payment system which is based on stand-alone system and mobile computing. It is an extension of manual colleting payment fees to automated system and the mobile communication network.

The thesis describes the implementation and experiences with a SMS application for SMS Payment System involving the following steps:

- All the coming SMS and sending SMS will be view and monitor in the SMS messaging server.

- The interface for payment system will develop using Visual Basic.NET

- Configure and testing SMS application trough FBus Cable connect to personal computer

- The project was implemented using a standard personal computer without purchase of any new software

1.2   Problem Statement

Currently paying for the parking at the shopping complex parking bay can be very frustrating and difficult task if it is coincide on weekend or on the holiday season. This is because the peoples or the shoppers with cars need to take the ticket at the entrance before entering the parking bay. Then sometimes they don't have the parking lot because it's full but still have to pay for the parking charge. This is because the parking fee is started during they entering the parking bay and they take long time during finding the empty parking lot. Besides that some shopping complex charging users for parking in their shopping complex's parking lots, the long queues to pay at the toll booth may cause time wasting for some people

1.2.1   Problem Identification

Some of the problem that has been identified based on Traditional Parking Payment System is:

1) The users need to take along queue to pay for their parking lots.

2) Some shopping complex, the user need to find the ticket payment machine by themselves to pay for their parking lot and that machine is not at every level of parking bay.

3) The users still need to pay for the parking even though they did not find the empty parking lot.

2

4) There is always happened the robbery cases at the parking payment booth because the transaction is in cash money.

5) Sometimes the cash money also has been stole by the irresponsible staff that collects the parking payment.

1.2.2 Significant of the project

The main objective of this project is to develop an effective SMS payment system in a way to improve traditional parking payment system in the most shopping complex. In order to improve the current system, the development will be focusing on how to make it more practical and effective.

Before the development can successfully carried out, the current parking payment system need to be analyze, then only the author can have better understanding on the problem faces by the current system in gaining knowledge that might help in improving the process and procedure of the traditional system.

Implementation of SMS Payment System can be beneficial to many parking business including who responsible collecting parking payment at shopping complex. This system will provide a fast and friendly alternative to the parking user and also to the people who manage that system itself.

This system aims at helping many shopping complex in revolutionize traditional parking payment system, which can be proving to be tedious and time-consuming. Moreover, the system will help reduce the opportunity cost, and resolve the problem that been identified by the author.

1.3   Objectives of the Project

The objectives of this project are:

- To test a practical approach of SMS application to the Payment System
- To automate the parking payment system by using SMS.
- To eliminate the long queue at the paying booth.
- To create a good and reliable design system by applying a well known database management system and programming language.

1.4   Scope of Study

This project involves the testing of the feasibility of SMS application in new development of payment system. The project task is mainly focus on the usability, reliability and availability of the system. Security will not be the main issue discussed in the project.

1.4.1   Stand-Alone System

In this project, the author will come out with stand-alone system as the output. The stand-alone system is a system that will be developing using Visual Basic.Net. The main user of the system is the parking staff and the parking user. This mean that they is just 1 interface because the parking user just need to used their SMS application in their mobile phone to send the SMS to the system that manage by the parking staff. The system will receive the SMS from the user and the system will automatically start the time.

1.4.2   SMS Application

Because of the system name is *SMS Payment System*, so that means the system is using SMS application for the payment of parking lots. The SMS application that been

4

embedded in the system is using Mobile FBus15 which is connect the mobile phone directly to the computer by using FBus cable. When the user or the cars enter to the parking bay, they will receive the ticket from the ticket machine at the entrance of parking bay. The users just need to send the SMS to the system when they park their car at the parking lot. The time at the system will automatically run when they park at the parking bay. The users just need to send their ticket numbers, their parking lot number and also the hour the want to stay. The system will automatically deduct their phone credit regarding to the how many hour they want to stay and the parking rate. This SMS application is effective now a day because at every people are using mobile phone. This system will add more function to their mobile phone besides just making and receiving call to new technologies *SMS Payment System.*

1.4.3   Alert System

Alert System will be set in the *SMS Payment System.* There are alert systems that will be embedded in this system which is short message (SMS) alert

SMS Alert will be providing just for user or parking users. An SMS will automatically send to the parking user 15 minutes before the parking time is expired. An SMS will be send again when there are no SMS received to the system 5 minutes before expired time. The user will get 2 SMS alert to remind them to add more parking time or they want to exit from the parking lot. If there already paid for add some times they just ignore the SMS alert that they just receive.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

SMS stands for short messaging service. It's a way to send text over wireless phone systems. The text appears on your handheld's screen, or in the case of a cellular phone, on the phone's display. SMS messages are text messages of up to 160 characters.

No phone call is required to send or receive a text message. In fact, it is possible to send and receive messages on Handspring phones while on a voice call. SMS has been around since 1991, has gained huge usage in Europe and Asia, but has come into widespread use in North America recently. SMS is a universal text messaging system but has come to be associated with its prime adopter, the GSM/GPRS wireless networks.

2.2   How SMS works

SMS works on a store-and-forward basis. Instead of being sent directly to the recipient, SMS messages travel through several important nodes before reaching the recipient.

The SMS message is submitted to your wireless service provider's SMS Center. After the message is processed internally, the SMS Center sends a request to the Home Location Register (HLR) and receives the routing information for the recipient. The SMS Center sends the message to the Mobile Switching Center (MSC).The MSC collects the recipient's information from the Visitor Location Register (VLR) and, sometimes, proceeds with an authentication operation. The MSC forwards the message to a Mobile Server. The MSC returns the outcome of the Forward Short operation to the

SMS Center. The SMS Center reports delivery status of the short message back to the sender.

2.3   SMS Messaging Server

SMS Messaging Server is an SMS messaging framework that enables companies to send, receive and process SMS messages. The framework is designed support virtually any scenario where low-and high volume SMS messaging is required.

SMS Messaging Server consists of the following components:

- A Windows Service, running in the background. This service is responsible for sending, receiving and processing SMS- and e-mail messages;
- A Configuration Database, containing all configuration parameters. Can be any OLE/DB compliant database, like MS Access, MS SQL and Oracle;
- A Message Database, containing all in- and outgoing messages. Can be any OLE/DB compliant database, including MS Access, MS SQL and Oracle;
- A Manager application to make changes to the configuration and view messages
- A Monitor application to view real-time what's happening inside the system.
- An ASP-based Web interface to allow access from any where in the world.
- An API to allow custom scripting.
- A collection of samples showing how to process incoming messages

2.4   Parking Payment System for Mobile Phone Users

Park and Go is a new automated payment system for local councils and parking operators that enables motorists to pay for parking using their mobile phones. Once parked in an area that supports Park and Go, motorists will have the option of paying using cash in the traditional way or using their mobile phones.

Motorists that want to use Park and Go much first pre-register their name, mobile phone number and other relevant details with the centralized database that serves all Park and Go sites. This can be done by post, fax, phone or over the Web. Once registered, paying for parking becomes as simple as dialing into the Park and Go server, stating in which Park and Go area they are parked and stating for how long they wish to park.

Traffic wardens in Park and Go areas will have on-line access to centralized servers and hence be able to tell whether vehicles have exceeded the time period paid for. Again, there are several options for motorists to indicate they have paid using Park and Go including the use of bar-coded stickers that can be scanned by wardens. Motorists could even be sent SMS messages to indicate they are nearing the end of their parking time.

2.5   SMS is Convenient

Dr. Subrahmaniam Karuturi state that SMS is convenient and cost effective for a number of reasons. When we compare it with the cost of airtime for voice calls or wireless web access, SMS is a real bargain. SMS is known colloquially as 'text messaging', is a massive phenomenon in Europe and Asia, particularly among young user in the 12-22 age.

According Tom Celements, he agreed that the benefits of SMS to subscribers' center on 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.

Base on the website articles stated that SMS is a relatively simple messaging system provided by the mobile phone networks. SMS messages are supported by GSM, TDMA and CDMA based mobile phone networks currently in use. Although services based on SMS have been feasible for many years, the recent mobile phone penetration and large scale adoption of the existing services by users have made the SMS based services even more attractive to service providers.

