Car Theft Prevention System

by

Syahrul Aniza Sharil

Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
(Information Communication Technology)

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CERTIFICATION OF APPROVAL

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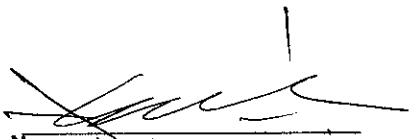
Approved by,



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July 2006

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.

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SYAHRUL ANIZA BINTI SHARIL

ABSTRACT

Car theft cases in Malaysia have been a threat to the government and the community as a whole. Increasing cases of car thefts in public areas, paid parking service, mall parking, and also in the neighborhood are the reasons why this project is initiated. The proposed system is a security system designed to collaborate with the existing security systems in car parks such as shopping mall car parks and hotel car parks. It also poses as a verification system for the car and its owner. This project is also initiated to create a low-cost but effective security system in car parks. Current systems adopt single authorization method for security purpose which is prone to security breakage and has a few flaws in its implementation. Therefore, this system is designed with two-factor verification which consists of car registration number (what you know) and MyKad (what you have). These two inputs or authentication elements are very important as they act as a "binder" between the car owner and its car thus becoming the verifier for this system. In developing this system, iterative development methodology is used and it is being modified to cater the need of this project. Iterative development methodology is suitable for this system based on its nature where analysis phase, design phase and implementation are being executed iteratively until a satisfied product is produced. It is also suitable to be used for projects with a small timeframe. Included in this report as well, is the technical configuration required during the product development which consists of system's configuration and database configuration. During the analysis part of this project, there has been a few interesting findings that supports the creation of this project. Among them is the adoption of two-factor authentication using password and token or smart card is proven to be cheaper yet effective compared to a single biometric authentication which is very expensive to be implemented. Besides that, privacy violation and identity theft becomes easier and more damaging when biometric system is adopted. Finally, smart card has been recognized as the future of better security due to its flexibility to collaborate with password authentication and biometric authentication which is currently being widely used in various fields such as banking service and national security.

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CHAPTER 1: INTRODUCTION

This chapter contains brief information of the project which includes the background study of this project, problem statements that lead to the design of this project, its objectives as well as the project scope.

1.1 Background of Study

Car theft issue has been highly debated throughout the nation as the numbers of cases reported are quite alarming. Though today's cars are mostly equipped with high end security systems, they do not seem to be adequate to deter car thieves from stealing them. The car theft cases usually occurred in residential areas, public car parks including paid car park service and in unattended areas. Therefore, instead of being totally dependent on the security systems installed in a car, having an external security method would be a great help to curb car theft cases.

The project about to be discussed in this report is a car theft prevention system focusing in parking areas such as shopping mall parking areas, paid parking services, hotel parking areas etc. The system developed caters for seasonal parking users as well as for regular parking users. For regular parking users, this system requires end users (parking operator) to enter the incoming car's registration number while the car driver swipes his or her MyKad to the card reader device allocated at both entrance point and exit point of the parking area. User's I/C number is retrieved when MyKad is being read by the card reader. The combination of both car registration number and user's I/C number received at both entrance and exit points will be the authentication or proof that the car being driven in and out of the car park belongs to the right owner. For the seasonal parking users, a barcode reader replaced the parking operator at both entry point and exit point. The barcode reader reads a barcode sticker provided to all seasonal parker

which holds the information of the car. Then, the driver will swipe his or her MyKad at the card reader device allocated at the entrance and the exit point. The authentication process for seasonal parking will also be the same as the one implemented for regular parking users.

In this system, MyKad is used as a reference as it is being carried around everywhere by each individual for identification purpose. It is also convenient to the end user to use MyKad as it allows centralized data verification which means, user do not have to own or buy different identifier cards to cater different types of security systems. Besides that, MyKad contains important information of a person such as the person's address, thumbprint and picture. In case there is a car theft attempt, the system can easily capture the person's I/C number which can be used by the authorities to attain suspect's personal information thus, helping them to track the suspect. Furthermore, MyKad's capability to store a variety of information allows better enhancement of the proposed system in the future

By having this system implemented in parking areas, car owners can be rest assured that their car would be in a safe hand especially when they have paid for the parking service. Besides that, it will also be beneficial for parking service businesses as public's trust towards their service will increase. Hence, their business revenue may increase due to the trust gained from their customers.

1.2 Problem Statement

1.2.1 Problem Identification

The car theft prevention system is proposed and designed to enhance the current security system in parking areas. Even though there are several security measures taken by the car park services, car theft still happen due to these problems:

- The CCTV (Closed Circuit Television System) camera located in the parking area may not be able to record and cover each and every corner of the parking area. Thus making it easier for car thieves to steal car outside the range covered by the CCTV without being notice.
- Current parking service uses magnetic parking ticket as part of their security measure. However, some car owners left their parking ticket in the car which makes it easier for car thieves to pay for the ticket and leave the parking area.
- In most paid car park service, if a parking ticket is lost, the car driver will only have to pay for the penalty of losing the ticket and no questions will be asked. Such practice actually benefited car thieves as they can always claim that the parking ticket is lost even if the actual car owner does not leave his or her parking ticket behind. Once they paid for the penalty, they are free to go.
- The security personnel in the car park do not patrol around the parking area as frequent as they should be. This situation makes it easier for car thieves to steal a car in an unsupervised area in some part of the parking area.
- Most of the cars that are reported stolen do not have proper security system installed in their car. Without a proper security system, a car is more vulnerable to car thieves. This usually applies to old series car as they were manufactured in the years when car security was not a big issue to bother.
- Current parking systems focused more on revenue than security. Security system only implemented in areas where control access is needed. Besides that, some of the security measure implemented concerns only on the safety of the driver or car owner.

1.2.2 Significant of the Project

This project is designed to help curbing car theft cases in parking areas especially in shopping mall parking area and paid parking services. This system is designed to collaborate with the current security system installed in these parking areas. Therefore, we could prevent car theft before it happens rather than trying to track back the car after it has been stolen.

If this system is successfully implemented, car theft cases may decrease. Hence, allowing the public to feel secure having their car parked in shopping mall's car parks as well as paid parking services. This system also provides security measure for cars that are not installed with proper security features when parked at a public parking area. According to the car theft statistics, lower security featured cars are more vulnerable to car thieves. Preventing car theft will benefit the public in such way that they do not have to experience the agony of bearing financial loss. The losses incurred by the insurance company due to car theft cases could also be reduced if a security system is implemented in parking areas.

1.3 Objective and Scope of Study

1.3.1 Objectives

The objectives of the project are as bellows:

- To create a security system that could collaborate with the existing security system implemented in parking areas.
- To design a verification system that would verify the owner of a vehicle by using car registration number and driver's I/C number.
- To produce a low cost security system that can be implemented in parking areas.
- To conduct research on biometric system and smart card system.

1.3.2 Scope of Study

The scope of study done in this project includes the study of car theft scenarios and statistics in Malaysia. Besides that, an in depth study of the occurrence rate of car theft in parking areas was initiated. The causes of car theft cases in such area was also taken into consideration as part of the study in order to design a good end product that can help to prevent car theft cases.

Besides that, a study of current security systems in parking areas was initiated. This study is done to find out whether there is any similar system as the proposed project exists. If such system exists, the scope of study conducted should focus on the effort to enhance or improve the system to suit the target users.

To sustain author's decision in using smart card reader over biometric reader for this system, a study of both smart card system and biometric system was performed. The study done helped in identifying the advantages as well as the disadvantages of both systems. The findings of the study are included in this report as a supporting point in choosing smart card as the authentication method for this project.

Before embarking into the development phase of the system, a survey was also conducted to the target user which is the public as this is a community based project. The survey served the purpose of getting responses from the public concerning their acceptance towards such system. Besides that, it also gathers all the important information needed regarding car theft as well as their opinion towards the current security systems implemented in a parking area. Based on the collected data, we managed to predict the public's acceptance towards the developed system.

For the design of the system, a study of the type of card reader device to be used was conducted to ensure that a cost effective device is carefully chosen to serve the purpose of the system. The interactivity between user and the system was also taken into account in order to ensure the device and the system's interface is easy to understand and

use. Other than that, the scope of study also covered the learning of programming languages used in developing the project which is C# programming language. Besides that, Oracle 9i and Microsoft Access were revised for the database of the system. Through rigorous study on both database platforms, Oracle 9i is use based in its robustness, scalability, good transactional control and it is designed for multi-user applications.

1.3.3 Relevancy of the Project

The car theft prevention system will add benefits to the current security system implemented in most parking services and areas. By combining both techniques, it will be easier to curb and identify car theft attempts in such places. The party that will benefit the most is the public as extra precautions are taken to ensure that their property is safe within the car park area. Thus, creating a safer environment for the public to park their car in a public parking areas such as shopping mall parking area and paid parking services. The solution proposed with this project shall avoid car owners from incurring or experiencing loss from car theft incident.

1.3.4 Feasibility of Project within the Scope and Time Frame

This project was developed within a specified time frame given. There were limitations and constraints throughout the development of this project. However, the main goal to be achieved at the end of this project is to create a prototype of a security system that would be able to identify and confirm the owner of a car. The main objective was achieved throughout the development phase. Other objectives were achieved during the planning phase as well as the development phase.

CHAPTER 2: LITERATURE REVIEW AND THEORY

2.1 What is the car theft scenario in Malaysia?

Based on several car theft statistics found over the Internet, the rate of vehicle thefts reported to insurers jumped 33 per cent to 26,566 cases in 2004, signaling the fourth successive year it has been on the rise in Malaysia. Of the 26,566 vehicles reported stolen last year, 66 per cent were motorcycles and 27 per cent were private cars. [1]

PIAM (Persatuan Insurans Am Malaysia) chairman, Anuar Mohd Hassan (2005) points out that "Vehicle theft is a growing problem. Our statistics show almost 73 vehicles, including motorcycles; private cars and other vehicles were stolen every day in 2004. The figure represents losses totaling some RM1.5 million to vehicle thefts every day last year, "[1]

According to the car theft statistics, it reveals that vehicle thefts are concentrated in Kuala Lumpur, Selangor and Johor which together account for 55 per cent of the total reported vehicle thefts in the country. [2b]

2.2 What causes car theft?

There are a few factors that lead to car theft cases. Among them, police reports have indicated that the non-installation of effective vehicle anti-theft devices as one of the reasons for the high vehicle theft rate. [2b]

The conditions in car park areas also contribute to the car theft cases. Checks by The Star at 10 underground and two rooftop car parks in Kuala Lumpur and Petaling Jaya revealed a mixture of good and bad verdicts. Dingy corners in eight of the 10 car parks

visited were adequately lit, while the two rooftops car parks did not have adequate lighting at night. In one rooftop car park in a commercial complex in Petaling Jaya, many of the lights were either switched off or were not working while security guards were not seen patrolling the area. Some big underground car parks in Kuala Lumpur had very few guards to man the area and the frequency of security patrols was too far apart. In some car parks, a guard was seen making rounds only once every hour. [3] Besides that, one car park in Kuala Lumpur had too many blind spots – like pillars and interlinked parking areas – that were not covered by CCTV. [3]

According to Malaysian Security Services Providers Association president, Datuk Rahmat Ismail (2003)

> We usually recommend the installation of CCTV to cover all corners of the car park, to place at least one guard on each floor and other monitoring and communications gadgets based on risks assessment of the building and its surroundings. "However, more often than not, clients look for cost-cutting solutions. [3]

Based on the above statement, 108 crimes were reported in the city at shopping complexes. They are a murder case, a snatch theft, 23 robberies, 30 vehicle thefts, and 53 thefts from vehicles. [3]

2.3 Where car theft takes place?

Throughout the research done, it is believed that car theft can happen everywhere. No matter where you park your vehicle, there's always a risk of it getting stolen these days. Vehicles have been stolen from parking lots in hotels, shopping complexes or public car parks. In fact vehicles parked in front of homes have also disappeared. [4]

Most vehicle thefts were reported to have taken place at car parks with unrestricted exits, roadside public parking even when vehicles are parked at home or just outside the home. [2a]

City police chief DCP Datuk Dell Akbar Khan (2003) said that 36 cases were reported in hotel car parks last year, comprising seven robberies, 24 thefts from vehicles and five vehicle thefts. Between January and June 22 this year, 25 cases were reported, which include five robberies, seven thefts from vehicles and 13 vehicle thefts. [3]

2.4 What are the existing security systems in car parks?

While doing the research on existing security system in car parks, the police had commented that present security and safety measures at shopping complexes and office buildings, and especially at car parks, is not ideal. [3]

In Malaysia, the security systems and measures that are required to be adopted in car parks are installation of CCTV, putting up lights in all corners of the area and hiring security guards to patrol around the area. This statement is supported by Richard Chan, president of the Malaysian Shopping Complexes and High Rise Buildings Management Association (2003) where he claimed that "majority of the association members have complied with the requirements outlined by the police and authorities, including the installation of CCTV, lighting up all corners and hiring security guards to go on patrol rounds".[3]

There are other parking systems that have few security features but their approach is more towards securing their revenue as car parks service provider. The main objective of the security measure implemented in these systems is to prevent parking ticket fraudulent, faster access and exit verification and driver's or car owner's safety. Among the systems found during the search of existing car park's security systems are Federal APD – Airport Parking Control and Security System which controls and monitors access and exit system from the parking facility through License Plate Recognition[8], Amano LPI System which tracks vehicle entry by license plate number and parking ticket to eliminate error or parking theft [9]. Other parking systems found are Proximity Reader which uses ASP Electrostatic Proximity Technology by Amano Cincinnati which verifies user by the signal receives from the card embedded with CMOS microchip [10] and

TransCore Parking, Security and Access Control System which uses Amtech®-brand radio frequency identification (RFID) technology for wireless automatic vehicle identification (AVI) parking and access control applications [11]. The process, outcome, advantages and disadvantages of systems mentioned above will be explained further in Chapter 5: Results and Discussion.

2.5 Why Smart Card Over Biometrics?

When the project was first proposed, the author had to choose whether to use biometrics or smart card as the verification key for this system. Most people think biometrics is the solution when security is involved. However, according to Steve Hunt, vice president and security research leader at Giga Information Group (2002)

> In my view, biometrics, as cool as they are, suffers many of the shortcomings of passwords. Because you can lift them--just like you steal a password, you can steal a biometric signature or fingerprint or face. Passwords are often considered not private because people can figure out what those passwords are, or they're passing clear text across the wire. And faces and fingerprints are not private--you leave fingerprints all over the place, on everything you touch.
>
> The bottom line is that biometrics suffers many of the same shortcomings as passwords, and they're a hell of a lot more expensive than passwords. So why use them? The answer is, you can use them in conjunction with a smart card. [12]

Besides that, smart cards provide a portable storage mechanism for the biometric template. This means template management is eliminated across the biometric reader network. [13] The statement above supports Steven Hunt's opinion regarding the use of biometrics in security system as it will be more reliable and compatible when being used together with smart card. Furthermore, this computer card (smart card) can be programmed to perform tasks and store information. [14]

Although using security tokens or smart cards requires more expense, more infrastructure support and specialized hardware. Still, these used to be a lot cheaper than

biometric devices and, when used with a PIN or password, offer acceptable levels of security, if not always convenience. [18]

Based on the supporting evidences, the reliability of biometrics system in the future depends on its collaboration with smart cards. Therefore, smart card is selected to be used for this system as it offers a promising success than biometrics system in the future due to its versatility which allows it to be adopted in many areas of applications.

CHAPTER 3: METHODOLOGY

In this chapter, the methodology used for the project development will be described briefly. In consideration of the time frame given, Rapid Application Development was chosen for this project. Based on its adjustments in the SDLC phases, part of the system developed can be developed quickly and handed over to the users. This approach shall help limit the changes forced thus saving development time as well as the cost needed to build this project. In this chapter, the system architecture for the developed system is included to provide further understanding of how the system works.

3.1 System Architecture

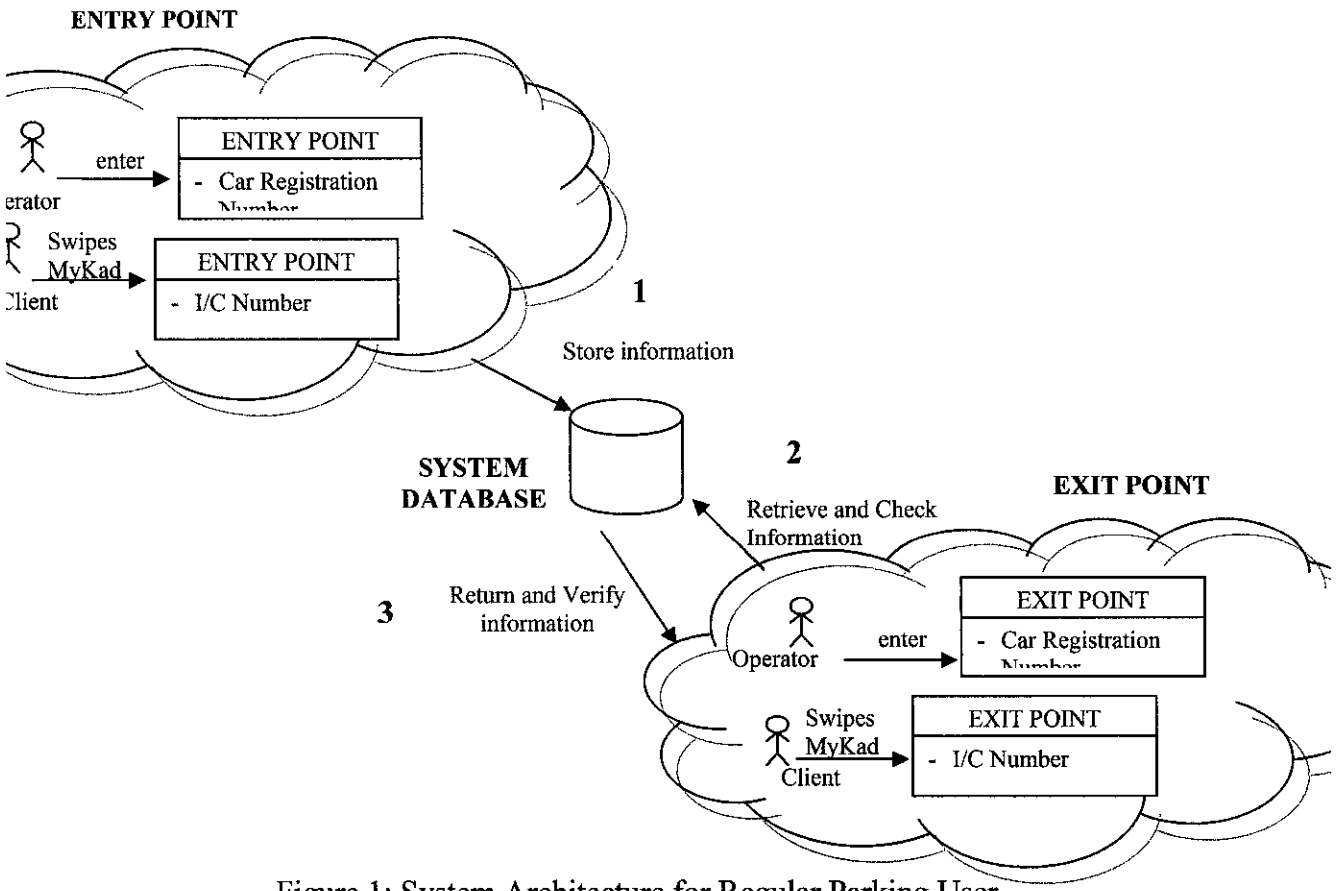


Figure 1: System Architecture for Regular Parking User

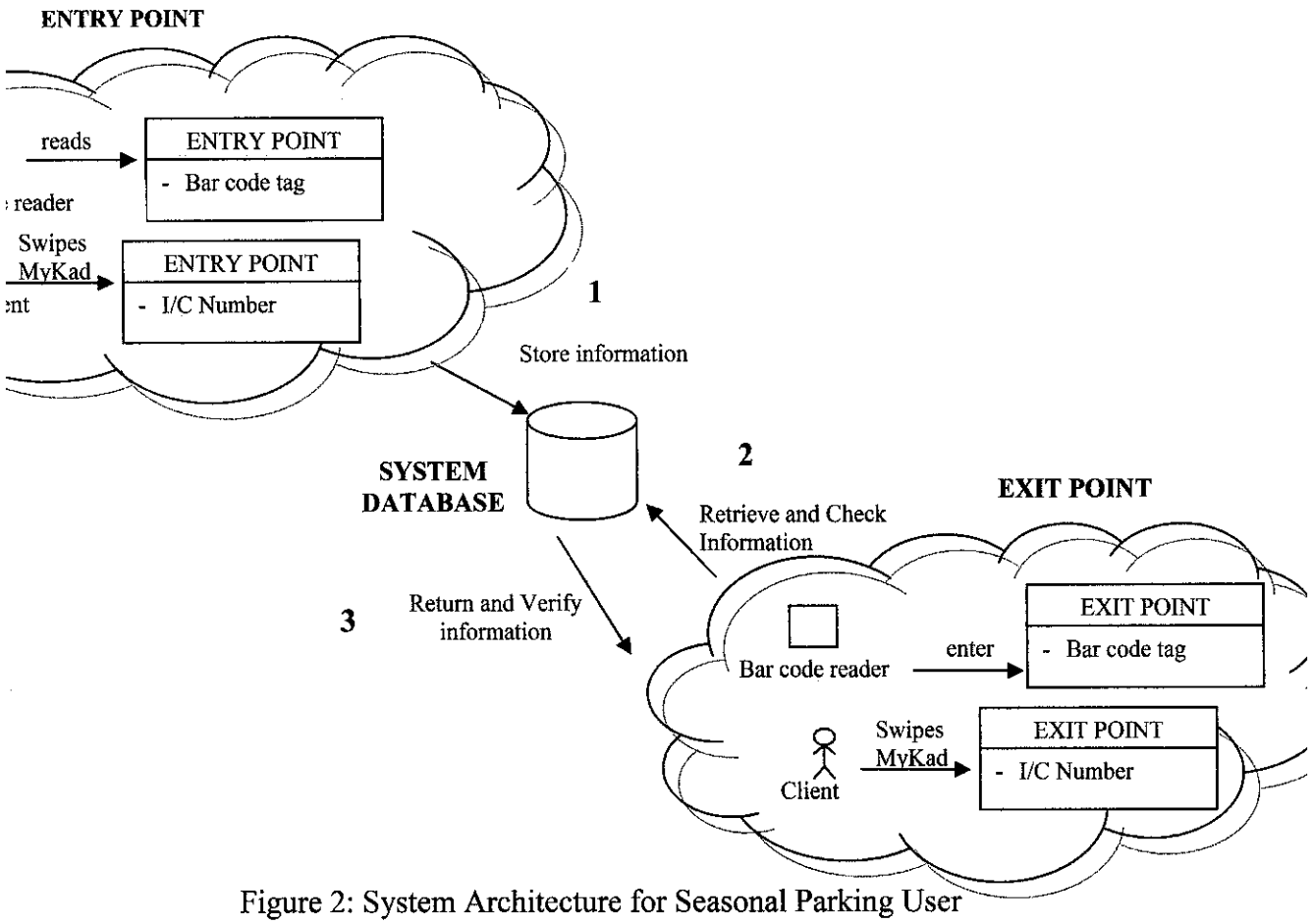


Figure 2: System Architecture for Seasonal Parking User

Based on the system architecture depicted in Figure 1, the system consists of three major components which are the entry point, the exit point and the system's database. At the entry point, parking operator enters the incoming car's registration number while the car driver swipes his/her MyKad for I/C number retrieval. Both inputs are stored in the database.

At the exit point, parking operator once again enters the registration number of the outgoing car. The car driver will have to swipe his/her MyKad again at this point. These inputs are used as query attributes for the database. The database then returned to the system whether the information given at the exit point exists and match with the information gathered at the entry point. If the information does not match or does not exist, the system will warn the parking operator and the car driver of the status. Car driver

is not allowed to leave the parking area. If the information exists and match, the system will verify the car driver as the correct owner of the vehicle. Therefore, the car can be driven out of the parking area.

The same procedure is also being applied for the seasonal parking users. However, based on Figure 2, parking operator is being replaced with a bar code reader. The bar code reader will read a bar code tag which is provided to all seasonal parkers.

3.2 Class Diagram

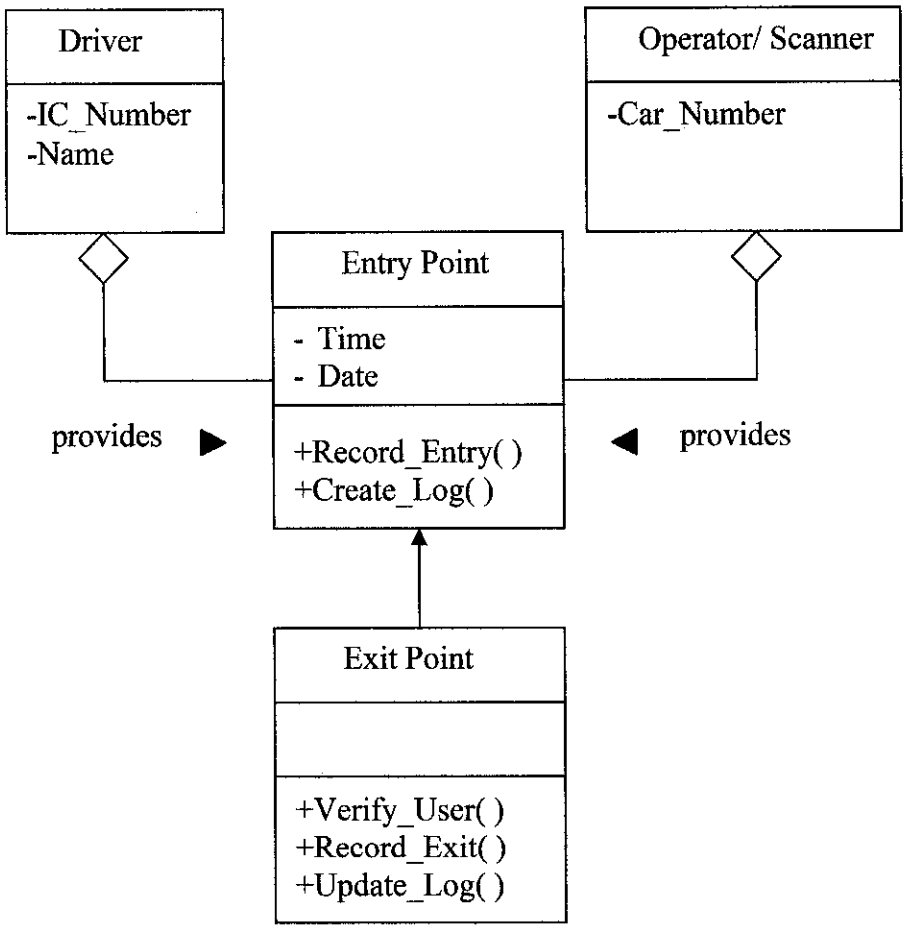


Figure 3: Car Theft Prevention System Class Diagram

3.3 Procedure Identification

3.3.1 Research

To collect information regarding this project, the followings approach were taken:

- Literature reviews – Finding out about car theft statistics in Malaysia as well as the security measures currently implemented by car park management.
- Survey – Survey is conducted to the target user to get their feedback regarding the to-be developed system. The survey also gathers information about public's awareness towards vehicle theft issues and their opinion regarding current security systems implemented in parking area.
- Verification key assessment – Assessment of biometrics system and smart card system based on its functionality, reliability, usability and the advantages and disadvantages of both systems. Results of the assessment determined the verification key used for this system.
- Device assessment – Finding out about the card reader devices available in the market and their main features. Research about the cost breakdown for each type of card reader was conducted. Results of device assessment determine the suitable card reader used for this project.

