

RFID-Based Tourism Information System

By

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Dissertation submitted in partial fulfillment of the requirements for the
BACHELOR OF TECHNOLOGY (HONS)
(BUSINESS INFORMATION SYSTEM)

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CERTIFICATION OF APPROVAL

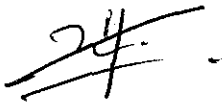
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A project dissertation submitted to the
Business Information Systems Programme
Universiti Teknologi PETRONAS
in partial fulfilment of the requirement for the
BACHELOR OF TECHNOLOGY (Hons)
(BUSINESS INFORMATION SYSTEMS)

Approved by,



(Mr. Mohd Hilmi Hasan)

UNIVERSITI TEKNOLOGI PETRONAS
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January 2009

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.



NURUL HANNAH BINTI ABDUL HAMID

ABSTRACT

The purpose of this dissertation is to record all relevant activities involving research which focuses on developing tourist information system via Radio Frequency Identification (RFID). The RFID system aims to provide an alternative and automate the current method of conveying information to the tourist who came to Malaysia. Currently, the current method to convey information to the tourist is through brochures, maps, the internet, tourist information counter, etc.

Personalization is tailoring to a user based on personal detail or characteristic they provide. If the tourist or user is Malaysian, the information display will be in Bahasa Malaysia, and if the tourist is from France, the information will be display in French language. The personalization is based on the language used by the tourists and their nationality. Personalization provides better information as it provides more specific information that is increasingly relevant to a person's interest and increase the reliability of information. It is usually in accordance with individuals' standards, tastes and preferences. The methodology adopted is prototyping-based methodology.

In addition, the technology used for the project development is purely RFID using passive RFID tag and passive RFID fixed reader. Based on the author's research, the RFID technology is suitable to be used for this particular system. It is hope that the RFID based Tourist Information System can be used as a tool to convey information, displaying welcome messages, routes or promotions to the Malaysian tourists in the future. This dissertation also includes introduction, project literature review and study, project work and methodology, result and discussion, conclusion and recommendations and last but not least, references and appendices.

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LIST OF ABBREVIATIONS

RFID	Radio Frequency Identification
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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Malaysia boasts an exciting year-round calendar of world class and unique local events, ensuring visitors have endless opportunities to enjoy nature-based adventures, enriching cultural experiences or fabulous shopping sprees. By having large LCD display with RFID reader, information about interesting places and events can be access easily. This project will provide an alternative on information source gathering rather than from tourist information centre, tourist pamphlet, tourist guide, via phone calls or website. The information displayed will be based on the tourist registered for the privilege card at main attractions or huge shopping malls.

Based on Berita Harian news on Saturday, 2 August 2008, there was already 13 millions of domestic and international tourist who had visited Kuala Lumpur, the main capital of Malaysia in year 2007. A total of 10.9 millions of international visited Malaysia in the first sixth month of year 2007 while 8 millions of them visited Kuala Lumpur. The government and the Ministry of Tourism are currently researching on tourist background such as on their nationality and why did they came to Malaysia. With that information, they can come up with more events, programmes and places of attraction. The government would like to provide more interesting places to visit especially during the current global economic crisis. The Tourism Information System via RFID is hoped to help the government to capture the tourist behavior and visiting habits and display useful information, thus, the government could improved their marketing strategies and developed more attractive places for people to visit.

1.2 PROBLEM STATEMENT

Currently, the current method to convey information to the tourist is through brochures, maps, the internet, tourist information counter, etc. Sometimes, the tourist needs to buy maps or need assistance from tourist guide in order to get to their destination of main attractions in Malaysia. Information should be easily accessible to the tourist as sometimes there would be communication or language barrier between the tourist and local citizens. By having the tourism information system, tourist will have more access to information that will be interesting to them such as places of attractions and events highlights. The tourism information displayed will be multi-lingual which consist of Bahasa Malaysia for the Malaysian tourists, French language for tourist from France and English language for tourists with other nationality. It is also more convenient and less hassle as the kiosk or tourist information counter might not be very helpful as there is less number of tourism centre and it is located quite far (10 minutes walk from KLCC). This system would give the tourists more flexibility in their trip here in Malaysia. From the questionnaire distributed to the tourist, the common problems faced by tourists who visit Malaysia is that up to date signage's are not available, tourism information are not easily reached and scarce of information kiosk.

1.2.1 Significant of the project:-

The numbers of tourist domestically or internationally are currently increasing from year to year. Thus, there is a need to track and study the tourist visiting behavior as it would benefit the tourism industry. Once the tourist is registered into the system, the tourism information will be displayed according to the tourist's nationality and language used. For example, the young tourist will be promoted with local theme park promotions and events promotions in museum for the older tourist or displayed kimono's fashion shop or Japanese promotional item location on sale for the Japanese tourist. The government and the tourism industry would gain benefits as the system could track the tourists visiting habits and used that information to develop certain places based on the tourists' interest.

Malaysia is also currently aggressively competing with the other ASEAN countries in the tourism industries. Thus, there is a need or cutting edge to capture / track the tourist visiting habits, instead of providing more friendly services and Malaysian hospitality to the tourist and improved on it.

Based on the News Straits Times, August 11, 2008 article, Malaysia will miss this year's target of 22.5 million tourist arrivals because of the higher cost of promotions, stiff competition from other destinations and domestic uncertainties. Tourism Malaysia now expects that it will attract 21.5 million tourists this year, one million short of the initial target. Still, the figure will be 3 % higher than the 20.9 million arrivals last year, instead of 8 %. The shortfall of one million tourists is likely to cause some RM2 billion losses in foreign receipts. Tourism Malaysia director-general Datuk Mirza Mohammad Taiyab said that it will be a challenge to reach the 22.5 million tourist arrival target. Malaysia needs 11.4 million visitors between July and December this year, or 1.92 million tourists each month, to reach the goal. In the first six months, the country welcomed 10.96 million tourists. Malaysia needs to contend with rising competition from other destinations as other countries were also aggressively promoting new destinations. Malaysia does not have a system in displaying helpful information or tracking tourists visiting habits and behavior.

1.3 OBJECTIVES AND SCOPE OF STUDY

1.3.1 Objectives:

1. To develop RFID-Based Tourism Information System to convey information to the tourists.
 - Project Description – The flow of the system starts by having an LCD display attached with passive RFID reader. The users of the system which is the tourist needs to register for a tourist privilege card embedded with passive RFID tag at Malaysia's huge shopping malls participating outlets.
 - When the tourist carries the tourist privilege card embedded with the passive RFID tag past the passive RFID reader, the reader will read and capture the identification number. The identification number is look up in the database and the message is displayed based on the tourist privilege card identification number. In addition, the tourism information or message display is according to the tourist nationality i.e. if the tourist is from France, the message will then be displayed in French language.

1.3.2 Scope of Study

The scope of this project will mainly focus on tourists whom visited Malaysia, especially Kuala Lumpur. The system will be developed according to the requirements of the users, and test a prototype of the system to receive feedbacks from them. It is design in such a way whereby the tourist can obtained information related to places of attraction and event highlights. Specifically for this project, most of the tourist feedbacks are tourist from the ASIAN and Middle East countries. The system will display information on places of attractions and event highlights as it is the highest ranking result of the common information that tourists usually require when travelling in the questionnaire. This system provides multi-lingual tourism information; however, for this project, the tourism information display will only be in Bahasa Malaysia, English and French language.

1.4 FEASIBILITY OF THE PROJECT

Feasibility analysis guides the author in determining whether to proceed with this project. Feasibility analysis identifies the important risks associated with the project and it includes technical feasibility, economic feasibility and organizational feasibility.

1.4.1 Technical Feasibility

Factors	Risk	Assumption
Familiarity with the application and technology	Low	The RFID technology is not a new technology and the system is developed using visual basic and C# language.
Project Size	Moderate	The scope of this project had been limited to the tourist whom visited Kuala Lumpur.
Compatibility	Moderate	This project has moderate compatibility as there is no need for new technology or application to be integrated.

1.4.2 Economic Feasibility

Economic feasibility analysis identifies the financial risk associated with the project.

Development Cost	Operational Cost
Development Team Salaries	Hardware Repairs
Consulting Fees	Communications Charges
Development Training	
Hardware and Software	
Tangible Benefits	Intangible Benefits
	Increased Recognition
	Improved Customer Service

1.4.3 Organizational Feasibility

The organizational feasibility determines how well the system ultimately will be accepted by its users. The proposed project champion is expected to be the Ministry of Malaysian Tourism. The system administrator is in-charged of the system while the system users will be the targeted tourists.

1.5 INTRODUCTION TO RADIO FREQUENCY IDENTIFICATION (RFID)

Radio frequency identification (RFID) system is a special kind of sensor network to identify an object or a person using radio frequency transmission. A typical RFID system includes transponders (tags) and interrogators (readers): tags are attached to objects/persons, and readers communicate with the tags in their transmission ranges via radio signals. RFID systems have been gaining more and more popularity in areas such as supply chain management, automated identification systems, and any place requiring identifications of products or people.

RFID (Radio Frequency Identification) is a method of identifying unique items using radio waves. Typical RFID systems are made up of 2 major components: readers and tags. The reader, sometimes called the interrogator, sends and receives RF data to and from the tag via antennas. A reader may have multiple antennas that are responsible for sending and receiving the radio waves. The tag, or transponder, is made up of the microchip that stores the data, an antenna, and a carrier to which the chip and antenna are mounted.

RFID technology is used today in many applications, including security and access control, transportation and supply chain tracking. It is a technology that works well for collecting multiple pieces of data on items for tracking and counting purposes in a cooperative environment.

Table 1 RFID and Barcodes Compared (adapted from Wyld, 2006).

Barcode	RFID
Require line of sight to be read	Can be read without line of sight
Can only be read individually	Multiple tags can be read simultaneously
Cannot be read if damaged or dirty	Can cope with harsh or dirty environments
Can only identify the type of item	Can identify a specific item
Cannot be updated	New information can be over-written
Require manual tracking and therefore are susceptible to human error	Can be automatically tracked removing human error

2.1 INTRODUCTION TO TECHNOLOGY USED

Radio frequency identification (RFID) technology is a wireless communication technology that enables users to uniquely identify tagged objects or people. RFID is rapidly becoming a cost-effective technology. There are many types of RFID tags. Some include miniature batteries that are used to power the tag, and these are referred to as active tags. Those that don't include an on-board battery have power "beamed" to them by the reader and are called *passive* tags. In addition, some tags have memories that can be written to and erased, like a computer hard disk, while others have memories that can only be read, like a CD-ROM; these are referred to as "smart" and read-only tags, respectively. The cost and performance of tags can vary widely depending on which of these features are included in their design. (*V. Daniel Hunt 2007*)

RFID tags can hold many kinds of information about the objects they are attached to, including serial numbers, time stamps, configuration instructions and much more. RFID readers are composed of an antenna and an electronics module. The antenna is used for communicating with RFID tags wirelessly. The electronics module is most often networked to the host computer through cables and relays messages between the host computer and all the tags within the antenna's read range. The electronics module also performs a number of security functions such as encryption/decryption and user authentication, and another critical function called anti-collision, which enables one reader to communicate with hundreds of tags simultaneously.