8

2.6 MySQL Relational Database Management System is an open source and easy to use.

There are several reasons why most developer chooses MySQL. One of it is MySQL software is an Open Source and the Database Server is very fast, reliable, and easy to use. Open Source means that it is possible for anyone to use and modify the software. MySQL, the most popular Open Source SQL database management system, is developed, distributed, and supported by MySQL AB. MySQL AB is a commercial company, founded by the MySQL developers. It is a second generation open source company that unites open source values and methodology with a successful business model.

Another reason why most developer chooses MySQL are the MySQL software is dual licensed. Users can choose to use the MySQL software as an open source or free software product under the terms of the GNU General Public License or can purchase a standard commercial license and MySQL Server works in client/server or embedded systems.

2.7 Conclusion

The above technical capabilities are suggest of used in developing this SMS payment system. All of them are working with the interface application of:-

- SMS sent and received
- The application of monitoring the SMS payment by the user
- Database of parking lot numbers

The interface is developing for the staff that in charge of monitor the parking lot fees. The data will be update daily. That staff will make sure that every car will send the SMS to pay for their parking fees. If there is not SMS received, he or she will produce the fine ticket. The user can pay for their parking fees anytime before the exit from the

9

parking bay. The system will automatically run the timer after the detector at the parking lot detect car was park at that lot.

CHAPTER 3

METHODOLOGY

3.1 Procedure Identification

The methodology being used in the development of the prototype of the project is Rapid Application Development (RAD). RAD methodology emphasizes extensive user involvement in a rapid and evolutionary construction of working process of a system to accelerate the system development process. RAD helps in decreasing time needed to implement information systems radically through speedy development and shorter schedules.

RAD aims to analyze business process rapidly, design a viable system solution through intense cooperation between users and developers as well as to get the finished application into the hands of users quickly. This methodology relies on extensive user involvement, Joint Application Design session, prototyping, integrated CASE tools and code generators.

RAD methodology consists of four (4) phases: Requirements Planning Phase (Analysis), User Design Phase (Design), Construction (Detailed design and code generation) and Cutover (Installation and Handover). This project will go through all phases. The following diagram depicts the relationships between stages in the RAD process.

```
┌─────────────────────────┐
│  Requirement Planning   │
│         Phase           │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      User Design        │
│         Phase           │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│     Construction        │
│         Phase           │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│        Cutover          │
│         Phase           │
└─────────────────────────┘
```
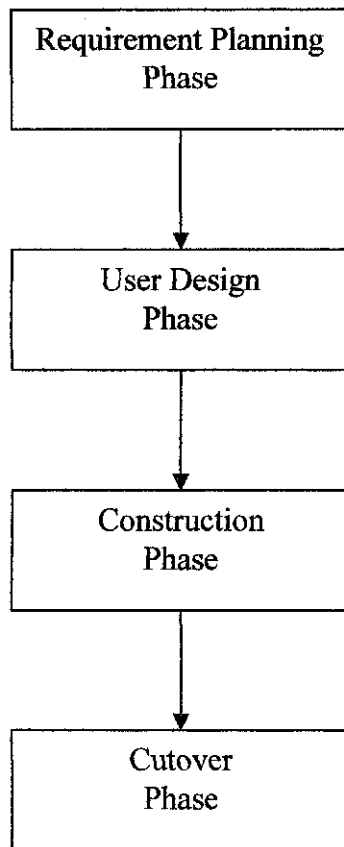
Figure 3.1: Rapid Application Development Process

3.1.1   Requirements Planning Phase (Analysis)

It is also known as the Concept Definition Stage. During this first phase of RAD, the author identified the objectives of this project and the requirement specification including hardware and software requirements of the system for the prototype. The author also identified the high-level process decomposition that determines the functions of the prototype as well as the area it will support. In addition, the scope of the project was identified in these phases, which are online system, tracking activities, alert system, online report and online message as the area of study.

The author has to ensure there is a need of having the prototype and demonstrate that the prototype able to work as expected. Besides, the author also identified the potential or key users of the system. Author determined the tasks and activities that will be incorporated throughout the project with respect to time frame given. Possible cost and risks associated with this project were also outlined. In addition, the author spent a lot of time throughout this analysis phase by conducting many readings and studies on various research papers, journals, white papers, articles and relevant websites covering the mentoring programme, online system, tools and programming language used and related areas.

3.1.2   User Design Phase (Design)

This phase is also known as Functional Design Stage where design and refine involved. In this stage, the outcomes from the analysis phase were reviewed and revised in term of scope, objectives, data models and reports. Initial design using prototyping also was started. Based on findings of research and studies during analysis phase, the author had come out with system's framework as guided by her supervisor, hence provides initial views on the designing the application.

Installation and configuration of software were also done during this phase by using Microsoft Visual Studio.Net, MySQL Administration and MySQL Query Browser. The designations of the application such as the story board, page banner, layout and ERD have been done. This has given basic idea of what the system or prototype will look like in the construction phase.

3.1.3   Construction (Detailed Design and Code Generation)

This phase is usually known as Development Stage. During the development, detailed design is done using suitable design tool and the design is translated into code via code generator. Adjustments and necessary modifications will be made. The system's prototype will be implemented module by module with respect to functionalities and features developed.

The changes will be done during design as the codes will be regenerated and optimized. Number of users will be selected to validate and test the system comprising the screens layout and also the functions of the prototype itself. Usability will be done on every subsystem to ensure that the system's prototype is easy to use. Testing will be done on the features and functionalities to ensure they are operational.

3.1.4   Cutover (Installation and Handover)

Cutover or Deployment Stage involves various activities towards the implementation fully functional prototype into real environment. These include final user testing and training, data conversion, and the implementation of the application. The system is put into real operation and is ready to be widely-used by all end-users. The system is the modified version as the result from feedback during testing. In this phase, the system is already fully tested as final documentation is prepared to guide end-users in using the system. The system is expected to function correctly and is capable of meeting the user requirements.

Applying RAD as the chosen methodology has provided the author with various advantages. RAD tools are easy to learn and promote good design of a user-friendly interface. Furthermore, RAD allows for quick testing and debugging of a system as it provides early visibility through prototyping. In addition, RAD also offers greater flexibility in which redesign process is done almost at will.

3.2   Tools Used

3.2.1   Microsoft Visual Studio.Net with Smart Device Application

Visual Studio.Net provides the tools need to design, develop, debug, and deploy Smart Device Applications especially mobile phone. To efficiently manage the items that are required by development effort, such as references, data connections, folders, and files, Visual Studio .Net provides two containers which are solutions and projects. An interface for viewing and managing these containers and their associated items is provided as part of the integrated development environment (IDE). Building, debugging, and testing are key activities in developing and finishing robust applications, components, and services.

The tools provided with Visual Studio.Net are designed to allow author to control build configurations, identify and resolve errors efficiently. ASP.Net combines extraordinary developer productivity with performance, reliability, and deployment. It helps author deliver SMS applications in record time, serves more users with the same hardware, ensures the application are always available to users and extend application reach to new customers and partners.

3.2.2   MySQL Administrator

MySQL Administrator is a powerful visual administration console that enables author to easily administer their MySQL environment and gain significantly better visibility into how the databases are operating. By using MySQL Administrator, author will be able to achieve higher database availability through improved management, reduce errors through visual database administration and deliver a more secure environment through easier privilege management. It also enables author to easily perform all the command line operations visually including configuring servers, administering users, and dynamically monitoring database health.

15

3.2.3   MySQL Query Browser

MySQL Query Browser is the easiest visual tool for creating, executing, and optimizing SQL queries for MySQL Database Server. It gives author a complete flexibility to visually build, analyze and manage queries. Developer can use the visual tools or can maintain complete control by hand coding the query. It provides an easy way to use web browser like interface that gives instant access to all of the Query Browser's functionality. And also, the Script Editor inside it provides a robust interface for creating, editing, and debugging large SQL scripts that involve multiple SQL statements.

3.2.4   Mobile FBUS 1.5

Mobile FBUS is made to fit the needs of mobile technologies. Currently there have two versions, Mobile FBUS Pro for building complete mobile solutions, and Mobile FBUS Lite for building simple mobile communication applets.

The Mobile FBUS control can be incorporated into any programming environment that supports ActiveX controls (e.g. Microsoft Visual Basic, Microsoft Visual C++, and Microsoft Access). For Delphi programmers we have developed a separate Delphi component. For ASP we have an ActiveX DLL available to customers of the OCX, and for all other languages there is a Direct DLL license available.