3.3.2 Development Methodology

For the development of this project, RAD (Rapid Application Development) is used considering the time frame given is quite short. This development method was chosen based on categories that indicate the suitability of adopting this development method. The categories are project scope, project data, project decisions, project team, project technical architecture and project technical requirement. [5] The RAD category that best suits this project is Iterative Development. The development methodology is presented in Figure 2.

The iterative methodology breaks the overall system into a series of versions that are developed sequentially. The analysis phase identifies the overall concept, and the project team, users and system sponsor then categorize the requirement into a series of versions. The most important and fundamental requirements are bundled into the first version of the system. The analysis phase then leads into design and implementation, but only with the set of requirements identified for version 1. [6]

The basic idea behind iterative enhancement is to develop a software system incrementally, allowing developer to take advantage of what was being learned during the development earlier, incremental, deliverable versions of the system. Key steps in the process were to start with a simple implementation of a subset of the software requirements and iteratively enhance the evolving sequence of versions until the full system is implemented. At each iteration phase, design modifications are made and new functional capabilities are added. [7]

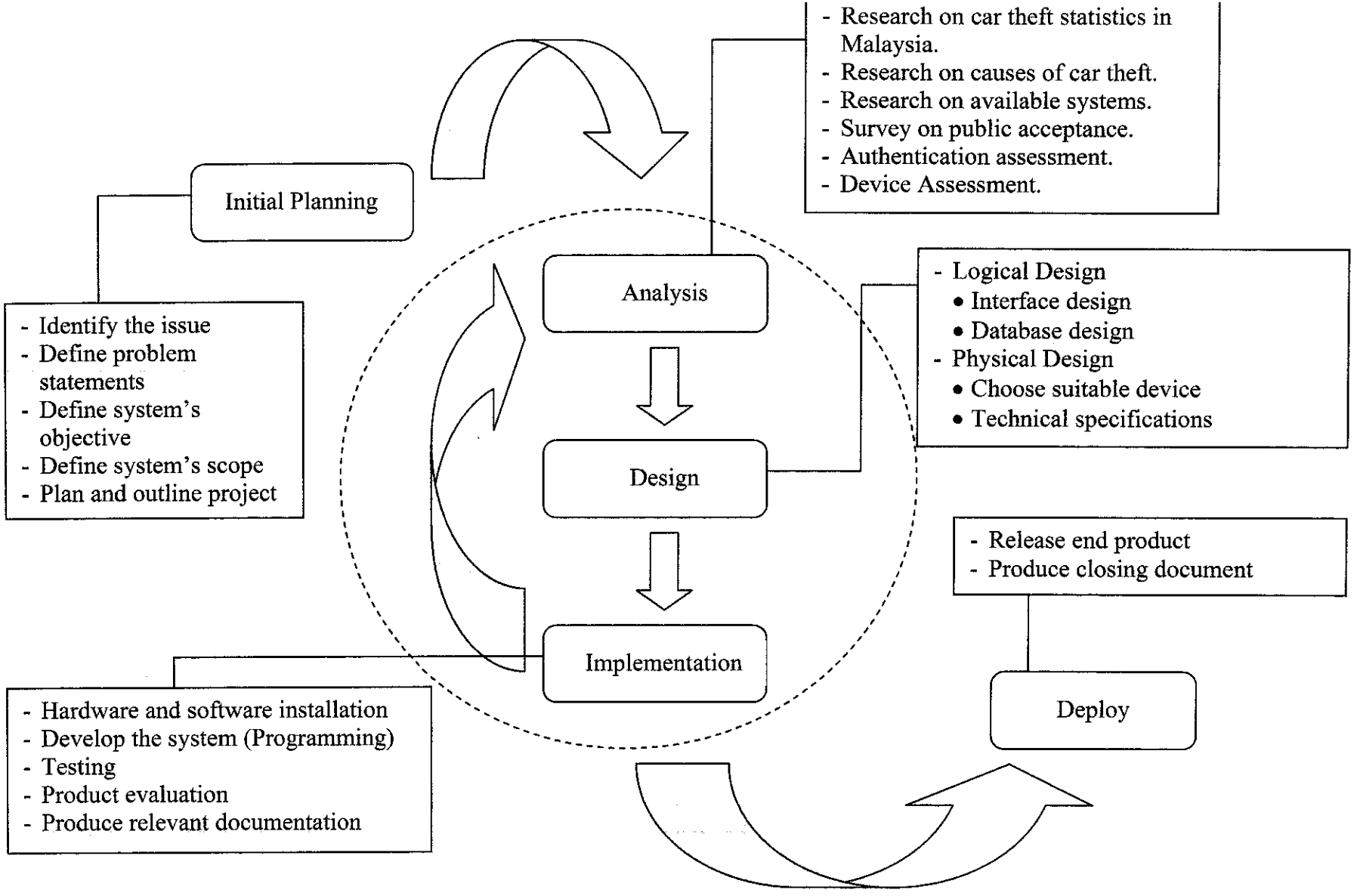


Figure 4: Iterative Methodology

3.3.2.1 Planning

In the planning stage, brainstorming about this project was done. In determining the type of project to be developed, the issue has to be identified first. In this case, it is the car theft issue. Then, the problem statement of the issue selected is listed followed by the main objectives of the system. Next, the scope of the system is determined at this stage. The scope defined helped in ensuring the project is achievable by the end of the project period. Once the system's objectives and system's scope are clearly determined, the project plan is initiated. Project plan describes how the system will be developed and the list of tasks should be executed throughout the system development life cycle. The planning of this project was outlined very carefully as it determines whether the product is be able to be delivered at the end of the time frame given.

3.3.2.2 Analysis

For the analysis phase, two major activities are conducted which are research, survey and assessments. Research and survey was done to find out more about the case being studied which is car theft statistics and cases in Malaysia. Besides that, a research is also done to find the causes or factors of car theft cases especially in parking areas. The research conducted is very crucial in determining the user of the system and the expected system functionality.

A research of currently available security systems for car parks is also initiated. This area of research is crucial in order to avoid redundancy of the existing system. At this stage, problems and drawbacks of the current security system are collected to ensure that the system is be able to strengthen the currently available system. If an almost similar product is found, research area should focus on how to improve the existing system rather than 'going around the cycle' work.

A survey was also be initiated at this stage. The purpose of the survey being conducted before the development phase is to get feedbacks from the public regarding the

developed system. The survey includes the information regarding public's awareness towards the current vehicle theft issue and their opinion about the current security system in parking areas.

In the analysis phase as well, the authentication assessment was performed (smart card system and biometrics system). The assessment conducted for both authentication systems focused more on the pros and cons of adopting one of them for this system. The results achieved at the end of this assessment play an important role in supporting the project's intention to adopt a smart card authentication to be implemented in this project. All possible findings concerning the project are carefully reviewed to ensure the best solution is proposed to the end user.

Last but not least, device assessment is also conducted. Since this project is designed to implement smart card authentication, therefore assessments of available smart card reader is conducted. In view of the fact that this project is based in Malaysia, hence the information of the devices will be gathered from the local smart car readers' manufacturer. The result of the assessment determines the type of card reader used for this system as well as the user interface for this system.

3.3.2.3 Design

Design phase is also considered as one of the most challenging part in Software Development Life Cycle phase. In this phase, the design of the system must be carefully developed. This is to ensure that user's interactivity with the systems meets user's expectation. Therefore, the design phase was divided into two major design areas. They are logical design and physical design. In the logical design are, the interface design and the database design is initiated. Both interface and database design is very important to ensure great human interactivity with the system and also good system process and flow.

As for the physical design of this system, the technical specification of the system is established. The technical specification includes the selection of hardware and devices

used for this system as well as the tools and platform needed in building the project. Furthermore, the system's flow and type of validation was also determined in this phase. This is to ensure that the system is reliable and effective for the target users. Good product design derived from these two design areas determined product's value to the society in preventing car theft cases in the parking area.

3.3.2.4 Implementation

This is the phase where the installation of hardware and software needed to build this project takes place. Once both entities are installed, the prototype of the proposed system is constructed. The system is built and later tested to ensure it performs in conformance with the system objectives. For this system, test conducted focused more on device interaction with the OS and its ability to endure long hours of operation. Black box testing was executed during the implementation phase. This test is crucial to ensure the correctness of the system based on the system's requirements.

3.4 Tools Required

3.4.1 Software

- C#
- Oracle 9i SQL+
- MyKad Proprietary SDK

3.4.2 Hardware

- Smart Card reader (MyKad compatible)
- Bar Code reader
- Personal Computer

CHAPTER 4: RESULTS AND DISCUSSION

In this chapter, all the results and findings derived from the research and assessments done are displayed and discussed. The results shown in this chapter covers the car theft statistics in Malaysia and the available car park security systems in the market which are currently being implemented in car park areas. Results from the survey conducted to the public are also displayed in this chapter together with the assessments done on the authentication systems as well as the devices involved for the project.

4.1 Car Theft Statistics

TAHUN	2000	2001	2002	2003	2004	2005
JENAYAH HARTA BENDA						
Pecah Rumah & Curi (Siang)	8,675	7,449	6,821	6,928	6,550	6,923
Pecah Rumah & Curi (Malam)	24,238	21,003	18,444	18,861	18,354	17,542
Curi Motor Lori/Van	3,698	4,306	4,570	5,551	4,892	5,507
Curi Motokar	7,278	8,520	8,544	8,537	8,624	9,711
Curi Motosikal	45,903	47,223	47,137	50,212	51,560	51,709
***Curi Ragut**	15,082	14,368	14,640	15,798	11,536	9,617
Lain-Lain Curi	54,881	33,210	28,043	27,638	33,080	34,317
JUMLAH	**145,569**	**136,079**	**128,199**	**133,525**	**134,596**	**135,326**
JUMLAH JENAYAH INDEKS	167,173	156,469	149,042	156,315	156,455	157,459
KES SELESAI						
TAHUN	2000	2001	2002	2003	2004	2005
JENAYAH HARTA BENDA						
Pecah Rumah & Curi (Siang)	2,102	1,935	1,932	2,265	2,204	2,653
Pecah Rumah & Curi (Malam)	5,408	6,181	6,251	6,266	6,224	7,001
Curi Motor Lori/Van	624	944	1,292	1,565	1,697	1,667
Curi Motokar	1,673	2,119	3,569	4,277	4,217	4,532
Curi Motosikal	12,240	18,679	21,567	22,994	22,792	22,448
Curi Ragut	166	7,142	7,886	8,859	6,197	5,325
Lain-Lain Curi	21,762	14,728	13,353	14,090	17,571	19,629
JUMLAH	**43,975**	**51,728**	**55,850**	**60,316**	**60,902**	**63,252**
JUMLAH KES SELESAI	51,302	61,429	66,540	72,940	72,694	76,284
Peratus Selesai	*32.48*	*39.26*	*44.65*	*48.94*	*46.46*	*48.45*

Table 1: Polis Diraja Malaysia Crime Statistics (2000-2005) [17]

Based on the statistic above, we can see that car theft cases increases every year except in year 2003 where the cases drops by 7 from 8544 cases to 8537 cases. However, the car theft cases reported increased to 87 cases in 2004 and shot to an alarming amount of 1087 cases in 2005. What we can conclude from these figures is that car thieves are getting smarter as they managed to break the security systems installed in the cars. Despite the high-end security system for cars available in the market and the anti-car theft campaign conducted by PIAM (Persatuan Insurans Am Malaysia) [1], car theft cases are still on the rise. Referring back to Table 1, the car theft cases solved by the police force are less than 50% each year. Based on the statistic given, it is obvious that once a car is stolen, it is very hard for the owner to retrieve it back. This is because a stolen car is driven to a warehouse where it is sprayed a new layer of paint, and chassis and registration numbers are altered if it is decided to be shipped out of the country to be sold. Vehicles stolen near the borders like Johore are usually driven out of the country immediately after the preparation and efforts by the police to recover the vehicles are unsuccessful due to lack of cooperation by the neighboring countries. [15]

To support this project's main objective which is to create a car theft prevention system in car parks, statistics of crime cases occurring in shopping complexes as well as hotel car parks are included. The statistics will be depicted in the pie charts below.

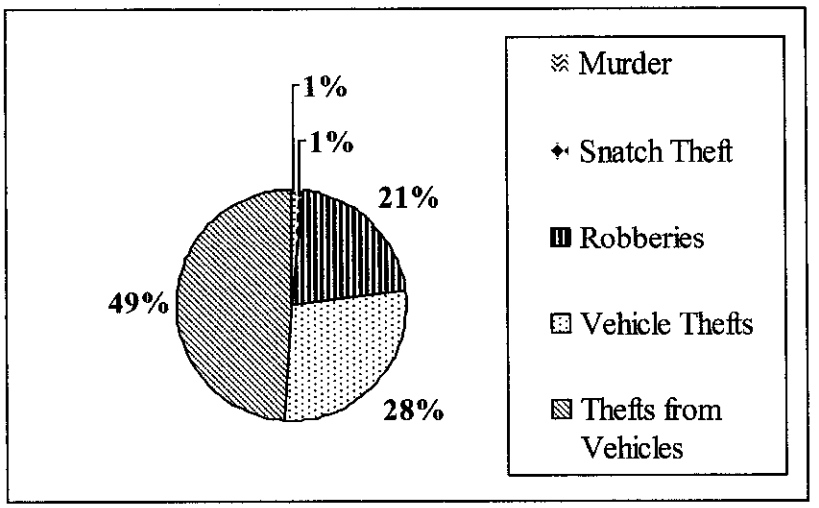


Figure 5: Crime Cases in Shopping Complexes in 2002. Chart is derived from article [3].

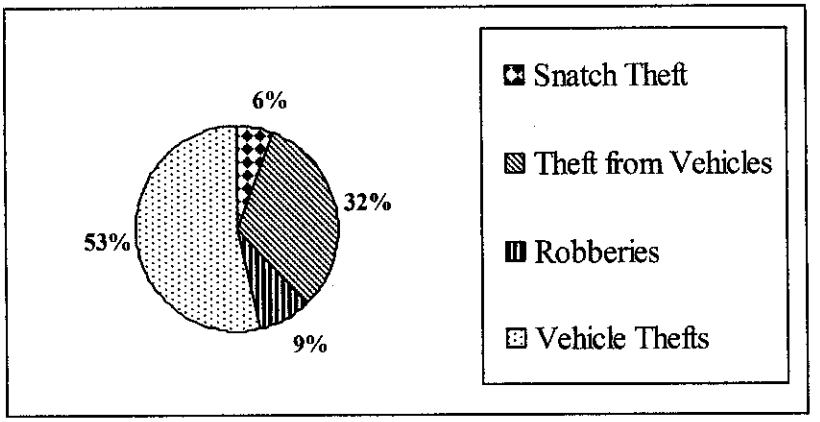


Figure 6: Crime Cases in Shopping Complexes (January 2003 - June 2006). Chart is derived from article [3].

Based on Figure 5, there are five major crimes reported in shopping complexes. They are murder case and snatch thefts which contributed 1% of the overall 108 crime cases, 21% is from robberies, 28 % causes by vehicle thefts and finally 49% of the overall crime cases were of thefts from vehicles. We can see from the chart that vehicle theft is the second highest crime reported in shopping complexes. However, when referring to Figure 6, it shows that vehicle theft has become the highest crime reported in the first half of the year 2003. It contributed 53% from the 82 cases reported to the authorities which double the number of vehicle theft cases reported in 2002.

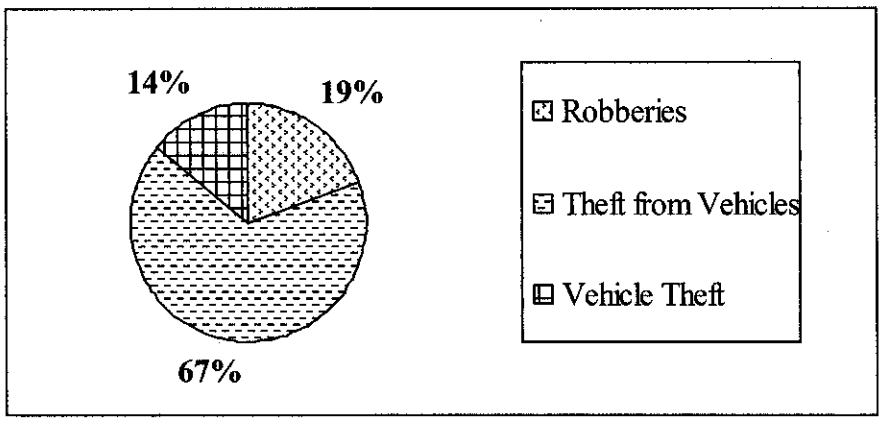


Figure 7: Crime Cases in Hotel Car Parks (2002). Chart is derived from article [3].

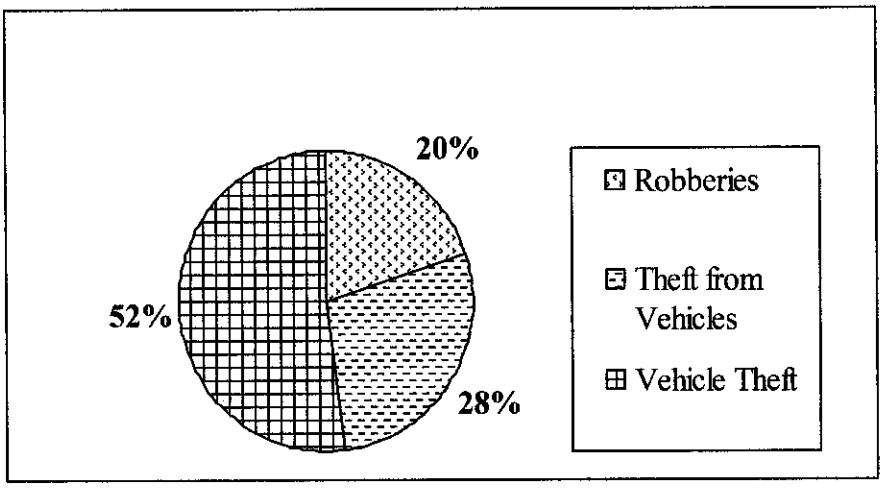


Figure 8: Crime Cases in Hotel Car Parks (January 2003 - June 2003). Chart is derived from article [3].

Based on the pie chart in Figure 7 and Figure 8, there are three main crimes reported in hotel car parks. They are robberies, theft from vehicles and vehicle theft. In 2002, again vehicle theft has become the second highest crime reported in hotel car parks. It contributed 14% from the overall 36 cases reported. In 2003 (from January to June), vehicle theft cases becomes the highest crime reported as it contributed 52% of the overall 25 cases reported. As can be seen, the increase of vehicle theft cases in the first half of the year 2003 is twice higher than the cases reported for the whole year of 2002.

Through the observation done on both crime statistics in shopping complexes and hotel car parks, we can conclude that even in secured places as mentioned above, car theft can still occur. Therefore, by enforcing an additional security system will help to improve the security measures currently adopted by the parking management.

4.2 Currently Available Parking Security Systems

Through some research and studies done, there are a few available parking security systems that are being implemented in car parks. The results listed in the table below are among the security systems that have been implemented in various countries.

In the table, each system will be described which will lead to the conclusion of the reliability of these systems.

NO	SYSTEM	PROVIDER	DESCRIPTION
1.	Federal APD- Airport Parking Control and Security	Federal Sign Corp. USA	- Integrates device technology with image technology - License plate recognition: 1) Reduce ticket fraud 2) Calculate parking time 3) Calculate fees for lost ticket 4) Control traffic 5) Verify access and exit 6) Control access in secured areas. 7) Provide license plate data to local and federal law enforcement agencies when requested.
2.	Amano Cincinnati's License Plate Inventory (LPI) System,	Amano Cincinnati Inc. USA	- Tracks vehicle entry by license plate number and parking ticket. - Prevents use of lost, stolen and swapped tickets - Eliminates fee calculation errors by cashier - Reporting capabilities - Password-protected
3.	TransCore's AVI (Automatic Vehicle Identification)	TransCore	- Uses Amtech®-brand radio frequency identification (RFID) technology for wireless (AVI) parking and access control applications. - Identify and track

			vehicles for secure access control and to accurately collect parking fees. - TransCore AVI is automated to provide hands-free convenience for patrons, and parking owners and operators. - Reduces cash handling and streamlined back-office operations.
4.	PRX120A	Amano Cincinnati Inc. USA	- ASP electrostatic proximity technology. - ASP reader can be mounted directly on or near metal. - Do not require coax or other costly interconnection. - ASP readers can read bi-directionally or single direction. - Verifies user by identifying the signal received from the card which is embedded with CMOS microchip.
5.	CCTV (Closed Circuit Television)	Malaysia	- Monitor activities taking place in car parks. - Suitable for parking area that has a small number of security personnel. - Convenient for large parking areas. - Does not cover all areas and corners. - Hard to monitor on screen when the number of CCTV installed is large.
6.	Security personnel	Malaysia	- React faster when encountered with crimes.

			- Not well trained. - Not adequate in certain premises. - Receives low pay, thus lack sense of responsibility.

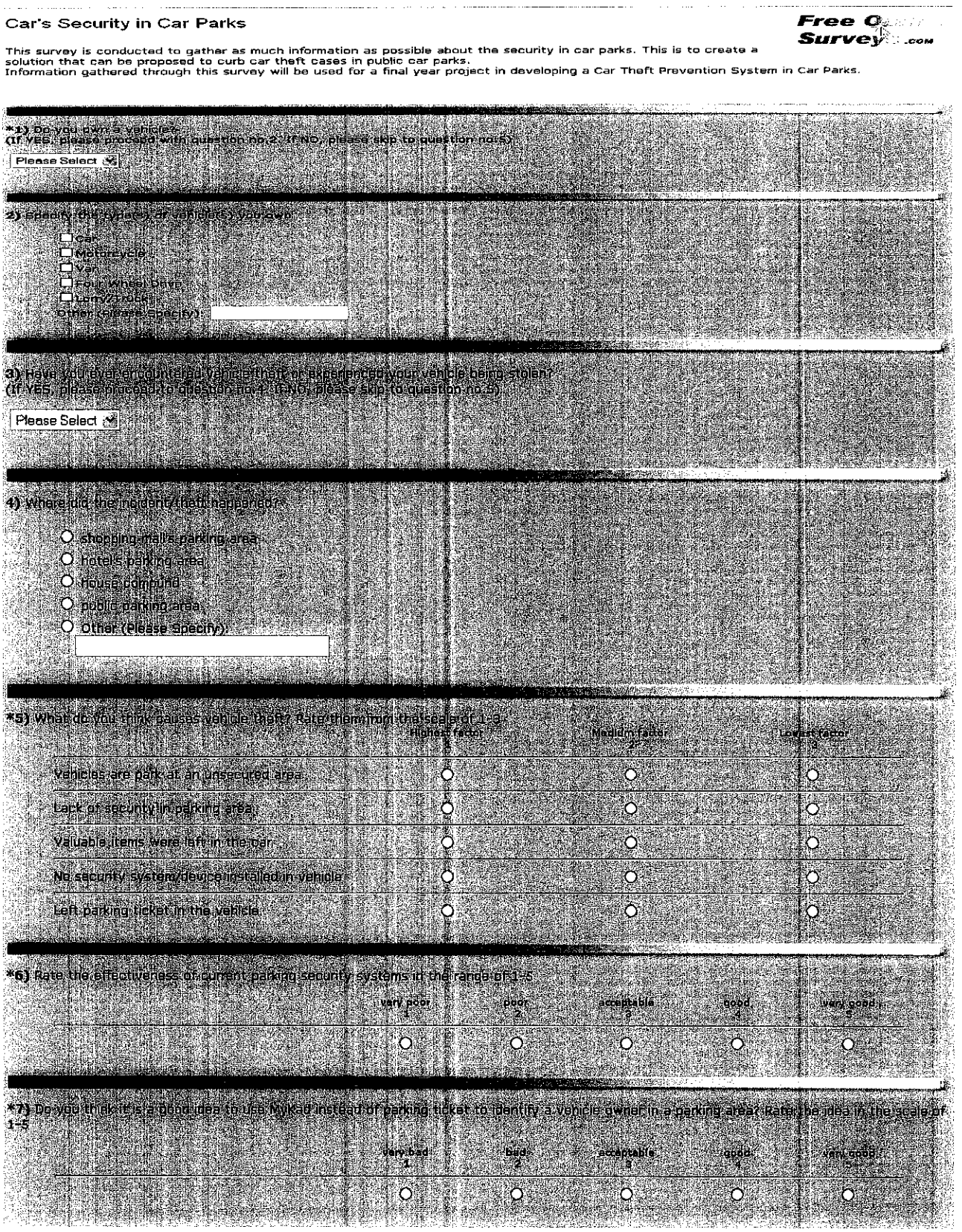
Table 2: Current Parking Security Systems. Derived from articles [8], [9], [10], [11].

