Mobile Car Rental System

by

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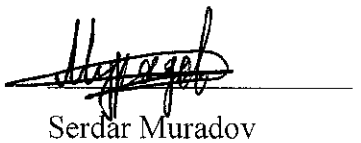
CERTIFICATION OF ORIGINALITY

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 reference and acknowledgements, and that the original work contained herein has not been undertaken or done by unspecified sources or persons.



Serdar Muradov

Abstract

This paper gives an overview of "*M-commerce*" approaches that allow car-rental companies in Malaysia to upgrade and optimize their business processes. First it addresses issues that are found in traditional car rental sector like slow turnaround and large amount of time needed to do reservation. Later it describes how these issues are solved using new mobile technology that provides true mobility, instant information and better customer service over traditional manual and wired online car rental business. To achieve a positive result author applied prototyping methodology throughout this project that quickly provides a system for the users to interact with. The successful result in the end of this project proved that mobile technology can easily and efficiently be applied to businesses that provide services, such as car rental companies. However drawbacks were also found, which are small memory, limited functionality and limited content of mobile devices that can be eliminated in future with new developments of wireless devices and communication infrastructures. Finally this project paper highlights the result of research and development activity that was carried out to develop new system, which will benefit car-rental companies in a way increasing number of customers, reducing operating cost and finally making them more competitive in our rushing world.

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CHAPTER 1

INTRODUCTION

Mobility, context-awareness and other elements combined provide a customer with a completely new setting of consuming services at any time and any place. This project introduces Smart Car Rental service, which allows customers to use mobile devices for booking cars; by selecting date, location and type of car at Car Rental Company's branch beforehand. Further, this system provides the company with means of administration and monitoring the reservations to optimize their businesses.

1.1 Background of Study

A car rental agency or a rent-a-car is a company that rents automobiles for short periods of time (ranging from a few hours to a few weeks) for a fee. It is an elaborate form of a rental shop, organized in numerous local branches, primarily located near airports or busy city areas.

Car rental agencies primarily serve people who have cars temporarily out of reach or out of service, for example travelers who are out of town or owners of damaged or destroyed vehicles who are awaiting repair or insurance compensation. Because of the variety of sizes of their vehicles, car rental agencies may also serve the self-moving industry needs, by renting vans or trucks.

To survive in a competitive market, car rental companies are always tracking innovative technologies, in order to be the first to provide new and unique services. The main purpose of this project is to apply new M-commerce to traditional car renting companies, so that their business can be optimized and bring more benefits. This new system has a lot of advantages to company, for example increased impulse reservations and time savings.

The mobile business has undergone tremendous growth in the last few years. It is in fact, expected to grow even much faster over the next few years. *According to* a book "Wireless Internet and Mobile Business" (Deitel, 2005), "Mobile business has recently emerged as one of the hottest topics in the world commerce and technology. The growth of the Wireless Internet and commercial mobile-based applications offers ever-increasing operational cost savings to enterprises, extending trading communities and lowering the financial barriers to M-commerce participation". Increased competition, cost and customer pressures have brought all-sized enterprises to the attention of reviewing their business processes.

1.2 Problem Statement

1.2.1 Problem Identification

The current studies show that there are many problems related with traditional manual and wired online car rental processes. One of the important aspects is that customers always depend on access point; whether it is agency attendance or computer with wired internet access. In addition to that, using various types of business transactions in order to manage numerous customers is time consuming as well. Thus, there is a high probability of cost and slow turnaround related with manual and wired online car rental.

1.2.2 Description of the project

The M-commerce car rental system desired by car-rental companies should meet the following System and Information Requirements:

System Requirements

- Allow customers to make reservation according to the date, location and car type preferred
- Allow customers to view all needed information about reservation
- Allow customers fast booking car that is as simple as possible
- Check whether the customer has valid driving license
- Allow administrator to maintain and update information stored in database
- Produce statistics about daily transactions

Information Requirements

- Information needed to create reservation
- Date, location and car type selections
- Customer information
- Availability of cars at the moment
- Status of specific record

1.3Objective and Scope of Study

1.3.1 Objective

There is always a reason as to why a system is proposed, whether it is something entirely new or an enhancement of an existing system. There could be many reasons as to developers come up with proposed systems, the core reason is the fact that there is a problem with the way existing work is done so to overcome these problems a new way of doing things is proposed, sometimes not entirely new and sometimes a fully new system. As in this case, with the help of preliminary investigation that was done, there are problems that were encountered and the investigation showed that the current system needs to be enhanced to provide better results for the users. Following are project objectives:

1) To investigate current system and processes of car-rental companies.
2) To define issues of mobile based application system.
3) To evaluate requirements of mobile based application system.
4) To develop a fully functional system based on the prototype and analysis made during FYP part.
5) To advance the acceptance of mobile based application system among users

1.3.2 Scope of Study

In general, the research examined the appropriate theoretical and technical aspects of M-commerce concerning to the implementation of a new mobile-based car rental system in reality. Therefore, the scope has been subdivided into more clear categories:

1) To carry out studies on car rental environment that is paper-based.
2) To list down the advantages and downsides of traditional transactions.
3) To fulfill the requirements of both company and customers on mobile business transaction.
4) To find out all possible issues of mobile business that will be related to the project.

1.3.3 Feasibility of the Project within the Scope and Time Frame

The scope and time frame of this project has been deliberately arranged in order to fulfill the requirements throughout two semesters of the Final Year Project for Bachelor of Technology. The scope of this project will evolve around the learning of the website development, ASP, Access and IIS script in developing the application. These include creation of necessary database for company, user interface in building the application and its implementation.

CHAPTER 2

LITERATURE REVIEW

2.1 Defining M-commerce

Mobile commerce (commonly referred to as "M-commerce") is concerned with the use, application and integration of wireless telecommunication technologies and wireless devices within the business systems domain. The area of M-commerce includes reference to the infrastructures and electronic technologies necessary for wireless data and information transfer, in all its multimedia forms (i.e. text, graphics, video and voice). It also incorporates the study of the various wireless technologies, and the portable mobile devices, used to send and receive data and information (e.g. mobile phones, Personal Digital Assistants (PDAs), and wireless modems).

The use of wireless technologies extends the nature and scope of traditional electronic commerce (E-commerce) by providing the additional aspects of mobility and portability. Therefore, M-commerce is sometimes referred to as mobile E-commerce. M-commerce can be considered to be a flexible solution to many of the negative aspects of fixed-wired E-commerce. Wireless-based network infrastructures, and the portable mobile technologies that support such infrastructures, provide flexibility and mobility within the business systems domain. Despite this general understanding, defining M-commerce can still be a semantic exercise in its own right. Within the context of this research paper, M-commerce is referenced to mobile computing and pervasive computing systems, theory and practice. Therefore, M-commerce is succinctly defined as the interconnection of portable computing technologies, and the wireless telecommunications networking

environments necessary to provide location independent connectivity within the business information systems domain.

By far the most commercial application of wireless telecommunications has been the ability to access the Mobile Internet from portable devices, such as PDAs and particularly mobile phones. The Mobile Internet relies on a number of different networking infrastructures and technologies to support wireless Internet access. However, the Mobile Internet is but one application amongst many others within the M-commerce world. In similar way, the mobile phone has come to be seen as the primary device in the wireless world. However, the mobile phone is only one device amongst many other portable mobile devices (e.g. wireless PDAs, wireless vending machines, wireless local area networks, etc.) that need o be suited to appreciate the full breadth and richness of the technologies, devices and applications available in the M-commerce world.

M-commerce is currently mainly used for the sale of mobile phone ring-tones and games, although as 3G/UMTS services roll out it is increasingly used to enable payment for location-based services such as maps, as well as video and audio content, including full length music tracks. Other services include the sending of information such as football scores via SMS (*http://en.wikipedia.org/wiki, 2006*).