16

CHAPTER 4

RESULT AND DISCUSSION

This chapter summarizes the evaluation of the product, result and findings of the evaluation and discussion of the project. The discussion covers the result and output of the *SMS Payment System*

4.1   Evaluation

An evaluation has been performed on *SMS Payment System*. This evaluations being done at the end of the project development when the project is done. Selection is made to particular users among student and also the people from various backgrounds and courses. Heuristic evaluation has been applied for the evaluation.

Heuristic evaluation is the most popular of the usability inspection methods. Heuristic evaluation is done as a systematic inspection of a user interface design for usability. The goal of heuristic evaluation is to find the usability problems in the design so that they can be attended to as part of an iterative design process.

Several step to perform the heuristic evaluation:

1. Plan evaluation
2. Choose evaluators
3. Review the heuristics
4. Conducting the evaluation
5. Analyzing the results

4.1.1　SMS Payment System Evaluation

Evaluation of complete product is conducted among UTP students in their own residential collage. This kind of evaluation is similar to field study evaluation where this style takes the evaluator out into the user's natural environment in order to observe the system in action. In this environment, user will expose with interruptions and feeling as in real situation where they usually pay for the parking lot everyday.

For that the author has selected ten students from various courses. This evaluation is done in order to determine the effectiveness of the new payment system comparing to the traditional system of manual payment for the parking lots. It also was being done to determine the effectiveness of using mobile phone in providing alert to the user, the effectiveness of the system and also how the system works. Questions generally base on user satisfaction on the interface and user agree ness on the functionality and effectiveness of the system.

4.1.2　Evaluation Procedure

The step for conducting the testing are:
1. Ten users basically the students are taken to be as subject for the testing.
2. Each of the users will see the demo of the system by the author first then they have the chance to use that system.
3. Each of the students is given a set of questionnaire to answer after try and used the system.

First of all, the author or the system developer will show or demo how the system works. The author also will explain a little bit about the flow of system to work. Then the respondents have a chance to use the system by themselves. They have the chance to send the SMS and also receive the SMS alert from the system.

After they finish try and used the system, they were given a set of question to be answered. The response gather from the questionnaire is more specific and easy to analyze. The questionnaire was design in two different sections. The first section is for content, layout and design. The respondents were asked to indicate their satisfaction in term of the design factors such as text colour and style, background colour and layout. The second section is for the functionality and effectiveness of the system. Respondents were asked to indicate their level of agreements on the statement provided.

4.2 Result and Findings

From the evaluation conducted, all data collected were analyzed to get the result. The result being analyzed using the bar chart from the data gathered during valuation and from some calculation that the author done. Following are the details of the result.

Design, Content & Layout	Strongly Dissatisfied	Somewhat Dissatisfied	Neither Satisfied Nor Dissatisfied	Somewhat Satisfied	Ve Satis
	Number of Respondent				
Design	0	1	3	4	2
Content	0	0	2	5	3
Layout	0	0	4	4	2
Text Colour	0	1	3	5	1
Text Style	0	2	1	6	1
Background Colour	0	1	3	4	2
Colour Combination	0	1	3	5	1

Table 4.1: Data Gathered From the Evaluation Regarding Content, Design, Layout, Text and Colour

Functionality & Effectiveness	Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Very Agree
	Number of Respondent				
Enhance Participation	0	0	2	5	3
Enhance Interaction	0	0	0	7	3
Save Time	0	0	0	5	5
Make Life Easier	0	0	0	5	5
Effective SMS application	0	0	2	4	4
Effective Alert System	0	0	3	3	4
Overall Effective	0	0	0	6	4

Table 4.2: Data Gathered From the Evaluation Regarding Functionality and Effectiveness of SMS Payment System.

Table 4.1 and 4.2 is both tables for data gathered from the evaluation. Table 4.1 shows data gathered regarding content, design, layout, text colour, text style, background colour and colour combination. While table 4.2 shows data gathered regarding functionality and effectiveness of the *SMS Payment System*. The functionality is enhancing user participation, enhance interaction between user and the system itself, save the time consume and make life of the user easier. The effectiveness being evaluated based on the SMS application that been used, alert system that send the SMS to alert the users, and the system as the whole.

From the above data gathered, Mean, Mod and Median were calculated. From table 4.3 and 4.4 below, we can see mod and median of all criteria is almost the same. This is because data gathered are not distributed equally among the answer. Means that, there is no respondent who choose answer 1 which is strongly dissatisfied and also a little number of respondent answer 2 which is somewhat dissatisfied. The mean being calculated in other to know the average answer for all of the criteria. The most average

answer for all criteria regarding the design, content, layout, text and colour is between 3.5 and 3.9 which is considered neither dissatisfied nor satisfied. While for functionality and effectiveness evaluation, author found that, most average answer for all criteria is 4, somewhat agree.

Criteria	Mean	Mod	Median
Design	3.7	4	4
Content	4.1	4	4
Layout	3.8	3,4	4
Text Colour	3.6	4	4
Text Style	3.6	4	4
Background Colour	3.7	4	4
Colour Combination	3.6	4	4

Table 4.3: Mean, Mod and Median of Content, Design, Layout, Text and Colour

Criteria	Mean	Mod	Median
Enhance Participation	4.1	4	4
Enhance Interaction	4.3	4	4
Save Time	4.5	4,5	4,5
Easier Life	4.5	4,5	4,5
Effective SMS Application	4.2	4,5	4
Effective Alert System	4.1	5	4
Overall Effective	4.4	4	4

Table 4.4: Mean, Mod and Median of Functionality and Effectiveness of SMS Payment System
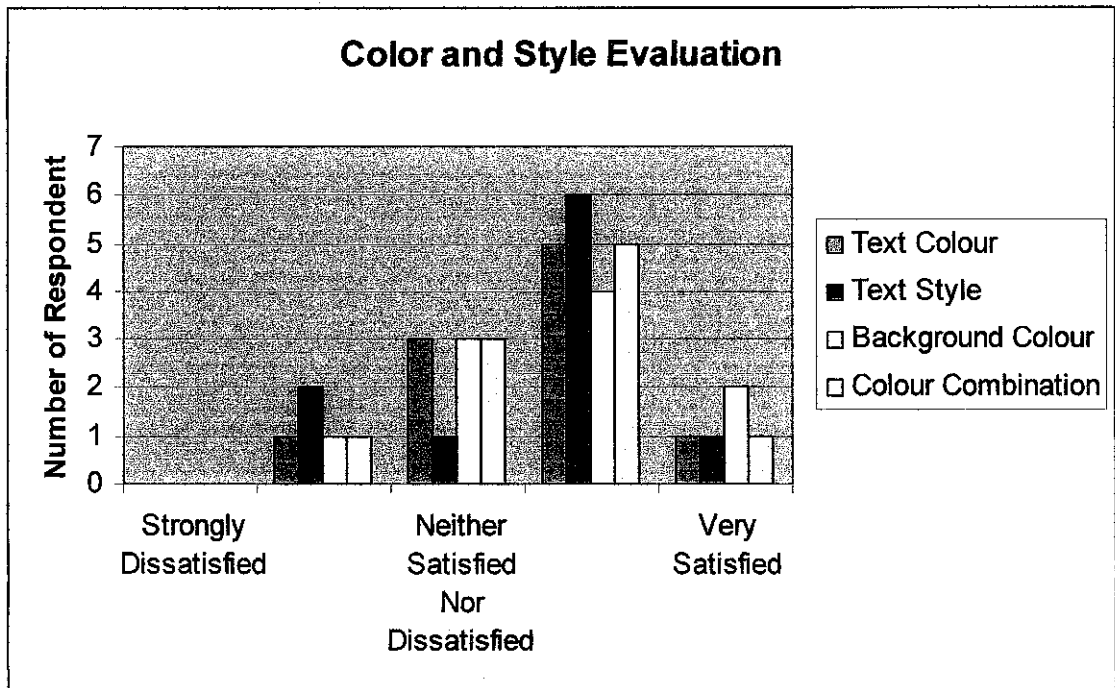
21

Color and Style Evaluation

Figure 4.1: Result of Evaluation Regarding Text Style, Text Colour, and Background Colour and Colour Combination.