Based on the findings above, we can conclude that the available systems are mostly focused on profit making to the parking management than offering security to the users (car owners). This is because the systems are developed to prevent parking tickets fraudulent as well as to ensure that the system managed to calculate the accurate parking fee for each customer using their service. It cannot be denied that some of these systems do implement an element of security by using the parking tickets and monitoring through CCTV. However, using a single authentication method, it is easier for car thieves to steal cars out of the parking areas. CCTV system implemented is currently the best security installed in the parking areas. Though it is suitable for large parking areas with minimum number of security personnel, it is almost impossible to install too many CCTV in large area. This is because it will be difficult for the security personnel in the control room to monitor each and every camera installed. This proclamation is supported by the statement made by Richard Chan, president of the Malaysian Shopping Complexes and High Rise Buildings Management Association (2003). He said that based on one suggestion of 23sq m per camera calculation, some big shopping centers in town would have to install some 1,500 cameras and that would make the task of monitoring every screen rather tough. [3]

4.3 Survey on Public's Acceptance

A survey was conducted online using www.freeonlinesurvey.com. A URL was created where respondents did their survey through the address sent to their e-mail. The purpose of the survey is to get the public's level of awareness about the issue as well as

their opinion towards the current system as well as the to-be developed system. The questionnaire form being distributed is as follow:



Car's Security in Car Parks

Free O... Survey...com

This survey is conducted to gather as much information as possible about the security in car parks. This is to create a solution that can be proposed to curb car theft cases in public car parks.
Information gathered through this survey will be used for a final year project in developing a Car Theft Prevention System in Car Parks.

*1) Do you own a vehicle?
(If YES, please proceed with question no.2. If NO, please skip to question no.5)
Please Select

2) Specify the type(s) of vehicle(s) you own:
- Car
- Motorcycle
- Van
- Four Wheel Drive
- Lorry/Truck
- Other (please specify):

3) Have you ever encountered car theft or attempted your vehicle being stolen?
(If YES, please proceed to question no.4. If NO, please skip to question no.5)
Please Select

4) Where did the incident/theft happened?*
- shopping mall's parking area
- hotel's parking area
- house compound
- public parking area
- Other (Please Specify):

*5) What do you think causes vehicle theft? Rate them from the scale of 1-3

	Highest factor 1	Medium factor 2	Lowest factor 3
Vehicles are park at an unsecured area			
Lack of security in parking area			
Valuable items were left in the car			
No security system/device installed in vehicle			
Left parking ticket in the vehicle			

*6) Rate the effectiveness of current parking security systems in the range of 1-5

very poor 1	poor 2	acceptable 3	good 4	very good 5

*7) Do you think it is a good idea to use MyKad instead of parking ticket to identify a vehicle owner in a parking area? Rate the idea in the scale of 1-5

very bad 1	bad 2	acceptable 3	good 4	very good 5

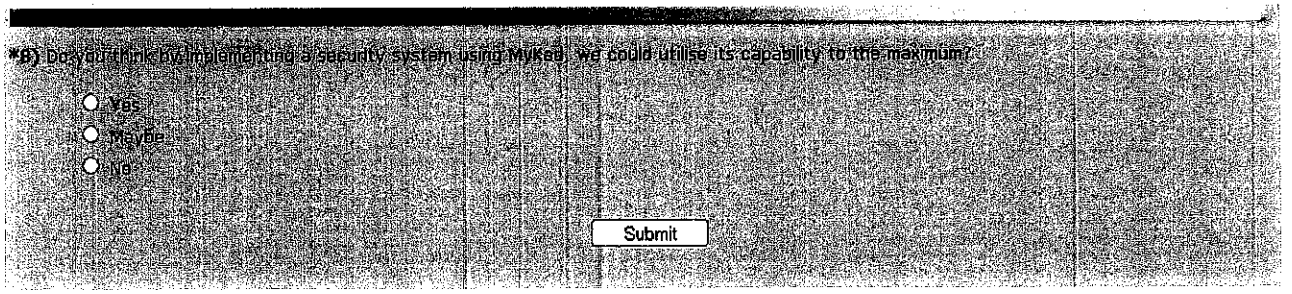


Figure 9: Online Survey Form

There were 69 respondents for the survey conducted. The results of the survey are being depicted in the diagrams below. Each diagram represents the result from each survey. See the diagrams below for further understanding:

- Question 1:

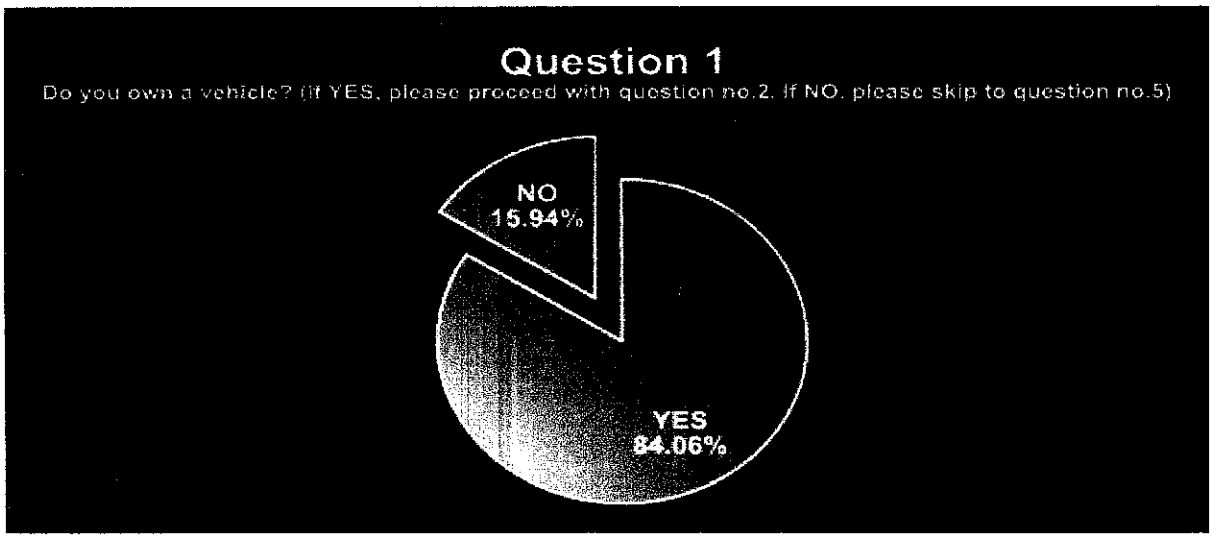


Figure 10: Result for Question 1

Based on the diagram above, 15.94% (11) respondents do not own a vehicle while 84.06% (58) respondents own at least a vehicle.

- Question 2:

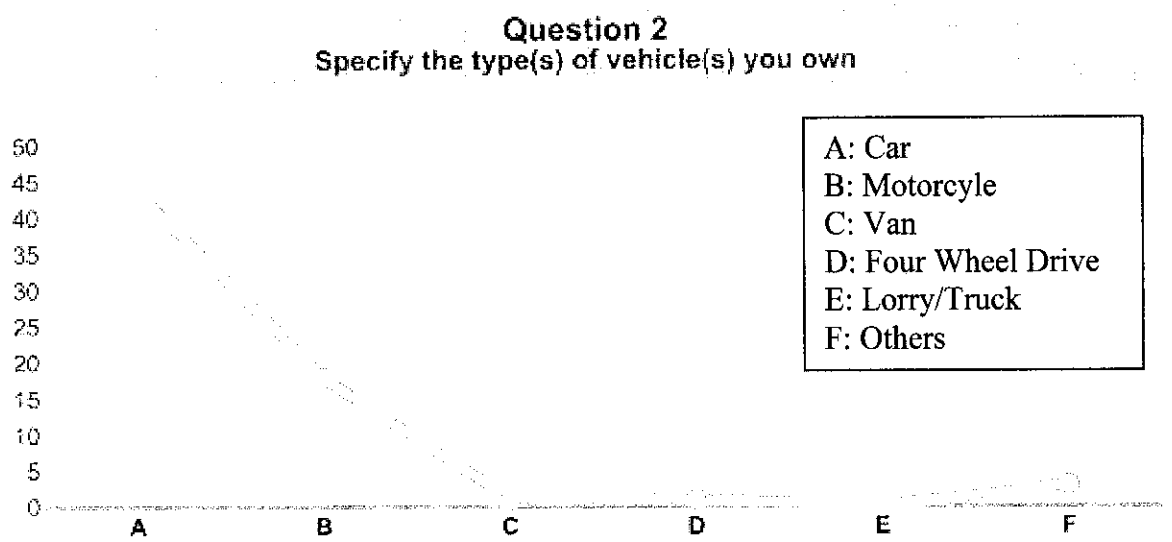


Figure 11: Result for Question 2

Based on the above results, 44 out of 58 persons own a car while18 of them owns a motorcycle. Only one person owns a van and a four wheel drive vehicle each and three out of 58 persons own other types of vehicle. Approximately 9 people own more than one vehicle (Refer to Appendix 1.4).

- Question 3:

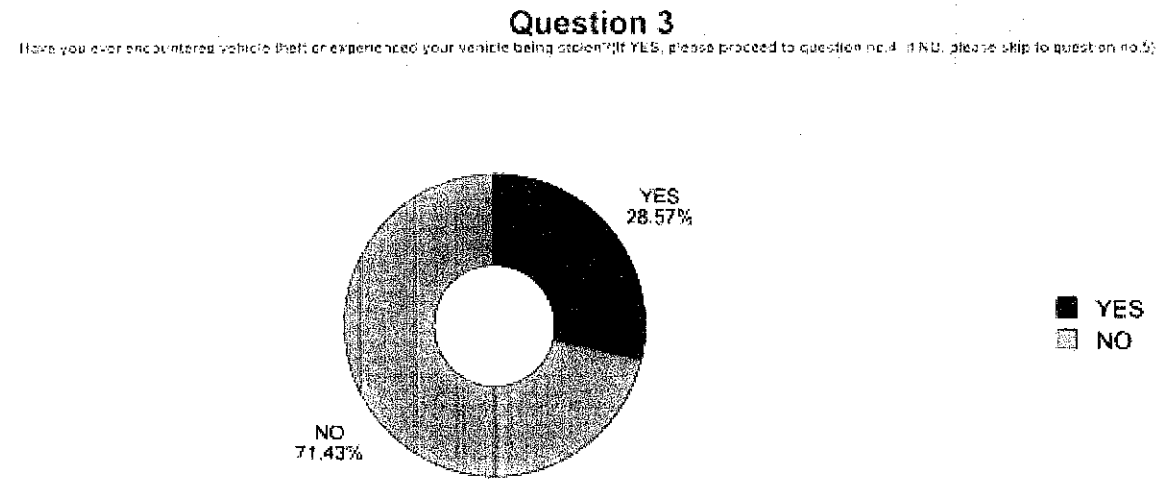


Figure 12: Result for Question 3

Based on the survey in Question 3, 16 out of 56 respondents experienced or encountered vehicle theft. 40 of them however, have never experienced the situation before.

- Question 4:

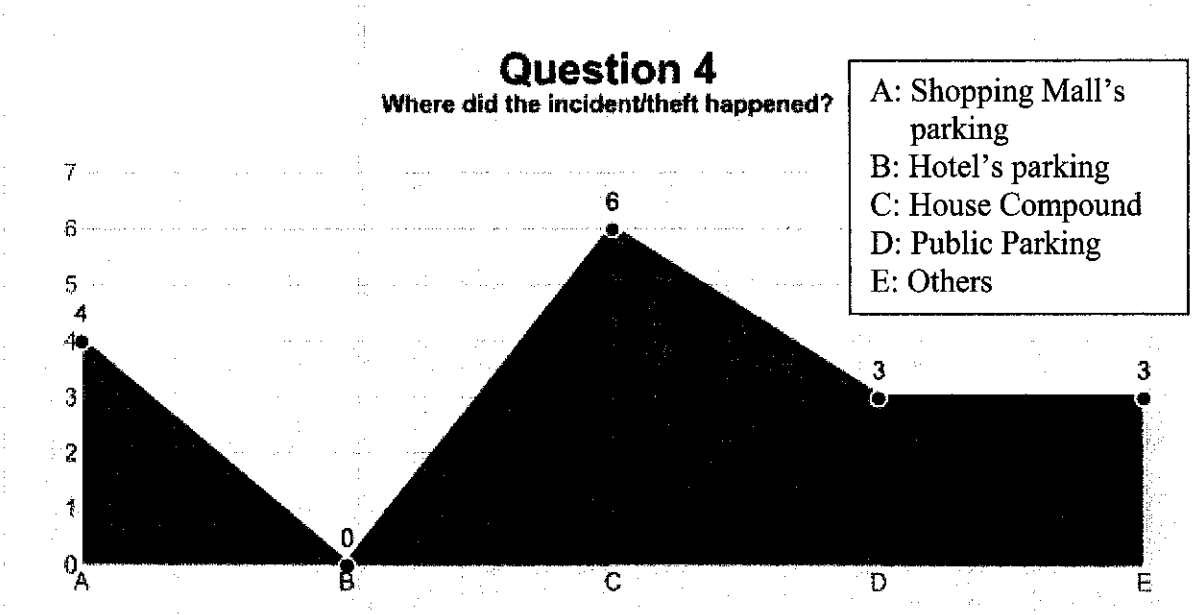


Figure 13: Result for Question 4

Result on question 4 however, indicates that only 16 respondents recalled where the incident occurred. 4 of them encountered with such incident in a shopping mall's parking area. None of them ever encountered it in a hotel's car park. Most of the respondents (6 people) experienced such incident near their house compound while 3 respondents state that the incidents took place in a public parking area. 3 others indicate that vehicle theft occurred in other places such as outside snooker hall, at a cafeteria parking lot and in an apartment's parking lot. The results above signify that vehicle theft can happen anywhere even in a secured place such as shopping mall's parking lot as well as apartment's parking lot.

- Question 5:

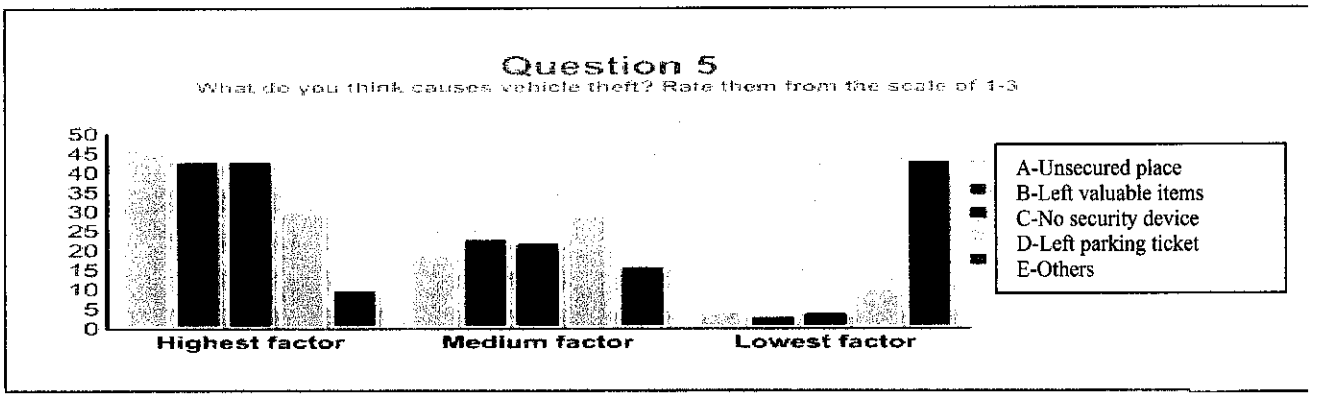


Figure 14: Result for Question 5

Based on the above diagram, it shows that 46 respondents voted unsecured parking place as the highest factor that causes vehicle theft. 19 respondents think that it is a medium factor that causes vehicle theft. However, 4 respondents claim that parking their vehicle in an unsecured place is the lowest factor that causes vehicle theft.

43 respondents on the other hand voted that drivers who left their valuable items in their car and not installing a security device to their vehicle caused vehicle theft are the main factor that causes vehicle theft. 23 respondents voted that leaving valuable items behind is just a medium factor that contributes to vehicle theft while only 22 respondents commented that not installing a security device is a medium contributing factor towards vehicle theft. On the contrary, 3 respondents think that factor B is just a low factor and 4 respondents voted factor C as the low factor which contribute to vehicle theft.

30 respondents on the other hand voted that leaving parking ticket in the vehicle becomes the highest factor that contributes to vehicle theft while 16 respondents believes that it is only a medium factor. However, most respondents (43) think that leaving the parking ticket in the vehicle is only a low contributing factor towards vehicle theft.

- Question 6:

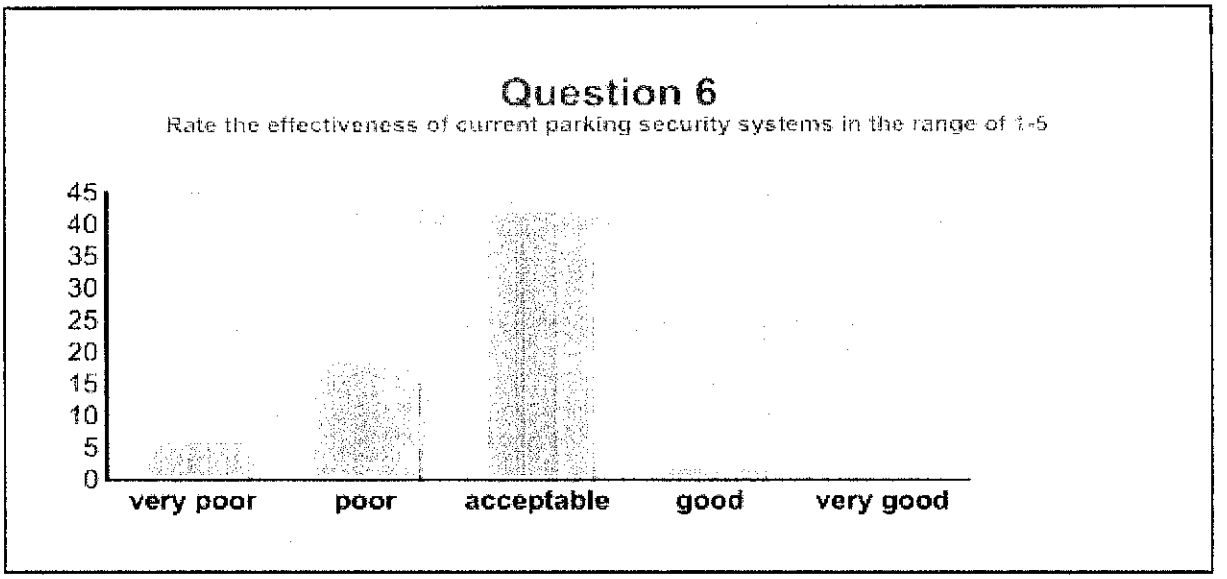


Figure 15: Result for Question 6

In Figure 15, most respondents (42) voted that the current security install in the parking area is acceptable and adequate. 19 respondents claimed that the current security system is poor and 6 of them thinks that the service is very poor. 2 respondents approved that current security system implemented is good enough to curb theft vehicle. However none of the respondents voted the current system as very good. Therefore, we could summarize that the current system is average and need improvement to assure public's trust towards their system.

- Question 7:

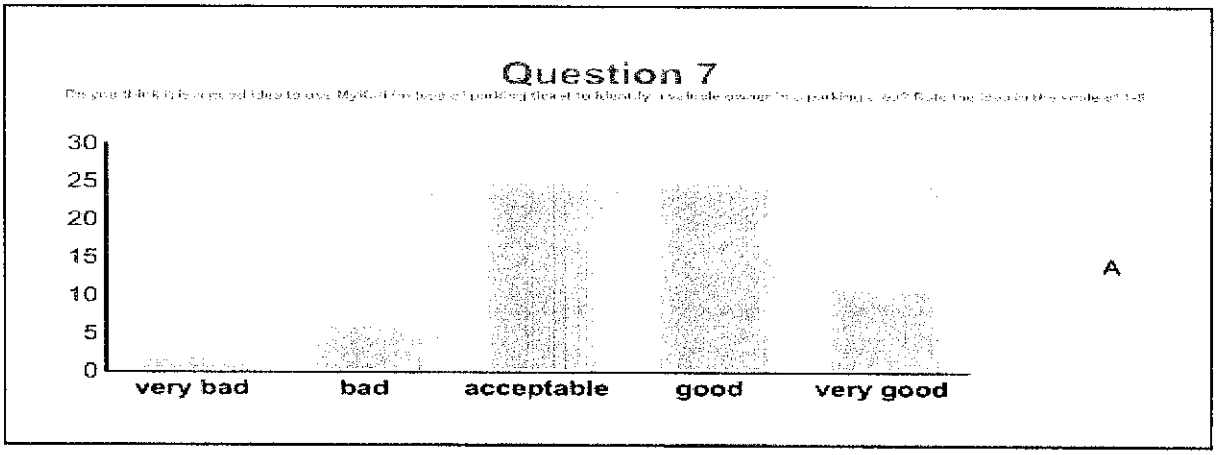


Figure 16: Result for Question 7

When asked about the proposed system, there are 25 respondents voted the idea as acceptable and good. 11 respondents on the other hand think that the idea is very good to be implemented in order to enhance the current security system. However, 2 respondents rate the idea as bad and 1 respondent rate the as very bad. Based on the result, we can be seen that the idea is widely accepted by the public. Therefore, it shows that developing the system is a worthwhile effort as the public believed that it could change the current vehicle theft scenario.

- Question 8:

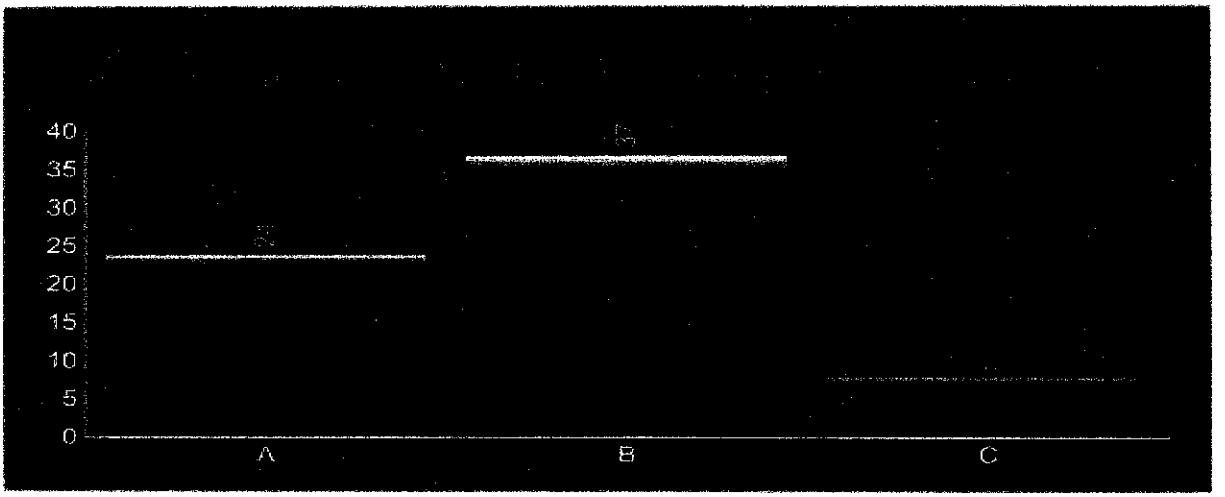


Figure 17: Result for Question 8

Based on the survey conducted, 24 respondents agree that MyKad capabilities can be utilize to the maximum when the security system is being implemented. 37 respondents on the other hand believe that maybe by implementing the security system using MyKad allow its capabilities to its fullest extent. However, 8 respondents do not agree by the idea that MyKad capabilites is being used to its highest capacity. Therefore, we could conclude that most of the public think that may be applied in this system to enhance its capability and ensure its value to the society.

4.4 Authentication Assessment

In implementing security systems, there are three types of authentication method can be used. They are password system, token or smart card system and biometric system. Password system can be easily defined as something that you know such as password and PIN number. In such system, user will usually determine the password or PIN number to be used which others do not know. The token or smart card system on the other hand is based on what you have such as your identification card (MyKad) and student ID card. These token is created for the user as an object to verify the user in a specific application or system and it belongs only for the dedicated individual. Last but not least is the biometric system which verifies user by what they are such as physical traits or behavioral characteristics. The elements used in biometric systems are universal as everyone has it but different people have different pattern of characteristics and traits. The differences of each authentication method are described in the Table 3. Based on the table illustrated, we could see the advantages and the disadvantages of each authentication system. This project's intention to use smart card system will be supported through the description listed in the table.

Password System (What you know)	Token or Smart Card System (What you have)	Biometric System (What you are)
- Widely used method - Easy to change - No additional hardware required. - Accepted method of authentication. - Allow password sharing - Easy to intercept - Password theft is hard to be detected. - Vulnerable to guessing, dictionary and brute-force attacks. - Confusing when	-No need to remember password. -Smart card theft is easily detected. Prevent unauthorized access. -Cannot be used simultaneously (different person and different place). -Allow applications to be written in the smart card. -Additional hardware required. -Authentication device may be lost, damage or	- Unique and universal. - Cannot be changed. - Pattern recognition problem. - Biometric matching errors: 1) False acceptance 2) False rejection - Not accurate and dependable enough. - Privacy violation becomes easier and more damaging. - Accuracy is impossible to assess before deployment.

different password is needed for different application.	stolen. -Power problem. -Subjected to reverse engineering and other treatment which compromise security.	- Cost of failure is high.

Table 3 : Assessment of Authentication Method in Security System. Derived from article [16] and [12]

To create a better security for a system, strong authentication can be implemented by using two-factor authentication. Two-factor authentication usually uses 'what you know' as one of the factor together with either 'what you have' or 'what you are'. [16] Based on the statement, the to-be system is implementing two-factor authentication where car registration works as 'what you know' while MyKad acts as 'what you have'. Besides that, MyKad capability to store images such as card holder's picture and finger print allows it to work together with biometric system. Furthermore, smart cards provide a portable storage mechanism for the biometric template. This means template management is eliminated across the biometric reader network [13] which eradicates the possibility of identity theft over the network.