Passive RFID Tags do not contain a battery. Instead, they draw their power from the reader. The reader transmits a low power radio signal through its antenna to the tag, which in turn receives it through its own antenna to power the integrated circuit (chip). The tag will briefly converse with the reader for verification and the exchange of data. As a result, passive tags can transmit information over shorter distances (typically 10 feet or less) than active tags. They have a smaller memory capacity and are considerably lower in cost (\$1.00 or less) making them ideal for tracking lower cost items.

There are two basic types of chips available on RFID tags, Read-Only and Read-Write (*Paxar Americas Inc*). Read only chips are programmed with unique information stored on them during the manufacturing process. The information on read-only chips can never be changed. (*Refer to Appendices B*)

As quoted by *Patrick J. Sweeney II*, in essence, an RFID system is just a reader and a tag communicating over the air at a certain frequency, like any other radio communication. The readers, antennas, tags, and frequency make up the basics of an RFID system. There are three basic components to an RFID system, as shown in Figure 2.1:

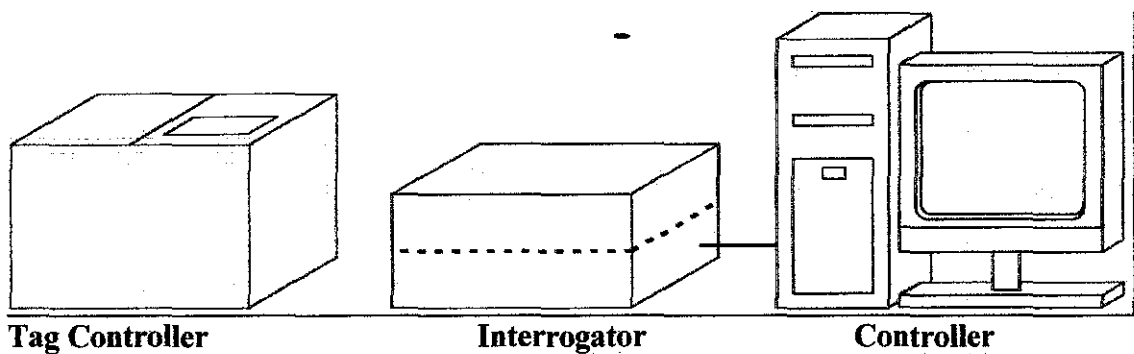


Figure 2.1 The Basic Building Blocks of an RFID System. Source: LARAN RFID.

Industries looking for a reliable, hard-to-falsify, tiny and especially cheap way to stock and manage goods are nowadays abandoning optical bar reading architectures in favor of UHF passive RFID tags. Indeed, these devices allow a reading range of few meters and does not require any external battery or power generator, but obtain the power supply directly from the RF signal, providing, therefore, a great advantage in terms of both size and cost.

2.2 RELATED WORKS

2.2.1 Cascadia: A System for Specifying, Detecting, and Managing RFID Events

Radio Frequency Identification (RFID) technology has become increasingly popular in the last several years. New applications that use this technology are emerging both in industrial settings and pervasive computing environments. RFID enables applications to track the movements of objects and people carrying small RFID tags in an environment equipped with RFID readers. In an RFID system, RFID readers produce streams of tag-read events (TREs) of the form (time, tag_id, antenna_id) that indicate when and where tags are being detected. In a friend finder application, TRE streams can serve to automate sharing of a user's current or historical location, as well as the activities they perform (e.g., having lunch).

University of Washington, Seattle proposes Cascadia, a new infrastructure that greatly simplifies the development of pervasive RFID applications such as those described above. Their focus is on large-scale, passive RFID deployments with fixed-location readers that exist within a single administrative domain such as a hospital, corporate or academic campus. Cascadia's data model comprises of a location model, an entity model, and an event model. The data model abstracts away the many technical details and difficulties of an RFID deployment to present applications with data in a form that is easier to work with. The location model hides the details of the RFID infrastructure while capturing an abstract notion of tag location and movement. The entity model allows applications to work with meaningful entities (e.g. people, places, things). Finally, the event model defines how entity movements and relationships can map to high-level events and how these events are represented.

User-oriented applications need to reason about meaningful entities, not RFID tags. As such, they model people, things, and places as relations People, Things, and Places with predefined attributes (*Refer to Table 2.1*).

Cascadia also allows applications to organize entities into a hierarchy (or lattice) with varying levels of abstraction. For example, a person, “Hannah”, can also be a member of a group, such as “student”. The student group can in turn be part of a larger group such as “person”, and so on (hierarchies for things and places are similar). The entity model allows applications to specify this type of hierarchy at runtime by adding separate relations. For example, a relation Role might map RFID tag numbers to groups identifying students, staff, and faculty. (*Department of Computer Science and Engineering, University of Washington, Seattle*)

Location Model -At(time,tagID,loc,prob)	Event Model -EventType(time,a1,...,an,prob)
Entity Model -People(tagID,name) -Things(tagID,name,owner) -Places(name,coordinates) - Also includes the relations that encode the entity lattice	Event Primitives -with and without -inside and outside -near and far Event Operators -AND: Conjunction -LASTS: Duration -SEQ: Sequence

Table 2.1: Cascadia data model

Event	% of Apps
1) X enters the proximity of an entity	36%
2) X enters a place	21%
3) X leaves the proximity of an entity	17%
5) Object is next to/touching object	14%
6) X leaves a place	11%
7) X stays in proximity of a entity	9%
8) X stays at a place	6%
9) X is not in a place	2%
10) X and Y move to distance D apart	2%

Table 2.2: The most common RFID events ranked by frequency of use in the literature

2.2.2 A Group Tour Guide System with RFIDs and Wireless Sensor Networks

Po You Chen and colleagues from National Tsing Hua University, Taiwan proposes a new application framework for group tour guiding services based on RFIDs and wireless sensor network. They consider a sensing field mixed with multiple independent tourist groups, each with a leader and several members. Members of a group will follow the moving path of their leader, but may occasionally roam around randomly based on their interest. Sensor nodes have to track leaders' locations and maintain following paths from members to leaders. A member may ask where his/her leader is, and a leader may "recall" his/her members. They propose a feasible solution to such an application by using existing technologies. A group guiding protocol is presented. The design enables reliable group guiding at low cost and low traffic load.

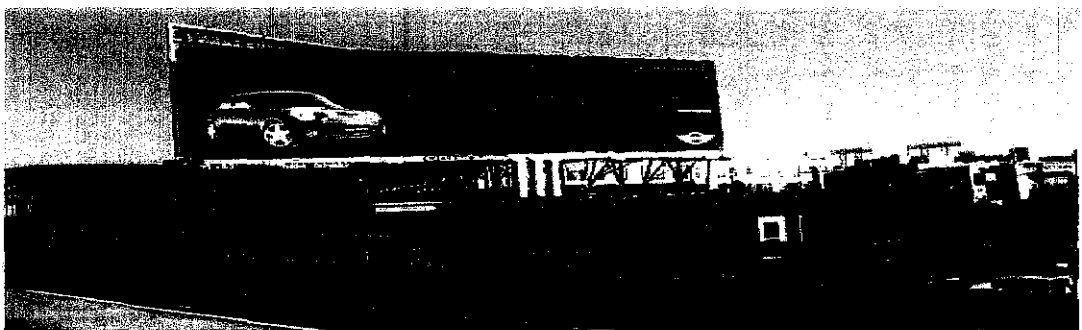
This work considers group guiding where tourists may form groups. The problem requirements are as follows:

- (1) Tourists in the same group may have similar behaviors, but with a certain degree of freedom. For example, they are likely to be in proximity but not necessarily always so.
- (2) The tour guide can broadcast instructions to members. On the contrary, a member may ask for information from the guide.
- (3) A member may get lost and need to locate the tour guide from time to time.
- (4) Multiple groups may coexist and their members may mix in the same physical environment. Although many navigation applications have been proposed for Wireless Sensor Networks, the group guiding application has not been well addressed

2.2.3 RFID and Mini Cooper

The “RFID-Enabled Billboards Talk to Mini Motorists” shows that there are a few related works or systems which are currently available using the RFID technology. It has been done by the MINI USA. RFID key fobs are distributed to Cooper owners where interactive billboards will read the tags and flash personalized messages to drivers. “Mini, at the suggestion of its agency Butler, Shine, Stern and Partners, created a voluntary participation program in which select Mini Cooper owners attached an RFID fob to their keychain containing personal information such as occupation, birthday, etc. The agency purchased billboards with LCD displays that read the passing RFID signals and flash: “Mary, moving at the speed of justice,” if Mary is a lawyer, or “Mike, the special of the day is speed,” if Mike is a chef.” (*Mark Harrison 2007*)

Apart from that, there is news on this technology as well. “The program is an effort to display Mini drivers’ brand loyalty and sense of community with others—Mini Cooper motoring clubs and fan Web sites abound—while at the same time generating marketing buzz about the diminutive cars. When drivers carrying RFID-enabled key fobs drive past the billboards, readers housed in the signs read the identification number encoded to the driver’s fob. The interrogators can read the tags from as distant as 500 feet. Once an ID is captured, the interrogator sends it to a central server, which looks it up in a database and decides what message to display. It makes this decision based partly on how the driver answered a questionnaire before receiving the fob, and partly on other factors, such as the city it is in or the current day or season.” (*Mary Catherine O’Connor 2007*).



CHAPTER 3

PROJECT WORK AND METHODOLOGY

A methodology is a formalized approach in implementing the System Development Life Cycle (SDLC). It is a list of steps and deliverables of a system. A system development methodology provides guidelines to follow for completing every activity in the systems development life cycle, including specific models, tools and techniques. There are three types of methodologies which are Structured Design Methodology, Rapid Application Development (RAD)-based Methodology, and Prototyping-based Methodology. Prototyping-based Methodology is used as this project framework.