Figure 4.1 show result regarding four criteria of the web site tested which are text colour, text style, background colour and colour combination. Here we can see that for each of the criteria, the highest answer choose by respondents is 4, somewhat satisfied. For text colour, 10% out of total respondent strongly satisfied, 50% of the respondent are somewhat satisfied, 30% of the respondents are neither dissatisfied nor satisfied and the remaining are somewhat dissatisfied . As for the text colour, 10% of the respondent strongly satisfied, 60% of the respondents are somewhat satisfied, 10% of the respondents are neither dissatisfied nor satisfied and 10% are somewhat dissatisfied. For background colour, out of total respondent 20% strongly satisfied, 40% are somewhat satisfied, 30% of the respondents are neither dissatisfied nor satisfied and 10% are somewhat dissatisfied. Meanwhile, for the colour combination, 10% strongly satisfied, 50% are somewhat satisfied, 30% are neither dissatisfied nor satisfied and the remaining is somewhat dissatisfied.
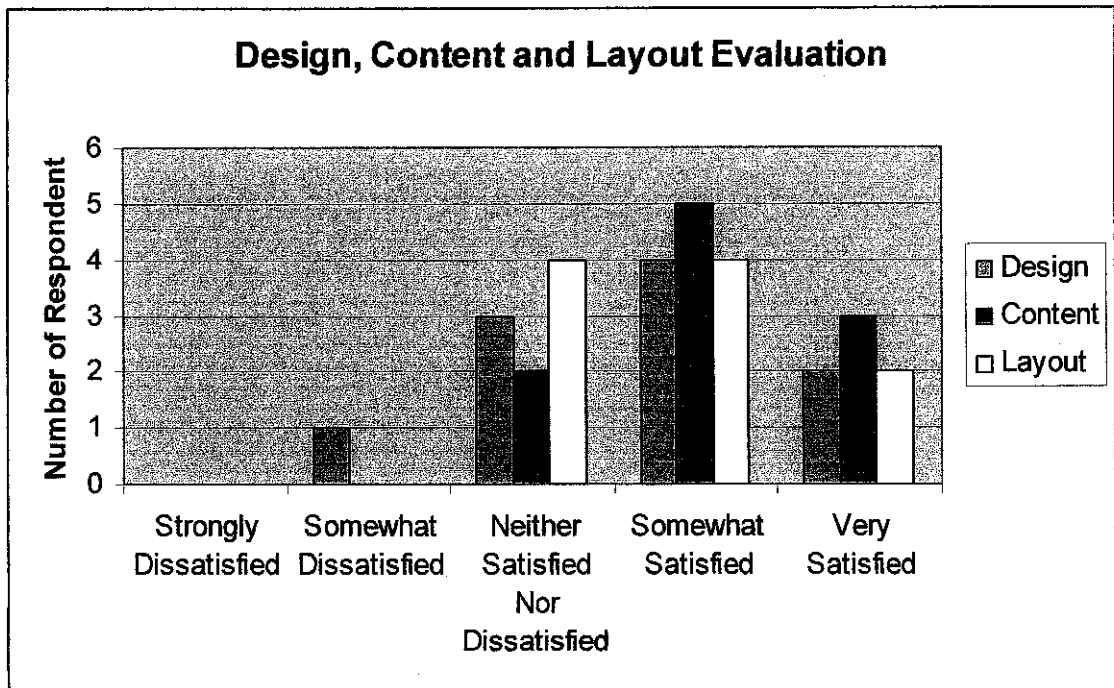
Figure 4.2: Result of Evaluation Regarding Design, Content and Layout of the SMS Payment System.

Figure 4.2 show results regarding another three criteria of the web site tested which are designs, content and layout. Same with figure 4.2, we can see that for each of the criteria, the highest answer choose by respondents is 4, somewhat satisfied. For design, 20% out of total respondent strongly satisfied, 40% of the respondents are somewhat satisfied, 30% of the respondents are neither dissatisfied nor satisfied and 10% are somewhat dissatisfied. As for the content, 30% of the respondent strongly satisfied, 50% of the respondents are somewhat satisfied and the remaining of the respondents are neither dissatisfied nor satisfied. While for the layout, out of total respondents 20% strongly satisfied, 40% are somewhat satisfied and 40% are neither dissatisfied nor satisfied.
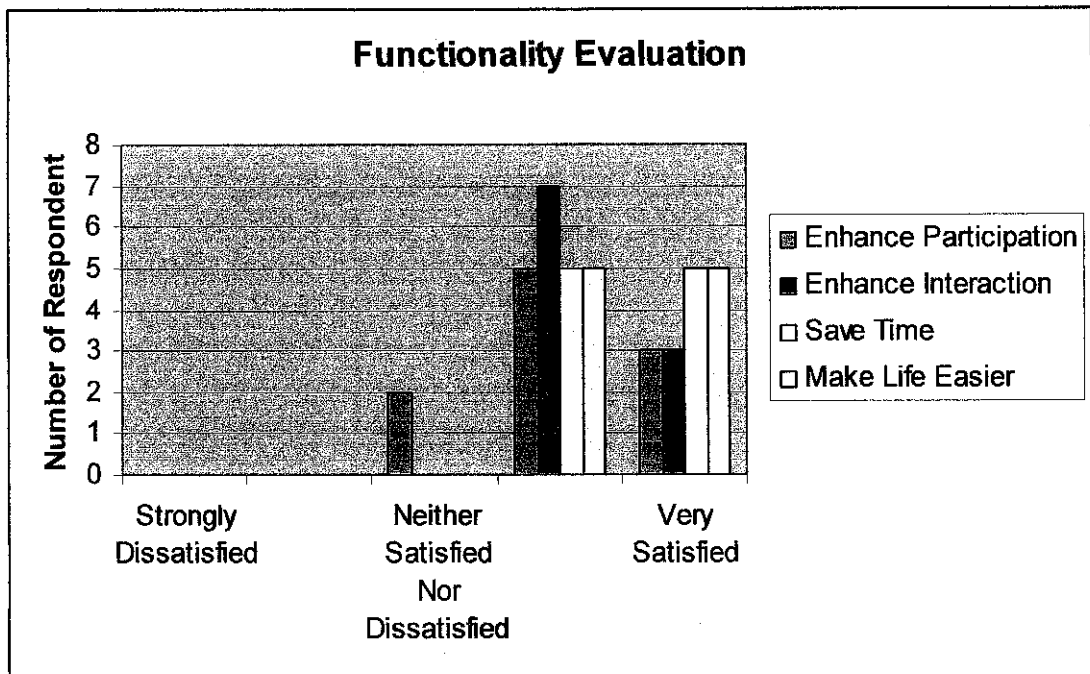
Functionality Evaluation

Figure 4.3: Result of Evaluation Regarding Functionality of SMS Payment System.

Figure 4.3 show results regarding functionality of *SMS Payment System*. There are four criteria being questioned during the evaluation. The criteria are enhancing participation, enhance interaction, save time and make life easier. The highest answer for most of the criteria is 4 which is somewhat agree except for save time and make life easier. For enhancing participation, 30% out of total respondent strongly agree, 50% of the respondents are somewhat agree and the remaining are neither disagree nor agree. For enhance interaction, 30% of the respondent strongly agree and 70% of the respondents are somewhat agree. While for both save time and make life easier, half of the respondents are strongly agree and another half are somewhat agree. As we can see here, no respondents was answered for 1, strongly disagree and 2, somewhat disagree.
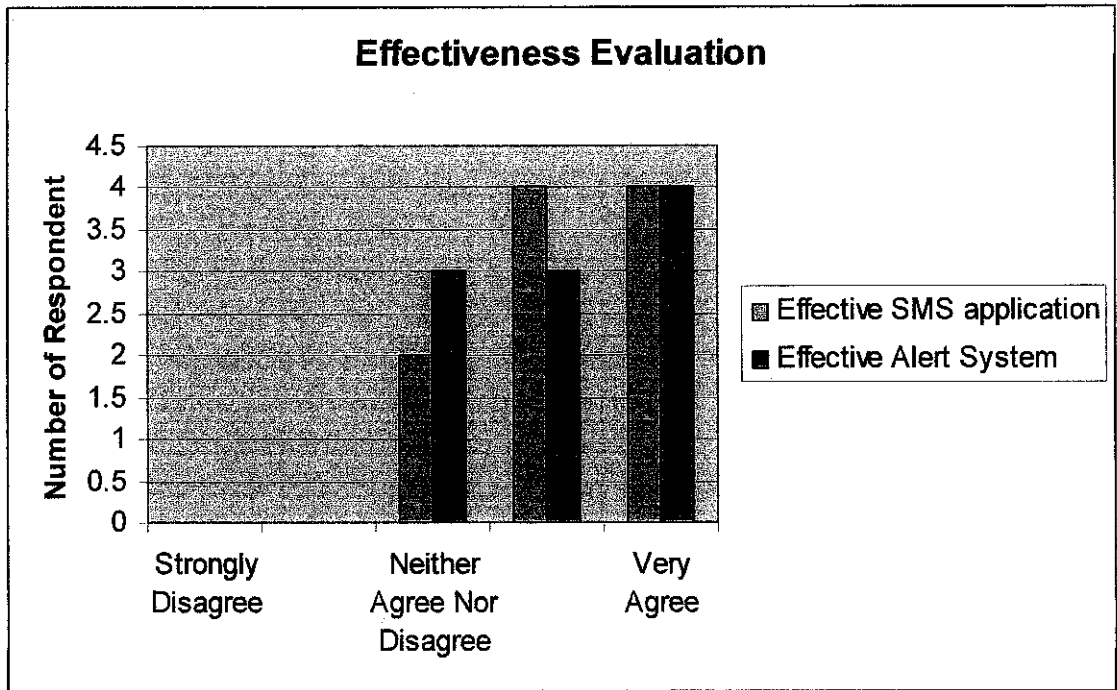
Figure 4.4: Result of Evaluation Regarding Effectiveness of SMS Payment System.

Figure 4.4 show results regarding effectiveness of *SMS Payment System*. Now, there are just two criteria being questioned during the evaluation. The criteria are based on scope of study which is SMS Application and alert system. The first statement in the questionnaire is about the effectiveness of SMS Application used. For that, 40% out of total respondent strongly agree, 40% of the respondents are somewhat agree and the remaining are neither disagree nor agree. For the second statement which is about the effectiveness of the alert system, 40% of the respondent strongly agree, 30% of the respondents are somewhat agree and 30% are neither disagree nor agree. Same with figure 4.3, no respondents was answered for 1, strongly disagree and 2, somewhat disagree.
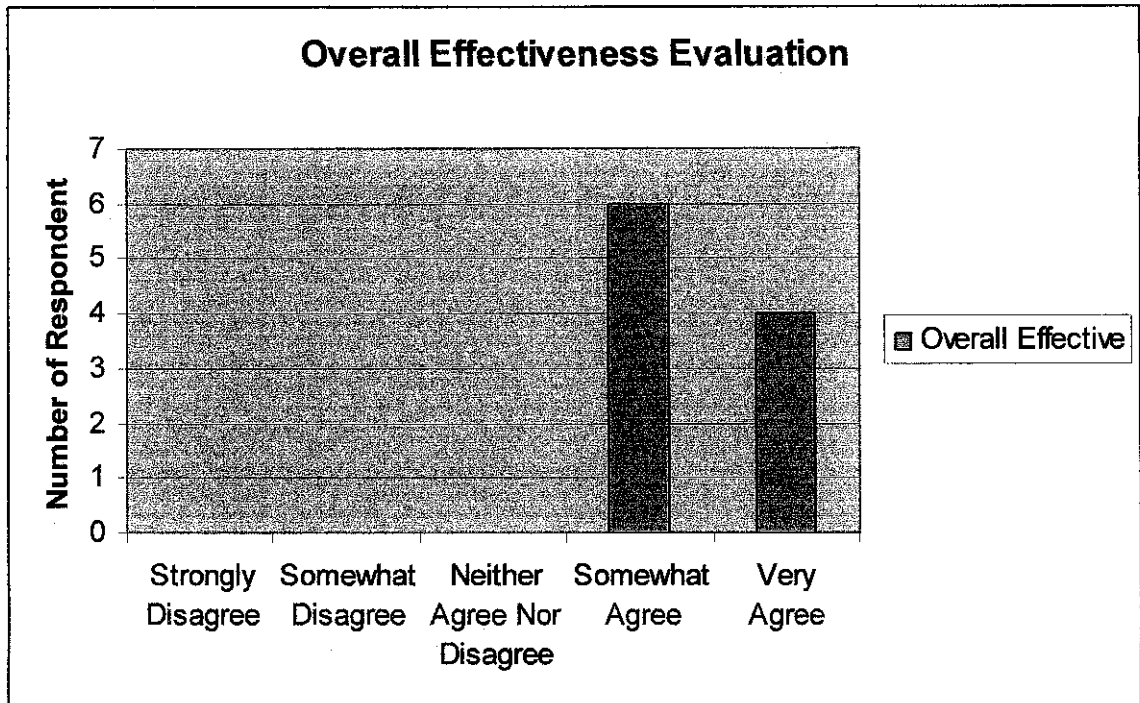
Overall Effectiveness Evaluation

Figure 4.5: Result of Evaluation Regarding Effectiveness of SMS Payment System as Overall.

Figure 4.5 show results regarding effectiveness of the *SMS Payment System as a whole*. The statement being questioned to the respondents are 'Overall, the SMS Payment system is effective and efficient'. For that, 40% out of total respondent strongly agree and 60% of the respondents are somewhat agree.

4.3   Discussion

In developing the system its normally related to elements in Human Computer Interaction (HCI). In designing and developing a system, elements in the HCI must take into consideration. Two important element of HCI related will be discussed in this section.

The system that developed by the author is a standalone application and consist of one main page that monitors the parking area. It is known that a multilevel parking area may consist of hundreds or maybe thousand of parking lots. Therefore, this system monitors

26

the parking area by its levels. One system monitor one level but it may interlink to each other and only one operator can monitor all the activities of the Smart Parking System.
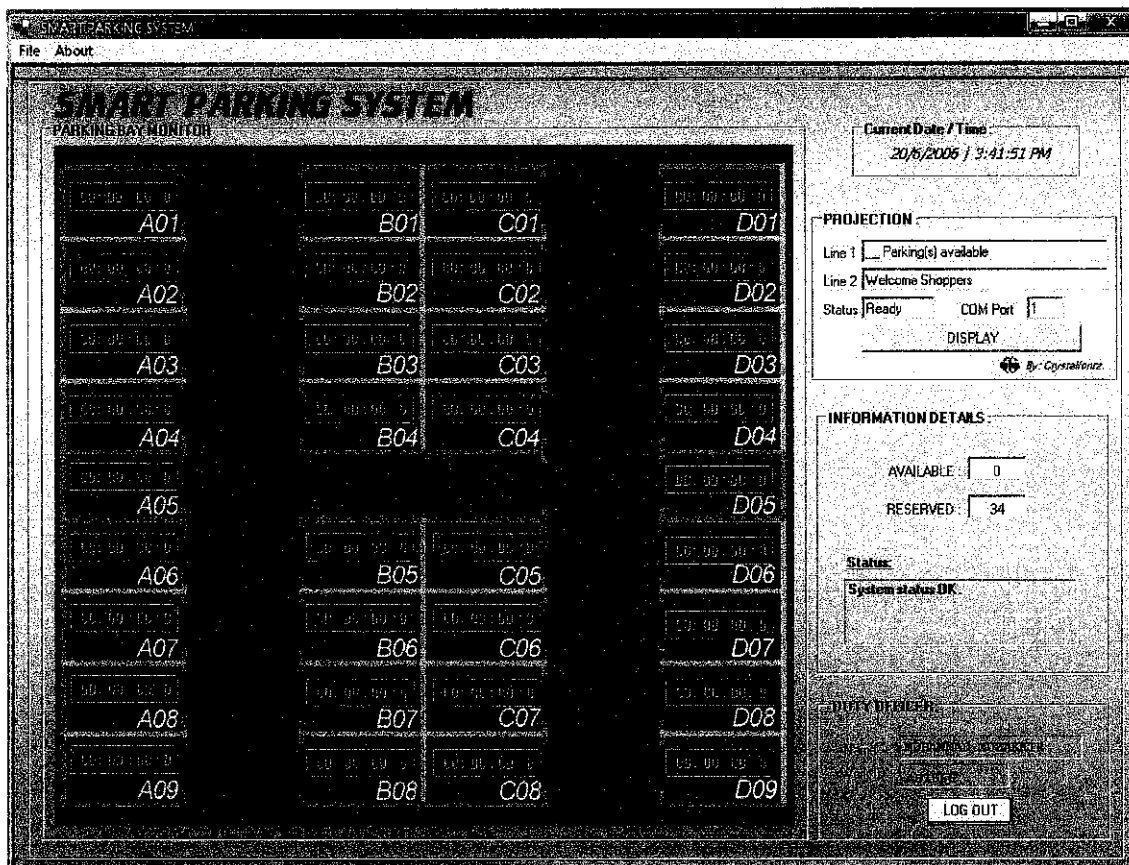

Figure 4.6: Main interface (parking partially reserved)
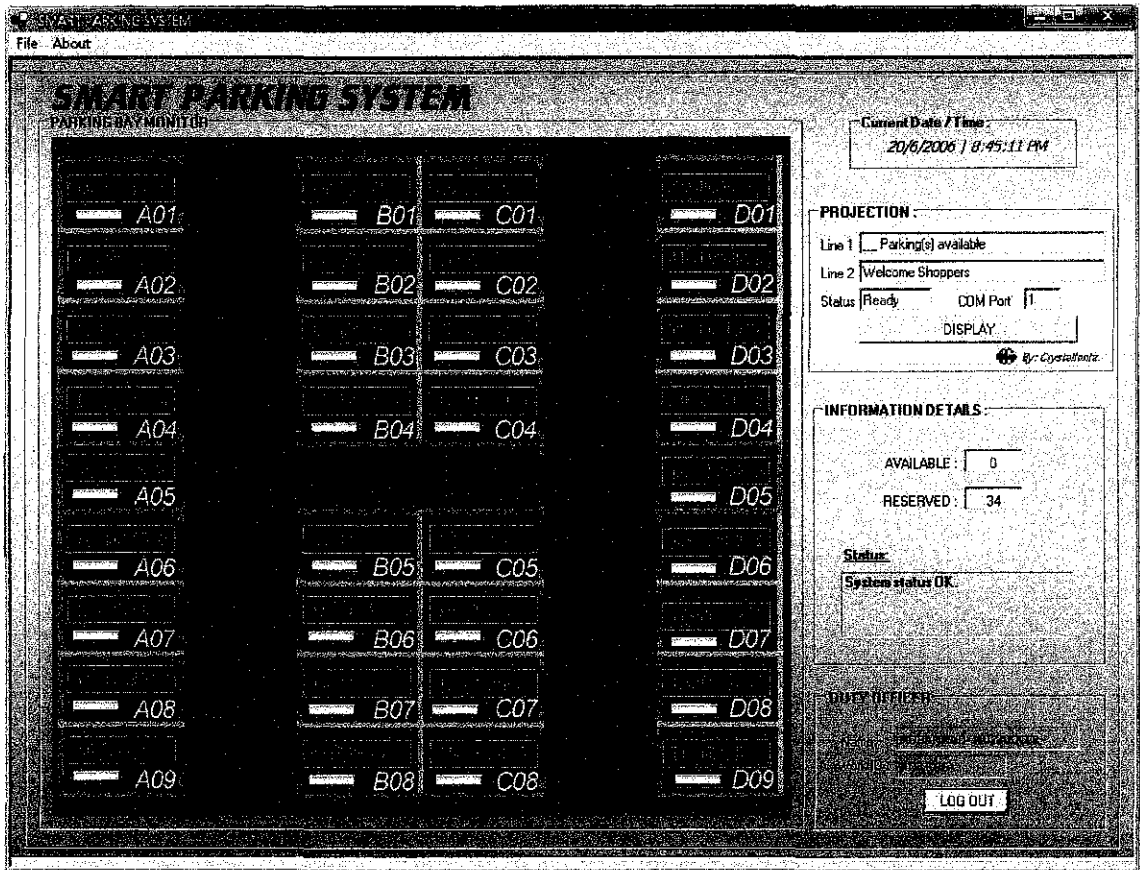
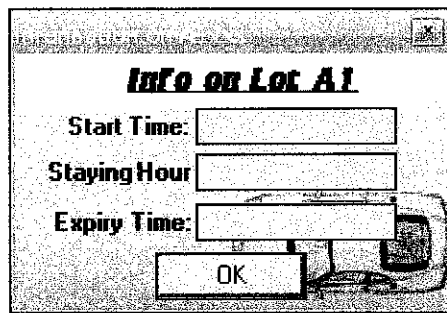Figure 4.7: Main interface (parking full)

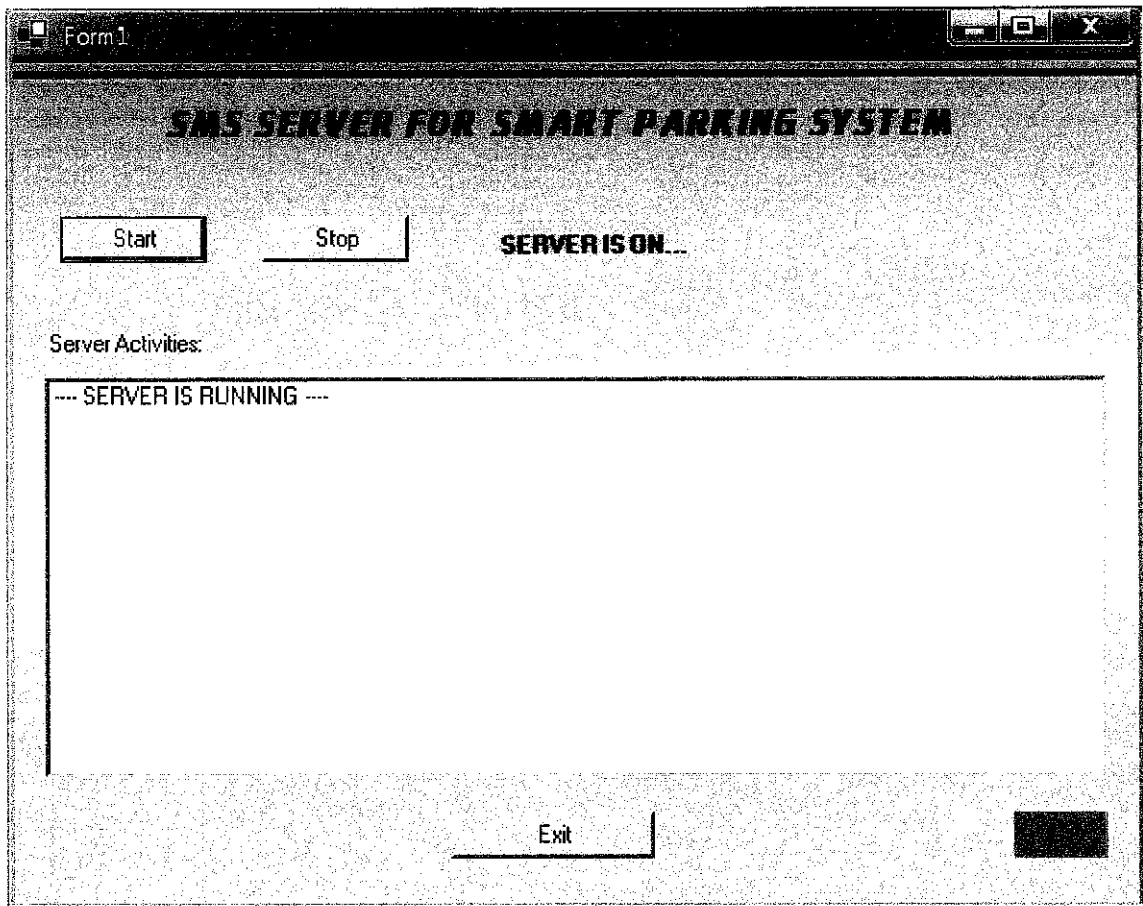Figure 4.8: Interface of info page for one parking lot

Figure 4.9: The interface of SMS Server for SMS Payment System

4.3.1 Effectiveness of SMS Payment System

In scope of the study, the system expected to function correctly and capable of meeting the scope mentioned, which are developing a stand-alone system, enable of sending and receiving SMS, sending alert system, and minimize time using for pay the parking charged. As an overview, SMS Payment System is a system as whole. The development of alert system is only a portion of this system in order to make it more effectives compare to ordinary SMS Payment system.