Currently the main payment methods used to enable m-commerce are:

- premium-rate calling numbers,
- charging to the mobile telephone user's bill or
- deducting from their calling credit, either directly or via reverse-charged SMS

'M-commerce' was coined in the late 1990s during the dot-com boom. The idea that highly profitable M-commerce applications would be possible though the broadband mobile telephony provided by 2.5G and 3G cell phone services was one of the main reasons for hundreds of billions of dollars in licensing fees paid by European telecommunications companies for UMTS and other 3G licenses in 2000 and 2001.

Other examples of M-commerce applications are information-on-demand systems like news services or stock tickers, banking and stock brokerage applications by SMS, WAP or iMode (*http://en.wikipedia.org/wiki, 2006*).

2.2 Trends in Mobile Commerce

PDA's and cellular phones have become so popular that many businesses are beginning to use M-commerce as a more efficient method of reaching the demands of their customers. Although most trends and advances are seen in Asia and in Europe, North America (Canada and the United States) is also beginning to take advantage of m-commerce (Mobile Commerce and Wireless Computing Systems, 2004).

Banks and other financial institutions are exploring the use of M-Commerce to broaden/retain their business by allowing their customers to not only access account information, e.g. bank balances, stock quotes and financial advice, from anywhere, but also the possibility to make transactions, e.g. purchasing stocks, remitting money, via mobile phones. This service is often referred to as Mobile Banking or M-Banking. The stock market services offered via mobile devices have also become more popular and are known as Mobile Brokerage, as they allow the subscriber to react to market developments in a timely fashion and irrespective of their physical location.

News information is also becoming more popular with subscriptions to daily headlines from anywhere in the world being transmitted to mobile devices. Sports and entertainment are areas that have also grown with the demand for mobile related services. Shopping and reservation services are now more accessible when using mobile devices. Corporations are now using m-commerce to expand everything from services to marketing and advertisement. Although there are currently very few regulations on the use and abuses of mobile commerce, this will change in the next few years. With the increased use of m-commerce comes increased security. Cell phone companies are now spending more money to protect their customers and their information from online intrusions and hackers.

2.3 Future Implications

Financial Institutions such as Banks see mobile commerce as offering new channels of service to customers as well as offering them new and innovative products. These financial institutions are working to design and implement new applications that will offer mobile payment (i.e. being able to pay for groceries) and mobile brokering. The travel industry, in realizing the possible benefits of m-commerce, is working on technologies that will take care of travel arrangements, update customers on flight status, notify them when this information changes and will offer to make new arrangements based on preset user preferences requiring no input from the user. Therefore, a customer's entire trip can be scheduled and maintained using only their mobile device. The retail sector is also looking into the possibility of using mobile commerce for making the purchase of merchandize easier. Customers will be able to browse and order products while using a cheaper more secure payment method. An example of this is; instead of using paper catalogues, retailers can send customers a list of products that the customer would be interested in, directly to their mobile device. Additionally, retailers will also be able to track customers at all times and notify them of discounts at local stores in which that customer would be interested in. Shopping will also be easier. Soon, phones will be equipped with "bar-code scanners" and shoppers could scan an item and find out its pricing and availability. In the entertainment industry, m-commerce could be used for the purchasing of movie tickets, verify someone's ID or authorize their reservation information. This industry will also be able to promote wireless gaming and music.

2.4 Advantages of M-commerce

1. The benefits of M-Commerce include customer satisfaction, cost savings, and new business opportunities.
2. Use M-Commerce anytime, anywhere with the light-weighted device.
3. Single owner has control over data whereas the mobile device can be highly personalized.

4. M-Commerce can bring the buyer and seller together more easily and facilitate greater profits and a closer customer relationship.

2.5 Disadvantages of M-commerce

1. Mobile devices do not generally offer the graphics or processing power of a PC.
2. The small screens of mobile devices limit the complexity of applications.
3. Each network has a differing approach to M-Commerce meaning that the international reach and ubiquity of e-commerce will not be matched.

2.6 M-commerce versus E-commerce

In many respect E-commerce and M-commerce are not very different. Both concepts aim to exploit commercial opportunities via electronic technologies. E-commerce is concerned with data and information transfer, and with Internet access, via wired technology; whereas, M-commerce is concerned with data and information transmission, and Internet access, via wireless technologies and various portable devices. E-commerce serves customers and clients that are stationary, while m-commerce customers are moving and dependent upon a portable PC, such as a mobile phone or PDA. The similarities between E-commerce and M-commerce have led many people to refer to M-commerce as 'mobile E-commerce'. However, this limits the definition of m-commerce too much. There a number of fundamental differences between E-commerce and M-commerce. For example, M-commerce enables location-based services and products. Furthermore, mobility is treated as an asset, rather than a by-product of the technological domain (e.g. no more need to wait in line at airport check-in desks, etc.). In addition, the Mobile Internet is constrained by a number of factors, such as display screen size and memory capacity. Therefore, the type of data and information presented within the wireless domain is often transient (and passing), and relevant only to one place at one specific time. The definition of M-commerce extends many of the concepts of the wired Internet (Mobile Commerce and Wireless Computing Systems, 2004).

2.7 Security in a Mobile World

Wireless computing systems introduce some new points of vulnerability to established, wired information resources and also some new types of security problems. Wide area, local area and personal area networks are all vulnerable to intruders breaching confidentiality and integrity, and to potential denial of service attacks. However, how these threats are manifested, how severe they are and how likely they are to occur very much depends on type of use.

Wireless networks are very common, both for organizations and individuals. Many laptop computers have wireless cards pre-installed for the buyer. The ability to enter a network while mobile has great benefits. However, wireless networking has many security issues. Crackers have found wireless networks relatively easy to break into, and even use wireless technology to crack into non-wireless networks. Network administrators must be aware of these risks, and stay up-to-date on any new risks that arise. Also, users of wireless equipment must be aware of these risks, so as to take personal protective measures.

The risks to users of wireless technology have increased exponentially as the service has become more popular. There were relatively few dangers when wireless technology was first introduced. Crackers had not yet had time to latch on to the new technology and wireless was not commonly found in the work place. Currently, however; there are a great number of security risks associated with wireless technology. Some issues are obvious and some are not. At a corporate level, it is the responsibility of the IT department to keep up to date with the types of threats and appropriate counter measures to deploy. Security threats are growing in the wireless arena. Crackers have learned that there is much vulnerability in the current wireless protocols, encryption methods, and in the carelessness and ignorance that exists at the user and corporate IT level. Cracking methods have become much more sophisticated and innovative with wireless. Cracking has become much easier and more accessible with easy-to-use Windows-based and Linux-based tools being made available on the web at no charge. IT personnel should be

somewhat familiar with what these tools can do and how to counteract the cracking that stems from them.

2.8 M-commerce Services for Consumers

Users of mobile phones and wireless PDAs, in addition to consuming digital products, also consume commercial digital services. Example:

a) Travel (e.g. booking on-line or checking availability);

b) Ticketing and billing (e.g. booking online and new vending and payment types);

c) Banking (e.g. checking on-line and transferring money between accounts).

One of the most successful on-line applications and services is the ability to check the availability of planes, trains and other forms of travel. This is as true of wired E-commerce as for wireless M-commerce. For example, various web travel sites allow the user to check flights and destinations and to book flights on-line.

The concept of travel is so associated with mobility that M-commerce and travel are easy partners. In a typical example of purchasing a travel ticket on-line via a PDA, a user may also check the details of the country (for currency and hotels), and may even download a travel map of their destination. They will thus have all the relevant information, from travel diary to location maps, available on one portable mobile device. In addition, when at their destination a user could, at the last minute, check on restaurants while traveling by taxi from airport to their hotel – something that would not be possible with such immediate with wired E-commerce. The PDA in particular acts as a traveling information resource, providing the user with information, such as currency conversion, route planning, event scheduling, and language translation dictionary and ticketing.