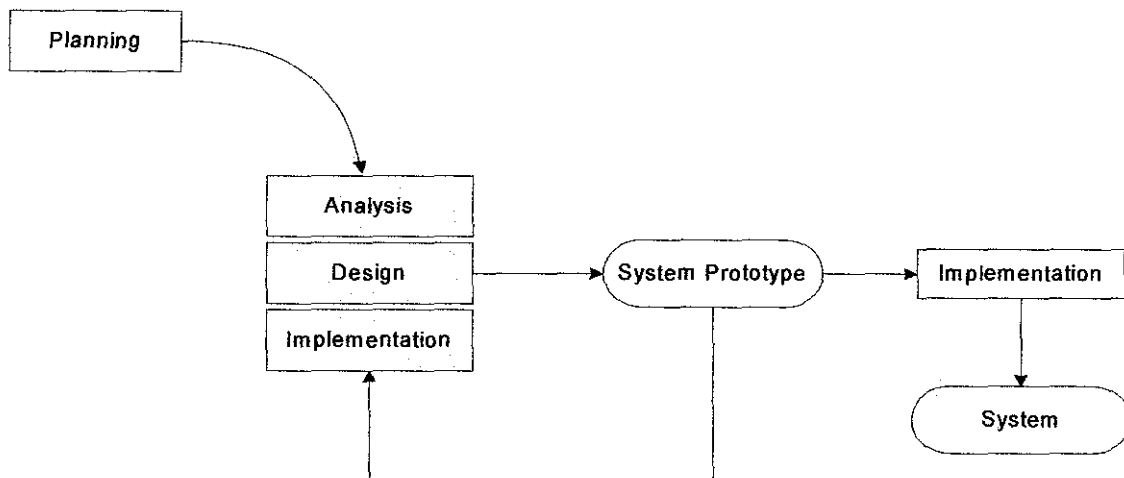


Figure 3.1: Prototyping-based Methodology

A prototyping-based methodology performs the analysis, design and implementation phases concurrently. All three phases are performed repeatedly until the system is completed. With this methodology, the basic of analysis and design are performed and work immediately begins on a system prototype. The key advantage of this methodology is that it quickly provides system for the users to interact with even if it is not ready for widespread organizational use at first. Prototyping reassures the users that the project team is working on the system and prototyping helps to more quickly refine the real requirements. Users can interact with the prototype to understand what it can do and cannot

3.1 GANTT CHART

		Weeks													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Continue on System Graphical User Interface (GUI) design	X	X												
2	Develop system database and system configuration			X	X										
3	Development of system prototype				X	X	X	X							
4	System testing phase								X	X	X				
5	Adjust changes on the system										X	X			
6	Finalize system											X	X		
7	System submission													X	
8	System presentation														X

3.2 PROJECT MILESTONE

Suggested Milestone for the Second Semester of 2-Semester Final Year Project

No.	Detail/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Project Work Continue														
2	Submission of Progress Report 1				●										
3	Project Work Continue														
4	Submission of Progress Report 2								●						
5	Seminar (compulsory)														
5	Project work continue														
6	Poster Exhibition									●					
7	Submission of Dissertation (soft bound)												●		
8	Oral Presentation													●	
9	Submission of Project Dissertation (Hard Bound)														●

● Suggested milestone
■ Process

3.3 DEVELOPMENT TOOLS

3.3.1 Software

Below are the software tools used for the development of this system:

Software	Minimum Requirement
Operating System	Window XP Service Pack 2
Supporting Software	Microsoft Visual Studio 2008 Microsoft Access
Middleware for RFID devices	Windows CE Device

3.3.2 Hardware

These are the minimum hardware specification/requirements for the system that will be developed:

Hardware	Model	Reason of usage
Passive RFID Tag (Read/Write Tag)	-	Its transmit information on a shorter distance
Passive RFID Fixed Reader	Juno7	To read the tag information
Information Display Unit / Large LCD Display (CPU Monitor)	Dell	To display the information to the tourist

CHAPTER 4

RESULT AND DISCUSSION

According to the Tourism Malaysia Communications Division, the Tourism Malaysia State offices are located in; Perlis, Kedah, Perak, Negeri Sembilan, Melaka, Johor, Sabah, Sarawak, Pahang, Terengganu and Kelantan while the Tourism Information Centre are located at:-

- 1) Tanjung Puteri (Johor)
- 2) Langkawi International Airport;
- 3) Kuah, (Langkawi)
- 4) Bukit Kayu Hitam (Kedah)
- 5) Labuan (Federal Territory)
- 6) Bayan Lepas International Airport (Penang);
- 7) George Town (Penang)
- 8) Putra World Trade Centre (Kuala Lumpur)
- 9) Malaysia Tourism Centre (Jalan Ampang, Kuala Lumpur)
- 10) Visitor's Service Centre (Kuala Lumpur International Airport)
- 11) KL Sentral and
- 12) Lumut (Perak)

In addition, the Malaysia Tourism Centre in Jalan Ampang provides the following facilities:-

- Brochures on the various tourist destinations in Malaysia.
- Internet access to tourist sites of Malaysia.
- Booking of domestic tour packages.
- Currency Exchange facility.
- Automated Teller Machine.
- Souvenir Shops.
- Tourist Police Counter
- Video presentation
- Cultural shows on Tuesdays, Thursdays, Saturdays and Sundays from 2:00pm – 2:30pm.
- Exhibits on Malaysia's culture

Based on Figure 4.1, which shows the tourist arrivals and receipts to Malaysia, it can be concluded that the number of tourists either domestic or international increased year by year.

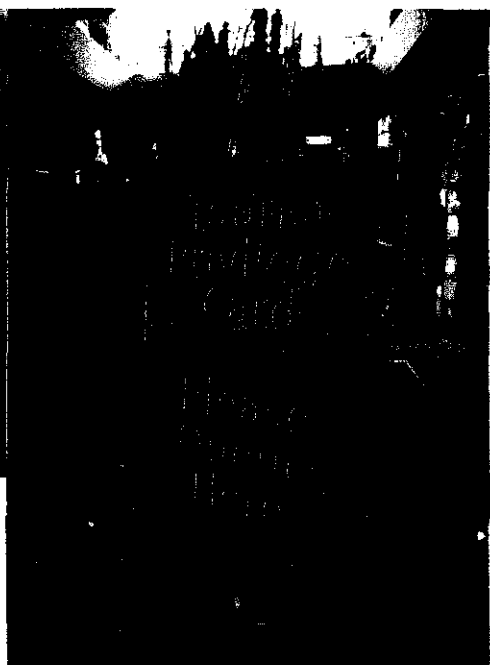
YEAR	ARRIVALS	RECEIPTS (RM)
2007	20.9 Million	46,070.0 Million
2006	17.45 Million	36,271.5 Million
2005	16.4 Million	31,954.1 Million
2004	15.7 Million	29,651.4 Million
2003	10.5 Million	21,291.1 Million
2002	13.2 Million	25,781.1 Million
2001	12.7 Million	24,221.5 Million
2000	10.2 Million	17,335.4 Million
1999	7.9 Million	12,321.2 Million
1998	5.5 Million	8,580.5 Million

Figure 4.1: Tourist Arrivals and Receipts to Malaysia

The Tourist Privilege Card is a card which entitles tourists to amazing discounts and exclusive offers when they shop at selected outlets at Suria KLCC, etc. It is extended to all tourists visiting Malaysia only and application is free-of-charge. The application procedure is simple and all that is required for the tourists is to approach the Suria KLCC Concierge Desk and present their ID or passport. The card will be issued on the spot and the privileges will take effect immediately. Tourists will enjoy special discounts, gift redemptions and more by simply present their Tourist Reward Card at over 100 participating outlets such as Pavilion Kuala Lumpur, KLCC, Sunway Pyramid, Mid Valley Mega mall, etc. Some malls called the card as Tourist Reward Card or Tourist Privilege Card. One tourism information kiosk on Malaysia is available at Malaysia Tourism Centre in Jalan Ampang.



Figure 4.2: Example of Tourist Privilege Card at Suria KLCC



4.1 RFID SYSTEM ARCHITECTURE

An RFID system is designed to carry data in mobile transponders known as tags and retrieve data from tags by machine-readable means. The data can provide any sort of information, which includes in this case, personalization of information towards tourists. In addition, an RFID system also requires a method to read the data in the tags, means to communicate the data to some sort of information system and ways to enter or program data into the tags.

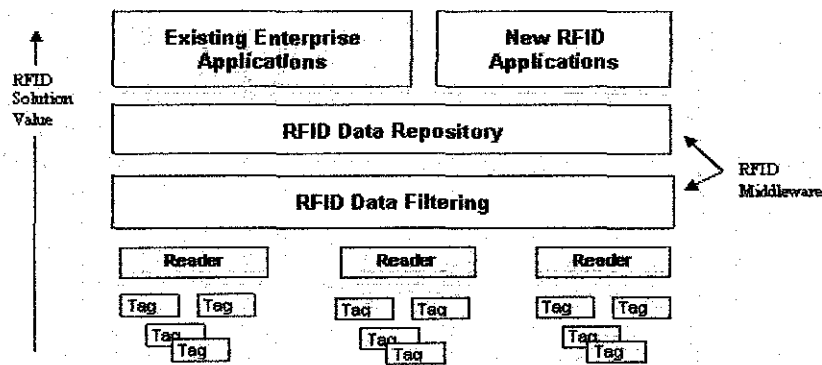


Figure 4.3: Typical RFID Architecture

The components of an RFID system are as described below:-

- Tag. A tag is an RFID component that is attached to a physical item to be read or tracked.
- Reader. A reader is a device that detects the presence of a tag. A reader is the primary device that converts the physical presence of a tag into an electronic event that can be acted upon by software.
- Middleware. The purpose of having middleware is to perform primary filtering of tag events that are generated by readers and to provide a consistent programming interface to different types of devices. Filtering is used to reduce the number of events being generated into the RFID application. Middleware also serves as a device driver by providing a common applications programming interface (API) that can be used to control readers from different manufacturers.

4.2 RFID-BASED TOURISM INFORMATION SYSTEM ARCHITECTURE

4.2.1 RFID-Based Tourism Information System Database Design

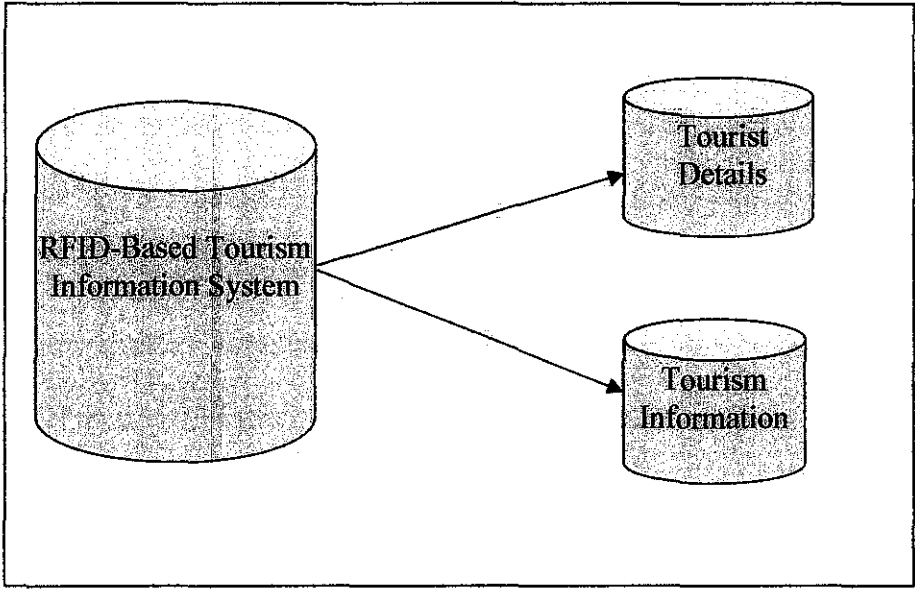


Figure 4.4: System Database Design

As shown in Figure 4.4, the Tourism RFID Information System database contains tourist details and tourism information.

