# FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
# UNIVERSITY OF MALAYA

## WXES 3182

## A COMPUTER AIDED LEARNING PACKAGE ABOUT COUNTRIES (CALPAC)


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# Abstract

A Computer Learning Package about Countries (CALPAC) is developed with its goal to provide an alternative way for the users to learn information about some countries in the world by using computer technology. CALPAC is designed to be easy to use, yet provide the useful functionality needed to learn efficiently. The information provided by the system should be from the authoritative sources to make the information is more reliable. Functions that are provided are countries information learning, database maintenance, indexing and game. The game provided in the CALPAC hopes can even make the learning process more efficient and effective. The database of the CALPAC is a multimedia database which contains electronic text, images, audio and video. The limitation is the CALPAC only covers 30 countries from 5 different continents in the world. CALPAC is developed under Microsoft Visual Basic .NET and with the support by Macromedia Flash MX. Apart from that, Microsoft Access is used as the database management system. Under the combination of these tools, the project should produce a very high impact application. Since the local market still lack of this type of learning package, it is possible that this package is needed very much. It is believed that the CALPAC will be beneficial to the people who are interested in this field.

## Acknowledgments

First of all, I would like to express my warmest gratitude to my supervisor, Associate Professor Dr. Ow Siew Hock for her invaluable guidance. I sincerely direct this appreciation for her enormous concern, advise, patience, encouragement and rightful criticism.

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# Chapter 1

# Introduction

# Chapter 1 Introduction

## 1.1 Project Overview

Computer Aided Learning (CAL) is the terms reserved for learning tools that using the computer technologies to assist people in study or learning. It is not necessary learning something in information technologies' world but also widely used in others fields such as school education, general knowledge, music, sports, and etc.

Therefore A Computer Aided Learning Package about Countries (CALPAC) is developed to help people to learn some general knowledge related to some countries in the world using computer technologies. Some multimedia techniques like audio, graphics and animation will be adopted in this system to make the learning process more interesting, effective and efficient. An attractive and user-friendly interface is also the main aspect to consider during developing this system to ensure that the system can easily attract attention and interest of the users.

CALPAC is a standalone application, which can be run by installing from CD-ROM. CALPAC, is also a bilingual system (Malay and English) and will mainly divide into two sections. The first section is the learning section and another section is game section. The learning section is designed as a leaning tool that contains some fact and information about the countries. The game section contain of a game where the user can evaluate themselves about what they had learned and to assist them in the learning process. The game was known as "CALPAC Challenge" in the system.

CALPAC provides people with a change of style of learning, which move from the traditional learning to virtual learning. By providing interesting graphics, animation, sound effects and game, instead of just reading from book. It does not

only attract the people to learn but also makes the learning process full of fun and more efficient.

In conclusion, this system will help to improve the people's general knowledge about the countries in the world.

## 1.2 Project Goals

The goal of Computer Aided Learning Package about Countries (CALPAC) is to develop software that can cover thirty countries in the world. It should offer all the correct and real information that is comprehensive and can be used by anyone at anytime.

It is hopes that people can utilize this learning package in their learning process; especially those are interested in this field. It is also hope that people can know the world better by using this system.

## 1.3 Project Objectives

The objectives of this project are:

(a) To provide different ways of learning for user to learn countries information.

- Through Computer Aided Learning, its will encourage the user to be more information technology literate. The game in the system will also act as another way for user to remember the knowledge they had learned more effectively.

(b) To provide a high correctness system with actual and true information.

- Information provided in the system is from authoritative sources and reliable.

(c) To establish a user friendly, attractive and consistent interface that provides a comfortable study environment.

- It is to represent the CALPAC in a more interactive and interesting manner and provides a well comfortable study environment.

## 1.4 Project Scope

### 1.4.1 Target Users

The targeted users for this system are mainly the secondary school students or others who are interested. The targeted user mostly will from Malaysia because of the bilingual system but the users in the other countries are also welcome.

### 1.4.2 Target Content Area

The system plans to cover 30 countries from 7 different continents in the world. The details of the selection are show in the table 1.1. The selections of these countries were based on the availability of the sources especially in gathering the welcome greeting for the entire countries.

Table 1.1: Targeted countries in CALPAC

| Continent | Number of Countries Selected | Countries Selected |
|---|---|---|
| Asia | 8 | Malaysia, Indonesia, Thailand, China, Japan, South Korea, Jordan, Saudi Arabia |
| Africa | 2 | Egypt, South Africa |
| North America | 1 | United States of America |
| Central America and Caribbean Sea | 2 | Cuba, Mexico |
| South America | 3 | Argentina, Brazil, Mexico |
| Europe | 12 | Austria, Belgium, France, Germany, Italy, Netherlands, Poland, Portugal, Russia, Spain, Switzerland, United Kingdom. |
| Australia & Oceania | 2 | Australia, New Zealand |

### 1.4.3 Modules and Functions

To provide a comprehensive, maintainability and attractive system to the users, the system was targeted to develop by combination from several modules and functions. The system will be a bilingual system that can be using in either Malay or English. The system should provide online help that can assist the user to use the system whenever the users face problem. The scopes of the modules are described as below:

a) **Maintenance Module**

To develop a module that allows the administrator to maintain the system. Login ID and password permission are required to access. The module allows the administrator to add, edit or delete on the Countries Information and Game Questions.

b) **Countries Information Module**

To develop a module that provide comprehensive information for user to learn which includes flag, map, costume, place of interest, national anthem (sound), welcome greeting (sound) and country information (capital, independence date, population, languages, ethnic groups, religious, government type, currency, climate, area, location and background).

c) **CALPAC Challenge (Game) Module**

To develop a game that integrates the idea of quiz. More than 100 questions will be provided for user to play and evaluate.

d) **Indexing Module**

To develop an indexing function that allows the user to search for the countries by filtering using first alphabet of the country name.

## 1.5 Project Schedule

Project scheduling plays an important role in planning and developing the system. It specifies all the process in the system development and the duration of time for each activity to successfully implement the project. Some of the activities are carried out in parallel.

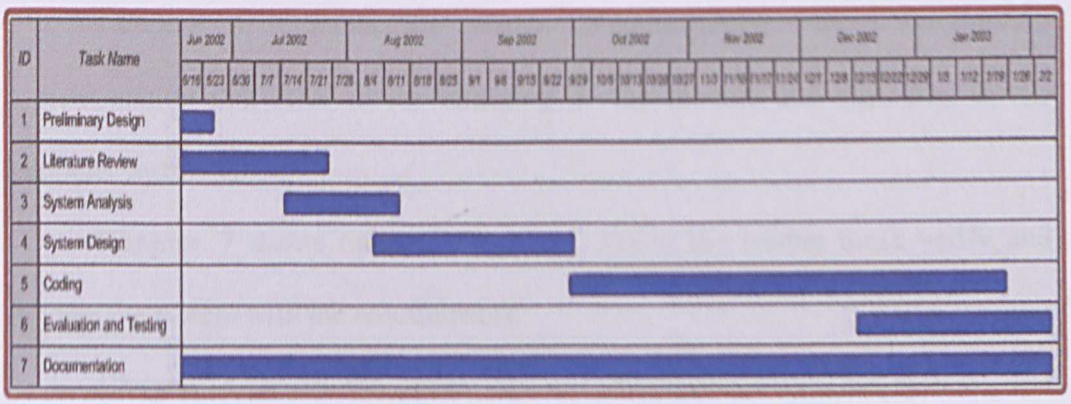



Figure 1.1: Project Schedule

## 1.6 Chapters Summary

**Chapter 1** summarizes the overview of the project. It also covers the project's goals and objectives. The scopes of the project also cover in this chapter. Lastly the project schedule is developed to assist in the planning of this project.

**Chapter 2** covers all the literature reviews for the project. It includes the research on the project definition, research of the existing systems and the comparison between the existing systems with the proposed system. There are also research and analysis of the development tools for the system.

**Chapter 3** explains the methodology used to develop the system. Software process model and fact-finding techniques will be discussed in details.

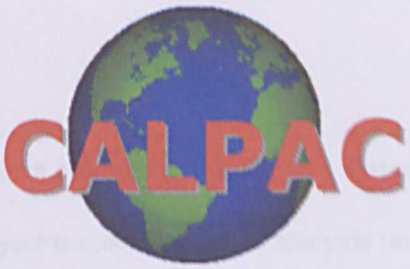
**Chapter 4** is on the system analysis. The functional and non-functional requirements will be present in details. In addition, the software and hardware requirements of the system will be included.

**Chapter 5** shows the system design. System structure chart, data flow diagrams and database design will be shows in details. Furthermore, the user interface design of the system will be presented.

**Chapter 6** is about the system implementation. About the system implementation that refer to the changing of the module and algorithm to the computer instructions.

**Chapter 7** shows the system testing. About the testing those verify and validate the system with the requirements.

**Chapter 8** shows the conclusion and discussion about the system. The problems, strength, weakness and future enhancements are discussed here.




# Chapter 2

# Literature Review

# Chapter 2 Literature Review

## 2.1 Introduction

Literature review is an early research about a system development. It covers the problems research, project domain research, analysis on the existing systems and research on the tools or techniques that will be used in developing the system.

## 2.2 Computer Aided Learning (CAL)

### 2.2.1 Introduction to CAL

The applications of computers are growing rapidly, and expectations of this technology are growing at the same rate. One of the newest branches of computer application is Computer Aided Learning or CAL.

Although computers and educational packages are generally in use today, Computer Aided Learning in the future will be even more essential and important. Today computers are used as a big, fast encyclopedia or data book, a tape recorder, type writer or video, but in the future CAL systems will contain smart adaptive trainers that will adapt themselves to learners' features and propose the best method of teaching. CAL now is a new idea, but as time goes by, it will become very important and wide-spread.

### 2.2.2 A Brief History of CAL

CAL's history began in the early 60's, when the third generation of digital computers were built and introduced. These systems were cheaper and more reliable than the earlier models. So digital computers became typical facilities in universities and research centers. Consequently, researchers

started to find new fields of applications for the computers and CAL was one of those. Certainly at the beginning, like other technological productions, CAL systems, which are a combination of computer hardware, added special purpose peripherals, and CAL software, had only scientific and academic applications, and were experimental.

During the 70's, CAL systems were developed but the development rate was still low, because of some technical and also economical limitations, especially concerning hardware that was still expensive, massive and mainly without adequate sound and graphic facilities.

The main problems for the earlier version of CAL systems were:

- Low quality of graphic displays (e.g. monochrome monitors).
- Handling problems of random access audio tapes.
- Cost of terminal per hour, it was higher than an adequate level for general use.

During the 80's and 90's these and other CAL problems were eliminated by the Digital Revolution. Low quality, monochrome graphics displays were substituted by video quality and 16 million colors displays. Nowadays computing and processing speeds of a typical computer are tens of times higher than the most advanced computer of the 70's. Compact discs (CDs and DVDs) and real sound/video peripherals brought multi-media facilities into the personal computer world. Now, everybody can have a real studio on his table. Therefore, as time went by, CAL system designers could develop their ideas and implement them. The results are current CAL systems.

### 2.2.3 Features in Current CAL Systems

Current CAL Systems become more and more advance but commonly will have the following features:

a) **Easy to Access**

Nowadays, everybody can get an educational package, which is normally a CD, or uses educational Web sites. The total costs of a PC computer and educational software are cheap enough for most average wage earners people and more important, are as cheap as educational centers all around the world can bear.

b) **Quality**

Sounds and graphics are really high quality.

c) **Storage**

A normal CD can store up to about 650 megabytes of data

d) **System's Variety and complexity**

Audio, video, animation and game are included in current CAL.

Definitely, CAL systems have made a lot of progress over recent years, although here is not the end of the line and systems still have some disadvantages and weaknesses that must be reduced in future.

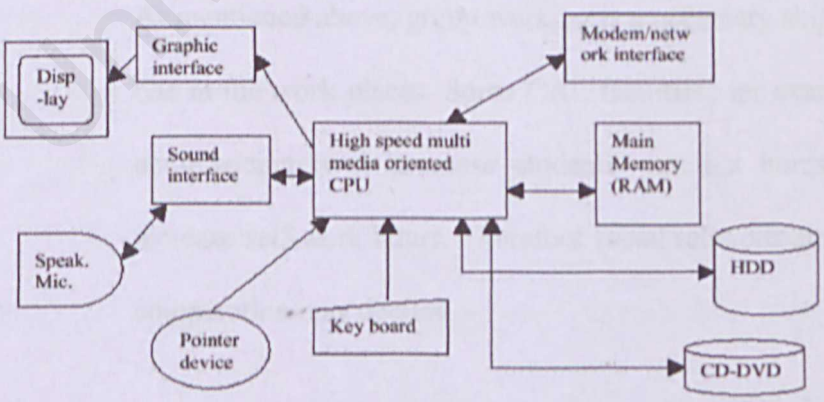



Figure 2.1: Configuration of Typical CAL System

### 2.2.4 Disadvantages of the CAL Systems

First of all, it must be said that most of the disadvantages written below do not have a direct relation to CAL systems. In fact they are results of some incorrect and excessive usage of CAL tools. The most important disadvantages of CAL systems can be listed as:

a) **Declining teachers' role**

The idea of substituting CAL systems instead of teachers is not logical and rational. The human relationship between students and teachers can not be generated by a machine, even the most expert machine of the world.

b) **Wider Gap**

CAL systems are expensive and need some platforms and peripherals for running, and these facilities are expensive too. Thus developing countries and less-wealthy education centers can not use them. Consequently, the gap between teaching qualities of those two categories will become wider. Nowadays, the Internet and rate of Internet use has generated such a gap too.

c) **Poorer Social Behavior**

As mentioned above, group working is a necessary skill for every one in the work places. Some CAL facilities, for example video conferencing, will decrease students' in-class hours and will increase self-work hours. Therefore social relations and students' co-operation may decline.

**d) Losing Academic Traditions**

Education has been used as a tool for training students. Students have not only been educated, but have also learned about good ethics and responsibility in schools and universities. The majorities of students directly or indirectly are affected by their teachers' behavior and morals and repeat them.

Although, CAL systems have such disadvantages, especially if used excessively and non-rationally, their advantages are much more precious. Today a school or a university without any computer is hard to imagine and in the future this will be harder.

### 2.2.5 Conclusion of CAL

Recent advances in science and technology have enforced some changes in teaching methods. Multi media facilities, fast, cheap PCs and world wide networks make them powerful and available. In the future, CAL systems' development will continue. Besides this, expert CAL systems that will have intelligence attribute, will be practical and make teachers' duties lighter. Artificial intelligence is, and will be the key point in future CAL systems. Meanwhile, virtual reality and near-to-real simulators will have an important role in tomorrow's CAL.

CAL is not the whole future of the education. However, as time goes by, CAL systems will become more essential, expert and not to be ignored.

## 2.3 Country

### 2.3.1 Definition of Country

According to Oxford Advanced Learner's Dictionary, country means an area of land that forms a politically independent unit. Country is also known as nation. According to Nations Online (http://www.nationonline.org, 2002), a nation or country means a specialized type of political organization characterized by a full-time, specialized, professional work force of tax-collectors, soldiers, policemen, bureaucrats and the like that exercises supreme political authority over a defined territory with a permanent population, independent from any enduring external political control and possessing a local predominance of coercive power (always supplemented with moral and remunerative incentives as well) great enough to maintain general obedience to its laws or commands within its territorial borders.

### 2.3.2 Fact of Country

According to CountryWatch.com (http://www.countrywatch.com, 2002), all the countries in the world covers 192 independent states, including the world's newest country, East Timor.

Because the United Nations has 189 member states, many people assume there are only 189 countries or sovereign states, yet there are three countries, such as the Holy See (Vatican City) and Switzerland, which are not included in this list. Switzerland, for example, upholds its tenet of neutrality by holding only "observer" status at the United Nations. The third country, East Timor, has not yet become a member state due to its recent

admission into the community of independent states. It is anticipated that East Timor will soon become another member of the United Nations.

## 2.4 Existing Off-the Shelf Software

This section describes several off-the shelf software which very similar to the CALPAC that available in the market.

### 2.4.1 Interactive Atlas 3

Interactive Atlas 3 was published by ARC Media, Inc. This software provides the features that seen very close to CALPAC but with some extra features that CALPAC do not need and also lacking of some features that will be adopt into CALPAC. The interface of this software provide user a very clear imaging and easy to follow. Figure 2.2, 2.3 and 2.4 will show some captured screen of Interactive Atlas 3.

Features of Interactive Atlas 3:

- The globe view interface makes finding information much easier with the pullout locator that shows you where you are on the world map.
- Country profiles with authoritative information on geography, population, economics, currency, language, ethnic, religious, government, transportation, military, maps, flags and photographs.
- Illustrated data on oceans, seas, lakes, rivers, waterfalls, mountains, volcanoes, deserts and caves.

- Hundred of printable maps of all continents and over 250 countries, plus all the United States' states and Canadian provinces.
- Over 1200 of color photographs that give user a very rough view of the countries.
- Provide indexing function that let user can easily search for the entire country they wish.