2.9 What is Car Rental?

Car rental is generally a business of recent model cars that are available, in exchange for a fee, for periods typically ranging from a day to a week or longer. Rental cars can often be found in Rental Car Centers typically found near airports. A car rental agency or a rent-a-car is a company that rents automobiles for short periods of time (ranging from a few hours to a few weeks) for a fee. It is an elaborate form of a rental shop, organized in numerous local branches, primarily located near airports or busy city areas. The internet is changing the car rental industry with companies that are now called online car rental companies.

Car rental agencies primarily serve people who have a car that is temporarily out of reach or out of service, for example travelers who are out of town or owners of damaged or destroyed vehicles who are awaiting repair or insurance compensation. Because of the variety of sizes of their vehicles, car rental agencies may also serve the self-moving industry needs, by renting vans or trucks.

Car rentals are subject to many conditions which vary from one brand to another. The vehicle must be returned in a good condition and must not exceed a maximum driven distance; otherwise extra fees may be incurred. Additionally, some companies set up a minimum age for the vehicle driver, which in some cases is as high as 25, even in countries where the age of majority is much lower. Recent conditions have utilized GPS technology to limit maximum speeds or driving to specific regions.

CHAPTER 3

METHODOLOGY / PROJECT WORK

3.1 Prototyping Methodology

In order to accomplish the project, the developer has decided to use a good and common strategy. This guideline is represented by the "Prototyping" Model, which serves as the conceptual guideline for most projects.

The greatest advantage of prototyping is its ability to control requirements creep, thus improving system quality. Prototyping alone can reduce requirements creep to less than 10 percent. This advantage justifies developer's including some prototyping in almost any development project. In addition, prototyping increases user involvement and commitment. Users feel that they are an integral part of the development effort because their insights and feedback are incorporated into the system design.

3.1.1 Procedure Identification

The procedure identification is usually undertaken when the various stages are involved in the research process of the project. It is therefore important to note that the research and design of the mobile-based application also require a comprehensive procedure identification technique to be used effectively. Moreover, according to the research studies - often customers do not identify detailed input, particularly in the data collection stage of the project.

For this system the author preferred to use prototyping based methodology. A prototyping–based methodology performs the analysis, design and implementation phases concurrently, and all three phases are performed repeatedly in a cycle until the system is completed. The first prototype is usually the first part of the system that the user will utilize. This is shown to the users and project sponsors who provide comments, which are used to re-analyze, re-design, and re-implement a second prototype that provides a few more futures. This process continues in a cycle until the analyst, users, and sponsors agree that prototype provides enough functionality to be installed and user in the organization. After the prototype (now called the "system") is installed, refinement occurs until it is accepted as the new system. (Figure 3) The key advantage of a prototyping based methodology is that it very quickly provides a system for the users to interact with, even it is not ready for the wide spread organizational use at first. Rather than attempting to understand a system specification on paper, the user can interact with the prototype to get a better understanding of what it can and can not do.

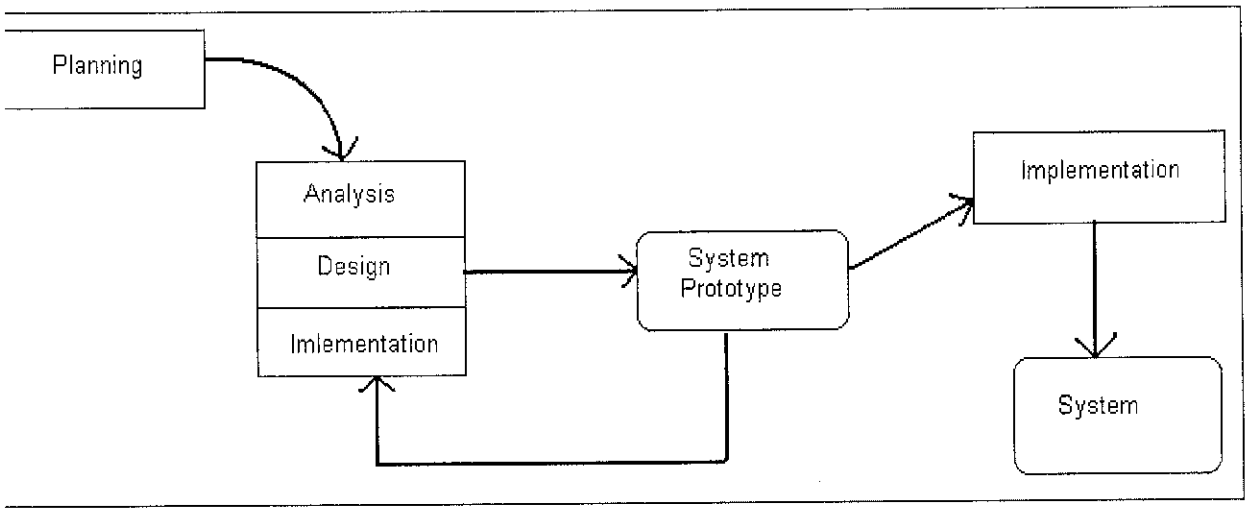


Figure 1: *The Prototyping Methodology*

3.2 Identifying Problems and Objectives

Identifying problems and setting new objectives for new smart car rental system will make this phase successful. It has therefore been practically observed all possible problems and opportunities that were obtained during preliminary information gathering. The first phase always requires a good understanding in a business car rental system. It helped to identify problems within the companies. These problems have been then discussed by the owner of this project in order to solve today's conventional car rental system problem.

From the process of problem identification it has been clearly defined the real problems of a car rental process. These problems state that companies are spending a lot of money on their operational costs (see Table 1). If these companies are unable to maintain their cost spending by having a high volume transaction for a lower price, which means they are not competitive enough to survive in today's business. Furthermore, the opportunities of this system can still be improved upon through the use of mobile business system.

Table 1: *Basic Rental Price Distribution Channel Table*
(Car Rental Business in UK, 2005)

	Basic Rental Price by Distribution Channel (£)		
	Rental Company A	Rental Company B	Rental CompanyC
Internet Booking Price	123	132	136
Telephone Booking Price	138	177	136
Travel Agency Booking Price*	-	124	120

3.3 Preliminary Information Gathering

The next phase is to find out available information on the problem identification that is carried out in the earlier stages of the project. The information gathering technique encompasses several worth following steps in order to effectively collect the right data for the right problem are:

1. Analyzing market structure,
2. Analyzing research papers, possible files and database records,
3. Visiting related web sites of companies,
4. Researching magazines and journals,
5. Studying the car rental process in action
6. Providing questionnaires and surveys.

As a conclusion of this phase, the owner has been gathered a car rental process details and has also complete information on traditional system (people, goal, data and procedures involved in the manual rental process).

3.4 Analyzing System Needs

In this phase, the owner has to analyze the systems needs based on gathering information above. The special tool and technique have been useful to define the requirement determinations. One of the tools is to have a logical data flow diagram of the car rental process. From this data flow diagram identified and analyzed input, process and output of the manual booking system within this industry. Moreover, it provided an additional list of data items that is used in the rental process with its specifications. During this stage, the owner has analyzed conditions, alternatives, actions and other rule-based statements clearly.

The main advantage of having this mobile smart car rental system will help to have high volume transactions for lower prices, which means company will have a better performance.

3.5 Designing the Prototype

In the designing stage of the Prototyping, the owner has been used all collected information in order to achieve the logical sketch of a developing system. In this logical sketch, the owner has provided effective inputs in order to address the problem by using special techniques of system analyst such as good-look form and design the screen properly. Thus, one of the parts of designing is to have a good project interface, which the owner has also taken into consideration carefully. The best example of system's interface here could be is to have all process functions and same time reduce user interactions with it, because the display size of mobile phones is small.

To resolve the above problems and develop a systematic solution, author decided to build M-commerce car rental system with distributed architecture (see Figure 1).