4.2.2 RFID-Based Tourism Information System Design Architecture

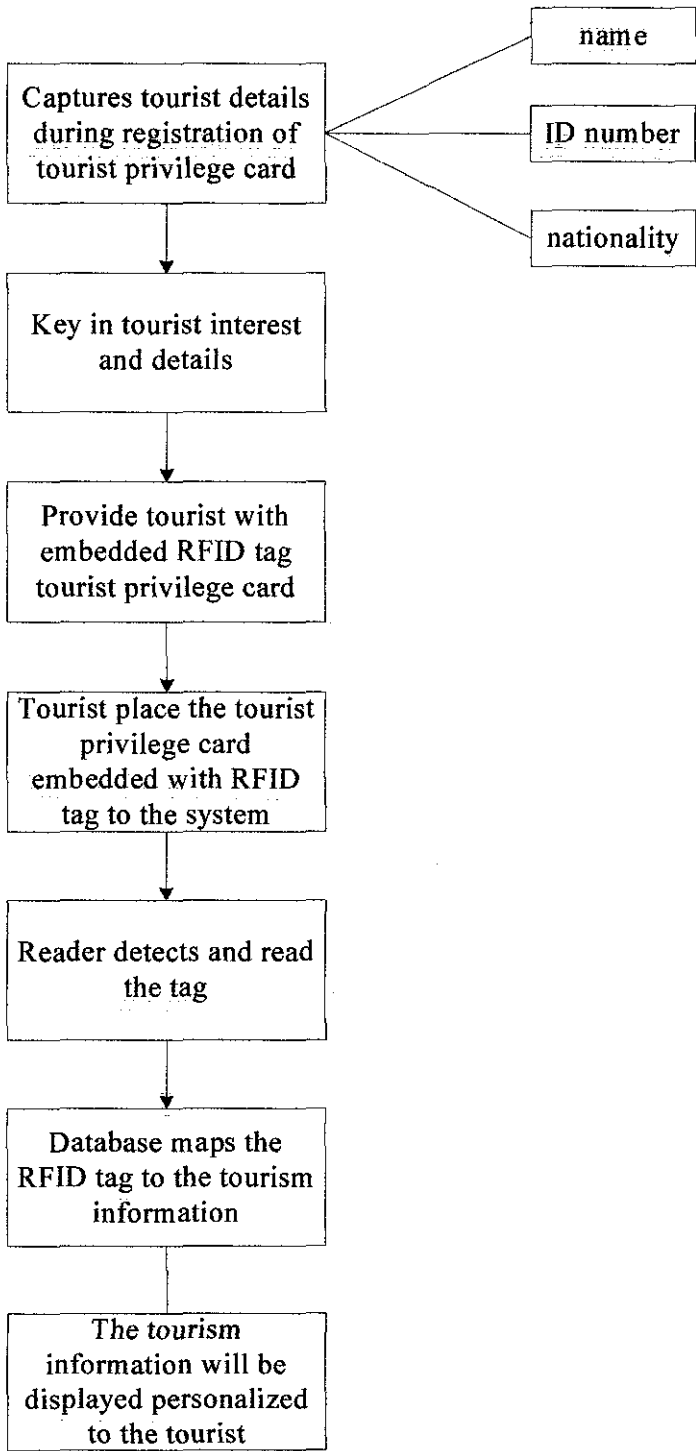


Figure 4.5: RFID-Based Tourism Information System Design Architecture

This system aims to help display helpful information to the tourist who came to visit Malaysia. As a start, the system will capture and store tourist important details such as their name, nationality, interest, etc. The tourist needs to register for a tourist privilege card embedded with the passive RFID tags in order to use the system. The tourist details are very important as it helps to personalized information according to specific tourist based on his or her nationality or language used.

The back end system which includes the graphical user interface (GUI) will be design using Visual Basic. The LCD display and RFID reader will be placed at strategic places such as shopping malls, public transportation stations, theme park, Malaysia tourism centre, etc.

4.2.3 RFID-Based Tourism Information System Use Case Diagram

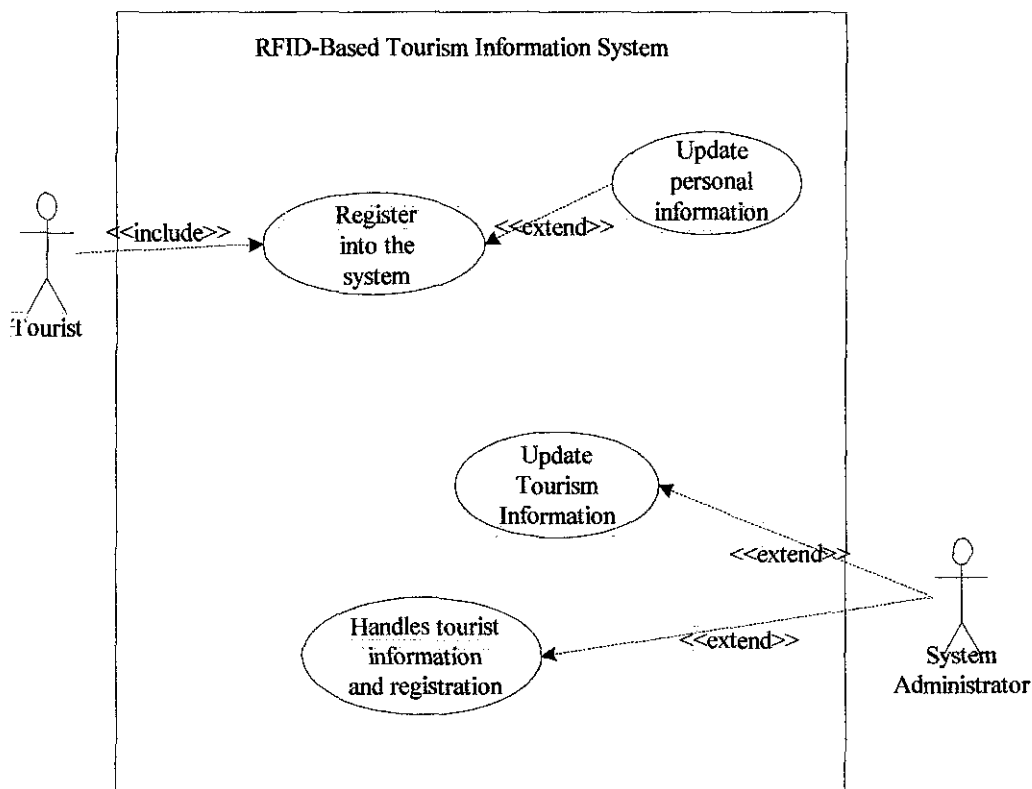


Figure 4.6: Use Case Diagram

4.2.4 RFID-Based Tourism Information System Architecture

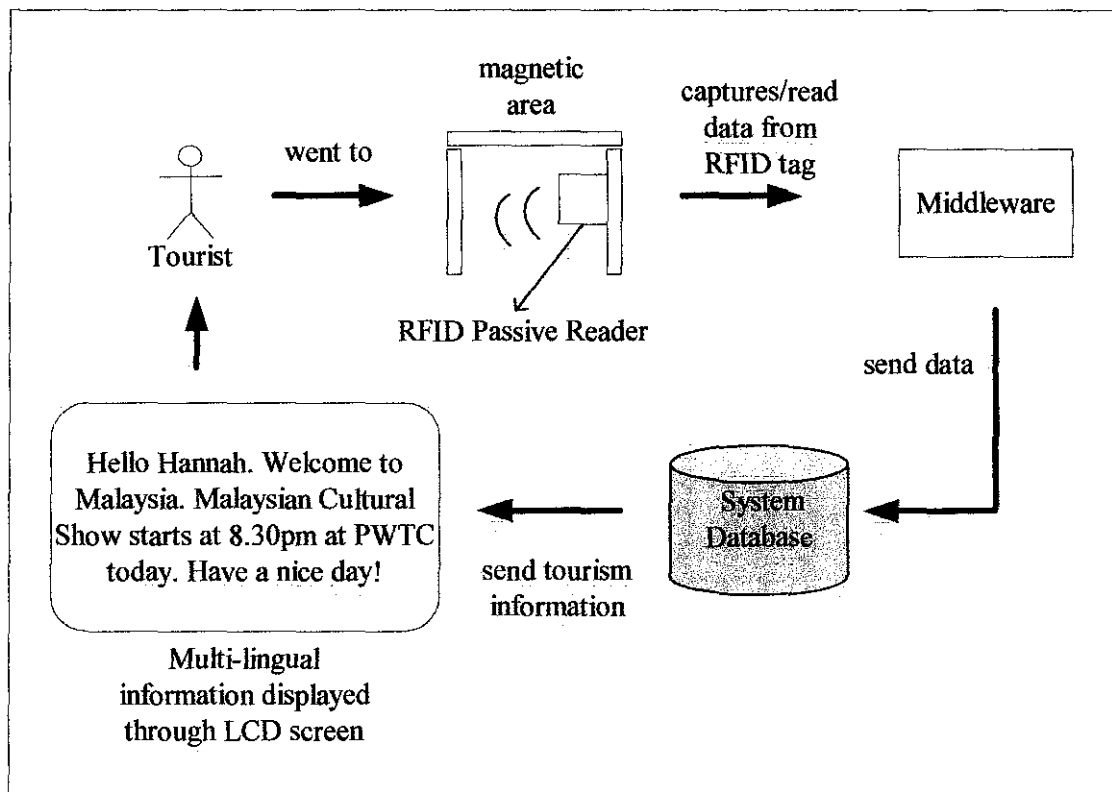


Figure 4.7: RFID-Based Tourism Information System Architecture

Referring to Figure 4.7 above, it illustrates a better understanding on the RFID-Based Tourism Information System works. Assuming that the tourist had already registered for a tourist privilege card embedded with the passive RFID tag, when the tourist went to the RFID reader located at tourist strategic area, it will displayed information personalized to the tourist. The RFID reader captures the data from the RFID tag and data is send through middleware to the system database. Information will then be validated and it will send the tourism information to the tourist through the stand LCD screen. This system provides information in three languages which are Bahasa Malaysia, English and French language i.e. if the tourist is from France, the information displayed to him or her can be “Accueil chaleureux. Le Carnaval de Megasale de Malaisie 2009 à travers le le 4 juillet de Malaisie – le 31 août” which means “Hi. Welcome to Malaysia. Malaysia Megasale Carnival 2009 throughout Malaysia 4 July – 31 August”.