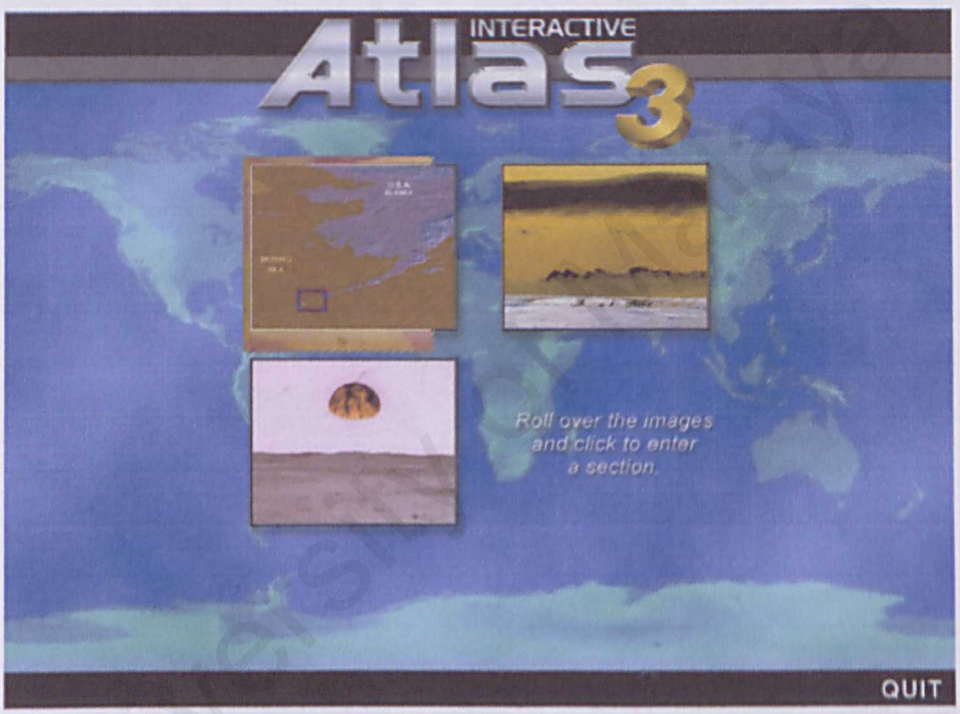



Figure 2.2: Captured Screen of Interactive Atlas 3 Main Page


Figure 2.3: Captured Screen of Interactive Atlas 3

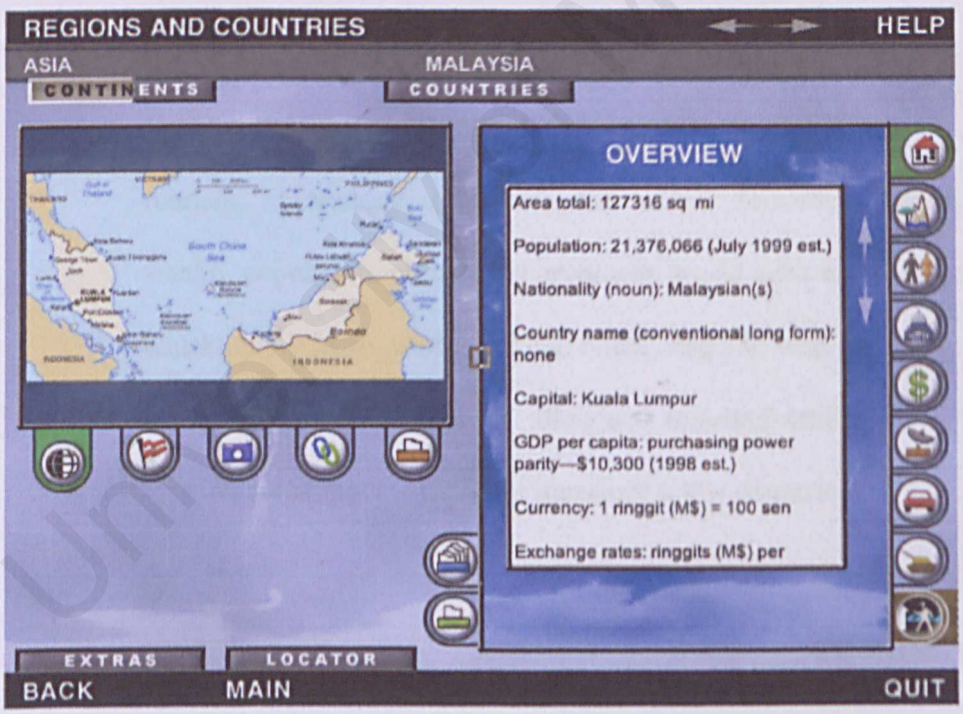



Figure 2.4: Captured Screen of Interactive Atlas 3

### 2.4.2 3D World Atlas - An Indispensable Guide To The World

3D World Atlas was developed by Encore Software, Inc. This software was purposed to be an atlas guide for the users. This software provides some features that seen similar to CALPAC but with some extra features that CALPAC do not need but also lacking of features that will be adopt into CALPAC. 3D World Atlas represents a very attractive and user-friendly interface. Figure 2.5 and 2.6 will show some captured screen of 3D World Atlas.

Features of 3D World Atlas:

- 3D World Atlas combines the cartographic qualities of an atlas with the background information of an encyclopedia and the analytical and statistical depth of a gazetteer.
- The globe view interface that can let user to zoom in and out.
- Country profiles with authoritative information on politics, aid, tourism, chronology, transportation, media, economic, health, wealth, population, climate, environment, world affairs, resources, education, defense, world ranking, crime, flag and map.
- Provide indexing function that allow user to search easily.
- Provide some movies files that introduce a few countries.

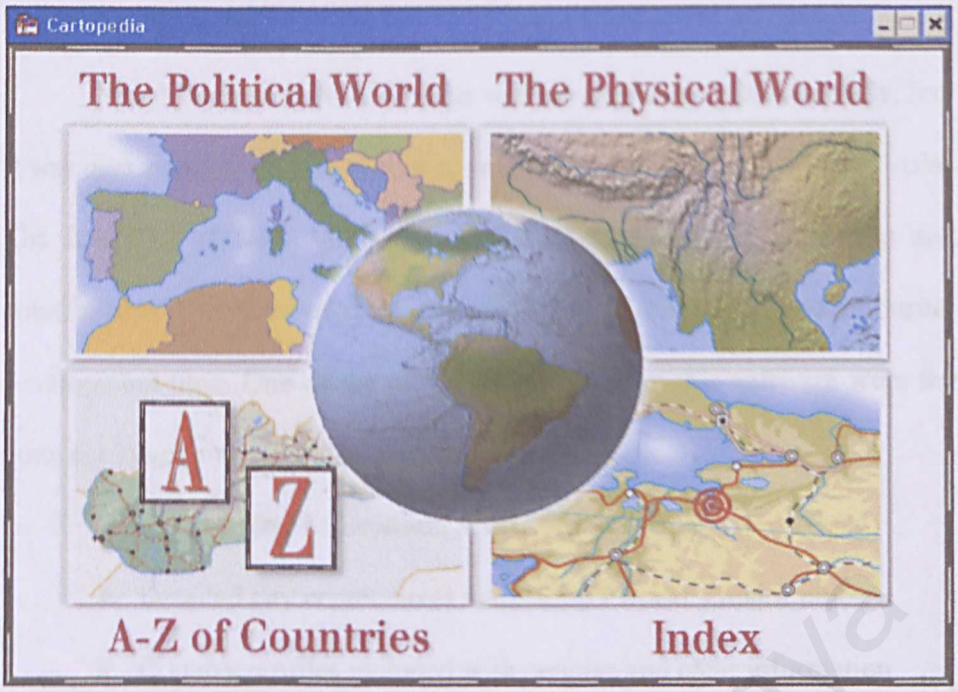



Figure 2.5: Captured Screen of 3D World Atlas Main Page

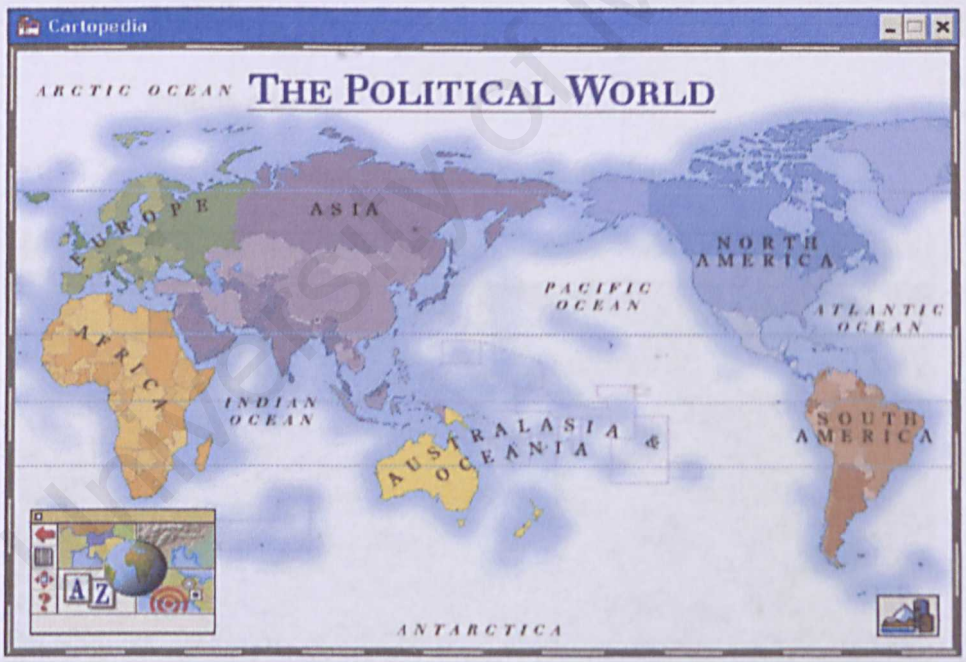



Figure 2.6: Captured Screen of 3D World Atlas Globe View

### 2.4.3 New Millennium Atlas Deluxe

New Millennium Atlas Deluxe was developed by Rand McNally, Inc. It was also an atlas product similar to Interactive Atlas 3 and 3D World Atlas. The interface of New Millennium Atlas Deluxe is quite attracting and colorful also. It contain of some features that CALPAC might adopt during development time. One of the most disadvantages in this software were the quite confusing menu bar and slower respond time.

Features of New Millennium World Atlas Deluxe:

- Detailed city center street maps for 65 world's major cities.
- Country profiles included with concise and clear information.
- Very detail map that allow user to search even for a small town.
- Contain some geographic articles that allow user to read about human development through historical, cultural, scientific and wildlife article.
- Provide zooming function with sliding bar.

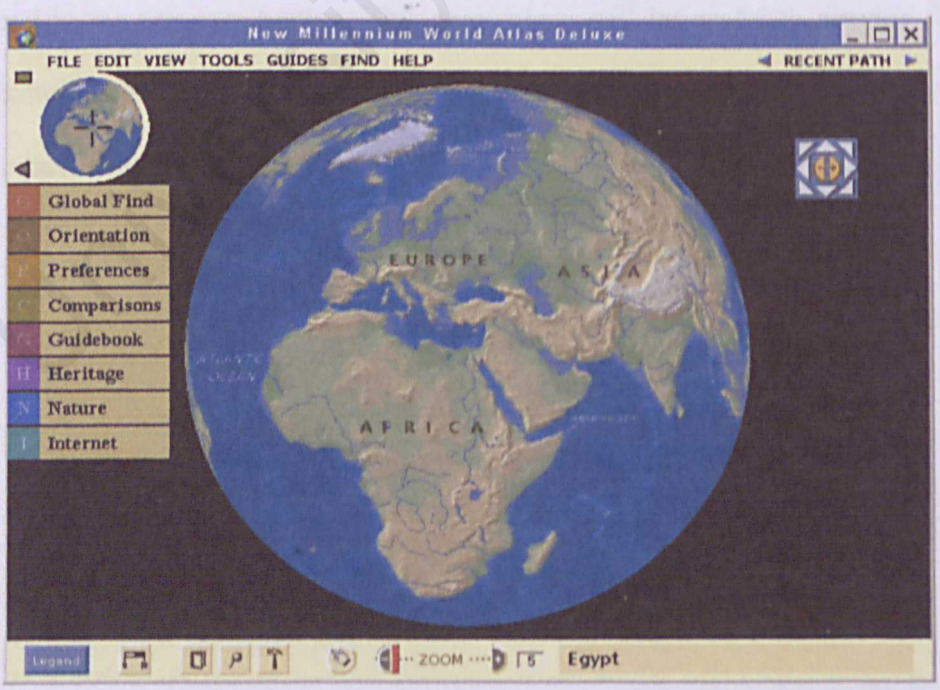



Figure 2.7: Captured Screen of New Millennium World Atlas Deluxe Main Page


Figure 2.8: Captured Screen of New Millennium World Atlas Deluxe

## 2.5 Features Comparison of Existing Packages

Table 2.1 show some features comparison of existing packages that mentioned in the previous section. This comparison will be useful to provide the useful features that can be adopted, some useless features that can be avoided and found some missing features in those systems.

Table 2.1: Features Comparison of Existing Packages

| **Interactive Atlas 3** | **3D World Atlas** | **New Millennium Atlas Deluxe** |
|---|---|---|
| Provide interesting & interactive interface. | Provide interactive & interesting interface. | Provide interesting interface but quite confusing. |
| Provide globe view for easy navigation. | Provide a very neat globe view for easier navigation. | Provide globe view that more confusing to the user. |
| Provide comprehensive country profiles but too tedious so can't easily attract user to read. | Provide comprehensive country profiles but also tedious. | Provide comprehensive and concise country profiles and presented in point-form. |
| Covers not only countries but also others like sea, lakes, river, cave, waterfall, mountain and etc. | Only covers the countries in the world. | Covers not only countries but also others like heritage, nature, world history and etc. |
| Provide printable maps for all countries plus all the states of USA. | Provide printable maps for all the countries but also some major cities in the world. | Provide very details map even for a small town. |
| Provide thousands of photographs to give a rough introduce. | Provide a few short movies that introduce some cultures of some major countries. | Lack of photographs and movies. |
| Provide indexing function. | Provide indexing function too. | Provide indexing function too. |
| Only provide enlarging function to view the map for a country. | Provide zooming function for easy selection. | Provide zooming function by using sliding bar. |
| Provide some sound effects and some music. | Only provide a few sound effects only | Only provide a few sound effects only. |
| Did not provide any game or quiz. | Did not provide any game or quiz. | Did not provide any game or quiz. |
| Did not provide any game or quiz for user. | | |
| Did not provide introduction to national costume and national anthem. | | |
| Not a learning package but more like an encyclopedia. | | |

## 2.6 Similar Past Year Projects

Some research and analysis on the similar existing past year projects done by the students of University of Malaya have been carry out. It is purpose to find out any useful features that can be adopt and useless features that can be ignored. The summary of the analysis was show in Table 2.2.

Table 2.2: Summary of Similar Past Year Projects

| Year | Title | Description | Comment | Developing Tools |
|---|---|---|---|---|
| 1999/2000 | ALPS – SPM Physics Learning Package | Consists all the details for SPM Physics Paper-1, include trail exam and exercise. | Very attractive interface and features. Provide animation. | Visual Basic 6.0, Flash, MS Access |
| 2000/2001 | Computer Aided Learning for Chinese Phonetics | To assist primary school student to learn Chinese Phonetics. | Only provide very basic features with not so interesting user interfaces. | Visual Basic 6.0, MS Access |
| 2000/2001 | Computer Aided Learning Package for C# | Introduction to new programming language – C# .NET | Very interesting user interfaces but provided a slow respond speed during loading. | Macromedia Director |
| 2000/2001 | M-Sign | Helps user to learn Malaysian's sign language. | A nice user interface. Basic features provided | Visual Basic 6.0, Flash, MS Access |

## 2.7 Development Tools Consideration

There are a few criteria that can be considered during the analysis of the developing tools. The tools should be able help to develop the system in a rapid environment.

### 2.7.1 Programming Tools

The programming tool is the main tool in developing the system. The tools should support:

a) Enable the development of windows applications that work with database.

b) Support to create a high impact graphical user interfaces.

c) Be able to create professional looking installation packages for the application.

#### 2.7.1.1 Microsoft Visual Basic .NET

Microsoft Visual Basic is an event driven programming language, where the code is executed as a responds to an event. Visual Basic also enables the developer to create application in a rapid application development (RAD) environment.

Microsoft Visual Basic .NET is the latest version of the visual basic tool set that enable the developers to address today's pressing application development issues effectively and efficiently. Visual Basic .NET enable developer to create Windows based application in less time, incorporate data access from a wider range of database scenarios, and create components with minimal code.

Developers can use Visual Basic .NET to build Windows-based applications that leverage the rich user interface features available in the Windows operating system. All the rapid application development (RAD) tools that developers have come to expect can be found in Visual Basic .NET, including drag-and-drop design and code behind forms. The forms feature provides an easy way to create a graphical user interface.

Visual Basic .NET lets you tackle any data access scenario easily. Visual Basic .NET provides support for both the new Microsoft ADO.NET for flexible, highly scalable data access and ActiveX Data Objects (ADO) data binding for connection oriented data access.

Visual Basic .NET supports full object-oriented constructs to enable more componentized, reusable code. Language features include full implementation inheritance, encapsulation, and polymorphism. This features provide the availability for developers to reuse the code where enable more rapid development.

#### 2.7.1.2 Java

Java Programming language is a complete object-oriented language that is based on C++. Java programming language was developed by Sun Micro Systems in 1991. It can be used to make standalone applications as well as mini applications or applets and for special server applications.

Java is a simple and familiar language – It's an object oriented language similar to C++ so the learning curve for programmers with a background in C++ or other object-oriented languages is small. (However,

for those with little or no prior programming experience the learning curve can be quite steep)

Writing in Java requires less code than other languages -- Java takes out a lot of the complexities of C++ making its programs significantly smaller and less complex.

Java is platform independent so it avoids platform dependencies and allows programmers to write programs once and run them anywhere. So a program initially written in a Windows environment can run on a Mac or Solaris platform.

### 2.7.2 Database Management System (DBMS)

The database management system (DBMS) to be used in the system should be considered seriously. The DBMS will act as the backend database for storing all the data.

#### 2.7.2.1 Microsoft Access XP

Microsoft Access is a powerful relational database management system which suitable to low and medium scale system. Microsoft Access XP is the latest version of Microsoft Access which is one of the applications in the Microsoft Office XP package. Microsoft Access offers an easy-to-use database for managing and sharing data. It is ready to use for those who are creating a stand-alone desktop database for personal use, departmental use or for entire organization.

Microsoft Access brings not only the traditional broad range of easy data management tools but also adds increased integration with the Web for

easier sharing of data across a variety of platforms and user levels and additional ease-to-use enhancements to assist with personal productivity.

One of the strength of using Microsoft Access is it makes information easy to find and use. Microsoft Access continues to offer an ease-to-use tool for easily finding information that provides consistency and integration with the other applications in the Office suite.

Access consists of Web-Enabled Information Sharing where it allows easily sharing information via the corporate intranet and the ability to easily host a database within the browser. This combines the power of a desktop database with the power of the web.

#### 2.7.2.2 Microsoft SQL Server 2000

Microsoft SQL Server 2000 is a defining release for Microsoft's database products, building on the solid foundation established by SQL Server 7.0. SQL Server is a relational database management system which can manage much more data than Microsoft Access. Microsoft SQL Server is more suitable for the large scale system because of the ability. Microsoft SQL Server 2000 also shows a solid performance in networking and internet based applications. SQL Server 2000 provides agility to your data management and analysis, allowing to adapt quickly and gracefully to derive competitive advantage in a fast-changing environment. A complete database and data analysis package, SQL Server 2000 opens the door to the rapid development of a new generation of enterprise-class business applications that can give your company a critical competitive advantage. Furthermore,

Microsoft SQL Server 200 is highly scalable and reliable in processing large amount of data.

### 2.7.3 Multimedia Tools

The multimedia tools can help to create the high impact user interfaces and environment. It is use to create the multimedia content likes animation, audio effects, and etc.

#### 2.7.3.1 Macromedia Flash MX

Macromedia Flash was developed by Macromedia, Inc. It is a multimedia tool that enables developer to create multimedia content for internet content and application. The approachable environment includes powerful video, animation, audio, vector graphics, bitmap graphics and application development features, which allow designers and developers to create rich user interfaces, online advertising, product tours, e-learning courses and enterprise application front ends.

#### 2.7.3.2 Macromedia Director 8.5

Macromedia Director is an industry standard authoring tool for multimedia production. It is mainly designed for web application. It combines multimedia elements into portable movie and backs them up with Lingo, which is Director's own interactive scripting language.