4.5 Device Assessment

In this part of the report, I shall summarize the type of card readers available together with its description and functionality in Table 4. The cost of each device will also be included in the table so that a decision can be made on which card reader should be used to develop the prototype of this system. In order to support author's decision in using smart card system, the cost of a biometric reader will also be included. There are two main smart card reader and biometric reader in Malaysia. Therefore, the listed products are manufactured by these two companies.

Model	Manufacturer	Description	Cost
SCR 20	IRIS Corporation Berhad	- Smart card reader/writer. - Smart card OS supports Microsoft Windows. - Sliding contact smart card reader. - Access speed up to 96 kbps. - Communication speed up to 1.5 Mbps over USB communication. - Can be linked to PC via USB or serial cable. - Compact and light weight. - Flexible as it is compatible with IRIS range of smart cards.	RM 135.00
ST-Bio	IRIS Corporation Berhad	- Biometric scanner - Uses imaging technology and sensors for authentication and access control. - Scans finger print. - Connection interface using serial cable or RJ45. - Compatible with Microsoft Windows OS. - Capture rate 15fps.	RM 1000.00
SCR30	Integrity Business Solution Sdn Bhd	- Smart card reader/writer - Connectivity through USB interface - 1.5 Mbps over USB communication - Access speed up to 96 Kbps - Support Microsoft Windows OS - Sliding contact smart card connector.	RM 230.00
SCR 3311	Integrity Business Solutions Sdn Bhd	- Smart card reader/writer - Connectivity through USB interface - Heavy metal based. - Top slot card insertion	RM 400.00

Table 4 : Product Description and Cost. Derived from [19], [20], [21].

Based on Table 4, there are three types of card reader offered by two different manufacturers. As can be seen, all three card readers hold the same functionality and capability. Therefore, the most cost saving device of all would be SCR 20 by IRIS Corporation Berhad. The card reader capability should be adequate to serve the purpose of creating a prototype for the car theft prevention system. Besides that, we can also conclude that is not practical to implement biometric authentication for this system as the device is more expensive compared to a card reader. Having a costly device might draw away potential customers (parking management) to adopt this security system for their parking service.

4.6 Testing and Results

This subsection explains the test conducted and the results derived out of these tests. The conducted test discussed in this subsection is black box testing.

4.6.1 Black Box Testing

Black box testing was conducted with the purpose to ensure that the system developed meets the objectives set during the analysis phase. The main objective of the test conducted was to ensure that the system gives correct output according to the input or status of the current process state. The correctness of the system flow was also identified and tested during the black box testing. This testing was carried out throughout the project's development phase.

4.6.1.1 Results of Black Box Testing

Shown in this subsection are the expected output for the correct condition and false condition of the system. The results are divided into two major categories which are ***Regular Parking User System*** and ***Seasonal Parking User System***.

Regular Parking User System

1) *Correct Operation for Entry Point*

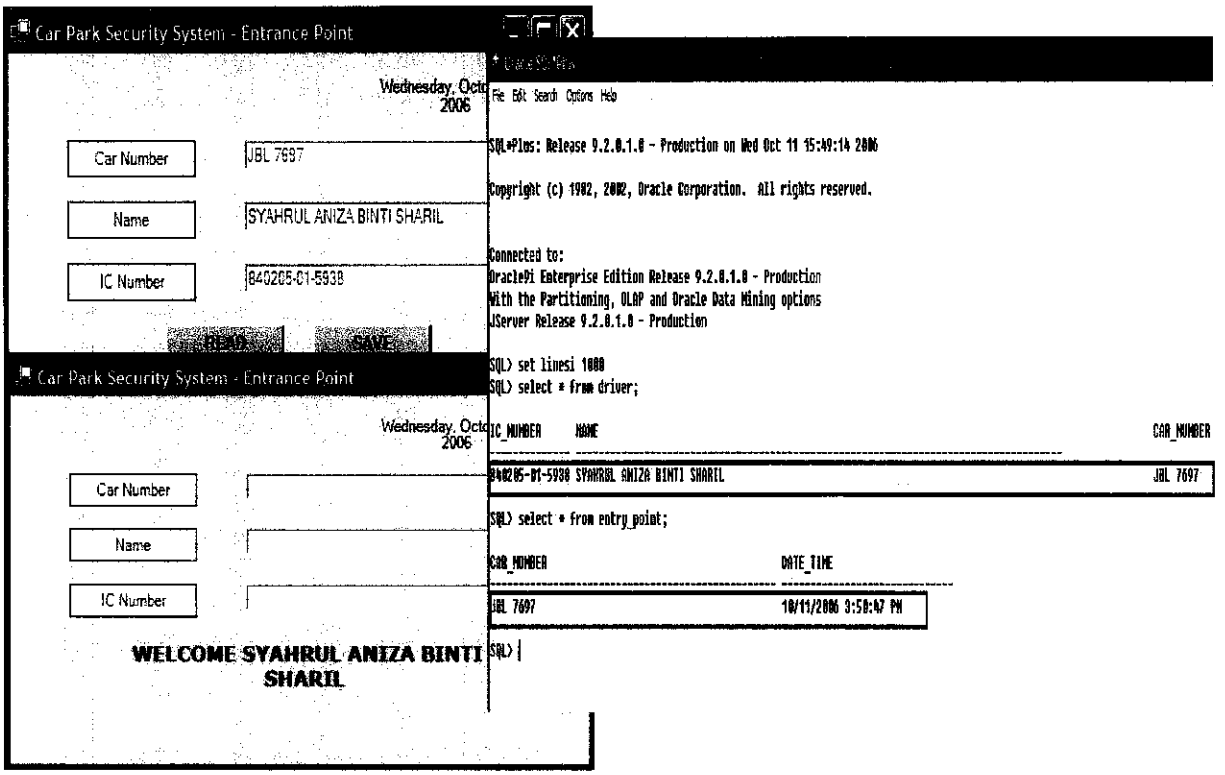


Figure 18: Correct Operation for Regular Parking User –Entry Point

Based on Figure 18, correct operation at the Entry Point for Regular Parking User will display a welcome message if MyKad is successfully read and saved. The data captured at this point will be saved in the *driver* table and the *entry_point* table. The screen snapshots in the above figure, shows the flow of the system. First, acquiring the information then, saving the information retrieved into the database and finally, the welcome message display which indicates that information has been successfully saved into the database.

2) *Correct Operation for Exit Point*

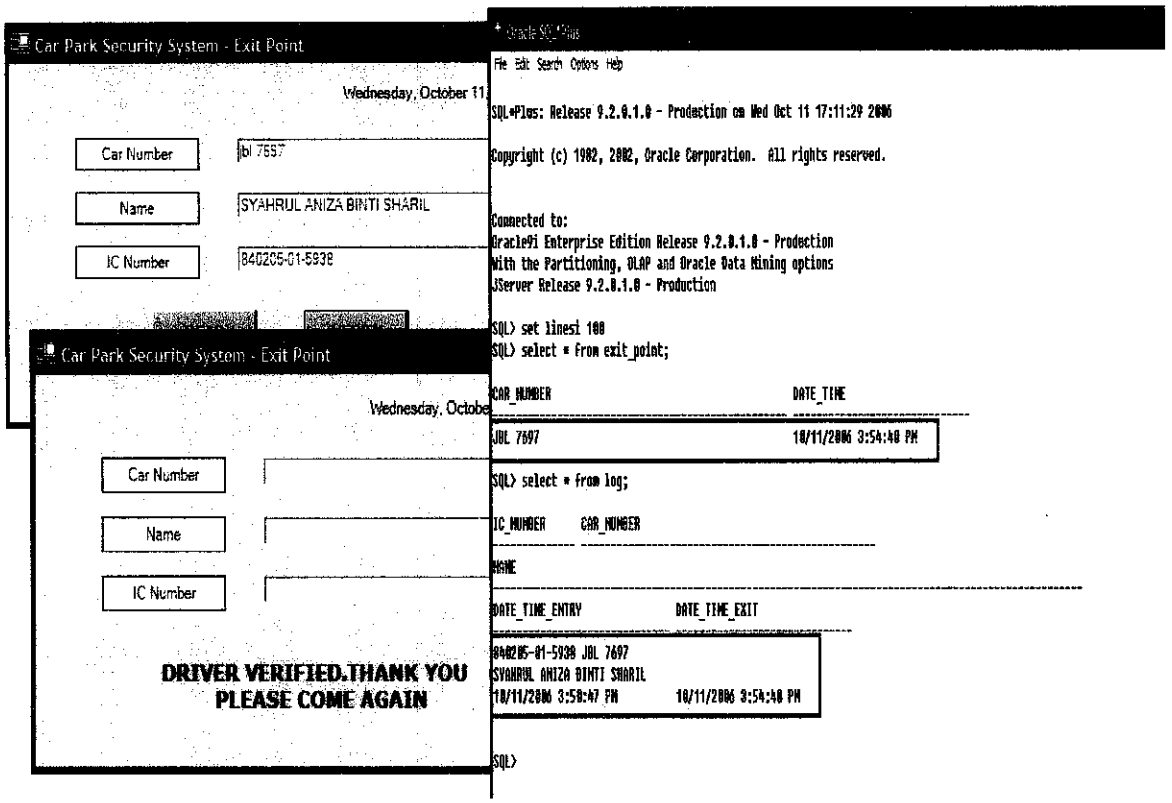


Figure 19: Correct Operation for Regular Parking User – Exit Point

Figure 19 shows the correct operation at the exit point for regular parking user. At this point, the information gathered is used to identify a driver and his/her car. Information matching is done using SQL query. If the driver and the vehicle are identified, a thank you message will be displayed. The snapshot of Oracle SQL Plus shows the information recorded in the *exit_point* table and *log* table. *Log* table data is updated by storing the *date_time_exit* information.

3) *Incorrect Operation for Exit Point (Unidentified Driver)*

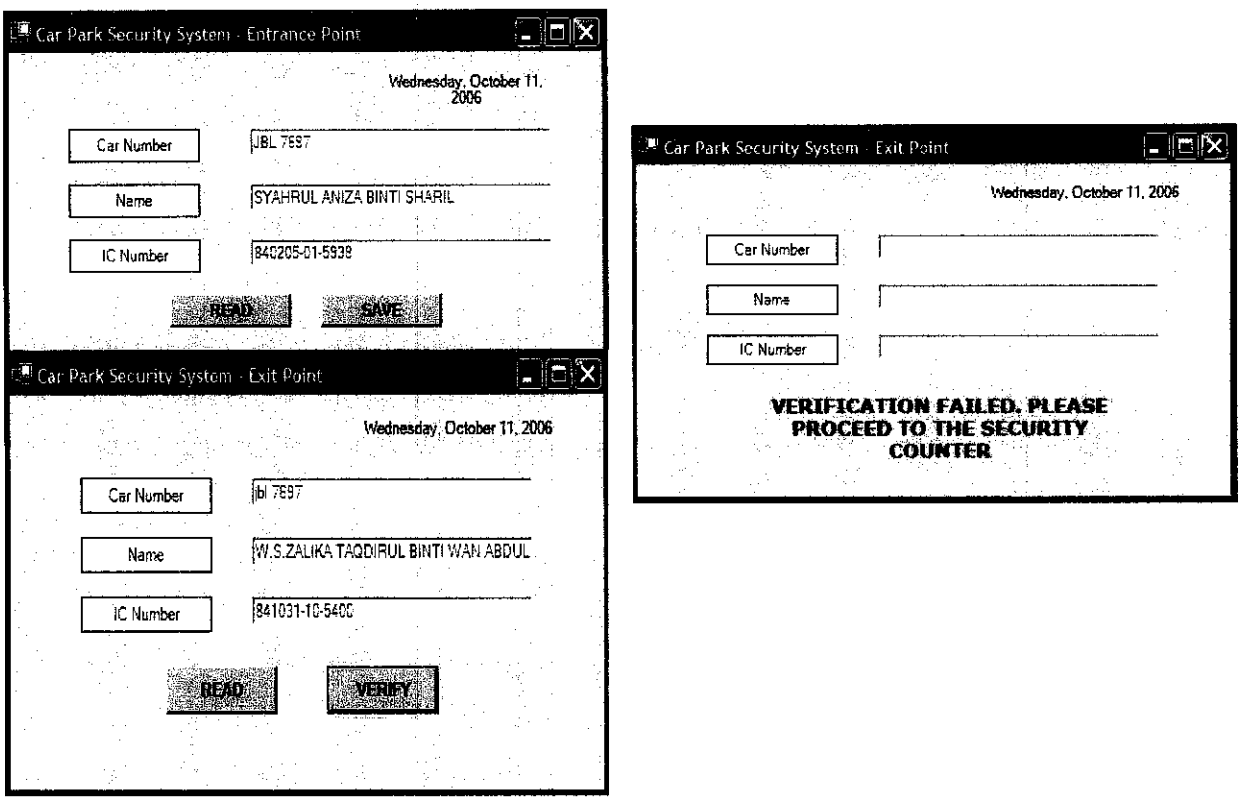


Figure 20: Unidentified Driver for Regular Parking User – Exit Point

In Figure 20, it represents the information gathered at the entry point and at the exit point. From the snapshots, we can see that at the exit point, an unauthorized person is trying to drive a car out of the parking are which belongs to a driver named '*SYAHRUL ANIZA BINTI SHARIL*'. When such attempt is identified by the system, a warning message is displayed. At the same time, the system will record the attempt done by the unauthorized driver into the *log* table. The purpose of logging the incident is to allow parking administrator to lodge a police report if the unidentified driver never clarifies their action with the security officers.

4) *Incorrect Operation for Exit Point (Unidentified Vehicle)*

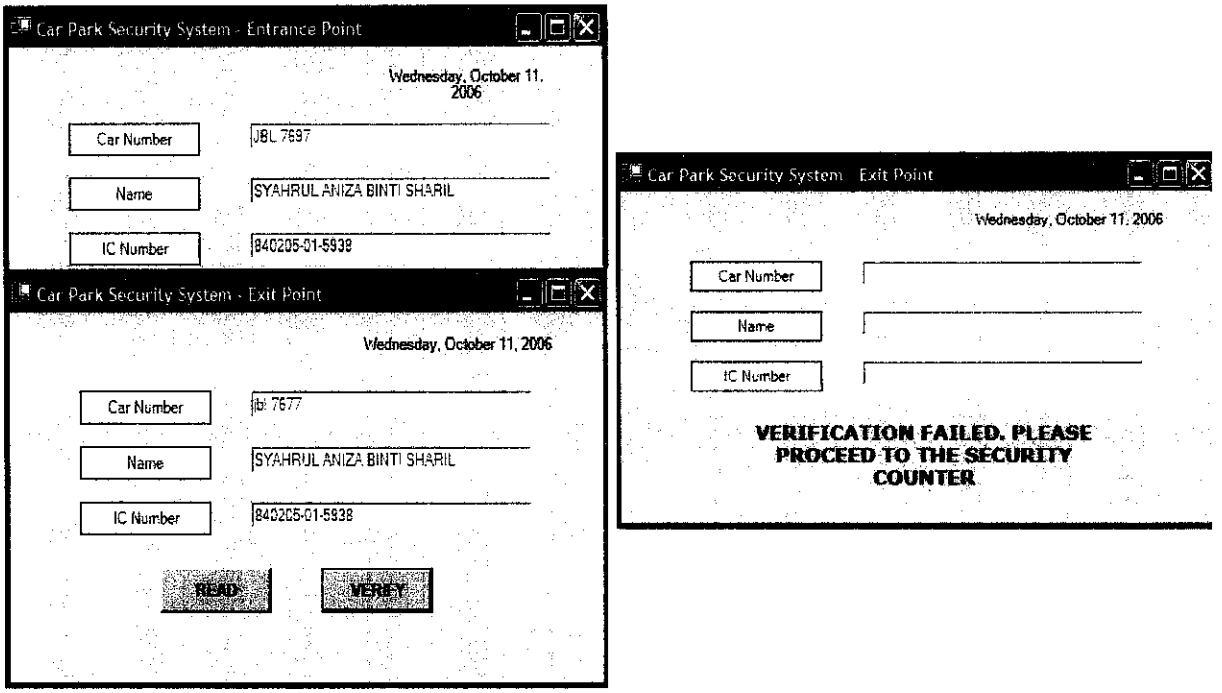


Figure 21: Unidentified Vehicle for Regular Parking User – Exit Point

Based on the snapshots shown in Figure 21, it shows that a registered driver is trying to drive out an unidentified car. In such case, an error message will also be displayed. The car driver will have to clarify with the security officers before they can go out of the parking area. For this situation, the incident will also be recorded in the *log* table. The purpose is also the same as mentioned in the unidentified driver case.

Seasonal Parking User

For the seasonal parking user interface, the flow of the system is the same as the flow of regular parking user. The difference is only on the method of acquiring the car plate number. The process is done automatically using a bar code scanner. However, the results expected for each case is depicted in the figures in the following page.

1) *Correct Operation for Entry Point*

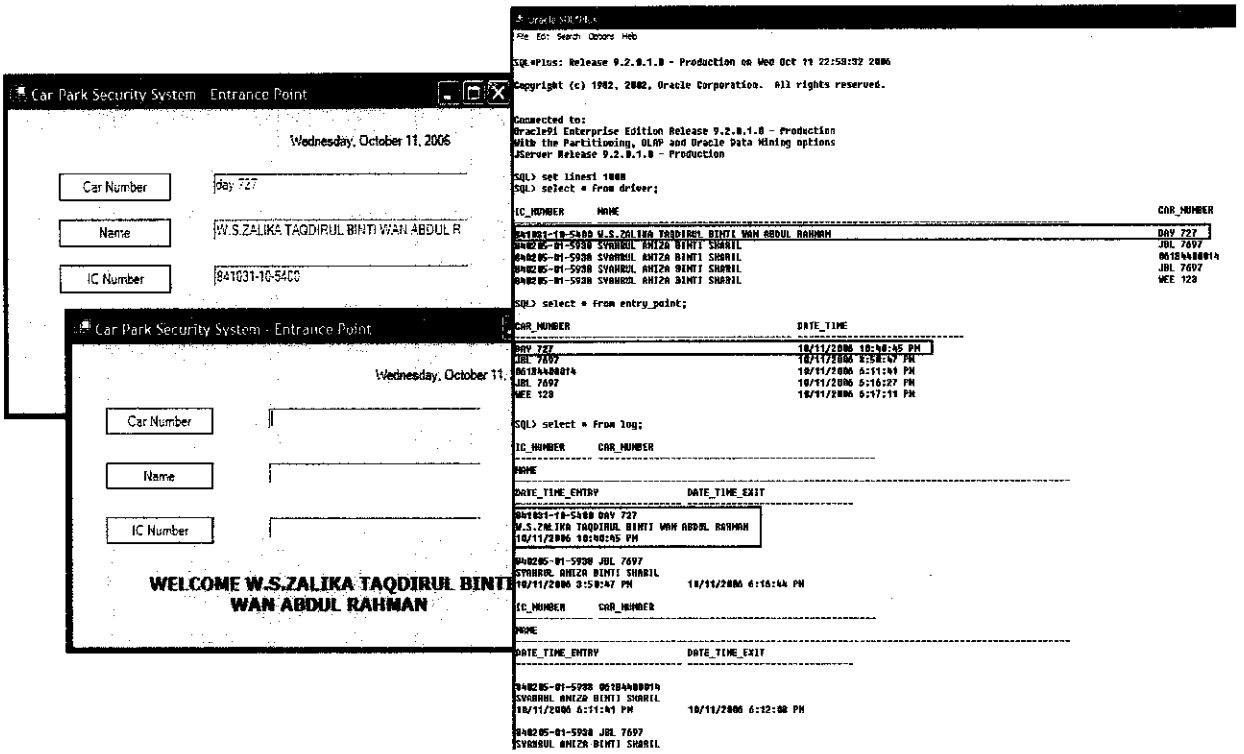


Figure 22: Correct Operation for Seasonal Parking User – Entry Point

2) *Correct Operation for Exit Point*

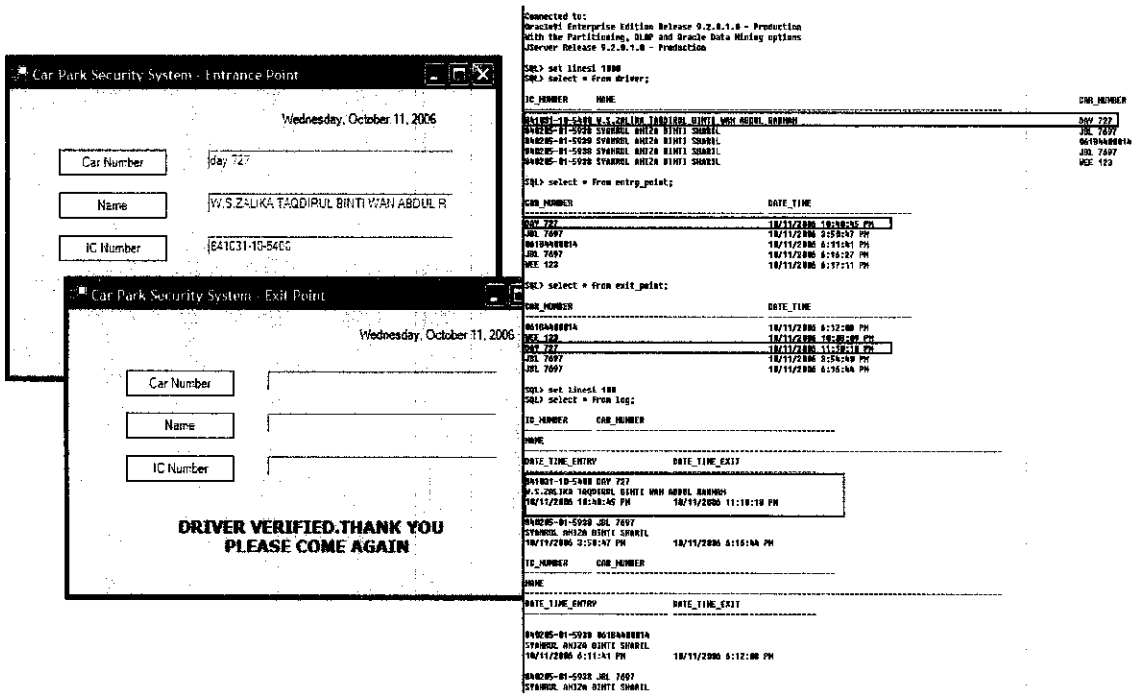


Figure 23: Correct Operation for Seasonal Parking User - Exit Point

3) *Incorrect Operation for Exit Point (Unidentified Driver)*

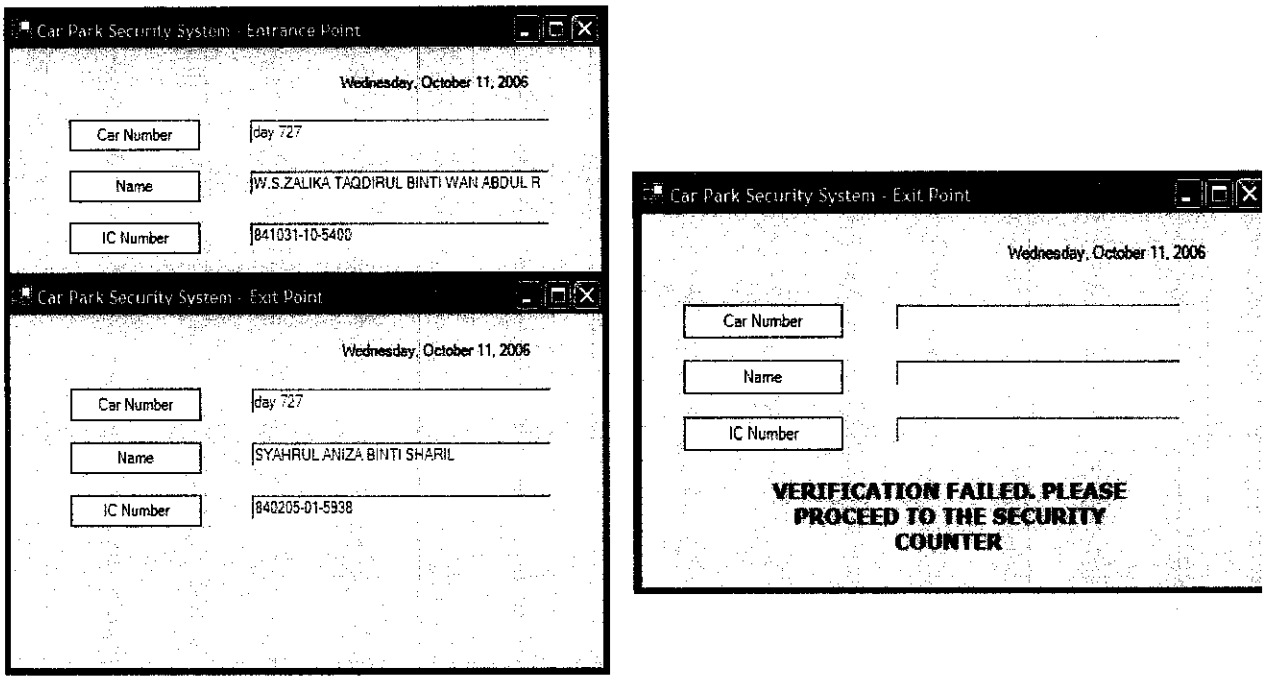


Figure 24: Unidentified Driver for Seasonal Parking User – Exit Point

4) *Incorrect Operation for Exit Point (Unidentified Car)*

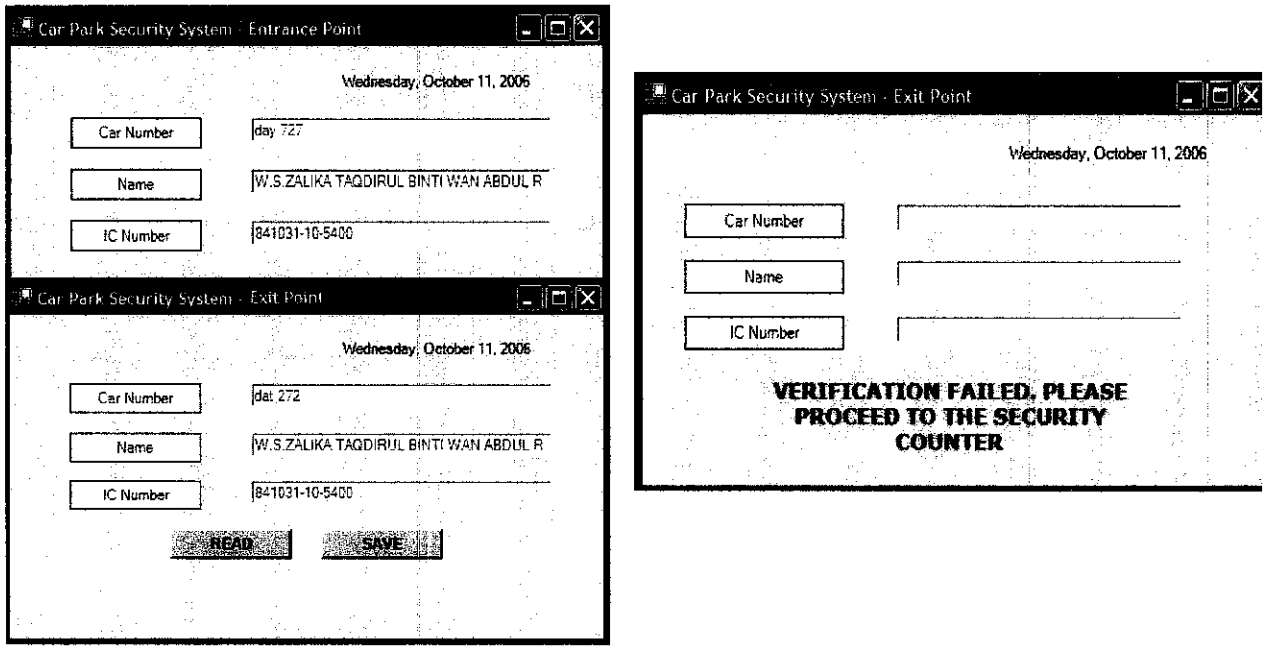


Figure 25: Unidentified Vehicle for Seasonal Parking User – Exit Point

CHAPTER 5: TECHNICAL CONFIGURATION

In this chapter, all technical aspects of the system shall be described. The technical aspects involved in the discussion are system's interface, devices framework, code structure, database configuration and database creation.