4.3 BACK END SYSTEM GRAPHICAL USER INTERFACE

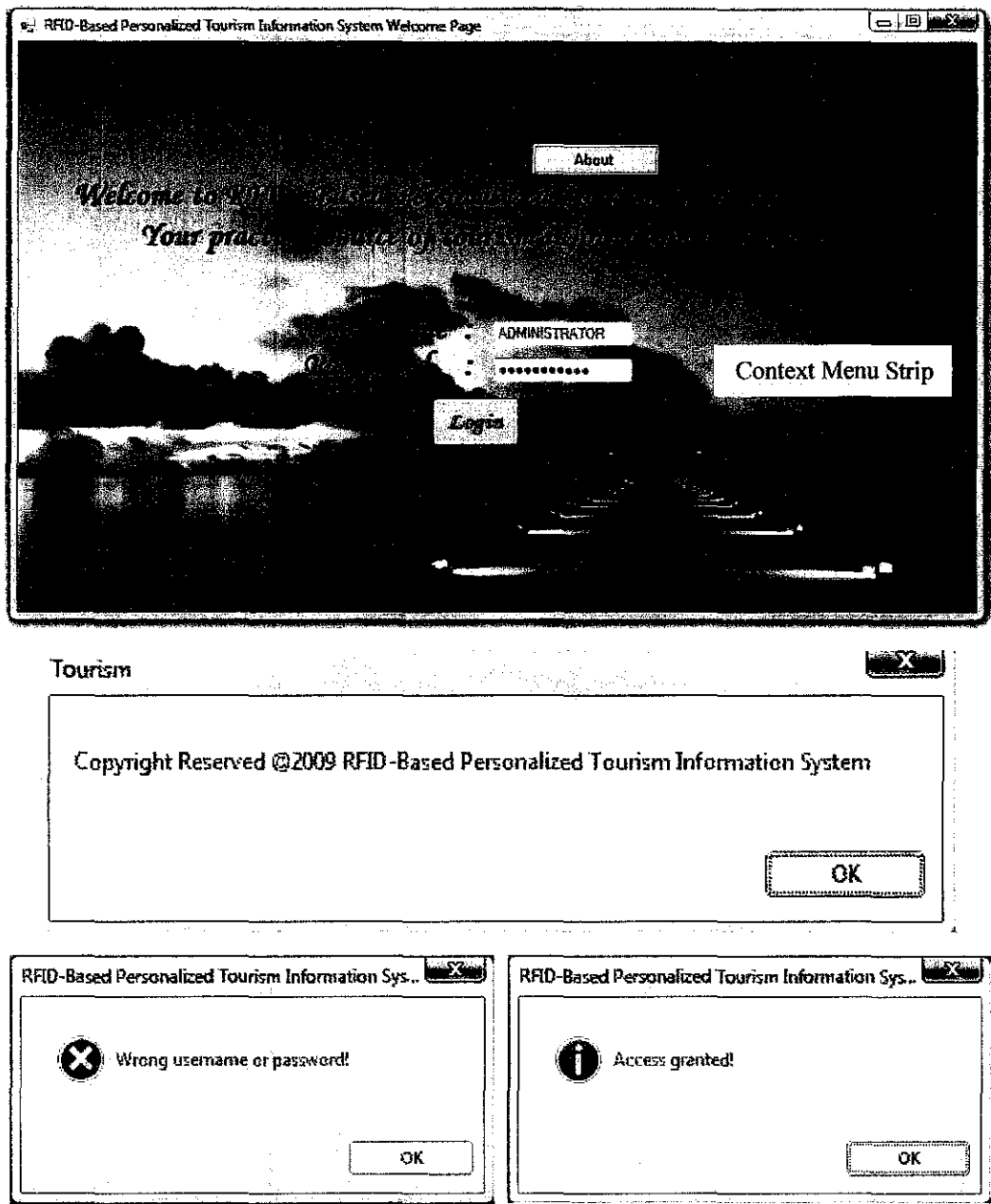


Figure 4.8: RFID-Based Tourism Information System Welcome Page

As shown in above interface, Figure 4.8 includes the RFID-Based Tourism Information System Welcome Page. The tourist or the user needs to get through this page in order for them to register for a tourist privilege card. The card will be embedded with the RFID passive tag. The registration process can takes place at the Malaysia Tourism Centre or any big shopping mall information counter in Malaysia such as KLCC Suria, MidValley

Megamall, Subang Parade, Pavilion, Time Square shopping mall, One Utama shopping mall, The Curve, etc. The system administrator is in charged of the tourist's registration and he/she will need to enter the correct user name and password. Once the correct user name and password is entered, the access granted message box will appear.

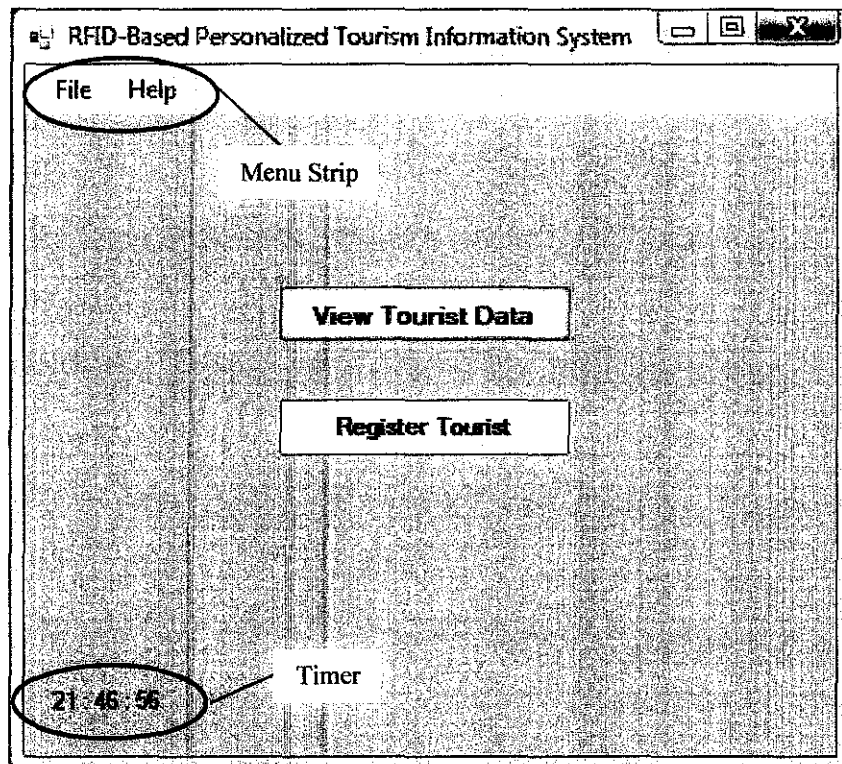


Figure 4.9: RFID-Based Tourism Information System Administrator Page

Once the system administrator had successfully login into the system, he or she will be directed to this page. The system administrator can choose the options on whether to view the tourist details or register the tourist into the system.

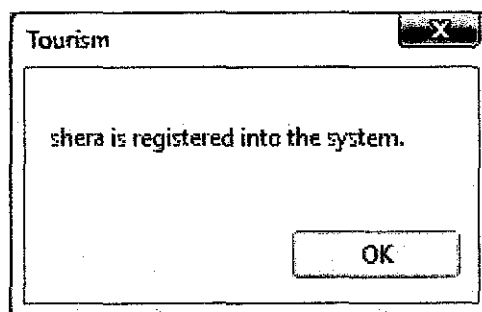
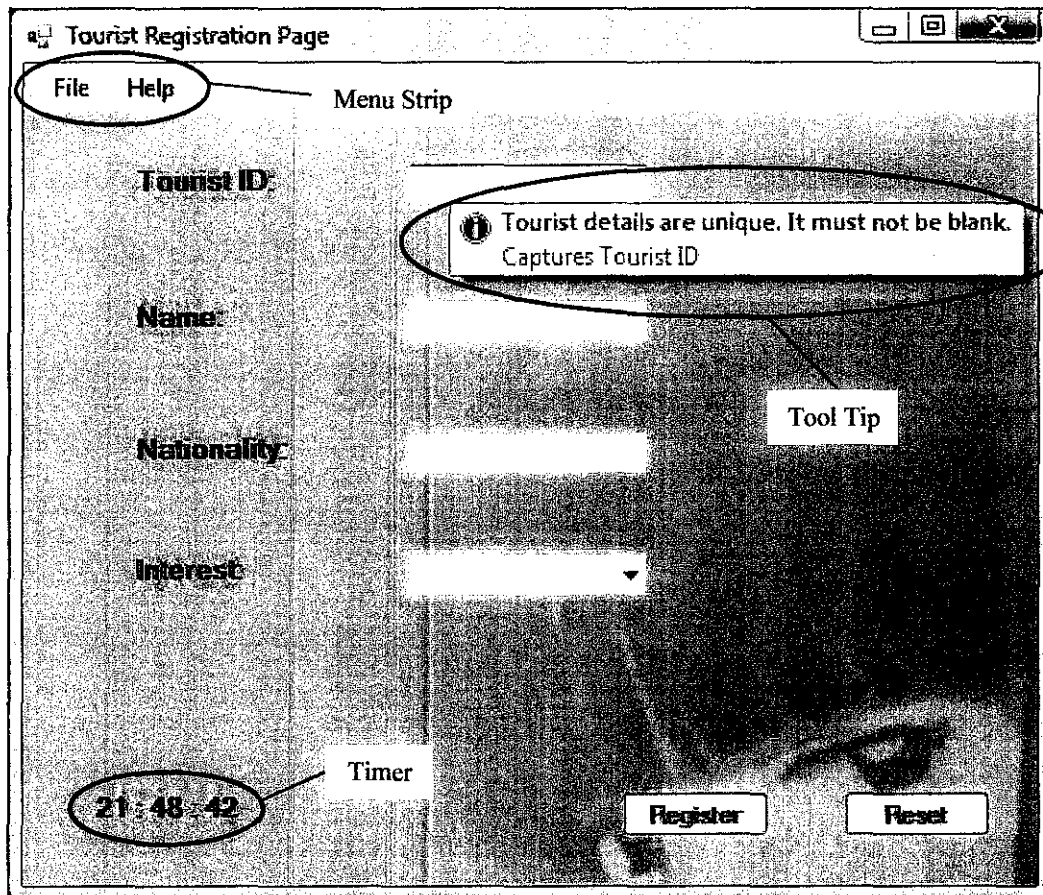


Figure 4.10: RFID-Based Tourism Information System Registration Page

Once the correct user name and password were inputted by the system administrator, it will lead to the tourist registration page. If not, an error message box will appear. On the tourist registration page, the system administrator will need to fill up the tourist's necessary information required such as name, ID number, nationality, interest at the tourist registration counter. It's a one time registration. After the tourist is successfully registered and the information is stored into the database, a message box stating that the tourist name is registered into the system will appear such as shown in Figure 4.10.