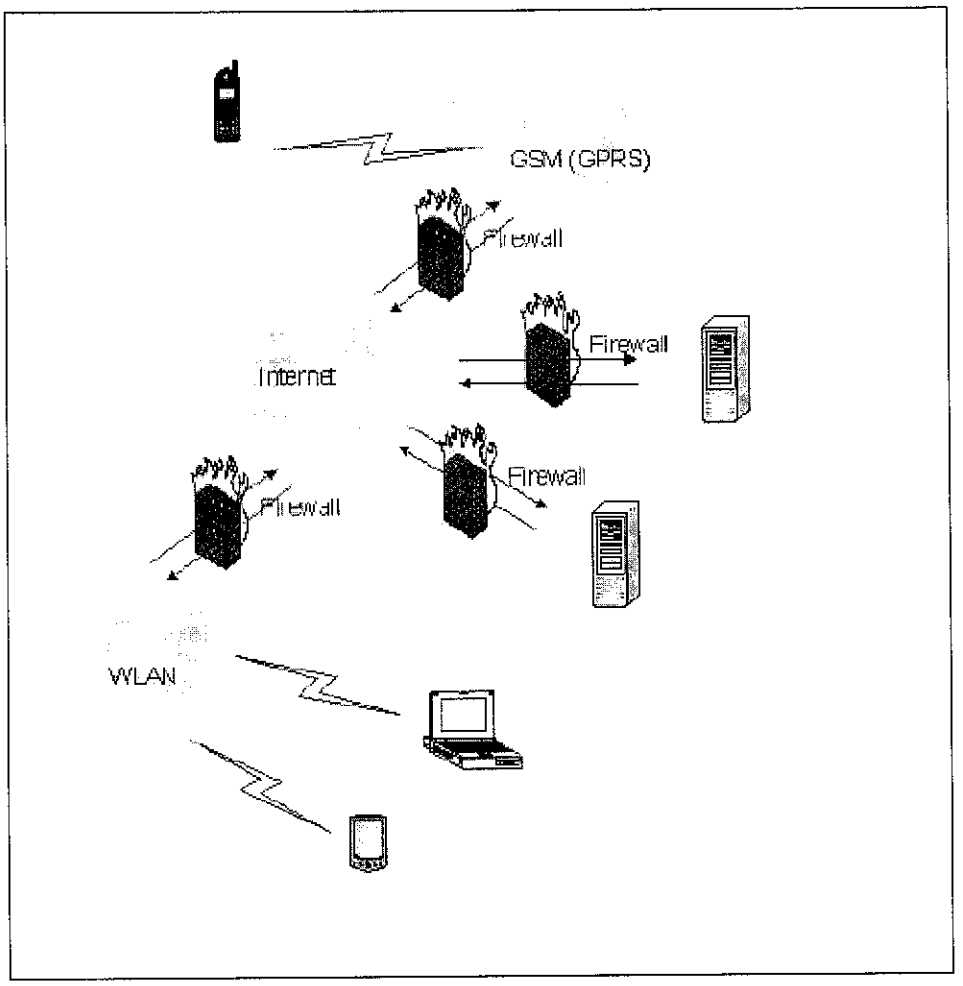


Figure 2: *M-commerce distributed system on Internet*

There are two actors for the proposed system: customer and administrator (also can be company employee). Figure1 shows the relationships among the customers (who use mobile phone) and the proposed system. The customers interact directly with the system via the company's website when connecting to the Internet through their mobile phones or devices. The internal part of the M-commerce system carries two main jobs, first it stores all information in database, second it allows to administrator view all records.

3.6 Developing the Prototype

In this stage of the Prototyping, the owner has to use the programming skills in order to develop a project prototype that will be presented and evaluated as a final product. Some of the possible techniques for designing and documenting application may include diagrams, charts and pseudocode. During this development, the owner will have a good working relationship with the users of this system. The effective documentation for this application and including manuals, online help and Web sites that are related to car rental system could be very handy for the users in order to improve their knowledge on smart car rental system features.

The prototype of this application will have a continuous development until it reaches its satisfactory output for the users and the developer. Therefore, to make this prototype with more meaningful functions it must keep updating its content and revise on the new suggestions made.

The proposed system is a multi-tier Web-based application. A multi-tier application – sometimes called an n-tier application – has several modular parts, called tiers. Each tier may reside on any number of computers.

In the top tier or client tier, markup languages display the interface to users, allowing them to interact with the application. The client tier uses client-side scripting (XHTML) to manipulate information. The middle tier interacts with both the client tier and the data tier. The bottom tier, or data tier, stores the application's data in a database. Databases are efficient data repositories.

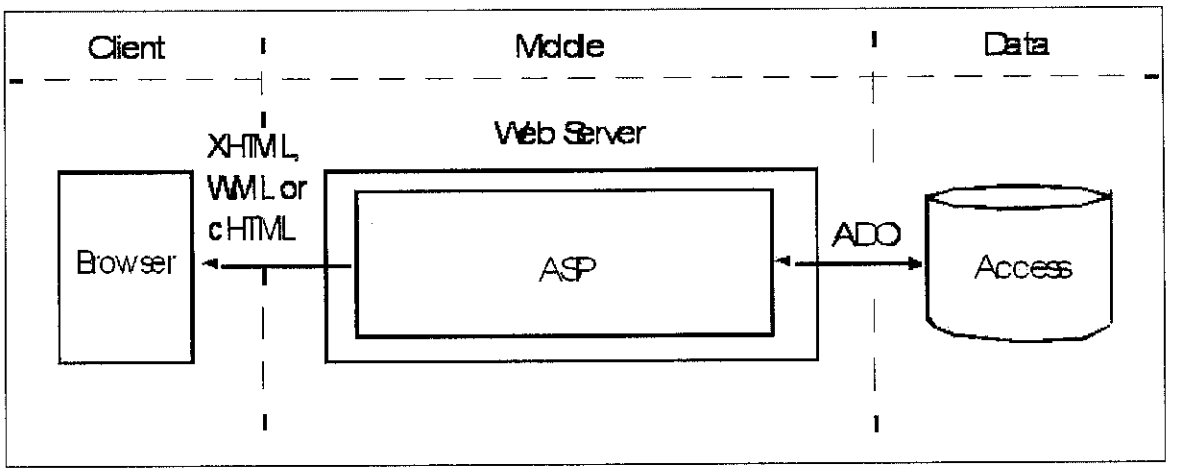


Figure 3: *Three-tier architecture for the proposed application (Deitel, 2005).*

3.6.1 Developing the Prototype Interfaces

Customers access the M-commerce car rental system via Internet through their phone or mobile devices. So the Website of company, which hosts the M-commerce car rental system, must be able to be accessed via Internet. The proposed system needs an interface to the database which stores all information. The system consists of HTML, XHTML and ASP documents (see Figure 2).