The main focus of the *SMS Payment System* is making the traditional system more efficient and effective in order to improve and overcome the problem faced. The system being develop need to embedded the SMS alert system to users in order to come out with an effective system. Moreover, the system is expected to be as a tool to

29

facilitate the system by enabling the SMS payment system to make the system meet with its requirement. With this SMS Payment system, it is easier to the company which responsible of collecting parking charged to improving their works and their collecting system.

On this project, effectiveness will be value highly by implementing a SMS Payment System. According to result and finding of the evaluation above, only 20% of respondents answered for 3, neither agrees nor disagrees for the effectiveness of SMS application system. While for effectiveness of SMS alert system, only 30% answer for 3 neither agrees nor disagree. The remaining of the respondents answer for 4, somewhat agree and strongly agree.

Means that, more than 30% of the respondent are agree with the effectiveness of all the criteria. It show that most of the respondents from the survey agree that the SMS Payment System is effective as it can give lot of advantages to the users, such as save their time and energy and make their life easier on making payment for parking charges.

Referring to figure 4.5, 60% out of total respondent answer for 4, somewhat agree and the remaining 40% answer for 5, strongly agree. This show that all of the respondents agree that, as overall, the SMS Payment *System is effective.*

On overall, it can be concluded that the objective being stated in the introduction which are to implement a tool to SMS Payment system and all the objective is been achieved.

4.4 Workflow of Smart Payment System

The workflow of the Smart Parking system is described as follow:

1. Start: Shopper drives in and takes ticket produced at the entrance.

2. Car parked: IR detects a car is parked and send signal to computer and timer starts.

3. SMS: Shopper sends short message to the server and enters the hours stay at the car park.

4. Reminder: 15 minutes before the hour stay finish, the server will send an automatic message to remind user that their hour stay is finishing in 15 minutes. The server ask user to reply back to top up their staying hour.

5. Top up: If shopper adds more hour stay, the server will reset back and 15 minutes before the hour stay finish, server will send another message to remind user.
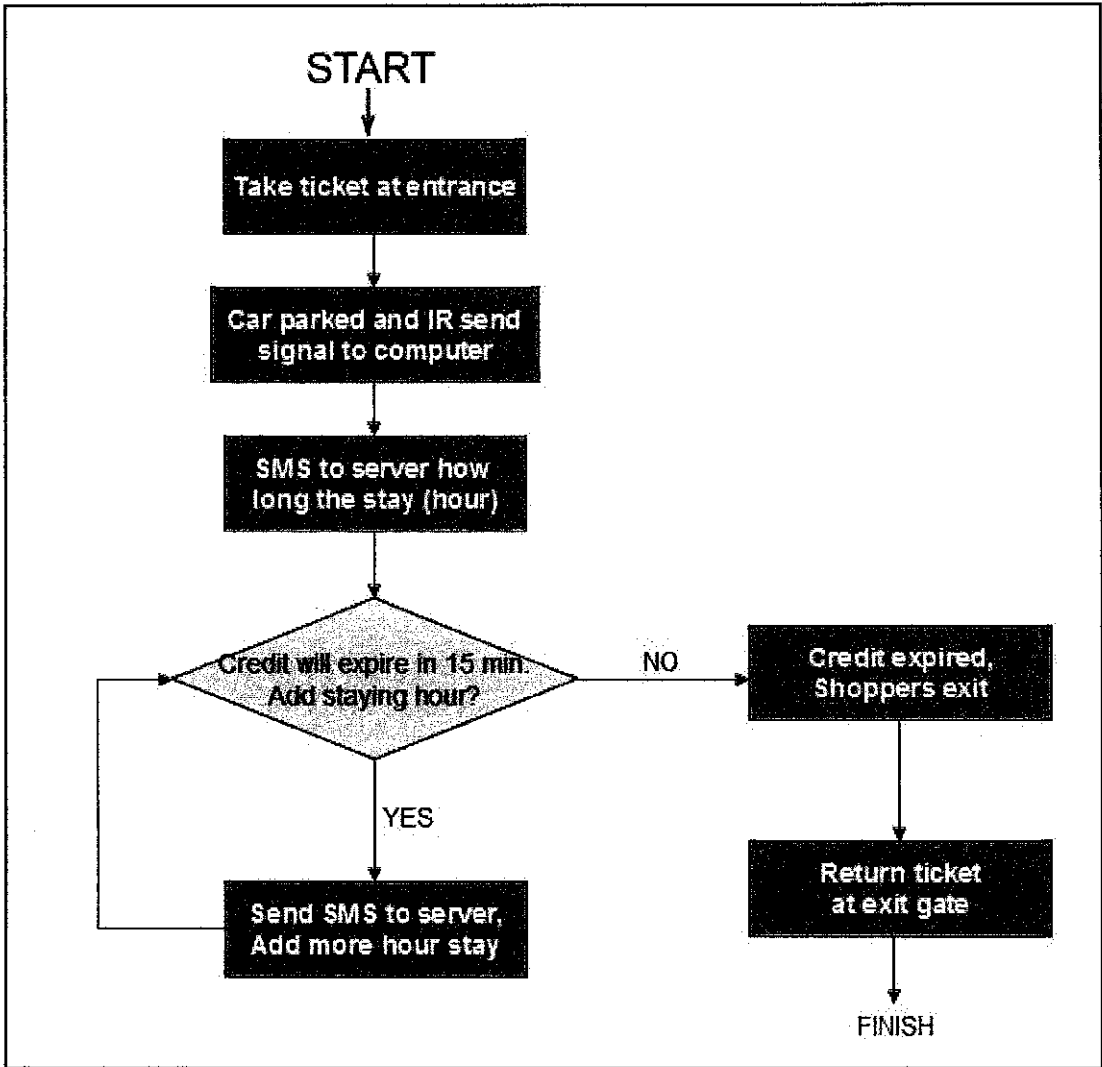
6. End: Time is up and shopper leaves the parking space.

Figure 5.0: Smart Parking System from user's perspective

CHAPTER 5

CONCLUSION

5.1   Conclusion

SMS Payment System is system with the purpose to improve the current traditional system in order to make the user from different background to use their mobile phone more from just make a call or receive a call or just send the SMS to their friends to new application which is make their life simple. This system helps them to maximize the used of their mobile phone and also overcome the traditional system that is ineffective and time wasting. With this system, the problem of time consuming, ineffectiveness of the system and others problem that have been identified by author previously can be overcome.

Short Message Services (SMS) makes it possibly to communicate with the mobile user and to send and receive information. SMS Payment System shows how SMS can be feasible and compatible working with automated payment system. It shows that a mobile network such as SMS can be work together with the stand-alone system which is developing using Visual Basic.Net and FBus15.ocx

The establishment of *SMS Payment System* is more on referring to the use of SMS application which is ever available in every people mobile phone. The author believe that now a days each everyone must have at least one mobile phone on their own and sometimes there have the people that have 2 mobile phone. The uses of the SMS application in their mobile phone have taken the important role in overcoming the possible problem of the traditional system.

Compare to traditional system, the *SMS Payment System* is more effective. The SMS Payment System consists of advance function which is the SMS alert system and the Mobile FBus15. Other than that, the system is easy to manage and require minimum staff to manage the system.

In designing the interface of system, some HCI issue is taken into consideration. Focus is given to acceptance, functionality and most importance is effectiveness of the system. For completion of this project, evaluation is done to collect data from users by distributing questionnaires. Evaluation of completed product was conducted with participation from students as the evaluators. The evaluation is done in the hostel environment to give them a natural and familiar environment. Analyzing the data from the evaluation enable the author to predict the user acceptance and agree of the functionality and effectiveness of the system.

As the project reach towards the end, project objective have been achieved. User's acceptance, functionality and effectiveness of the product are being questioned during the evaluation. From the result, it is concluded that, with the implementation of the *SMS Payment System*, the problem being stated in problem statement and identification will be overcome as it can give many advantages to the user.

5.2   Problem Face during Project Implementation

My first planning on implementation of the system is to add some function which is to return back the user phone credit if the pay more credit for the parking they used. But the author find out there is very difficult to implement that function in the system. This is because the author didn't find the solution for that function.