Tourist Details

ID	Name	Nationality	Interest
3456	Ol	African	
5555	Syaina	Malaysian	
7676	Aiman	Malaysian	
7691	Shera	Malaysian	
7760	Anis	Malaysian	
7777	Aya	Japanese	
7884	Hannah	Malaysian	
8877	Mehi	Egyptian	
8888	Ayu	Malaysian	
8900	Olivia	France	Mega Sales

*

Next

RFID-Based Personalized Tourism Information System

1 of 1

Name: Hannah Search

Tourist ID: 7884

Name: Hannah

Nationality: Malaysian

Exit Page

Figure 4.11: RFID-Based Tourism Information System Tourist Details Page

This particular page shows the database of the tourist who are already registered. All tourists in the database will be displayed here for the system administrator to view. The administrator can also search for a tourist based on the tourist's name to view his or her details. Apart from that, the system administrator can view all tourist's details or to view the tourist's details in sequence.

Figure 4.11 above displayed the details of the tourist registered in sequence for the system administrator to search and view. This page also provides save and help functions.

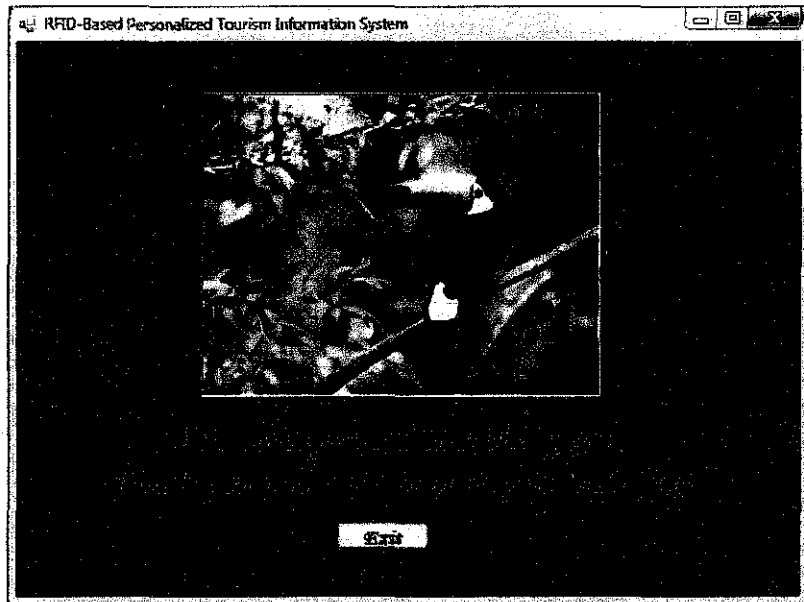


Figure 4.12: RFID-Based Tourism Information System Exit Page

Figure 4.12 illustrates the RFID-Based Tourism Information System Exit Page after the user or tourist had finish registering or inputting their information in the system.

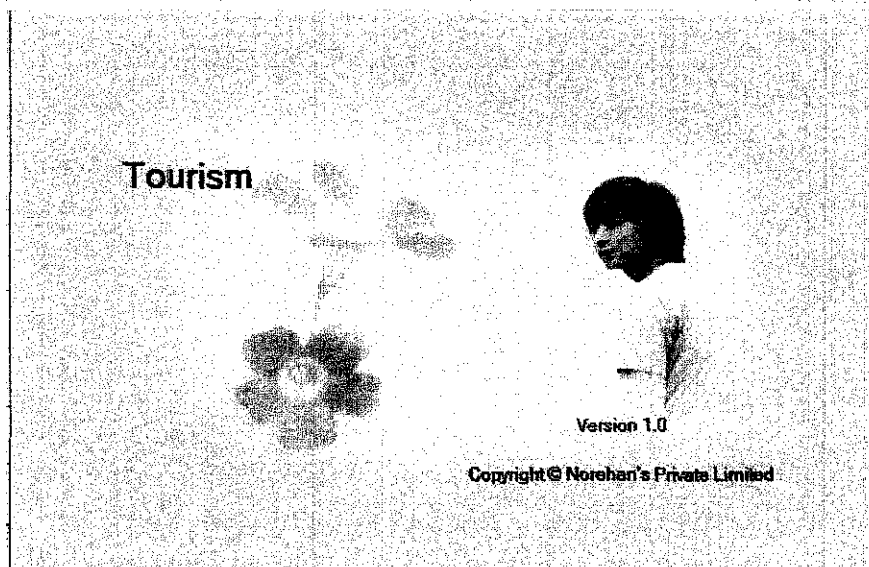


Figure 4.13: RFID-Based Tourism Information System Splash Screen

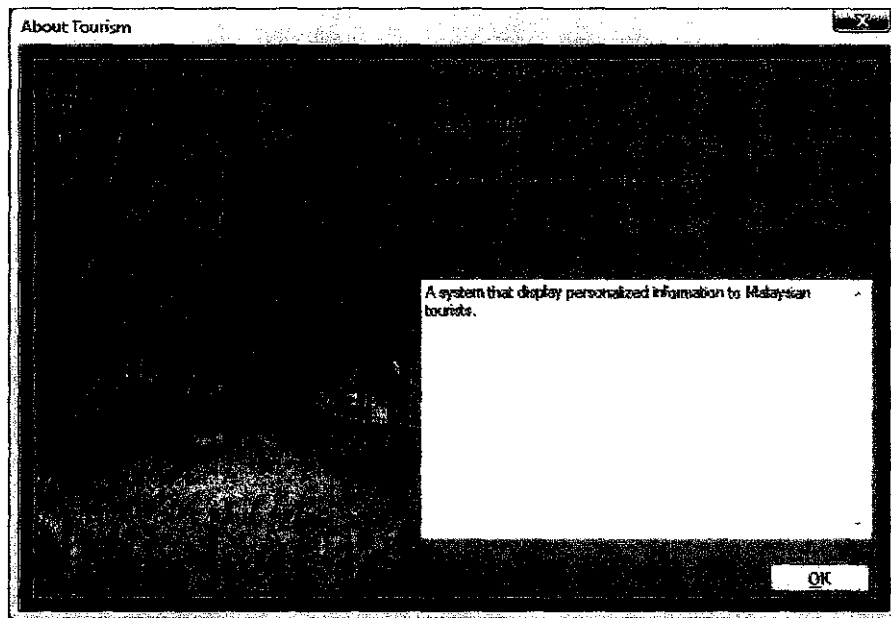


Figure 4.14: RFID-Based Tourism Information System About Box

The About Box is also included in the system. When the system administrator clicks the help menu or the context menu strip in the system, the about box will appear as shown in the Figure 4.14 above.

4.4 READER SYSTEM GRAPHICAL USER INTERFACE

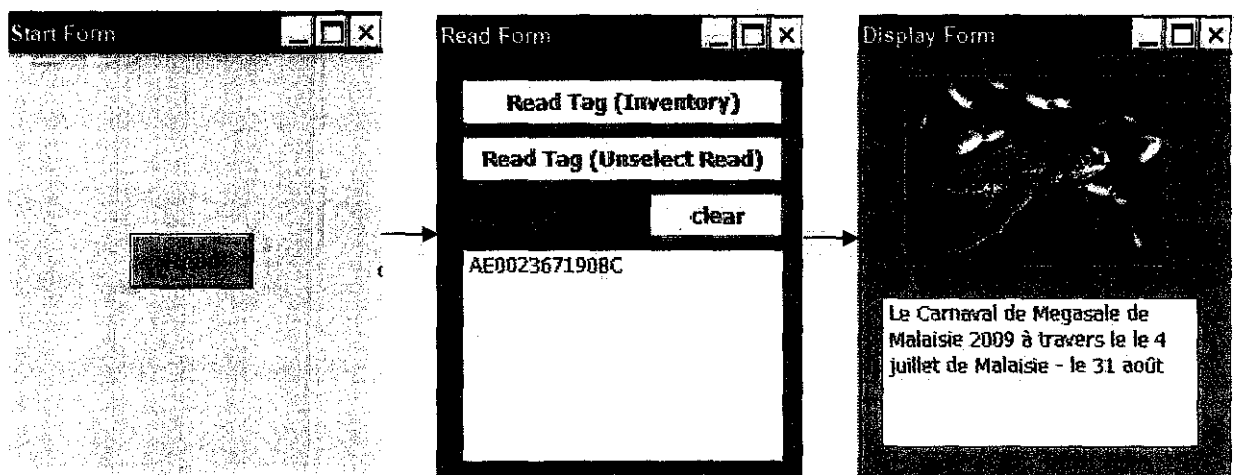


Figure 4.15: Reader System Graphical User Interface

4.5 QUESTIONNAIRE RESULTS

The questionnaire questions are as attached in the appendices section of this report. The analysis of the questionnaire result is as shown below together with its explanations. The number of respondent for this questionnaire is 30 respondents and it comes from various tourists with different nationalities who came to Malaysia in year 2008.

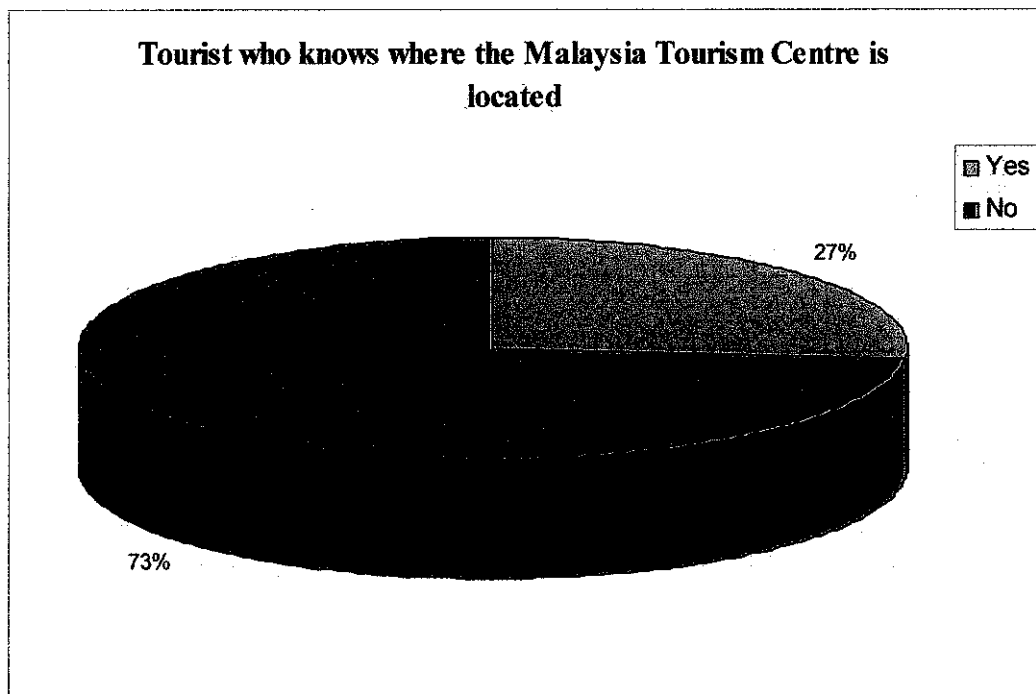


Figure 4.16: Percentage of Tourist who knows where the Malaysia Tourism Centre is located

Based on Figure 4.16, most of the tourist are aware of the Malaysia Tourism Centre but does not know where the tourism centre is located. From the pie chart, it shows that 73% of tourist does not know where the Malaysia Tourism Centre is located and 27% of the tourist knows where the Tourism Centre is located. Most of the tourist search for sources on Malaysia Tourism information via the Internet and from their friends and family. Minority of the tourist get their sources on Malaysia Tourism information through media channels such as magazines, brochures, flyers, pamphlets, newspapers and some television.