5.1 System Interface

5.1.1 Interface for Regular Parking User

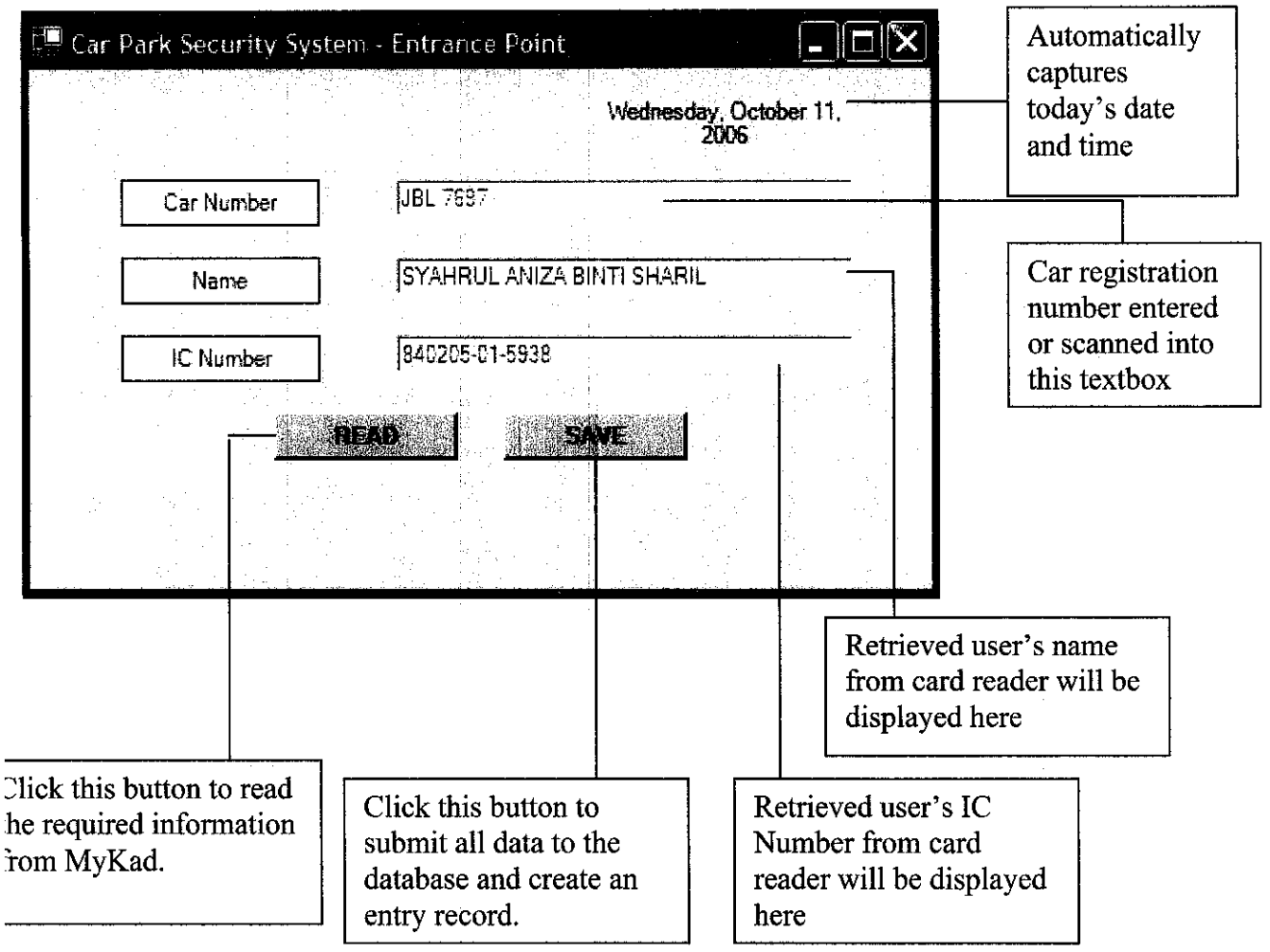


Figure 26: Entrance Point Interface

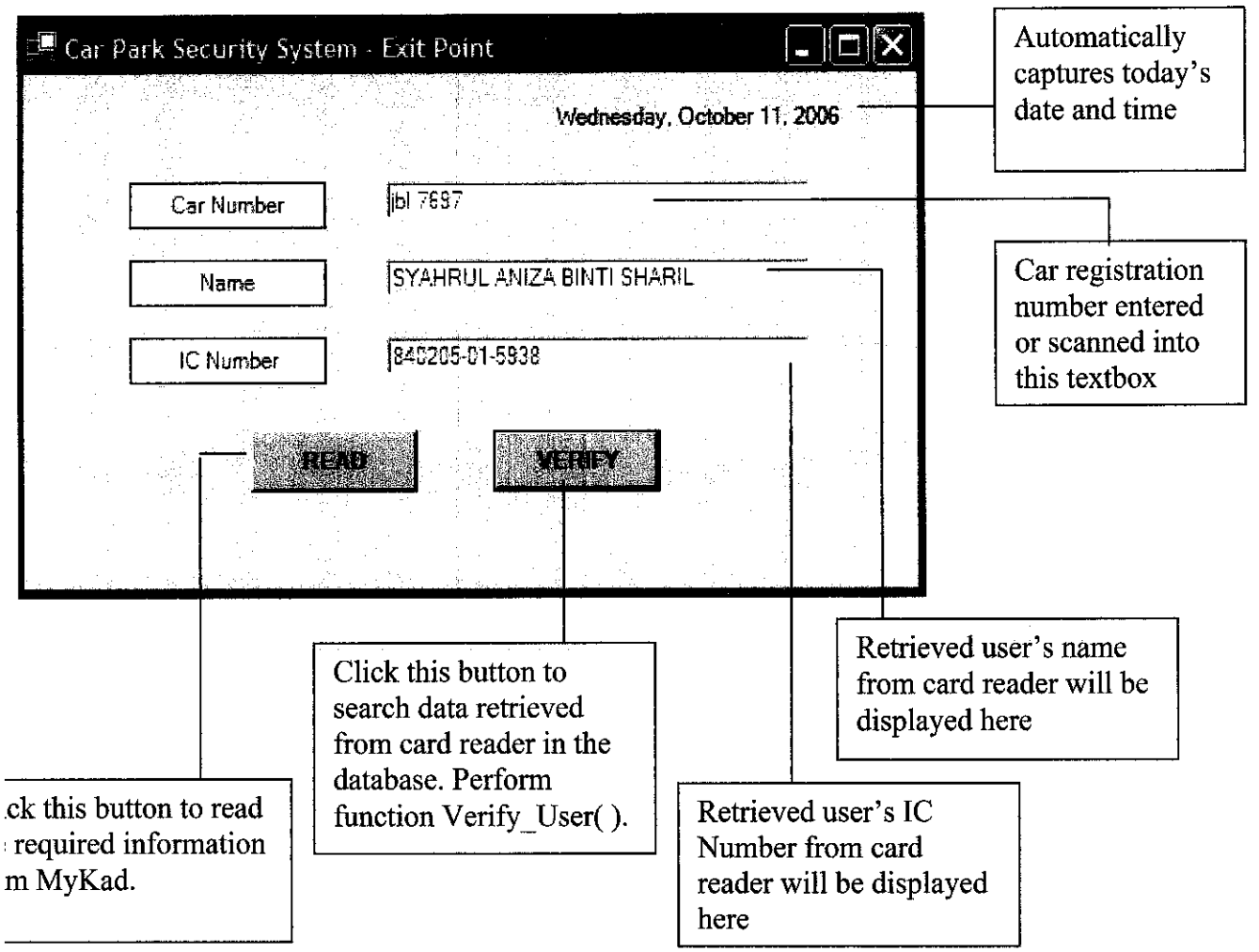


Figure 27: Exit Point Interface

The interface for regular parking user will be controlled by the parking attendant or patron. Each time a car comes in or goes out of the parking area, the parking attendant will have to enter the car's plate number. Then, the user registration and authentication process will be triggered by the submit button (entrance interface) and search button (exit interface) pressed by the parking attendant after all required information is obtained.

5.1.2 Interface for Seasonal Parking User

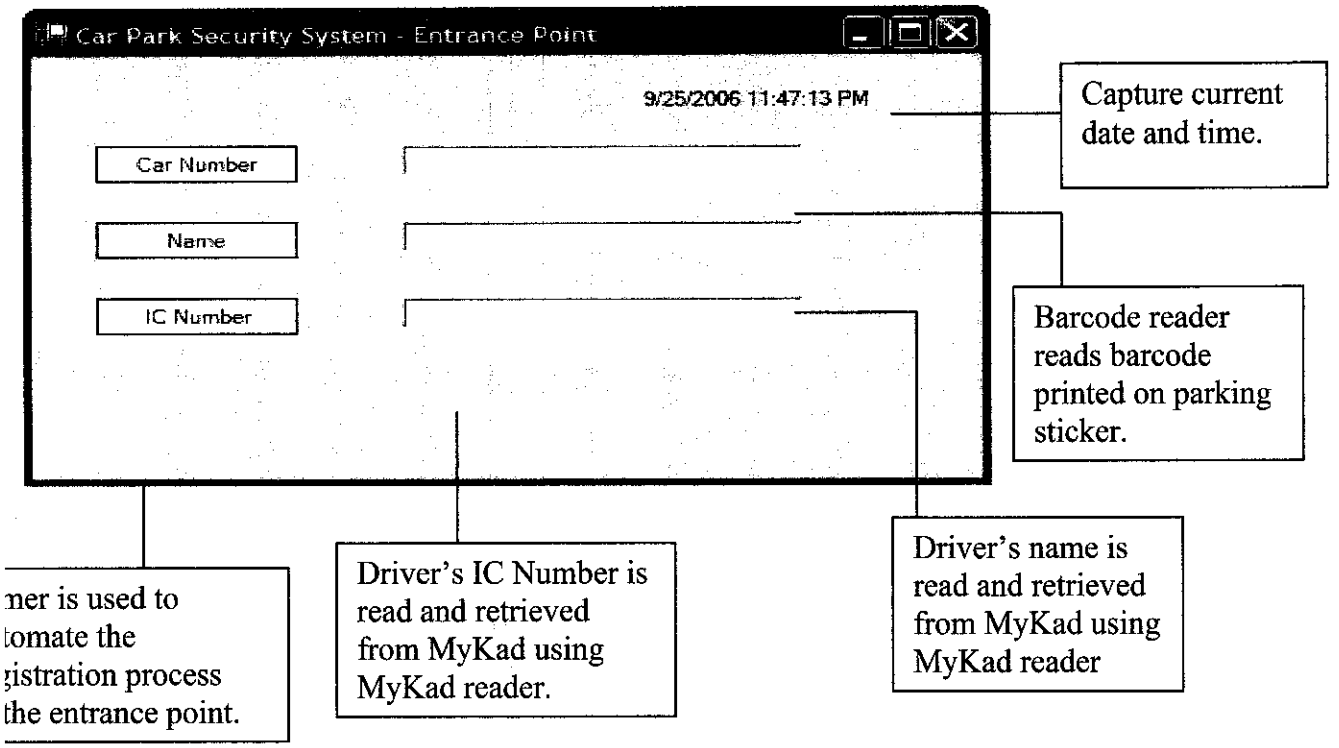


Figure 28: Entrance Point Interface

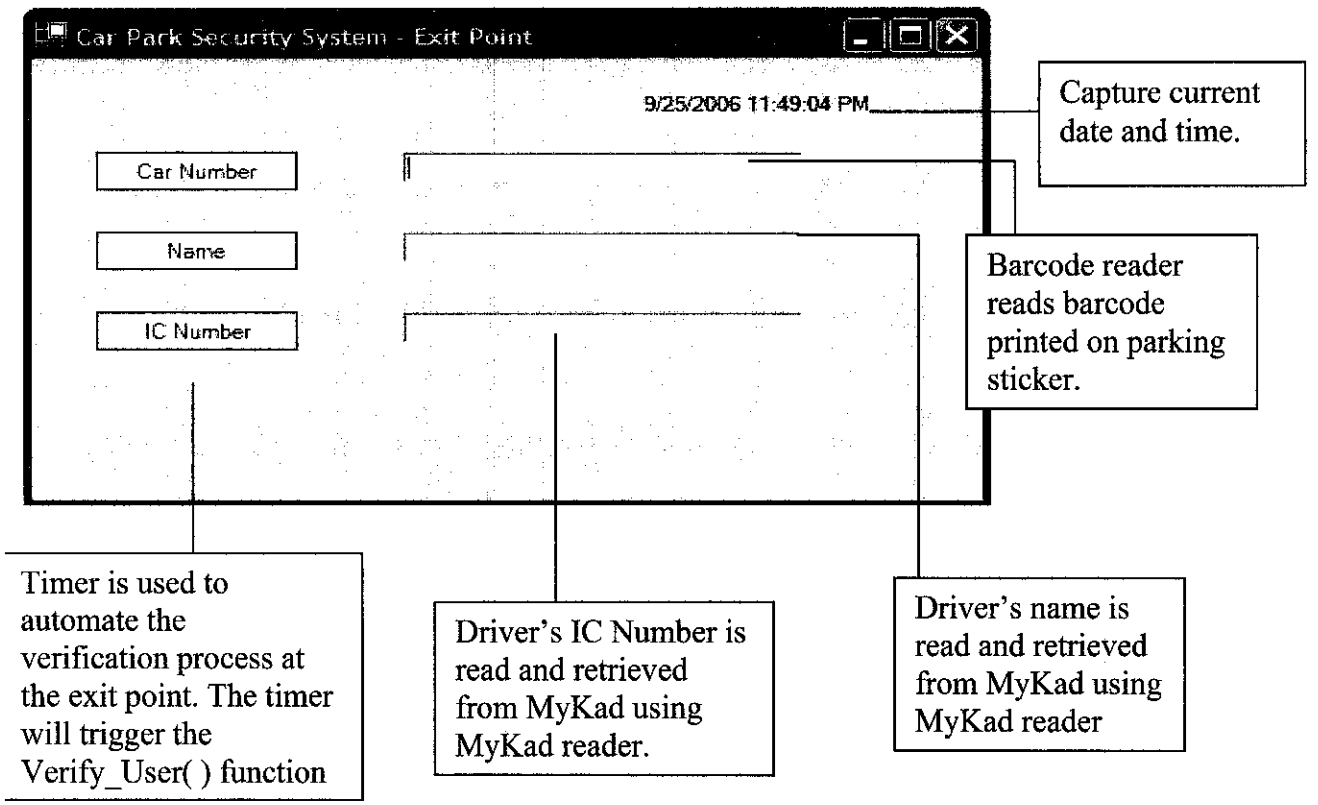
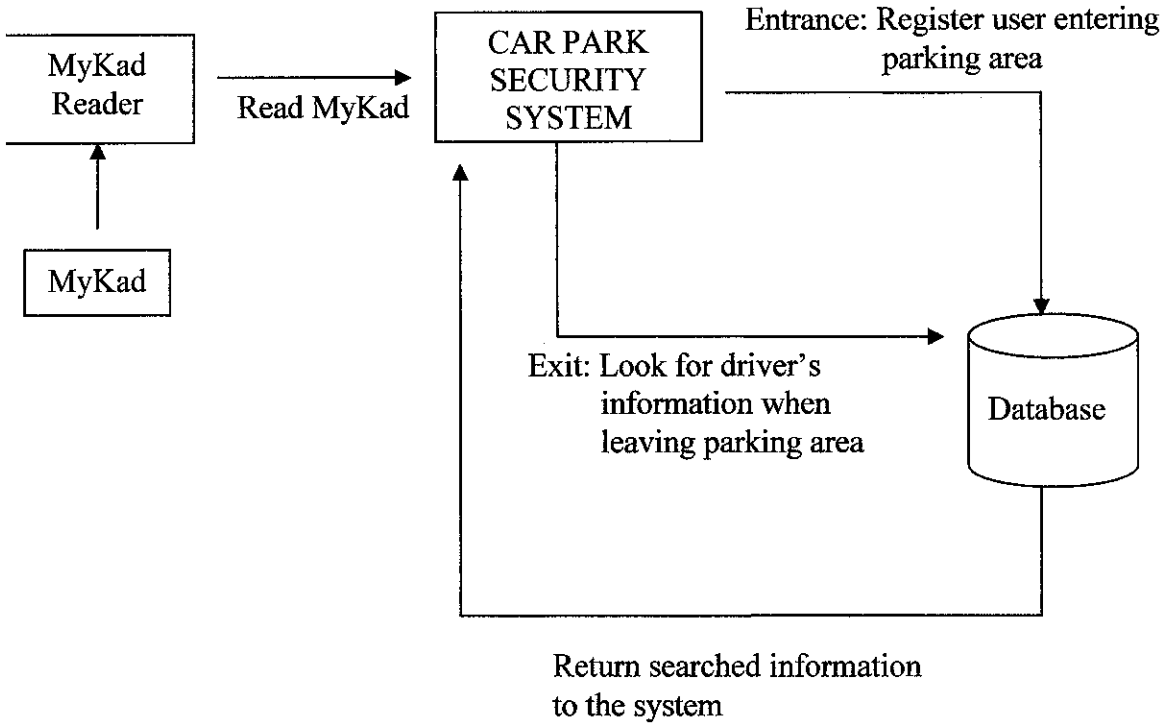


Figure 29: Exit Point Interface

The interface for the seasonal parker user does not require an external trigger for it to perform its registration and authentication functions. A timer is declared and used to automate both processes as there will be no parking attendant assigned to monitor the seasonal parker process.

5.2 Devices Framework

5.2.1 How Does Card Reader Works In the System



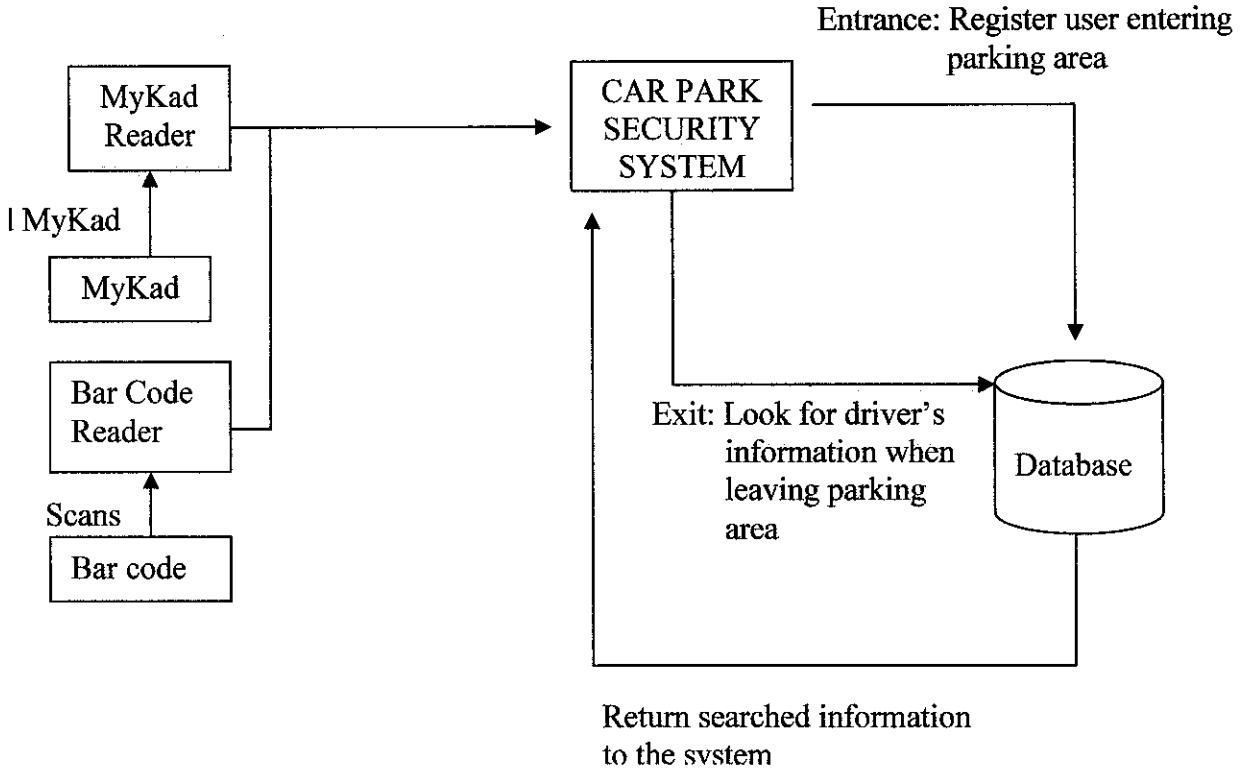
ote : The above diagram is only applicable for Regular Parking User

Figure 30: MyKad Reader Framework

MyKad reader reads the information from MyKad at the entrance and the exit point. The information retrieved at the entry point is saved in the database. The information gathered at the exit point on the other hand is used to match driver's

information which has already been stored in the database. The system will either verify the driver or alert the driver as well as the parking operator if the driver is unidentified.

5.2.2 How Does Card Reader and Bar Code Reader Work In the System



Note : The above diagram is only applicable for Seasonal Parking User

Figure 31: MyKad Reader and Bar Code Reader Framework

Based on the framework shown in Figure 22, information gathering is automated through the use of MyKad reader and bar code scanner. At the entry point, information gathered by these two hardwares is saved into the database. At the exit point, once again information will be gathered and compared with the information that has already been saved at the entry point.

5.3 System Database

5.3.1 Database Configuration

The figures shown below are the steps taken during the database configuration using Oracle9i. For this system, a database called '***parksys***' was created. In configuring the database, Database Configuration Assistant module was used.