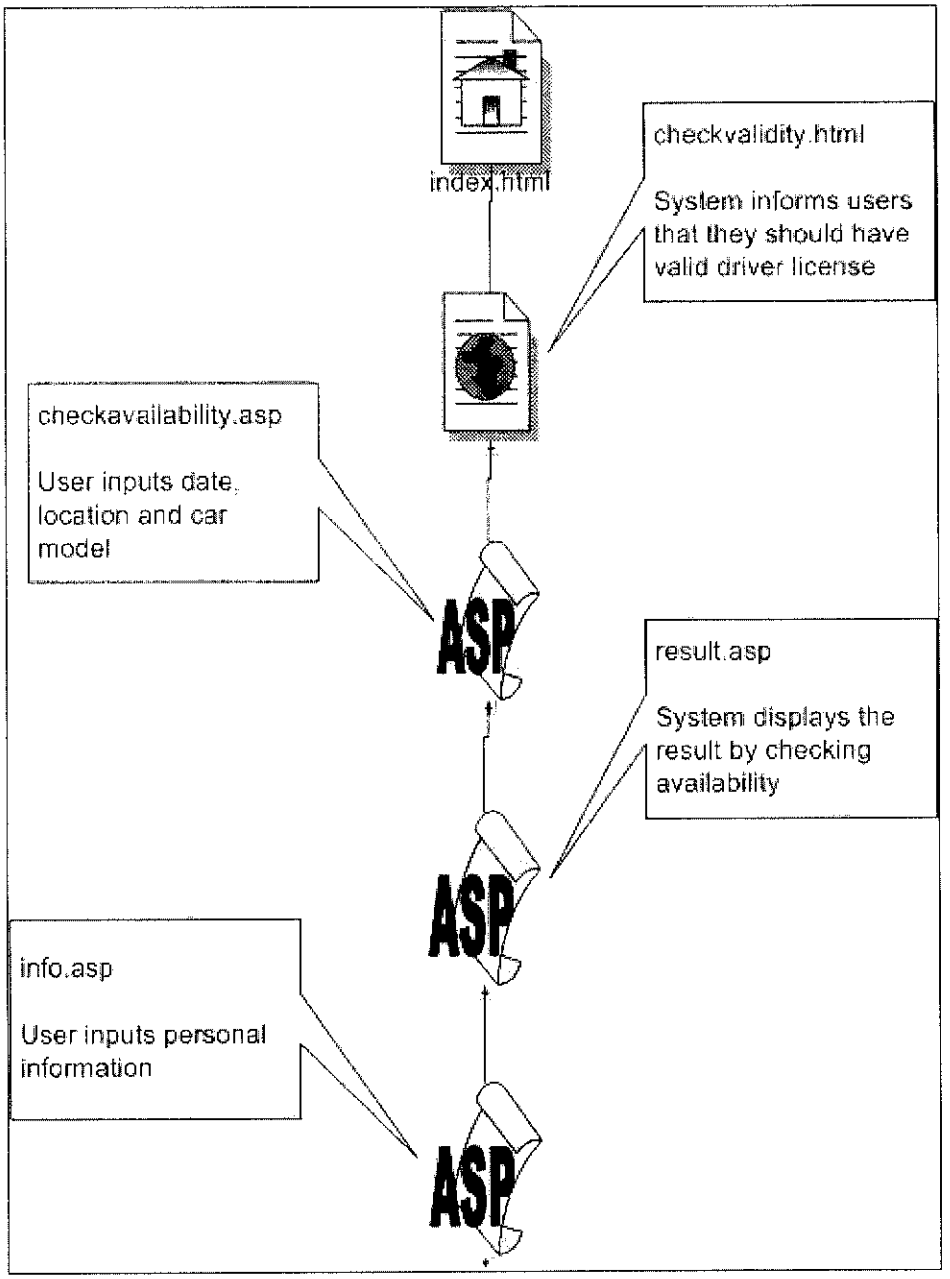


Figure 4: *The relationship between the application's documents*

3.7 Testing and Maintaining the Prototype

Before the developing system completion and submission, the owner will test it continuously. This is because the problems that may occur in final stages may cost very high, in terms of time and resources. Therefore, the owner will be doing some of the partial tests of the system and where the users' involvements are needed the owner will conduct a development in conjunction with users. The number of tests will be made for this application in order to pinpoint problems of the system. In doing the first successful testing round, it can also achieve its preliminary objective in this project.

3.8 Implementation and Evaluation of Prototype

In the last phase of this project, the owner will implement a prototype of developing system for final users. In addition, the owner will propose a system solution to companies in order for them to convert from their traditional process to new mobile system. This process may include converting files from old formats to new ones and building a new database in order to be able to keep all data in digitized form in the computer system.

CHAPTER 4

RESULTS AND DISCUSIONS

4.1 Other M-commerce Development Techniques

With the rise of mobile computing and the development of new innovative technologies, we can find many programming languages and problem-solving techniques that are in some ways similar to each other. It was important to choose the best matching approach to develop this system. During this project it was proven that the selected approach was practical and efficient. It was strategically right to choose ASP as a middle tier programming language, because it is very stable and easy to use.

4.2 Evaluation Results of New System

The developed system was periodically tested and evaluated throughout all duration of project. Generally two types of testing users were involved; first it was novices who don't have IT background, second it was IT students. Their feedbacks and suggestions were analyzed carefully and later applied to the developing system. The result of evaluation shows that the root cause of most problems faced by users was mobile technology itself. The small size of screen, small buttons and lack of choices are examples to previous sentence. In order to eliminate these and other problems developer decided to reduce number of interactions between user and system by using drop list boxes for users to enter all required information (see Figure 5). This approach also reduces load on memory of mobile devices in a way reducing the line of script codes.

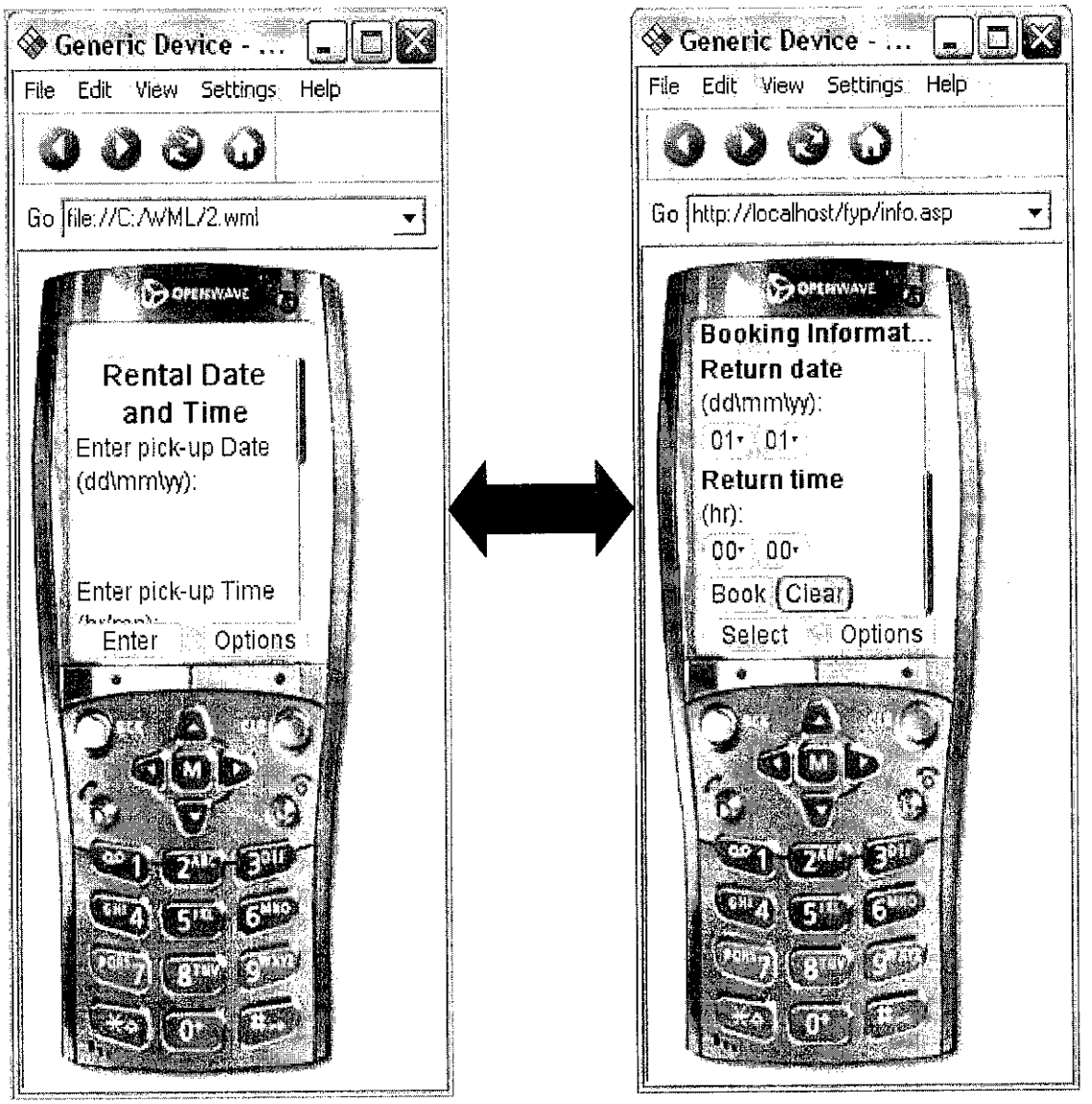


Figure 5: *Comparison between input box and drop list box.*

4.3 Comparison between Existing and New Systems

In the end of a development the comparison was made between traditional and new developed system. The most important advantage of new system was its mobile concept, which allows users to use system whenever and wherever they want. Both rural and countryside area people can benefit from the new system. Also it shows that more users are willing to use such system that shows increase in number of customers. However study made by developer shows that this increase will continue until other car-rental companies start to use same approach.