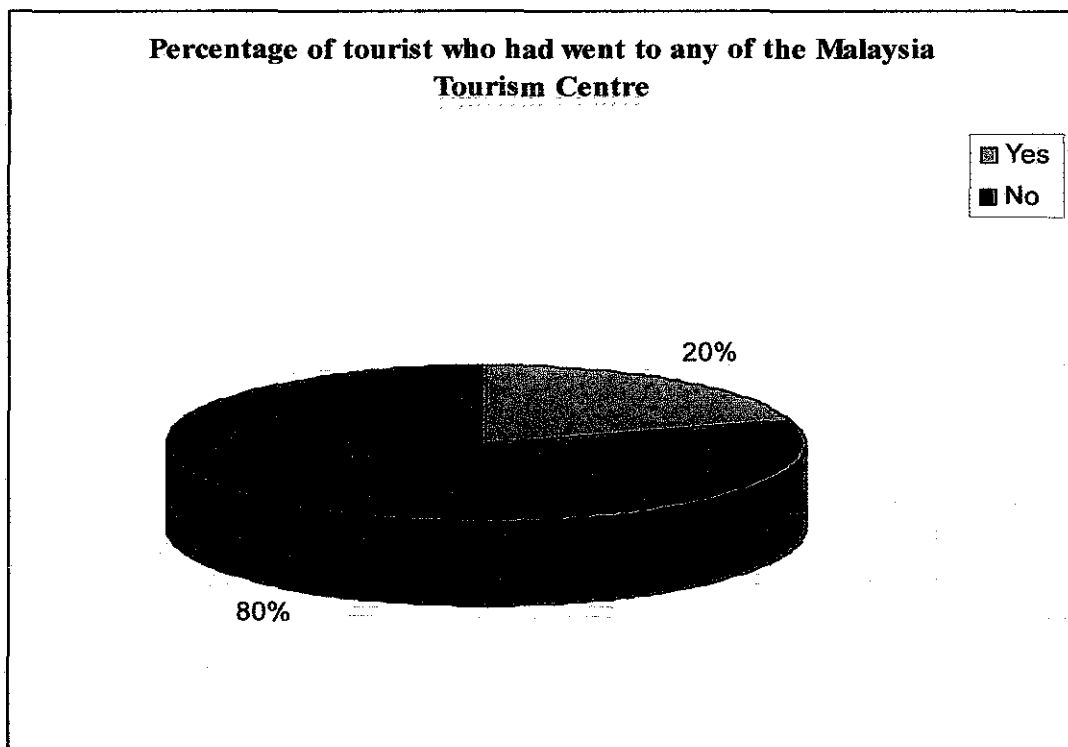


Figure 4.17: Percentage of Tourist who had went to any of the Malaysia Tourism Centre

From the feedback of tourist in the questionnaire, through the pie chart above, we can see that 80% of the tourist have not went to any of the Malaysia Tourism Centre during their stay in Malaysia while a percentage of 20% of them had been to the Malaysia Tourism Centre. Since these questionnaire respondents are basically tourist, all of them had been to Malaysia's capital city which is Kuala Lumpur. Most of the tourists who visited Malaysia came here for Malaysia's mega sale, scenery, nature, beaches and extreme activities and food and entertainment that they can get in Malaysia. Next best reason for the tourist to visit attractive places in Malaysia were because of its technology and buildings which includes of Museum and KLCC Twin Towers and also because of ethnicity and uniqueness of multiracial races and Malaysian cultures.

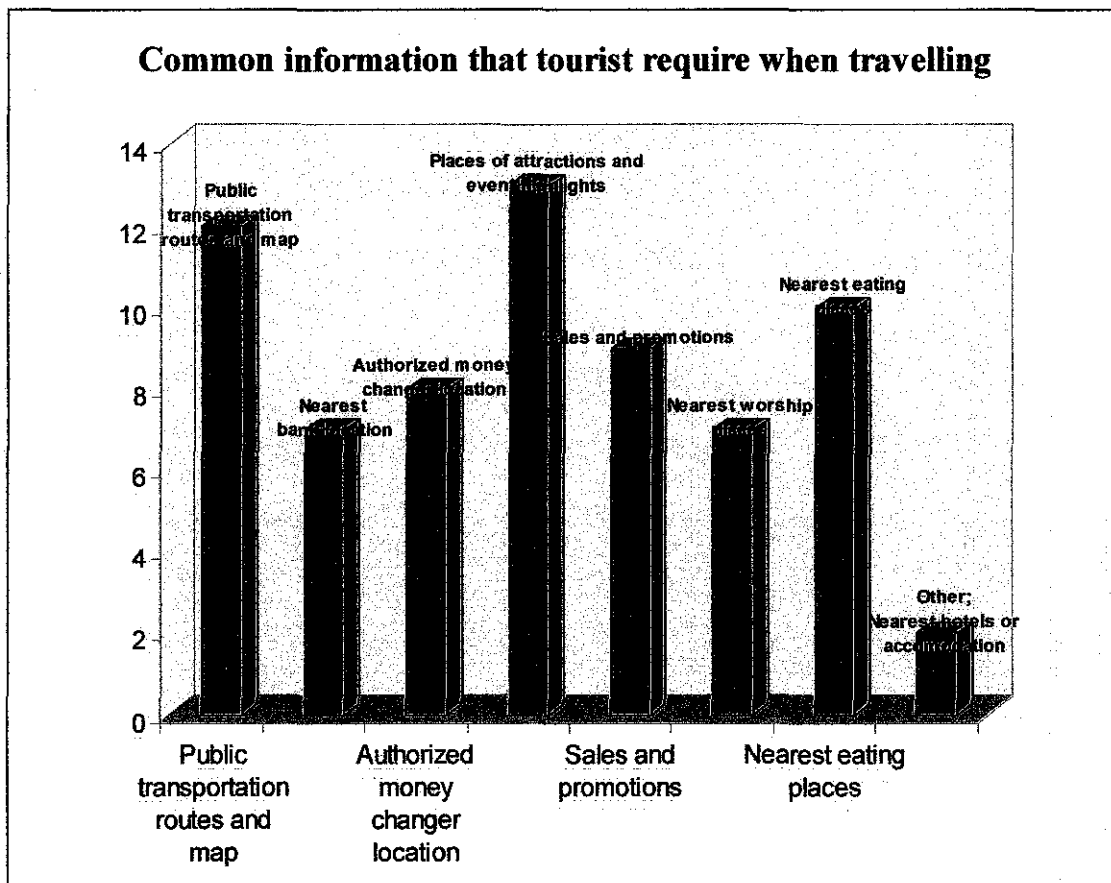


Figure 4.18: Graph of common information that tourist require when traveling

As shown in the graph above, the highest ranking of tourism information that tourist require when traveling were the places of attractions and event highlights. In addition, the second and third highest ranking of common information that tourist require when traveling were the public transportation routes and map and also the nearest eating place to them. Others includes the sales and promotions, authorized money changer location, nearest bank location, nearest worship places and from the questionnaire results, some tourist even suggested that they require information on the nearest hotels or accommodation. Apart from that, from the questionnaire feedback, most tourists suggested to locate the RFID-Based Tourism Information System in shopping malls and public transportation and ticketing counters.

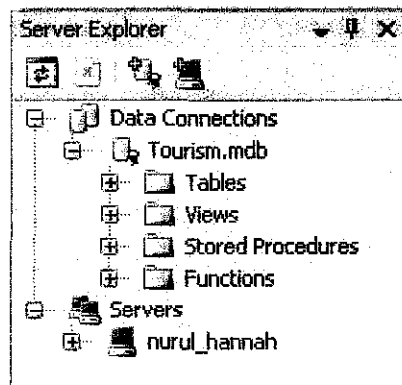
4.6 SYSTEM TESTING

System testing specifically for this prototype requires 2 types of testing which are unit testing and user acceptance testing. In unit testing, the test plan is developed directly from the specification of the class; each item in the specification becomes a test and several test cases are developed for it. Each module is tested to find whether it works properly and error free. The unit testing is done by the developer. As for user acceptance testing, it is tested by novice users to validate the acceptance of the system. User acceptance testing often repeats previous tests but is conducted by users themselves to ensure they accept the system. In user acceptance testing, users closely monitor system for errors or useful improvements.

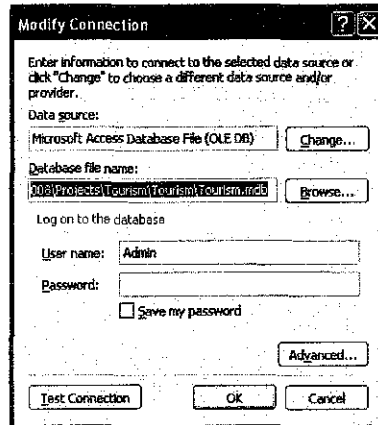
4.6.1 Unit Testing

The Unit Testing involves database testing. This testing is done to ensure that the database creation is successfully tested and connected. The test cases used to test the database are as follows:

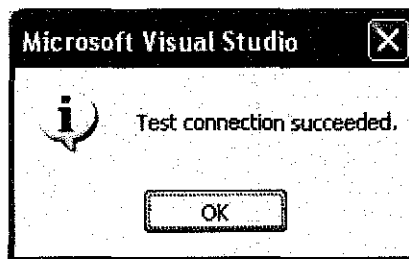
- 4.1 Open Project using Microsoft Visual Studio and select server explorer.



- 4.2 Right click database name and click modify connection. A modify connection window will appear as below:



- 4.]] Click test connection. The result of the database test cases is shown below.



4.6.2 User Acceptance Testing

For this project user acceptance testing, users are the one to conduct the testing.

The complete test plan is provided in the appendices section of this dissertation.

4.7 SYSTEM EVALUATION

Communication with the RFID reader is done via the RS232 serial interface or via the optional Bluetooth Serial Port Profile (SPP) interface. The RFID API command primitives are divided into two categories; system commands and TAG commands. The command primitives are transferred as data packets. The different types of data packets that can be transferred via the communication interface are described in terms of a request, response or an indication. A request is always sent from the Host to the RFID reader. A request is always followed by a response. A response is always a response upon a request and cannot be achieved without sending a request first. A response is sent

from the RFID reader to the Host. An indication is always sent from the RFID reader to the Host. An indication can be sent from the RFID reader at any time, indicating some changes that will affect the Host.

There were 15 test conducted for the user acceptance testing. The system did face a few errors during the system testing process. However, the author expects to eliminate the errors occurred to its minimum level although the percentage of error is minor. The pie chart below shows the user acceptance testing result ratio.