Lingo is a powerful scripting language. It enables a Director developer and the user to control any situation in the production. While

adding features to Director that Lingo does not provide, we can obtain or create C modules called Xtras, which could communicate with Director.

Furthermore, Director has a host of media editors to create, modify, import or edit graphics, sounds, text, video and interactivity to deliver the highest quality productions possible.

## 2.8 Summary

As a whole, literature review is very important to the development of a project as all information relevant to the project are thoroughly analyzed and reviewed. Next chapter will concentrate on the methodology that to be used during developing the system.


# Chapter 3

# Methodology

# Chapter 3 Methodology

## 3.1 Introduction

The methodology is the techniques and research method used to solve the project problem. This chapter will discuss the details of the methodology using during developing the system in details. The software process model and the fact finding techniques will be presented in this chapter.

## 3.2 Software Process Model

A software process is a set of activities and associated results which produce a software product. A software process model is a simplified of a software process which is presented from a particular perspective. In next section will present a process model that used in this system.

### 3.2.1 Waterfall Model

The waterfall model was one of the first published software process models where the stages are depicted as cascading from one to another (Royce 1970). The waterfall model builds correction pathways into the model that enable a return to a previous stage. It is the most widely used methodology to implement the software development life cycle. As show in the figure 3.1, the waterfall model consists of five phases including requirement analysis, system and software design, implementation and unit testing, integration and system testing, and operation and maintenance.

In the requirement analysis phase, the current problem will be identified, the need and constraints of the system will be recognized and the

system goals and objectives will be set. Any existing system will be analyzed and development tools required will also be specified. They are then define in detail and serve as a system specification.

The system design process partitioned the software and hardware system requirement. It established the overall system architecture. The software design is concerned with the database design and the user interface design which are the fundamental software abstractions.

During the implementation and unit testing phase, the software design is realized as a set of programs. Unit testing ensure that each unit meet its specification.

In the integration and system testing, all the individual program units are integrated and tested as a complete system. The testing ensures that the complete system meets all the requirements. After testing, the system is ready to deliver.

Finally, the system is installed and use. Any error discovered by the user will be corrected and any new requirements will be fulfilled.

The advantages of waterfall model include:

- Avoid the pressure of writing code long before it is known what is to be built.
- Reduce project time and cost.
- Helping developer lay out what they need to do.
- Is easy to explain for others people.
- Easy to associate and identify each milestones with its deliverer.

### 3.2.2 Conclusion

Due mainly to the time constraints and nature of the system, the waterfall model was chosen for this project. It presents comprehensive steps on what happen during the development and it suggests to the developers the sequence of the event they should deal with.

To enable developer return to the previous phase, the enhancement version of waterfall model is used. The correction pathways have been integrated into the waterfall model for this purpose.

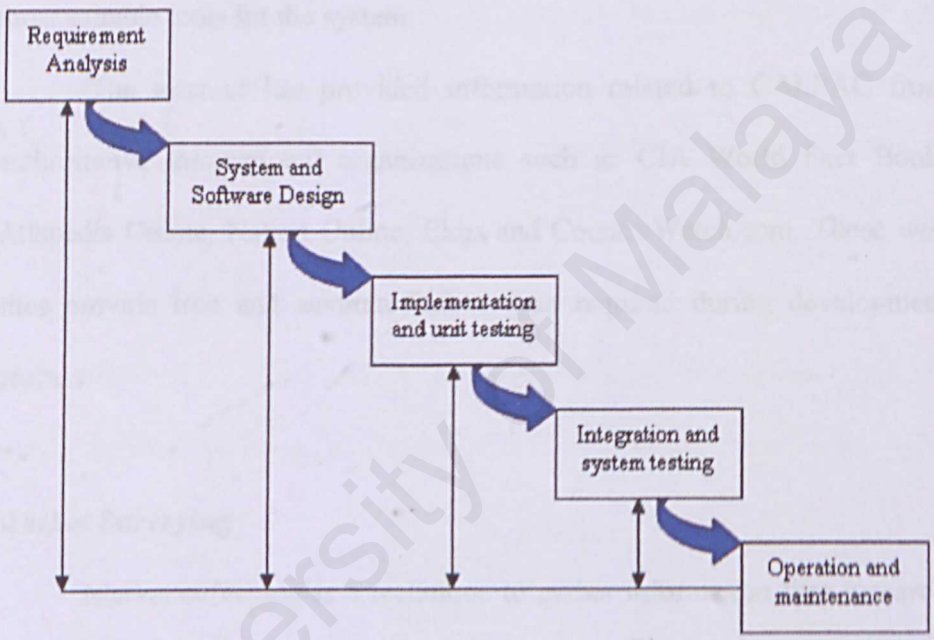



Figure 3.1: Waterfall Model Using in CALPAC

## 3.3 Fact Finding Techniques

Useful information and recommendations are obtained through carrying efforts of fact finding. In most cases, a combination of these techniques is essential to increase both effectiveness and efficiency in gathering factual information to support project development. The technique being carried out to gather information includes internet surfing, market surveying and reading.

### 3.3.1 Internet Surfing

Surfing the internet is indeed the best method of fact finding technique. Today, most of the information requested can be getting from internet and internet already serves as a biggest electrical database in the world.

The information about the available developing tools can be obtained from vendor's web site. These are helpful in evaluating and selecting the most suitable tools for the system.

The internet has provided information related to CALPAC from authoritative international organizations such as CIA World Fact Book, Atlapedia Online, Nation Online, Eldis and CountryWatch.com. These web sites provide true and accurate information required during development process.

### 3.3.2 Market Surveying

Market surveying is a technique to gather information thru research in the current market. The important information get from market surveying was the existing software or learning packages that related to the project. The information is helpful in giving ideas on the features of the project, data should keep track in system database and the user interface designs.

The surveying found that just only a few software that related to this project available in the market. Most of the software founded was purely like an encyclopedia but not learning packages. There contains all of the information but without the features that guide the user throughout the

process of learning. As a conclusion, the market still lack of this type of computer aided learning packages related to countries.

### 3.3.3 Reading

There are wide varieties of materials available for reference. This ranges from books, encyclopedia, magazines, handbooks, manual, directories, dictionaries and others. The printed materials still remain as the most authoritative resources in information gathering.

Most printed materials are ready references sources and are quick and accurate in answer the factual queries. One of the weakness is some of the contents in printed materials are not updated or providing latest information and technologies.

Part of the research work for this system is come from reference books. Some of the books were from Main Library of University of Malaya and Library of Faculty of Computer Science and Information Technology, University of Malaya.

## 3.4 Summary

In this chapter, the methodology used in the development process of the system had been discussed in details. In the next chapter, the system analysis will be presented.


# Chapter 4

# System Analysis

# Chapter 4 System Analysis

## 4.1 Introduction

System analysis is an early phase in system development life cycle. It involves identification of functional and non functional requirements. Development tools required for development will be discussed in this chapter too. The hardware and software requirements will also be identified.

## 4.2 Functional Requirements

Functional requirements are the functions that a system must provide in order to fulfill the software requirements. Functional requirement describes an interaction between the system and the environment. Following are the functional requirements for this system.

**a) System Overall**

(i) Allows user to switch between English and Malay when using the system except database maintenance subsystem.

(ii) Provide online help for user.

**b) Countries Database Maintenance Subsystem**

(i) Allows 2 administrators to make changes in the database.

(ii) Provides password protection to prevent unauthorized changes.

(iii) Allows administrator to add, modify and delete for the countries profiles and CALPAC challenge's questions.

(iv) Allows administrator to change the user ID and password.

**c) Countries Information Subsystem**

(i) Allows user to view the countries' flag and map and enable the user to view the flag and map in larger size.

(ii) Provides comprehensive information for user to learn which includes costume, famous buildings or places and country information (capital, independence date, population, languages, ethnic groups, religious, government type, currency, climate, area, location and background).

(iii) Allows user to listen to the countries' national anthems and welcome greeting in national languages.

(iv) Allows user to select the country through filtering by continent.

**d) Countries Challenge Subsystem (Game)**

(i) Allows user to play a game which are integrating the quiz idea.

(ii) Allows system to choose question randomly from

(iii) The question can be in combination of text, sound or graphic. The answer will be in the objective selections of four.

(iv) Allows user to choose the level of the game. (Beginner, Intermediate and Advance)

(v) Allows user to view their score and their progress.

(vi) User will lose the game if answer a question incorrectly or exceed the time limit.

(vii) Provides two lifelines that can help the user to answer the question. A lifeline only can be use once. The first lifeline will

help the user to remove two incorrect answers from their selection and the second lifeline will provide a hint to the answer.

(viii) The system can keep the 5 top scorers for each level and numbers of questions chosen.

Table 4.1: Time and score for each level

| **Level** | **Total Questions** | **Time / Question** | **Score / Question** |
|---|---|---|---|
| Beginner | 20 | 30 seconds | 5 |
| Intermediate | 25 | 25 seconds | 10 |
| Advance | 30 | 20 seconds | 20 |

**e) Countries Indexing Subsystem**

(i) Provides indexing list of countries in the system.

(ii) Allows user to search according to first alphabet of the countries name.

(iii) After the user selection, the system should proceed to the entire country information page.

## 4.3 Non-Functional Requirements

Non functional requirements are the set of constraints under which a system must operate and the set of standards which a delivered system must meet.

a) **User Friendly**

The system must be considered as attractive and an easy-to-use application where the users will only need to use any pointing devices to point around the system. This could be implemented by using menu driven hierarchical design to display the CALPAC menu items.

b) **Correctness**

The information provided by the system should be an authoritative data. The information provided should be at high level of correctness or accuracy where the information would not present an incorrect view to the user.

c) **Maintainability and expandability**

The system should allow adding new countries and game questions to provide a flexible environment to expand the information in the package. The system should also allow editing or deleting county profile and game questions to consider as a maintainability system.

## 4.4 Development Tools Selected

After the review and the analysis during the literature review, some tools had been selected in order to maximize the outcome of the ideas.

### 4.4.1 Programming Tool

- **Microsoft Visual Basic .NET**

  Microsoft Visual Basic .NET had been selected as the programming tool for the project. Microsoft Visual Basic .NET is the most productive tool for creating high performance windows application. The reasons of the Microsoft Visual Basic .NET had been chosen are as follow:

  a) Can easily access to database by using ADO.NET

  b) GDI+ that allow doing advanced drawing and painting within forms.

  c) Visual designer for windows forms

  d) Code aware editors that include statement completion, syntax checking, and etc.

  e) Integrated compilation and debugging.

  f) Expand features from Visual Basic 6.0 to provide a superior environment for developing windows applications.

  g) Feel more comfortable and can develop the application rapidly.

  h) Latest technology from Microsoft.

### 4.4.2 Database Management System (DBMS)

- **Microsoft Access XP**

  Microsoft Access in the relational database management system (RDBMS) will be used as the system database. The reasons of Microsoft Access had been chosen are as follows:

  a) Microsoft Access is more suitable for the medium and small scale application if compare with the others as CALPAC is only a small scale application.

  b) Provide easy menu driven interface.

  c) Can be easily access by application developed by Visual Basic .NET by using ActiveX Data Object .NET (ADO.NET)

  d) Easily to maintain as most of the people have Microsoft Access that is included in the Microsoft Office package.

### 4.4.3 Multimedia Tool

- **Macromedia Flash MX**

  Macromedia Flash is selected as the multimedia tools. The Macromedia products should produce the multimedia features required by the system. There are enabling to create beautiful, compact and resizable animation and graphics. Furthermore, their capabilities to import by the Visual Basic by using Shockwave Flash Control for Multimedia Flash are very important.

## 4.5 Software Requirements

The software requirements are requirements that have to do with the software needs that must be fulfilled in order to develop or run the system.

### 4.5.1 Developer Software Requirements

The developer should have all of the software shown below in order to develop the system and to maximize the potential of the project.

a) Microsoft Windows 98/Me/2000/XP

b) Microsoft Visual Studio .NET

c) Microsoft Access

d) Macromedia Flash MX

e) Macromedia Director 8.5

f) Adobe Photoshop 6.0

### 4.5.2 User Software Requirements

The users of the system should at least have the requirements show below in order to execute the system.

a) Microsoft Windows 98/Me/2000/XP

b) Microsoft Access

## 4.6 Hardware Requirements

The hardware requirements are requirements that have to do with the hardware needs that must be fulfilled in order to maximize the performance of the system.

### 4.6.1 Developer Hardware Requirements

The developer of the system should have the below hardware to develop the system and to make sure that the developing process going smoothly.

a) IBM Compatible PC

b) Intel Pentium III 450Mhz or above

c) 128 MB SDRAM or above

d) Others standard computer peripherals such as scanner, speaker, microphone, CD-RW Burner, and etc.

e) Sound Recorder

### 4.6.2 User Hardware Requirements

The users of the system should fulfill the below requirements in order to maximize the performance of the system.

a) IBM Compatible PC

b) Intel Pentium II 300Mhz or above

c) 64 MB SDRAM or above

d) Minimum 500 MB free hard disk space

e) Others standard computer peripherals such as CD-Rom, speaker and mouse.

## 4.7 Summary

During the system analysis phase, the system requirements had been identified, as well as development tools for the project has been selected. The hardware and software requirements also been discussed. In the next chapter, the process of converting the conceptual ideas from requirement specification in system analysis into more technical specification will be presented.


# Chapter 5

# System Design

# Chapter 5 System Design

## 5.1 Introduction

System Design is a process to convert the conceptual ideas from requirements specification into more technical specification. In system design, requirements are translate into models or representation of software that can be access for quality before implementation phase begins. This chapter included the system architecture, program design, database design and user interface design.

## 5.2 Program Design

Program design is based on the system requirements defined in system analysis phase. It translates the system requirements into system functionality. The design focuses on the system structure chart and data flow diagrams.

### 5.2.1 System Structure Chart

System structure chart show the top-down design of a program. The use of this chart is to describe the interaction between each module. The combination of all the modules represents the whole system and each module can also break into sub-component parts.

The CALPAC was form by the combination of four main modules which are Countries Database Maintenance Subsystem, Countries Information Subsystem, Game Subsystem and Countries Indexing Subsystem. Each of these modules was further divided into subcomponents.

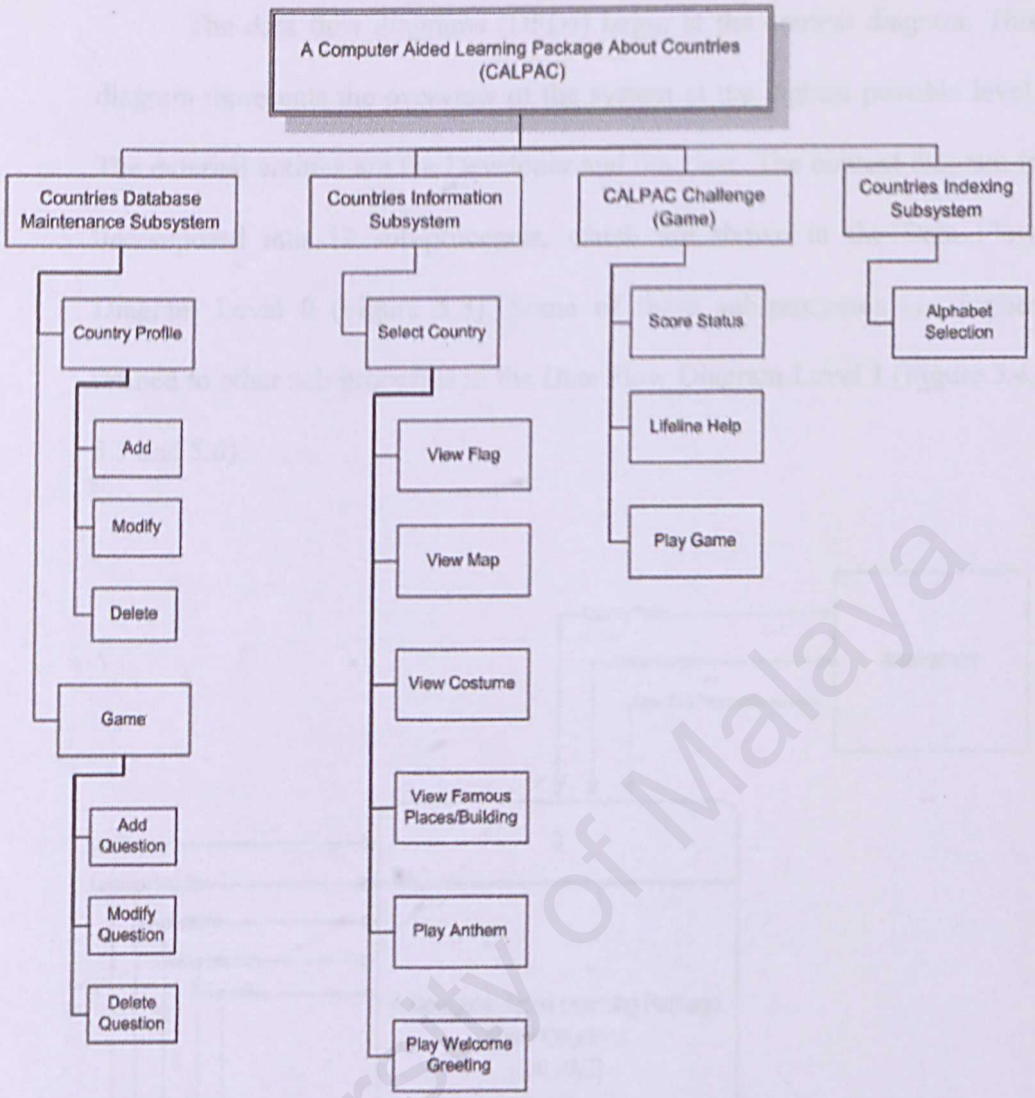



Figure 5.1: System Structure Chart of CALPAC

### 5.2.2 Data Flow Diagram

Data flow diagram is using to represents the function, or processes, which capture, manipulate, store and distribute data between the system and its environment as well as between components within the system. Data flow diagram can put together a graphical representation of data processes throughout the system. The symbols used are based on the System Analysis and Design book written by Kendall and Kendall (Kendall & Kendall, 1999)

The data flow diagrams (DFDs) begin at the context diagram. This diagram represents the overview of the system at the highest possible level. The external entities are the Developer and the User. The context diagram is decomposed into 12 sub-processes, which are shown in the Data Flow Diagram Level 0 (Figure 5.3). Some of these sub-processes are further refined to other sub-processes in the Data Flow Diagram Level 1 (Figure 5.4, 5.5 and 5.6).

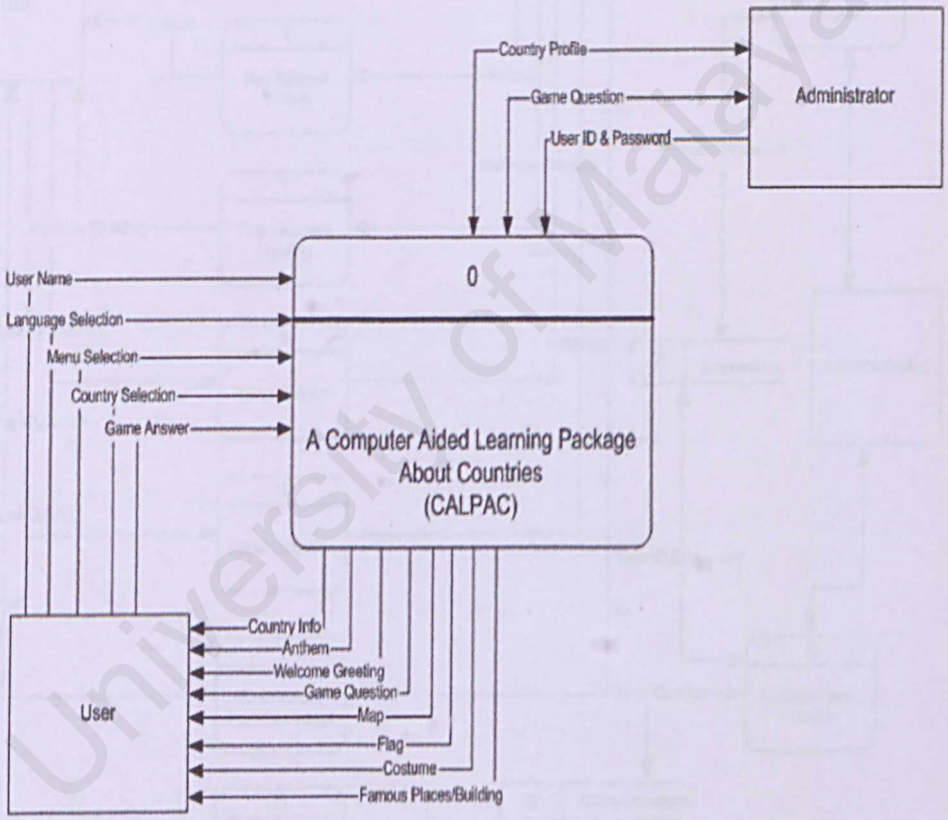



Figure 5.2: Context Data Flow Diagram

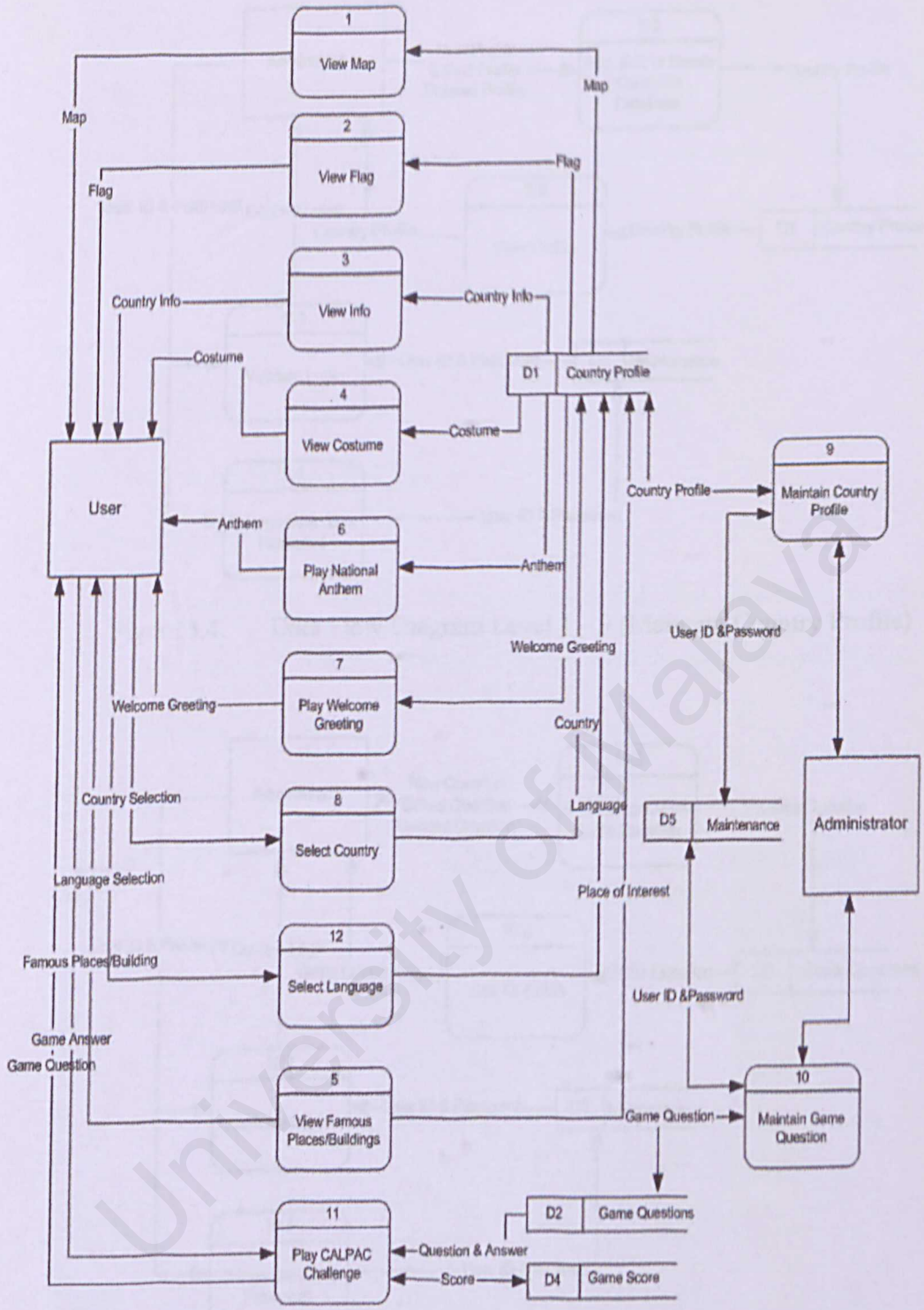



Figure 5.3: Data Flow Diagram Level 0

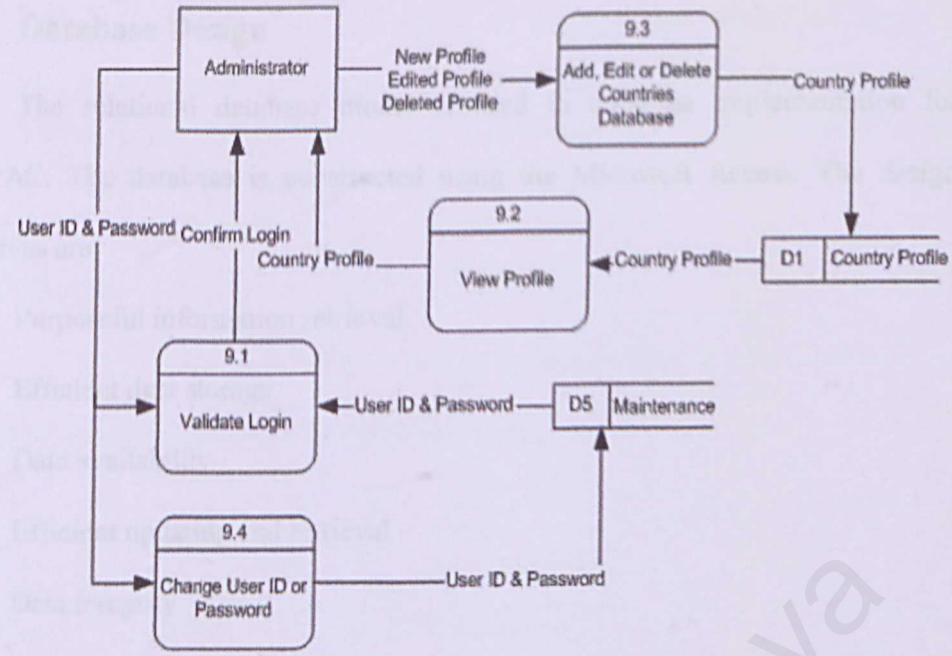



Figure 5.4: Data Flow Diagram Level 1 – 9 (Maintain Country Profile)

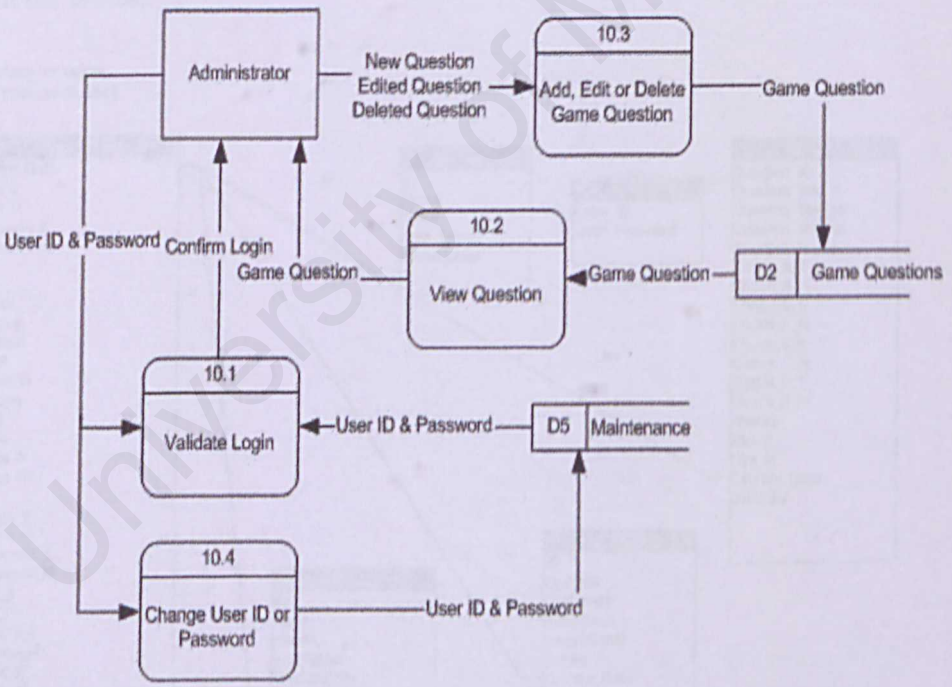



Figure 5.5: Data Flow Diagram Level 1 – 10 (Maintain Game Question)

## 5.3 Database Design

The relational database model is used in database implementation for CALPAC. The database is constructed using the Microsoft Access. The design objectives are:

a) Purposeful information retrieval

b) Efficient data storage

c) Data availability

d) Efficient updating and retrieval

e) Data integrity

During design the database, we need to identify the database, then the attributes and data type of the database. Figure 5.6 will show the relationship between the tables.

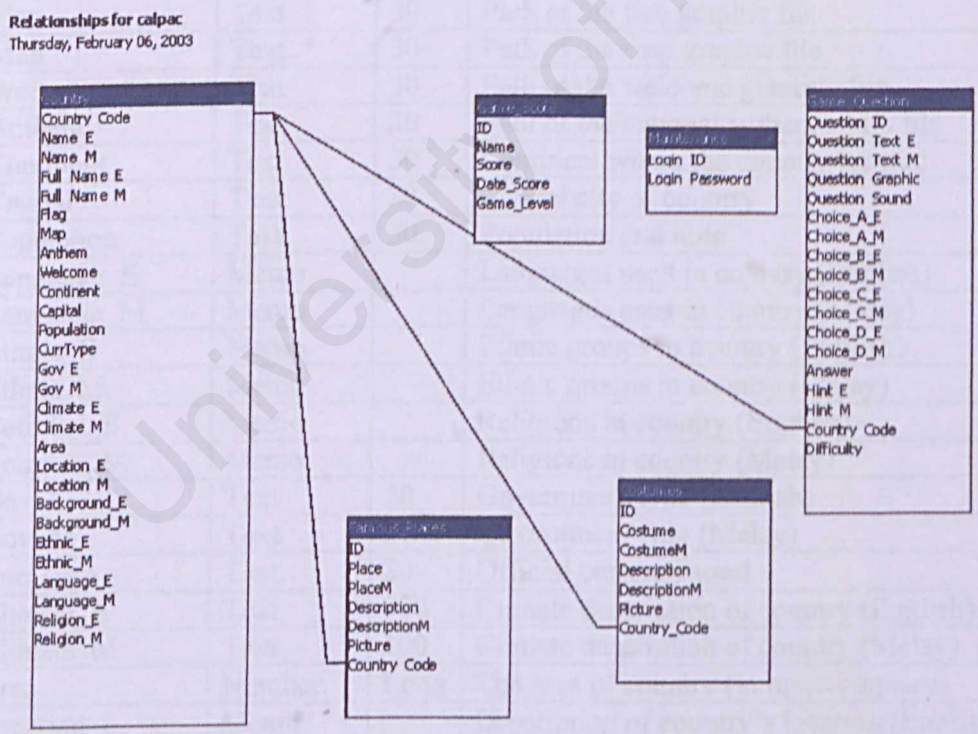



Figure 5.6: Relationships in CALPAC Database Design

Tables 5.1 to 5.6 show the tables of the database. There are Country, Costumes, Game_Question, Famous_Places, Game_Score and Maintenance. Each table contains at least one primary key which marked with '*'. The data types using in the tables are based on Microsoft Access's data type.

**Table: Country**

Table 5.1 is the Country table, which contains the information about the countries to show in the system exclude famous places/building.

Table 5.1: Country Table

| Field Name | Data Type | Size | Description |
|---|---|---|---|
| *Country_Code | Text | 5 | The country code |
| Name_E | Text | 30 | Country name in English |
| Name_M | Text | 30 | Country name in Malay |
| Full_Name_E | Text | 50 | Country full name in English |
| Full_Name_M | Text | 50 | Country full name in Malay |
| Flag | Text | 30 | Path of the flag graphic file |
| Map | Text | 30 | Path of the map graphic file |
| Welcome | Text | 30 | Path of the welcome greeting file |
| Anthem | Text | 30 | Path of the national anthem audio file |
| Continent | Text | 30 | Continent where the country located |
| Capital | Text | 30 | Capital city of country |
| Population | Text | 30 | Population and note |
| Language_E | Memo | | Languages used in country (English) |
| Language_M | Memo | | Languages used in country (Malay) |
| Ethnic_E | Memo | | Ethnic groups in country (English) |
| Ethnic_M | Memo | | Ethnic groups in country (Malay) |
| Religion_E | Memo | | Religions in country (English) |
| Religion_M | Memo | | Religions in country (Malay) |
| Gov_E | Text | 30 | Government type (English) |
| Gov_M | Text | 30 | Government type (Malay) |
| CurrType | Text | 30 | Official currency used |
| Climate_E | Text | 100 | Climate description of country (English) |
| Climate_M | Text | 100 | Climate description of country (Malay) |
| Area | Number | Long | The area of country (in meters square) |
| Location_E | Memo | | Description of country's location (English) |
| Location_M | Memo | | Description of country's location (Malay) |
| Background_E | Memo | | Background description of country (English) |
| Background_M | Memo | | Background description of country (Malay) |

**Table: Game_Question**

Table 5.2 is the Game_Question table, which used to store the questions of the game.

Table 5.2: Game_Question Table

| Field Name | Data Type | Size | Description |
|---|---|---|---|
| *Question_ID | Number | Long | ID of the question |
| Question_Text_E | Memo | | Question in English |
| Question_Text_M | Memo | | Question in Malay |
| Question_Graphic | Text | 30 | Path to graphic file |
| Question_Sound | Text | 30 | Path to audio file |
| Choice_A_E | Text | 30 | Choice A in English |
| Choice_A_M | Text | 30 | Choice A in Malay |
| Choice_B_E | Text | 30 | Choice B in English |
| Choice_B_M | Text | 30 | Choice B in Malay |
| Choice_C_E | Text | 30 | Choice C in English |
| Choice_C_M | Text | 30 | Choice C in Malay |
| Choice_D_E | Text | 30 | Choice D in English |
| Choice_D_M | Text | 30 | Choice D in Malay |
| Answer | Text | 1 | Answer (A,B,C,D) |
| Hint_E | Text | 200 | Hint (English) |
| Hint_M | Text | 200 | Hint (Malay) |
| Difficulty | Text | 1 | Level of difficulty (B,I,A) |
| Country_Code | Text | 5 | (Foreign Key) To enable deletion of question when deleting a country. Only applicable to question that related only to one country. |

**Table: Costumes**

Table 5.3 is Costumes table which contains the data of the costumes of the countries.

There are one or more than one costumes in one country.

Table 5.3: Costumes Table

| Field Name | Data Type | Size | Description |
|---|---|---|---|
| *ID | AutoNumber | Long | Auto generated ID |
| Costume | Text | 50 | Name of the costume (English) |
| CostumeM | Text | 50 | Name of the costume (Malay) |
| Description | Memo | | Description of the costume (English) |
| DescriptionM | Memo | | Description of the costume (Malay) |
| Picture | Text | 30 | Path to image file |
| Country_Code | Text | 5 | (Foreign Key) |

**Table: Famous_Places**

Table 5.3 is Famous_Places table which contains the data of the famous places or buildings of the countries. There are one or more than one famous places or buildings in one country.

Table 5.4: Famous_Places Table

| Field Name | Data Type | Size | Description |
|---|---|---|---|
| *ID | AutoNumber | Long | Auto generated ID |
| Place | Text | 50 | Name of the place (English) |
| PlaceM | Text | 50 | Name of the place (Malay) |
| Description | Memo | | Description of the place (English) |
| DescriptionM | Memo | | Description of the place (Malay) |
| Picture | Text | 30 | Path to image file |
| Country_Code | Text | 5 | (Foreign Key) |

**Table: Game_Score**

Table 5.4 depicts Game_Score table that store the top 5 scorer and the scores for each levels and amount of questions.

Table 5.5: Game_Score Table

| Field Name | Data Type | Size | Description |
|---|---|---|---|
| *ID | AutoNumber | Long | Auto generated ID |
| Name | Text | 50 | Name of the scorer. |
| Score | Number | Long | The game score |
| Date | Date/Time | | Date and Time of the score |
| Level | Text | 1 | 'B','A','I' (Beginner, Advance, Intermediate) |

**Table: Maintenance**

Table 5.5 is the Maintenance table, which used to store the administrator ID and password that used for database maintenance.

Table 5.6: Maintenance Table

| Field Name | Data Type | Size | Description |
|---|---|---|---|
| *Login_ID | Text | 12 | User ID of the Administrator |
| Login_Password | Text | 12 | Password of the Administrator |

- Memo data type can store up to 65536 characters.
- Long is from -2,147,483,648 to 2,147,483,647

## 5.4 User Interface Design

Interface design is the communication gateway between the user and the system. A good, ease to use and user friendly interface will make the user feel comfortable and easier to use. User interface design must take into account the need and the experience of the user. User interface covers both the input and output of the system. The input interface must able to capture all the input needed for the system without any errors. Therefore, the interface must contain protection against error entering the system. Besides that, output must well line out and easy to understand.