Even though the author manage to achieve other scope of study for the project such as alert system and built the SMS application with mobile phone connect direct but, it is difficult for him as a beginner programmer to find the exactly suitable application. This is because some application he found cannot be communicate directly from mobile

34

phone and the computer. So, the author comes out with Mobile FBus15 application that connects the mobile phone with the computer through FBus cable.

MySQL database is license free and can be install to any computer to being used for any purpose except for the profit making where it need to buy the license. The installation of MySQL is very east despite to its capability to support a large and robust database application.

Configuration to the installed MySQL software on my computer is very difficult when software cannot create database instance. The author had try several time to create database instance and not successful until he make some configuration to his computer security and setting. However this problem might not occurred if MySQL database is installed on dedicated computer. When they are too many other software install on the computer, it can disturb MySQL software functionality.

5.3   Recommendation

This project is look as easy as name of the topic but not in the progress and its development. There are many aspects should be considered in order to make the system run properly as in real system. Thus, author should hold the project very carefully by clearly define every requirements before proceed to the construction phase. Otherwise the problem will occur.

Development tools like Visual Studio.Net and MySQL that used to develop web based application is essential to student to grasp. Even though the tools are very crucial but it did not give difficulty rather than the process of the system in order to provide the system that effective and satisfaction.

Student must be able to make a program that can be used to develop their application if they want to achieve project objectives. Otherwise they might face a difficulty to explain their product functionality with the incomplete application. Given that the main

objectives of Final Year Project is to offer them an experience in developing real system, that different than standard group project.

Selection of devices and tools should be make carefully especially to whom unable to catch up new things fast. Student should able to provide a prototype of system by using any devices that appropriate to the project. For the application that required data transfer between mobile phone to computer, student should used serial data cable that compatible with the phone model. Otherwise they might use infrared or Bluetooth embedded mobile phone to communicate with computer.

LIST OF REFERENCES

[1]   *"SMS Parking System Goes Even Further"*:
       http://www.ameinfo.com/70953.html

[2]   Denis Costello, *"Mobility & Micropayment"*, ZAFION, Mobile Payment
       Consultancy

[3]   SMS Messaging Server 4.0: http://www.activeXpert.com

[4]   Derek Mitchell *"Sending SMSs from your Microsoft .NET Compact
       Framework-based Applications"*, http://www.microsoft.com/MSDN Library

[5]   *"Smart Phones Feed Smart Parking Meters"*: http://www.mobileinfo.com

[6]   MySQL.com: http://www.mysql.com

[7]   Paul Dubois and Stefan Hinz, 2004, "MySQL Certification Study Guide".

[8]   Dr. Subrahmaniam Karuturi, June 2003, <http://www.funsms.net/>

[9]   Geoffrey Elliot and Nigel Philips, 2004, Pearson Addison Wesley, "Mobile
Commerce and Wireless Computing System".

[10]   Tom Clements, Feb 2003,
<http://developers.sun.com/techtopics/mobility/midp/articles/sms/>

[11]   CSWL, April 2001, "SMS (Short Message Service) -Technical Overview"
< http://www.cswl.com/whiteppr/tech/sms.html>

1. http://dev.mysql.com/tech-resources/articles/

2. http://www.mysql.com/products/tools/administrator/

3. http://dev.mysql.com/doc/query-browser/en/

APPENDICES

List of appendices:
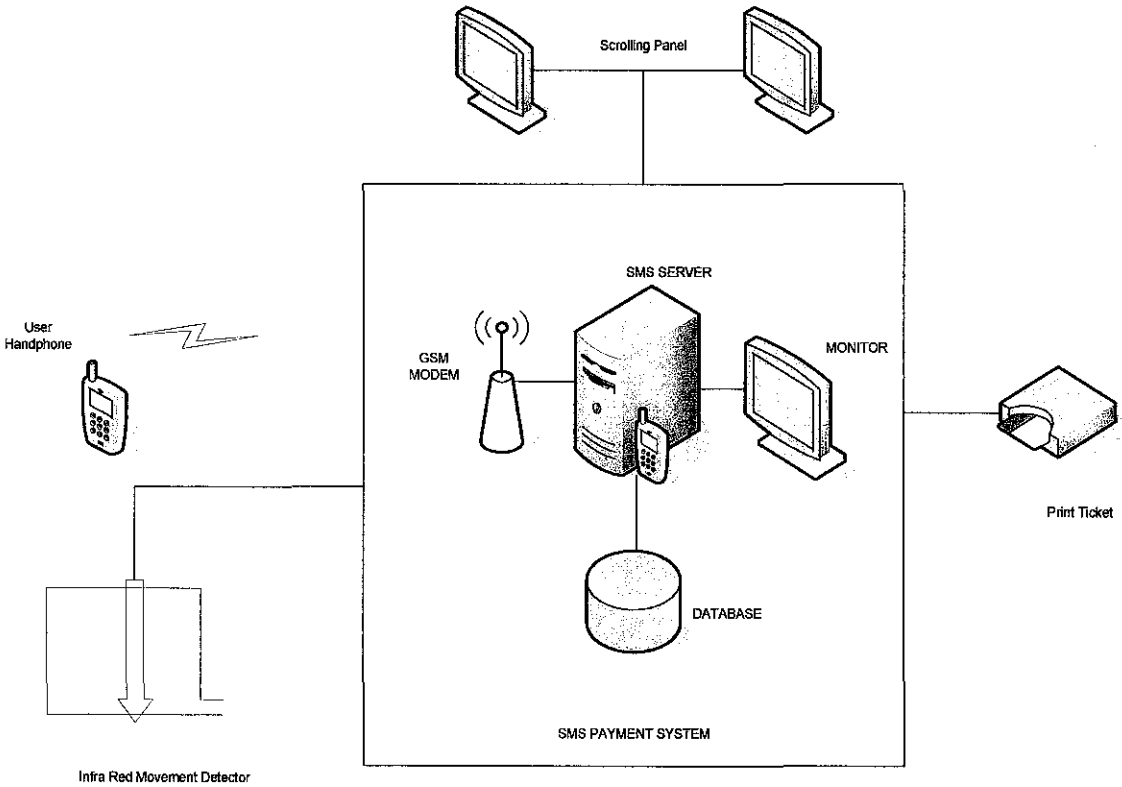
Appendix A: System Framework

Appendix B: Work Flow Chart

Appendix C: Sample of Questionnaire

SYSTEM FRAMEWORK

Scrolling Panel

SMS SERVER

GSM
MODEM

MONITOR

User
Handphone

Print Ticket

DATABASE

SMS PAYMENT SYSTEM

Infra Red Movement Detector

WORKFLOW CHART

START

```
┌─────────────────────────┐
│  Take ticket at entrance │
└─────────────────────────┘

┌─────────────────────────┐
│  Car parked and IR send  │
│    signal to computer    │
└─────────────────────────┘

┌─────────────────────────┐
│   SMS to server how      │
│  long the stay (hour)    │
└─────────────────────────┘
```

Credit will expire in 15 min. Add staying hour?

NO → Credit expired, Shoppers exit

YES ↓

Send SMS to server, Add more hour stay

Return ticket at exit gate

FINISH

Evaluation Questionnaire: *SMS Payment System*

Section 1: Design, Layout, Content, Style and Colour

Are you satisfied with the website design based on these criteria? Indicate your answer in the area provided using the given ranking.

1	2	3	4	5
Strongly Dissatisfied	Somewhat Dissatisfied	Neither Satisfied Nor Dissatisfied	Somewhat Satisfied	Strongly Satisfied

    a. Text Colour   _____

    b. Text Style   _____

    c. Background Colour   _____

    d. Colour Combination   _____

    e. Layout   _____

    f. Content   _____

    g. Design   _____

Section 2: Functionality and Effectiveness of the system

Indicate your level of agreement for the statement below in the area provided based on the rank given.

1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Strongly Agree

    a. The online system is interesting and effective enough for enhancing user participation in *SMS Payment System.*

_____

    b. The system can enhance the interaction of parking user with SMS application.

c. The SMS Payment system can make the life simple for the parking user in paying for the parking at the shopping complex.

_____

d. The SMS application can prevent the user from wasting their time queue for paying the parking lot.

_____

e. The SMS alert is effective enough in addition to notify the parking user about the expiry time of their parking lot.

_____

f. Online message is the best alternative for SMS between students and advisor due to most advisors did not want their hand phone number to be known by their students.

_____

g. Overall, the SMS Payment system is effective and efficient.

_____