4.4 Statistics on Mobile Usage in Asia-Pacific in 2004

Asia/Pacific excluding Japan (APEJ) enjoyed a strong performance in mobile services in 2004, surpassing growth in the major regions of North America and Western Europe. Total mobile subscribers in APEJ grew a robust 25.6% in 2004 over 2003 to 527.3 million. The 10 key markets in APEJ also saw mobile service revenue grow a healthy 18% in 2004 year on year to $69.8 billion. India was the fastest growing market in the region as subscribers more than doubled to 48 million, while China, the Philippines and Thailand were also significant contributors (see Table 2).

Led by strong subscriber growth, mobile service penetration in APEJ improved to 20% in 2004, from 16.1% in 2003. However, the diversity of these 10 markets in terms of market maturity, competition, network technology, growth potential, per capital income and service adoption, drew wide differences amongst markets. Five of these markets had reached penetration of 75% and above; namely, Australia, Hong Kong, Singapore, South Korea and Taiwan; while other emerging and less developed markets are catching up fast. But at the other end of the continuum is India, which still lags far behind with mobile service penetration at a paltry 4.5% in 2004. In the next phase of growth for mature markets, 3G services made noticeable progress last year. South Korea enjoyed more than doubling in 3G subscribers, while Australia and Hong Kong saw adoption rates pick up. 3G subscribers totaled 10.2 million in 2004, accounting for 1.9% of the market in APEJ (International Data Group, 2005).

Table 2: *Mobile usage in Asia-Pacific grows 18% in 2004 (International Data Group, 2005).*

	2004	2009 Forecast
Australia	17,869,000	20,784,988
Hong Kong	7,228,527	8,315,013
India	48,014,214	148,777,014
Malaysia	14,597,000	22,494,860
Philippines	32,747,205	57,461,093
PRC	317,272,441	535,372,441
Singapore	3,861,000	4,662,600
South Korea	36,586,052	40,483,256
Taiwan	21,996,405	22,816,989
Thailand	27,148,083	39,904,995
Total	527,319,927	901,073,249

4.5 Acceptance of M-business

A comprehensive review has been conducted in this part of study to identify determinants of user acceptance of Smart Car Rental services. The review eliminates the confusion surrounding the meanings of independent variables of user acceptance. Following an intensive search of existing acceptance studies in IT/IS, e-commerce and m-commerce domains, sufficient quantitative research findings have been retrieved, and an analysis has been performed to measure the extent to which the relationships between user acceptance and its determinants are supported.

4.5.1 Perceived Usefulness

Perceived usefulness is defined as how well consumers believe a service can help them perform their daily activities. There are other constructs that have identical meaning, including relative advantage, extrinsic motivation, and job fit of perceived consequences. The similarity between these constructs has been verified in. Previous studies suggest a positive relationship between perceived usefulness and user acceptance. When this belief increases, consumers' intention to use a service will increase correspondingly.

4.5.2 Perceived Ease of Use

Perceived ease of use refers to the extent to which a user believes that using the service will be free of effort. Complexity was also introduced in the literature to measure the degree to which a service is perceived as relatively difficult to understand and use. The complexity construct is just the opposite of the perceived ease of use construct. A service perceived to be less difficult to use can attract more users to adopt it. Consequently a positive relationship is expected between perceive ease of use and user acceptance.

4.5.3 Social Influence

Social influence is defined as the degree to which an individual user perceives that important others believe he/she should use the service.

4.5.4 Confidence Belief

As it is difficult to find a construct in the literature that has an identical meaning to confidence belief, we define the term as the extent to which a user believes that a service is trustworthy, and that using the service will be free of risk. The construct has become increasingly important in the context of m-commerce as security and privacy concerns have a significant impact on consumers' confidence. It seems likely that it is the degree of trust and perceived control that has a direct influence on usage intention, although facilitating conditions can significantly enhance a user's confidence in using a service.

4.5.5 Affective Attitude

Many studies adopt attitude as a construct that measures to what extent a user has a favorable or unfavorable evaluation or appraisal of the behavior in question. A user who believes pleasure and enjoyment can be derived from using a service is likely to use it extensively (Ajzen, I., 1991).

4.6 Solution to Issues of M-business

The obstacles to M-commerce, such as the cost of mobile devices and mobile Internet services and difficulty in accessing efficient and fast cellular telecommunications networks, are diminishing each year. Thus mobile commerce is becoming more attractive to both business organizations and individuals. The main obstacles that are continuously being addressed in research and development within the M-commerce world are as follows:

1. Wireless Mobile Internet access via a mobile phone remains more costly than wired Internet access via a laptop computer (or PC), and data transmission speeds are limited over wireless network infrastructures.
2. Concerns over privacy and security still pervade the wireless data transmission world despite the fact that 3G technology is inherently more secure than previous.
3. Many individuals and organizations still harbour concerns over the health issues of wireless technology (particularly with regard to microwave radiation emissions levels).

CHAPTER 5

CONCLUSION AND RECOMENDATIONS

Mobile commerce is a new way of running a business using many innovative technologies and organizational structures. Although it is a natural extension of many existing technology clusters, it also represents a departure into never-before-encountered possibilities; it is by no means clear what will be required to realize this potential – to know what particular technologies will provide the capabilities to exploit them. It is, however, clear that to develop competence in exploiting these capabilities is going to require innovative practice and social and communication structures. Organizations that can develop effective new practices and structures to support them will do very well; those that cannot adapt will disappear. This is, therefore, worth keeping in mind as the many new innovative ideas that make up mobile commerce are going to be adopted within the social system in which we work.

In essence, competitive advantage in M-commerce resides in the ability of business organizations to exploit and explore the business possibilities available to an industry. The growth and spread of M-commerce, like many other technological developments in the past, is being driven by three factors:

1. developments in mobile wireless applications and technologies (innovation);
2. proliferation and use of wireless technologies by (potential) customers (adoption);
3. desire by organizations to expand markets and add value to products and services (increased competition).

In many industries there is short-term gain in the ability to exploit wireless technologies to advantage, and be amongst the first to do so. In the longer term, and many industries are at this stage, sustainable gain for business resides in exploring innovative ways of incorporating wireless telecommunications and mobile devices into the networked business information system domain. The aim is to achieve location independent connectivity for business advantage, both internally for employees and suppliers, and externally for customers and clients.

The successful result of this project showed how M-commerce can benefit all types of companies by its innovative and mobile-oriented solution towards continuous business and performance.

Last I would like to give few recommendations to all people who are interested to continue my study on this challenging and exciting topic. With the short time and scare resources I had, I could only develop the basic, but functioning system. That is why there is still place for improvement in my system. It will be nice if users can have more choices to make during reservation. For example they will need to edit or cancel previously made reservation. Also it will be practical if customers can reserve optional equipments, such as children seats and services, such as filling fuel tank. Administrator side of this system is another aspect of improvement. Definitely, more functions can be added to this side such as adding new location to database and improving statistic web page.