A good interface will reduces the complexity for the user. Today, the graphic user interface (GUI) already substitute the text based interface to act as the main interface design. GUI will provide user the user friendly and ease to use environment without need to memorize the command. As the CALPAC was a learning package that most of the users are not computer literate, the GUI interface will enable the users to maximize the benefits from the system.

Figures below will show the preliminary user interfaces design of the system.

**a) Main Page Interface Design**

Figure 5.7 shows the main page interface design of the system where the four main subsystems can access easily.

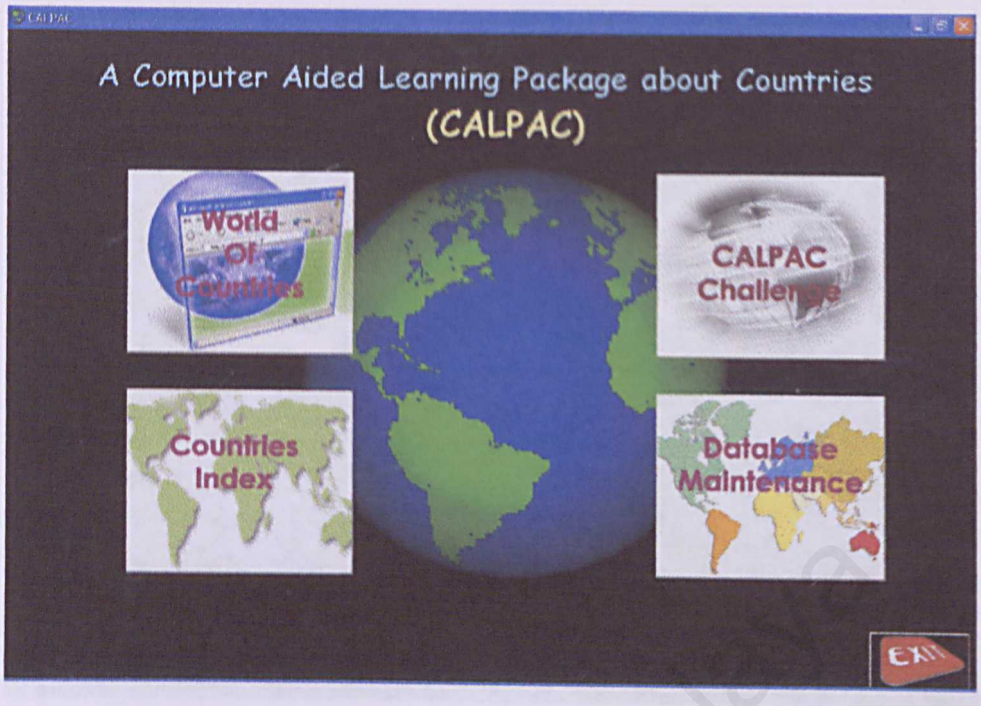



Figure 5.7: Main Page Interface Design

**b) Database Maintenance Interface Design**

Figure 5.8 shows the database maintenance interface design. The administrator can choose to make any types of maintenance they wish easily.

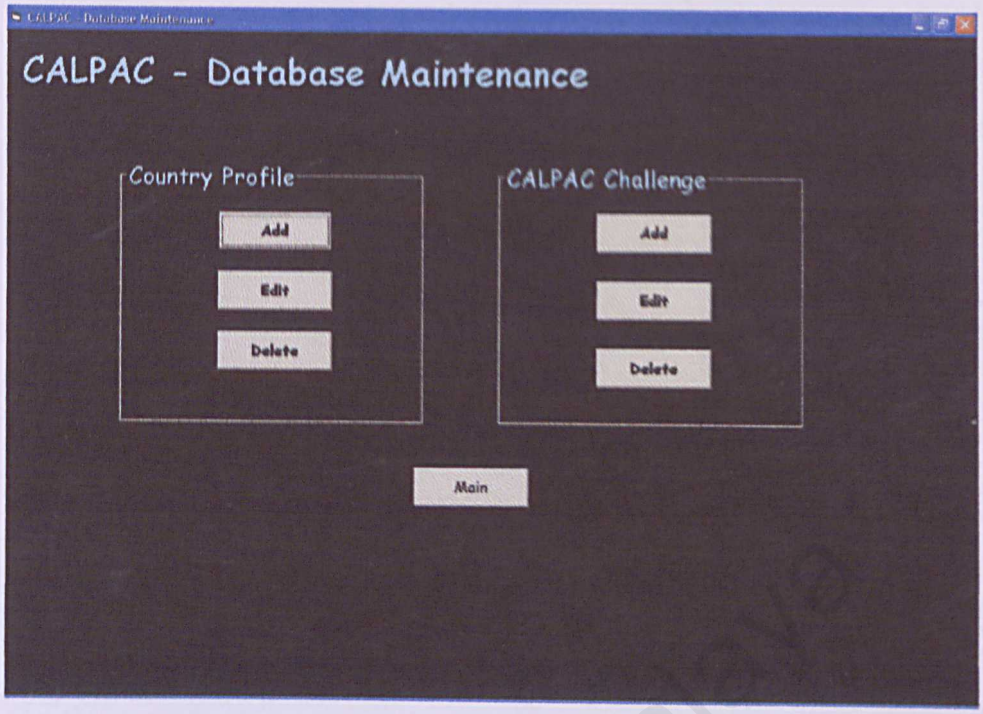



Figure 5.8: Database Maintenance Interface Design

**c) Countries Information Interface Design**

Figure 5.9 and Figure 5.10 show the countries information interface design. Figure 5.9 shows the interface design of the system before user selecting a country. Figure 5.10 shows the interface design of the system after user has selected a country.

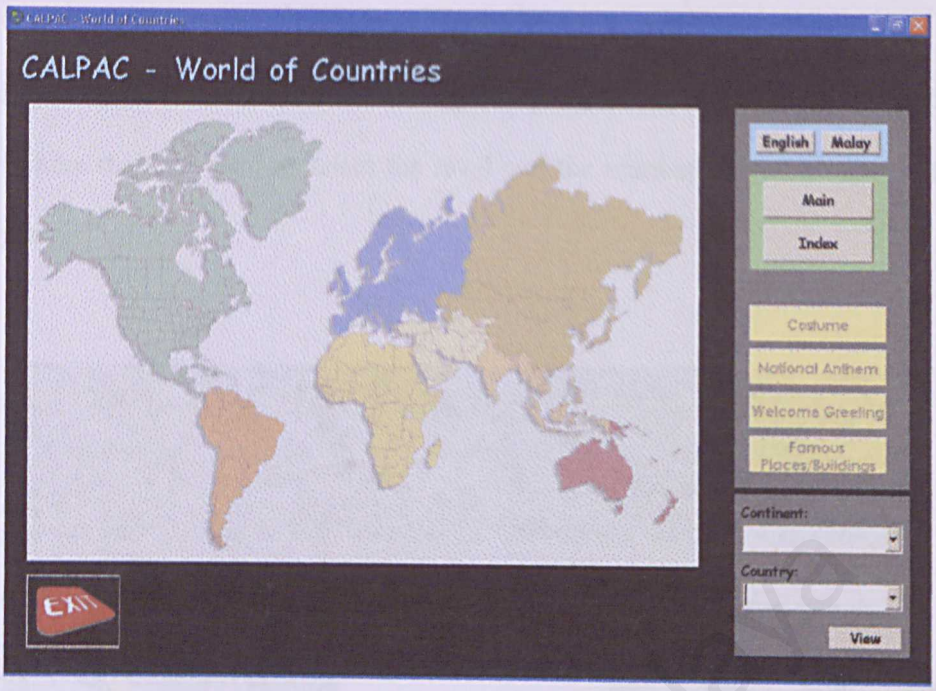



Figure 5.9: Countries Information Interface Design (Before Select a Country)

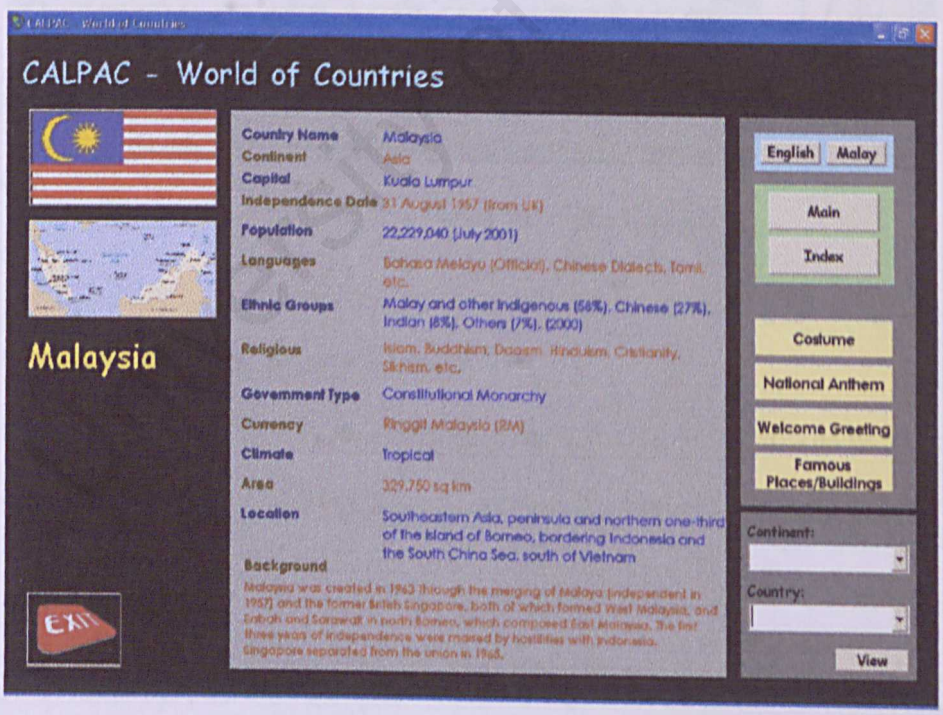



Figure 5.10: Countries Information Interface Design (After Selected a Country)

**d) CALPAC Challenge (Game) Interface Design**

Figure 5.11 shows the interface design of the game but before user proceed to here the user need to select the level and the number of questions of the game.

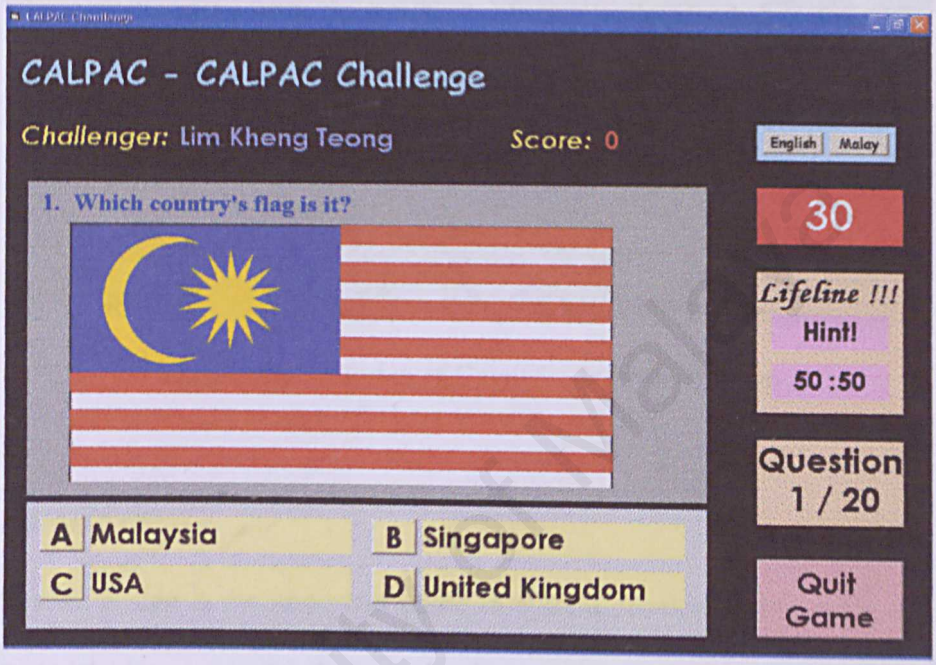



Figure 5.11: Game Interface Design

**e) Countries Indexing Interface Design**

Figure 5.12 shows the interface design of the indexing function. The user can select the alphabet to view the list of countries started with this alphabet.

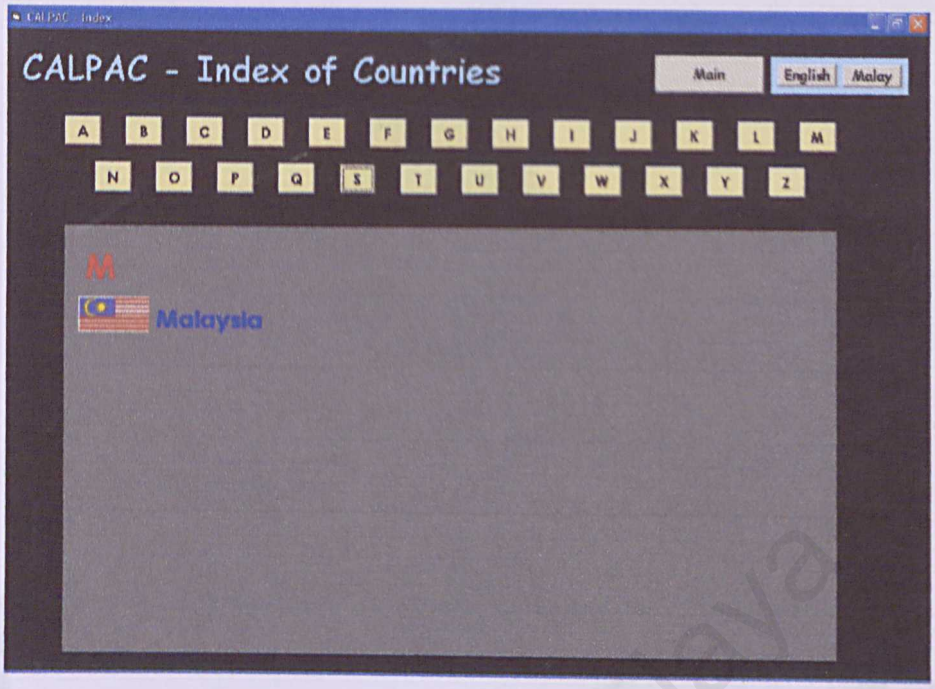
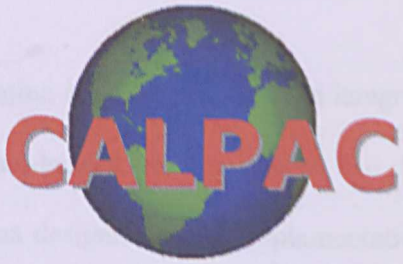



Figure 5.12: Index of Countries Interface Design

## 5.5 Summary

System design is the important phase in system developing life cycle. It is important to take into account before any implementation or coding is done in order to get the overall system flows and to show clearly the ideas on how a system to be developed. After the system design being finalizes the implementation or coding phase can be started as the design will be realized to become a real system.




# Chapter 6

# System Implementation

# Chapter 6 System Implementation

## 6.1 Introduction

System implementation is the acquisition and integration of the physical and conceptual resources that produces a working system. It is the physical realization of the database and application designs. System implementation includes building and testing its contained modules and sub-modules, involving system requirements and design conversion into program codes.

## 6.2 Development Environment

The initial stage of system implementation involves setting up the development environment. The usage of dynamic and suitable hardware and software could help accelerate the development or construction of the system. The hardware and software tools used to develop the entire system are as discuss below:

### 6.2.1 Hardware Configuration

The following hardware specifications have been used to develop the system:

a) AMD Athlon 800 MHZ Processor

b) 384 MB SDRAM

c) 20 GB Hard disk drive

d) Creative Vibra 128 PCI Sound Card

e) CD-RW Burner

f) Recordable Walk-Man

g) Standard floppy disk drive, printer, speaker and modem.

### 6.2.2 Software Configuration

There are a lot of software tools, which are used in designing and writing report. The design process involves drawing and designing the images, chart, data flow diagram and other foundation implementations of the software development. Table 6.1 summarizes the software tools used in the development of the system.

Table 6.1: Summary of Software Tools for the Development of CALPAC

| Software | Usage | Description |
|---|---|---|
| Microsoft Windows 2000 Professional | Development Platform | Operating System |
| Microsoft Visual Studio .NET | System Development | Coding and interface design |
| Microsoft Access XP | Database | Database design, construction and implementation for data storage and manipulation. |
| Creative Recorder | Audio Recording | Record the audios transfer from recordable walk-man. |
| Adobe Photoshop | Interface Design<br>Image Editing | Editing image data and interface images. |
| Macromedia Flash | Interface Design | Solution to provide animating buttons and banner. |

## 6.3 Database Development

The first step in the system development is to develop the system's database based on the logical data model for the system created during the system design phase. The database used for the initial development stage for the system was Microsoft Access XP.

The database development was started by creating an empty database called CALPAC. All the tables are then created by specifying all the fields for each table

and the field properties. A primary key id allocated for each table in the database. Figure 6.1 shows captured screed of list of tables in the database development of CALPAC using Microsoft Access XP.

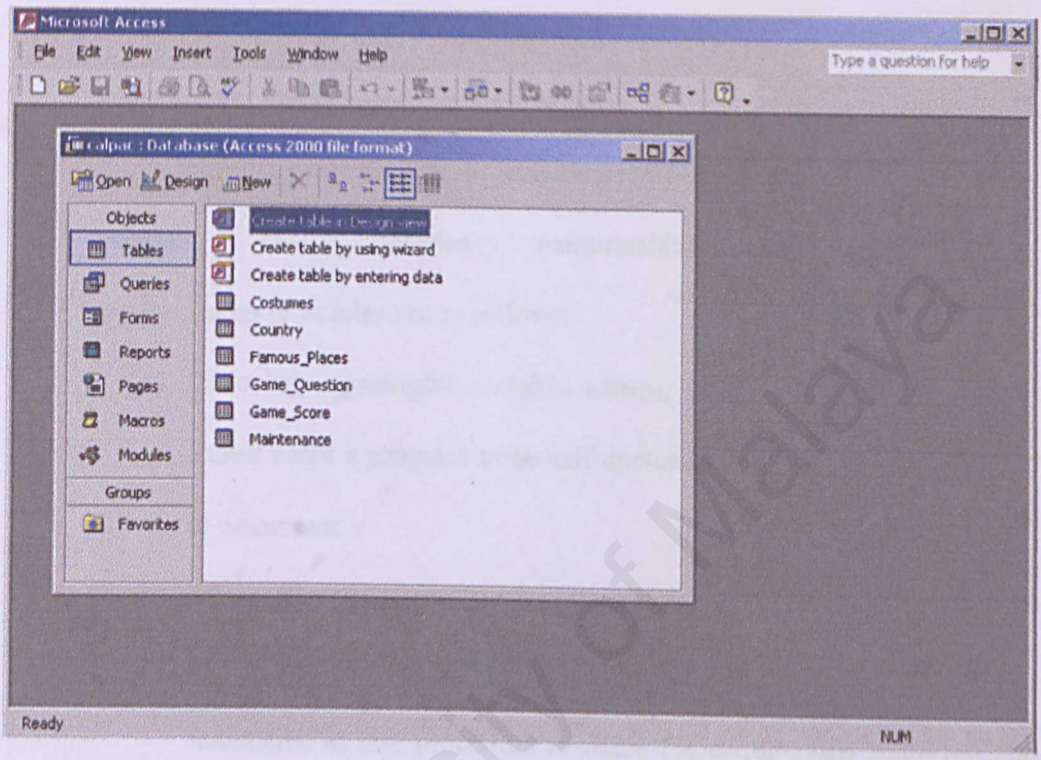



Figure 6.1: List of Tables for CALPAC database in Microsoft Access XP

## 6.4 Application Development

### 6.4.1 The Tool and Principles

Application development involves code generation that translates all the algorithms and designs into Visual Basic .NET codes. Visual Basic .NET is a visual and event driven programming language. In traditional programming languages, programming is done in a text environment and the program is executed sequentially. In Visual Basic .NET, programming is done in a graphical environment. Each subprogram in the system is program

independently to complete the system. The subprogram is trigger when the user or the system invokes the event.

The ActiveX Data Object (ADO) .NET is used in the system to connect the code with the database that develops using Microsoft Access XP. ADO .NET is an easy to use yet extensible technology for adding databases access to the Visual Basic .NET application.

Several programming principles have been employed in writing the program to ensure consistency, maintainability and reliability. All the programming principles are as follows:

a) Choosing meaningful variable names, procedure names and form names helps a program to be self documenting without excessive use of comments.

b) All declarations are placed at the beginning of subroutines or procedure and declaration are separated from the executable statements in that procedure to make the declarations stand out and contribute to program readability.

c) Insert comments to document the programs and improve codes readability.

Figure 6.2 shows the sample of coding. All the programming principles were followed when writing the programs.

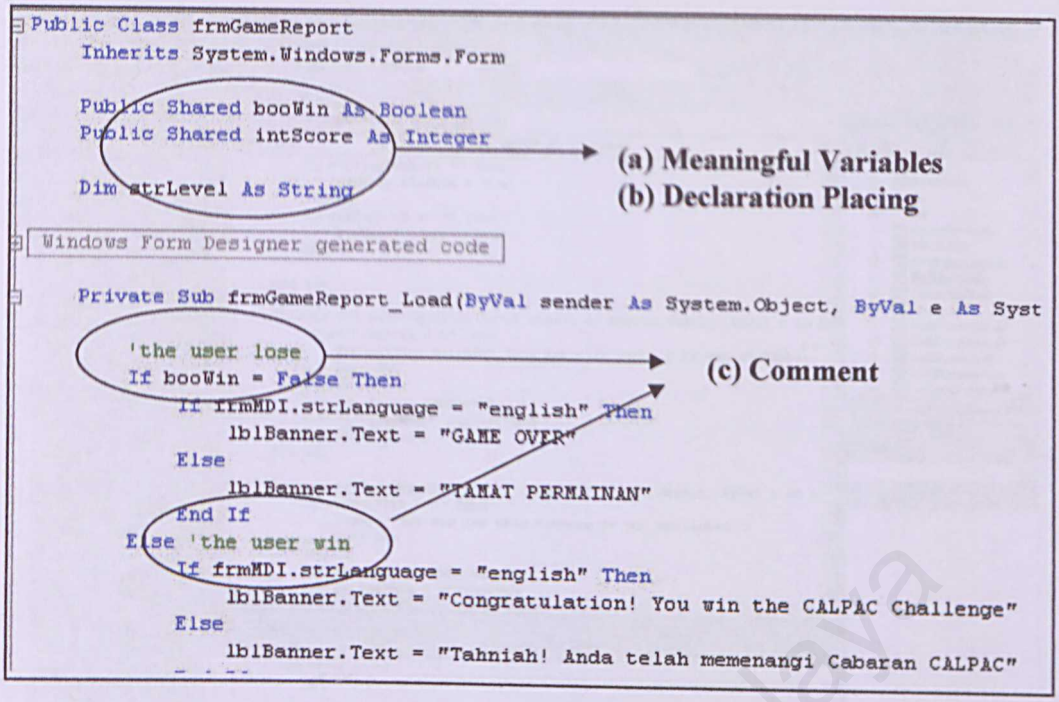



Figure 6.2: Sample Code of CALPAC

### 6.4.2 The Working Space

The working space of the Visual Basic .NET is an integrated development environment which contains of the graphical interfaces. Figure 6.3 shows the working space of the Microsoft Visual Basic .NET.

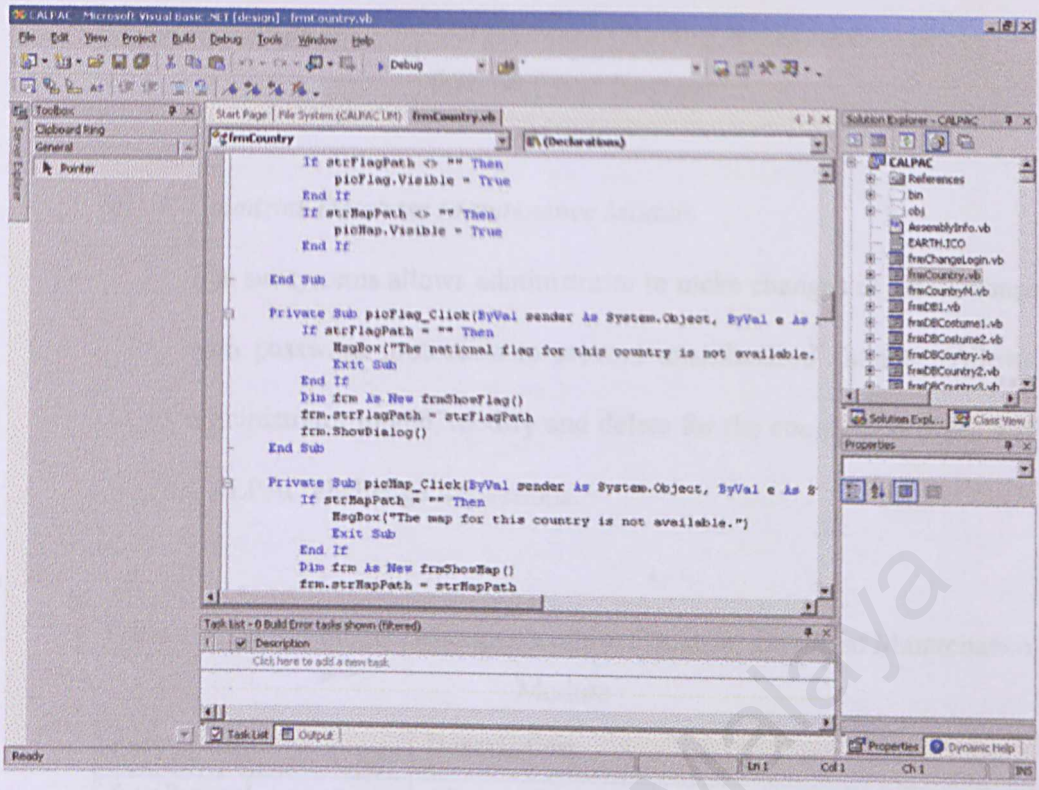


Figure 6.3: The Working Space of Microsoft Visual Basic .NET

### 6.4.3 The Method

The coding approach used in the development in this system is the top-down approach. This approach allows the higher level modules to be coded first before the lower level modules. This approach is very suitable in developing the system in Visual Basic .NET which the main form was created first followed by the sub forms.

Table 6.2: Forms and its Description in the Main Module

| Form Name | Description |
|---|---|
| frmMDI.vb | The multiple document interfaces that used as the container for the other forms. |
| frmMain | The main page of the CALPAC which contains the links to other modules. |

| | |
|---|---|
| frmSelectLanguage | The prompted form that let the users to select their preferred language. |

*(a) Countries Database Maintenance Module*

The subsystems allows administrator to make changes in the database with password protection to prevent unauthorized changes. Allows administrator to add, modify and delete for the countries profiles and CALPAC challenge's questions.

Table 6.3: Forms and its Description of the Countries Database Maintenance Module

| **Form Name** | **Description** |
|---|---|
| frmChangeLogin | Allows the administrators to change their login ID and password. |
| frmLogin | The form that ask for administrator's login ID and password. |
| frmDB1 | The main page in the Database Maintenance Subsystem. |
| frmDBCountry1 | The form for the administrators to add, edit and delete the countries information. |
| frmDBCountry2 | The continuous form for the frmDBCountry1. |
| frmDBCountry3 | The form for the administrator to add, edit and delete famous places. |
| frmDBCountry4 | The continuous form for the frmDBCountry3. |
| frmDBCostume1 | The form for the administrator to add, edit and delete costumes. |
| frmDBCostume2 | The continuous form for the frmDBCostume2. |
| frmDBQuestion | The form for the administrators to add, edit and delete the game questions. |
| frmDBQuestion2 | The continuous form for the frmDBQuestion. |

(b) *World of Countries Module (Countries Information)*

The module provides comprehensive information for user to learn costume, famous places, national anthem, welcome greeting and country information.

Table 6.4: Forms and its Description of the World of Countries Module

| **Form Name** | **Description** |
|---|---|
| frmCountry | The main form of the module in English. |
| frmCountryM | The main form of the module in Malay. |
| frmShowFlag | The form to view the enlarge size of the flag. |
| frmShowMap | The form to view the enlarge size of the map. |
| frmShowCostume | The form to view the costumes. |
| frmShowPlaces | The form to view the famous places. |
| frmPlayAnthem | The form to play the national anthem. |

(c) *CALPAC Challenge Module (Game)*

The module provides the game that integrates the idea of quiz for the user to play.

Table 6.5: Forms and its Description of the CALPAC Challenge Module

| **Form Name** | **Description** |
|---|---|
| frmInsertName | Ask the game player to insert their name and select the level of difficulty. |
| frmGame | The main form of the game. |
| frmGameInstruction | Instruction for the game. |
| frmGamePortal | The portal for the game before entering the main form. |
| frmGameReport | The report shows the top 5 scores at the end of the game. |
| frmGamePic | The form to view the enlarge size of the picture. |

*(d) Countries Indexing Module*

The module provides an indexing function that allows the user to search for the countries by filtering using first alphabet of the country name.

Table 6.6: Forms and its Description of the Countries Indexing Module

| **Form Name** | **Description** |
|---|---|
| frmIndex | The main form of the indexing module. |

## 6.5 Summary

In this chapter, the explanation for the system implementation which regarding the transformation of the designed modules and algorithm into the executable instructions by using the appropriate programming language had been discussed in details. The system testing will be followed in the next chapter.


# Chapter 7

# System Testing

# Chapter 7 System Testing

## 7.1 Introduction

Testing is one of the main phases in the development of CALPAC. In this phase, the process of testing and debugging are done to detect defects and bugs of a system. These processes are usually done incrementally with system development.

## 7.2 Testing Process

There are various type of testing strategies available to assess the completeness and correctness of a system. The testing strategy, adopted for the CALPAC was divided into 3 main tests, the unit testing, integration testing and system testing. The testing process of this system is show in the figure 7.1.

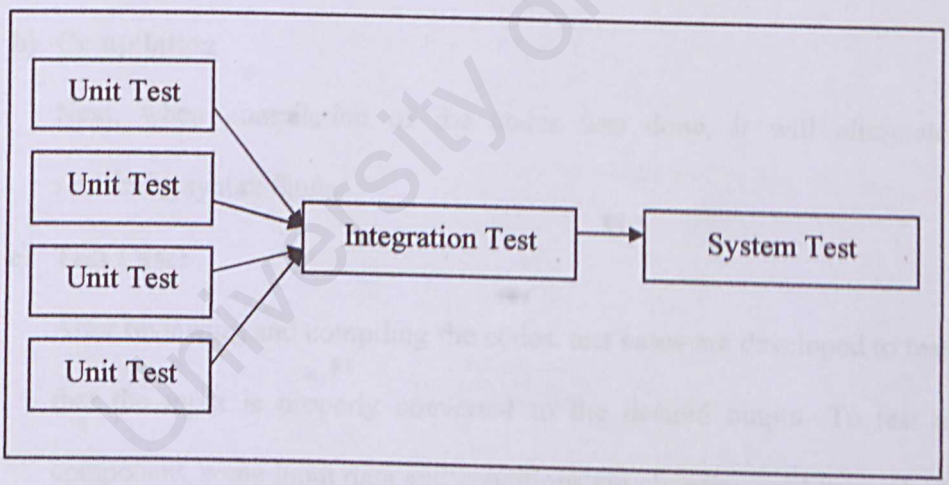



Figure 7.1 Testing Process

### 7.2.1 Unit Testing

Unit testing focuses verification effort on the smallest design which is the software component or module. All the important control paths in this project are tested to uncover errors within boundary of the modules. There

are three kinds of testing strategy carried out for the unit testing. There are code review, compilation and test cases. All of these activities were carried out together in a time.

**a) Code Review**

The codes are examined line by line to ensure that any uncovered semantic errors during the implementation could be revealed. There are two types of code review: a walkthrough and an inspection. In a walkthrough, the codes and documentation will be presented then the comments on their correctness will be collected. During inspection, the testers check the code and documentation against a prepared list of concerns. Review on the algorithm and computations will be taken to ensure their correctness and efficiency.

**b) Compilation**

Next, when compilation of the codes was done, it will eliminate remaining syntax faults.

**c) Test Cases**

After reviewing and compiling the codes, test cases are developed to test that the input is properly converted to the desired output. To test a component, some input data and conditions are choosing, and then allow the component to manipulate the data and observe the output. In the unit testing, all the independent components are tested and make sure all the outputs are correct and meet the requirements.

### 7.2.2 Integration Testing

When the individual modules and components are working properly, and meet the objectives, these modules are integrated into a working system. Integration testing is a systematic technique for constructing the program structure while at the same time conducting tests to uncover errors associated with the interfacing. The objective is to take unit tested components and build a program structure that had been dictated by system. The appropriate strategy need to choose to suit not only the integration timing and coding order, but also the cost and thoroughness of the testing.

Bottom up integration strategy had been choosing for this project. Bottom up integration testing begins construction and testing with modules at lowest levels of the system and then moving upward to the modules at the higher levels of the system. The figure 7.2 below shows the bottom up integration strategy.

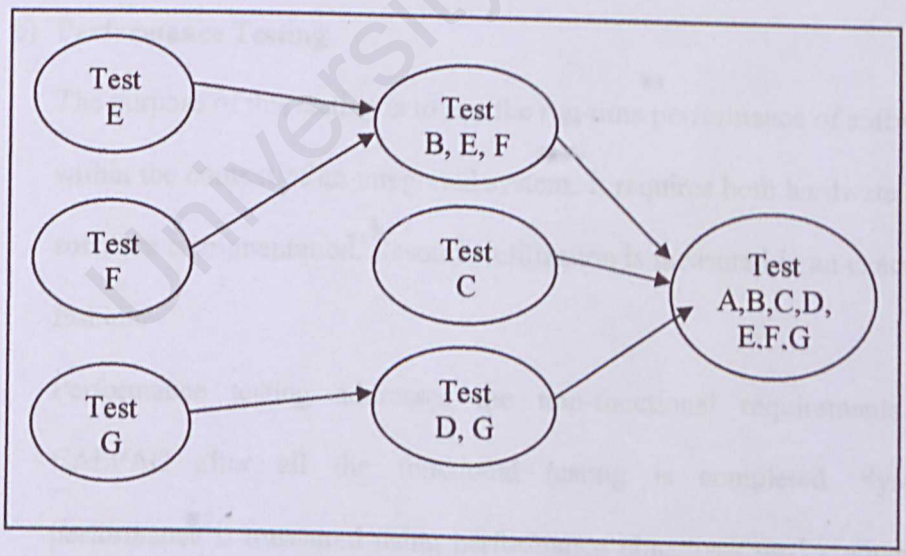



Figure 7.2 Bottom-Up Integration Strategy

### 7.2.3 System Testing

System testing is a series of different tests designed to fully exercise the software system to uncover its limitations and measure its capabilities. The objective is to test an integrated system and verify that it meets specified requirements. Although each test in the project has a different purposes, all work to verify that system elements have been properly integrated and perform allocated functions.

There are several types of system testing that are worthwhile for a system. For this project, two types of system testing are used:

**a) Function Testing**

System testing begins with function testing which focuses on system functionalities. Each function can be associated with system components that accomplish it. Function testing compares the system actual performance with its requirement, so the test cases for function testing are developed from the requirements document.

**b) Performance Testing**

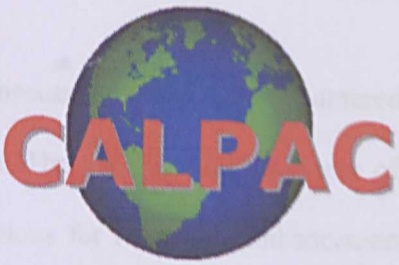
The purpose of this testing is to test the run-time performance of software within the context of an integrated system. It requires both hardware and software instrumentation. Resource utilization is measured in an exacting fashion.

Performance testing addresses the non-functional requirements of CALPAC after all the functional testing is completed. System performance is measured using performance objectives set by potential users as highlighted in the non-functional requirements section as guidelines. In the case of CALPAC, performance testing examines how

effective data manipulations are carried out, query (record retrieval, searching and sorting) speeds, inter-module communication speed and also audio and image file-loading speed from the CALPAC database.

## 7.3 Summary

Software testing is a critical element of software quality assurance and represents the review of specification, design and coding. After the testing, the system should be able to perform correctly and free of errors. However, there are still some critical problems and errors will occurred only after some time of using the system. Therefore, testing and evaluation should not just end up in this phase but have to keep along the software lifetime.




# Chapter 8

# Discussion and Conclusion

# Chapter 8 Discussion and Conclusion

## 8.1 Introduction

This chapter will discuss the problems encountered during the development of system and its solution. The strength and weakness of the system will also be discussed plus the suggestions for the future enhancement. The conclusion of the project also included in this chapter.

## 8.2 Problems Encountered and Solutions

The following are the major problems encountered from the beginning of the project through the end of the system development process.

**a) Difficulties in Collecting Information**

Due to the time constraint, the process of information collecting must be fast, but there was lack of information needed especially the costumes and the welcome greetings. Finally, to solve this problem, the help from lecturers in Faculty of Languages and Linguistic and the internet were able to solve the problem in time.