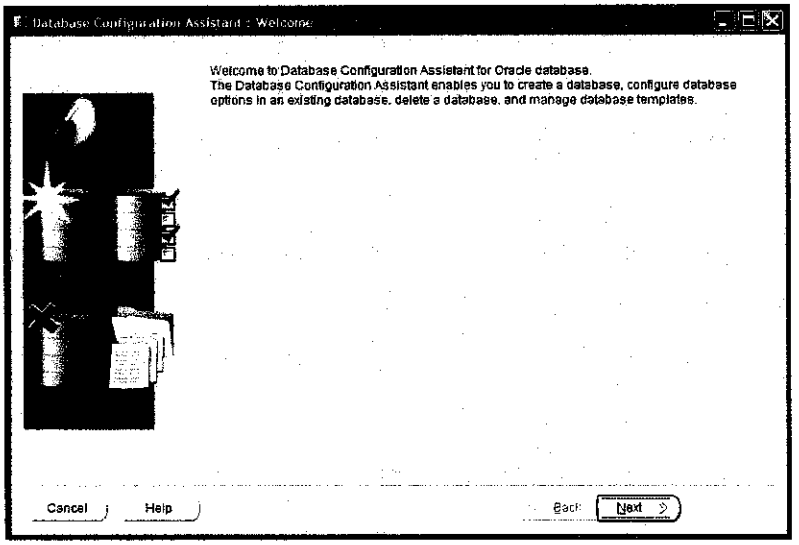


Figure 32: Start Module Page for Database Configuration

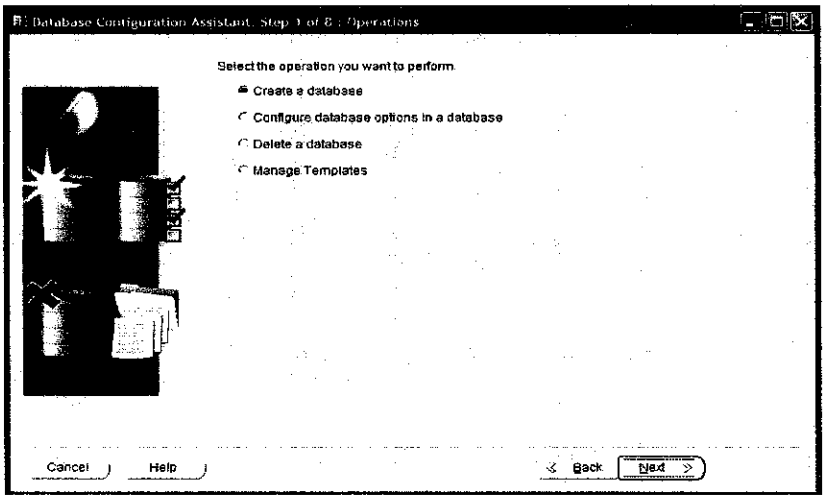


Figure 33: Step 1 – Choose Database Operation

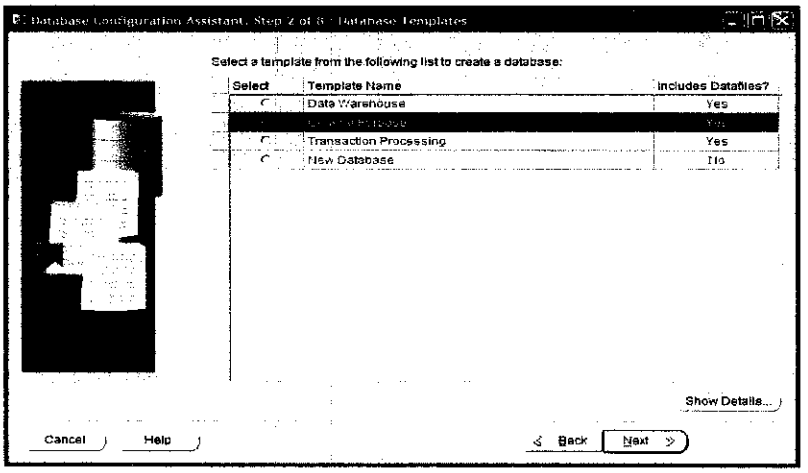


Figure 34: Step 2 –Choose Database Template

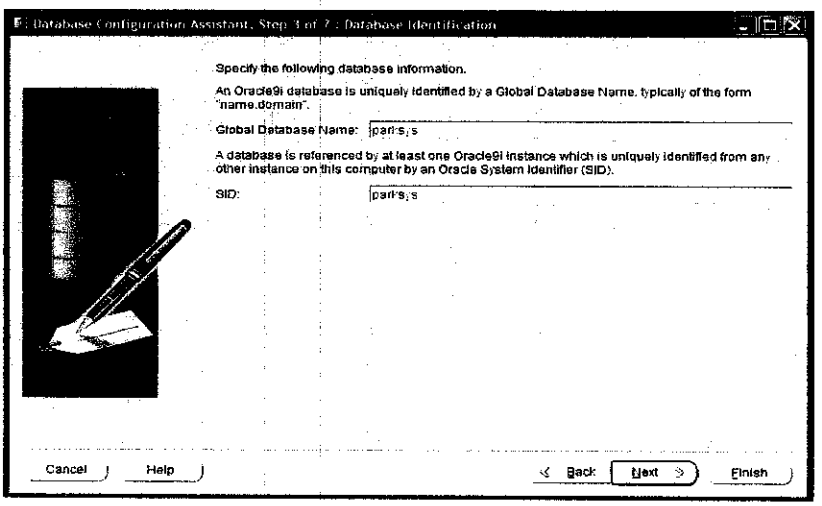


Figure 35: Step 3 –Declare Global Database Name

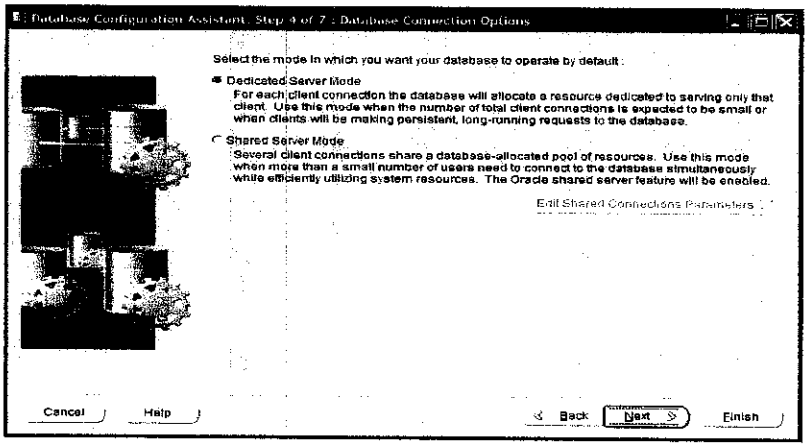


Figure 36: Step 4 –Select Database Operation Mode

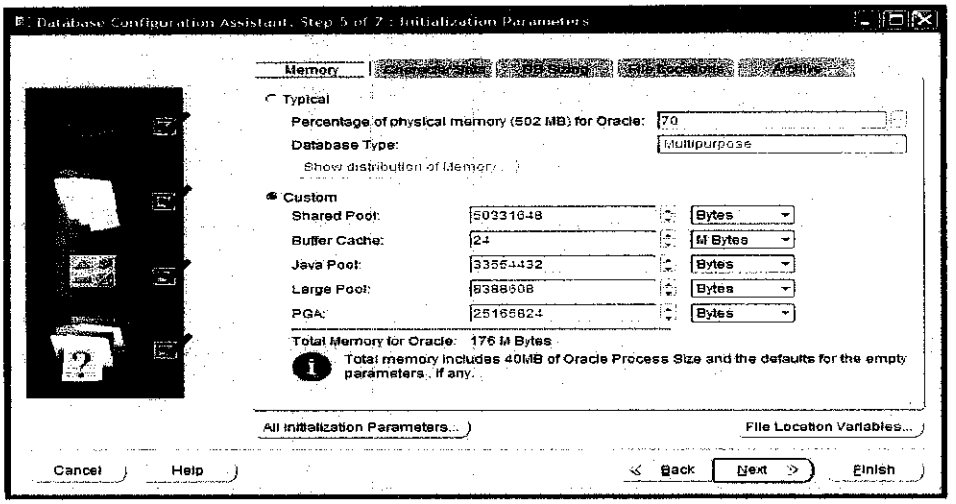


Figure 37: Step 5 –Define Database Characteristics

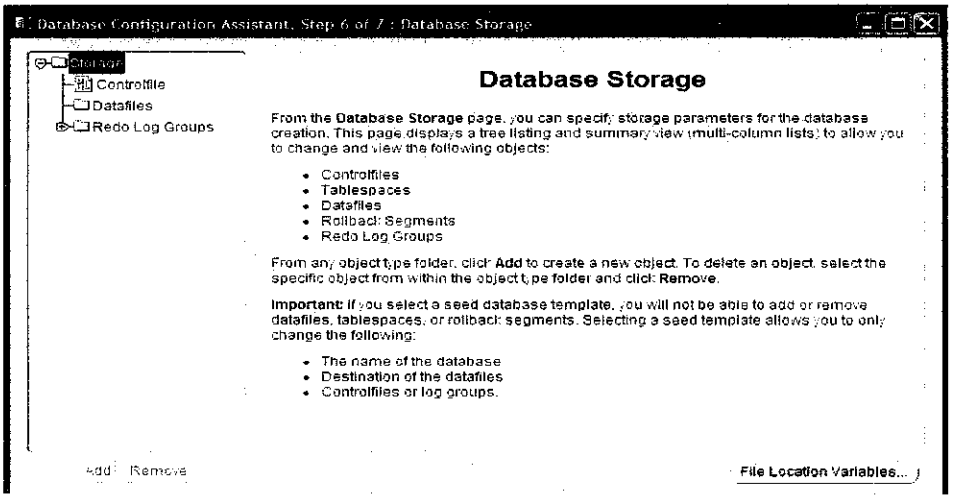


Figure 38: Step 6 –Define Database Storage

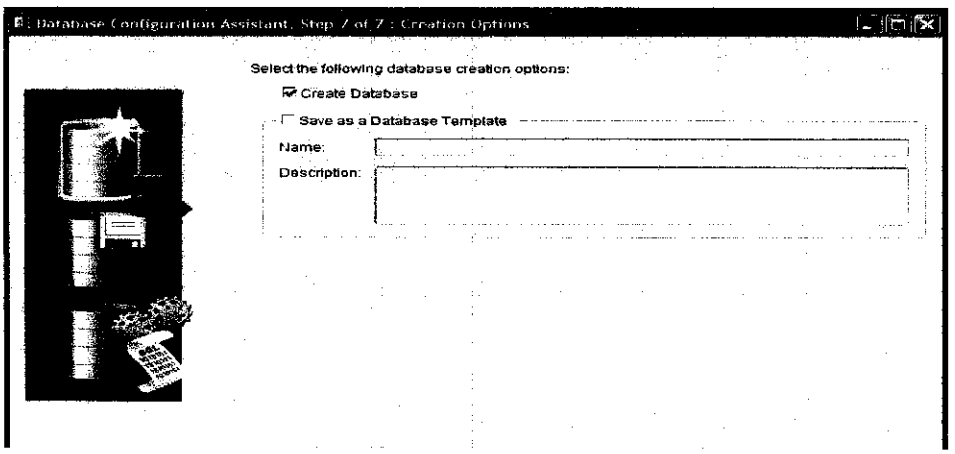


Figure 39: Step 7 –Confirm Database Creation

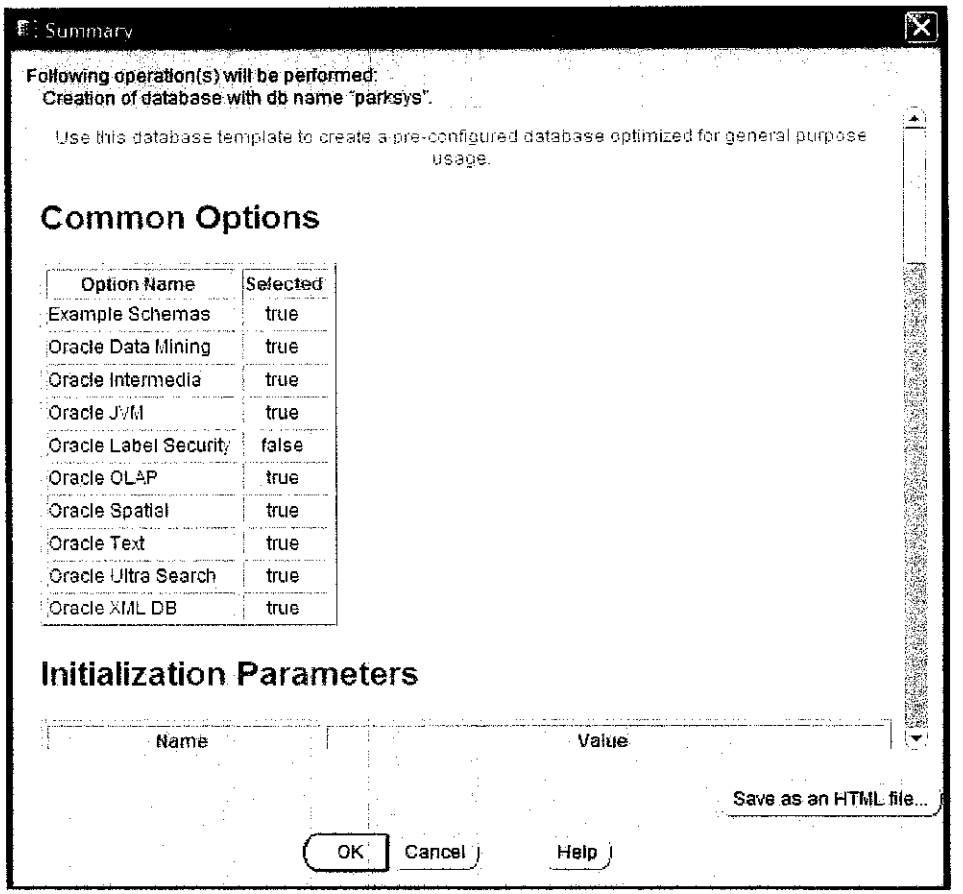


Figure 40: Step 8 –Database Creation Based on Defined Characteristics

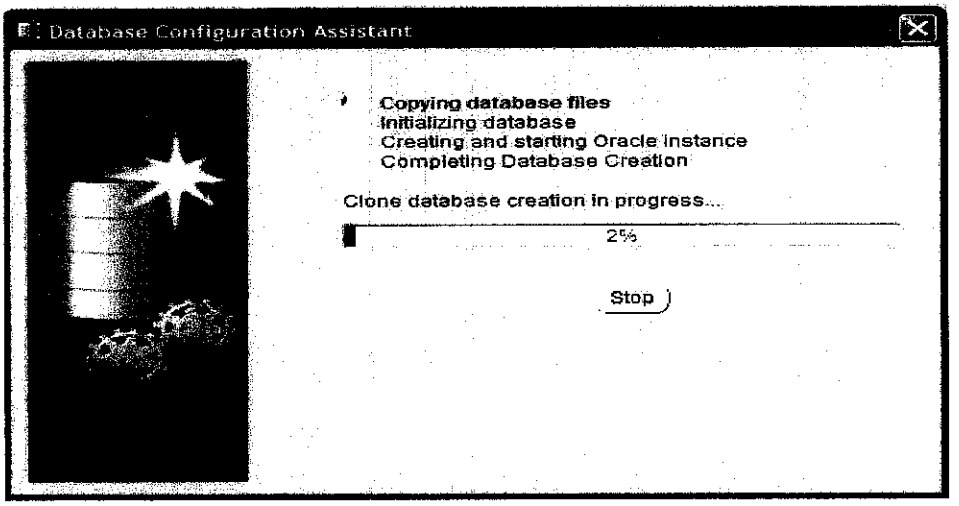


Figure 41: Database Creation in Progress

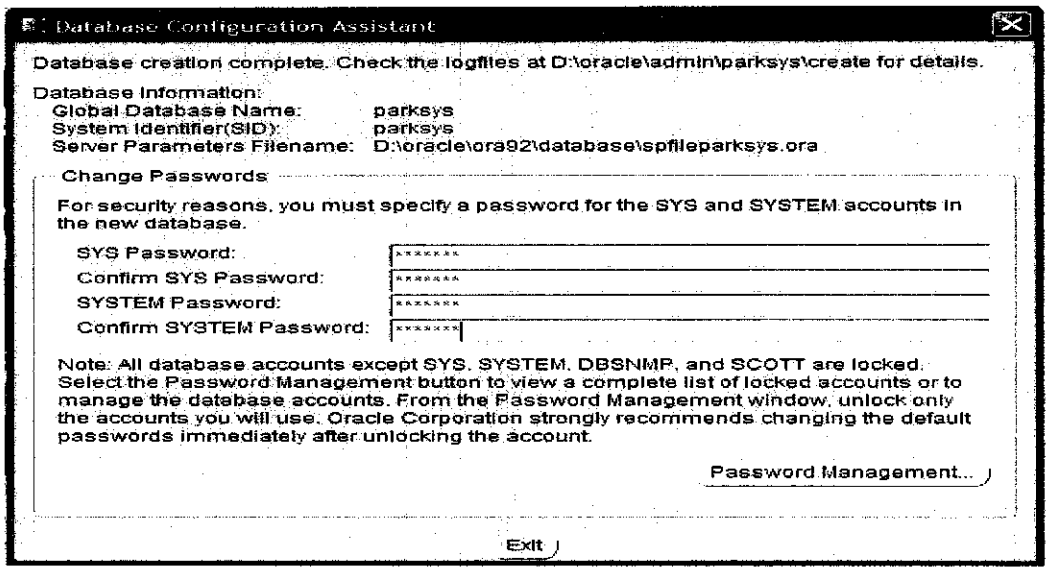


Figure 42: Database Creation Completed

5.3.2 User Configuration

Once database creation is successful, the next important step in configuring the database is to create a user that can use the database created for the Car Theft Prevention System. For the system usage purpose, a default system user which is '***PSADMIN***' was created. User is created using '***Oracle Enterprise Manager Console Login'.*** This username will be used to allow data storage and data manipulation on the database

created for the developed system. The diagrams shown below are the steps taken to create a user for a database that has been created earlier.