REFERENCES

1) Danielle Zilliox, 2002 "*The get-Started Guide to M-Commerce and Mobile Technology*", AMACOM, USA.

2) Deitel, 2002 "*Wireless Internet & Mobile Business*", Prentice Hall, USA.

3) Brian Stanford-Smith and Paul T. Kidd, 2000 "*E-business Key Issues, Applications and Technologies*", Cheshire Hen bury, United Kingdom

4) Alan Dennis, Barbara Haley Wixom *"System Analysis & Design"*

5) Geoffrey Elliot and Nigel Phillips, 2004 "*Mobile Commerce and Wireless Computing Systems"*

6) Yandong Fan , "Speech Interface: An Enhancer to the Acceptance of M-commerce Applications"

7) *http://www.avis.com /*

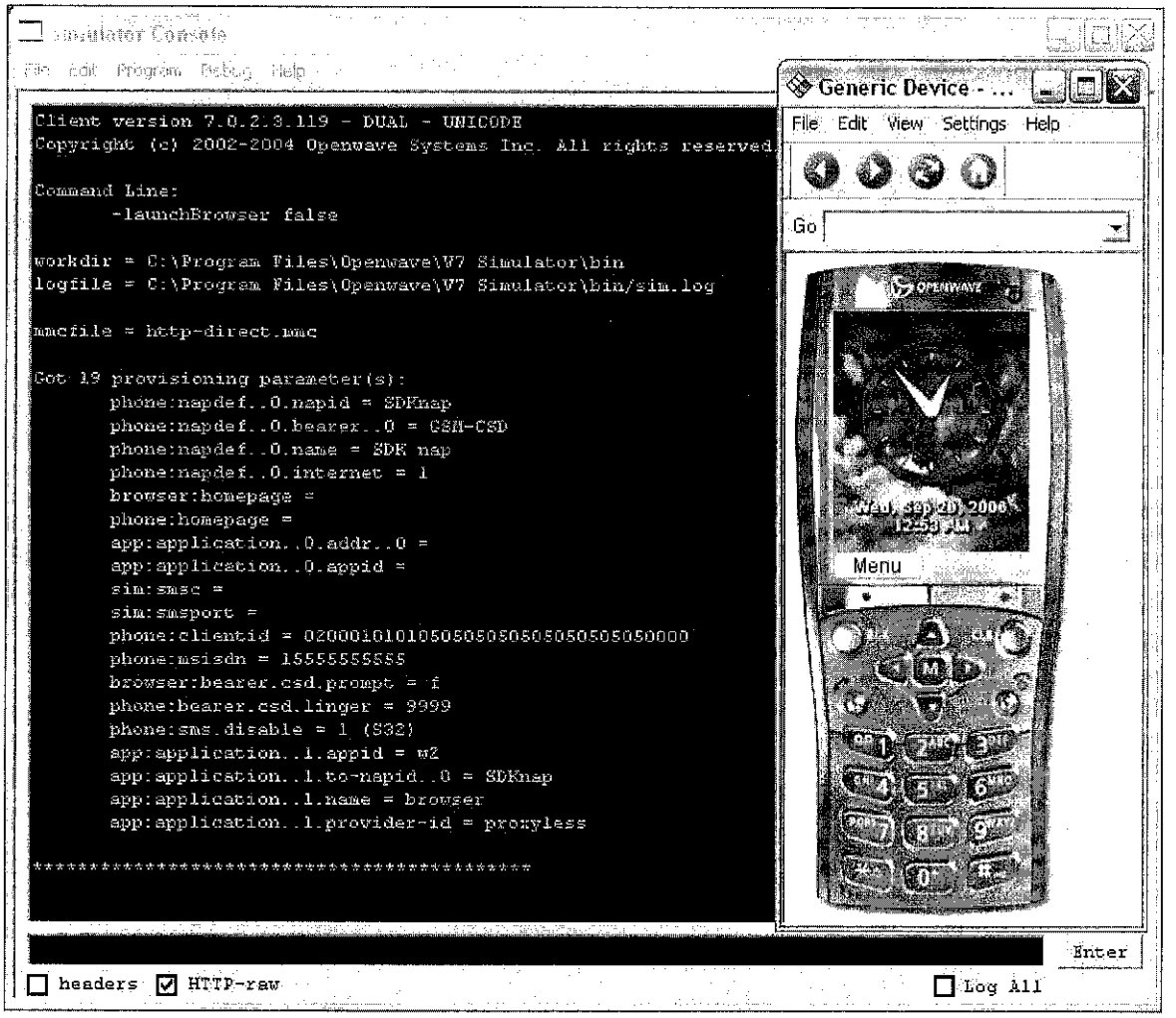
8) *http://scriptorium.lib.duke.edu/adaccess/carandbus.html /*

9) *http://www.wikipedia.org*

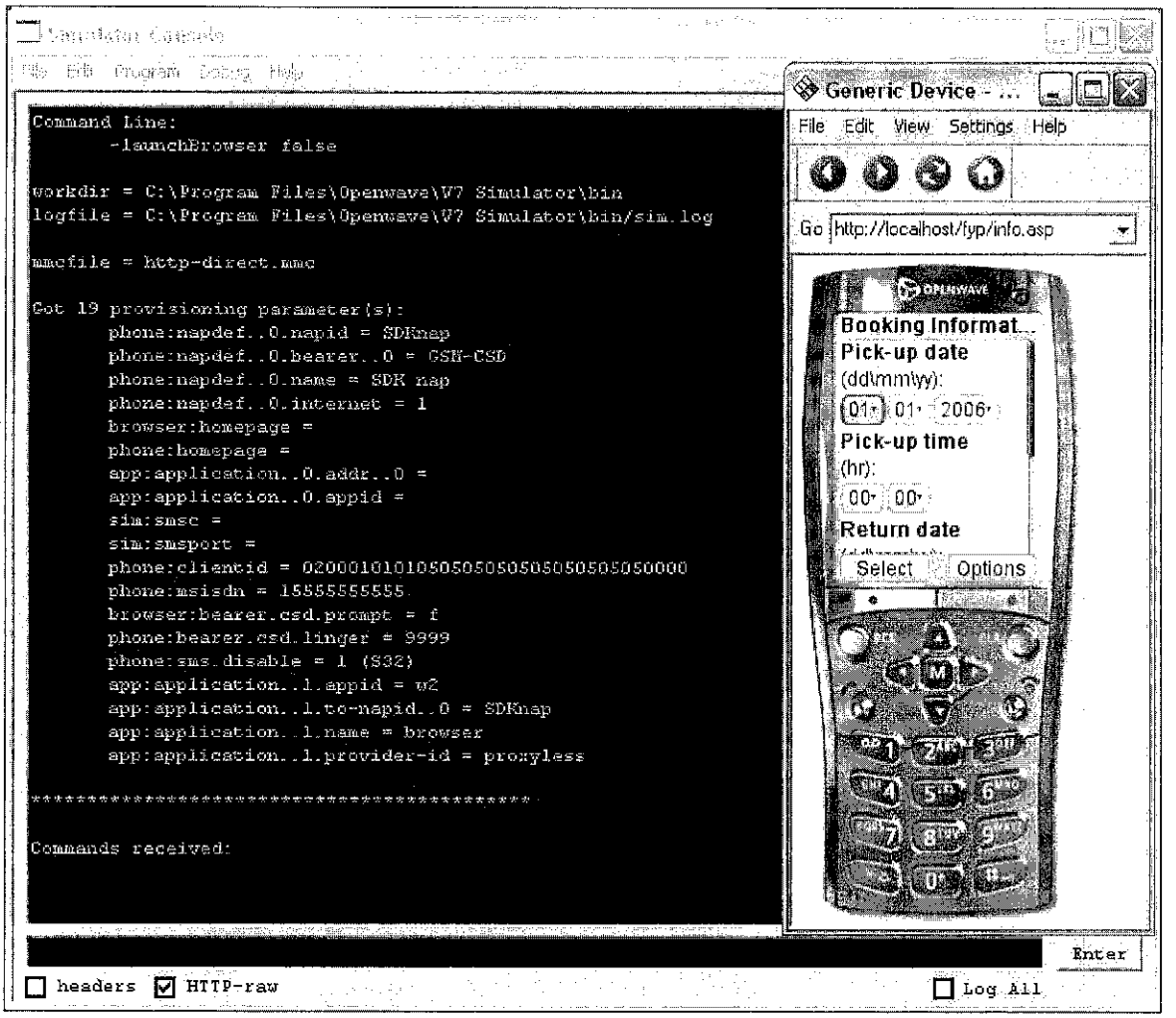
10) *http://www.idc.com/*

APPENDICES

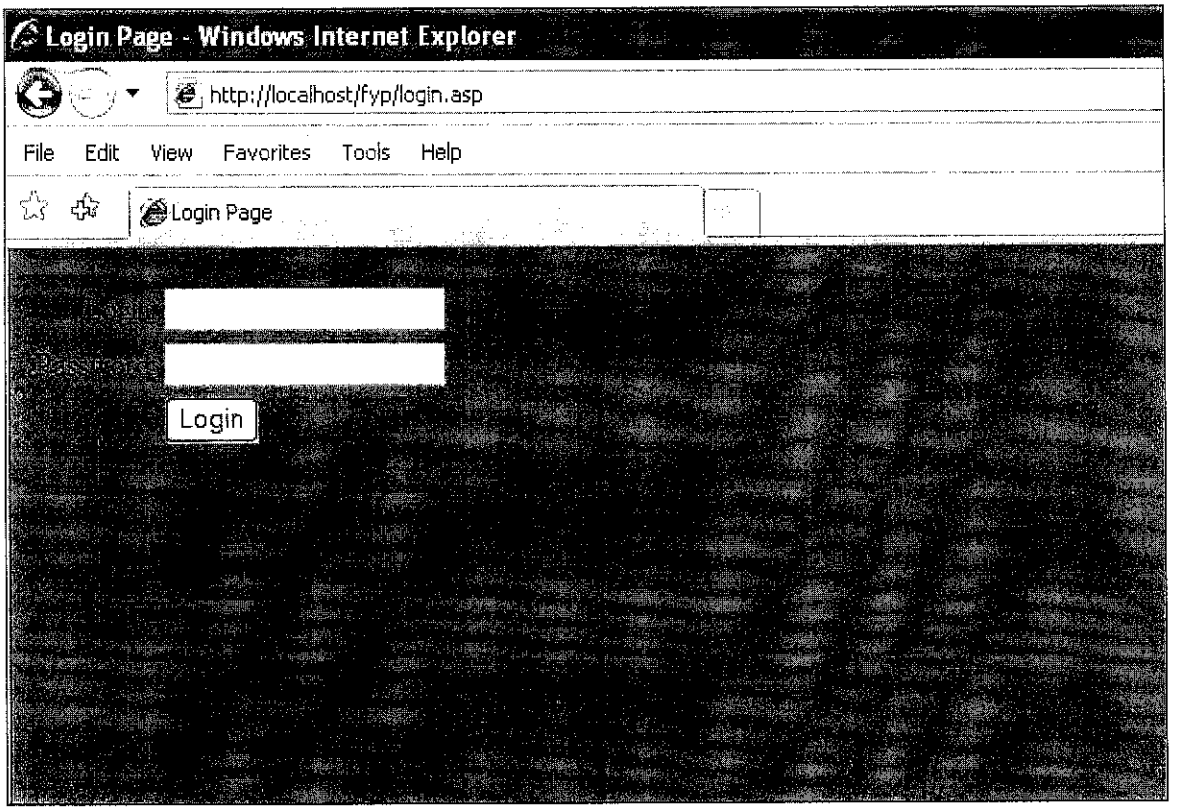
Openwave V7 Simulator



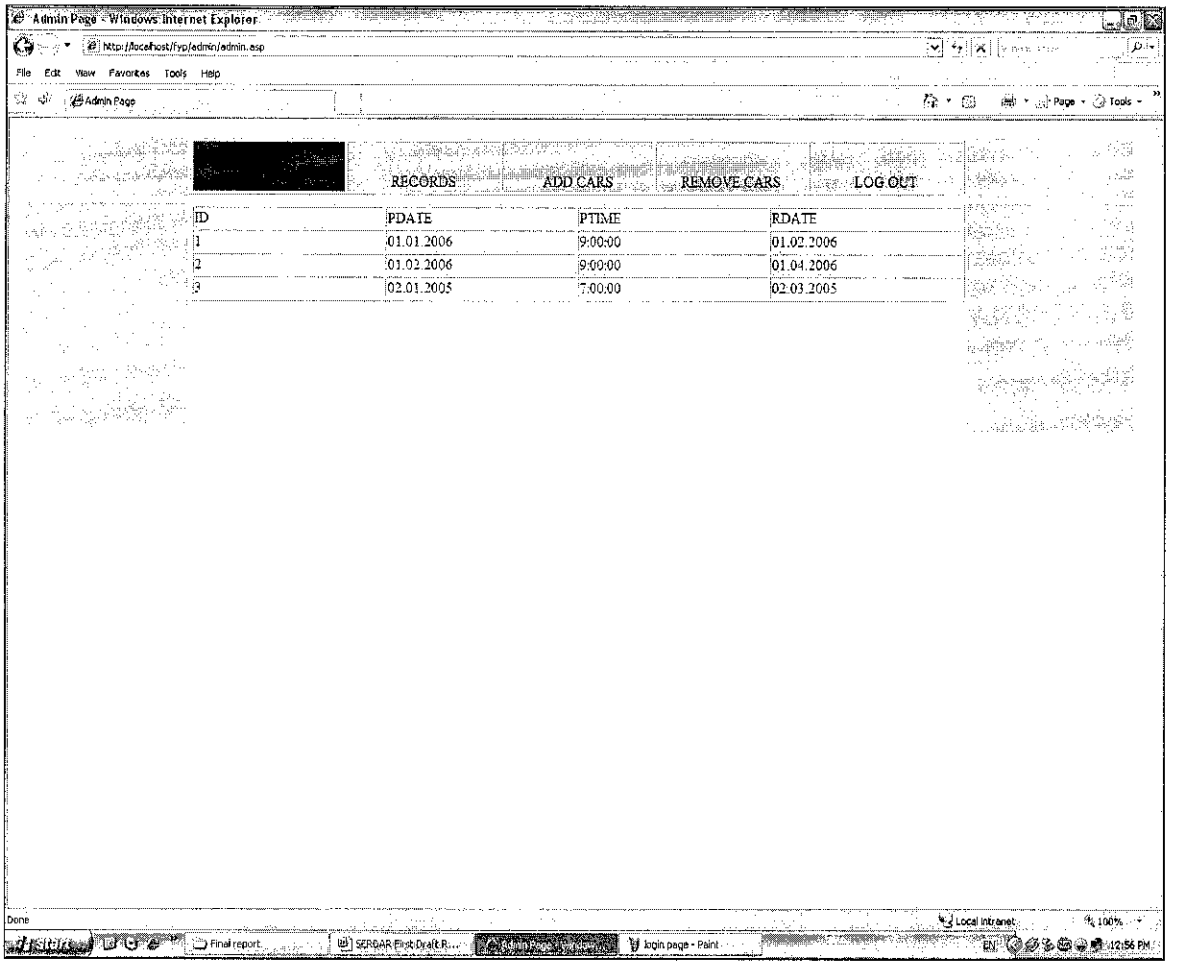
Web page for Rental Date & Time



Administrator Login Page



Administrator Home Page



Administrator Car Add Page