**b) Lack of Knowledge in The Languages and Tools Chosen**

Due to the time constraint, the learning and developing process was done in parallel. The Visual Basic .NET is a new programming language that never taught and learnt before. Although having some background on the Visual Basic 6.0 but the .NET version is very different if compare with version 6.0 especially the ADO .NET and the syntax. There was also lack of references in the internet because of the Visual Basic .NET is still very new.

Most of the problems faced were manageable through the references from the books and internet with also the more efficient way such as trial and error.

**c) Difficulties in Designing the User Interfaces.**

Problem that faced during the development are lack of knowledge and experience of the real system flow and layout of standard user interface. Therefore, it is difficult to designing the appropriate logic and user-friendly interface. To get the knowledge to the system flow and user interface design, some real commercial computer aided learning packages were taken as reference.

## 8.3 Strength and Significance of the System

**(a) Attractive and user-friendly interface**

The CALPAC interface is attractive and simple, where the graphical user interface features have been integrated in the system. All of the functions and links were presented to the users clearly and consistently.

**(b) Flexibility in changing data in database**

The database maintenance module can be considered as the back-end system for CALPAC. It is the site that makes use by the administrator to manipulate data in the database. The administrator can choose to add, search, modify or delete records in the CALPAC database. The administrator can even maintain the images stored in the database.

**(c) Ease to use**

The system can be considered as ease to use for several reasons. First, by having all the buttons clear and attractive, the user will manage learn to use

the system easily. Second, the administrator can easily manipulate the database without knowing how the database functions. All the features manage to make the system transparency to the users.

**(d) Fast response time**

The system is designed in such a manner that they are loaded in a reasonable amount of time. The users need not to wait for a long time when using the system. The ADO.NET provides a very efficient way for the system to get the data from database.

**(e) Security features**

The security issues are taken into consideration for the maintenance module so as to prevent any unauthorized users from manipulating the data stored in the database. The maintenance module is protected with password and login ID and the maximum number of administrators is only two for the system.

## 8.4 Weakness and Limitation of the System

**(a) Not compatible with certain operating system**

As the system was developed by using the latest programming language, some of the operating system such as Microsoft Window 98/Me/2000 needs to install some extra components such as Microsoft Data Access Component 2.7 and Microsoft .NET Framework in order to execute the system. The system only able to execute in the Microsoft Window Platform.

**(b) Best view only in 800 X 600 screen resolution**

The system also has a weakness in the appearance. The system only best viewed under 800 X 600 screen resolution but viewing under 1024 X 768 screen resolution is also acceptable.

**(c) Provides not much information**

Due to the time constraints, the information collected was not very complete especially the costumes and the famous places.

## 8.5 Future Enhancement

Further development and many new ideas have come about while the system was being implemented. Owning to time constraint and other factors, not all of the ideas could be incorporated into the system. It is hoped that the following aspects could be considered in future:

**(a) Improve in Interface Design**

Much can be improved to the CALPAC interface design. More complex graphics and animation graphics can be incorporated into the system.

**(b) Improve in the Information Provided**

The information provided in the system also can be enhanced in the future. The costumes and famous places information still not very enough in the system while the countries facts also can be added.

**(c) Improve in the Functionality**

The functionality of the system can also be added. The country's national flowers can be added and the game can also enhance to be more interesting.

## 8.6 Conclusion

Overall, this project has achieved and fulfilled the objectives and requirements as a Computer Aided Learning Package about Countries that provides the countries' information to the users. The completion of this project will also

provide the different type of learning method to the users interested in this field. However, there are still many rooms for improvement in system.

Throughout the development of the system, a lot of knowledge was gained such as knowledge in the new programming languages - Visual Basic .NET and programming concepts. The Visual Basic .NET also implemented the object-oriented technology, so the object-oriented programming skill has been improved. In order to develop the system, the knowledge about countries in the world also needed. As such, the general knowledge about countries has improved.

Finally, all the problems faced and experiences gained during the system development should be useful in the future endeavors. It is hope that this system will be a success and provide the foundation for the more comprehensive and innovative system.

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# Appendix A

# User Manual

# User Manual

## 1.0 About CALPAC

CALPAC, also known as A Computer Aided Learning Package about Countries consists of World of Countries, Index of Countries, CALPAC Challenge and Database Maintenance. CALPAC possesses 30 countries from 7 continents in the world.

## 2.0 Run Time Requirements

CALPAC requires the following software and hardware configuration in order to execute perfectly.

**Software**

- Microsoft Windows® 95, 98, Me, NT, 2000, XP
- Microsoft Access 98+
- Microsoft Data Access Components 2.7 (Available in Setup Disk)
- Microsoft .NET Framework Package (Available in Setup Disk)

**Hardware (Minimum Requirements)**

- IBM or compatible with Pentium III 500 or above
- 500 MB Hard Disk Space
- 128 MB SDRAM or above
- Pointing Devices
- Screen Resolution - 800 X 600 (Most Suitable)

## 3.0 How to Setup

To setup the CALPAC, double click on the "Setup" icon in the setup disk and following the steps to complete the installation.

In order to run the CALPAC, two components are needed - Microsoft Data Access Components 2.7 and Microsoft .NET Framework Package. Both of the components are available in the setup disk with the file names "mdac_typ.exe" and "dotnetfx.exe" respectively. Double click on the icon and following the steps will install the components.

## 4.0 Starting CALPAC

To start the CALPAC, double click on the CALPAC icon on the desktop. The following message box will prompt up when the system start to ask the language that the user prefer to use.

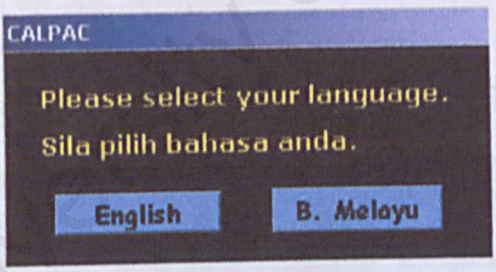



Figure 4.1: Language Selection

For the first time the system will ask for the new administrator ID and password. The administrator ID and password will be used in order to enter the database maintenance module. The system will allows maximum two administrators and another one can be add in the database maintenance module. After that, the main form of the system will be shown.

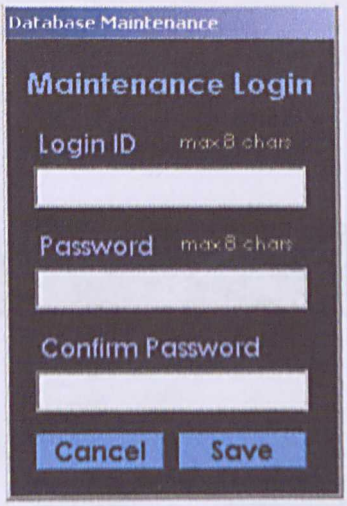



Figure 4.2: Insertion of the Maintenance Login ID and Password

## 5.0 Main Form

Figure 5.1 shows the main form of the system which consists of five buttons.

i) World of Countries
ii) CALPAC Challenge
iii) Index of Countries
iv) Database Maintenance
v) Exit

Tapping on these buttons will direct the user to respective page.

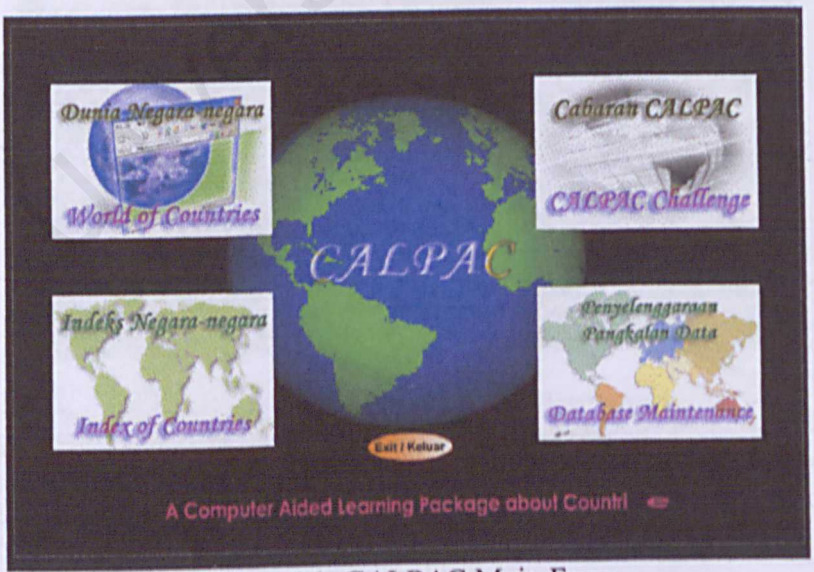


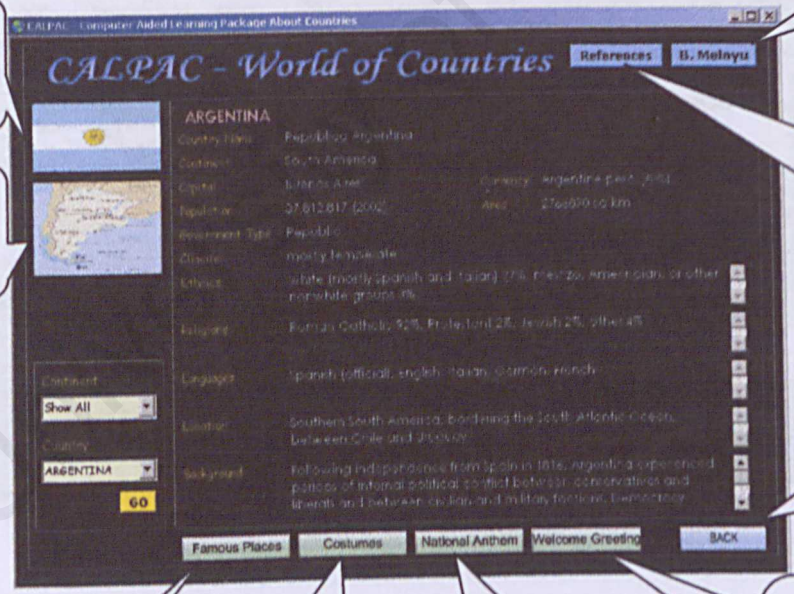

Figure 5.1: CALPAC Main Form

## 6.0 World of Countries


Select the continent to filter out the countries

Select the countries and click the 'go' buttons to view the entire country.

Figure 6.1: World of Countries Main Form




Change the language

Click to view the larger flag.

Click to view the larger map.

Click to view the references. Refer *figure 6.6*.

Click to back to main form

Click to view the famous places. Refer *figure 6.3*.

Click to view the costumes. Refer *figure 6.4*.

Click to play the national anthem. Refer *figure 6.5*.

Click to listen to the welcome greeting

Figure 6.2: World of Countries (country selected)

Figure 6.1 above shows the main form of the World of Countries. The user can filter out the countries according to continent and select a country and click "go" to view the country's information.

Figure 6.2 above shows the World of Countries form after select a country. The buttons at the right upper corner are the "References" and "B. Melayu". Click on the "References" buttons will direct the user to the references form and the "B.Melayu" will change the language of the system. Buttons on the left upper corner are the flag and the map. Click on the image will pop up the larger view of the image respectively. The bottom buttons are the "Famous Places", "Costumes", "National Anthem" and "Welcome Greeting".

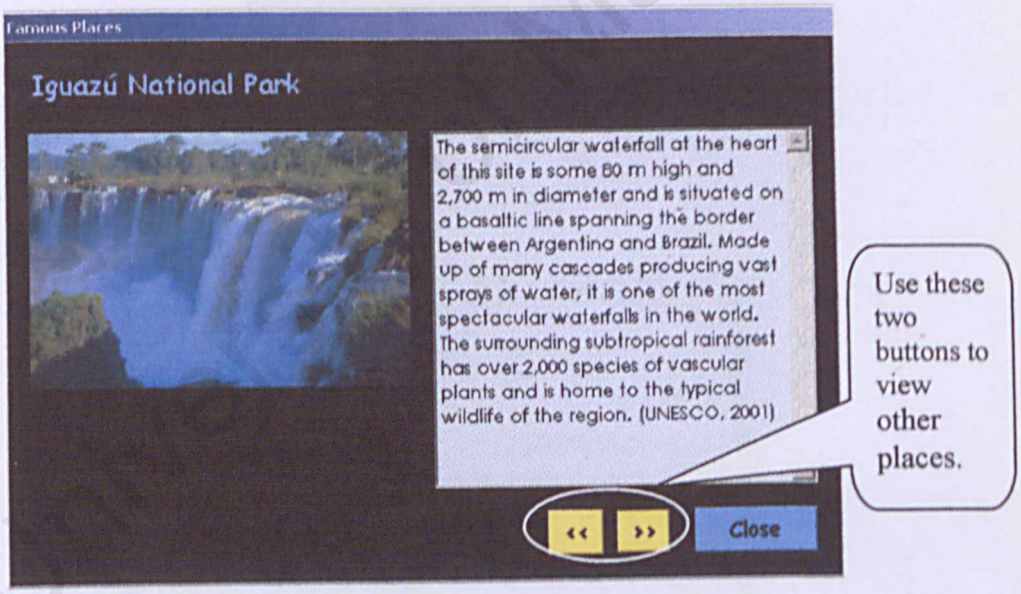



Figure 6.3: An Example of the Famous Places Form

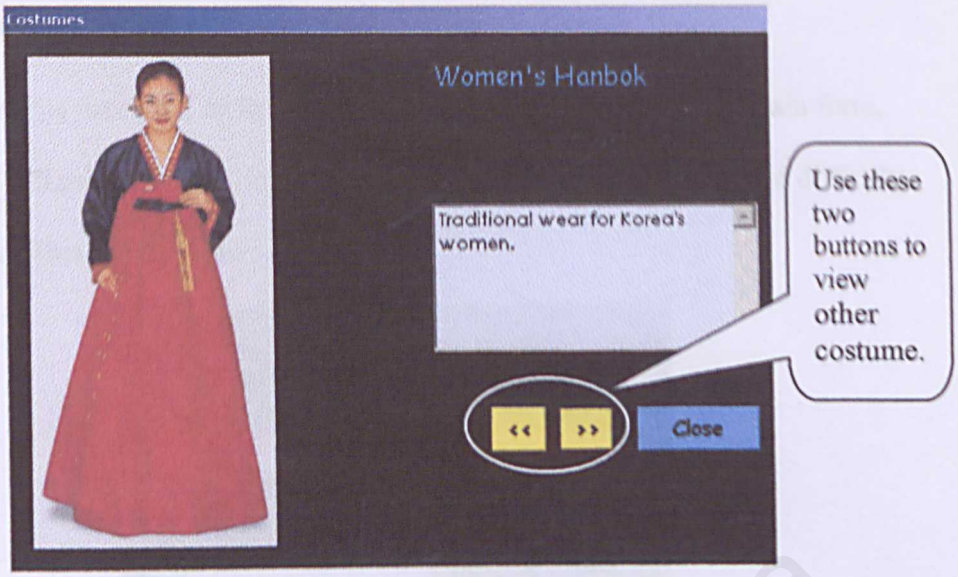



Figure 6.4: An Example of the Costumes Form

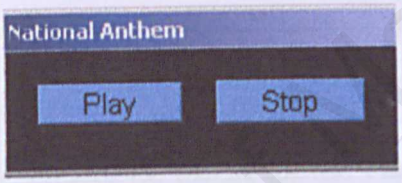



Figure 6.5: Play the National Anthem

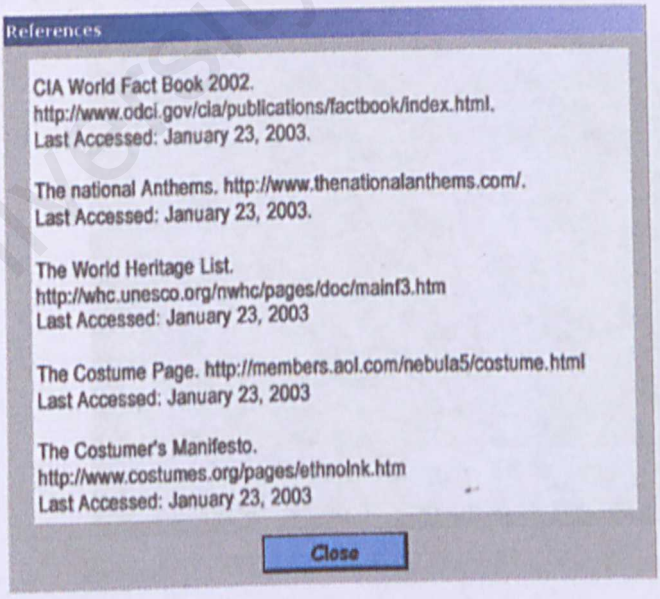



Figure 6.6: The References of the System

## 7.0 CALPAC Challenge

After the user click on the "CALPAC Challenge" button on the main form, the system will ask the user to insert his or her name and select the level of difficulty of the game. This will be shown in figure 7.1.

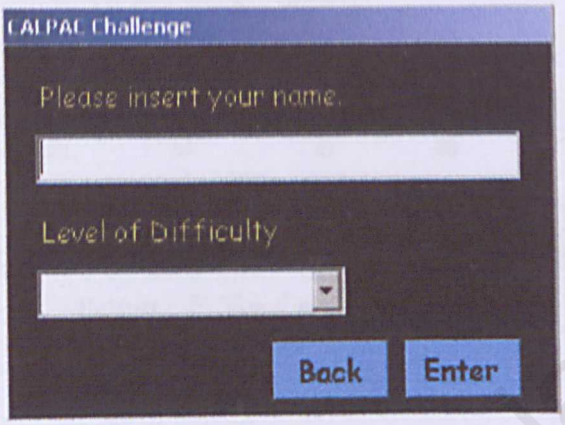



Figure 7.1: Insertion of the Name and Difficulty

After that the form in figure 7.2 will be shown. The system will ask whether the user ready to play the game. Click the "Game Instruction" button will show the instruction for the CALPAC Challenge.

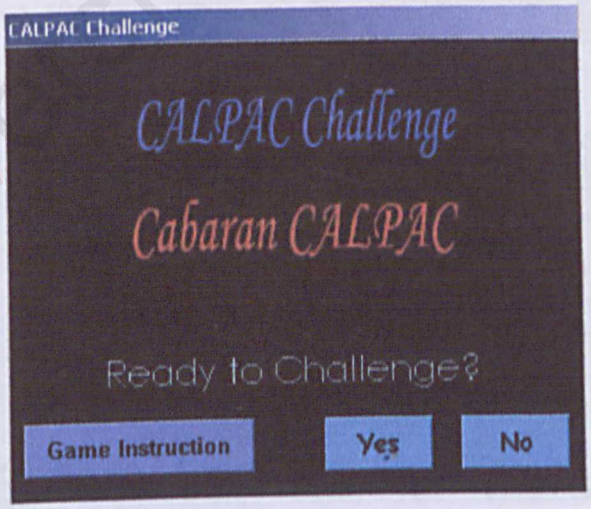



Figure 7.2: The Confirmation to Play the Game

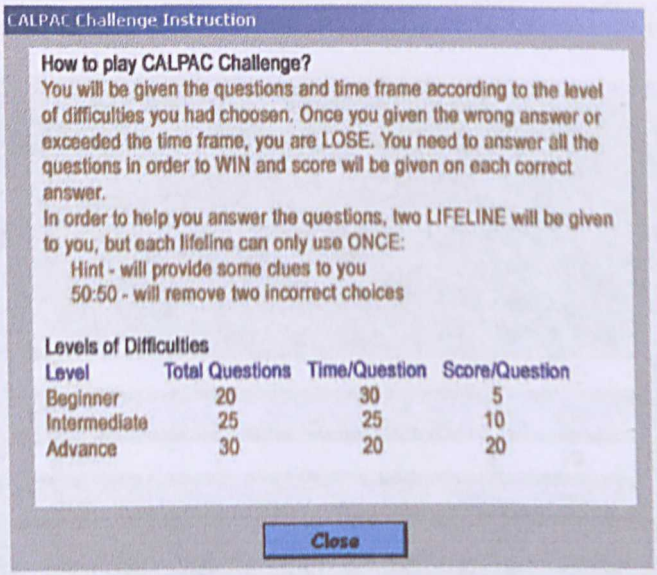



Figure 7.3: The Game Instruction

After the confirmation to play, the figure 7.4 will be shown to the user. The user allows changing the language inside the game. The detail about the game can be getting from the Game Instruction shown in figure 7.3.

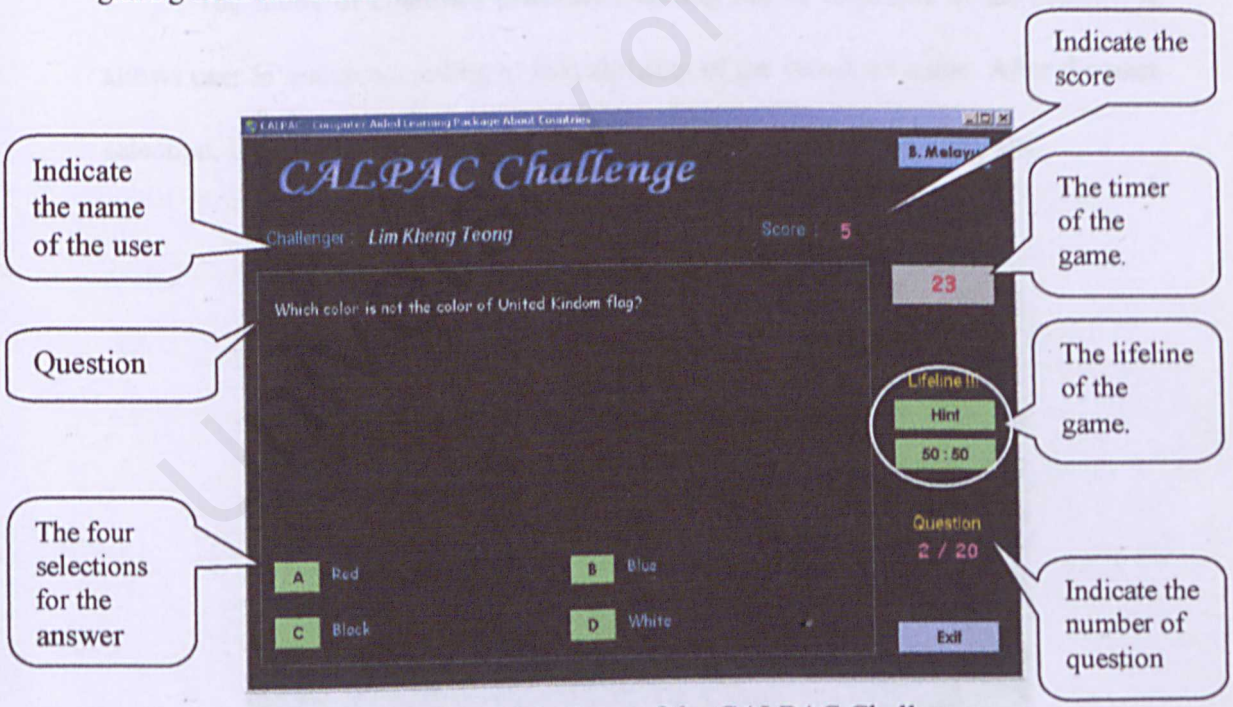



Figure 7.4: The Main Page of the CALPAC Challenge

After the game, the top 5 scores will be shown to the user as in figure 7.5.

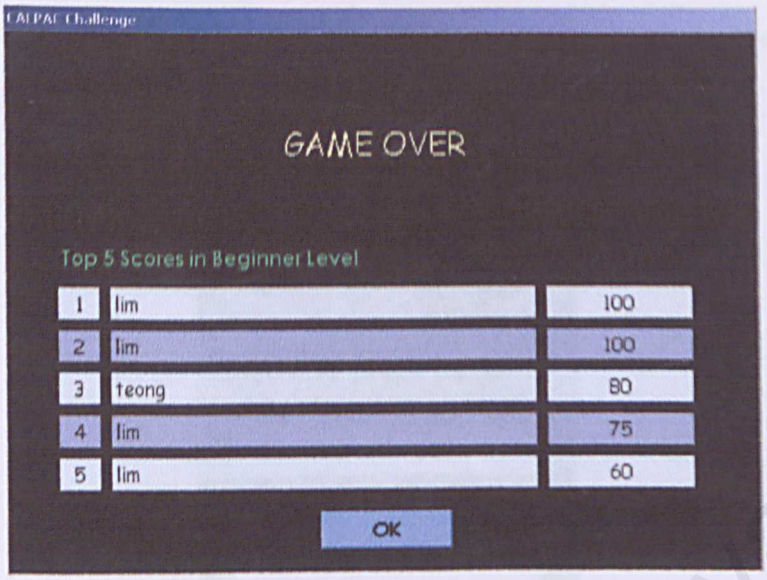



Figure 7.5: The Top 5 Scores

## 8.0 Index of Countries

The index of countries provides indexing list of countries in the system. It allows user to search according to first alphabet of the countries name. After the user selection, the system should proceed to the entire country information page.

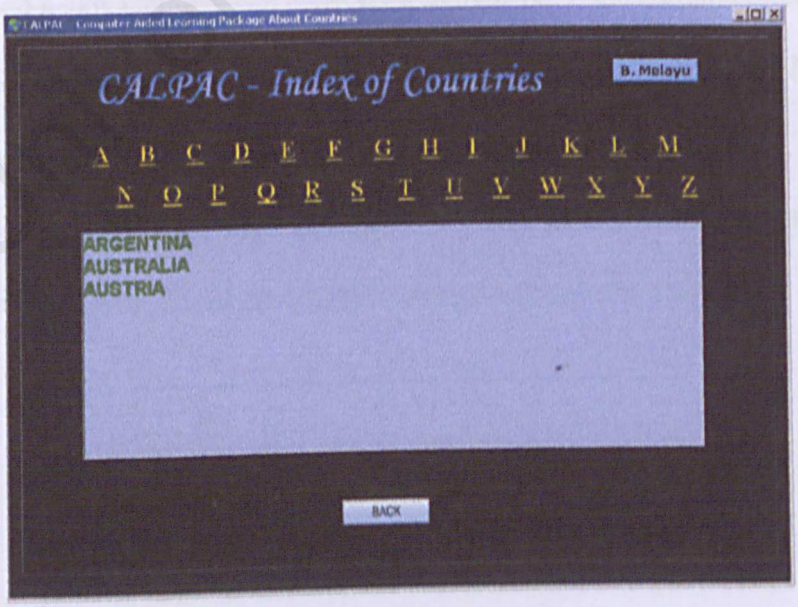



Figure 8.1: Index of Countries

## 9.0 Database Maintenance

When the user click on the "Database Maintenance" button on the main page, the system will ask the user for the login ID and password.

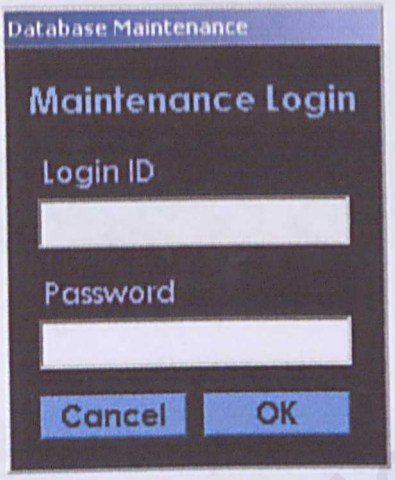



Figure 9.1: Maintenance Login

If the login is successful, the main page of the Database Maintenance will be shown. The administrator can choose to maintain the country detail, famous places, costume, game question, and change the login ID or password. The administrator even can add a new maintenance login ID if there is only one administrator exists because the system allows two administrators. The (E) in the form means English and (M) means Malay.

The World of Countries maintenance allows administrator to add, edit or delete the information. The administrator even can change the image file.

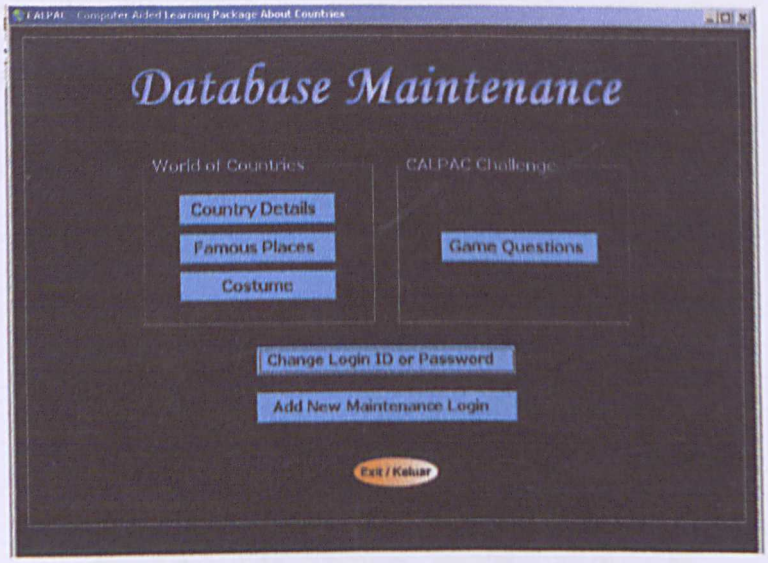



Figure 9.2: Database Maintenance Main Page

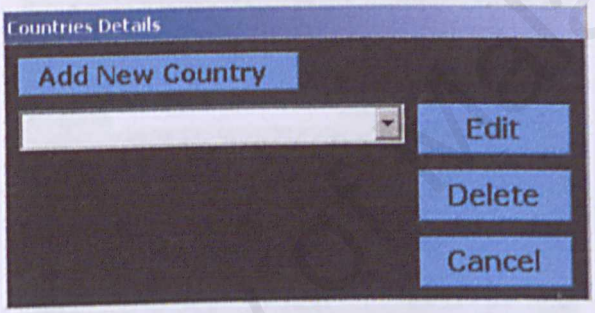



Figure 9.3: Maintaining the Countries Details

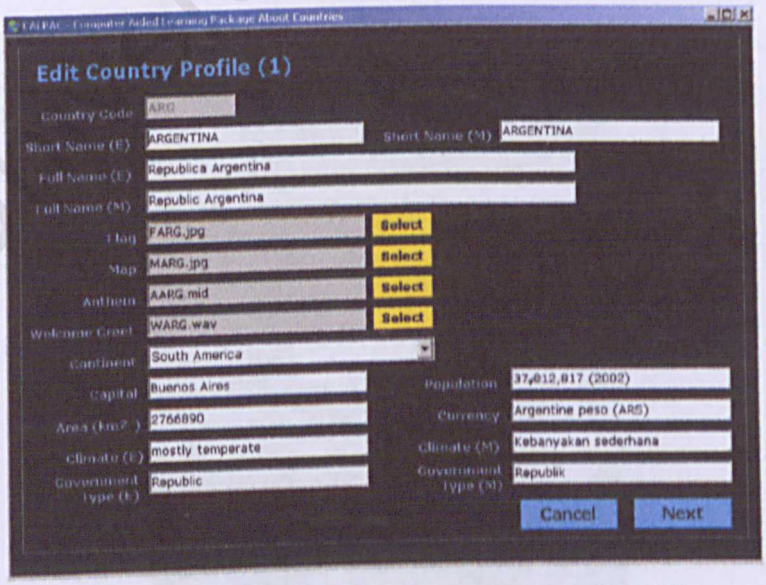



Figure 9.4: Add or Edit Country Details (Page 1)

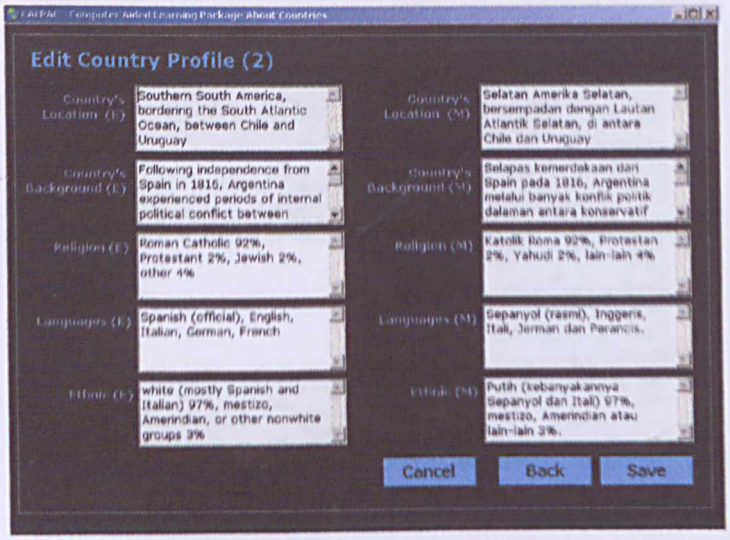



Figure 9.5: Add or Edit Country Details (Page 2)


Figure 9.6: Maintain the Famous Places


Figure 9.7: Add or Edit the Famous Places

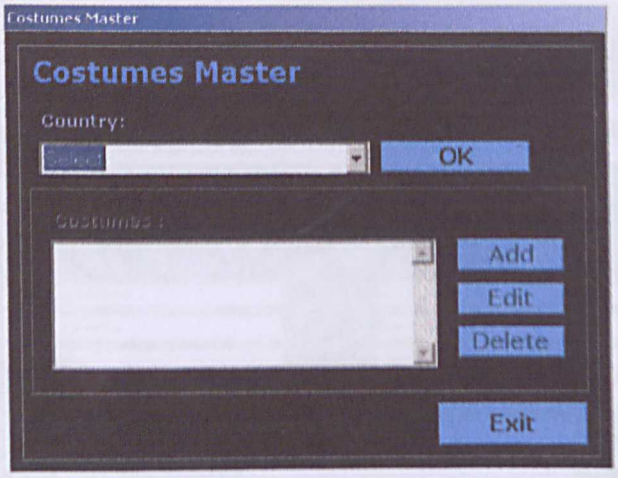



Figure 9.8: Maintain the Costumes

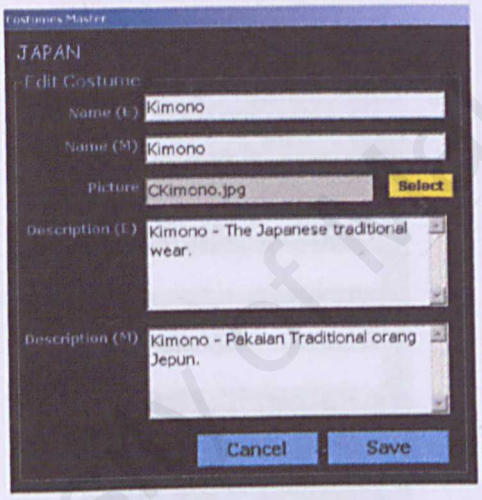



Figure 9.9: Add or Edit the Costumes

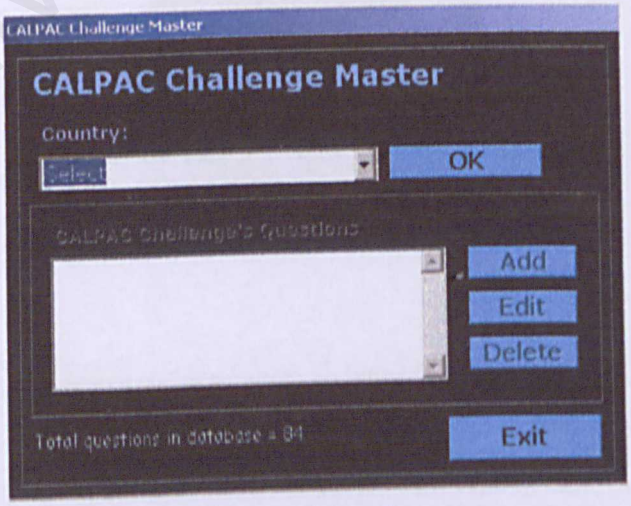



Figure 9.10: Maintain the Game's Questions

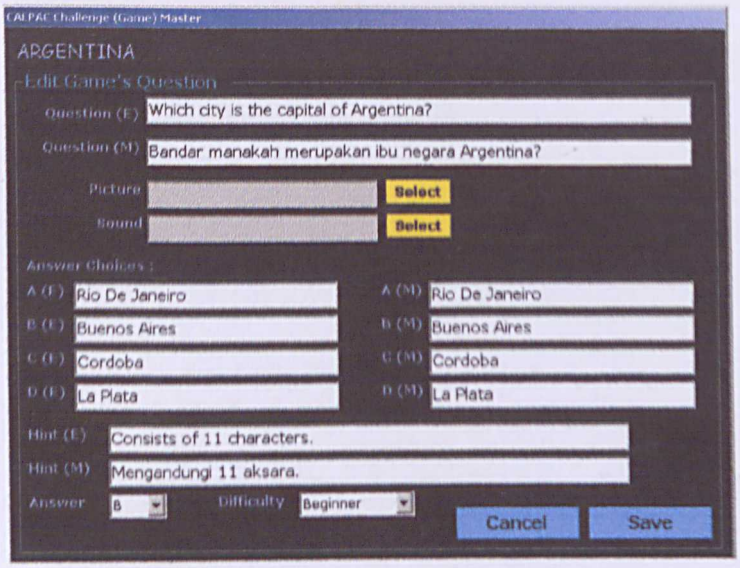



Figure 9.11: Add or Edit the Game's Question


Figure 9.12: Change the Login ID or Password