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Abstract

Bowling is a very well-known sport around the world. In our country itself more people play bowling everyday but yet we are still lack of professional bowling player who can bring up our country name in the eyes of the world. Interactive Bowling Portal (IBP) is a package that introduces bowling sport to more people in our community. This portal can be classified as a learning package that allows users to learn and enhance the understanding of bowling on more detailed way. The sections that can be found in this portal are Introduction to Bowling, Bowling History, Let's Go Bowling, User Feedback, Send Your Vote and Bowling Game.

In providing convenience to users, this system is developed as a web-based application where user can access the portal website online and using Human Computer Interaction (HCI). This portal is also wholly build-up in English language and using Active Server Pages (ASP), Macromedia Dreamweaver MX, Microsoft Access, and Internet Information Services (IIS). Besides, with addition of features such as colorful interface, sound effects, suitable animations and pictures inserted in the portal will make this system unique and fun to be reviewed. Interactive multimedia elements are used in this portal to make users feel more interesting learning how to play bowling.

IBP is a system that can be a new alternative in introducing bowling to more people through the website. Although actually we can find a few websites in the internet that teaches people how to play bowling but those websites are not with the aim to cater the

Lastly, thank you again to all individuals that have involved intentionally or unintentionally during the process of Interactive Bowling Portal (IBP) system development and report completion. All cooperation given by everybody is really appreciated.

Thank you.

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CHAPTER 1:

INTRODUCTION

1.0 Introduction

Nowadays almost all people know what are tennis, golf, billiard, cricket and football. They even know how to play the games and do enjoy those sports games everyday. Bowling is also one of the famous sports in the world. We can see that bowling sports event is included in big sports occasions and tournaments such as Olympic, Sea Games, Commonwealth and so on. Bowling is one of the oldest sports game in the world and historian suggested that the game made its way across Europe with Julius Caesar's centurions.

However, today bowling is played by all stages and categories of people in the society. Almost all young, old and high society to lower society knows how to play bowling or at least know what bowling is all about. There are many people who know how to play bowling in our country. We even have many professional bowling players such as Choy Poh Lai, Sarah Yap Mun Yee, Lai Kin Ngoh and so on that have brought up Malaysia's name in the eyes of the world. Shalin Zulkifli is the most talented bowling player in Malaysia and today she is already known as world champion in bowling.

Today, playing bowling is a very common activity among everybody. Some people play bowling as a hobby but some people really involved in bowling sport seriously. We can see that teenagers play bowling with their friend, parents play bowling with their children, officer play bowling with their colleagues and so on. Everybody play bowling with many reasons. Some find that bowling is the best way to spend their leisure time wisely. Besides enjoying the light exercise while playing bowling, they also can provide

more quality time to get along with family and friends joyfully. In fact, people also play bowling just because they love bowling itself and already addicted with the sport. They play bowling to improve their skills and to win bowling tournaments.

Because of that, today we can find many bowling centers located almost at everywhere such as Cosmic Bowls at Mid Valley Megamall, Bowling Center at Berjaya Time Square, Pyramid Mega Lanes at Sunway Pyramid and many more. The bowling centers are blooming like mushroom since the sport is becoming well-known among every stage of community. More business individuals want to invest their money in bowling center business due to possibility of substantial amount of profit in return. Besides, writers also grab this chance by publishing more books about bowling. Many people who would like to learn play bowling also will buy bowling books and thus writers will get more royalty as their income.

Unfortunately, there are also many more people who wished to play bowling but do not know how to play it. Though there are many bowling centers that give class to those who wants to learn play bowling and even books that teach how to play bowling can be found in bookstores but yet these alternatives do not help bowling beginners effectively. Thus, Interactive Bowling Portal (IBP) is produced to fulfill the needs of bowling fan widely. IBP is produced along the way to suit the needs of bowling fan in today's Information and Communication Technology (ICT) era.

The title Interactive Bowling Portal (IBP) contains three important key words that are interactive, bowling, and portal. From the Oxford Advanced Learner's International

Student Edition Dictionary, on page 707 the term *interactive* brings the meaning 1) that involves people working together and having an influence on each other and 2) (*computing*) that allows information to be passed continuously and in both directions between a computer and the person who uses it. While from page 146 *bowling* means a game in which players roll heavy balls (called bowls) along a special tracks towards a group of pins (bottle-shaped objects) and try to knock over as many of them as possible. Lastly from page 1022 *portal* brings the meaning of (*formal or literary*) a large, impressive gate or entrance to a building.

Not many people realize except for bowling players that we may hardly find bowling portal or websites that really teach how to play bowling in the internet. Though people can learn and get the information they want through books, magazines, and bowling centers that can be found very easily, but these ways are rather boring and most people are lack of time to go to bowling centers or read books. Reading book is less interesting and readers will easily lose of concentration and thus makes them hardly to remember what they have read. Whereas by going to bowling center, people will have to spend a lot of money and they can only go to the center that are far from home only during operation hours.

Interactive Bowling Portal (IBP) is implemented in web-based learning system since computers have been one of the most important aspects in our everyday life. Almost every applicable task nowadays is operating on computer-based application. This interactive portal may help people to learn how to play bowling in more interesting way. It is combined with multimedia elements such as sound, graphic, animation, colored

pictures and so on that may help people to remember whatever they have learned. Besides, this portal also can be used at anytime and anywhere without time limit as long as they have computer application connected to internet access connection.

IBP may give a big impact to bowling fans. Users will find that IBP is very interactive and very enjoyable to learn with. Besides, IBP is developed to give extra conveniences so that users can browse the portal at their own pace. They can decide whether to browse the portal during the day or at night whenever they have free time. By operating as a web-based system, this portal also can be available 24-7 hours per day and in the mean time users do not have to worry about the cost since internet service is always the cheapest alternative that can be found. The portal itself is actually totally free and they do not have to spend their time and money searching for CD-ROM. Users can browse the portal in a long time but still they have to pay a small amount of money only for the internet service used.

Last but not least, IBP also can be used as a very important tool for instructors and beginners in teaching and learning to play bowling. In time to come, this portal is believed to be a stepping stone that may help to produce more bowling professionals and stars for Malaysia in the future.

1.1 Project Overview

The Interactive Bowling Portal (IBP) is a learning package that aid users especially in how to play bowling. Currently, it is very hard to find or we can say there is no web-based portal on how to play bowling in the internet and most people learn to play bowling by using books, purchase the CD-ROM that comes from oversea through internet or go to bowling centers near to them. So, it is important to produce an online portal on how to play bowling for our community needs.

The contents that included in the portal are about introduction to bowling, bowling equipments and rules, bowling games online, details of the right way to play bowling that comes with interesting graphics, pictures animation and sound to increase the understanding of users more effectively and so on. The interface of the portal website is also created to be as exciting and user-friendly as possible to make the learning becomes more fun.

IBP is implemented in a well-organized and structured-information flow. Firstly, users have to register to become a member and they need to log in every time they want to access for information in the website. In the IBP, users will be taught depend on their categories such as whether they are in beginner, intermediate or professional group. Besides, users also can find a few links such as feedback that allow users to give comments, forums link that allow users to post their discussion, tips link where users can learn playing bowling tips of the day and so on. Lastly, there is also a link for administrator where only administrator is allowed to access and make updates and

maintenance towards the IBP. This is important to ensure that the IBP will always functioning and operating effectively to satisfy the users who accessed the portal.

By learning through this portal, people can save more times, costs and they do not have to go out of their house necessarily. They also can browse the portal as many times as they want to until they really understand how to play bowling in the correct way. Besides, the portal comes with interactive multimedia elements where users can find that it is very interesting to review each section of the contents. Their understanding can be increased and they can remember better about what they have learned through the portal.

1.2 Problem Statement

There are a few problem statements that had been derived towards the implementation and production of this courseware. The problem statements are:

1. Lack of information resources.

   There is hardly to be found or we can say there is no official portal website that really widely teaches people how to play bowling in the internet effectively. Almost all of the websites available are focusing on promoting their bowling centers and selling bowling equipments to users. These websites are very disappointing and not resourceful at all for those who wish to learn play bowling.

2. Costly alternatives.

   In the market it is also very hard to find CD-ROM based learning that teach how to play bowling in the market and sometimes there is only one that using other language such as Mandarin that of course can not be understood by many people except Chinese. Yet, this alternative also required users to spend some money to buy the CD-ROM as well as books and going to bowling centers. Whereas IBP is totally free to be browsed and encouraged unlimited users to join in.

3. Ineffective teaching manual.

   It is very dull and boring to learn how to play bowling by using books since some people have low concentration ability on reading and they have a limited time to read. Some books do not have pictures and this is not interesting at all but

some books with colorful pictures are usually very expensive. Besides, the information is limited and can not be updated since books are not operating based on knowledge-sharing system.

1.3 Project Aims

The Interactive Bowling Portal (IBP) development is taken up to satisfy the following major requirements:

To produce and provide an information and knowledge based learning tool as a new better alternative to our society that teaches beginners and bowling fans on how to play bowling correctly with the computerized concept to ease the learning and understanding. Besides, to provide this portal to be used by unlimited range of users including bowling instructors and bowling centers as learning tool and help them to produce new talents in bowling.

1.4 Project Objectives

Project objectives can be divided into two categories that are specific objectives and general objectives.

1.4.1 Specific Objectives

1. To design and develop Interactive Bowling Portal (IBP).

   IBP is developed as a web-based system especially to cater the needs of our community towards the effective interactive bowling learning tool resource. IBP that is using information technology may deliver knowledge and learning very fast, cheap, easy and effectively. It can be new best alternatives if to be compared to other available methods used to learn play bowling. This also will attract more people to play bowling and ensure that enough resources to achieve players performance and help to understand how to play bowling in practical way.

2. To create an interesting and fun Interactive Bowling Portal (IBP) for users to learn play bowling.

   IBP is designed as a simple but resourceful and nice to be reviewed system. IBP is developed to encourage interactive learning so that the learning process will be more fun and it also will help user to remember whatever they have learned better. The website is designed to be user-friendly system by using suitable colors and font size. Multimedia elements inserted into IBP makes this portal unique in its own way. IBP also will solve problem that occur which bowling

player can learn how to improve their performance whenever they have no chance to go to bowling center.

3. To help bowling fans enhance their knowledge and understanding.

   Interested users may learn about the latest techniques and gather new information on how to play bowling. Besides, IBP incorporates information gathering and knowledge sharing among users thus it makes IBP as an unlimited information portal of bowling. This is because IBP is functioning as an online community that providing user contribution metrics as well as an incentive for users to continue to take part in the community with the control of administrator. Users will finally find that IBP is the most resourceful tool that helps them to know bowling very well.

4. To learn multimedia elements and its advantages in teaching and learning.

   Multimedia element has become very important in system or project implementations since its ability to give big impact in performance. Multimedia is now widely used almost in everything especially for advertisement in television because it can produce very interesting and unique features such as sounds, moving graphics, three-dimension (3D) animation and so on. So by learning multimedia, knowledge in this field can be enhanced and it can be used later in the future.

1.4.2 General Objectives

1. To replace existing manual method in learning how to play bowling.

   Manual methods that people used to learn play bowling are usually by using books, magazines, going to class at bowling center and so on. These ways are nowadays beneficial but yet less effective and out-dated if to be compared by using IBP. By using IBP, the learning or even teaching method will be easier, faster and even low of cost. Students can learn at any time and any where without time limit as long as they have the internet access connection. This will be more convenient to each user too.

2. To develop a more resourceful system.

   This system is designed to contain full of information needed by a bowling fan in learning bowling. They especially can get huge information because IBP is operating based on knowledge-sharing web-based system.

3. To implement an effective IBP as learning and teaching tools especially for bowling fans and instructors.

   Information will be managed, arranged and updated frequently by the administrator and users will find that it is easy to search for information they need by using IBP rather than to spend time to go to bowling center or read books in order to get the same information they want. Instructors also can search and print out information from the website to be used at the bowling center

during class. This can be a big help to instructors since IBP is always an interactive, cheap, updated and effective teaching tool for them.

1.5 Project Scope

Since the scope of the project is indeed wide, the implementation of a complete system would require a substantial amount of time. In this project, the system will focus more on telling and teaching the users how to play bowling. However, several considerations have been decided during the development of this system.

1.5.1 Language

This IBP is build-up fully using English language since most people understand English rather than other languages. English is also known as global language so more people can make a benefit by using this portal if it is build up in English.

1.5.2 Target Users

The target users of this system are divided into two categories that are users and administrators:

1.5.2.1 Users

The user of this system is people who browse the portal to learn play bowling. They can be registered user or unregistered user of IBP website. The unregistered user can only access a few features of the portal. Whereas registered user that has already become a member of IBP, is allowed to access all information provided in IBP. In order to be a member, each end-user has to register and log in during every time they access the portal. The users of IBP can be beginners or anyone that wants to learn play bowling. The person can be at any level of age and society as long as they understand English and know how to use computer and internet.

1.5.2.2 Administrators

Administrator is a person who responsible in organizing and updating the portal from time to time. There will be a link in the portal where only administrator is allowed to get into the system and make any changes or maintenance towards the system. Other people will not be able to do so because only administrator will have the password and know how to manage the system.

1.6 Importance of The Project

The importance of the project is basically to eliminate the problem statements that existed. The importances of the project are:

1. To help attract more people to play bowling and to produce new talents in bowling by providing effective way to learn play bowling.
2. To provide the most low cost and interactive fun learning play bowling tool that definitely different than other methods available today.
3. To solve the lack of web-based portal that teaches how to play bowling in the internet and to provide this information widely.
4. As a new better alternative to learn play bowling rather than using books, CD-ROM and going to bowling center that are rather costly, boring, limited and times consuming.
5. To overcome common reading problems such as lose of concentration and boring by using a more interactive and interesting way to learn about bowling.
6. To provide a new learning tool to bowling instructor so that they can teach people to play bowling more effectively.
7. Can be used as a preparation to practice playing bowling at home before going to bowling center or tournaments.

1.7 Expected Outcome

This Interactive Bowling Portal (IBP) will be a very interesting learning module to be used by user besides it can teach user to play bowling effectively. The multimedia elements used in the system is hoped will make the system unique and able to enhance the understanding of the user. Not only that, the portal also can be used as a stepping stone to provide an information resource tool available widely in the internet. Thus, more people can learn how to play bowling and bowling instructor also can use the portal because it will be easy to find.

1.8 Limitations of The System

IBP is developed with the hope it can serve the needs of bowling fans as effective as possible. However, there are a few limitations that limit the options of several factors during the implementation of the system. These include:

1.8.1 Developer Point of View

There are developer's opinions towards IBP system that are:

1. IBP is implemented as a web-based system.

   This portal is build-up using web-based system so of course there will be unlimited amount of user would be able to access the information through the

internet. They do not have to buy a book or CD-ROM but just browse the portal to go through the contents. This is why the system is not provided as a stand-alone system. However, by this way developer will not get any profit unless the system is developed in its own way and required users to pay in order to retrieve the information.

2. Users categories.

   IBP is developed especially to cater the needs of bowling fans who are interested to know more about playing bowling. However, other people such as instructors and expertise are also encouraged to join and be a member as long as they are from the same background and have the same mission in joining the portal.

3. Exposure to threats.

   As a web-based system that operates on the internet environment, the system is exposed to threats such as hackers and virus. These threats possibility may corrupt the system instantly. So, administrator has to prepare a back up system and secondary storage in order not to lose the data in the system.

4. Language.

   The system is implemented using English language because most people understand English. So, other-language-spoken persons also have to know English in order to enjoy the portal.

1.8.2 User's Point of View

There are a few users' opinions towards IBP system that are:

1. Accessibility.

   IBP only can be accessed by users who have internet access connection and a personal computer that connected to the internet as a medium. For those users who do not have internet connection at home, they have to go to cyber café in order to browse IBP. So, they still have to pay some money after using the internet service.

2. Computer skill.

   Users must have the ability and knowledge on using computers and have experience in using internet so that they will have no difficulty to browse the portal. Or else, users will find the learning activities will not be interesting besides they are too slow in browsing the IBP and at last they will not understand whatever they have read or learned effectively.

1.9 Hardware and Software Specifications

There are a few hardware and software requirements needed in order to implement the system successfully. Without any of the tools, the system will not reach the requirement specifications and the system will not be able to achieve objectives stated.

1.9.1 Hardware Requirements

Hardware is the machinery and electronic parts of computer system that are used to develop and run the system. The minimum hardware requirements needed for IBP implementation are:

- Personal Computer (PC)
- 486 MHz CPU
- Processor Intel(R) Pentium(R) 3 or higher
- 240 MB of RAM or higher
- 1.5 GB of available hard disk space
- Super VGA (800x600) pixel resolution or higher resolution video adapter and monitor
- Modem with 33.6 Kbps or higher speed modem or a network connection
- Keyboard
- Mouse
- CD-ROM drive

- 3 ½ Floppy drive

1.9.2 Software Requirements

Software is defined as the programs used to operate a computer. The software that will be used to develop IBP are:

- Microsoft Internet Explorer
- Internet Information Service (IIS)
- Active Server Pages (ASP)
- Macromedia Dreamweaver MX
- Adobe Photoshop 7.0
- Swish v2.0
- Microsoft Access
- Sparkle Flash Keeper

1.9.3 Operating System

Operating system is defined as a set of programs that controls the way a computer works and runs other programs. The operating system that will be used to run IBP is:

- Microsoft Windows XP Professional or Home Edition

1.10 Project Schedule

In organizing and developing phase for the system, a schedule is needed in developing the system in a more proper and timely manner. Each phase will follow the time frame as allocated in the Gantt Chart. Gantt Chart produces a schedule and remind about the earliest possible started and finished time for each phase during the process of developing the system until the completion date.

Following is the Gantt Chart for Interactive Bowling Portal (IBP):

Table 1.1: Gantt Chart for Interactive Bowling Portal (IBP)

	Month / Phase	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1.	Preliminary Investigation	—	—							
2.	System Analysis		—	—						
3.	System Architecture and Design			—	—					
4.	Implementation				—	—	—	—		
5.	Maintenance and Testing							—	—	
6.	Documentation								—	—

1.11 Summary of Chapter 1

This chapter is mainly focused on the introduction of the project and specifically to give brief information about the whole part of the system. The purpose of system development as well as functions, objectives and concepts of the system are also stated in this chapter. In developing the system, the schedule and process of development is playing a big role as a guideline to ensure that all tasks will be carried out and completed as planed.

In the next chapter, Literature Review will be carried out whereby current system or slightly similar system will be reviewed to increase understanding on how it is implemented. Some references have been done in order to make plan on the implementation of IBP later.

CHAPTER 2:

LITERATURE REVIEW

2.0 Literature Review

Literature review is one of the most important features in the early stage of system development process. Literature review is necessary because through this stage we will gain information and guidelines on how the system has to be built. Thus, system design and architecture process can be preceded by following the founding from literature review process. Literature review is carried out by doing some studies on current system, slightly similar system, information resources, elements needed to build the system and so on. Through literature review, all the advantages and disadvantages of current system can be noticed and the best decision can be decided in order to produce a successful Interactive Bowling Portal (IBP).

Previously in Chapter 1 Introduction of Interactive Bowling Portal (IBP), preliminary investigation has been done in order to find the suitable topic and system requirement. Interactive Bowling Portal (IBP) is planned to be an interactive fun learning website that comes along with multimedia elements and have huge information of how to play bowling in order to function as an effective portal. During this stage too, discussions with supervisor have been carried out and a few elements have been underlined to be main characteristics or features that must be included in the IBP. Among of the elements are multimedia elements such as pictures, graphics, sounds and suitable colors must be included in the IBP. Besides, IBP also must has a user-friendly interface, search functions, log in functions, administrator link and so on to ensure the understanding and convenience of users in using IBP.

Consequently in order to guarantee IBP will be implemented as what has been planned before, investigation and analysis have been done precisely to recognize and ensure that suitable hardware and software will be chosen to be used during implementation phase later. All hardware and software available have to be considered to ensure that they will be compatible or useful enough in the process of producing the web-based IBP. The software is studied first in order to figure out whether all the elements and features that would like to be added in the IBP can be implemented by using the software or not. This process also plays a really big role since it can give impact towards the effectiveness of the system that will be produced. Many problems can be avoided and system implementation progress can be managed smoothly by first doing the literature review.

2.1 Purpose of Literature Review

Literature review is a necessary task in system development process. The main important purposes of literature review are:

1. To choose the best hardware and software for the system.

   In literature review, all current system or slightly similar system is analyzed to get to know what are the software and hardware being used by the system to make it functions. So, list of software and hardware requirements can be list down and each requirement is studied in order to know its strengths and weaknesses. Thus, the most suitable hardware and software will be selected to be used later during implementation of the system.

2. To gain more information.

   During the process of literature review, much information can be collected from other analyzed system or other resources. Examples of information that can be used later are like how to play bowling, pictures of people playing bowling, how to make an interesting color on the website, how to make the graphic moving and much more. So, this information gathered will be a guideline for the system that is going to be build and the system itself will be resourceful and successful.

3. To ensure the system will be delivered on time and to avoid system failure.

   Not only that, by choosing the right hardware and software, the system can be implemented easily and fewer problems will occur. Mistakes been done will make system not functioning well and effectively. Thus, the system will fail and system implementation objectives never can be achieved. Each problem occurred will required analysis, redesign and redevelopment to be done. These will waste a lot of time and consequently, the system will be delivered late too.

4. To make comparison between existing systems with other alternatives.

   Existing slightly similar systems and other alternatives such as books, bowling center, CD-ROM and so on are studied to figure out each other's strengths and weaknesses also the advantages and disadvantages. The IBP that is going to be built generally will eliminate all weaknesses and disadvantages of other systems. Whereas reference can be done from the strengths of each existing system and IBP can be implemented to be the same way or even better.

2.2 System Definition

After a few discussions, decision has been made to implement a system that teaches people how to play bowling. The system name is Interactive Bowling Portal (IBP).

2.2.1 Definition of Multimedia

Multimedia from the Oxford Advance Learner's International Students Edition Dictionary page 871, means 1) (*in computing*) using sound, pictures and film in addition to text on a screen and 2) (*in teaching*) using several different ways of giving information. Whereas from user's perspective, multimedia can be defined as computer information delivery method that can be presented through audio or video, addition to text, graphics images and animation. For example, the using of audio and video application to present the changes of dynamic situation in different field such as sport; will be able to make the presentation performs much better rather than only using text and image.

Multimedia word also can be divided into two root words that are *multi* and *media*. *Multi*, from page 871 of the same dictionary means more than one or many. While from page 830, *media* brings the meaning of 1) (*the media*) the main ways that large numbers of people receive information and entertainment, that is television, radio and the newspapers 2) plural of MEDIUM. From page 831, *medium* means 1) one way of communicating information, 2) something is used for a particular purpose and 3) (biology) a substance that something exists or grows in or that it travels through.

However, from Latin language *multi* means many or various and *medium* means substance that is used to deliver and carry something.

Therefore from various definitions that have been gathered, the conclusion definition of multimedia can be made. *Multimedia* is a variety of data and media combination that in purpose of to deliver information in order to make the communication become more effective. It contains a combination of graphic, image, video and animation used to produce an excellent output.

2.2.1.1 Multimedia Elements

There are five important multimedia elements that will be used to develop Interactive Bowling Portal (IBP). The elements are:

1. Graphics.

   Graphics is used to explain the concept that hardly to be interpreted by text. By using graphics, individual understanding can be increased rather than the using of text only. Generally, graphics is divided into two types that are bitmap and vector. Bitmap image is a binary representation in which a bit or set of bits corresponds to some part of an object such as an image or font. While vector image is a version of clipart that can be edit. The size and color can be manipulated and the clipart also can be printed. Vector clipart come in a variety of formats. The most popular are **.eps**, **.ai**, and **.wmf**. Storage space required to store vector image is much smaller than to store bitmap image.

2. Image.

Image is data that represents a two-dimensional scene. A digital image is composed of pixels arranged in a rectangular array with a certain height and width. Each pixel may consist of one or more bits of information, representing the brightness of the image at that point and possibly including color information encoded as RGB triples. Images are usually taken from the real world via a digital camera, frame grabber, scanner, or they may be generated by computer and or by ray tracing software.

3. Animation.

Animation is a motion picture made by photographing successive positions of inanimate objects.

4. Text.

Text is the simplest data and storage space needed to store the data is very small. It is the basic element of document development.

5. Sound (Audio).

Sound element may give a big impact towards message delivery. Common format being used are sound (.snd), wave (.wav), mpeg (.mp3) and midi (.mid). Wave and sound format are used to record voice whereas midi (music instrument digital interface) format is used to create and manipulate digital sound.

2.2.1.2 Advantages of Multimedia

Multimedia has been used widely by many individuals and organizations. This is because numerous benefits are gained from the using of multimedia. The advantages of multimedia are:

1. The power of multimedia is engaging a variety learning modalities (visual and audio), which can appeal to various learners styles simultaneously.
2. Interactive afforded by multimedia, which encourage practical learning become feasible.
3. Allow development of many engaging, interesting and convincing presentations.
4. Multimedia enhances text only presentations by adding interesting sounds and compelling visuals.
5. People are more interested in multimedia messages, which combine the elements of text, audio, graphics and video. Communication research has shown that the combination of communication modes (aural and visual) offers greater understanding and retention of information.
6. Used in simulations or to enhance practice of skills can support transfer learning.

2.2.1.3 Disadvantages of Multimedia

Though multimedia always gives a big help towards the completion any kind of presentations, but there are a few disadvantages in using multimedia. The disadvantages of multimedia are:

1. Purchase or rental of equipment to produce multimedia work can be costly.
2. The use of multimedia is still new to most trainers and instructional designer so, it may require high learning efforts for designer.
3. Multimedia combined wide elements of knowledge, it may contract out of specialized skills.
4. Courses or classes that teach multimedia are usually available in only one language that is mostly in English.
5. Students from developing countries can make a fully use of the material offered since they do not have access to the internet and lack of software and hardware.
6. There are limited choice of resources of multimedia references since almost all of the resources comes along the way from overseas so most of them are in English and costly.

2.2.2 Definition of Interactive

As have been stated before in the introduction, from the Oxford Advanced Learner's International Student Edition Dictionary, on page 707 the term *interactive* brings the meaning 1) that involves people working together and having an influence on each other and 2) (*computing*) that allows information to be passed continuously and in both directions between a computer and the person who uses it. Interactivity is basically one technology provided by multimedia which it is called Multimedia Interactive.

Interactive multimedia is a technology that allows users to use variety of input devices to communicate with computer and corresponding between each other. Examples of the input devices are joystick, keyboard, touch screen, mouse, microphone and so on. By using these devices, they also enables users to interact with text, graphics, sound, animation and video in order to retrieve the information needed in a more exciting situation.

Nowadays multimedia interactive is already widely used. At the museum, hospital, bookstores and bank we can see many touch screen provided for users to retrieve information they want, to make money transaction, to search for location of a place and so on. Not only that, far-distance-learning is also becoming trend in our community today. By using multimedia interactive, learning process can progress smoothly via computer, video and satellite. Besides, interactive multimedia also has been adapted into interactive-based learning through the web, CD-ROM, video-tape and cassette. There

are many other examples of multimedia interactive usage can be found since the use of it has no limitation at all.

In a web-based learning or basically we also can classify it as computer-aided learning situation; the using of interactive multimedia has become very important. Interactive multimedia is used to produce a more appealing and motivating learning situation by interacting with users. The attractive color combinations used as the interface, the arrangements of information on the website, the pictures added and so on will make the message that is going to be delivered will be more effective. Besides, users also will not feel boring and able to go through each section of the portal in a long time.

2.2.3 Definition of Bowling

Bowling means a game in which players roll heavy balls (called bowls) along a special tracks towards a group of pins (bottle-shaped objects) and try to knock over as many of them as possible. This definition of bowling can be found from page 146 of Oxford Advance Learner's International Student Edition Dictionary.

Bowling is indoor sport, also called tenpins, played by rolling a ball down an alley at ten pins. A regulation bowling alley is made of polished wood and measures 104.1 cm to 106.7 cm wide and 18.3 m from the foul line, where the ball is delivered, to the center of the head pin that is 19.2 m to the end of the alley. Bowlers roll a ball made of rubber composite or plastic, which has three or four finger holes and weighs from 4.5 to 7.26 kg, at plastic-covered maple pins standing 38.1 cm high and weighing between 1.42 kg

to 1.64 kg, set up in a triangular array in rows of increasing width at the opposite end of the alley.

A game consists of 10 frames, with two balls allowed a bowler in each frame. Each pin knocked down counts one point. Toppling all pins with the first ball is a strike and scores 10 points plus the total of the next two balls. Clearing the alley with two balls is a spare and scores 10 points plus the next roll. A perfect game, 300 points, requires 12 consecutive strikes.

2.2.4 Definition of Portal

An internet portal is a website that acts as a starting point with links to many other sites. Some of the largest portals include Yahoo, Excite, Lycos, Netscape, AltaVista, MSN, and AOL.com. There are also many smaller portals, known as "niche portals", for specific interests. These sites include Fool.com for investors and Garden.com for gardeners. Most large portals have millions of web pages indexed for visitors to search through. They also have a large directory of websites, which are categorized by topic. Though the primary purpose of a portal is to find other sites for users to search for information they need.

Whereas in page 1022 of Oxford Advance Learner's International Student Edition Dictionary stated that *portal* brings the meaning of (*formal or literary*) a large, impressive gate or entrance to a building. Portal usually contains a lot of information of a subject. Portal is used to keep information about something as much as possible in

order to provide the data for other people to refer. In this situation, the IBP is implemented to work as an interactive portal that teaches users how to play bowling. That is why browsing IBP is like entering a huge world of bowling information.

2.3 Web-Based System

Interactive Bowling Portal (IBP) is an interactive portal where users learn how to play bowling correctly. IBP is implemented as a web-based system since there are many advantages in using web-based system rather than by using other methods. Web-based can be divided to two keywords that are web and based. *Web* as defined in page 1526 from Oxford Advance Learner's International Student Edition Dictionary is 1) a complicated pattern of things that are closely connected to each other and 2) (*the web*) a Web site where a company, etcetera has information about itself on the Web. Whereas *based* from page 94 means 1) (*on something*) if one thing is based on another; it uses it or is developed from it and 2) *(-based) (in compounds)* containing something as an important part or feature.

IBP is functioning as a web-based system mainly because it is developed to cater the needs of our community especially the bowling fans. The advantages of using web-based system are:

1. To cater the substantial amount of our community request especially bowling fans towards bowling learning resources.

By using web-based system, the portal will be implemented as a website that can be browsed via computer as long as there is an internet connection connected to the computer. Through internet, the information can be delivered widely and almost all people will be able to retrieve the information about learning how to play bowling.

2. Information delivery becomes fast, easy, low of cost and save a lot of times.

   Not only that, by using web-based system; the information can be retrieved easily. Users only have to type the URL of the website and clicks enter to get into the website. They do not have to purchase books, by CD-ROM, video cassette or even going to bowling center. The information is at the fingertips and they may learn how to play bowling instantly.

3. Information is updated and available at 24 hours per day.

   Besides, web-based system enables administrator to make update towards the website from time to time. Not like a book, whereas writers have to publish the books into a number of editions. So, by using web-based the users may get the latest information from the portal and they wont feel boring browsing the site since there will be changes towards the portal interfaces and its contents. After maintenance has been done, the website will operate as usual. Users may get into the website at any time they want since internet service is accessible without time limit at all.

4. As a new alternative to replace other traditional method.

   Nowadays computer is playing a big role in every people's life. Computer is becoming more important since almost all businesses, transactions, tasks and so on are carried out by computer. So, IBP is developed as a web-based system to adapt with our ICT world environment today. By operating using the medium of computer, automatically more people will learn to use computer. Not only that, this is important since learning through computer is much helpful if to be compared by using books.

5. To increase understanding of knowledge and to provide fun learning environment.

   IBP is implemented along with multimedia interactive elements. This makes the website more interesting and fun to be browsed by user. Because of its features, users may remember whatever they have learned better and this also may enhance their understanding. Moreover, IBP may attract more users to browse its contents and thus learn how to play bowling later.

2.4 Information Gathering Method

Literature review is done by practicing a few methods to gather data. Variety of methods have been carried out because many kinds of data needed, required different ways to retrieve them. Methods that have been used to collect data were:

1. Documentation method.

   Data is assembled by doing some studies and analysis towards documents that are related to IBP. The documents obtained from own private collections, friends, and also from documents at the library.

2. Browsing internet method.

   Information also can be collected through internet. From internet, a few system that are slightly similar to IBP be studied and the information obtained is kept for reference later. Information such as suitable software and hardware needed to implement IBP, about bowling itself, and the way how IBP can be implemented also can be retrieved from browsing the internet.

3. Observation method.

   Observation method is done by collecting the data needed through observation towards the system that being studied to be implemented. The system scope, objectives, limitation and so on are the important guidelines in order to plan and design the IBP that is going to be implemented. Continuous observations towards

system implementation and reference systems have to be done from time to time in order to evaluate IBP's progress.

4. Analysis method.

   Analysis is important and be done after all the required data are collected. The data then interpreted and elaborated into a more simple, solid and suitable format depending on self understanding.

5. Comparison method.

   In order to make the best decision for IBP, comparisons have to be done to choose the best choice among other available choices. For example to choose a database software that is going to be used later, comparison between Microsoft Access 2002 and My SQL has to be done so that the best decision can be made.

2.5 Review of Existing Systems and Book

There are five existing systems and a book have been reviewed during this literature review process was being carried out. The systems are all web-based system found by browsing from the internet. While the book that teaches how to play bowling, was bought from Kinokuniya Suria KLCC book store.

2.5.1 The Bowling Portal.com

- (URL - http://www.thebowlingportal.com/), 09/08/2004.

The first existing system that has been reviewed is The Bowling Portal.com. This system has been selected because from its name itself, the system functions as a portal that gives information to internet users about bowling. The information provided is covering the whole elements of bowling and bowling fans can find almost all information that they want such as bowling equipments, bowling alleys, tournaments and so on.