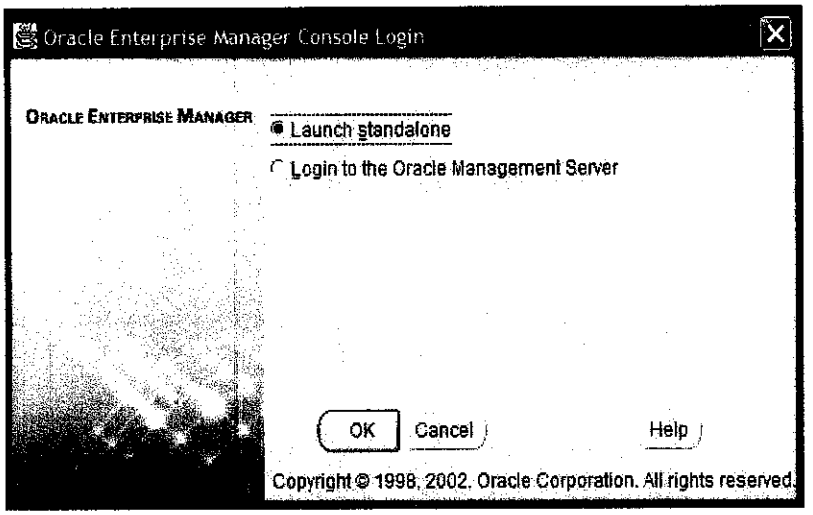


Figure 43: Start Module Page for User Configuration

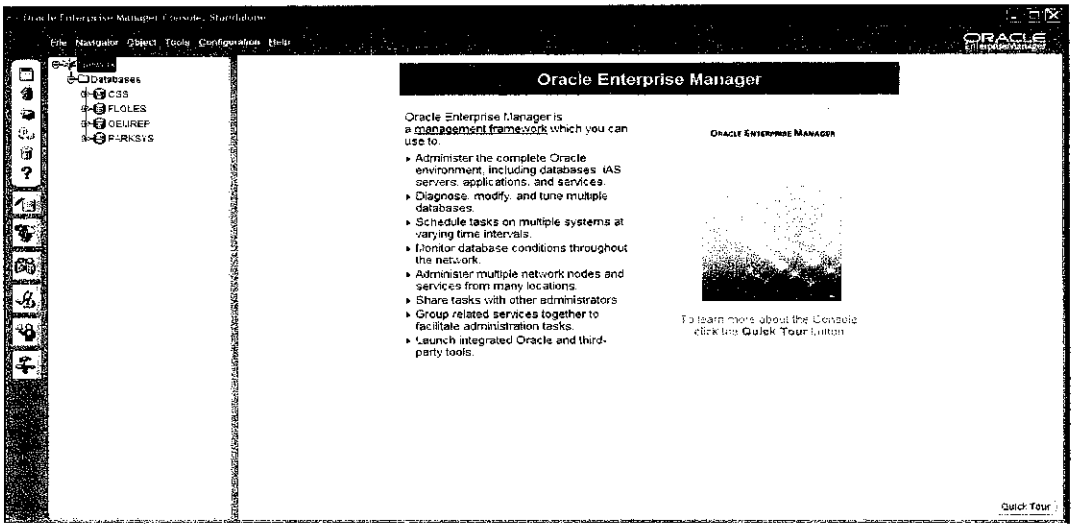


Figure 44: Step 1- Enter Oracle Enterprise Manager

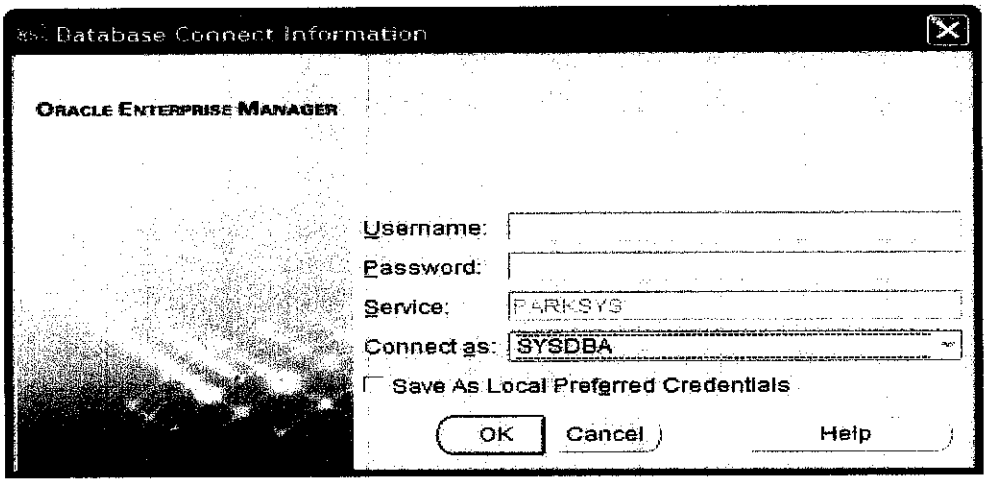


Figure 45: Step 2 -Connect to Database Required as SYSDBA

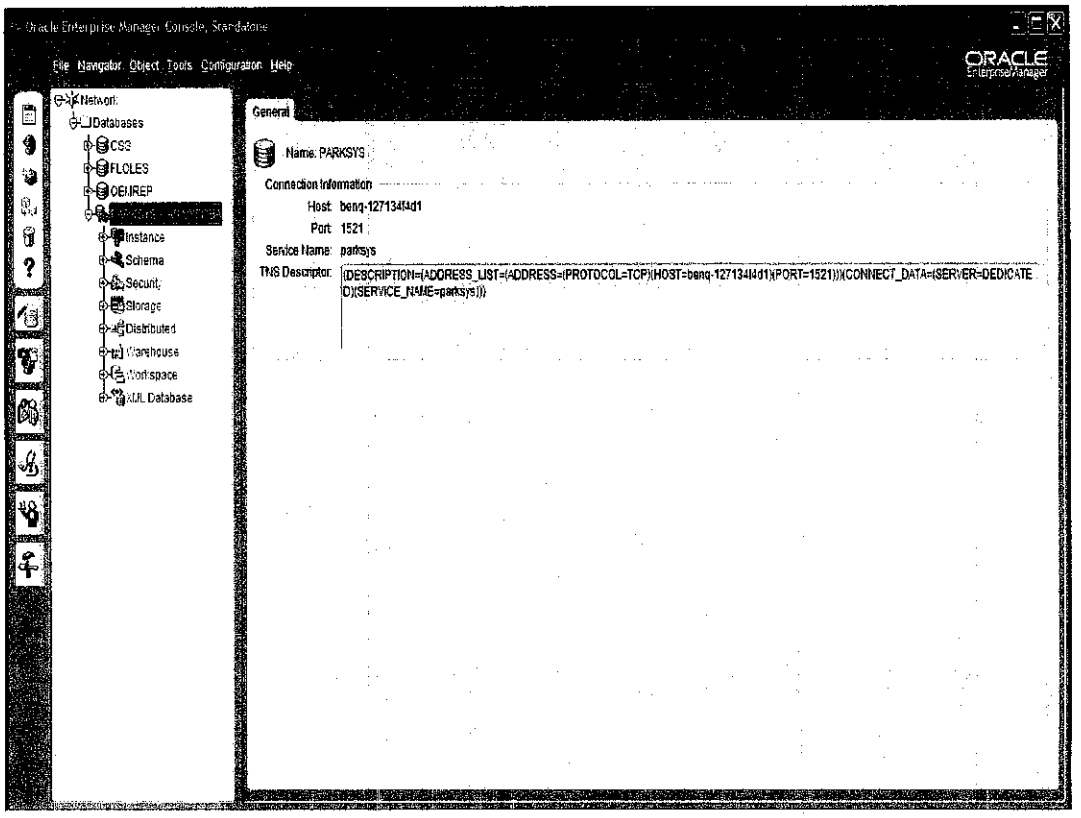


Figure 46: Step 3 –Identify the Connected Database

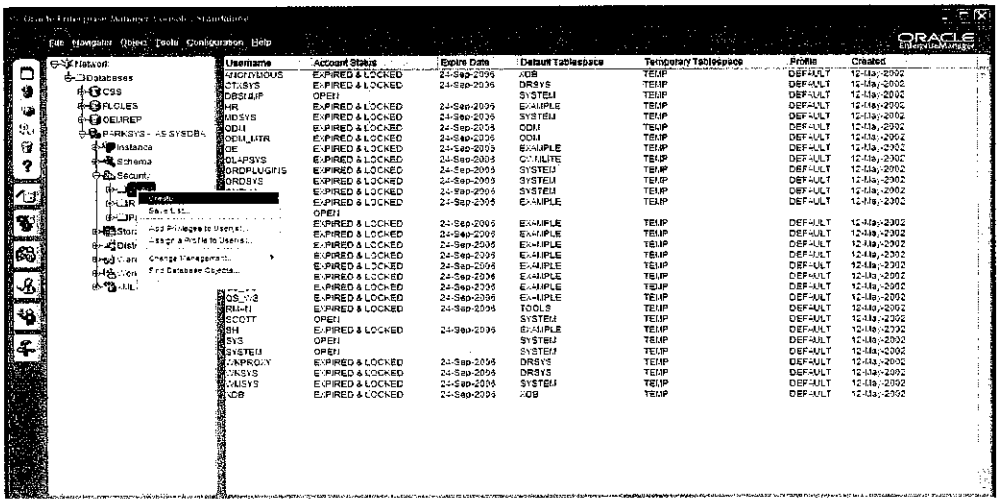


Figure 47: Step 4 –Create New User

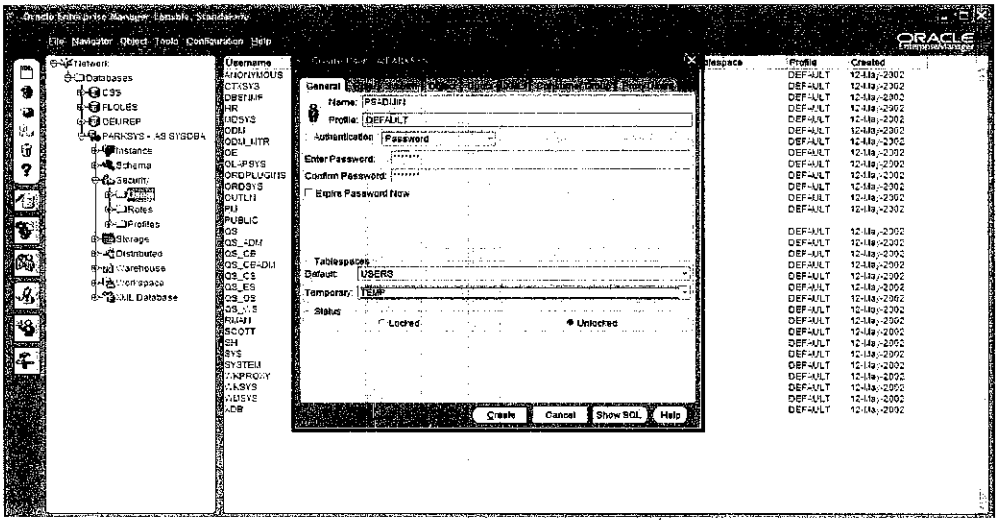


Figure 48: Step 5 – Define Username and Password

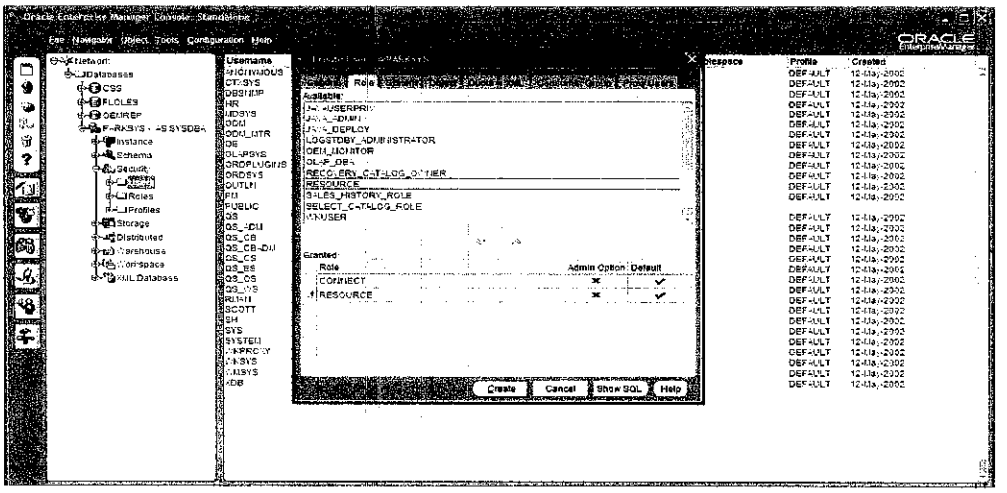


Figure 49: Step 6 –Define User's Role

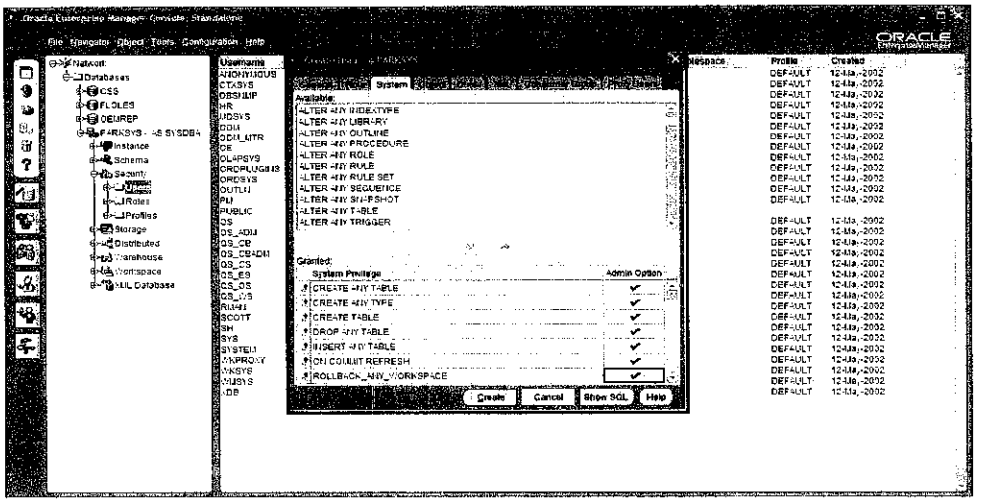


Figure 50: Step 7 –Define User's System Privilege

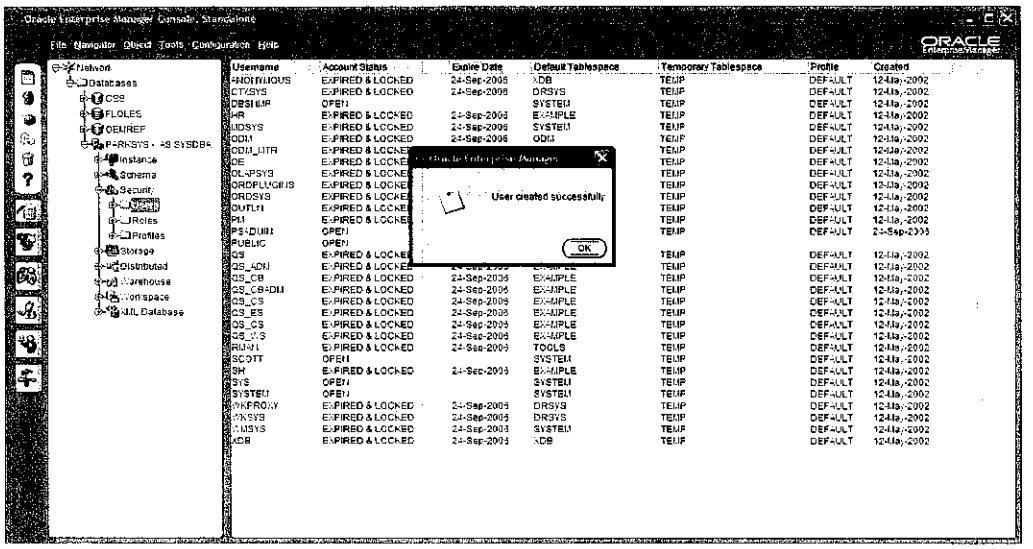


Figure 51: User Successfully Created

5.3.3 Table Structure

For the Car Theft Prevention System, there will be three main tables which are Driver, Entry_Point and Exit_Point. The attributes for each table will be described in the table below:

Table Name	Attributes	Data Type
Driver	1) IC_Number 2) Name	1) Varchar2(14) 2) Varchar(50)

Entry_Point	1) IC_Number_entry 2) Car_Number_entry 3) Date_Time	1) Varchar2(14) 2) Varchar2(20) 3) Varchar2(30)
Exit Point	1) IC_Number_exit 2) Car_Number_exit 3) Date_Time	1) Varchar2(14) 2) Varchar2(20) 3) Varchar2(30)
Log	1) IC_Number 2) Car_Number 3) Name 4) Date_Time_Entry 5) Date_Time_Exit	1)Varchar2(14) 2)Varchar2(20) 3)Varchar2(50) 4)Varchar2(30) 5)Varchar2(30)

Table 5: Car Theft Prevention System Table Structure

5.3.4 SQL Syntax

In this section, the syntax used in database creation and data manipulation will be shown. The syntax shown below will show how table is being created and how data is being stored into these tables. Then, the data will be manipulated using the SQL Data Manipulation Language (DML) to which will map the data needed for Verify_User ( ).

- *Create Table*

  1) Driver Table

```
CREATE TABLE Driver (
IC_Number VARCHAR2(14),
Name VARCHAR2(50),
Car_Number VARCHAR2(20) );
```

  2) Entry_Point Table

```
CREATE TABLE Entry_Point(
Car_Number VARCHAR2(20),
Date_Time VARCHAR2(30) );
```

  3) Exit_Point Table

```
CREATE TABLE Exit_Point(
Car_Number VARCHAR2(20),
Date_Time VARCHAR2(30) );
```

4) Log Table

```
CREATE TABLE Log(
IC_Number VARCHAR2(14),
Car_Number VARCHAR2(20),
Name VARCHAR2(50),
Date_Time_Entry VARCHAR2(30),
Date_Time_Exit VARCHAR2(30) );
```

- *Insert Data into Table*

1) Insert data into Driver Table

```
myCommand.CommandText="INSERT into DRIVER values ('"
                +IC_No+"','"+name+"','"+Car_No+"')";
myCommand.ExecuteNonQuery();
```

2) Insert data into Entry_Point Table

```
myCommand.CommandText="INSERT into ENTRY_POINT values ('"
                +Car_No+"','"+Date_Time+"')";
myCommand.ExecuteNonQuery();
```

3) Insert data into Exit_Point Table

```
myCommand.CommandText = "INSERT into ENTRY_POINT values ('"
                        +Car_No+"','"+Date_Time+"')";
myCommand.ExecuteNonQuery();
```

4) Insert data into Log Table

```
myCommand.CommandText = "INSERT into LOG (IC_Number,Car_Number"
                        +",Name,Date_Time_Entry) values("
                        +"'"+IC_No+"','"+Car_No+"','"+name+"','"
                        +Date_Time+"')";
myCommand.ExecuteNonQuery();
```

- *Data manipulation*

```
//find matching data for exit point

myCommand.CommandText = "SELECT a.ic_number,b.car_number FROM driver a,
entry_point b WHERE a.car_number=b.car_number AND a.ic_number='"+IC_No+"'
AND b.car_number='"+Car_No+"'";

   myReader = myCommand.ExecuteReader();

        if (myReader.HasRows == true) //if matching data found do this

        {

        myCommand.CommandText = "INSERT into EXIT_POINT values
                                ('"+Car_No+"','"+Date_Time+"')";
        myCommand.ExecuteNonQuery();
```

```
myCommand.CommandText = "UPDATE LOG set Date_Time_Exit
                  ='"+Date_Time+"',status = 'DRIVER IDENTIFIED'"
                  +"WHERE ic_number ='"+IC_No+"'"
                  +"AND name ='"+name+"'"
                  +"AND car_number ='"+Car_No+"'";
myCommand.ExecuteNonQuery();

myCommand.CommandText = "DELETE FROM Driver WHERE ic_number =
                        '"+IC_No+"'AND car_number ='"+Car_No+"'";
myCommand.ExecuteNonQuery();

myTrans.Commit();

Console.WriteLine("All records are written to database.");
statusLbl.ForeColor = Color.Blue;
statusLbl.Text="DRIVER VERIFIED.THANK YOU & PLEASE COME AGAIN";
statusLbl.Show();
statusTimer.Start();
}

else //if no matching data found, do this
{
myCommand.CommandText = "INSERT INTO LOG
                        (ic_number,car_number,name,date_time_exit,
                         status)"
                         +"VALUES ('"+IC_No+"','"+Car_No+"','"+name
                         +"','"+Date_Time+"','UNIDENTIFIED
                         DRIVER')";
myCommand.ExecuteNonQuery();

myTrans.Commit();

statusLbl.ForeColor = Color.Red;
statusLbl.Text = "UNIDENTIFIED DRIVER.PLEASE PROCEED TO THE
                  SECURITY COUNTER";
statusLbl.Show();
statusTimer.Start();
Console.WriteLine("Unidentified driver");
}
```

5.4 System's Program in C#

5.4.1 Codes for Seasonal Parking User (With Bar Code Reader)

5.4.1.1 Entry Point

```
static void Main()
{
      Application.Run(new Form1());
}

private void Form1_Load(object sender, System.EventArgs e)
{
      entranceDateLabel.Text += DateTime.Now.ToLongDateString();
```

```
        readTimer.Interval = 10000;
        readTimer.Enabled = true;
        readTimer.Start();

        statusTimer.Interval=3000;
        statusTimer.Enabled= true;
}

private void readTimer_Tick(object sender, System.EventArgs e)
{
        string APIname = "";
        int status= 0;
        int state = 0;

        byte[] temp = new byte[80];

        ClearData();

        status = MyKad_SDK.OpenReader();
        APIname = "OpenReader";

        if (0 == status)
        {
                string cardReader = "IRIS SCR21U 0";
                status  = MyKad_SDK.SelectDevice(cardReader,
                          cardReader.Length);
                APIname = "SelectDevice";
        }
        Application.DoEvents();

        if (0 != status)
        {
                StatusLabel.Text = "UNABLE TO READ MYKAD";
                statusTimer.Start();
                readTimer.Stop();
                readTimer.Start();
        }

        if (0 == status)
        {
                status = MyKad_SDK.CardDetect(ref state);
                APIname= "CardDetect";
        }

        if (0 == status && 1 == state )
        {
                try
                {
                        status = MyKad_SDK.CardConnectA();
                        APIname= "CardConnectA";

                        Application.DoEvents();

                        if (0 == status && 1 == state )
                        {

                                status = MyKad_SDK.SelectPTS(0x13);
```

```
            APIname= "SelectPTS";

        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
            status = MyKad_SDK.SelJPNApp();
            APIname= "SelJPNApp";
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
            ResetByteArray(ref temp);
            status = MyKad_SDK.JPN_GMPCName(temp);
            APIname= "JPN_GMPCName";
            driverNameTxt.Text = ConvertByteToString(temp);
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
            ResetByteArray(ref temp);
            status = MyKad_SDK.JPN_IDNum(temp);
            APIname= "JPN_IDNum";
            icNumberTxt.Text = ConvertByteToString(temp);
            if (12 <= icNumberTxt.Text.Length)
            {
        icNumberTxt.Text = icNumberTxt.Text.Insert(6, "-");
        icNumberTxt.Text = icNumberTxt.Text.Insert(9, "-");
            }

        }
        Application.DoEvents();
        StatusLabel.Text="PLEASE REMOVE MYKAD";
        statusTimer.Start();

}


catch (Exception ex)
{
        MessageBox.Show(null, ex.Message, "Exception",
        MessageBoxButtons.OK, MessageBoxIcon.Error,
        MessageBoxDefaultButton.Button1);
}
finally
{
        if( 0 != status || 1 != state )
        ErrorHandle( APIname, status, state);
        status = MyKad_SDK.CardDisconnect();
        status = MyKad_SDK.CloseReader();

        StoreData();
        ClearScreen();
        Application.DoEvents();
```

```
                readTimer.Stop();
                readTimer.Start();

            }
        }


}

private void ErrorHandle(string title,int status, int state)
{

        short sw12 =  0;
        string strstatus = "";
        string strsw12 = "N/A";

        if(status == -87)
        {
                sw12 = MyKad_SDK.GetError();
                strsw12   = String.Format("{0:X2}",sw12);
        }

        if(status > -100)
                strstatus = String.Format("{0:d}",status);
        else
                strstatus = String.Format("{0:x2}",status);

        MessageBox.Show("API Return Code = " + strstatus +
        "\nSW12 = " + strsw12 +
        "\nCardDetect value  = " + state,
        "From the API: " + title
        ,MessageBoxButtons.OK,MessageBoxIcon.Warning);

}


private void StoreData()
{
        string name = driverNameTxt.Text.Trim();
        string IC_No = icNumberTxt.Text.Trim();
        string Car_No = carNumberTxt.Text.Trim();
        DateTime today = DateTime.Now;
        string Date_Time = today.ToString();


        OracleConnection myConnection = new OracleConnection();
        myConnection.ConnectionString= "User
        Id=PSADMIN;Password=syahrul;Data Source=parksys";
        myConnection.Open();

        OracleCommand myCommand = myConnection.CreateCommand();
        OracleTransaction myTrans;

        // Start a local transaction
        myTrans =
        myConnection.BeginTransaction(IsolationLevel.ReadCommitted);
        // Assign transaction object for a pending local transaction
```

```
        myCommand.Transaction = myTrans;

        if (name != "" && IC_No !="" && Car_No !="")
        {
              try
              {
                    myCommand.CommandText = "INSERT into DRIVER values
                    ('"+IC_No+"','"+name+"','"+Car_No+"')" ;
                    myCommand.ExecuteNonQuery();

                    myCommand.CommandText = "INSERT into ENTRY_POINT values
                    ('"+Car_No+"','"+Date_Time+"')";
                    myCommand.ExecuteNonQuery();

                    myCommand.CommandText = "INSERT into LOG
                    (IC_Number,Car_Number,Name,Date_Time_Entry) values("
              +"'"+IC_No+"','"+Car_No+"','"+name+"','"+Date_Time+"')";
                    myCommand.ExecuteNonQuery();

                    myTrans.Commit();
                    Console.WriteLine("All records are written to
                    database.");
                    StatusLabel.Text=" WELCOME "+name;
                    statusTimer.Start();

              }
              catch(Exception e)
              {
                    myTrans.Rollback();
                    Console.WriteLine(e.ToString());
                    Console.WriteLine("Neither record was written to
                    database.");
              }
              finally
              {

                    myConnection.Close();
                    //ClearScreen();
              }

        }

}


private void ClearData()
{
        string Current_Time = DateTime.Now.ToLongTimeString();

        OracleConnection myConnection = new OracleConnection();
        myConnection.ConnectionString= "User
        Id=PSADMIN;Password=syahrul;Data Source=parksys";
        myConnection.Open();

        OracleCommand myCommand = myConnection.CreateCommand();
        OracleTransaction myTrans;
```

```
        // Start a local transaction
        myTrans =
        myConnection.BeginTransaction(IsolationLevel.ReadCommitted);
        // Assign transaction object for a pending local transaction
        myCommand.Transaction = myTrans;

        if (Current_Time == "3:00:00 AM")
        {
              try
              {
                    myCommand.CommandText = "TRUNCATE TABLE ENTRY_POINT";
                    myCommand.ExecuteNonQuery();

                    myCommand.CommandText = "TRUNCATE TABLE EXIT_POINT";
                    myCommand.ExecuteNonQuery();

                    myTrans.Commit();
                    Console.WriteLine("All data cleared");
              }

              catch(Exception e)
              {
                    myTrans.Rollback();
                    Console.WriteLine(e.ToString());
                    Console.WriteLine("Neither record was deleted.");
              }
              finally
              {
                    myConnection.Close();

              }
        }
}

private void ClearScreen()
{
        carNumberTxt.Text ="";
        driverNameTxt.Text ="";
        icNumberTxt.Text = "";
}

private void ResetByteArray(ref byte[] arr)
{
        for(long i = 0; i < arr.LongLength; ++i)
        {
              arr[i] = 0x00;
        }
}

private string ConvertByteToString(byte[] data)
{
        System.Text.StringBuilder val = newSystem.Text.StringBuilder(null);
        char[] arr =  System.Text.Encoding.ASCII.GetChars(data);
        val.Append(arr);
        return val.ToString();
}
```

```
        private void statusTimer_Tick(object sender, System.EventArgs e)
        {
                StatusLabel.Text="";
                statusTimer.Stop();

        }



}
}
```

5.4.1.2 Exit Point

```
static void Main()
        {
                Application.Run(new Form1());
        }

        private void Form1_Load(object sender, System.EventArgs e)
        {
                exitDateLabel.Text += DateTime.Now.ToLongDateString();

                cardReaderTimer.Interval = 10000;
                cardReaderTimer.Enabled = true;
                cardReaderTimer.Start();

                statusTimer.Interval=3000;
                statusTimer.Enabled= true;
        }

        private void cardReaderTimer_Tick(object sender, System.EventArgs e)
        {
                string APIname = "";
                int status= 0;
                int state = 0;

                byte[] temp = new byte[80];


                status = MyKad_SDK.OpenReader();
                APIname = "OpenReader";

                if (0 == status)
                {
                        string cardReader = "IRIS SCR21U 0";
                        status  = MyKad_SDK.SelectDevice(cardReader,
                                  cardReader.Length);
                        APIname = "SelectDevice";
                }
                Application.DoEvents();

                if (0 != status)
                {
                        statusLabel.Text = "UNABLE TO READ MYKAD";
```

```
        statusTimer.Start();
        cardReaderTimer.Stop();
        cardReaderTimer.Start();
}

if (0 == status)
{
        status = MyKad_SDK.CardDetect(ref state);
        APIname= "CardDetect";
}

if (0 == status && 1 == state )
{
        try
        {
                status = MyKad_SDK.CardConnectA();
                APIname= "CardConnectA";

                Application.DoEvents();

                if (0 == status && 1 == state )
                {

                        status = MyKad_SDK.SelectPTS(0x13);
                        APIname= "SelectPTS";

                }
                Application.DoEvents();

                if (0 == status && 1 == state )
                {
                        status = MyKad_SDK.SelJPNApp();
                        APIname= "SelJPNApp";
                }
                Application.DoEvents();

                if (0 == status && 1 == state )
                {
                        ResetByteArray(ref temp);
                        status = MyKad_SDK.JPN_GMPCName(temp);
                        APIname= "JPN_GMPCName";
                        driverNameTxt.Text = ConvertByteToString(temp);
                }
                Application.DoEvents();

                if (0 == status && 1 == state )
                {
                        ResetByteArray(ref temp);
                        status = MyKad_SDK.JPN_IDNum(temp);
                        APIname= "JPN_IDNum";
                        ICNumberTxt.Text = ConvertByteToString(temp);
                        if (12 <= ICNumberTxt.Text.Length)
                        {
                ICNumberTxt.Text = ICNumberTxt.Text.Insert(6, "-");
                ICNumberTxt.Text = ICNumberTxt.Text.Insert(9, "-");
                        }
```

```
                    }
                    Application.DoEvents();
                    statusLabel.Text="PLEASE REMOVE MYKAD";
                    statusTimer.Start();

                }


                catch (Exception ex)
                {
                    MessageBox.Show(null, ex.Message, "Exception",
MessageBoxButtons.OK, MessageBoxIcon.Error, MessageBoxDefaultButton.Button1);
                }
                finally
                {
                    if( 0 != status || 1 != state )
                    ErrorHandle( APIname, status, state);
                    status = MyKad_SDK.CardDisconnect();
                    status = MyKad_SDK.CloseReader();

                    StoreData();
                    ClearScreen();
                    Application.DoEvents();
                    cardReaderTimer.Stop();
                    cardReaderTimer.Start();

                }
            }
        }

        private void StoreData()
        {
            string name = driverNameTxt.Text.Trim();
            string IC_No = ICNumberTxt.Text.Trim();
            string Car_No = carNumberTxt.Text.Trim();
            DateTime today = DateTime.Now;
            string Date_Time = today.ToString();


            OracleConnection myConnection = new OracleConnection();
            myConnection.ConnectionString= "User
            Id=PSADMIN;Password=syahrul;Data Source=parksys";
            myConnection.Open();

            OracleCommand myCommand = myConnection.CreateCommand();
            OracleTransaction myTrans;
            OracleDataReader myReader;

        // Start a local transaction
        myTrans = myConnection.BeginTransaction(IsolationLevel.ReadCommitted);

            // Assign transaction object for a pending local transaction
            myCommand.Transaction = myTrans;

            if (name != "" && IC_No !="" && Car_No !="")
            {
                try
```

```
        {
myCommand.CommandText = "SELECT a.ic_number,b.car_number FROM
                        driver a, entry_point b WHERE
                        a.car_number=b.car_number AND
                        a.ic_number='"+IC_No+"' AND
                        b.car_number='"+Car_No+"'";
                        myReader = myCommand.ExecuteReader();

        if (myReader.HasRows == true)

        {

        myCommand.CommandText = "INSERT into EXIT_POINT values
        ('"+Car_No+"','"+Date_Time+"')";
        myCommand.ExecuteNonQuery();

        myCommand.CommandText = "UPDATE LOG set Date_Time_Exit
                              ='"+Date_Time+"',status ='DRIVER
                                VERIFIED'"
                                +"WHERE ic_number ='"+IC_No+"'"
                                +"AND name ='"+name+"'"
                                +"AND car_number ='"+Car_No+"'";

        myCommand.ExecuteNonQuery();

        myCommand.CommandText = "DELETE FROM Driver WHERE ic_number =
        '"+IC_No+"' AND car_number = '"+Car_No+"'";
        myCommand.ExecuteNonQuery();

        myTrans.Commit();
        Console.WriteLine("All records are written to database.");
        statusLabel.ForeColor = Color.Blue;
        statusLabel.Text="DRIVER VERIFIED.THANK YOU & PLEASE COME
        AGAIN";
        statusTimer.Start();
        }

        else
        {
        myCommand.CommandText = "INSERT INTO LOG
        (ic_number,car_number,name,date_time_exit,status)"+
        "VALUES ('"+IC_No+"','"+Car_No+"','"+name
        +"','"+Date_Time+"','UNIDENTIFIED DRIVER')";
        myCommand.ExecuteNonQuery();

        myTrans.Commit();

        statusLabel.ForeColor = Color.Red;
        statusLabel.Text = "VERIFICATION FAILED. PLEASE PROCEED TO
        THE SECURITY COUNTER";
        statusTimer.Start();
        }
}
        catch(Exception e)
        {
              myTrans.Rollback();
              Console.WriteLine(e.ToString());
```

```
                Console.WriteLine("Neither record was written to
                database.");
            }
            finally
            {
                myConnection.Close();
            }

        }

}

private void ClearScreen()
{
        carNumberTxt.Text ="";
        driverNameTxt.Text ="";
        ICNumberTxt.Text = "";
}

private void ErrorHandle(string title,int status, int state)
{

        short sw12 =  0;
        string strstatus = "";
        string strsw12 = "N/A";

        if(status == -87)
        {
                sw12 = MyKad_SDK.GetError();
                strsw12   = String.Format("{0:X2}",sw12);
        }

        if(status > -100)
                strstatus = String.Format("{0:d}",status);
        else
                strstatus = String.Format("{0:x2}",status);

        MessageBox.Show("API Return Code = " + strstatus +
                "\nSW12                    = " + strsw12 +
                "\nCardDetect value  = " + state,
                "From the API: " + title
                ,MessageBoxButtons.OK,MessageBoxIcon.Warning);

}

private void ResetByteArray(ref byte[] arr)
{
        for(long i = 0; i < arr.LongLength; ++i)
        {
                arr[i] = 0x00;
        }
}

private string ConvertByteToString(byte[] data)
{
  System.Text.StringBuilder val = new System.Text.StringBuilder(null);
  char[] arr =  System.Text.Encoding.ASCII.GetChars(data);
```

```
        val.Append(arr);
            return val.ToString();
        }

        private void statusTimer_Tick(object sender, System.EventArgs e)
        {
            statusLabel.Text="";
            statusTimer.Stop();
        }



}
}
```