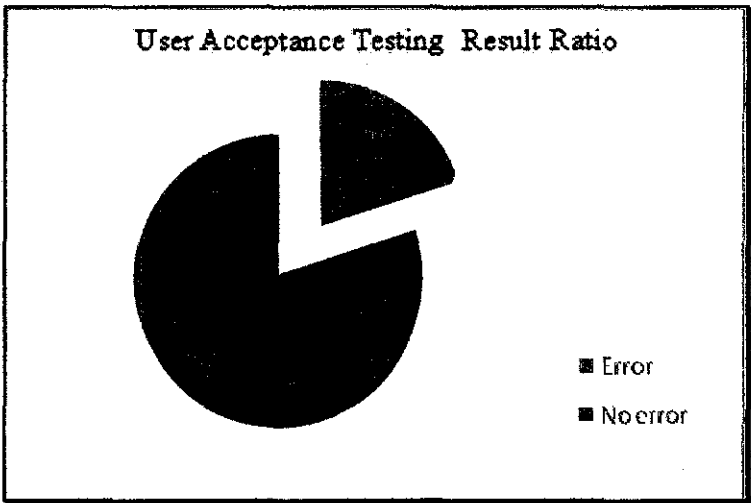


Figure 4.19: User Acceptance Testing Result Ratio

Most of time, the back end system and reader system run successfully. However, the defects of this system are mostly in the C# program which is the reader system. Possible limitations of the system includes the reader could not read tag from far away because passive RFID reader and tag used.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

As a conclusion, the RFID-Based Tourism Information System will be able to help provide tourist with beneficial tourism information. The personalized multi-lingual information displayed via the system will be helpful to the tourist whom visited Malaysia. The system benefits includes save time for the tourist to search for places of interests, trusted source of information to the tourist, ease of planning trips for the tourist, etc. It is hoped that Malaysia will be a vacation destination of choice for the tourists.

5.2 SYSTEM FUTURE ENHANCEMENT AND RECOMMENDATIONS

This section of the report provides recommendations and project future enhancement that can be conducted for the next course of action. The RFID-Based Tourism Information System features and design can be improved in several areas as below:

- Provide the system with multiple languages which includes non roman characters such as Japanese, Arabic or Korean language for the tourist to choose. Most tourists would prefer to read the tourism information displayed in their own language as there are used to their own language. Based on the questionnaire conducted earlier, some tourist felt that language is a barrier whilst traveling in Malaysia.
- Integrate the system with mobile application so that the displayed information can be downloaded into the tourist mobile phone. The tourist can not only see the displayed tourism information via the system but also download the information straight into their mobile phone for convenience. A small amount of fee could be charge and it can be done through collaboration with the telecommunication service providers companies.

- The system can be enhance and act as a tracking system for the tourism industry to detect the tourist visiting habits according to the tourist's nationality. The RFID reader can be installed at most common places of attraction for the tourist to capture their visiting behaviour.
- The system can displayed pictures of places with high resolutions as an addition to the tourism information.
- Provide audio features and speakers so that blind people can also use the system.

CHAPTER 6

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CHAPTER 7

APPENDICES

APPENDIX A: FYP QUESTIONNAIRE

Final Year Project (FYP) Questionnaire

This questionnaire is intended to capture the tourist feedback and trends in Malaysia. Please place a tick (/) at the appropriate box. You can place more than one tick (/) for question number 6, 7, 10, and 11 .

1. Please state your nationality: _____

2. Please state your gender:

☐ Male ☐ Female

3. Have you ever visited Kuala Lumpur?

☐ Yes ☐ No

4. Do you know where Malaysia Tourism Centres are located?

☐ Yes ☐ No

5. Have you ever been to any of the Malaysia Tourism Centre?

☐ Yes ☐ No

6. What are the common sources that you usually use pertaining to information on tourism places (certain places of attractions)?

	Internet
	Friends and Family
	Tourism Infoline
	Newspapers / Magazines / Brochures / Flyers / Pamphlets
	Others; Please specify:

7. What are your reasons to visit attractive places in Malaysia?

	Technology and buildings
	Events such as concerts, cultural shows, etc
	Mega Sale
	Ethnicity and uniqueness of multiracial races and Malaysian cultures
	Scenery, nature, beaches and extreme activities
	Food and entertainment
	Others; Please specify:

8. Is getting tourism information at the fingertips of your hand important to you before or when you travel?

☐ Yes ☐ No

9. If there is a tourist displayed information system at strategic places such as shopping malls, theme parks, LRT stations, etc would it be useful and easier to access tourism information for you?

☐ Yes ☐ No

10. Where would you suggest locating the tourist displayed information system?

	Petrol Stations
	Shopping Malls
	Public transportation and ticketing counters
	Theme Parks
	Malaysia Tourism Centre
	Others; Please specify:

11. What is the common information that you usually require when traveling?

	Public transportation routes and maps
	Nearest bank location
	Authorized money changer location
	Places of attractions and event highlights
	Sales and promotions
	Nearest worship places
	Nearest eating places
	Others; Please specify:

12. What is your opinion regarding the Malaysian tourism industry in general?

	Very Good		Good		Neutral		Poor		Very Poor
--	-----------	--	------	--	---------	--	------	--	-----------

13. In your opinion, by having the Tourism Personalized RFID Information System, would it help to convey tourism information at the right time? Please elaborate.

.....

14. What do you think are the most common problems faced by tourists who visit Malaysia?

	Up to date signage's are not available
	Tourism information are not easily reached
	Scarce of information kiosk
	Others; Please specify:

End of questionnaire.

Thank you for your time and kind cooperation in completing this questionnaire.

APPENDIX B: PROJECT ACTIVITIES

Project Planning	The planning phase is the process of understanding why a system should be build and determine how the developer will go about building it. During this stage, the author had gathered system requirements and also conducted the feasibility analysis. In addition, the author also had submitted project proposal for approval and developed the project Gantt chart.
Project Analysis	During analysis phase, questions of who will use the system, what the system will do and where and when it will be used is answered. The author had conducted document analysis which is searching for relevant literature review and done a study and survey by distributing questionnaires to the system user to get feedbacks from them.
Project Design	The project design phase decides how the system will operate in terms of hardware, software, network infrastructure, the user interface, databases, forms and reports, etc. During this phase, the author had developed the use case diagram, system architecture, the work flow design and also designing the system graphical user interface.
Project Implementation	The project implementation phase is the final phase in the System Development Life Cycle (SDLC). The implementation phase includes the construction, integration and installation of the system prototype. The RFID reader is checked so that it is connected with the back end system and configured so that there will be no deployment error.
System Testing and Evaluation	The RFID-Based Tourism Information System went through the system testing and evaluation phase at the end of the development. Among the testing conducted were the unit testing and user acceptance testing.

APPENDIX C: RFID TAG ATTRIBUTES AND PASSIVE TAGS

RFID Tag Attributes

	Active RFID	Passive RFID
Tag Power Source	Internal to tag	Energy transferred using RF from reader
Tag Battery	Yes	No
Availability of power	Continuous	Only in field of reader
Required signal strength to Tag	Very Low	Very high
Range	Up to 100m	Up to 3-5m, usually less
Multi-tag reading	1000's of tags recognized – up to 100mph	Few hundred within 3m of reader
Data Storage	Up to 128kb of read/write with sophisticated search and access	128 bytes of read/write

Figure 7.1: RFID Tag Attributes

Functionality: Read Only/Read-Write

Frequency: 125 KHz / 13.56 MHz / 915 MHz / 2.45 GHz Read/Write

Distance: Up to 6m (with mounted antenna)

Dimensions: Varies, as small as 0.8mm diameter

Weight: 6-54g

Memory: Up to 16 K bits

Data durability: 10 Years

Temperature: -40 to 70 degrees Celsius

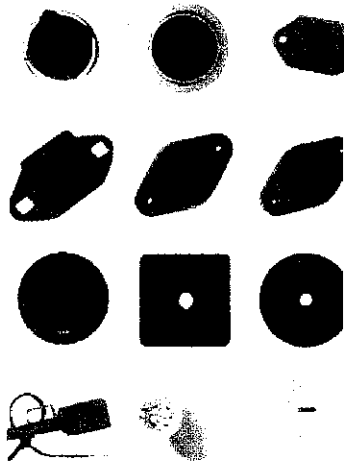


Figure 7.2: RFID Passive Tag Technical Specification and examples of passive RFID tags

APPENDIX D: SYSTEM TESTING TEST PLAN

Tester's Details:-

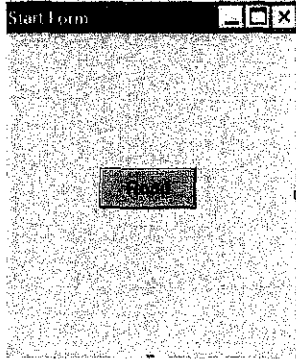
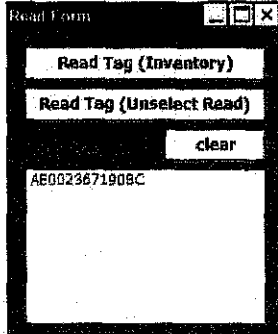
Name	
Testing Date	
Position	


Back End System Test Plan

No.	Instruction	Results	Comments/Remarks
1	<u>Log In Into System:</u> Log in into the system using the ADMINISTRATOR user name and specified password in the system welcome page. An information message box stating “Access granted!” will appear if the input is correct.	OK / NOT OK / NA	
2	<u>Tourist Registration:</u> After a successful login, click the Register Tourist button. Once the system is directed to the Tourist Registration Page, fill in the tourist's identification number, name, nationality and interest. If the tourist registration is successful, a message box will appear i.e. “Awangku is registered into the system”.	OK / NOT OK / NA	
3	<u>Tourist Viewing and Search Function:</u> After a successful tourist registration, the tourist display page will appear. Click on the next icon to view more tourists' details. The system also provides search tourist details function based on the tourist name. To test the search function, query the tourist name at the upper left side of the search option. The tourist details will appear in the text box.	OK / NOT OK / NA	

Reader System Test Plan

NOTE: Please ensure that the RFID passive reader is connected to the RFID-Based Tourism Information System and deploy without error. Testers may alert the project champion if any of the test cases fail.

No.	Instruction	Results	Comments/Remarks
1	<p><u>Going to the Read Form:</u> Click on the button read as shown below.</p> 	OK / NOT OK / NA	
2	<p><u>Read Tag:</u> Click on the button Read Tag (Unselect Read). The system should read the tag and the tag ID should be shown as the text box result below.</p> 	OK / NOT OK / NA	

3	<p><u>Display Information:</u> Once the tag ID was captured, check if the tourism information is displayed in the Display Form as below.</p> 	OK / NOT OK / NA	
---	---	------------------	--

Scope and Target Audience

Provide a detailed description of the system flow process. This test plan document is intended for System Administrator and pilot users involved in the setup or delivery of the system.

Consent Statement

To whom this may concern,

This is to confirm that the following student:

NAME: _____

STUDENT ID: _____

has conducted a testing for her FYP system prototype.

User's Testimonial and Comments:

