

Perpustakaan SKTM

HAND PHONE PACKAGES SYSTEM ADVISOR

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2003/2004**

ABSTRACT

The Hand Phone Package System Advisor is web based applications that be develop as an information platform for the hand phone packages to fulfill the need of the consumer and hand phone company to advertise their product nowadays. The main proposed of the system is to guide user to buy hand phone according to what the consumer need like budget, the hand phone brand and the specification. Case based reasoning is one of the Artificial Intelligent methods that we will implement in the system.

ACKNOWLEDGEMENT

Towards the completion my thesis Hand Phone System Advisor , I had endured tremendous challenges which I regard as a very valuable experience especially in preparing me upon facing the tough challenges of working world. However, I cannot say that I got over these entire problems alone without assistance from others whom I like to express my deepest gratitude for being able to give a helping hand whenever or wherever I needed them the most.

My foremost gratitude goes to my supervisor, Mr. Md Nor Ridzuan B. Daud for her undying dedication and advice as well as precious guidance upon guiding me to complete this proposal. Her precious guidance may never be forgotten and can never be measured with time and money.

My gratitude also goes to my moderator Puan Siti Soraya Abd Rahman for her attention and interest on my proposal as well as her precious advice on how I should make my system better. Without her giving the extra 'push' I will never realize that I what I think is good is actually not good enough.

Finally I would like to thank my to all my friends for their support and cooperation during all this torrid time. The likes Haidayu , Hasnidah, Syed Muhamad and Noor Hana are the ones who I like to thank for their role in supporting me and also precious advice.

Last but not least, my deepest gratitude goes once again to the above for their advice and support throughout the completion of my WXES 3182. Thank you.

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University of Malaya

Chapter 1: Introduction

1.0 Introduction

In order to complete the Bachelor's Degree in Computer Science, undergraduates are required to accomplish the final year project, which is to build a working system that encompasses skills and knowledge learnt in the past semesters. For the final year project I develop Hand Phone System Advisor that use a Case Based Reasoning technique to guide users to buy a personal hand phone. The main objective of this project is to create and develop a web base application using a case base reasoning technique that are intelligent , innovative and user friendly for the Internet user in the world wide web especially in Malaysians. By applying various AI techniques like Case Based Reasoning, the system will be able to provide solution for the costumer. Essentially, it is hoped that with the aid of this system will help users to gain a better understanding about the hand phone that they want to buy worth for their money and uses.

1.1 Project Overview

All over the world, people use and communicate with hand phones. Hand phones range in sizes from as small as a thumb, to as large as a regular telephone if needed. Hand phones can flip, fold, compact and store just about anything. Nowadays hand phone are the one most essential thing for uses beside our identification card, credit card. Any where we go we can see student, businessman, accountancy and all people with no age limit used and bought their hand phone any they go. Over pass these recent years the usage of hand phones in Malaysia is increasing tremendously. Now a wide variety of hand phones are available for purchase in Malaysia. Internationally known brands predominate to the market for example NOKIA, SAMSUNG, MOTOROLA. The latest models with all the new features are available here. The major brand names have dealers/distributors who handle the sales of their phones in Malaysia. Some of these dealers/distributors have kiosks or shops in the major malls or sell their wares through counters in electronics goods stores. Prices of hand phone range from RM 100 to RM 3000.

In Malaysia hand phone system are operated by many different type of companies, private company such as DIGI, MAXIS, TIMECEL and CELCOM and partially owned by the government phone company, Telekom Malaysia (TmTouch) once you have purchased a hand phone, you need to subscribe to one of these services. With the development of this system (Hand Phone Packages System Advisor) the costumer have guideline to purchase a hand phone from the budget, specification, design and the brand

that the customer give to the system . The system will help the customer to find the best hand phone that they want by compare it with the type of cases in the database.

This system will help the costumer to save time, money and energy because they didn't have to go to the shop any more. They can purchase it online. This also will avoid the customer from being cheated by the advertisement or pamphlets that the purpose only for selling their stuff.

1.2 Definition of Case Based Reasoning

Case Based Reasoning system use a various different techniques to match a situation or problem description to a database and known cases. Every case has a description of the case and the solution for the type of cases. The goal of the cases retrieval is to return case that is the most similar to the input specification . The user enters the description of the current problem, usually in free text form or selection. The CBR engine searches for case histories that are similar to this description. Then through a consultation session of the questions answer. The engine systematically narrow the number of candidate cases allowing the user to select the ones that seem the most appropriate.

1.3 Project Objective

The objectives for developing the system can be explain in this 2 area

1.3.1 Technical

1.3.1.1 Customer and Supplier.

The system will help customer to get information the latest information about the price, specification, design and functionality of the hand phone from the hand phone provider or supplier. This will help the company (hand phone provider) directly communicate with the customer. The supplier or provider of the hand phone will upload the latest information or package about the hand phone that the want to sell into the database and the customer can view it without being fraud or cheated. This system will help the company to advertise their product this also will increase the company income and the user can use the system 24 hours a day.

1.3.1.2 Reliability

System that gives the latest information about the hand phone packages from the hand phone company. It will avoid the customer or user of the system being cheated by reading the wrong source of information.

1.3.1.3 User friendly and easy to maintained

Developing a system that have a user friendly interface .This system use a case based reasoning technique so it is easy to supervise because case based reasoning system use a various different techniques to match a situation or problem description to a database and save the new cases to the database.

1.3.2 General

1.3.2.1 Reduce Cost

The system reduces cost, money and energy of the user. The customer didn't have spent hours shopping for hand phone or do research about the hand phone that they want. The system it self will give the information without the customer need to make comparison manually about the hand phone that they require.

1.3.2.2 Increase Knowledge

Help the customer to increase the knowledge about the latest hand phone viable in the market. Knowing the latest trend and technology that being used to the communication area for example 3G.

The objectives we hope to achieve can be summarizing as below:

- Enable to conduct sales promotions, marketing activities,
- Provides a basic platform for enterprises and their partners to communicate and collaborate in a secured environment.
- Allow easy feedback from customer, customer suggestion, opinion and demand, which are important in improving business services.

- Enables customers to shop or do other transactions any time, anywhere; enable employees to carry out their duties regardless where they are.
- To enable the control and management of hand phone sales to be done easily via web technology.
- To manage better relationship and transaction activities with suppliers and customer.
- To provide electronic catalogue replacing traditional ink-and-paper static medium.
- Streamlining the sales order fulfillment process such as in invoicing.
- Strengthened customer relationship through customized communications and services such as allows customers to track previously ordered item and status.
- To maintain customers profile for personalize interactions and build customer loyalty.
- To provide an ease of use, accessibility and user-friendly graphical user interface. The design of UI is at user skill level where no command or programming skill is needed to access the system. Users can handle the system very easily as simple as clicking on buttons only. Users do not have to do a lot of typing; data input is decreased to the minimum. Most of the data are retrieved from the database.

- To ensure the most reliable and the latest information is distributed in the network. This information is distributed electronically and most of it is retrieved from the database. Once the database is updated, all the info in the system, as can be seen in the web page, will also be updated automatically. The latest news can be reached to everyone in the company.
- To provide a paperless environment to manage human resource. The file-processing system is still not reliable because data are often duplicated and incompatible with one another. It is hard to determine which parts of files are needed. The best solution is to use database-processing systems where users are free concentrate on matters important to them. No paper is needed; all data is stored and retrieve from database.
- To reduce manpower if possible .By shifting from a manual-paper processing to a computerized processing is able to reduce manpower. Authorized employees can easily manage their own tasks provided in this system instead of depending on one specific employee to cope with all human resource tasks.

1.4 Project Scopes

In this section of the documentation, the project scope would be defined. The project scope explains what the system will do and what it will not. Generally the developments of the system are for searching the hand phone package that similar to the input that given by the user and give the best package for the user need. The system also helps the supplier to conduct sales promotions, marketing activities about their product. The scope of this project **can be categorized into three main areas** as below:

1.4.1 User Module

This system give will give an interactive feedback example if they are a problem about the product, user will give the feedback and the feedback can be view at the view module. The system also support multi-user environment that allowed the system to be access on the World Wide Web (internet)

1.4.1.1 General users

Everyone on the Internet is able to view the pages under this module. Users are allowed to view company's details, product catalogue, and FAQ. Furthermore, users able to place their order using the preformatted order form and send it online.

1.4.1.2 Registered users

A registered customer has the same viewing priority as the general users. Moreover, the users are allowed to access certain confidential data after mandating the authentication verification. The buyer will be automatically registered to the supplier system as they submit their first order form and customer details form. The login and password are predetermined by the customers themselves during the registration. Register customers are able to view their own profile, order history and order tracking.

1.4.2 Administrator Module

Administrator refer to the supplier internal officer that using the system doing backend processes such as hand phone packages management, sales, customers' sales analysis and real time customer inventory control. This module is restricted to the administration staff only, therefore, authentication is being used as security purpose before ones can access this module pages.

1.4.3 Supplier Module

All of the Hand Phone supplier have their own access password and Username to the system. So that it can avoid the database of the company being hack or modify by user. Hand Phone Company can update, edit, add or erase the data from the specific database. Provide the information about hand phone that the company provided.

1.4.4 User of the System

All of the internet users that interested to buy a hand phone are the user of the system. The next targets of user are the hand phone company .This system is important to them because help the company to conduct sales promotions, marketing activities, and advertisement.

1.5 Project Limitation

The limitations of this project are shown as below:

- User does not have the availability to customize the layout of web page.
- Delivery functions are not included.
- Tax charges are not accounted for.
- Currency conversion is not included in this project.
- This project only supports single communication language, which is English.

1.6 Project Significances

Much more benefits would be gained from the development of this project in terms of

- To eliminate much of the redundant paperwork and steps in the human resources processes by moving the flow of documents from paper format to electronic online system.
- It is to improve communications among the employees and reduce the unnecessary time as they can manage themselves easily.

1.7 System Requirement

The system requirement of Hand Phone System Advisor is divided into two parts, hardware requirement and software requirement. The hardware requirements for developing Intelligent Hand Phone Package System are:

- Intel Pentium 166 MHz and above
- 64 MB RAM and above
- 2 GB hard disk with a minimum of 650MB of free space PS/2 Keyboard (else a converter is required)

The software requirements for developing hand phone system advisor are:

- Windows 2000
- Apache server 2.0
- PHP(Processor Hypertext)
- MySQL
- Java Script
- Macromedia Dreamweaver

Chapter 2: Literature Review

2.0 Introduction

A literature review is an account of what has been published on a topic. It is more often included in a research report, essay or thesis. The purpose is to express knowledge and ideas established on a research or thesis topic, and to convey their strengths and weaknesses.

Writing a literature review would allow me to gain and demonstrate skills in two areas:

1. **Information seeking:** the ability to scan the literature efficiently, using manual or computerized methods, to identify a set of useful articles and books
2. **Critical appraisal:** the ability to apply principles of analysis to identify unbiased and valid studies.

In this section I hope to fulfill these criteria listed in accomplishing a good review:

- Be organized around and related directly to the thesis or research question being developed.
- Synthesize results into a summary of what is and is not known
- Identify areas of controversy in the literature

2.1.0 Fact Finding Techniques

Fact-finding is needed in order to have a better understanding of the system's needs and requirements. There are many sources that provide information in my research. The information gathering techniques involved are:

- **Internet Research**

Internet is used as the main resource for referring any ambiguities that arise during the entire development period. By analyzing in the similar system has made a big help in giving ideas on the features, functionality as well as the design of the web-based system. Besides that, online tutorials regarding programming language can also be obtained through surfing the Internet.

- **Document Room**

Previous seniors' thesis have been read through in order to gain an overall understanding on how a system was developed, what were the functional and non-functional requirements, and other related data. The general structure of each thesis has also been observed to find out the steps taken in carrying out a thesis.

- **Library**

Books, journals and magazines from the library have been read through and valuable information has been noted down.

- **Bookstores**

Several renowned bookstores contain relevant references about this project. Suitable references books have been purchased in order to learn in detail about the technologies used in this project.

- **Newspaper And Magazines**

Articles from daily newspapers about the related field of study for this project have been collected for future references. Much useful information has been found from Mobile Magazine that provides me with the latest technology in Information Technology and computing fields

- **Software Testing**

Relevant software and web development tools have been tested out to evaluate their suitability for this project.

2.1.1 Overview of Case Based Reasoning

Case-Based Reasoning refers to both a cognitive and a computational model of reasoning by analogy to past cases. A basic premise in CBR is that many problems that decision makers encounter are not unique, but rather they are variations of a problem type. It is often more efficient to solve a problem by starting with the solution to a previous similar problem than it is to generate the entire solution again from first principles. In fact, experts have been observed to reason by analogy to prior cases and solving a current problem, a case-based reasoner (whether it is a human or a computational model) recalls a similar past case and its solution. The reasoner then adapts the successful solution of the recalled case to adjust for any differences between the current case and the recalled case. Finally, the CBR stores the solution to the current case along with feedback about the outcome so that it can be used in solving future problems. Typically, a CBR system consists of a **data base**

of past cases and their solutions, a set of Indices for retrieving previous cases and storing new cases, a set of rules for measuring Similarity, and rules for adapting recalled case solutions. A CBR system first “gains an understanding of the problem. This is accomplished by collecting case attribute values that Identify the problem type and that distinguish one problem type from another. The case attributes that identify the problem type are used as indices for case storage and retrieval indices and rules for measuring similarity focus attention on the important features of a problem, i.e., features that can be used to explain why case solutions differ. Once the CBR “understands” the problem, it is reminded of previous similar cases. Solutions to recalled cases provide possible solutions to the new case.

2.1.2 History of Case Based Reasoning

The roots of case-based reasoning in AI is found in the works of Roger Schank on dynamic memory and the central role that a reminding of earlier situations (episodes, cases) and situation patterns has in problem solving and learning. Other trails into the CBR field has come from the study of analogical reasoning, and - further back - from theories of concept formation, problem solving and experiential learning within philosophy and psychology. For example, Wittgenstein observed that 'natural concepts', i.e. concepts that are part of the natural world - such as bird, orange, chair, car, etc. - are polymorphic. That is, their instances may be categorized in a variety of ways, and it is not possible to come up with a useful classical definition, in terms of a set of necessary and sufficient features, for such concepts. An answer to this problem is to represent a concept extensionally, defined by its set of instances - or cases.

The first system that might be called a case-based reasoner was the CYRUS system, developed by Janet Kolodner, at Yale University. CYRUS was based on Schank's dynamic memory model and MOP theory of problem solving and learning [Schank-82]. It was basically a question-answering system with knowledge of the various travels and meetings of former US Secretary of State Cyrus Vance. The case memory model developed for this system has later served as basis for several other case-based reasoning systems another basis for CBR, and another set of models, were developed by Bruce Porter and his group at the University of Texas, Austin. They initially addressed the machine learning problem of concept learning for classification tasks. This led to the development of the PROTOS system, which emphasized on integrating general domain knowledge and specific case knowledge into a unified representation structure. The combination of cases with general domain knowledge was pushed further in GREBE, an application in the domain of law. Another early significant contribution to CBR was the work by Edwina Rissland and her group at the University of Massachusetts, Amherst. With several law scientists in the group, they were interested in the role of precedence reasoning in legal judgements]. Cases (precedents) are here not used to produce a single answer, but to interpret a situation in court, and to produce and assess arguments for both parties. This resulted in the HYPO system, and later the combined case-based and rule-based system CABARET. Phyllis Koton at MIT studied the use of case-based reasoning to optimize performance in an existing knowledge based system, where the domain (heart failure) was described by a deep, causal model. This resulted in the CASEY system], in which case-based and deep model-based reasoning was combined.

In Europe, research on CBR was taken up a little later than in the US. The CBR work seems to have been stronger coupled to expert systems development and knowledge acquisition research than in the US. Among the earliest results was the work on CBR for complex technical diagnosis within the MOLTKE system, done by Michael Richter together with Klaus Dieter Althoff and others at the University of Kaiserslautern]. This lead to the PATDEX system , with Stefan Wess as the main developer, and later to several other systems and methods . At IIIA in Blanes, Enric Plaza and Ramon Lopez de Mantaras developed a case-based learning apprentice system for medical diagnosis, and Beatrice Lopez investigated the use of case-based methods for strategy-level reasoning. In Aberdeen, Derek Sleeman's group studied the use of cases for knowledge base refinement. An early result was the REFINER system, developed by Sunil Sharma. Another result is the IULIAN system for theory revision. At the University of Trondheim, Agnar Aamodt and colleagues at Sintef studied the learning aspect of CBR in the context of knowledge acquisition in general, and knowledge maintenance in particular. For problem solving, the combined use of cases and general domain knowledge was focused [Aamodt-89]. This lead to the development of the CREEK system and integration framework [Aamodt-91], and to continued work on knowledge-intensive case-based reasoning. On the cognitive science side, early work was done on analogical reasoning by Mark Keane, at Trinity College, Dublin, [Keane-88], a group that has developed into a strong environment for this type of CBR. In Gerhard Strube's group at the University of Freiburg, the role of episodic knowledge in cognitive models was investigated in the EVENTS project, which leads to the group's current research profile of cognitive science and CBR.

Currently, the CBR activities in the United States as well as in Europe are spreading out, and the rapidly growing number of papers on CBR in almost any AI journal). Germany seems to have taken a leading position in terms of number of active researchers, and several groups of significant size and activity level have been established recently. From Japan and other Asian countries, there are also activity points, for example in India. In Japan, the interest is to a large extent focused towards the parallel computation approach to CBR.

2.1.3 Method in Case Based Reasoning

All case-based reasoning methods have in common the following process:

- **retrieve** the most similar case (or cases) comparing the case to the library of past cases;
- **reuse** the retrieved case to try to solve the current problem;
- **revise** and adapt the proposed solution if necessary;
- **retain** the final solution as part of a new case.

A number of issues are important in accomplishing these steps. These are

- Case representation
- Similarity measurement between cases
- Retrieval algorithm
- Indexing

- Methodology issues: Generalization, retaining and forgetting cases, identifying features and question, and how to use general background knowledge.

There are a variety of different methods for organizing, retrieving, utilizing and indexing the knowledge retained in past cases.

Retrieving a case starts with a (possibly partial) problem description and ends when a best matching case has been found. The subtasks involve:

- identifying a set of relevant problem descriptors;
- matching the case and returning a set of sufficiently similar cases (given a similarity threshold of some kind); and
- Selecting the best case from the set of cases returned.

Some systems retrieve cases based largely on superficial syntactic similarities among problem descriptors, while advanced systems use semantic similarities.

Reusing the retrieved case solution in the context of the new case focuses on: identifying the differences between the retrieved and the current case; and identifying the part of a retrieved case which can be transferred to the new case. Generally the solution of the retrieved case is transferred to the new case directly as its solution case.

Revising the case solution generated by the reuse process is necessary when the solution proves incorrect. This provides an opportunity to learn from failure.

Retaining the case is the process of incorporating whatever is useful from the new case into the case library. This involves deciding what information to retain and in what form to retain it; how to index the case for future retrieval; and integrating the new case into the case library.

A CBR tool should support the four main processes of CBR: retrieval, reuse, revision and retention. A good tool should support a variety of retrieval mechanisms and allow them to be mixed when necessary. In addition, the tool should be able to handle large case libraries with retrieval time increasing linearly (at worst) with the number of cases.

2.1.4 Case-Based Reasoning Techniques

Case Representation

A case is “a contextualized piece of knowledge representing an experience that teaches a lesson fundamental to archiving the goal of the reasoner” [Kolodner, 1993]. Typically, there are three major parts of a case:

- Problem description: the state of the world while the case is happening and what problem needed solving at the time
- Solution: the stated or derived solution to the problem
- Outcome: the resulting state of the world after the case occurred.

Table 2-1 lists the content of the above major parts of a case.

Table 2-1 The Content of the Major Parts of a Case [Kolodner, 1993]

Major Parts	Contents
Problem Description	1. Goals to be achieved
	2. Constraints on the goals
	3. Features of the problem situation and relationship between its parts
Solution	1. Solutions
	2. Reasoning steps
	3. The set justifications for decisions
Outcome	1. The outcome it self
	2. Explanation of the expectation violation and/or failure
	3. Repair strategy
	4. Pointer to next attempt at solution

Another way to describe case presentations is to visualize the structure in terms of the problem space and the solution space [Watson, 1997 and Doyle, 1998]. Figure 2 illustrates the structure. According to this structure, the description of a problem resides in the problem space. The retrieval process identifies the features of the case with the most similar problem. When the best matching is found, the system uses similarity metrics to find the best matching case. In those processes, the solution of a case with the most similar problem may have to be adapted to solve the new problem.

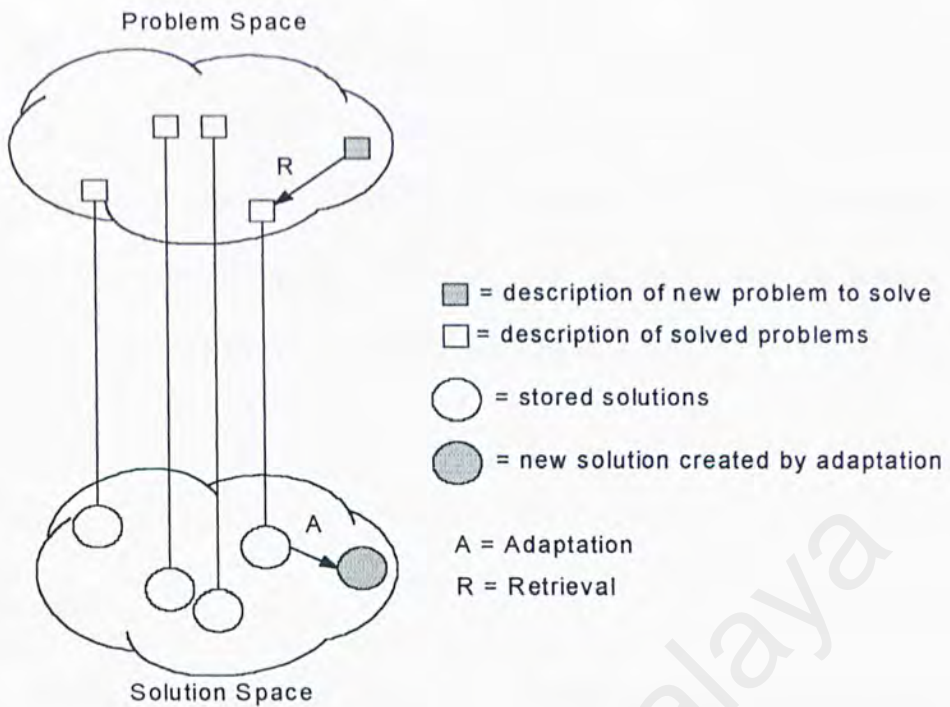


Figure 2.1 Problem and solution spaces [Watson, 1997 and Doyle, 1998]

2.1.5 Case Indexing

An index is a computational data structure that can be stored in memory and searched quickly. Case indexing involves assigning indexes to cases to facilitate their retrieval [Watson, 1995]. The CBR community proposed several guidelines on indexing [Hammond, 89 and Kolodner, 93]:

1. Indexes should be predictive.
2. Predictions that can be made should be useful ones, that is, they should address the purposes the case will be used for.
3. Indexes should be abstract enough to make a case useful for future cases.
4. Indexes should be concrete enough to be recognized in the future.

Methodologies for choosing indexing include manual and automated methods. In some systems, cases are indexed by hand. For example, when the cases are complex and the knowledge needed to understand cases well enough to choose indexes accurately is not concretely available, hand indexing is needed [Kolodner, 1993]. On the other hand, if problem solving and understanding are already automated, it is advantageous to use automated indexing methods.

2.1.6 Case Retrieval

Case retrieval is a process that a retrieval algorithm retrieves the most similar cases to the current problem. Case retrieval requires a combination of search and matching. In general, two retrieval techniques are used by the major CBR applications: nearest neighbor retrieval algorithm and inductive retrieval algorithm.

2.1.7 Nearest-Neighbor Retrieval

Nearest-neighbor retrieval is a simple approach that computes the similarity between stored cases and new input case based on weight features. A typical evaluation function is used to compute nearest-neighbor matching [Kolodner, 1993] as shown in Figure 2-2:

$$similarity(Case_I, Case_R) = \frac{\sum_{i=1}^n w_i \times sim(f_i^I, f_i^R)}{\sum_{i=1}^n w_i}$$

Figure 2-2 A nearest-neighbor evaluation function

Where w_i is the importance weight of a feature, sim is the similarity function of features, and f_i^I and f_i^R are the values for feature i in the input and retrieved cases respectively.

Figure 2-2 displays a simple scheme for nearest-neighbor matching. In this 2-dimensional space, *case3* is selected as the nearest neighbor because $similarity(NC, case3) > similarity(NC, case1)$ and $similarity(NC, case3) > similarity(NC, case2)$.

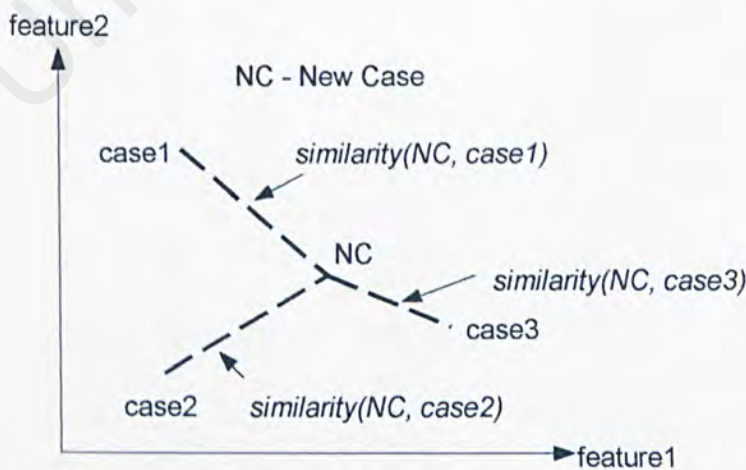


Figure 2.2 How to find the nearest neighbor of the new case NC.

2.1.8 Inductive Retrieval

Inductive retrieval algorithm is a technique that determines which features do the best job in discriminating cases and generates a decision tree type structure to organize the cases in memory. This approach is very useful when a single case feature is required as a solution, and when that case feature is dependent upon others.

2.1.9 Nearest-Neighbor Retrieval vs. Inductive Retrieval

Nearest-neighbor retrieval and inductive retrieval are widely applied in CBR applications and tools. Table 2-4 shows strengths and weakness of two techniques. The choice between nearest-neighbor retrieval and inductive retrieval in CBR applications requires experience and experimentation. Usually, it is a good choice using nearest-neighbor retrieval without any pre indexing [Watson, 1997]. If retrieval time becomes an important issue, inductive retrieval is preferable.

<i>Retrieval Techniques</i>	Strength	Weakness
Nearest Neighbor Retrieval	Simple	Slow retrieval speed when the case base is large
Inductive Retrieval	Fast retrieval speed	1. Depends on pre-indexing which is a time-consuming process 2. Impossible to retrieval a case while case data is missing or unknown

Figure 2.3 Comparison between nearest-neighbor retrieval and inductive retrieval

In some CBR tools, both techniques are used: inductive indexing is used to retrieve a set of matching cases, and then nearest-neighbor is used to rank the cases in the set according to the similarity to the target case.

2.2.0 Knowledge Representation

The exact meaning and use of the term “cases” varies from system to system. In general a case is unique knowledge entity describing a problem and solution. A case can be represent as a single database “object” or broken into two or more associated objects.

A typical case will have the following fields:

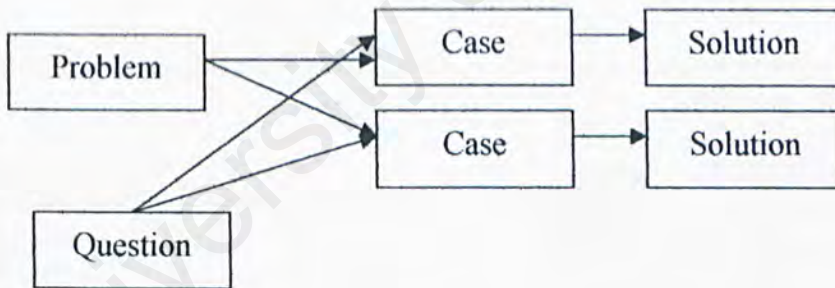
- Title

- Problem (or situation) description.
- Cause (or justification)
- Solution

In order to support the question and answer session each cases is associated with question object. The associated with the question object. The associated can be direct i.e. expressed in the case, or implied , in which case the CBR system calculate which question to ask as described in the following section. The following diagram shows a generic structure of a CBR knowledge representation.

Usually the presentation is

- A problem point to one or more cases
- A case has a single solution
- A question can influence one or more cases.



CBR systems vary in the case database is structured. The representation can be flat, where all case databases is structured. Were all cases are represented at the same level, or it can be hierarchical, expressing relationship between cases and sub cases. The hierarchical organization is useful when in the CBR system that use taxonomic task , for example , to identify an animal based on it feature . A detailed discussion of data structures is beyond the scope of this paper as the structure is not expected to impact the performance of a diagnosis system.

2.3.0 CBR Life Cycle System

CBR is a problem-solving paradigm based on the principles of Artificial Intelligence and Cognitive Science. Generally, the knowledge is organized in the form of stored cases representing previously solved problems. CBR is based on a simple premise: Similar problems have similar solutions. New problems are solved, by adapting solutions that were used to solve similar problems. New cases are added during consultation. CBR follows a cyclic process [1] of retrieval, reuse, revise and retain. The solutions suggested by cases are more accurate than those suggested by chains of rules, because cases reflect what really happened in a given set of circumstances [7]. Thus, CBR is reasoning by remembering

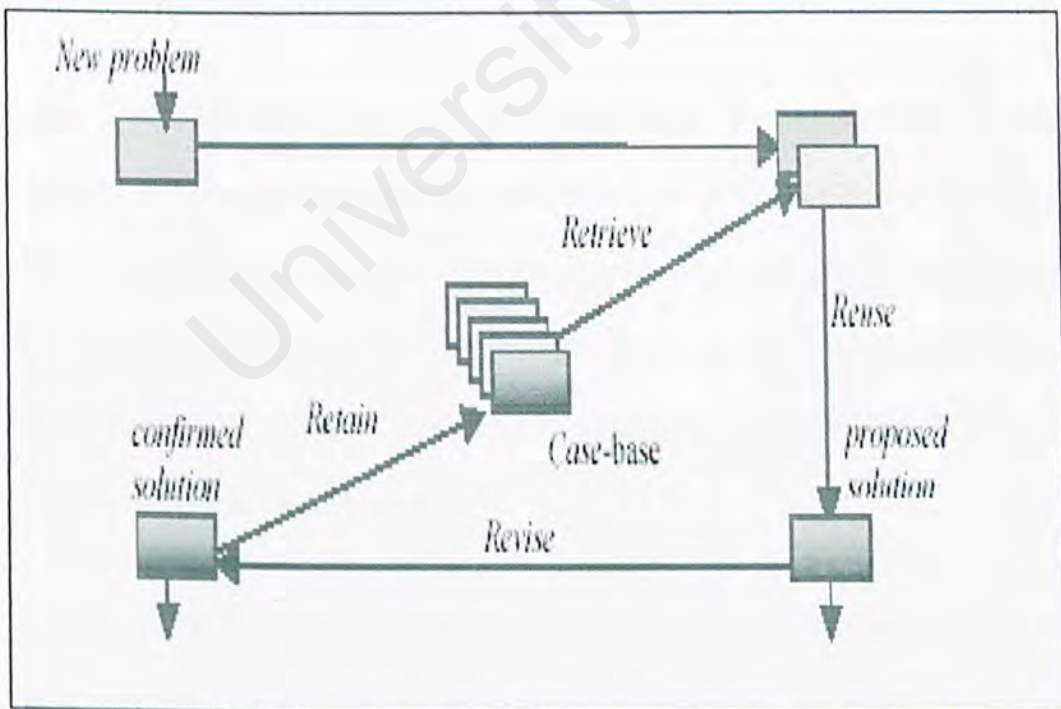


Figure 2.4 CBR process as a cyclical process comprising of four REs

1. **RETRIEVE** the most similar cases from the case history
2. **REUSE** the cases attempt to solve problem mean that use the past case solution to solve the new case
3. **REVISE** the propose solution, if necessary. To solve problem
4. **RETAIN** the modified solution as a new case.

2.4.0 Hand Phone

2.4.1 History of Hand phones

1947 was a big year for what was to become the hand phone industry. In that year researchers first developed ideas as to the possibility of creating mobile phones that used "cells" that would identify a user in whatever specific region he or she was initiating the call from. However, since technology was fairly limited at the time, more development was required.

Later that same year, the FCC (or, the Federal Communications Commission) decided to open up separate radio frequencies to be available for mobile calling. However, the commission only allowed twenty-three cell phone conversations in a given calling area. Thus, "we can partially blame the FCC for the gap between the initial concept of cellular service and its availability to the public" (Selling the Cell Phone: History of Cell Phones 1).

Finally, in 1968, companies such as AT&T and Bell Labs proposed new methods of incorporating the cellular phone system; in exchange, the FCC opened up more frequencies available to cell phone users. The companies' ideas were based on a concept of many small cellular towers that would handle phone calls for a certain

region. When users moved from one region to another, service was transferred to a closer tower. With this development in place, AT&T and Bell Labs began testing the phones for public use

2.4.2 How Hand Phone Work?

All over the world, people use and communicate with Hand phones. Hand phones range in sizes from as small as a thumb, to as large as a regular telephone if needed. Hand phones can flip, fold, compact and store just about anything. But how do they work?

Hand phone is just like a radio. It picks up signals from towers But if you wonder how the cell phone works and what makes it different from a regular household phone, read below as we go through the basics.

Each Hand phone has a cellular system. When we say a cellular system, it means a division of a city into small cells. Each cell has a base station that consists of a tower and a small building containing the radio equipment this allows widespread frequency reuse across a city, so that millions of people can use cell phones concurrently. Each cell is typically sized at and covers about a 10 square miles radius.

There is a requirement to have a large number of base stations in a city of any size to make cell phone use function conveniently. A typical large city can have hundreds of towers placed in certain regions to cover most of the areas completely. Central offices called the Mobile Telephone Switching Office (MTSO) handles all of

the phone connections to the normal land-based phone system, and controls all of the base stations in the region. Each carrier in each city runs one.

All hand phones have special codes related with them. These codes are used to identify the phone's owner, phone, and the service provider that they use. Here is what happens when you use your phone:

When a person first turns on their phone, it listens for a System Identification Code (SID) on the control channel. An SID is a unique 5-digit number that is assigned to each carrier by the FCC. This is a unique frequency that the phone and base station use to send signals to another about things like call set-up and channel changing. If the phone can't find any control channels to listen to, then it's out of range and will display on the phone a "no service" message.

When it receives the SID, the phone matches up to the SID programmed into the phone. If the SIDs match, the phone realizes that the cell it is corresponding with is part of its home system.

The phone also transmits a registration request, along with the SID and the MTSO keeps track of your phone's location in a database -- this way it is known what cell you are in when it wants to ring your phone.

The MTSO gets the call that is calling you and it tries to find you by looking in its system to see which cell you are in. The call is sent to you at that time. You are now talking by two-way radio to a friend!

As you travel and move near the end of your cell, your cell's base station sees that your signal strength is diminishing. In the meantime, the base station in the cell

you are moving closer to see your phone's signal strength increasing. The two base stations coordinate with each other through the MTSO, and at some point, your phone gets a signal on a control channel telling it to change frequencies. This hand off switches your phone to the new cell with out interruption to you and your call. As you travel, the signal is passed from cell to cell

2.4.3 Hand Phone in Malaysia

Recent years have seen enormous development in the infrastructure and usage of cellular telephones in Malaysia, known in Indonesia as hand phones. Just as in your home country, there are obvious advantages to the use of hand phones:

- You can utilize time stuck in Jakarta's notorious traffic jams to make calls.
- In the event of an emergency on the road you can call for help.
- People can leave confidential messages on your voice mail.
- Your office becomes mobile and people can track you down wherever you are - even on the golf course, on vacation or on a business trip.

Many companies in Malaysia provide hand phones for their managers. They may also pay part of your phone bill, for example paying the first RM 20 in monthly charges. If your work keeps you out of the office a lot, you may want to ask your firm if they will provide you with a hand phone.

Choosing a hand phone

A wide variety of hand phones are available for purchase in Malaysia. Internationally known brands predominate the market for example NOKIA. The latest models with all the new features are available here. The major brand names have dealers/distributors who handle the sales of their phones in Malaysia. Some of these dealers/distributors have kiosks or shops in the major malls or sell their wares through counters in electronics goods stores. Prices range from RM 100 to RM 3000. Some hand phones purchased abroad will work in Malaysia, as long as you subscribe to the operator that utilizes that phone system in Indonesia. For example, if you own a GSM phone, you can subscribe to MAXIS, TM TOUGH, DIGI TIMECEL, and CELCOM. Changing your phone number is as simple as buying a GSM card from your operator.

If you want to upgrade your current hand phone, you can still keep the same phone number with GSM phones because the phone number is contained within the card and not the phone itself, therefore the phone number moves with the card to the new phone. When you buy a new AMPS hand phone, the new phone can be reprogrammed in order to keep your old phone number.

Top of the line hand phones (and operators) include many practical features:

- frequently called phone number list
- voice mail box - to leave messages
- call diverting and call waiting
- screening of calls
- alarm, calculator, exchange conversion and games

- Data transmission via PC or fax, e-mail, or the internet!
- can change phone ring tones
- and much more ...

A major factor in the hand phone you choose is the life of the battery. The best batteries are Li-Ion. Choose a hand phone that has a battery that is good for up to 5 to 8 hours of usage. Also ask the dealer how long it will take to recharge the battery when it runs down. Better phones take only 1 to 4 hours to recharge.

The length of talk time and standby time is also very important, 60 to 450 hours is common on medium cost phones. Weight of the phone is another important factor. Some phones are down to 143 grams. The battery is the heaviest thing in the phone.

GSM cards

You do not need to "subscribe" to a service if you use a pre-paid SIM card. These can be purchased from phone kiosks and used directly. There are several ways to get hooked to a network, and all phone sellers can get you online instantly. You do not need a contract, and a simple pay-as-you-go type SIM card will give you a line.

GSM cards are issued by the cellular phone system operators. They are issued with a phone number recorded within the card. There are two types of phone cards:

1. Pre-paid card - when the amount already paid for runs out, you have to take the card to the service center and reregister, then they give you an activation code which you punch into the phone. Different operators issue these cards under different brand names. The card may cover a limited area (e.g. Greater Kuala Lumpur, Sabah, etc.), all of Malaysia or even international roaming.

Ask the operator about the limitations of the cards coverage. Some pre-paid cards have a time limit as well as cost limit.

2. The regular card is based on an atonement, or basic monthly charge, plus the usage and all relevant taxes which are billed to your billing address and payable monthly. Requirements for these types of cards have tightened considerably as the incidence of delinquent subscribers has increased during the monetary crisis.

Security

There are two ways to protect yourself from the consequences of theft if you are using a GSM phone. First, you can program a PIN number into your GSM Card. Persons using the phone card would have to know the code to utilize the card, thus preventing unauthorized persons from running up your phone bill. The second way is through a security code which is programmed into the phone and protects your phone from use with unidentified SIM cards.

If your phone is stolen, report the theft to your service provider and your phone number can be blocked for a small fee so that no one can run up your phone bill. Then, request that your new card have your old phone number programmed into it, to be used with your new hand phone! If your phone is stolen, the thief could just throw away the card and put in a new card if the phone isn't programmed to reject unidentified SIM cards.

Cellular phone system operators

- Cellular phone systems in Malaysia are operated by five different private companies, all of whom are partially owned by the government phone company, Telekom.

Choosing a phone operator

It would be helpful to ask the advice of other expatriates as to what operators they have used. Ask how satisfied they were with the service, and what problems they encountered in using the service. Just by looking at the hand phone numbers of your various colleagues, you will know which operator they use, as each operator uses a different prefix (see chart above).

Ask friends about the following common problems and how often they experience them with the operator they use:

- Bad transmission, static, interference from structures, cut off transmissions
- Limits of service coverage - can you receive calls if you are traveling in other parts of Malaysia or overseas (avoid the dreaded 'out of the service area' message by choosing an operator with full coverage).
- Security - what actions they take if someone gets your phone number/frequency and runs up your bill

Some of the problems encountered in hand phone usage can seem quite mysterious. For example, why that one hand phone is may have no problems receiving calls in a particular building, while others can not receive in that building. The difference is in the number of receivers/transmitters, your location - where you are in the building and its structure, as well as other technical factors. If the transmission for your call

isn't clear - try moving near a window - or to a different side of the building, or even outside to improve the reception.

2.5.0 Overview of Operating System / Platform

2.5.1 The World Wide Web

The World Wide Web (WWW) or the Web, is a subset of the computers on the Internet that are connected to each other in a specific way that makes those computers and their contents easily accessible to each other. The Web is a system consisting of an internationally distributed collection of multimedia files supported by clients (users) and servers (information providers). Each file is addressed in a consistent manner using its universal resource locator (URL). The files from the providers are viewed by the clients using browsers such as Mosaic, Netscape Navigator, or Microsoft's Internet Explorer. Browsers are fast becoming a standard Internet tool. The WWW links the various tools used on the Internet by providing users with a simple, consistent interface to a wide variety of information. The WWW supports text documents, Telnet sessions, sounds, graphics, file transfers and more by using hypertext. A hypertext text document not only contains information, but also links to other documents that contain related information. The standard method of formatting Web pages is to use hypertext markup language (HTML). HTML is a language that includes a set of codes attached to text. These codes are translated by the Web browser and result in a formatted Web page.

The number of Web sites has grown even more rapidly than the Internet itself. The number of Web site is currently estimated to be well over eight million and the

number of Web documents is likely over a billion. As more people gain access to the Web, commercial interest in using the Web to conduct business will increase and the variety of non-business uses will become even greater.

Platform

An operating system is the collection of programs that forms the foundation for the basic operations of the computer hardware. It performs and coordinates the interaction between hardware devices (e.g. the CPU and the monitor), peripherals (e.g. printer), and application software (e.g. a word processing program) [3].

The operating system is typically stored on disk, and a portion of it is transferred into temporary memory when the computer starts up. After it is in memory, it can go about its task of managing the computer and providing an interface for users to interact with the computer. Operating system perform many services such as determines the sequence of the applications in multitasking environment. Many different tasks including the following .

- Booting (or starting) the computer.
- Reading programs into memory.
- Managing memory allocation to those programs.
- Maintaining the structure of directories and subdirectories.
- Sending objects to the printer.
- Formatting disks.
- Controlling the computer monitor.

2.5.2 Linux

Linux is a complete operating system that is similar, but not identical to UNIX. It supports both 32 and 64 bit hardware and provides a stable multi-user Internet ready operating system. It was initially created by a young student, Linux Torvalds, at the University of Helsinki in Finland as a hobby. Originally the term Linux referred strictly to the kernel (the core of the operating system), but the phrase itself refers nowadays to a collection of configured software that runs on the top of the Linux kernel.

The source code for Linux is freely available to everyone. Freely available in this context means the source code for the kernel and most software cannot be withheld. This however, does not mean that Linux and its assorted distributions are free. Companies and developers may charge money for it as long as the source code remains available. Among the companies involved in the distribution of Linux are Red Hat, Caldera, S.U.S.E., and Stampede. These companies do not just compile and configure the software. Caldera, Red Hat and others have added their own proprietary software to their distribution.

Linux is used for a wide variety of purposes including networking, software development, and as an end-user platform. Linux is often considered as an excellent low cost alternative to other more expensive operating system. It is stable in the sense that, crashes of applications in Linux are much less likely to bring down the entire operating system as compared to Windows. Linux servers are also reliable, as they are often up for hundreds of days before requiring any reboots.

Linux uses internet and industry standard components and protocols giving a system with complete network integration. The operating system can act as a server for most major file serving protocols, and provide all the major internet applications. The X window system provides a networked and platform independent graphical interface that (unlike proprietary user interfaces) allows one desktop to access applications running on multiple machines across local and wide area networks.

2.5.3 Windows 98

One of the products in Microsoft's evolution of the Windows operating system for personal computer is Windows 98. An important of the user interface of Windows 98 is the Web technology and it was released with its tightly integrated browser. Microsoft Internet Explorer is an integral part of the operating system in the Windows 98. Users can view and access desktop objects that reside on the World Wide Web as well as local files and application using the Active Desktop of Windows 98. In fact, Windows 98 desktop is a Web page with HTML links and features that exploit Microsoft's ActiveX controls.

It also provides a 32-bit file allocation table (FAT32) that allowing a single-partition disk drive larger than 2Gbytes. The other features in Windows 98 includes supports for Universal Serial Bus (USB), which make it easy to plug in new devices support for Digital Versatile Disc (DVD), support for a new industry standard form of power management called Advanced Configuration and Power Interface (ACPI).

Windows 98 enables the news and other content to be set up and pushed to the user from specified Web sites. When using it as Web server, Personal Web Server (PWS) need to be installed in order for the Windows system to serve Web pages through Internet.

2.5.4 Windows NT

Windows NT is the operating system for personal computer created for users and business requiring advanced capability. It is actually comprise of two products: Microsoft NT Workstation and Microsoft NT Server. The workstation is a little more safe than Windows 98 and Windows 95. It is designed for users especially business users, who need faster performance. The server is designed for business machines that need to provide services for LAN-attached computers. Together with an Internet server such as Microsoft's Internet Information Server (IIS), it is required for a Windows system that plans to serve Web pages. The latest version, the Windows NT Server version 5.0 is now available, called Windows 2000.

Just like its desktop siblings (Windows 95/98), Windows NT is easy to use, fairly quick to learn, and has some great software bundled with it. It also comes with a colorful interface, with plenty of icons to assist users in navigating themselves through the system. There is no need for users to memorize difficult commands, as almost everything or anything on the Windows NT is done by simple clicks of the

mouse. The by far, makes Windows NT (also Windows 95/98) the most user-friendly operating system available in the world today.

Windows NT is also preferred above many other operating systems because of its ability to inter-operate with a variety of enterprise level software available in the market today. In other words, there are much more software designed to run especially on the Windows platform as compared to any other operating system in the world today. NT's improved system architecture also makes it far more superior than its desktop siblings, Windows 95/98, which makes it a better choice for business applications.

2.5.5 Windows 2000

Among latest version of Microsoft's evolving Windows operating system is Windows 2000. Before that, it is called Windows NT 5.0. Microsoft emphasizes that Windows 2000 is evolutionary and is built on NT technology. Most users of Windows 98 and Windows NT will in time move to Windows 2000. It is designed to appeal to small business and professional users as well as to more technical and larger business market for which the NT was designed.

The Windows 2000 product line consists of four products:

- **Windows 2000 Professional**, aimed at individuals and businesses of all sizes. It includes security and mobile use enhancements. It is the most economical choice.
- **Windows 2000 Server**, aimed at small-to-medium size businesses. It can function as a Web server and/or a workgroup (or branch office) server. It can be part of a two-way symmetric multiprocessing system. NT 4.0 servers can be upgraded to this server.
- **Windows 2000 Advanced Server**, aimed at being a network operating system server and/or an application server, including those involving large databases. This server facilitates *clustering* and *load-balancing*. NT 4.0 servers with up to eight-way SMP can upgrade to this product.
- **Windows 2000 Datacenter Server**, designed for large data warehouses, online transaction processing (OLTP), econometric analysis, and other applications requiring high-speed computation and large databases. The Datacenter Server supports up to 16-way SMP and up to 64 gigabytes of physical memory.

It was reported in earlier reviews that Windows 2000 is more stable than Windows 98/NT systems. It is less likely to crash. A significant new feature is Microsoft's Active Directory that enables virtual private networks to be set up by a company, data locally or on the network to be encrypted, and to give users access to shared files in a consistent way on any network computer.

The other features of the Windows 2000 are it has a fully customizable administrative console that can be based on tasks rather than files, applications, or users. Also Dynamic Domain Name Server (DNS), which replicates changes in the network using the Active Directory Services, the Dynamic Host Configuration Protocol (DHCP), and the Windows Internet Naming Service (WINS) whenever a client is reconfigured.

Besides that, it also has the ability to create, extend, or mirror a disk volume without having to shut down the system and to back up data to a variety of magnetic and optical storage media. In addition, it also has close integration with and supports for Microsoft's Message Queue Server, Transaction Server, and Internet Information Server (IIS).

Below are the key features for the Windows 2000 Operating System:

1) Reduces the Need for Reboot

One issue which often happens on previous versions of Windows operating system namely Windows 98 and Windows NT is the need to reboot the PC after certain event namely after installation of certain programs into the system. However Windows 2000 Professional

reduces these reboots dramatically and thus making it more user-friendly.

2) Driver Certification

With the driver certification, it reduces the risk of user installing non-certified drivers for their hardware which may result on their hardware device not working properly.

3) Full 32-bit operating system

minimizes the chance of application failures and unplanned reboots.

4) Microsoft Installer

Works with the Windows Installer Service, helping users install, configure, track, upgrade, and remove software programs correctly, minimizing the risk of user error and possible loss of productivity.

5) System Preparation Tool

Helps administrators clone computer configurations, systems, and applications, resulting in simpler, faster, and more cost-effective deployment.

6) Setup Manager

Provides a graphical wizard that guides administrators in designing installation scripts.

7) Remote Installation Services (RIS)

Permits an operating system installation across the network (including SysPrep images). RIS helps users save time and reduces deployment costs by allowing administrators to standardize settings to match organizational requirements. Although RIS requires Windows 2000 Server, it does not need to be installed on each client computer.

8) Multilingual User Interface (MUI)

Changes the user interface, permitting you to create, read, and edit documents in a number of languages easily.

9) Faster Performance

Provides 25 percent faster performance than Windows 9x on systems with 64 megabytes (MB) or more of memory.

10) Faster Multitasking

Uses a full 32-bit architecture, allowing users to run more programs and perform more tasks at the same time than Windows 95 or Windows 98.

11) Scalable Memory and Processor Support

Supports up to 4 gigabytes (GB) of RAM and up to two symmetric multiprocessors.

12) Peer to Peer Support for Win 9x and Win NT

Enables Windows 2000 Professional to interoperate with earlier versions of Windows on a peer-to-peer level, allowing all resource sharing such as folders, printers, and peripherals.

13) Microsoft Windows Services for UNIX 1.0

Provides new interoperability enhancements for integrating both Windows NT 4.0 and Windows 2000 into existing UNIX environments. Services for UNIX 1.0 provide a gateway for the Network File System (NFS) on Windows NT Server and Windows 2000 Server.

14) Personalized Menus

Adapts the Start menu to the way you work by showing the applications you use most often.

15) Troubleshooters

Assists users in configuring, optimizing, and troubleshooting numerous Windows 2000 functionalities, resulting in greater productivity, fewer help desk calls, and better customer service.

16) More Wizards

Makes it easier to perform routine or challenging tasks, resulting in fewer help desk calls and better customer service. For example, the Add Printer Wizard makes it easy to connect to local and network printers even when you're browsing the Web.

17) Windows NT Security Model

Permits only authenticated users to access system resources. The security model includes components to control that accesses objects (such as files and shared printers), the actions an individual can take on an object, and the events that are audited.

18) Encrypting File System (EFS)

Encrypts each file with a randomly generated key. The encryption and decryption processes are transparent to the user.

19) IP Security Support (IpSec)

Helps protect data transmitted across a network. IPsec is an important part of providing security for virtual private networks (VPNs), which allow organizations to transmit data securely over the Internet.

20) Smart Card Support

integrates smart card capabilities into the operating system. Smart cards enhance software-only solutions such as client authentication, interactive logon, code signing, and secure e-mail.

21) Microsoft Management Console (MMC)

Provides a centralized and consistent environment for management tools.

22) IntelliMirror

Gives users enhanced access to their information and software. IntelliMirror™ management technologies greatly benefit mobile computer users by letting their computer resources "follow" them regardless of where they log on to the network. Offline files, a feature of Intellimirror, lets users keep working on key documents even if the network connection fails. Intellimirror requires Windows 2000 Server.

23) Group Policy

Permits administrators to define customized rules about virtually every facet of a user's computer environment such as security, user rights, desktop settings, applications, and resources, minimizing the likelihood of misconfiguration. Group Policy works in conjunction with the Active Directory service and requires Windows 2000 Server.

24) Synchronization Manager

Lets you compare and update your offline files and folders with those on the network.

25) Integrated Internet Explorer 5.01

Provides Internet Explorer 5.01, integrating your desktop environment with the Web.

26) Strong development platform

Support for Dynamic HTML Behaviors and XML gives developers the broadest range of options--with the fastest development time.

27) IntelliForms

Alleviates the tedium of filling out forms on the Web by automatically entering your name, address, or other information that you've securely stored on your computer.

Unlike the Windows 9X versions which uses 9X kernel whereas Windows 2000 uses the NT (New Technology) kernel which improve the stability of the system. Unlike the Windows 9x operating system, Windows 2000 does not really have much emphasis on DOS-mode.

However the most notable difference of Windows 2000 with the Windows 9x is the file system they use. Unlike it peers which are the Windows 9x generation which uses FAT system, Windows 2000 preferably uses NTFS 5.0 or NT File System which they inherit from the Windows NT platforms.

NTFS or NT File System is actually not that unfamiliar for Windows user especially those who had previously been using the Windows NT platforms. NTFS 5.0 provides enhanced security, improved compression, and better performance. The most notable

improvement to NTFS may be invisible to most users, but it enables high visibility features: reparse points. Reparse points allow Microsoft and independent software vendors (ISVs) to extend the operating system's storage features by plugging custom code into the file system. Encrypting File System, Single Instance Store, and Volume Mount Points all use reparse points to extend the NTFS file system.

2.6.0 Software Technologies

2.6.1 Web Server Software

2.6.1.1 Apache Server

The Apache server is a powerful, flexible, HTTP 1.1 compliant Web Server. It is highly configurable and extensible with third-party modules. It provides full source code and comes with an unrestrictive license. It runs on Windows NT/9x, OS/2 and most version of Unix, as well as several other operating systems. Apache has a built-in search engine and HTML authoring tools and supports File Transfer Protocol (FTP). Apache is actively being developed and encourages user feedback through new ideas, bug reports and patches.

The Apache server allows administrators to easily set up password-protected pages with enormous numbers of authorized users, without slowing down the server. It also permits administrators to set up customized files, or even CGI scripts, which are returned by the server in response to errors and problems. This allows the administrator to perform on-the-fly diagnostics for both users and administrator.

Apache is also flexible enough to perform multiple Directory Index directives, where administrators can instruct the server to either send back index.html or run index.cgi when a directory URL is requested, whichever it finds in the directory. Those coming running Apache servers will also find that it has unlimited flexible URL rewriting and aliasing. Apache has no fixed limit on the numbers of Aliases and Redirects that may be declared in its configuration files. In addition, a powerful rewriting engine can be used to solve most URL manipulation problems.

Today the Apache server is the most widely implemented Web server on the Internet. It offers a powerful and customizable approach for any Unix-based server. It has been shown to be substantially faster, more stable and more feature-full than many other Web servers, including IIS. Apache is run on sites that get millions of hits per day and they have yet experienced any performance difficulties.

2.6.1.2 Internet Information Server

Internet Information Server (IIS) is a group of Internet servers (including a Web or Hypertext Transfer Protocol server and a File Transfer Protocol server) with additional capabilities for Microsoft's Windows NT and Windows 2000 Server operating systems. IIS is Microsoft's entry to compete in the Internet server market that is also addressed by Apache, Sun Microsystems, O'Reilly, and others.

IIS comes with three default services: WWW, FTP and Gopher. Its Internet Service Manager (ISM) application controls these services on this or any other IIS server on the network. ISM is run from the Window NT Server or from a Windows NT or Windows 95/98 workstation. For remote administration, ISM can be run from any browsers using on HTML version. IIS supports FTP, allowing users to download files and data from the IIS server site with the FTP protocol.

With IIS, Microsoft includes a set of programs for building and administering Web sites, a search engine that allows users to create custom search forms with a variety of tools, including ASP, ActiveX Data Objects, and SQL database queries, reporting tools from Crystal reports. (Crystal Reports is a visual reporting tool that lets you create presentation-quality reports and integrate them into database applications.), and support for writing Web-based applications that access databases. Microsoft points out that IIS is tightly integrated with the Windows NT and 2000 Servers in a number of ways, resulting in faster Web page serving.

A typical company that buys IIS can create pages for Web sites using Microsoft's Front Page product (with its WYSIWYG user interface). Web developers can use Microsoft's Active Server Page (ASP) technology, which means that applications - including ActiveX controls - can be imbedded in Web pages that modify the content sent back to users. Developers can also write programs that filter requests and get the correct Web pages for different users by using Microsoft's Internet Server Application Program Interface (ISAPI) interface.

To tap into the power of ASP and server-side scripting, IIS includes native scripting engines for VBScript and JavaScript. Server plug-ins is available for other scripting languages such as Perl, TCL, and REXX. You can even use several different scripting languages within a single ASP document.

Database access has also been extended in IIS. ActiveX Data Objects (ADO), an ASP component, lets developers access and control data in any ODBC- or OLEDB-compliant database using any ActiveX scripting language. Developers can put a Web front end on almost any legacy database without arcane CGI programming.

IIS includes security features and promises that it is easy to install. It works closely with the Microsoft Transaction Server to access databases and provide control at the transaction level. It also works with Microsoft's Net show in the delivery of streaming audio and video, delayed or live.

2.6.2 Web Authoring Tools

2.6.2.1 Microsoft Visual Interdev 6.0

Visual Interdev is an integrated development environment (IDE) for creating dynamic web sites. It is part of the Microsoft Visual Studio family, which consists of Visual Basic, Visual C++, Visual FoxPro, and Visual J++. Visual Interdev combines a number of tools into a single package to simplify development chores. There is support for project management, syntax highlighting of different types of web files

such as ASP or HTML, automatic synchronization of local files with web server files, and integrated databases access.

With Visual Interdev, a developer can assemble pages that use Microsoft's ActiveX technologies and other similar com technologies. Data driven web applications can also be developed using Microsoft's Universal Data Access, which includes ADO (ActiveX Data Objects), ODBC (Open Database Connectivity), and OLEDB. Visual Interdev also provides a robust development environment with a Scripting Object Model, design time control (DCTs), and a extensible toolbox for the purpose of rapid design, testing, and debugging of web pages. Web teams can now develop pages in isolation and maintain ready access to a master version. In short, Visual Interdev is an excellent all-rounder IDE, both for programmers and non-programmers.

2.6.2 .2 Microsoft FrontPage 2000

FrontPage 2000 is part of the Microsoft Office 2000 family. It runs on the Windows 95/98/NT/2000 operating system, and is one of the simplest and least complex HTML editors available in the market today. Because FrontPage 2000 is integrated into the Office 2000 package, it interacts easily with other components of Office 2000, such as Word, Excel, Access and Power Point.

FrontPage 2000 is aimed at letting non-programmers build no-nonsense pages for their web sites quickly and easily. It features built-in tools to facilitate the

creation of forms, tables, banners, Java Applets, and much more. Developers, writers and designers may also work on the same web project by using Microsoft FrontPage and Microsoft Visual Interdev in conjunction. In this case, Visual Interdev provides developers with a robust set of tools for developing web applications, while FrontPage provides a WYSIWYG environment for editing pages that does not require any programming knowledge.

2.6.2.3 Allaire Cold Fusion 4.0

Cold Fusion is a complete development and deployment environment ideally suited for building today's web-based e-commerce, content management, and business-automation initiatives. It is an ideal choice for workgroup, departmental and extranet applications, in which fast deployment times are critical, often with the work done by less-experienced developers.

Cold Fusion applications are essentially collections of pages. As with static web pages, Cold Fusion pages can contain HTML and other client technologies, such as JavaScript or PearlScript. Unlike static pages, Cold Fusion application pages are denoted by a specific ".cfm" extension, which is the default Cold Fusion file extension. Cold Fusion pages also contain an additional language, called the Cold Fusion Markup Language (CFML). CFML encompasses the Web's Hypertext Markup Language HTML and Extensible Markup Language (XML).

The Cold Fusion development platform consists of two basic components:

(i) Cold Fusion Server

The Cold Fusion Server is a high-performance web application server for deploying browser-based applications. It offers all the runtime services for delivering e-business applications built on a highly scalable and open architecture. Because CFML is processed on the server, and because web servers only know how to pass pages to browsers, the Cold Fusion Server must be installed on a web server to provide support for Cold Fusion applications. When the Cold Fusion Server is installed on a web server and a client requests a page with a “.cfm” extension, the following steps take place:

1. The web server passes files to Cold Fusion Server
2. Cold Fusion Server scans the page and processes all CFML tags.
3. Cold Fusion Server returns only HTML and other client-side technologies to the web server and, in turn, the browser.

(ii) Cold Fusion Studio

Cold Fusion Studio is an integrated development environment (IDE) that includes a variety of tools for building web applications. It provides a full suite of advanced editing tools including color coding, web application wizards, and two way visual programming. Cold Fusion Studio also includes visual database tools, and interactive debugger, full integration with source control systems, and support for remote and team development using the Cold Fusion Server.

Using the Cold Fusion development platform, developers can build web applications that connect to a wide range of existing business systems, such as RDBMS, messaging servers, file repositories, directory servers, and distributed object middleware. All the above make Cold Fusion an excellent tool for heavy-duty web development.

2.6.2.4 Macromedia Dream weaver

Macromedia Dream weaver is a professional visual HTML editor for creating and managing Web sites and pages. It gives developers the productivity of a visual Web page layout tool, the control of an HTML text editor, and support for new Web technologies, all in one software package.

Developers can use Dreamweaver to create Web sites visually, with confidence that the HTML being generated is concise and always editable. Dreamweaver includes advanced features that take advantage of the latest innovations on the Web, such as Dynamic HTML and Cascading Style Sheets, while still ensuring that Web pages work well in a variety of Web browsers. All of the code generated by Dreamweaver is carefully created to work on as many platforms and browsers as possible.

Other features of Dreamweaver include the easy integration of ActiveX components, java applets and plug-in for improved Web page interactivity.

Dreamweaver also integrates seamlessly with the other components of Macromedia, such as Flash Movies, Shockwave and Fireworks, which are essential for the development of interactive Web pages.

2.7.0 Database

2.7.1 Database Review.

More organizations are realizing the importance of data as a corporate asset that must be managed properly. Because of this, the process or methods by which the data are collected, stored and retrieved or disseminated have undergone vast improvements in recent years. This eventually increases the focus on the value of data to the organization particularly those relevant to the management or decision making process as well as long term strategic planning for the organization.

A database is an integrated collection of data, organized and stored in a manner that facilitates its easy retrieval. The structure of a database should correspond to the need of the organization and should allow multiple or concurrent access to the database by multiple users and when appropriate, for the use of more than one

application. The concept of a database organizes data into a logical hierarchy based on the degree of the data. This hierarchy consists of 4 elements which are[8]:

- i) Database
- ii) Files
- iii) Records
- iv) Data Elements.

Although the data are organized within a common structure, the sources of the data collected may come from different sources. Data sources may come from different methods such as:

- i) **Internal data:** data which originated from the organization itself such as daily transaction within the organization.
- ii) **External data:** data which is from the external source of the organization such as market research, census data and others.

In a business organization, transaction or interaction between the user and the database requires the existence and assistance of the Database Management System (DBMS).

2.7.2 Database Management System (DBMS)

The database is processed by the DBMS which is used by both the user and system developer. Both can access the DBMS directly or indirectly through application program.

A DBMS can be divided into 3 subsystems:

- i) **Design Tools Subsystem:** consists of a set of tools to facilitate the design and the creation of a database and its application. The tools are for creating tables, forms, queries, and reports. DBMS also provide programming languages as well as graphical user interface such as macro language embedded in Microsoft Access 2000.
- ii) **Run Time Subsystem:** processes the application components which were developed using the design tools of the DBMS. An example is that Microsoft Access 2000 has a run time facility that processes the application forms as well as connecting the tables inside the database.
- iii) **DBMS Engine:** an intermediary between the Design Tools Subsystem and the Run Time Subsystem. The DBMS receives the request of the 2 components and translates the requests into commands for further processing by the Operating System to read and write data on physical media.[8]

2.7.3 Database Development Process

In order to build an effective database and related applications, development team must thoroughly understand the user requirement model. They must build data models that eventually identifies the data to be stored in the database and defines the relationship between the data.

There are 2 general strategies for developing a database which are:

- i) **Top Down Development:** proceeds from general to specific. Begins with the study of strategic goals of the organization. Then the

development team works down towards more detailed description and the models describing the structure of the database.

- ii) Bottom Up Development: begin with the need to develop a specific system. The development process will eventually proceed with the team working upwards towards a more general context.

2.7.4 MySQL

What Is MySQL?

MySQL, the most popular Open Source SQL database, is developed, distributed, and supported by My SQL AB. My SQL AB is a commercial company, founded by the My SQL developers,

that builds its business providing services around the My SQL database. The My SQL web site (<http://www.mysql.com/>) provides the latest information about My SQL

Software and My SQL AB.

MySQL is a database management system.

A database is a structured collection of data. It may be anything from a simple shopping list to a picture gallery or the vast amounts of information in a corporate network. To add, access, and process data stored in a computer database, you need a database management system such as MySQL Server. Since computers are very good at handling large amounts of data, database management systems play a central role in computing, as stand-alone utilities or as parts of other applications.

MySQL is a relational database management system.

A relational database stores data in separate tables rather than putting all the data in one big storeroom. This adds speed and flexibility. The SQL part of

“MySQL” stands for “Structured Query Language”. SQL is the most common standardised language used to access databases and is defined by the ANSI/ISO SQL Standard. (The SQL standard has been evolving since 1986 and several versions exist. In this manual, “SQL-92” refers to the standard released in 1992, “SQL-99” refers to the standard released in 1999, and “SQL:2003” refers to the version of the standard that is expected to be released in mid-2003. We use the term “the SQL standard” to mean the current version of the SQL Standard at any time.)

MySQL software is Open Source.

Open Source means that it is possible for anyone to use and modify the software. Anybody can download the MySQL software from the Internet and use it without paying anything. If you wish, you may study the source code and change it to suit your needs. The MySQL software uses the GPL (GNU General Public License), <http://www.gnu.org/licenses/>, to define what you may and may not do with the software in different situations. If you feel uncomfortable with the GPL or need to embed MySQL code into a commercial application you can buy a commercially licensed version from us.

Why use the MySQL Database Server?

The MySQL Database Server is very fast, reliable, and easy to use. If that is what you are looking for, you should give it a try. MySQL Server also has a practical set of features developed in close cooperation with our users. You can find a performance comparison of MySQL Server with other database managers

on our benchmark . MySQL Server was originally developed to handle large databases much faster than existing solutions and has been successfully used in highly demanding production environments for several years. Though under constant development, MySQL Server today offers a rich and useful set of functions. Its connectivity, speed, and security make MySQL Server highly suited for accessing databases on the Internet.

The technical features of MySQL Server.

MySQL Database Software is a client/server system that consists of a multithreaded SQL server that supports different backends, several different client programs and libraries, administrative tools, and a wide range of programming interfaces (APIs). We also provide MySQL Server as a multi-threaded library which you can link into your application to get a smaller, faster, easier-to-manage product. There is a large amount of contributed MySQL software available.

It is very likely that you will find that your favorite application or language already supports the MySQL Database Server. The official way to pronounce MySQL is "My Ess Que Ell" (not "my sequel"), but we don't mind if you pronounce it as "my sequel" or in some other localised way.

The Main Features of MySQL

The following list describes some of the important characteristics of the MySQL Database

Internals and Portability

- Written in C and C++. Tested with a broad range of different compilers.
- Works on many different platforms. See Section 2.2.3 [Which OS], page 70.
- Uses GNU Automake, Autoconf, and Libtool for portability.
- APIs for C, C++, Eiffel, Java, Perl, PHP, Python, Ruby, and Tcl. See
- Fully multi-threaded using kernel threads. This means it can easily use multiple CPUs if available.
- Transactional and non-transactional storage engines.
- Very fast B-tree disk tables (MyISAM) with index compression.
- Relatively easy to add another storage engine. This is useful if you want to add an SQL interface to an in-house database.
- A very fast thread-based memory allocation system.
- Very fast joins using an optimised one-sweep multi-join.
- In-memory hash tables which are used as temporary tables.
- SQL functions are implemented through a highly optimised class library and should be as fast as possible. Usually there isn't any memory allocation at all after query initialisation.
- The MySQL code gets tested with Purify (a commercial memory leakage detector) as well as with Valgrind, a GPL tool (<http://developer.kde.org/~sewardj/>).
- Available as client/server or embedded (linked) version.

2.7.5 Microsoft SQL Server 7.0 Review

Overview of Microsoft SQL Server 7.0

Microsoft SQL Server version 7.0 is a defining release for Microsoft's database products, building on the solid foundation established by SQL Server version 6.5. As the most robust database for the Windows Family, SQL Server is the Relational Database Management System (RDBMS) of choice for a broad spectrum of corporate customers and Independent Software Vendors (ISVs) building business applications. Customer needs and requirements have driven significant product innovations in ease of use, reliability and scalability and data warehousing. Below are the design goals for Microsoft SQL Server 7.0

SQL Server Design Goals

i) Leadership and Innovation

Innovations enable SQL Server 7.0 to be the leader in several of the database industry's fastest growing application categories. These include data warehousing, line of business applications, mobile computing, branch automation, and eCommerce.

Important areas of leadership and innovation in Microsoft SQL Server 7.0 include:

- First database to scale from the laptop to the enterprise using the same code base, offering 100% code compatibility
- First database to provide multi-server management for a large numbers of servers
- Widest array of replication options of any database

- Best integration with Windows NT Server, Microsoft Office and BackOffice
- Universal Data Access, Microsoft's strategy for enabling high-performance access to a variety of information sources

One of the most important areas of innovation is Microsoft's strategy for Universal Data Access. This is a platform for developing multi-tier, enterprise applications that require access to diverse relational and non-relational data. This collection of software components interact using a common set of system-level interfaces called OLE DB, Microsoft's open specification for low-level interface to data. OLE DB is the next generation successor to the industry standard ODBC data access method.

OLE DB replaces DB Library as the internal interface for all SQL Server database operations. This allows heterogeneous queries that use the SQL Server query processor to perform with the same high level of performance as queries to the SQL Server storage engine.

ii) Ease of Use

Customers are looking for solutions to business problems. Most database *solutions* just bring multiple layers of cost and complexity. Microsoft's strategy is to make SQL Server the easiest database for building, managing, and deploying business applications. This means providing a fast and simple programming model for developers, eliminating database administration for standard operations, and providing sophisticated tools for more complex operations.

iii) Scalable and Reliable

As the organization expands, the database must grow to handle more data, transactions, and users. Hence the organization needs to protect investments as they scale database applications down to laptops and out to branch offices.

To meet these needs, Microsoft delivers a single database engine that scales from a mobile laptop computer running Windows® 95 or Windows 98, to terabyte symmetric multiprocessor clusters running Windows NT Server, Enterprise Edition. All these systems maintain the security and reliability demanded by mission-critical business

iv) Data Warehousing

Transaction processing systems remain a key component of corporate database infrastructures. Companies are also investing heavily in improving understanding of their data. Microsoft's strategy is to reduce the cost and complexity of data warehousing while making the technology accessible to a wider audience.

Microsoft has established a comprehensive approach to the entire *process* of data warehousing. The goal is to make it easier to build and design cost-effective data warehousing solutions through a combination of technologies, services, and vendor alliances.

The Microsoft Alliance for Data Warehousing is a coalition that brings together the industry's leaders in data warehousing and applications. The Microsoft Data Warehousing Framework is a set of programming interfaces designed to simplify the integration and management of data warehousing solutions.

Access versions which are the Access 95 and Access 97. Having suite both professional as well as new users because of its user friendliness, Access 2000 ability to integrate with other Office Applications such as Microsoft Words or Microsoft Excel. As a summary, Access 2000 provides the features which enable user to manage their database regardless whether they are building a database from scratch or maintaining a existing database. Microsoft Access 2000 targets the desktop user as their main user which means that these people do not really need to know and understand the knowledge of database to the highest extent in order to use it. User can create tables, fields and others easily with the assistance of its Wizard feature. This wizard feature will guide the user from step one until the user finished creating a table as well as inputting attributes into the table. Besides that, Access 2000 also offers form which enables users to key in attributes into the table instead of writing commands in order to do so. Besides entering through forms, user can also enter the values of attributes 'directly' into the table. 'Directly' means that Access provides the user with an interface with the likes of a table with rows representing the records and columns column representing the fields for a record. With the help of such interface user can just key in the attributes directly into the columns and thus created a record and so on. Another method of keying in inputs into the table is by importing from an external file. This is when the ability of Access to integrate with other Office applications. User can import external database, text files and others into the table as input.



Figure 2.5: Graphical interface enabling easier input.

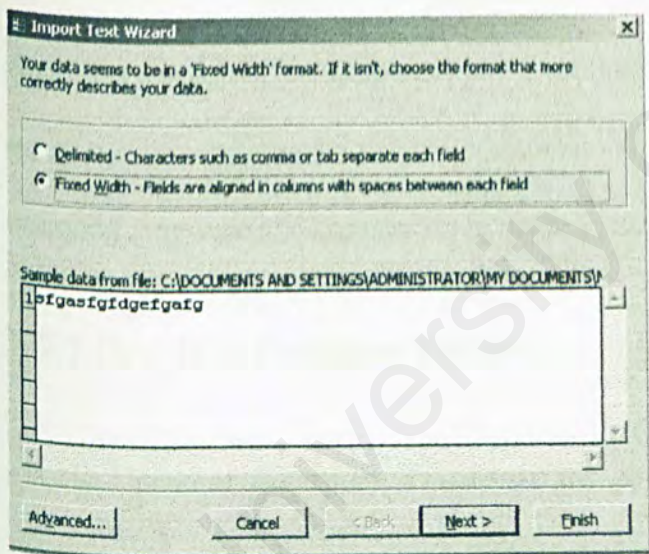


Figure 2.6: Importing external files into database.

Another notable feature of Access 2000 is the querying tool. Access 2000 provides a graphical user interface and wizard to help user to generate a query to the database. Instead of typing SQL commands like what normal RDBMS does, Access 2000 just

requires user to drag and drop the fields that they want to query and specify the query specification and eventually a query will be generated. As far as new users are concern, there is a wizard feature which guides the user to create a query from step one until a result is generated.

However for those who are familiar with programming languages such as developer, Access 2000 offers these people to write their own application or Visual Basic Application (VBA). This feature which offers limited development tools enables user to write their own application such as form for input, create or delete record and others.

As a summary, Access 2000 targeted user ranges from office clerks to system developers which offers graphical interface for its user friendliness. So, one does not really need to command a very high understanding of database knowledge as well as querying language and commands in order to use it.

2.7.7 Oracle 8i Database Review.

Oracle Database Enterprise Edition is the most powerful database available for driving enterprise e-business applications, on-line transaction processing applications (OLTP), query-intensive data warehouses, and high capacity web sites. Oracle Database Enterprise Edition has an unparalleled performance and scalability that spans from single CPU servers through massive server clusters and mainframes. [30]

With the integration of innovative technologies like native support for XML, Java and SQL, the Oracle Database Enterprise Edition is ready to power your e-business. Oracle Database Enterprise Edition delivers unprecedented ease-of-use, power, and

price/performance.

It includes:

- Scalable, browser-based systems management for end-to-end management of your entire e-business.
- Powerful Oracle Partitioning option for effectively managing terabytes of data with a minimum of administrative overhead.
- Strong, cost-effective data security designed for today's web and e-business environments.
- Support for highly available and scalability cluster configurations with the Oracle Parallel Server Option.
- Fast and easy storage and management of MS Word documents, Excel files, email, multimedia, XML files, and web pages in the Oracle Internet File System (available for Sun SPARC Solaris and MS Windows NT only).

The Oracle Database Enterprise Edition supports the largest Symmetrical Multi-Processor (SMP) systems and can be extended with the following options: Oracle Advanced Security, Oracle Parallel Server, Oracle Partitioning, Oracle Spatial, Oracle Visual Information Retrieval, Oracle Diagnostic Management Pack, Oracle Tuning Management Pack and Oracle Change Management Pack.

2.7.8 Lotus Notes/Domino

Lotus Notes is a Groupware technology from Lotus Development Corporation and it supports communication, collaboration and coordination between people working in groups. The most important component is the Notes database which is an

unstructured database. Through its database, Lotus Notes offers email, calendar and scheduling capabilities.

Since Lotus Notes is categorized as a groupware, it eventually facilitates group activities such as documents sharing, storage work routing and escalation and quick development of new shared application. Thus, Lotus Notes is being applied to foster teamwork in a groupware, improve business processes and extend the reach of the individual and the organization. Lotus Notes also combines many functions into a single piece of software. Thus through a single consistent interface, Lotus Notes makes all available functions easier to integrate and simpler to process. Lotus Notes is also very flexible with extensive capabilities that lend themselves to a variety of projects. With all these tools in one package, Lotus Notes makes it easier to share ideas and exchange information. Furthermore Lotus Notes provides a workplace where it allows user to read, write and make suggestions directly on their documents and by the same time encourages and supports collaboration and teamwork by making the documents more accessible to the right people at the right time thus making the documents more useful. Ultimately, Lotus Notes can reduce paperwork. Each database consists of documents which in turn may contain fields containing textual information images and OLE objects. Lotus Notes database is not a relational database and therefore does not have a primary key and relationship between databases. Any of such relationships that need to be established need to be coded.

2.7.9 Evaluation Issues between Microsoft SQL Server 7.0 and Microsoft Access 2000

For a quick background on the difference between a desktop application, such as Access, and an enterprise-level database, such as Microsoft SQL Server, it might be helpful to think about a continuum. The two database solutions are complementary yet operate at different ends of the spectrum and meet different customer needs. The right database for a particular situation depends on several factors, including scalability (number of users, size of data), reliability (mission-critical data, such as corporate payroll versus potential sales contacts) and available database experience (Office user versus professional database administrator).

A client/server database, such as Microsoft SQL Server, differs from a file-server database, such as Access, by providing greater scalability and reliability for data that is mission-critical for the enterprise. Access databases typically service individuals and small groups (10–20 users) with no more than a megabyte of data, which could easily be processed on the desktop. Microsoft SQL Server can support thousands of users with terabytes of information, and provides other enterprise-level database capabilities. For example, Microsoft SQL Server offers 24-by-seven support by providing the ability to conduct administration and maintenance while the database is online. Microsoft SQL Server also protects against data loss with a two-phase commit, which can be useful if a particular transaction is interrupted midstream due to power outage, network failure or other reasons.

2.8.0 Programming Language

2.8.1 Visual Basic

The Visual refers to the method used to create the graphical user interface (GUI). Rather than writing numerous lines of code to describe the appearance and location of interface elements, you simply add prebuilt objects into place on screen

The Basic refers to the BASIC (Beginners All-Purpose Symbolic Instruction Code) language, a language used by more programmers than any other language in the history of computing.

Visual Basic contains several hundred statements, functions, and keywords, many of which relate directly to the Windows GUI. Beginners can create useful applications by learning just a few of the keywords, yet the power of the language allows professionals to accomplish anything that can be accomplished using any other Windows programming language.

The Visual Basic programming language is not unique to Visual Basic. The Visual Basic programming system, Applications Edition included in Microsoft Excel, Microsoft Access, and many other Windows applications uses the same language. The Visual Basic Scripting Edition (VBScript) is a widely used scripting language and a subset of the Visual Basic language. Listed below are the features of Visual Basic:

- Data access features allow you to create databases, front-end applications, and scalable server-side components for most popular database formats, including Microsoft SQL Server and other enterprise-level databases.

- ActiveX technologies allow you to use the functionality provided by other applications, such as Microsoft Word word processor, Microsoft Excel spreadsheet, and other Windows applications. You can even automate applications and objects created using the Professional or Enterprise editions of Visual Basic.
- Internet capabilities make it easy to provide access to documents and applications across the Internet or intranet from within your application, or to create Internet server applications.
- Your finished application is a true .exe file that uses a Visual Basic Virtual Machine that you can freely distribute.

2.8.2 Java

2.8.2.1 Introduction

A simple, object-oriented, network-savvy, interpreted, robust, secure, architecture neutral, portable, high-performance, multithreaded, dynamic language. Below are the features of Java language.

Simple

Java omits many rarely used, poorly understood, confusing features of C++ that in our experience bring more grief than benefit. These omitted features primarily consist of operator overloading (although the Java language does have method overloading), multiple inheritance, and extensive automatic coercions.

Automatic garbage collection, simplifies the task of Java programming but making the system somewhat more complicated. By virtue of having automatic garbage collection (periodic freeing of memory not being referenced) the Java language not only makes the programming task easier, it also dramatically cuts down on bugs.

Another aspect of being simple is being small. A small size is important for use in embedded systems and so Java can be easily downloaded over the net.

Object-Oriented

Simply stated, object-oriented design is a technique that focuses design on the data or objects. Object-oriented design is also the mechanism for defining how modules "plug and play." The object-oriented facilities of Java are essentially those of C++, with extensions from Objective C for more dynamic method resolution.

Network-Savvy

Java has an extensive library of routines for coping easily with TCP/IP protocols like HTTP and FTP. This makes creating network connections much easier than in C or C++. Java applications can open and access objects across the net via URLs with the same ease that programmers are used to when accessing a local file system.

Robust

Java is intended for writing programs that must be reliable in a variety of ways. Java puts a lot of emphasis on early checking for possible problems, later dynamic (runtime) checking, and eliminating situations that are error prone.

Java has a pointer model that eliminates the possibility of overwriting memory and corrupting data. Instead of pointer arithmetic, Java has true arrays. This allows subscript checking to be performed.

Java programmers can be relatively fearless about dealing with memory because they don't have to worry about it getting corrupted. Because there are no pointers in Java, programs can't accidentally overwrite the end of a memory buffer.

Secure

Java is intended for use in networked/distributed environments. Toward that end, a lot of emphasis has been placed on security. Java enables the construction of virus-free, tamper-free systems. The authentication techniques are based on public-key encryption.

There is a strong interplay between "robust" and "secure." For example, the changes to the semantics of pointers make it impossible for applications to forge access to data structures or to access private data in objects that they do not have access to. This closes the door on most activities of viruses.

Architecture Neutral

Java was designed to support applications on networks. In general, networks are composed of a variety of systems with a variety of CPU and operating system architectures. To enable a Java application to execute anywhere on the network, the compiler generates an architecture-neutral object file format--the compiled code is executable on many processors, given the presence of the Java runtime system.

High Performance

While the performance of interpreted bytecodes is usually more than adequate, there are situations where higher performance is required. The bytecodes can be translated on the fly (at runtime) into machine code for the particular CPU the application is running on. For those accustomed to the normal design of a compiler and dynamic loader, this is somewhat like putting the final machine code generator in the dynamic loader.

The bytecode format was designed with generating machine codes in mind, so the actual process of generating machine code is generally simple. Efficient code is produced: the compiler does automatic register allocation and some optimization when it produces the bytecodes.

Multithreaded

Multithreading is a way of building applications with multiple threads. Unfortunately, writing programs that deal with many things happening at once can be much more difficult than writing in the conventional single-threaded C and C++ style.

Java has a sophisticated set of synchronization primitives that are based on the widely used monitor and condition variable paradigm introduced by C.A.R. Hoare. By integrating these concepts into the language (rather than only in classes) they become much easier to use and are more robust.

Other benefits of multithreading are better interactive responsiveness and real-time behavior.

2.8.3 Hypertext Markup Language

HTML (Hypertext Markup Language) is the set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page. The markup tells the Web browser how to display a Web page's words and images for the user. Because HTML documents are text-based, they are very flexible and can be displayed on a variety of platforms, as long as the platform has a browser that understands the language. Each individual markup code is referred to as an element (but many people also refer to it as a tag). Some elements come in pairs that indicate when some display effect is to begin and when it is to end. HTML is a non-proprietary format, based upon SGML, for describing the structure of hypermedia documents - plain text (ASCII) files with embedded codes for logical markup, using tags like `<A>` and `` to structure text into tables, hypertext links interactive forms, headings, paragraphs, lists, and more. It can be created and processed in a wide range of tools from simple plain text editors to sophisticated WYSIWYG (What You See Is What You Get) authoring tools.

HTML is a formal Recommendation by the World Wide Web Consortium (W3C) and is generally adhered to by the major browsers, Microsoft's Internet Explorer and Netscape's Navigator, which also provide some additional non-standard codes. The current version of HTML is HTML 4.0. However, both Internet Explorer and Netscape implement some features differently and provide non-standard extensions. Web developers using the more advanced features of HTML 4 may have to design

pages for both browsers and send out the appropriate version to a user. Significant features in HTML 4 are sometimes described in general as dynamic HTML. What is sometimes referred to as HTML 5 is an extensible form of HTML called Extensible Hypertext Markup Language (XHTML).

Cold Fusion Markup Language

CFML or Cold Fusion Markup Language is a set of special tags that are typically placed inside HTML pages and interpreted by the Cold Fusion Server. The tags perform such tasks as database connectivity and conditional logic, but they also handle other needs of the Web developer.

This server-side scripting language contains more than 70 tags for database connectivity, conditional logic, input and output, and integration with other Internet and file services. Over 200 additional functions handle items such as date and time, mathematical functions, and string manipulations. For database connectivity, SQL statements are embedded into Web pages by using CFML shortcuts, such as CFFORM and CFTABLE, which add functionality to HTML forms and simplify HTML tables, respectively. Additionally, CFML is extensible and it seamlessly integrates with major distributed objects standards such as COM and COBRA.

CFML files must be processed on the Cold Fusion server each time an application page is requested. As such, Web server will need to be installed with the Cold Fusion Server first before any CFML files could be processed. Despite the

limitations, CFML still provides a dynamic application environment that is powerful and easy to use.

2.8.4 Scripting Language

2.8.4.1 Visual Basic Script

VBScript, or by its full name, the Microsoft Visual Basic Scripting Edition Language, is a simplified version of the Visual Basic and Visual Basic for Applications family of programming languages. It is closely related to the BASIC programming language. While it does not offer the functionality of Visual Basic, it does provide a powerful, easy to learn tool that can be used to add interaction to Web pages.

VBScript is a scripting language, or more precisely a scripting environment, which can enhance HTML Web pages by making them active, as compared to a simple static display. It is the default language of ASP and is event-driven. VBScript provides a small but sufficient set of error handling capabilities. Handling multi-dimensional arrays in VBScript is also a breeze. VBScript arrays can easily be dimensioned and re-dimensioned, as required by the developer.

VBScript talks to host applications using ActiveX Scripting. With ActiveX Scripting, browsers and other host applications don't require special integration code for each scripting component. ActiveX Scripting enables a host to compile scripts, obtain and call entry points, and manage the namespace available to the developer.

With ActiveX Scripting, language vendors can create standard language run times for scripting. Microsoft will provide run-time support for VBScript. Microsoft is working with various Internet groups to define the ActiveX Scripting standard so that scripting engines can be interchangeable.

Specifically, VBScript was created by Microsoft to use either as a client-side scripting language for the Microsoft Internet Explorer (version 3.0 and later), or as a server-side scripting language with the Microsoft Internet Information Server (version 3.0 and later). However, VBScript is more often used as a server-side scripting language because of its potent processing capabilities on the server-side.

2.8.4.2 JavaScript

JavaScript is a platform-independent, event-driven, interpreted programming language developed by the Netscape Communications Corporation and Sun Microsystems. Originally called Live Script (and still called Live Wire by Netscape). JavaScript is affiliated with Sun's object-oriented programming language Java primarily as a marketing convenience. They interoperate well but are technically, functionally and behaviorally very different. A popular misconception about JavaScript is that many people believe that JavaScript is Java because of their similar names. This is definitely not true as JavaScript is not Java.

User can develop server applications or client applications with Java Script. The term “server” is referring to the computer where the Web page resides. The term “client” is referring to the browser application that loads and displays Web page. Java Script is an extension to HTML that lets users create more sophisticated Web pages than they ever could with HTML alone.

The Netscape Navigator 2.01 and its later releases support Java Script. There are several version of Java Script supported by certain browsers and browser version. Unfortunately, this can often lead to confusion in compatibilities. Since Netscape originally introduced Java Script, Java Script 1.0 was the language specification supported in Netscape Navigator 2.0. Subsequently, Navigator 3.0 supported new enhancements that comprised Java Script 1.1. At present, Navigator 4.0 support Java Script 1.2.

Java Script offers much more expressive power than HTML alone. Java Script can do things such as create multipart documents, build dynamic documents that take users through a Web site from one document to another, and generate documents that interact with the user.

2.8.4.3 Perl / PerlScript

Perl (Practical Extraction and Reporting Language) is a script programming language that is similar in syntax to the C language and that includes a number of

popular UNIX facilities such as sed, awk, and tr. Perl is an interpreted language that can optionally be compiled just before execution into either C code or cross-platform byte code. When compiled, a Perl program is almost (but not quite) as fast as a fully precompiled C language program. Perl is regarded as a good choice for developing common gateway interface (CGI) programs because it has good text manipulation facilities (although it also handles binary files). Larry Wall invented it.

In general, Perl is easier to learn and faster to code in than the more structured C and C++ languages. Perl programs can, however, be quite sophisticated. Perl tends to have devoted adherents.

Plug-ins can be installed for some servers (Apache, for example) so that Perl is loaded permanently in memory, thus reducing compile time and resulting in faster execution of CGI Perl scripts.

2.8.5 Web Server Technology

2.8.5.1 PHP (Hypertext Preprocessor)

PHP (officially “PHP: Hypertext Preprocessor”) is a server-side HTML embedded scripting language. PHP codes are executed on the server. This means the client would receive the results of running that script, with no way of determining what the underlying code may be. The Web server can even be configured to process all HTML files with PHP, and there is no way that users can tell that the HTML file was written in PHP.

Rasmus Lerdorf first conceived PHP sometimes in the fall of 1994. Early non-released versions were used on his home page to keep track of who was looking at his online resume. The first version used by others was available sometime in early 1995 and was known as the Personal Home Page (PHP) Tools. It consisted of a very simplistic parser engine that only understood a few special macros and a number of utilities that were in common use on home pages back then. The parser was rewritten in mid-1995 and named PHP/FI. Version 2. The FI (Form Interpreter) came from another package Rasmus had written interpreted html form data. He combined the Personal Home Page tools scripts with the FI, and added Microsoft SQL support and PHP/FI was born. PHP/FI grew at an amazing pace and people started contributing code to it. Today, PHP ships with a number of commercial products, with Red Hat Linux being one of them.

PHP is different from a CGI script written in other languages like Perl or C. Instead of writing a program with many commands to output HTML, the programmer writes an HTML script with some embedded code to output text instead. However, PHP can do anything any other CGI program can do, such as collect form data, generate dynamic page content, or send and receive cookies. Perhaps the strongest and most significant feature in PHP is its support for a wide range of databases writing a database enabled Web page is, therefore, incredibly simple with PHP.

Developers have literally flocked to PHP, with its modest learning curve, free and open development, native database connectivity, stability and availability for a variety of platforms. PHP's primary strength is in its rapid development of dynamic

Web pages. Developers without heavy programming experience can leverage PHP to complete tasks otherwise cryptic or obtuse in alternative languages. The architecture of the PHP language is simple but powerful, and includes an extremely wide variety of functions suited for many tasks, both traditional data processing tasks and more Web-oriented functions as well.

2.8.5.2 Active Server Page (ASP)

Microsoft Active Server Page is a file which containing HTML with embedded one or more executable code written in a language such as JavaScript or VBScript is processed on a Microsoft Web server before the requested page is sent to the users or clients. With ASPs, the executable code contained in the file is executed on the server rather than on the client machine. The result of that execution, together with any HTML or other information contained in the file, is sent to the client and displayed by the browser [15]. (See Figure 17)

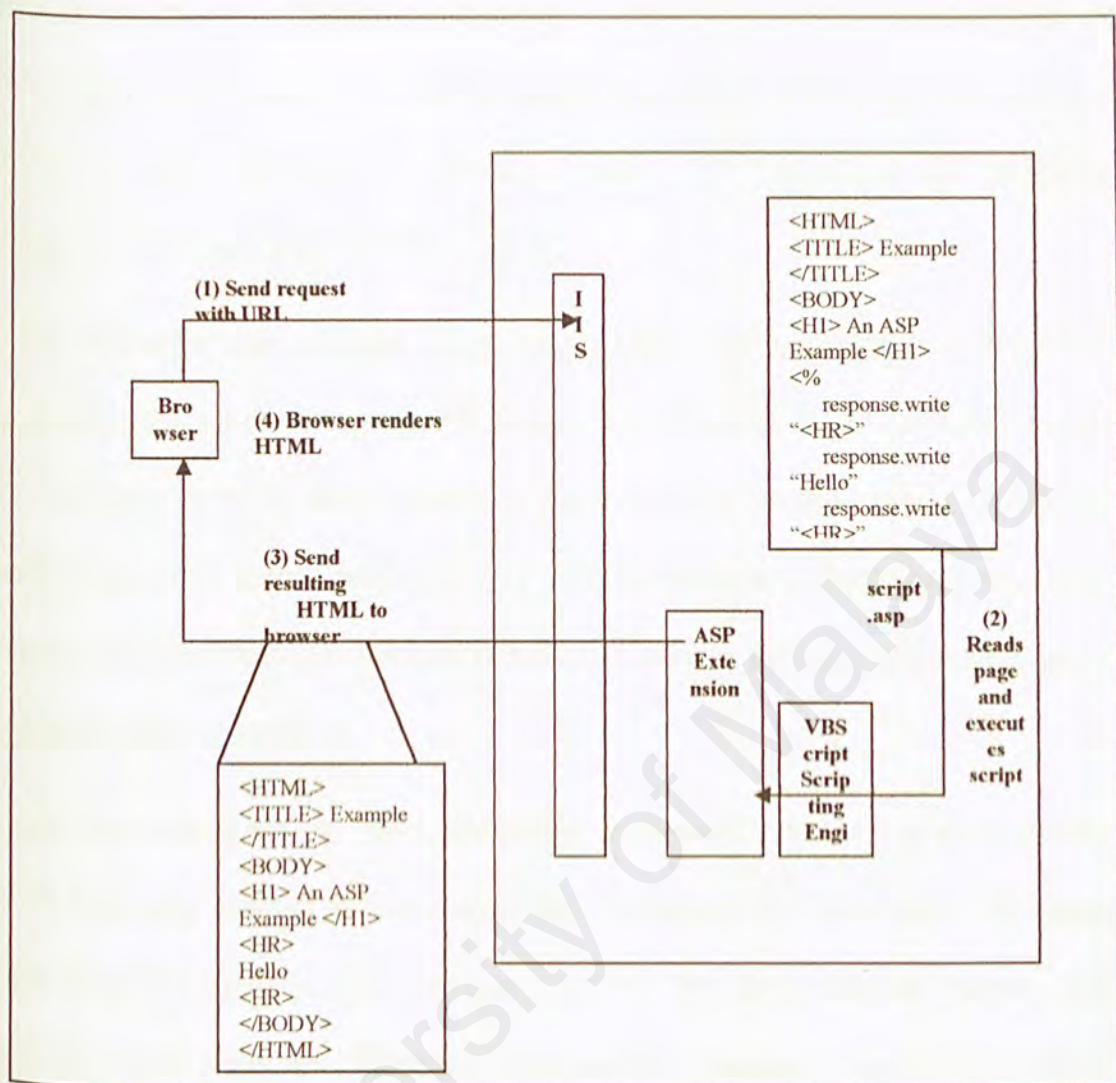


Figure 2.7: A request referencing an ASP page causes IIS to execute the script in the named file, and then send the result to the client

The ASP functionality can be thought of as two separate parts. One is a scripting engine that actually reads and interprets the script code on the page, and the other is a standard ISAPI extension named asp.dll that actually implements the core ASP functions. Which scripting engine is loaded depends on what language the page contains .

An ASP file (ASP script must end in .asp) can contain HTML tags, ordinary text, or script statements in some language. A scripting engine must be available on the

server machine for the language the script statements are written in. Windows 2000 includes engines for VBScript and Microsoft Jscript (Microsoft's implementation of JavaScript), and engines for other languages are available from the third parties. While the ASP machinery is language-neutral, VBScript is by far the most commonly used choice for ASP developers.

ASP is a server side scripting. It is similar to the common gateway interface (CGI) application that all involve programs that run on the server, usually tailoring a page for the users. ASP is server-generated page that can invoke other programs to perform tasks like access database, serve different pages to different browser, etc. It is more efficient than CGI because it runs as a service and can take advantage of multithreaded architectures.

ASP has evolved into an "open technology framework", means it is not necessary to use Microsoft product to create code in it. Nowadays, you can create ASP pages using whatever language you want such as C++, Java or JavaScript. Anyway, the most popular is VBScript. VBScript is the simplest language to use in the website. ASP can also take advantage of COM and DCOM (Component Object Model and Distributed Component Object Model) objects with minimum effort.

With ASP, the code can be simply written in the HTML page. No compiling and no complex interfacing needed. ASP has made it much quicker and easier to create highly interactive Web sites. It also makes your pages easier to maintain and update in the future.

2.8.5.3 Common Gateway Interface (CGI)

Common Gateway Interface is a common way for Web servers to interact dynamically with clients (users). It is a standard way of interfacing backend applications with Web servers. It is used to pass a browser's request to an application program; the application then processes the data and formulates it into HTML documents, and then returns it to the Web server. These documents are then sent back to the browser (the client). The application program (or CGI application) can be written in a number of languages such as Perl, C, C++ and Java. However, the most popular language used in a CGI application is Perl, which the file has a ".pl" suffix.

2.8.5.4 JSP (Java Server Pages)

Easier to use ... " Java Server PagesTM (JSPTM) v2.0 ...

Web developers and designers use Java Server Pages technology to rapidly develop and easily maintain information-rich, dynamic web pages that leverage existing business systems. The upcoming, next release makes JSP technology even easier to use especially in developing online applications at MMU.

"Easier to use" was the major objective driving the Java Server Pages v2.0 specification changes. Now, it is:

Easier to use JSP technology without needing to learn the Java language

HTML-savvy web page developers and designers can use JSP technology without needing to learn how to write Java scripts. Although scripts are no longer

required to generate dynamic content, they are still supported to provide backward compatibility.

Easier to extend the JSP language

Java technology-savvy tag library developers and designers will find it is even easier to extend the JSP language with "simple tag handlers". Simple tag handlers utilize a new, much simpler and cleaner, tag extension API. This will spur the growing number of pluggable, reusable tag libraries available, which reduces the amount of code needed to write powerful web applications.

Easier to write and maintain pages

The Java Standard Tag Library (JSTL) expression language is now integrated into JSP technology and has been upgraded to support functions. The expression language can now be used instead of script let expressions.

JavaServer Pages technology allows web developers and designers to rapidly develop and easily maintain, information-rich, dynamic web pages that leverage existing business systems. As part of the Java family, JSP technology enables rapid development of web-based applications that are platform independent. JavaServer Pages technology separates the user interface from content generation enabling designers to change the overall page layout without altering the underlying dynamic content.

Chapter 3: Methodology and System Analysis

3.1 Introduction

After the literature search and review, the next step is to perform a detailed analysis. The main purpose of the system analysis phase is to learn exactly what takes place in the current system, and to determine and fully document in detail what should take place. The result of this process will be used to recommend improvement to the system.

Through system analysis, the programmer may add, delete and modify system components toward the goal of improving the overall system. The information gathered during this phase has provided alternative strategies to develop this system. Although software design can be identified and defined as a distinct activity, it must be compatible in both concept and implementation with essential development activities such as analysis and coding that precede or follow it. Through this phase also, the programmer can determine types of functional requirements and non-functional requirements for the system.

3.2 Objectives of System Analysis

Following are some of the objectives of the analysis:

- To determine type of methodology to be used.
- To study the problem faced by the user.
- To study the problem and find out the best solution to reduced it.

- To acquire knowledge on how this system will be developed with the new emerging technology.
- To choose the development tools for the new system among different types of tools that have been studied in Chapter 2.

3.2.1 Overview of Methodology

The word 'methodology' is a combination of two Yunanian words – 'methodos' and 'logos'. Methodos means a way or manner, and logos means knowledge on how to do analysis. In short, methodology is further defined as a collection of procedures, techniques, tools and documentations. It helps software developers to build a system according to plan and produce a high quality product.

There are a lot of methodology models in existence currently. Ranging from the classic life cycle models to the innovative evolutionary models – they provide adequate analysis on project duration, budget and requirements to software developers. Below are some of the most popular methodology models:

- Waterfall Model
- Waterfall Model With Prototype
- V Model
- Transformation Model
- Prototyping Model
- Operational Specification Model

3.3 System Development Methodology

The methodology used in the development of Intelligent Hand Phone Package System is the Waterfall and prototyping model. As the name implies the stages of development cascades from one phase to another. Each stage of a development is required to be completed before proceeding to the next phase. The Waterfall model offers the benefit of a structured development, in addition to good visibility and proper documentation for each development stage.

3.3.1 Prototyping Model

A system development model gives a standardized and systematic approach to the project development. Software prototyping is an information system development methodology based on building and using a model of a system for designing, implementing, testing and installing the system

The Prototype Modeling methodology has been chosen to aide in the development of this project because of its many advantages and the main reason this methodology was chosen is because of its iterative approach in modeling processes whereupon each prototype developed in each modeling stage is revised continuously and flaws detected during revision period will be corrected earlier. A prototype is the usually full-scale and functional form of a software design constructed.

The characteristics of prototyping are:

- Prototyping is based on building a model of a system to be developed
- Prototyping uses the model for designing the system
- Prototyping uses the model to implement the system
- Prototyping uses the model to perform both the system and the acceptance testing of the system.

In implementing the prototyping methodology in this system development there are a few steps to be taken. These steps are listed next:

- The system requirements are defined in detail, whereupon requirements are gathered through various discussions with my supervisor and fellow colleagues and also through reviewing a number of products available in the market representing aspects of an example of system proposed.
- A preliminary design is created for the new system.
- A first prototype of the new system is constructed from the preliminary design. Basically, the first prototype is a scaled down system, which represents an estimate of the characteristics of the final system.
- The first prototype has to be thoroughly evaluated, by noting its strengths and weaknesses. Remarks on system performance will be collected and evaluated.

- Thus first prototype will be modified based on the remarks, and second prototype is built.
- Second prototype is analyzed in the same manner as the first prototype
- Preceding steps are iterations, which are finally concluded when system has function fully satisfying system's own requirements and the users. Final prototype represents the final product desired.

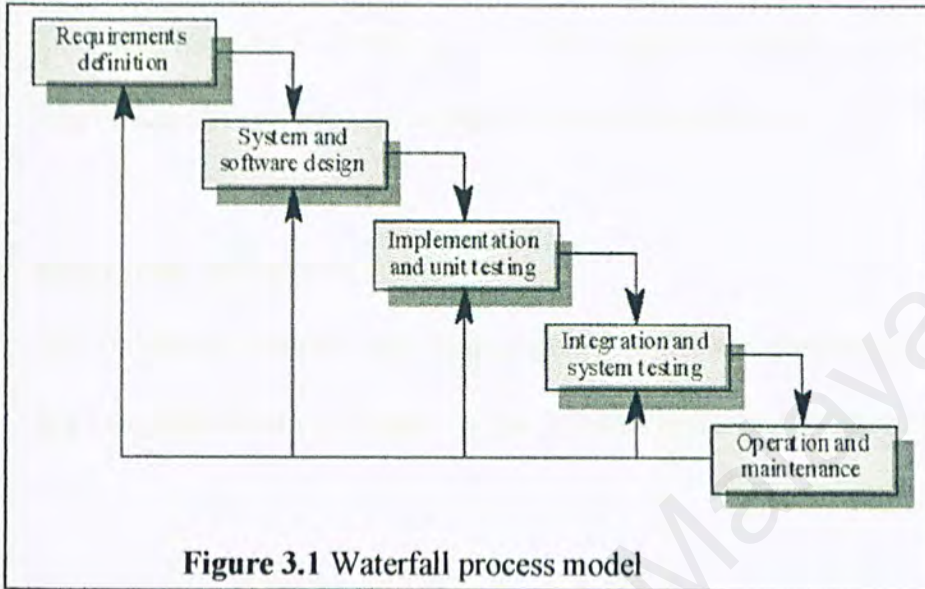
Final system is thoroughly evaluated and tested. Routine maintenance is carried out on a continuous basis to prevent extensive failures and minimize downtime.

This methodology proposes several advantages like:

- It reduces development costs.
- Decreases communication problems.
- Lowers operations costs.
- Minimizes time required during maintenance phase.
- A system that meets user's definitive needs is created.
- Reduces and saves manpower

3.3.2 The Waterfall Model

The waterfall model is also called the "classic life cycle" or the "linear sequential model". The stages of the waterfall model are performed sequentially, in a systematic fashion. Only after a stage is completed can the next stage begin. However, if errors are detected during any stage, one can return to the previous stage for corrections.



The waterfall model encompasses the following activities:

1. Requirement Analysis and Definition

The concept, purpose and functionality of Electronic Marketing System are identified and defined. During this stage, we have to study the existing system that is available in the market, and do planning for the new system. After finish this stage, it comes to system design.

2. System and Software Design

Under this stage, we will begin the software design stage, where it will establish an overall system architecture.

3. Implementation and Unit Testing

This stage involves representing the software system functions in a form that may be transformed into one or more executable program.

4. Integration and System Testing

The individual program units or programs modules are integrated and tested as a complete system to ensure that the software requirements have been met.

5. Operation and Maintenance

After testing, the system can be installed to its site to be fully utilized. Maintenance for the system has to be done from time to time.

The **advantages** Waterfall model as the development methodology:

- **System are visibility**

Waterfall model is good visibility. For a relatively big system, documentation of the project is important. It can be used as a reference in the future. The software engineer can very clearly in mind that at what stage the software process is currently in. This will let them easily manage the software process.

- **System are well structured**

Waterfall model is good structured. As what we know, the software processes are designed at the beginning of the software development. What we needs to then are developed the system step by step according to the structure of the outlined.

- **System are predictable**

Waterfall model is more emphasize on planning rather than rapid development. For this purpose, it is easier to estimate the cost needed to develop the system.

- **System are ease to use**

No special skills are required in this approach. This is because all the outlined of the system is draft out. What the developer needs to do then is done according to what was already structured out.

Disadvantages of Waterfall model

- Inflexible partitioning of the project into distinct stages
- This makes it difficult to respond to changing customer requirements
- Therefore, this model is only appropriate when the requirements are well-understood

- This process model is not suitable for a high cost project development if there is always a change about the hardware requirement
- This process model rule stratified that each phase must complete each phase before going to the next phase

Because they are some weakness with the waterfall process model, the prototyping technique is combining with the waterfall model so develop a quality system

3.3.3 Waterfall with Prototyping model

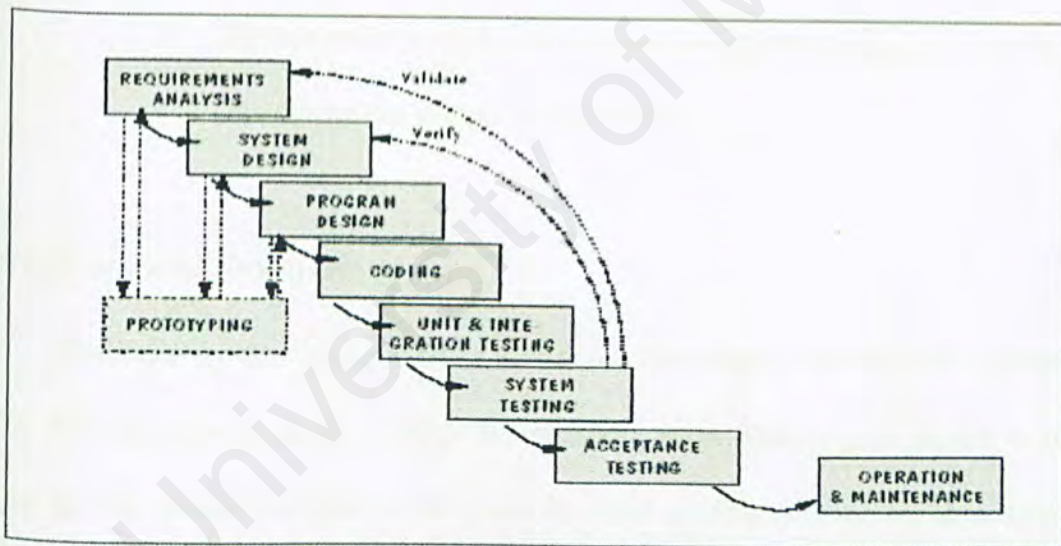


Figure 3.2 Waterfall with Prototyping model

The reason that I chose Waterfall with prototyping model so that I can be amended with prototyping activities to improve understanding. Requirements prototyping: to ensure that the requirements are feasible and practical, if not revisions are made at the requirements stage. Design prototyping: helps developers assess alternative design strategies and decide which is best for a particular project

The advantages of waterfall and prototyping model

- It reduces development costs.
- Decreases communication problems.
- Lowers operations costs.
- Minimizes time required during maintenance phase.
- A system that meets user's definitive needs is created.
- Reduces and saves manpower
- If there is some changes error to the system requirement
- System testing can be reduce because it always being test during the during the system development.

3.4 Analyses and Synthesis

Methodology that being used or chose for this project involves two process models. The first process model a Waterfall process model. This process model is not suitable for this project because if the there is some modification or changes to the functional requirement it cannot be done by this process model because the system that used this process model didn't have iteration so the development of the system will be delivered late. The second process is Waterfall and prototyping model that have an interactive approach for fulfill the user needs. One of the most important thing for developing a system are time, cost to develop a system so that it will complete the customer need.

As a conclusion the process model that being chosen to develop this system is Waterfall and prototyping process model because it has all the advantages that suitable for developing the system.

3.4 Software Development Life Cycle (SDLC)

Software development life cycles are abstract model that define the activities, ordering of activities and information flow associated with the development of software. Life cycles exist for describing the entire development process as well as for particular focused activities such as system test or preparing to release software. These life cycles form the basis of project management. Without a life cycle to depict the activities that software development is supposed to undertake, a project management is not capable the software development has progressed.

3.5 .1 System Requirement Analysis

As stated above, this project is going to be developed using the Waterfall Model approach. Thus, the strategy or plan to develop this project will follow closely the steps that are involved in the Waterfall Model. The steps taken for this project is described below:

3.5.2 Identifying requirements

In developing a system it is very important to identify the system requirement. In order to identify them, a lot of information is needed. As for this project, information was gathered through research and analysis.

a) Research

Research for this project was done on the Internet and Reference Books. The results of this research were described in Chapter Two.

b) Review & Analysis

Review and analysis was conduct in order to identify problems, requirements, opportunities and objectives of the project.

3.5.3 Requirements for this project

After gong through all the information gathered and analyzing it, the requirements for this project were outlined. Basically, they are divided into functional requirements and non-functional requirements.

3.5.4 Functional Requirements

A functional requirement described an interaction between the system and its environment. Besides that, it also describes how the system should behave given the certain stimuli.

3.5.5 Non-Functional Requirements

A non-functional requirement or constraint describes a restriction on the system that limits ones choice for constructing a solution to the problem.

3.5.4.1 Functional Requirements

Functional requirements describe the system's services and functions that provide for the users.

i. Authorization access

The system has different types of authorization for different type of user of the system the reason is for maintaining the integrity and the security of the information so that only an authorized personal can modify; edit the data in the system.

ii. Key in the specification of the of the hand phone.

User need to input the hand phone specification that they need. So that the system can generate the information about the hand phone that user need.

iii. Update and edit the information

This system allow the user of the system to add new

Information about the latest hand phone or update the past information in the database.

iv. Viewing the information

User can view the statement of the hand phone packages after input the specification. This viewing function only can be view by certain rank of personal so that they can do the task without be allowed to modify the data.

v. Help function

This function is provided in every menu in this system to navigate the user how to use the system. Manual for the system also being provided to the user. to help used the system.

vi. Database

All the data a being kept in the database. They backup file are provided in case the system broke down so that all the information are save .

v. Erase the record

The menu for editing or erase the record being provided to the user (supplier and administrator) to allowed them to erase the record that not use.

3.5.5.1 Non-Functional Requirements

The non-functional requirement for this project is describe as below:

Brows ability

“Brows ability earns logically classifying the data and information.”

As the size of information system grows, so does the need to logically organize the data. This implies grouping conceptual sets of data with similar conceptual sets of data. Brows ability becomes apparent when it is coupled with hypertext and logical groupings of information. A browse able information system can provide advantages such as: entire system can be see at a glance, no need of vocabulary knowledge, Similar items are grouped together, easy to navigate, and stimulates thinking

Readability

“Readability means good page layout”

Readability is the extents to which a system can be expected to perform its intended function with required precision and accuracy. Thus, the system should be reliable in performing its daily functions and operations. For example, whenever a button is clicked, the system should be able to perform some functionality as generate some message to inform the user what is happening.

Scalability

The scalability is to promise the capability of the system to migrate as a client or server to machines of greater or lesser power, depending upon requirements, with little or no charge to underlying components. Database scalability issues can be resolved using distributed database architecture where as web application scaling can be addressed by increasing bandwidth or by additional web servers.

Usability

The system should be developed so that it is easy to use it. It will enhance and support rather than limit the office processor. Human interfaces need to be intuitive and consistent with the inventory management system and within it self.

Security

The system should be equipped with sufficient security. Each access by the user should be authenticated and validated by the system. Te system should not show any potential of leakage of information. The password should be encrypted.

Data and Services Backup

The system should be able to restore to its normal operation from any potential disaster. There should be a second backup of data and services to ensure the continuous of operation.

Manageability

The modules within the system should be easy to manage. This will make the maintenance and enhancement works simpler and less times consuming.

Flexibility

The system should have the capability to take advantages of new technologies and resources. The system should be able to implement in the changing environment.

3.6 Programming Technologies and Languages Consideration

Analysis has been done in order to select the most appropriate programming technologies and languages that suit the requirements of this system. Below are the choices that have been decided.

3.6.1 Hardware Requirement (minimum)

The hardware requirements prior to implementation of the system are show as the table below:

Hardware components	Requirements
Computer	Pentium 166 MHz processor and above
Memory	At least 32 MB RAM
Hard disk space	At least 4 GB
Others	Network connection

3.6.2 Software Requirement

Description	Technologies/Software
Operating system/ Platform	Windows 2000
Database server	MYSQL
Web server software	Apache
Web development tool	Macromedia Dream weaver MX
Web development technology	PHP
Markup and scripting language	HTML, java script

Selected Programming Technologies and Language

3.6.2.1 Why Windows 2000?

Microsoft Windows 2000 is a multipurpose server operating system. Windows 2000 server is a complete platform available for building and hosting web based applications with the new features introduced with the Windows 2000 Option Pack. Now, it is an easy server operating system available.

The number one reason to move to Windows 2000 is the overall value it offers. Windows 2000 can help users reduce costs through improved management and increase productivity through improved reliability and ease of use. The average system uptime of Windows 2000 was over 50 times that of Windows 98 and 17

times that of Windows NT Workstation 4.0. Windows 2000 is easier to deploy, manage, and support. Centralized management utilities, troubleshooting tools, and support for self-healing applications all make it simpler for administrators and users to deploy and manage desktop and laptop computers.

After reviewing other development platform, I choose Windows 2000 as my development platform to develop the proposed system. Windows 2000 is used as the operating system for the whole system. It is known to be more user-friendly and stable than other server based operating system. All the other developing tools will be running on this server.

3.6.2.2 Why Windows Database server My SQL?

Internals and Portability

My SQL is a data server written in C and C++. It also have been tested with a broad range of deferent compilers. My SQL can works on many deferent platforms. Uses GNU Automake, Autoconf, and Libtool for portability.. APIs for C, C++, , Java, Perl, PHP, Python, Fully multi-threaded using kernel threads. This means it can easily use multiple CPUs if available. It has transactional and non-transactional storage engines. Very fast B-tree disk tables with index compression. MySQL database server is the world's most popular open source database. Its architecture makes it extremely fast and easy to customize. Extensive reuse of code within the software and a minimalistic approach to producing functionally-rich features has resulted in a database management

system unmatched in speed, compactness, stability and ease of deployment. The unique separation of the core server from the storage engine makes it possible to run with strict transaction control or with ultra-fast transactionless disk access, whichever is most appropriate

3.6.2.3 Why Web Server Software Apache 2.0?

Apache has been shown to be substantially faster, more stable, and more feature-full than many other web servers. Although certain commercial servers have claimed to surpass Apache's speed (it has not been demonstrated that any of these "benchmarks" are a good way of measuring WWW server speed at any rate), we feel that it is better to have a mostly-fast free server than an extremely-fast server that costs thousands of dollars. Apache is run on sites that get millions of hits per day, and they have experienced no performance difficulties

3.6.2.4 Why Web Authoring Tool Macromedia Dream weaver?

Macromedia Dream weaver provides powerful and open integration with the products and technologies you use. Dream weaver is open and agnostic, giving you the freedom and flexibility to choose the technology that works best for you today, and in the future. Take a look at what you can do with Dream weaver

Harness today's technologies, including secure file management. Leverage Secure FTP to fully encrypt all file transfers and prevent unauthorized access to your data, file contents, usernames, and passwords. Continue to work in a platform-independent

development environment that supports Cold Fusion, J2EE™, **PHP**, Microsoft. NET and all other leading server technologies.

- Seamlessly integrate external files and code. Copy and paste from Microsoft® Word and Excel documents directly into Dream weaver while preserving fonts, colors, and CSS styles. Leverage full Unicode support to use, render, and save any font and encoding supported by the operating system, including double-byte character sets.
- Enhance productivity with tighter integration with Macromedia Flash, Fireworks, and other design and development tools in the Macromedia Studio MX 2004 suite.

Work smarter with an evolved, customizable workspace. Consistent user interface elements across applications (such as shared sites, files, color, and panel management, coding metaphors, and a common Property inspector) let you easily move among the Macromedia Studio MX tools.

Microsoft Word and Excel Copy and Paste Copy and paste from Word and Excel documents directly into Dream weaver while Microsoft preserving fonts, colors, and CSS styles.

3.6.2.5 Why PHP (Hypertext Pre-processor)?

They are some reasons why I chose PHP. The first is speed comparing with ASP, PHP has much faster access than PHP because In PHP modules, everything runs in PHP'

memory space. This means that PHP code will run faster because there is no overhead of communicating with different computer configuration objects in different processes. The second is PHP is open Source. The 3rd Compatibility with My SQL Database. There are lots of PHP tools to manage and maintain My SQL databases. The feature set is complete compared to other databases. We have very useful functions like `mysql_insert_id` and `mysql_affected_rows` which are not available for other database products.

3.6.2.6 Why JavaScript?

JavaScript is an interpreted programming or script language from Netscape. JavaScript is designed to extend the capabilities of the web application to provide user interactivity. It is a compact, object-based scripting language for developing client and server Internet applications. A web browser such as Netscape Navigator interprets JavaScript statement embedded directly in an HTML page. JavaScript is used in web site development to do things such as automatically change a formatted date on a web page, cause a linked-to page to appear in a pop-up window and cause text or a graphic image to change during a mouse rollover. JavaScript is an object-based language that comes with many built-in objects. Each object will perform a specific task. It is a scripting language where the commands and functions are embedded in the web document together with other regular text and HTML tags. JavaScript is event-driven that means it will respond to user initiated external events that occur. An event could be a mouse click or when web page is loaded or unloaded. JavaScript is secure as it enforces restrictions. For instance, the application

will not be able to read or write to any file on the web server or the local client machine. It is platform-independent. As long as the browser is JavaScript-capable, it will be able to interpret the commands

Chapter 4
System Design
University of Malaya

Chapter 4: System Design

4.1 Introduction

System design is concerned with how the system functionality is to be provided by the different components of the system. Meanwhile, design defined as the process of applying techniques and principles for the purpose of defining a device, a process or a system in sufficient details to permit its physical realization. It is the creative process in which requirements are translated into representation of software and transforming the problem into a solution. Initially the presentation gives an overview of the system. Subsequent refinement leads to a design representation that is very close to the source code. The common steps involved including analysing, designing, coding and testing the system to ensure that it conforms to the software specifications and requirements. The design of this system can be viewed from the following aspects:

- System architecture design
- System structured chart
- System functionality design
- Graphical user interface design (GUI)
- Database design

4.2 System Design Overview

System design is a very important factor in system development as it determines the success of a system. The system specification describes the features of a system, the components or elements of a system and their appearance to user. Requirements that are around in analysis stage are the one actually translated into design specifications.

The objectives of system design are listed below:

a) Specify Logical Design Elements

- * Detail design specifications that describe the features of an introduction system: input, output files and database and procedures.

b) Support Business Activities

- * Result of using the system help business performance
- * Design fits the way the firm conducts its business
- * Technology is secondary to the results produced using the system

c) Meet User Requirements

Meets user needs stated in term of:

- i) performing appropriate procedures correctly
- ii) presenting proper form of information
- iii) providing accurate results
- iv) using appropriate method of interaction
- v) providing overall reliability

d) Easy to use

- * Favorable human engineering
- * Ergonomic design that is physically comfortable and contributes to user effectiveness and efficiency.

e) Provide software specifications

- * Specific components and functions with adequate detail to construct application software

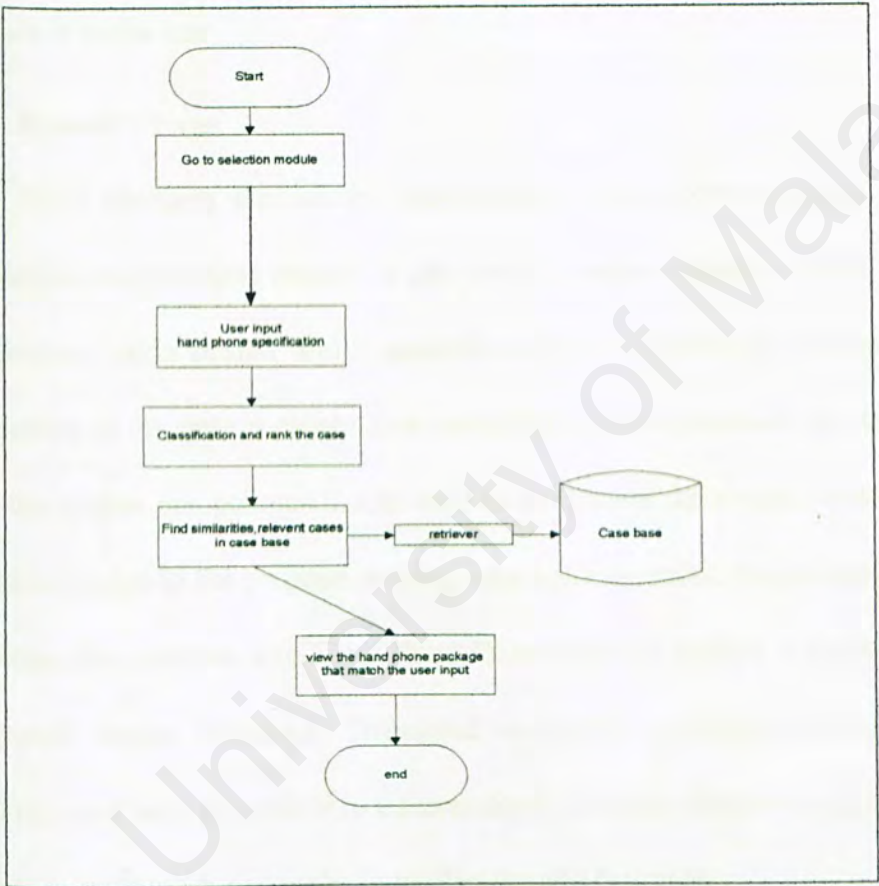
f) Conform to Design Standards

- * Design and specification of the design in accordance with prescribed rules and practices of the organization.

In this stage, the information collected earlier was used to accomplish the design of the system. System design phase is an iterative process of two important stages, namely the conceptual design and technical design. It is a creative process of transforming the problem and requirements into a solution or working system. The conceptual design indicates to the users what the system will perform. Once the users have satisfied and approved the conceptual design level, then the design phase will automatically move or translate into a more detailed document named technical design. Technical design describes the hardware configuration, software needs, user interfaces, input and output of the system, network architecture and files or databases output of this stage is a design specification, which many include structure chart, data flow diagrams, a system

flowchart, entity-relationship diagram and the names and function of any pre written code routines.

4.2.1 Program Flow



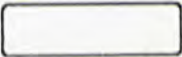
This program flow give the overview how the system work using case base reasoning technique.



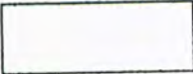
Figure 4.1 Program flow of Hand Phone System Advisor

First the user needs to input the specification of hand phone for example the first are type of hand phone, example NOKIA, SAMSUNG or MOTOROLA the 2nd are price, RM 200 to RM 600 and the third functionality for example SMS ,Composer (ring tones) ,polyphonic , WAP . After user had input the specification the system will calcify the input and rank the case. The CBR ENGINE then find the similarity or relevant hand phone package that provide by the supplier in the case –base and view it to the user.

4.3 Process Design

After choosing the suitable development tools, system design can move into conceptual and technical design. In this project, system design is divided into 3 levels: architecture, code design and executable design. Architecture design related to the association of the system capabilities identified in the requirement specification together with the system components that is used to implement the system. Meanwhile the code design is related to the program writing, whereas executable design specifies the flow of the executable product. Intelligent Hand Phone Package System is designed based on the structured design technique. Structured design is a process-oriented technique for breaking up a large program into a hierarchy of structure chart of modules that result in a computer program that is easier to implement and maintain.

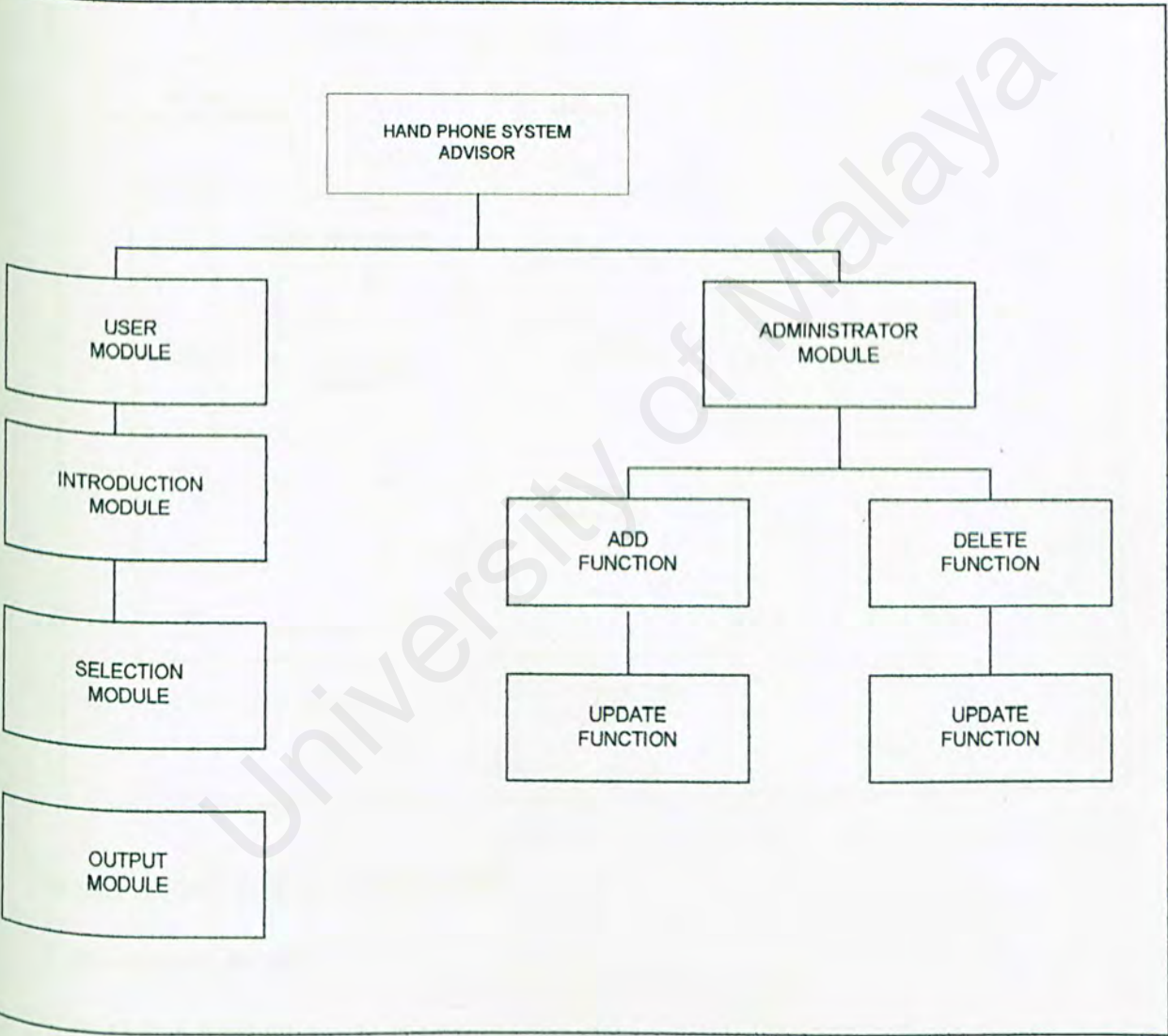
Symbol	Detail
	Process : explain the process

	that of input and output
	Data flow symbol
	Data stores
	external agent

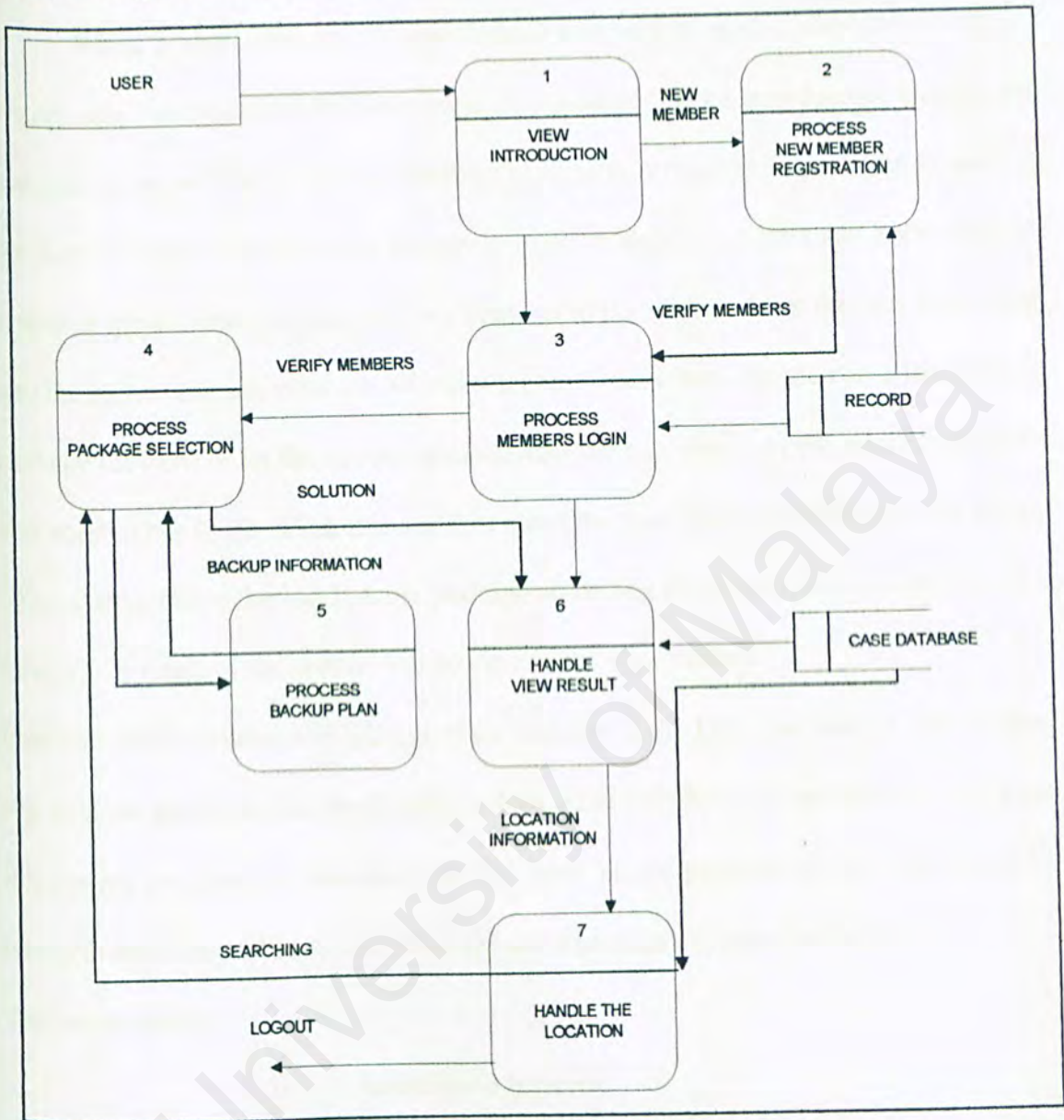
Symbols in Data Flow Diagram

A data flow diagram (DFD) is a tool that depicts the flow of data through a system and work or processing performed by that system. Data flow diagram have been popular for more then 20 years , but the interest in DFD has been recently renew because of their applicability in business process redesign. A business process have become realize that most data processing systems Have merely become outdated, inefficient, and bureaucratic business process, there is renew interest in stream lining those business processes . This is accomplished by the first modeling those business process for the purpose of analyzing, redesigning, and /or improving them. Subsequently information technology can be applied to the improved business process in creative ways that maximize the value to the business.

In Intelligent Hand Phone Package There are some main modules that important for developing the system. These modules are the component that builds up the system. They are sub module that also important to the system. The Case Based reasoning technique will be implementing in the selection module.



4.3. Zero diagram of User Module



In user module they are 3 sub modules:

- i. Introduction module
- ii. Selection Module
- iii. Output module

When a user enter the system, the system will give the overview about the system, this function available in introduction module .In the introduction module the user can chose to register to be a members in register module or login to the system if the user all ready register to the system in login module. User only can enter into the system if the all ready register and be a member to the system. After the user have login into the system the can enter the selection module where they can the chose hand phone package the need or let the system decided what the user need . In the selection module user need to key in the information or data about the hand phone specification in a form. . The system chose the hand phone package according to the user desire selection. The selection or result of the system will be view in the view module.

User can chose to know the address of the supplier at the Location module. Where they can gets the packages that the supplier offers. After that the user can chose to exit from the system or continue searching for the hand phone package. If the user chose to continue searching in the system, they are some process that needs to be done

The processes are:

i. Identifying process

The process being use to identify the cases according input from user. The system will indexing the cases and compare the cases to the case database

ii. Comparing process

Where the cases beings compared with the previous cases .in the cases database. If they are no similar cases with the input cases the system will generate the solution using the similarity process and view it to the user.

iii. Similarity process

If the comparing process didn't found any cases that similar in the case database then the similarity process will search the cases in case data base. If they are more then one case similar in the cases database. The search fro cases will pass to the

iv. Matching process

The case that found using similarity process cannot be the best solution to user. The matching process will find the exact cases and solution for the user.

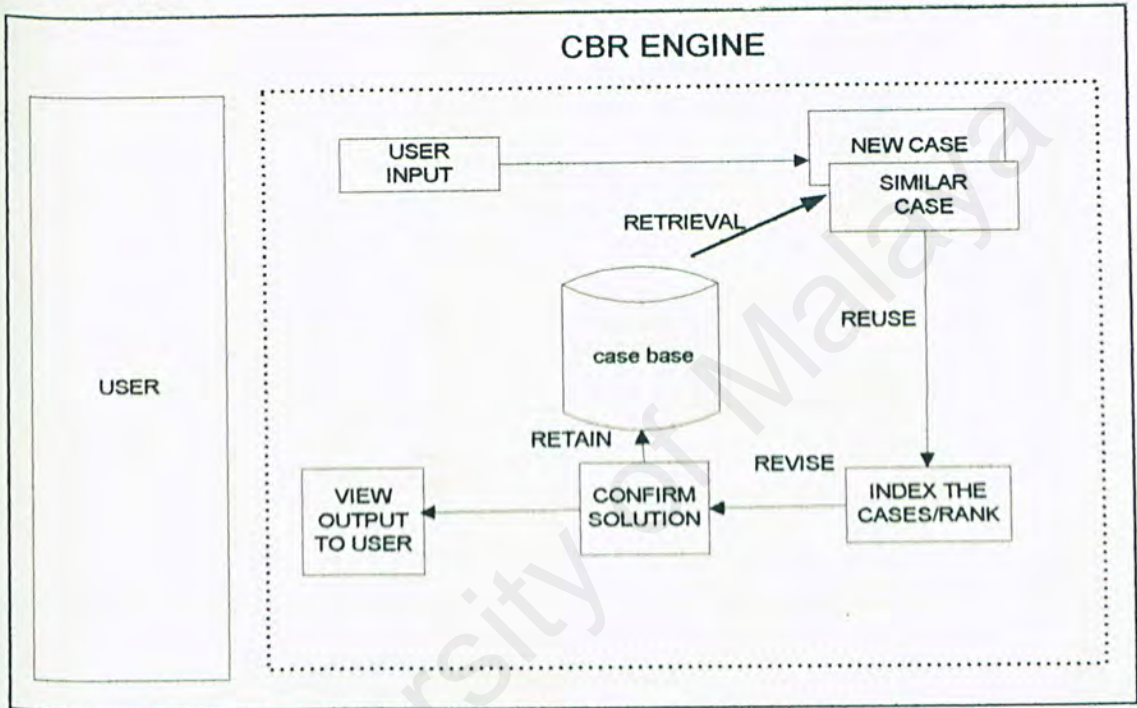
v. Observe process

After matching process the cases will be observe and be graded according to the highest percentage of similarity and be send to the store

vi. **Saving process**

When a new solution is found, this case will be save in the case database.

4.4 CBR engine



Implementing case based reasoning engine consist of designing correct algorithm, choosing data structure for the case base file and coding algorithms in a formal programming language . In order to design correct algorithm, one must take account the functional requirement of the four modules: retrieved, reuse, revise, retain. Choosing an effective data structure for case base file means that said design data structure allow efficient searching of case base .

4.5. Administrator Module

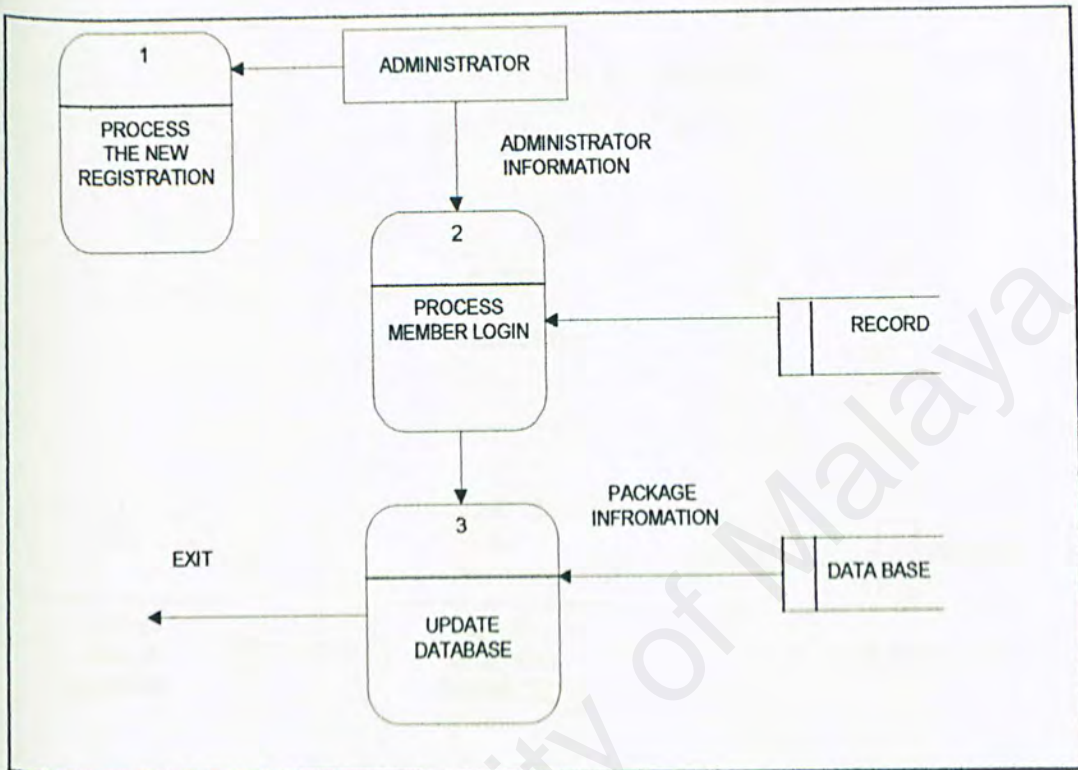
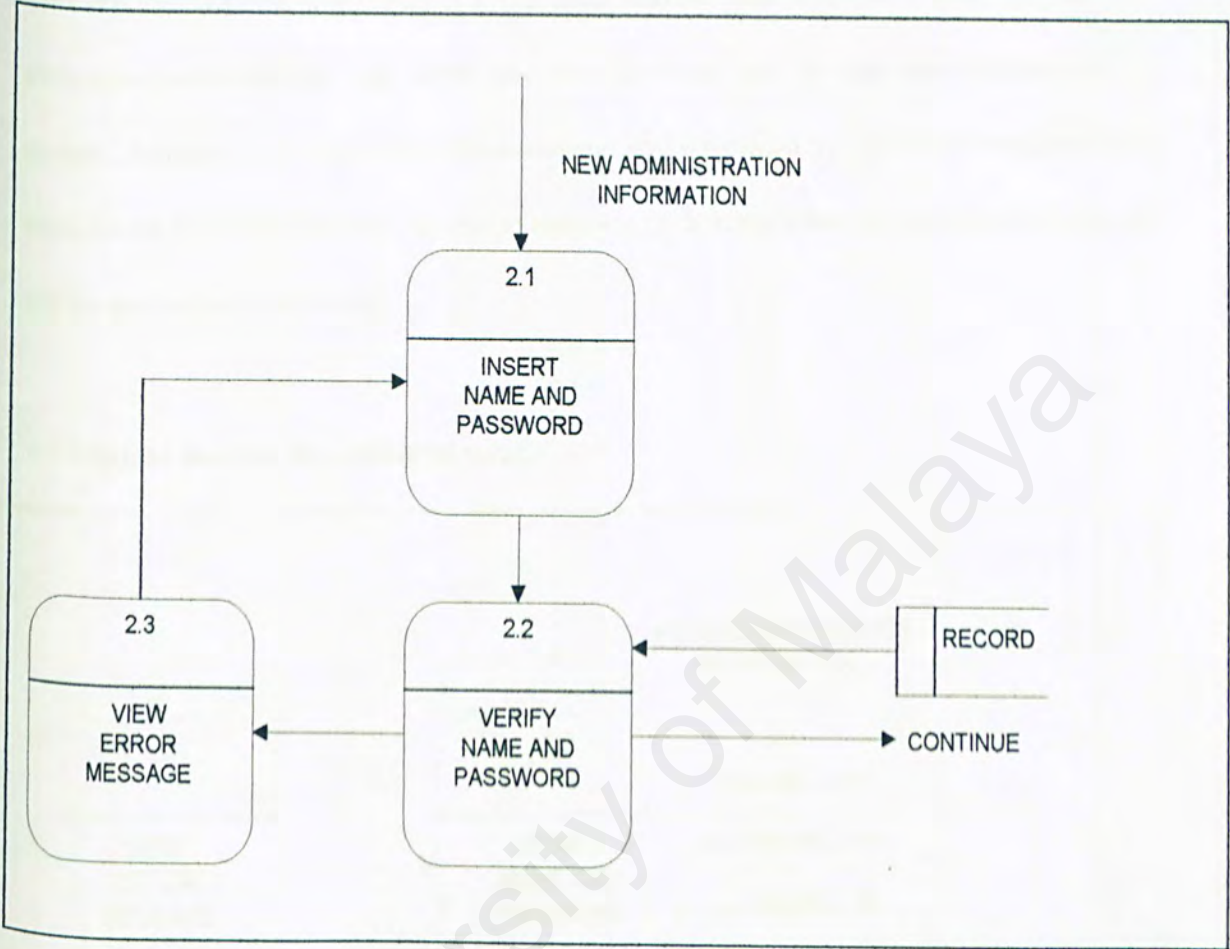


Figure 4.7 Administrator Module

In the administrator module they are 3 sub modules:

- i. Register module.
- ii. Login module.
- iii. Update module.

4.6 Login for administrator



Module Login

This module is purposely build to avoid unauthorized access to the system so that only authorizer administrator can enter into the database and do the maintenance of the system. Administrator has their own username and password to login to the system. This module are build for security reason so they are no a manipulation, modification data by the un authorized personnel.

4.7 Update module for administrator.

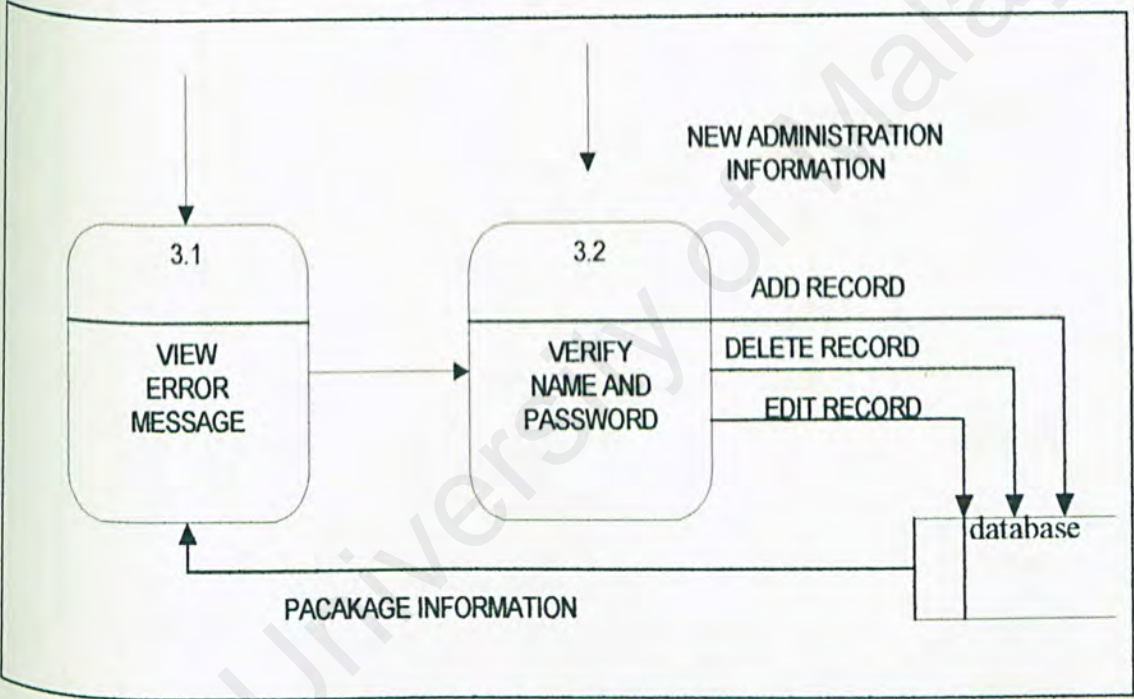
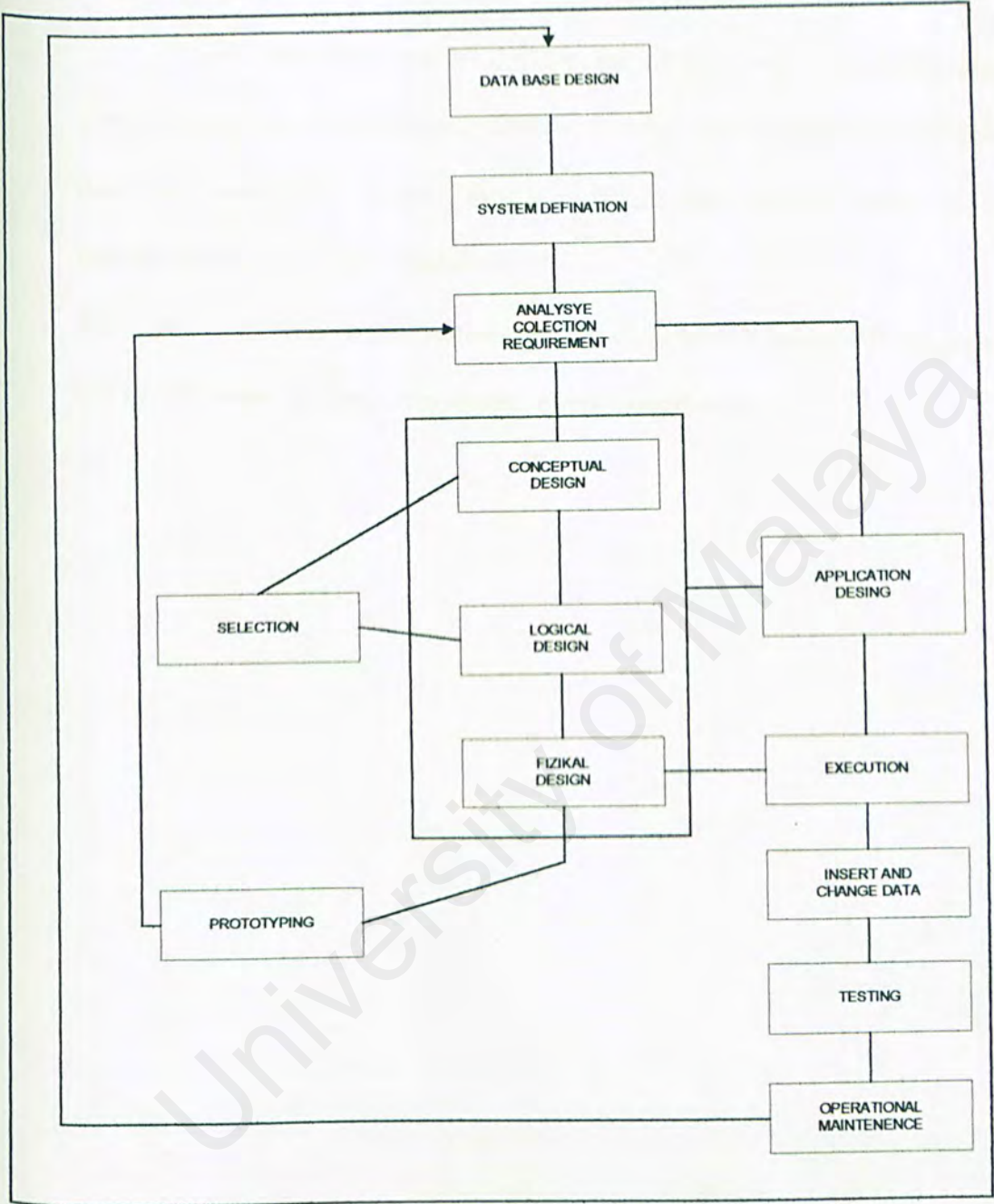


Figure 4.10 First level of the update module for administrator

4.6 Data Base Life Cycle Diagram



4.7 Relational Database

Model that being use to develop the relation with data is the entity relationship model. The relational database is being implemented from relational database management system that is software that control access to and maintenance of data in the database.

The logical structures of the database are the collection of entity. All the entities and attributes are the basic component of relational database.

4.8 Interfaces Design

4.8.2.1 Login Module

HAND PHONE SYSTEM ADVISOR

Administrator Login

Username:

Password:

Figure 4.12 Login Module interface

This is the example of prototype login module that all the users, administrator, or suppliers need to login before enter the system.

4.8.2 Input Screen for User

HAND PHONE SYSTEM ADVISOR

Let us help you chose the best hand phone that fits you

1. Price Range are you Considering?

Up to RM\$300

2. Hand phone with MP3 player

☐ Yes

☐ No

3. Hand phone with GPRS/WAP

☐ Yes

☐ No

4. Hand Phone Brands(The most popular form mobile magazine survey)

☐ Nokia

☐ Samsung

☐ Motorola

☐ Sony Ericson

5. Would you like your phones with the polyphonic ringers ?

Figure 4.13 User selection interfaces

4.83 Output Screen for Hand phone Suggestion

HAND PHONE SYSTEM ADVISOR	
Brand:	samsung
Price:	2199
Model:	sgh-c100

HAND PHONE SYSTEM ADVISOR	
Brand:	samsung
Price:	2199
Model:	sgh-e700

HAND PHONE SYSTEM ADVISOR	
Brand:	samsung
Price:	2199
Model:	e700

HAND PHONE SYSTEM ADVISOR	
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CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 Introduction

System implementation is the process that converts the system requirements and designs into program codes using selected programming language. It focuses on implementing the solution as software. This stage involves both application and database implementation. Nevertheless, the system analysis, system design and implementation phases are usually overlapping with one another, as they do not have a clear boundary. Hence, this phase at times involves some modifications to the previous design.

5.2 Development Environment

Development environment has certain impact on the development of a system. Appropriate hardware and software chosen will not only help to speed up the system development but also determine the success of the project. Below are the lists of hardware and software tools being used to develop the entire system?

5.2.1 Hardware Requirement

Hardware requirement during system development process are as below:

- Pentium 133 MHz processor and above
- 32MB RAM and above
- Hard Disk capacity 4 GB and above
- Other standard desktop PC components
- Network connection

5.2.2 Software Requirement

5.2.2.1 Software Tools for Design and Report Writing

There are a lot of software tools that can be used in designing and writing report. The design process involves drawing of structure chart, data flow diagram and others that form the foundation of the software development. This logical design

is able to graphically describe an overall view of whole system and the also interconnection between modules. Microsoft Word is the software that used to design and write report for this system.

5.2.2.2 **Software Tools for Development**

During the system development process, software tools as determine during system analysis (Chapter 3) are being used. However, there is minor modification at the software version and also few additional tools are selected. Table 15 depict the software tools used to develop the system.

Technologies/Software	Description	Purpose
Windows 2000	Operating System (OS)	System Requirement
MySQL	Database that store and manipulate data	Database
Apache server	Web Server Host	System Requirement
Micromedia Dreamweaver MX	Coding the web pages	System Development
Hypertext Pre Processing (PHP)	Coding the web pages	System Development
Hyper Text Markup Language (HTML)	Coding the web pages	System Development
Javascript	Coding the web pages	System Development

5.3 **Program Development and Coding**

Program development is the process of creating the programs needed to satisfy an information system’s processing requirements. Developing and Coding is the phase which takes the longest time in the development life cycle. Therefore, using the right tool and the right way to develop the system are crucial in determining the success of a project. For Hand Phones Packages System Advisor, it involves developing using different programming languages from Hypertext Pre Processing, JavaScript, and Hyper Text Mark-up Language (HTML). Before starting on the coding process or any other detailed works on the program, a review on the

program documentation needs to be done followed by design of the program and finally going into the program coding process.

5.4 Review the Program Documentation

The first and foremost step to be taken in program development phase is to review the program documentation that was prepared during the earlier phases. The program documentation prepared in the system design phase of IBS consists of architectural view, concepts and controls, module flow diagram, data dictionary and also the sample layout of the interface. The documentation provides a guide and an understanding of the works that need to be done in the coding phase.

5.5 Designing the Program

After reviewing the program documentation, designing the program is the next following process after that. For this phase, determining how the program can accomplish the features and functions that are described in the program documentation and developing a logical solution to the programming problem is done. The logical solution or the logic of the program is a step-by-step solution to the programming problems.

5.6 Coding Approaches

There are two approaches in coding, namely top-down and bottom-up. The bottom-up coding is based on coding some complete lower level modules and leaving the high-level modules merely as skeletons that are used to call the lower modules, whereas the top-down approach is the reverse.

Hand Phone Packages System Advisor was developed modularly using both the top-down and bottom-up approaches. Developing Hand Phone Packages System Advisor with top-down approach involves building the high-level software modules that are refined into functions and procedures. The advantages of using bottom-up approach in Hand Phone Packages System Advisor are:

1. Testing can begin on some of the modules while others are still being coded.
2. Critical functions can be coded first to test their efficiency.

5.7 Coding Style

Coding style is an important attribute of source code. An easy to read source code makes the system easier to maintain and enhance. Elements taken into considerations while coding a easy to maintain and enhance system are internal documentation, standard naming convention and standard graphical user interface.

Internal documentation is achieved by using comments while coding, providing a clear guide to programmers for future enhancement. Statements of purpose indicating the functions of modules and descriptive comment are embedded into source code to describe the processing functions.

A standard naming convention and also a standard usage of graphical user interface components is employed in developing the system making. Standard naming convention provides programmers with easy identification of variables. While a standard in usage of graphical user interface components provides the users an environment that will not generate much surprise to them. Usages of these standards perform as a mean towards coding consistency and standardisation.

5.8 Development Tool – Macromedia Dream weaver MX

This tool enables easy performance of the many complex programming and database tasks required in the creation of a web site, as well as the incorporation of HTML formatting and layouts, graphics and other multimedia components.

When working on a web site with apache Server and performing tasks like adding files to the site or editing any of the existing files, this tool creates a second copy of the files on the local computer. This is called the working copy. Whenever these working copies are saved, Visual InterDev updates the file on the web server as well.

5.3.4 Debugging

Debugging was carried out when the particular functions or codes did not perform what is intended or the worse is that it prompt error when is run or during compilation. Debugging of codes are made easier with the usage of IDE tool when coding in HTML with embedded PHP

5.3.4 Description of the System Modules and Functionality

Basically this system can be categorized into 8 sections. The table below shows the description on each module and also its functionality.

Module	Description	Functionality
User	General Users and all visitors can directly access to the system for selection	General Users and all visitors can view and get the information regarding to the Hand phone item advertising and marketing promotion provided by the front-end system without login to the system.
Administrator	Administrator login into the system to perform their daily jobs.	Enable only valid administrator to access into the back-end system based on their position and department by authentication. As a result, the users with certain access right are only allowed to access certain level of the system to increase security.
	Add and Delete function For the system maintenance and update	This function only valid to the administrator Only to perform add and delete function for of the hand phone model so the system always update with the latest model.

Table 5.2 Module Function Descriptions

5.4 Chapter Summary

The implementation assures that the system being developed is operational and then allowing the users to take over its operation for use. After the detail explanation of the implementation phase, the next chapter will discuss about the testing phase. This is also a very important stage whereby testing is essential to assure quality of the system. During system implementation, system requirements and designs were converted into program codes. Besides, it also involves development environment setting such as the operating system and the database server. Several software tools were used to deploy the design into machine-readable language and then in turn to produce the required applications.

Chapter 6

System Testing

After the development and coding in implementation phases, this is followed by the system testing stage. Testing is done throughout the system development and not just at the end. All the system's newly written or modified application program as well as procedural manuals, hardware and system interfaces are tested thoroughly. Testing also meant to turn up heretofore unknown problems. Testing is an essential series of steps that helps assure quality of the system. It is done on many different levels at various intervals as work progresses.

Many programmers view testing as a way to demonstrate how their programs perform properly. However, the idea of demonstrating correctness is really the reverse of that testing is all about. We test a program to demonstrate the existence of a fault. Because our objective is to find faults, we consider a test successful only when a fault is discovered. Fault identification is the process of determining what fault or faults caused the failure, and fault correction or removal is the process of making changes to the system so that the fault are removed.

6.1 Types of Faults

The objective of testing is to find error and fault. Fault identification is the process of determining what fault or faults caused the failure, and fault correction or removal is the process of making changes to the system so that the faults are removed . When no obvious fault exists, program is tested to isolate more faults by creating conditions where the code does not react as planned. Therefore, it is important to know kind of faults to seek. Faults can be categorized as below:

1. Algorithmic faults
2. Syntax faults
3. Documentation faults

6.1.1 Algorithmic Fault

Algorithmic faults occur when a component's algorithm or logic does not produce the proper output for given input because something is wrong with the processing steps. These faults are easy to spot by reading through the program (call desk checking) or by submitting input data from each of the different classes of data that we expect the program to receive during its regular working.

Typical algorithmic faults include:

1. Testing for the wrong condition.
2. Forgetting to initialize variables or set loop invariants.
3. Forgetting to test for a particular condition (such as when division by zero might occur).

6.1.2 Syntax Fault

Syntax faults can be checked while parsing for algorithmic faults. This will ensure that the construct of programming language is used properly. Microsoft Interdev does not come with a compiler to catch syntax faults before a web page is published. Therefore, syntax faults within web pages can only be traced after the web pages have been published.

6.1.3 Documentation Fault

Documentation fault occurs if the documentation does not match what the application does, and such faults can lead to other faults later because of the wrong implementation.

Usually, documentation is derived from system design and provides a clear description of what the programmer would like to program to do, but the implementation of these functions is faulty. Such faults can lead to other faults later.

6.2 Testing Planning

The purpose of having test planning is to help in designing and organizing tests, so that testing is carried out appropriately and thoroughly.

A test plan has the following steps:

- a) Establishing test objectives
At the beginning, we have to know what we are going to test on. So we have to establish our test objectives.
- b) Designing test cases
After establishing test objectives, we begin to design the test cases that are used to test the system.
- c) Writing test cases
After designing, we have to start writing the test cases.
- d) Testing test cases
At the same time, we also test the test cases.
- e) Executing tests
After all testing have been done, we execute our tests on the system.
- f) Evaluating test results
After executing tests, we evaluate the test results.

6.3 Testing Process

Testing is a process of exercising or evaluating a system by manual or automatic means to verify that it has satisfied requirements or to identify differences expected and actual results. Testing is probably the least understood part of a software development project. A bug is any unexpected, questionable, or undesired aspect or behavior displayed,

facilitated or caused by the software being tested. Testing can uncover different classes of errors in a minimum amount of time and with a minimum amount of effort.

In the testing phase, the system is tested as a single, monolithic unit. IBS are built out of modules or sub-systems, which are again, built out of sub-modules which are composed of procedures and functions. The testing process therefore proceed in stages where testing is carried out incrementally in conjunction with system implementation.

The testing process consists of five stages as shown in Figure 6.1 below. In general, the sequence of testing activities not only includes component or unit testing, integration testing and user testing. Due to the fact that defects are discovered at any on stage, they require program modifications to correct them and this required other stages in the testing process to be repeated. Errors in program components come to light at later stages of the testing process. The process is therefore an iterative one with information being fed back from later stages to earlier parts of the process.

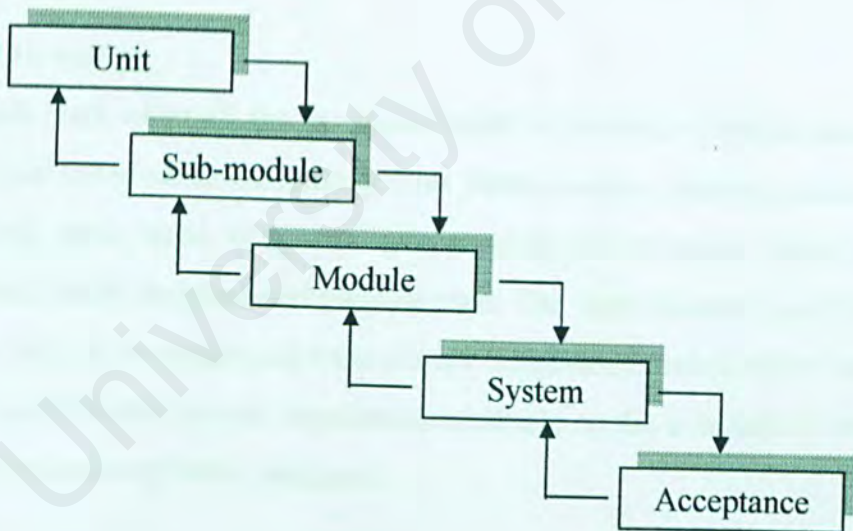


Figure 6.1: Testing process

As can be seen from the Figure 6.1, the arrows from the top of the boxes indicate the normal sequence of testing and the arrows returning to the previous box indicate that previous testing stages is repeated. The stages in the testing process are:

Unit Testing

After a program is completely coded, it will be tested under unit testing. Individual components are tested to ensure that they operate correctly. Each component is tested independently, without other system components.

Sub-module testing

A sub-module is a collection of dependent components like collection of procedures and functions. A sub-module encapsulated related components so can be tested without other system sub-modules.

Sub-system/ module testing

Module testing will start when all the programs under a particular module have been completely coded and tested under unit testing. This phase involves testing collections of sub-modules, which have been integrated into modules/sub-systems. Some of the modules are independently designed and implemented. The most common problem that arises during this stage in the system, as modules are integrated is sub-systems interface mismatched. The modules test process therefore concentrate on the detection of interface errors by rigorously exercising these interfaces.

System testing

The system testing is to recover errors associated with interfacing when integrating all the modules. The modules are integrated to make up the entire system. The testing process is concerned with finding errors that result from unanticipated interactions between modules and system components. This includes testing the interfaces between modules, the correctness of the output and the usefulness of the system documentation and output.

It is also concerned with validating that the system meets functional and non-functional requirements.

Acceptance testing

This is the final stage in the testing process, before the system is accepted for operational use. The system is tested with data supplied by the end users rather than simulated test data. Acceptance testing reveals errors and omissions in the system requirements definition because real data exercises the system in different ways from the test data. Acceptance testing also reveals requirements problems where the system's facilities do not really meet the user's needs or the system performance is unacceptable.

6.3.1 Testing with test data and live data

Before the system is put into production, all programs are desk-checked, checked with test data, and checked to make sure that all the modules work together with one another as planned.

Program testing with test data

At this stage, first of all, all the programs written is desk checked to verify the way the system will work. Each step in the program is check to ensure the routine works as it is written. This is followed by both valid and invalid data test. These data are run to see if base routines work and also to catch errors. Test data include possible maximum and minimum values, as well as possible variations in format and codes. Outputs from test data are carefully verified.

Link testing with test data

When programs pass desk checking and checking with test data, it went through link testing. Link testing checks to see if programs that are interdependent actually work together as planned. A small amount of test data are designed to test systems specifications as well as programs, is used for link testing. It takes several passes through the system to test all combinations. This is because it is immensely difficult to unravel problems if everything is test at once.

Test data that are used cover variety of processing situations for link testing. First, test data are processed to see if the system can handle normal transactions. If the system works with normal transactions, then variations are added, including invalid data used to ensure that the system can properly detect errors.

Full system testing with test data

When link tests are satisfactorily concluded, the system as a complete entity is tested as well. Test data created for the express purpose of testing system objectives are used.

System testing includes reaffirming the quality standards for system performance that were set up when initial system specifications were made. Everyone involved in the system once again agree on how to determine whether the system is doing what it is supposed to do. This will include measures of error, timeliness, ease of use, proper ordering of transactions, acceptable down time and understandable procedure manuals.

Full system testing with live data

When system tests using test data prove satisfactory, the new system is tried with several passes on what is called as “live data” – data that have been successfully processed through the existing system. This allows an accurate comparison of the new system’s output with what that is known to be correctly processed output, as well as a good feel of how actual data will be handled.

6.4 Unit Testing

Unit testing verifies that the component functions properly with the types of input expected from studying the component's design. The first step is to examine the program code by reading through it, trying to spot algorithm, data and syntax faults. This is followed by comparing the code with specifications and with the design to make sure that all relevant cases have been considered. Next, the browser is used to view the web pages

or result and then eliminate remaining syntax faults if necessary. Finally, test cases are developed to show that the input is properly converted to the desired output.

Unit testing tries to look for all the possible errors that will occur in a program. A complete test process should test all of the following categories of test data:

- a) Normal data – to test a given correct data will produce the expected results
- b) Erroneous data – for a given erroneous data, like invalid date format, does the system detect it or not?
- c) Boundaries value analysis – data that are out of the range specified will be used to test the system because errors may occur at the extreme point
- d) Condition testing data – some functions may be active under certain condition, therefore a set of data are tested on all possible conditions

The first stage of testing Hand System Advisor is unit testing. Unit testing involves testing each component on its own, isolated from the other components in the system. The following steps specify how unit testing is carried out for this system:

- a) The code of the program is examined by reading through it to spot for algorithmic faults and syntax faults.
- b) All command buttons, text boxes and other control objects are tested to check its functionality.
- c) Different types of test data are used like number, character, date and etc. to test all the control objects.
- d) The web page is published to eliminate remaining faults.
- e) Test cases are developed to ensure that the input is properly converted into the desired output.

Examining the code

In this stage, the codes of the program are read to identify faults. After that, a code walk-through is carried out. In a walk-through, the code and the accompanying documentation are presented to the review team. Then, the team will comment on their correctness. For this project, the review team members consist of my course mates. Walk-through is conducted in an informal manner. This method is useful to identify faults that have been left out by the programmer.

Control Objects Testing

Command buttons are clicked to test their functionality and text boxes are tested with different data types and also null value to make sure invalid data will not cause any fault.

Different Data Type Testing

Different data types like numbers, characters or date is used to test certain function because some control objects will only accept certain data type, invalid data type can be traced by the system without causing any error.

Choosing Test Cases

To test a component, input data and condition are chosen. Then the component is allowed to manipulate the data, and output is observed. The input is selected so that the output demonstrates something about the behavior of the code. A test point or test case is a particular choice of input data to be used in testing a program. A test is a finite collection of test cases.

To perform tests on the components, we must first determine the test objectives. Then, we select test cases and define a test designed to meet the specific objective. Some data

are purposely chosen to be improper. This is to check that the code handles incorrect data gracefully.

Test Thoroughness

To test a code thoroughly, we can choose test cases using at least one of several approached based on the data manipulated by the code:

- Statement testing: Every statement in the component is executed at least once in some test.
- Path testing: Every distinct path through code is executed at least once in some test.

6.4.1 Unit Testing Example

There were many test cases involved in testing Hand Phone System Advisor. Therefore, only a few will be shown as example.

Unit Test Case Example 1

Each table in server database has at least associated with two trigger programs. Unit testing was carried out on each trigger program once it was completed. Table below shows the test case for unit testing of hand phone selection file.

Step	Test Procedure	Expected Output	Test Result Analyzing
1	For User Module ,User Fill-up forms (radio button) with various data of hand phone specification	System determined the output and the data in the case base will be added or update	System View the suggestion of the hand phone model ,brand and price

2	Fill-up different selection specification of hand phone feature.	System check in database according to the user selection.	System View the suggestion of the hand phone brand.
3	Fill-up different selection specification (brand) of hand phone feature.	System check in database according to the user selection (brand)	System View the suggestion of the hand phone model ,brand and price
6	Filled all the require fields in correct selection and methods and then submit	System check in database according to the user selection	System View the suggestion of the hand phone

Table 6.1 Test Case for User Module Hand System Advisor

Unit Test Case Example 2

Administrator module in the Hand Phone System Advisor Web Based Application will update the database went user Add and Delete table in the MySQL database. Unit Testing was carried out to ensure that the table was updated successfully. Table below shows the test case for unit testing on the function of updating the records. The Change Password Administrator module in the Hand System Advisor application will update employee and membership password in the server database if they could provide the correct combination of User ID and Password. Unit Testing was carried out to ensure that the password was updated successfully. Table below shows the test case for unit testing on the function of changing password

Step	Test Procedure	Expected Output	Test Result Analyzing
1.	Before enter the delete and add function administrator must enter the login function this system	System display member profile for correct member name and password verification.	The correct requested profile records are retrieved.
2.	Testing for correct combination of administrator name and password.	System display authentication.” welcome Administrator”	Systems retrieve profile records of the correct login function name and password.
3	Edit profile in the database of the administrator user name and password and test the login function	The modified profile records for administrator are updated and the request of the login is verified.	Objective of updating the records into admin table is achieved.

Step	Test Procedure	Expected Output	Test Result Analyzing
4	Enter User ID and Old Password. Testing for incorrect combination of User ID and Password.	System verifies the valid Administrator in making the changes of the database. System will display failed authentication e.g. access denied for incorrect User ID and Password.	Message incorrect User ID and Password will be displayed (access denied) if the combination of User ID and Password does not exist.

Table 6.2 Test Case for Edit for Login Profile Records

Unit Test Case Example 4

Testing is being done with the function of ADD and DELETE function of the administrator module

Step	Test Procedure	Expected Output	Test Result Analyzing
1	Testing being made to add function where the new hand phone models and it specification like brand model price and hand phone functionality like messaging , check in the data base to verify that the new data is being added	The row in database table data spec will be increase	The database in data spec table will show the new data that has being inserted
2	Testing being made to delete function where the hand phone models and it brand specification are selected to be deleted	The row in database table data spec will be added	The database in data spec table will delete in the table.

Table 6.4 Test Cases for Add and Delete Function

6.7 Integration Testing

When the individual components are working correctly and meet the objectives, these components are integrated into a working system. In other words, integration testing is the process of verifying that the system components work together as described in the system and program design specifications.

Integration testing is used in Hand Phone System Advisor for constructing its program structure while at the same time conducting tests to uncover errors associated with interfacing.

6.8 System Testing

The last testing procedure done is system testing. Testing the system is very different from unit testing and integration testing. The objective of unit testing and integration testing is to ensure that the code has implemented the design properly. In other words, the code is written to do what the design specifications intended. In system testing, a very different objective is to be achieved, that is to ensure that the system fulfills user requirements.

Hand Phone System Advisor is tested whether it meets specific performance efficiency objectives in Performance Testing. Data Integrity Testing is used to verify that the data is stored in a manner where it is not compromised under updating, restoration or retrieval processing in Hand Phone System Advisor.

The following system testing was also carried out

*** Recovery Test**

Recovery test address responses to the presence of faults or loss of data, power, devices or services. One of these was carried out by shutting down the server and activates the Hand Phone System Advisor application.

The test result showed that Hand Phone System Advisor application could still function properly by retrieving records from the database.

*** Stress Test**

Stress test is to determine whether a program fulfill the requirements defined for it. Equally important is to make sure that program works, as it should, even under extreme condition.

One of these tests was carried out by activating ten accesses simultaneously. The test result showed that the system is able to activate ten accesses simultaneously without any problem.

* **Security Testing**

Verify the protection mechanism in the system against improper penetration.

* **Function Testing**

Function testing is based on the system functional requirements. The testing is carried out for 2 modules and its sub-modules in Hand Phone System Advisor. This modules including User Section, Administrator Login Section, and Budget vs. Actual Sales sub-modules within the Executive Information System. Each module is tested individually to determine whether the system performs as required

* **Performance Testing**

Performance Testing addresses the non-functional requirements of the application.

The types of performance tests carried out for this application are

a) Volume tests

The fields and records are checked to see if they can accommodate all expected data.

b) Security tests

This test ensures that the application fulfills the security requirements.

c) Timing tests

System performance is timed to ensure that it meets user's requirement.

d) Human factor tests

Display of the web page and messages are examined to determine user friendliness.

e) Browser independence tests

6.9 Chapter Summary

Having discussed about the system testing and implementation, the next chapter will see the system evaluation. This coming chapter will touches various things like problems encountered during the development process, system strength and limitation and others.

Chapter 7
System Evaluation
University of Malaya

Chapter 7- System Evaluation

After having gone through the implementation and testing phase, the final phase of developing this system is the evaluation stage. In this phase, system evaluation involves determining the problems or difficulties, which arise during and after the program coding phase, recognizing the system strengths and weaknesses, and finally draft out the system limitations and also its future enhancements.

7.1 Problems encountered and solutions

Research and studies on the fields such as the systems similar to hand phone packages system advisor are not much available in the internet.. It was too general or might be a physical office that full of electronic technology.. At the beginning development of the system, I have confused and misunderstand of the scope of my system. Fortunately, through the guidelines from my supervisor and moderator, I get some idea in developing this Hand Phone System Advisor. For the hand phone packages system advisor, Besides that, grasping the concepts of a totally new programming environment in My MySQL database using PHP (Hypertext Pre Processing) and JavaScript are also take times to learn and master it. A study though out the books does not guarantee you know how to apply it practically in your system. Moreover, many problems and difficulties appeared during the whole system development. Few of the major problems and difficulties encountered during the development and coding process is listed below.

7.1.1 Difficulties in Choosing a Development Technology, Programming Language and Tools

There are many software tools available to develop a web-based database system currently as stated in the earlier chapters. Choosing a suitable technology and tool was a critical process as all tools have their strengths and weaknesses. In addition, the availability of the required tools for development is also a major consideration.

In order to solve this problem, advises and views were sought from project supervisor, course mates and even seniors engaging in similar project. Furthermore, surfing the Internet and visiting the library helped to clarify some doubts.

7.1.2 Getting Familiar with Development Platform and Tools

Macromedia Dream Weaver MX

While developing Hand Phone system, the first difficulty that is encountered is about the learning of the tools needed for development of the system. Through the teaching from my team members, I am getting a basic knowledge on how to work with this development tools.

Macromedia Dream weaver MX is a Macromedia latest Web Based development tool for Web applications. It was renumbered to fit the PHP, ASP, JSP, Java, Cold fusion is a major upgrade that improves the development environment and product integration among the family of macromedia products. For example, while developing a database

Macromedia Dream weaver MX is a complex product with many development and management features. Once you understand the technology of PHP (Pre Processing Hypertext, SQL Language and JavaScript, you realize that Macromedia Dream weaver is really an all-in-one development tool for creating data-driven Web applications.

My SQL

For first time user, especially for those who are not familiar with MYSQL Server Database platform, like some of the IBS development's group members including me, facing some difficulties when using and configuring this software application database server. For example, at the beginning of my system development duration,

I was unable to insert data into the database because of the incorrect setting. These force me to reinstall the program again. By following the instruction through out the reference books the program was configured correctly.

source code, and view the output results through the browser, you will get a better understanding of the function writing in that language.

7.2 System Strengths

This Hand Phone system Advisor is Web Based Application systematically as follow:

a) Security

This system is implemented with security login. For Administrator, login is required before using the ADD and Delete Function system. The login screen requires Administrator ID and Password only. If the user enters the wrong password, this system will not allow the user to access the system. An authentication and authorization function is needed for ensuring the integrity of the system. For security purpose, only authorized access rights to their department system to perform their daily task. . This can avoid non-authorized users access the system to perform task illegally.

b) Simple and user-friendly interface

Hand phone System Advisor is developed by using Graphical User Interface (GUI) and hyperlink connection based development tools, therefore, all pages are kept simple. This is to provide a user-friendly system to the user for fast learning and ease of use. Command button, text box and other control objects are used to allow the user to execute command with ease. An action is just a click away and the user just needs minimal knowledge of mouse and keyboard to use this system. For instance, within the Hand Phone System Advisor, the executive

only have to select the items through out the hyperlink and list boxes without typing any words unless setting and editing the Target Sales. This features make executive saving their time and make their job more efficiency and effective. Moreover, they don't need to memorize all the product category and code in their mind.

c) *Searching/ Information Retrieval capability*

A good information retrieval system is designed such that it is easy to use even for a novice user. The system allows searches/ information retrieval function to be performed and so on by retrieve record from the database based on the user request.

d) *Display process message*

There are a lot of processes between the system and its database; therefore, it is important to inform the user what the system has done when clicking on any command button. Messages like 'Access Denied" or 'Welcome Administrator" will be displayed to inform the user the actual process produce by the system. Without these messages, user might think that the system is faulty if no results are returned when a command is executed. In addition, user also knows that the records are updated or inserted into the database successfully.

e) *Incorporates data validation*

Data validation is done prior to insert record into the database. All the fields in the form will be checked for null value or invalid data type. With this feature, error when inserting record into the database will not occur. Error message will also be prompted to the user if important field is not filled. For instance, the user must filled up all the required fields in the correct manner before they can accepted as a membership user. Furthermore, in the Setting New Target Sales within the Executive Information System, the executive are only allowed to enter the Numeric value for each target sales figure for system to calculate the unit variance or percentage.

7.3 System Constraints

Due to time and knowledge limitation, there are a few system constraints in Hand Phone System Advisor, some of them are discussed below:

- a) The last year actual sales price will need to insert manually into the database for testing purpose because there is no maintenance system to keep track the last year record. Anyway, the existing system will operate accurately in the real time environment. The maintenance system can be considered as a future enhancement for this system
- b) This Apache server of the system only can run and operate at Windows 2000 or higher version due to the compatible software requirements and platform. But it can be access from others platforms with Internet Explorer.

7.4 Future Enhancements

System development is a dynamic process and changes must be expected. For this information system, there can still have some improvements. Here are some suggestions for future enhancements to increasing the powerful of the whole Hand Phone System Advisor:

- a) All the report can be printed
If the all the business reports and information can be printed in a hardcopy, this utilities will fulfilled the user requirements
- b) Help Function
A Help function should be added into the system to provide information to the entire user especially for the beginner user to operate with each module.
- c) Attractive Homepage
IBS will become better publicized if its homepage is enhanced to be more attractive and interactive by adding more meaningful and user-friendly images, 3D images, animation images and sounds.
- d) More Modules and Functions

Adding more modules and functions, for example, Forum and Chatting Services can enhance Hand Phone System Advisor. Moreover, Picture, chart result can be used to attract more users using the system.

f) User Customisation

User customisation is what currently most service providers are providing their users with. With user customisation, users can determine the contents of the site that they wish to have or member services that they intend to have. As user customisation will involve yet another complex and detailed planning to be done, it will be a good and beneficial service to be provided to users as a future enhancement.

7.5 Knowledge and Experience Gained

From the beginning of this project until the final documentation, a number of problems have occurred and experiences are learned from there. This project gives a lot of benefit and knowledge, there are:

a) The importance of all phases in SDLC

System analysis is an important phase in the system development life cycle (SDLC). This phase capture user requirements and the goal of the system. If this phase is wrong defined, it will cause faulty to the system development and later progress. With a complete and thorough system analysis, the system that is developed will fulfill all the requirements and achieve its goal.

System testing is also an important phase in SDLC. There is no application that is free of error in this world. However, with the procedures in the system testing phase, errors and faults in the system can be minimized. The functionality of each module or form can also be tested and confirmed that it meets the user requirements.

b) Development tools knowledge

This project is developed using, Macromedia Dream weaver MX with Apache Web Server, My SQL, PHP, and JavaScript. a very powerful development tool for developing Web based environment information system. It is easy to use and

provides graphical user interface. MySQL is used as database for this system; it is a large and powerful database program that provides a lot of functionality such Backup, Restore, Query Analyzer and etc. In addition, the weaknesses of Access database are solved

7.6 Chapter Summary

The next chapter is the conclusion of this report which summarizes all the details from chapter on to chapter seven of the report, which started from introduction and followed by literature review, methodology, system design, system development, system testing and implementation and lastly system evaluation.

SUMMARY/CONCLUSION

As a conclusion Case Base Reasoning system is a automation system that compare the hand phone packages using Case based Reasoning technique. This system use Nearest Neighbor algorithm one of the method in case base reasoning. This system allowed user to choose their hand phone according to the hand phone packages specification that the consumer need. This system also allowed supplier of the hand phone to advertised and promoted their product and it will help to increase the selling of their product.

REFERENCES

- Chappell, David. (2000). Understanding Microsoft Windows 2000 distributed services. USA: Microsoft Press.
- Sommerville, Ian. (2001). Software engineering (6th ed.). England: Addison-Wesley Publishers Ltd.
- Pressman, Roger. S.(1998). Software engineering: A beginner's guide. USA: McGraw-Hill.
- Jeffrey L. Whitten, Lonnie D. Bentley, Kevin C. Dittman (2001) System Analysis And Design Method USA McGraw- Hill.
- Mobile World Magazine (2003) August/September Issue 8
- Askandar Ab Rashid, Zaitun Ismail, (2001). Developing Website Using HTML Step By Step. Kuala Lumpur: Venton Publising.
- George F Luger (2002) Artificial Intelligent: Structure and Strategies for Complex Problem Solving (4th) USA: Addison Wesley.
- Sellapan ,(2000). Software Engineering : Management and Method, 1nd ed Petaling Jaya. Senjana Publishing
- Brad Bulger,Jay Greenspan,David Wall(2002)MySQL /PHP Database Application ed Wiley

WEB PAGES

www.mhhe.com

<http://php.weblogs.com>

<http://www.mysql.com>

www.macromedia.com

<http://www.nokia.com>

[www. mobileworld.com.my](http://www.mobileworld.com.my)

<http://sample.vitnet.com.sg/showcase/handphoneshop/product>

<http://www.fda.gov/cellphones/>

<http://www.oke.com/>

www.samsung.com

www.digitalamit.com

www.3dbuzz.com