5.4.2 Codes for Regular Parking User (Without Bar Code Reader)

5.4.2.1 Entry Point

```
static void Main()
        {
            Application.Run(new Form1());
        }

        private void Form1_Load(object sender, System.EventArgs e)
        {
            entranceDateLabel.Text += DateTime.Now.ToLongDateString();

        }

        private void readBtn_Click(object sender, System.EventArgs e)
        {
            string APIname = "";
            int status= 0;
            int state = 0;


            byte[] temp = new byte[80];

            Application.DoEvents();


            try
            {
                readBtn.Enabled = false;

                status = MyKad_SDK.OpenReader();
                APIname = "OpenReader";

                if (0 == status)
                {
                    string cardReader = "IRIS SCR21U 0";
                    status  = MyKad_SDK.SelectDevice(cardReader,
                    cardReader.Length);
                    APIname = "SelectDevice";
                }
```

```
        Application.DoEvents();

        if (0 == status)
        {
              status = MyKad_SDK.CardDetect(ref state);
              APIname= "CardDetect";
        }

        if (0 == status && 1 == state )
        {
              status = MyKad_SDK.CardConnectA();
              APIname= "CardConnectA";
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              status = MyKad_SDK.SelectPTS(0x13);
              APIname= "SelectPTS";

        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              status = MyKad_SDK.SelJPNApp();
              APIname= "SelJPNApp";
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              ResetByteArray(ref temp);
              status = MyKad_SDK.JPN_GMPCName(temp);
              APIname= "JPN_GMPCName";
              driverNameTxt.Text = ConvertByteToString(temp);
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              ResetByteArray(ref temp);
              status = MyKad_SDK.JPN_IDNum(temp);
              APIname= "JPN_IDNum";
              icNumberTxt.Text = ConvertByteToString(temp);
              if (12 <= icNumberTxt.Text.Length)
              {
              icNumberTxt.Text = icNumberTxt.Text.Insert(6, "-");
              icNumberTxt.Text = icNumberTxt.Text.Insert(9, "-");
              }
        }
        Application.DoEvents();

}
catch (Exception ex)
{
        MessageBox.Show(null, ex.Message, "Exception",
```

```
                MessageBoxButtons.OK, MessageBoxIcon.Error,
                MessageBoxDefaultButton.Button1);
        }
        finally
        {
                if( 0 != status || 1 != state )
                ErrorHandle( APIname, status, state);
                status = MyKad_SDK.CardDisconnect();
                status = MyKad_SDK.CloseReader();
                readBtn.Enabled = true;
        }
}

private void ErrorHandle(string title,int status, int state)
{

        short sw12 =  0;
        string strstatus = "";
        string strsw12 = "N/A";

        if(status == -87)
        {
                sw12 = MyKad_SDK.GetError();
                strsw12   = String.Format("{0:X2}",sw12);
        }

        if(status > -100)
                strstatus = String.Format("{0:d}",status);
        else
                strstatus = String.Format("{0:x2}",status);

        MessageBox.Show("API Return Code = " + strstatus +
                "\nSW12                    = " + strsw12 +
                "\nCardDetect value  = " + state,
                "From the API: " + title
                ,MessageBoxButtons.OK,MessageBoxIcon.Warning);

}

private void ClearScreen()
{
        carNumberTxt.Text ="";
        driverNameTxt.Text ="";
        icNumberTxt.Text = "";
}

private void ResetByteArray(ref byte[] arr)
{
        for(long i = 0; i < arr.LongLength; ++i)
        {
                arr[i] = 0x00;
        }
}

private string ConvertByteToString(byte[] data)
{
System.Text.StringBuilder val = new System.Text.StringBuilder(null);
```

```
        char[] arr =  System.Text.Encoding.ASCII.GetChars(data);
        val.Append(arr);
        return val.ToString();
}

private void saveBtn_Click(object sender, System.EventArgs e)
{
        StoreData();
}

private void StoreData()
{
        string name = driverNameTxt.Text.Trim();
        string IC_No = icNumberTxt.Text.Trim();
        string Car_No_Capture = carNumberTxt.Text.Trim();
        string Car_No = Car_No_Capture.ToUpper();
        DateTime today = DateTime.Now;
        string Date_Time = today.ToString();

        statusTimer.Interval = 3000;
        statusTimer.Enabled = true;
        OracleConnection myConnection = new OracleConnection();
        myConnection.ConnectionString= "User
        Id=PSADMIN;Password=syahrul;Data Source=parksys";
        myConnection.Open();

        OracleCommand myCommand = myConnection.CreateCommand();
        OracleTransaction myTrans;

        // Start a local transaction
myTrans = myConnection.BeginTransaction(IsolationLevel.ReadCommitted);
        // Assign transaction object for a pending local transaction
        myCommand.Transaction = myTrans;

        if (name != "" && IC_No !="" && Car_No !="")
        {
                try
                {
                myCommand.CommandText = "INSERT into DRIVER values
                                        ('"+IC_No+"','"+name+"','"+Car_No+"')" ;
                myCommand.ExecuteNonQuery();

                myCommand.CommandText = "INSERT into ENTRY_POINT values
                                        ('"+Car_No+"','"+Date_Time+"')";
                myCommand.ExecuteNonQuery();

                myCommand.CommandText = "INSERT into LOG
                (IC_Number,Car_Number,Name,Date_Time_Entry) values("
                +"'"+IC_No+"','"+Car_No+"','"+name+"','"+Date_Time+"')";
                myCommand.ExecuteNonQuery();

                myTrans.Commit();
                Console.WriteLine("All records are written to database.");
                statusLabel.Text=" WELCOME "+name;
                statusLabel.Show();
                statusTimer.Start();
```

```
                }
                catch(Exception e)
                {
                myTrans.Rollback();
                Console.WriteLine(e.ToString());
                Console.WriteLine("Neither record was written to database.");
                }
                finally
                {

                      myConnection.Close();
                      ClearScreen();

                }

          }

    }

    private void statusTimer_Tick(object sender, System.EventArgs e)
    {
          statusLabel.Text="";
          statusLabel.Hide();
          statusTimer.Stop();
    }



    }
}
```

5.4.2.2 Exit Point

```
static void Main()
    {
          Application.Run(new Form1());
    }

    private void Form1_Load(object sender, System.EventArgs e)
    {
          exitDateLabel.Text += DateTime.Now.ToLongDateString();
    }

    private void readBtn_Click(object sender, System.EventArgs e)
    {
          string APIname = "";
          int status= 0;
          int state = 0;


          byte[] temp = new byte[80];

          Application.DoEvents();


          try
```

```
{
        readBtn.Enabled = false;

        status = MyKad_SDK.OpenReader();
        APIname = "OpenReader";

        if (0 == status)
        {
        string cardReader = "IRIS SCR21U 0";
        status  = MyKad_SDK.SelectDevice(cardReader,
        cardReader.Length);
        APIname = "SelectDevice";
        }
        Application.DoEvents();

        if (0 == status)
        {
              status = MyKad_SDK.CardDetect(ref state);
              APIname= "CardDetect";
        }

        if (0 == status && 1 == state )
        {
              status = MyKad_SDK.CardConnectA();
              APIname= "CardConnectA";
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              status = MyKad_SDK.SelectPTS(0x13);
              APIname= "SelectPTS";

        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              status = MyKad_SDK.SelJPNApp();
              APIname= "SelJPNApp";
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              ResetByteArray(ref temp);
              status = MyKad_SDK.JPN_GMPCName(temp);
              APIname= "JPN_GMPCName";
              driverNameTxt.Text = ConvertByteToString(temp);
        }
        Application.DoEvents();

        if (0 == status && 1 == state )
        {
              ResetByteArray(ref temp);
              status = MyKad_SDK.JPN_IDNum(temp);
              APIname= "JPN_IDNum";
```

```
                    icNumberTxt.Text = ConvertByteToString(temp);
                    if (12 <= icNumberTxt.Text.Length)
                    {
                    icNumberTxt.Text = icNumberTxt.Text.Insert(6, "-");
                    icNumberTxt.Text = icNumberTxt.Text.Insert(9, "-");
                    }
              }
              Application.DoEvents();

        }
        catch (Exception ex)
        {
              MessageBox.Show(null, ex.Message, "Exception",
              MessageBoxButtons.OK, MessageBoxIcon.Error,
              MessageBoxDefaultButton.Button1);
        }
        finally
        {
              if( 0 != status || 1 != state )
              ErrorHandle( APIname, status, state);
              status = MyKad_SDK.CardDisconnect();
              status = MyKad_SDK.CloseReader();
              readBtn.Enabled = true;
        }
}

private void verifyBtn_Click(object sender, System.EventArgs e)
{
        VerifyData();
}

private void VerifyData()
{
        string name = driverNameTxt.Text.Trim();
        string IC_No = icNumberTxt.Text.Trim();
        string Car_No_Capture = carNumberTxt.Text.Trim();
        string Car_No = Car_No_Capture.ToUpper();
        DateTime today = DateTime.Now;
        string Date_Time = today.ToString();

        statusTimer.Interval = 3000;
        statusTimer.Enabled = true;

        OracleConnection myConnection = new OracleConnection();
        myConnection.ConnectionString= "User
        Id=PSADMIN;Password=syahrul;Data Source=parksys";
        myConnection.Open();

        OracleCommand myCommand = myConnection.CreateCommand();
        OracleTransaction myTrans;
        OracleDataReader myReader;
        // Start a local transaction
myTrans = myConnection.BeginTransaction(IsolationLevel.ReadCommitted);
        // Assign transaction object for a pending local transaction
        myCommand.Transaction = myTrans;

        if (name != "" && IC_No !="" && Car_No !="")
```

```
{
        try
        {
        myCommand.CommandText = "SELECT a.ic_number,b.car_number FROM
        driver a, entry_point b WHERE a.car_number=b.car_number AND
        a.ic_number='"+IC_No+"' AND b.car_number='"+Car_No+"'";
        myReader = myCommand.ExecuteReader();

              if (myReader.HasRows == true)

              {
              myCommand.CommandText = "INSERT into EXIT_POINT values
              ('"+Car_No+"','"+Date_Time+"')";
              myCommand.ExecuteNonQuery();

              myCommand.CommandText = "UPDATE LOG set Date_Time_Exit
              ='"+Date_Time+"',status = 'DRIVER IDENTIFIED'"
              +"WHERE ic_number ='"+IC_No+"'"
              +"AND name ='"+name+"'"
              +"AND car_number ='"+Car_No+"'";
              myCommand.ExecuteNonQuery();

              myCommand.CommandText = "DELETE FROM Driver WHERE
              ic_number = '"+IC_No+"'AND car_number ='"+Car_No+"'";
              myCommand.ExecuteNonQuery();

              myTrans.Commit();
              Console.WriteLine("All records are written to
              database.");
              statusLbl.ForeColor = Color.Blue;
              statusLbl.Text="DRIVER VERIFIED.THANK YOU & PLEASE COME
              AGAIN";
              statusLbl.Show();
              statusTimer.Start();
              }

              else
              {
              myCommand.CommandText = "INSERT INTO LOG
              (ic_number,car_number,name,date_time_exit,status)"+
              "VALUES ('"+IC_No+"','"+Car_No+"','"+name
              +"','"+Date_Time+"','UNIDENTIFIED DRIVER')";
              myCommand.ExecuteNonQuery();

              myTrans.Commit();

              statusLbl.ForeColor = Color.Red;
              statusLbl.Text = "UNIDENTIFIED DRIVER.PLEASE PROCEED TO
                               THE SECURITY COUNTER";
              statusLbl.Show();
              statusTimer.Start();
              Console.WriteLine("Unidentified driver");
              }

        }
        catch(Exception e)
        {
```

```
                myTrans.Rollback();
                Console.WriteLine(e.ToString());
                Console.WriteLine("Neither record was written to
                database.");
            }
            finally
            {
                myConnection.Close();
                ClearScreen();
            }

        }

}

private void ErrorHandle(string title,int status, int state)
{

        short sw12 =  0;
        string strstatus = "";
        string strsw12 = "N/A";

        if(status == -87)
        {
            sw12 = MyKad_SDK.GetError();
            strsw12   = String.Format("{0:X2}",sw12);
        }

        if(status > -100)
            strstatus = String.Format("{0:d}",status);
        else
            strstatus = String.Format("{0:x2}",status);

        MessageBox.Show("API Return Code = " + strstatus +
            "\nSW12                    = " + strsw12 +
            "\nCardDetect value  = " + state,
            "From the API: " + title
            ,MessageBoxButtons.OK,MessageBoxIcon.Warning);

}

private void ClearScreen()
{
        carNumberTxt.Text ="";
        driverNameTxt.Text ="";
        icNumberTxt.Text = "";
}

private void ResetByteArray(ref byte[] arr)
{
        for(long i = 0; i < arr.LongLength; ++i)
        {
            arr[i] = 0x00;
        }
}
```

```
        private string ConvertByteToString(byte[] data)
        {
        System.Text.StringBuilder val = new System.Text.StringBuilder(null);
        char[] arr =  System.Text.Encoding.ASCII.GetChars(data);
        val.Append(arr);
        return val.ToString();
        }

        private void statusTimer_Tick(object sender, System.EventArgs e)
        {
              statusLbl.Text="";
              statusLbl.Hide();
              statusTimer.Stop();
        }

}
}
```

CHAPTER 6: CONCLUSION

This project is mainly designed to propose a supporting security system that could help prevent car thefts especially in parking areas in malls, hotels and other car park service available. Based on the alarming car theft statistics, it is always a good measure to take extra precaution by having more security system installed in parking areas. Besides that, the to-be system can be used to work together with the existing security system to ensure better security. By creating this system, we can extend the usability of MyKad in security systems which involve public properties. The fundamental of such system has already been implemented in banking system and national registration system. This system is also developed to adopt the smart card system as it has the capability to evolve and enhanced. Hence, making it more compatible to be implemented in security systems compared to biometric systems. The to-be system is developed for the usage of both regular parking user as well as seasonal parking user.

For future enhancement, the system should automate the input entry of car registration number which is currently designed to receive typed input by the parking operator (for regular parking user interface). The automation of acquiring the car registration number can be done using barcode maker and barcode reader which are currently being implemented for seasonal parking user. The barcode maker will create a bar code represents the car registration number while the barcode reader will read the bar code and process the information needed. Another alternative that can be used to automate the input entry is by acquiring the image of the car's plate number and process the image to be a useful data that can be stored in the database. Besides that, MEPS function and Touch N Go function in the MyKad could be used for the parking fee payment. This is because over the years, MyKad capabilities have been enhanced to cover these capabilities. However, these enhancements can only be implied if the workload complement with the time frame given to develop this project.

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APPENDIX

APPENDIX 1.1

QUOTATION

To: Universiti Technology Petronas,
Bandar Ser Iskandar,
Tronoh, Perak
31750 Malaysia

Quotation No.: PRIV/K J/0207/2006/Q
Date: 10-May-06
Tel No.: -
Fax No.: -
H/P : 012-77292192

Attn.: Syahrul Aniza Sharil
Project: Education Purpose

We are pleased to quote you the following items :-

*THIS IS AN INDICATIVE PRICING

Item	Model No.	Desctiption	Qty	Unit Price (RM)	Total (RM)
1	6000-0092	Desktop Biometric Scanner ST-Bio	1	1,050.00	1,050.00
2	6000-0160	Desktop Smart Card Reader SCR20UV3	1	135.00	135.00
3	5000-0303	Thumbprint Verify SDK for ST-Bio	1	2,000.00	2,000.00
4	5000-0442	Proprietary SDK for SCR20U	1	2,000.00	2,000.00
TOTAL PRICE					5,185.00

* Note : Above prices are nett (after discount) and exclude taxes.

Terms & Conditions:

1. Payment: Cash on Delivery,
   OR
   Beneficiary Name: IRIS Corporation Berhad

   TT or sight LC
   Bank Name: EON Bank Berhad,
   28-32 Jalan Kapar,
   41000 Klang,
   Selangor Darul Ehsan, Malaysia

A/C #: 0013-10-01320-1
Swift code: EOBB MYKL

2. Delivery: 2 weeks upon PO confirmation

3. Validity : 7 days from the quotation issued

4. Warranty: 12

5. Delivery: F.O.B Kuala

For delivery outside KL, please advise us your Courier Agent and Account number

6. Others: Please quote product model number with descriptions for your order

We trust the above quotation provided herein is worthy of your consideration. Please do not hesitate to contact us if you need any further clarification.

Thank you.

Yours faithfully,

Kenji Liew
Sales Executive
Sales & Marketing

Zanariah Mohamad
Manager
Sales & Marketing

IPPENDIX 1.2

Integrity Business Solution Sdn Bhd (693807-U)

No.54-3, Jalan USJ 9/5P, Subang Business Centre 47620 Selangor Darul Ehsan, Malaysia.
Tel: 603-8023 2846 / 8025 9919 Fax: 603-8023 2587
Email: info@integrity.com.my URL: http://www.integrity.com.my

Quotation

ame : Syahrul Aniza
ompany : Universiti Teknologi PETRONAS
ddress : Bandar Seri Iskandar, 31750 Tronoh, Perak
Malaysia

Date : 15th May 2006
Ref N : IBS50000/UTP001
Tel :
Fax :

ear Sir/Madam,

s per requested, we would like to submit our quotation for your kind attention.

lo	Item Description	Quantity	Unit Price (RM)	Total Price (RM)
1	Software Development Kit for MyKad Reader c/w - Sample code, sample program, documentation & MyKad DL - Mykad program (read open data, JPN, JPJ & imagration)	1 CD	2,000.00	2,000.00
2	SCR3311 contact smart card read/write reader - USB interface - heavy metal base	1 unit	400.00	400.00
3	SCR30 contact smart card read/write reader - USB interface	1 unit	230.00	230.00
4	Courier and handling cost	1	55.00	55.00
			Total Amount (RM)	2,685.00

erms and Conditions:

ayment : 100% TT in advance upon confirmation of PO (for outstation)
elivery : Ex-stock or 2 - 3 weeks from date of PO or on availability hardware
'arranty : 1 year for manufacturing defects on hardware
alidity : 30 days from date of quotation

ur Bank Details:
umiputra Commerce Bank Berhad (USJ 9 Barnch)
09 - 0010111 - 051

ould you require any further information please do not hesitate to contact the undersigned at any time nvenience to you.

ours faithfully,
tegrity Business Solution Sdn Bhd

Accepted by
Authorized Signature & Company Stamp

emmy Mok
count Manager
obile : 016 265 8619
mail : Demmymok@integrity.com.my

Name:
Date:
Purchase Order No:

1) Do you own a vehicle?
(If YES, please proceed with question no.2. If NO, please skip to question no.5)

	Percentage	Responses
Yes	84.1%	58
No	15.9%	11
Total responses:		**69**

2) Specify the type(s) of vehicle(s) you own

	Percentage	Responses
Car	65.7	44
Motorcycle	26.9	18
Van	1.5	1
Four Wheel Drive	1.5	1
Lorry/Truck	0.0	0
Other	4.5	3

3) Have you ever encountered vehicle theft or experienced your vehicle being stolen?
(If YES, please proceed to question no.4. If NO, please skip to question no.5)

	Percentage	Responses
Yes	28.6%	16
No	71.4%	40
Total responses:		**56**

	Percentage	Responses
shopping mall's parking area	23.5	4
hotel's parking area	0.0	0
house compund	35.3	6
public parking area	17.6	3
Other	23.5	4
Total responses:		**17**

5) What do you think causes vehicle theft? Rate them from the scale of 1-3

	1 Highest factor	2 Medium factor	3 Lowest factor	Responses	Average Score
Vehicles are park at an unsecured area	**46 (66.67%)**	19 (27.54%)	4 (5.80%)	69	1.39 / 3 (46.33%)
Lack of security in parking area	**43 (62.32%)**	23 (33.33%)	3 (4.35%)	69	1.42 / 3 (47.33%)
Valuable items were left in the car	**43 (62.32%)**	22 (31.88%)	4 (5.80%)	69	1.43 / 3 (47.67%)
No security system/device installed in vehicle	**30 (43.48%)**	29 (42.03%)	10 (14.49%)	69	1.71 / 3 (57.00%)
Left parking ticket in the vehicle	10 (14.49%)	16 (23.19%)	**43 (62.32%)**	69	2.48 / 3 (82.67%)
					1.69 / 3 (56.33%)

6) Rate the effectiveness of current parking security systems in the range of 1-5

6 (8.70%)	19 (27.54%)	**42 (60.87%)**	2 (2.90%)	0 (0.00%)	69	2.58 / 5 (51.60%)
						2.58 / 5 (51.60%)

7) Do you think it is a good idea to use MyKad instead of parking ticket to identify a vehicle owner in a parking area? Rate the idea in the scale of 1-5

1 very bad	**2 bad**	**3 acceptable**	**4 good**	**5 very good**	**Responses**	**Average Score**
2 (2.90%)	6 (8.70%)	**25 (36.23%)**	**25 (36.23%)**	11 (15.94%)	69	3.54 / 5 (70.80%)
						3.54 / 5 (70.80%)

8) Do you think by implementing a security system using MyKad, we could utilise its capability to the maximum?

		Percentage	**Responses**
Yes		34.8	24
Maybe		53.6	37
No		11.6	8
		Total responses:	**69**

Q1	Q2a	Q2b	Q2c	Q2d	Q2e	Q2f	Q3	Q4	Q5a	Q5b	Q5c	Q5d	Q5e	Q6a	Q7a	Q8	Date Taken
2							2	999999	1	2	1	1	2	3	3	2	8/10/2006 23:36
1	1						2		1	1	1	1	3	2	3	2	8/10/2006 23:43
1	1	1					2		1	1	1	1	1	3	3	2	8/10/2006 23:48
1	1	1					2		1	1	1	1	3	3	2	3	8/10/2006 23:49
1	1						2		1	1	1	2	3	3	5	2	8/10/2006 23:50
1	1						2		1	1	1	1	1	3	3	3	8/10/2006 23:54
1		1					2		1	2	1	1	3	4	4	1	8/10/2006 23:55
1		1					1	3	2	1	3	2	3	3	4	1	8/10/2006 23:55
1	1						2		1	1	1	2	3	3	5	1	8/11/2006 0:03
1	1	1					1	4	2	1	1	1	1	1	5	1	8/11/2006 0:03
1	1						1	Outside snooker hall	1	2	1	2	2	3	4	1	8/11/2006 0:16
1	1						2		1	1	2	2	1	3	5	3	8/11/2006 0:19
2									1	2	2	1	3	1	4	1	8/11/2006 0:21
1	1						2		1	2	2	2	3	2	5	2	8/11/2006 0:22
1	1						2		2	1	2	2	2	3	4	1	8/11/2006 0:25
1	1						2		2	1	1	1	3	1	5	1	8/11/2006 0:25
1	1	1					1	3	1	1	2	2	2	3	4	1	8/11/2006 0:26
1	1						1	3	3	2	1	1	3	3	4	1	8/11/2006 0:48
1	1								1	1	2	3	3	3	1	3	8/11/2006 0:52
1			1				1	1	1	1	1	1	2	1	4	1	8/11/2006 0:54
2									1	2	1	2	3	3	3	2	8/11/2006 0:57
2									1	1	2	2	3	3	5	2	8/11/2006 0:59
1	1						1	3	2	1	1	1	1	2	3	2	8/11/2006 1:27
1	1	1					2		1	1	2	2	3	2	3	2	8/11/2006 1:29
1	1						2		1	1	1	1	1	3	4	1	8/11/2006 1:29
1	1						2		2	2	1	1	3	2	4	2	8/11/2006 1:30
1	1						1	1	1	1	2	2	2	3	4	1	8/11/2006 1:39
2							2		1	2	1	2	3	3	3	1	8/11/2006 1:47
1	1	1					2		1	3	1	1	3	3	4	2	8/11/2006 2:08
1	1						2		2	1	1	3	2	3	3	1	8/11/2006 2:08
2									2	1	2	2	2	3	3	2	8/11/2006 2:08
1	1						2		1	2	1	2	3	3	3	2	8/11/2006 2:09
1	1						2		2	1	2	1	3	2	3	2	8/11/2006 2:09
1	1						2		1	1	1	1	1	3	3	2	8/11/2006 2:09
1	1								1	1	1	1	3	3	4	2	8/11/2006 2:09
1	1						1	4	2	1	3	3	3	2	3	2	8/11/2006 2:10
1		1					2		1	1	1	2	3	2	3	2	8/11/2006 2:13
1	1						2		1	1	1	1	2	1	5	2	8/11/2006 2:15
2									2	1	1	2	3	3	4	1	8/11/2006 2:18
1	1						2		2	2	2	2	3	3	3	2	8/11/2006 2:22
1		1					1	4	1	3	1	1	1	3	3	2	8/11/2006 2:22
1						bicyle	2		3	3	3	3	3	3	2	3	8/11/2006 2:23
1	1						2		1	1	2	3	3	2	2	3	8/11/2006 2:24
1		1					1	3	1	1	2	2	3	2	3	1	8/11/2006 2:26
1		1					2		1	1	1	2	3	2	5	1	8/11/2006 2:27
1		1				trailor	1	cafetria	3	2	2	3	3	3	4	2	8/11/2006 2:27
1	1						2		1	1	1	2	3	2	3	1	8/11/2006 2:33
1	1						2		1	2	2	1	3	3	4	2	8/11/2006 2:35
1						Chopper	2		1	1	1	1	1	3	1	3	8/11/2006 2:38
1	1								1	1	1	1	2	2	4	1	8/11/2006 2:46
1	1						2		1	2	1	2	3	2	2	2	8/11/2006 2:54

1	1								1	2	1	1	3	3	4	2	8/11/2006 3:10
1		1					1	1	1	2	2	1	3	3	3	2	8/11/2006 3:43
1			1				2		2	2	1	3	3	3	4	1	8/11/2006 3:51
1	1	1					1	3	1	1	2	3	3	3	4	2	8/11/2006 4:28
2									2	2	1	1	3	2	2	2	8/11/2006 4:43
1		1					1	1	1	2	1	1	2	3	4	2	8/11/2006 4:45
1	1						2		2	1	2	3	3	3	4	2	8/11/2006 4:45
1	1						2		1	1	1	1	3	2	5	2	8/11/2006 4:57
1		1					1	Apartment parking area	1	2	2	1	1	3	3	2	8/11/2006 7:05
1	1	1					2		1	1	1	1	3	1	4	2	8/11/2006 7:19
2									3	2	3	2	2	2	3	2	8/11/2006 8:03
2									1	1	2	2	3	3	4	2	8/11/2006 8:34
1	1						2		1	1	2	2	2	3	4	1	8/11/2006 9:05
1	1						2		2	1	1	2	3	2	4	1	8/11/2006 10:24
1	1						2		2	2	1	2	2	2	3	2	8/11/2006 17:22
1	1						2		1	1	1	1	3	2	3	1	8/12/2006 0:11
2									2	2	1	3	2	3	2	3	8/12/2006 0:24
1	1						2		2	1	1	2	2	3	3	2	8/12/2006 7:27