There are a few features that have been found from this website. The features are the necessary elements needed in any website portal including IBP. The features are:

1. Huge information resource.

   The Bowling Portal.com is a website that provides information about other bowling websites as much as possible. As can be seen, the website gives links to other websites where users can purchase and get any information related to bowling in the internet. For example, there are links where users can purchase

bowling equipments such as ball, shoes, ball cleaners and so on. Besides, users also can get into directory that lists down all bowling center's website, bowling books that can be purchased, bowling tournaments and many more.

2. Nice looking interface.

   The interface of The Bowling Portal.com is very simple with suitable colors and the contents are organized systematically. Users may understand and can browse the website easily.

3. Search engine module.

   This system also has search engine module that can be used by all users in order to help them in searching any information related to bowling that they want. By typing in the keywords of the needed information, IBP will list down all necessary information related to the given keyword to be chosen by the user. This module will make the information search process faster and easier.

However, there are a few system weaknesses that can be detected from The Bowling Portal.com that are:

1. The Bowling Portal.com functions more as a directory.

   Generally, The Bowling Portal.com does not help bowling fans to learn playing bowling at all. This is because the website only provides links to other websites related to bowling. Users will find that though The Bowling Portal.com provides

links to other bowling websites that teach how to play bowling, but the websites do not help much since the information provided is not complete.

2. Time consuming.

   Besides, users will have to spend very long time to browse from one website to another in order to search the best website that caters their needs. This will waste their time and very itchy.

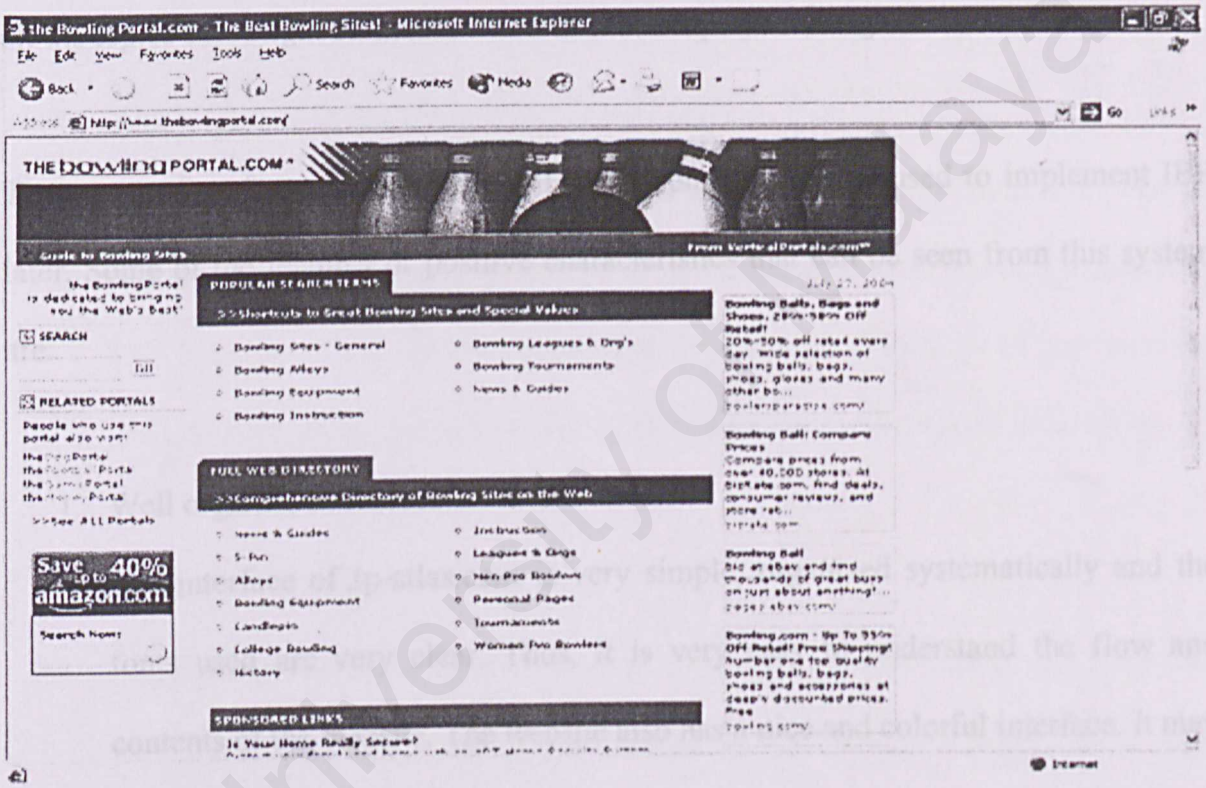

Figure 2.1: The Bowling Portal.com Website Interface

2.5.2 The Ip-atlas.com

- (URL - http://www.ip-atlas.com/pub/bowling), 09/08/2004.

The second system that has been reviewed is Ip-atlas.com. This website provides other websites links that related to bowling. As can be seen, Ip-atlas.com gives links to bowling video clips websites, bowling portals websites, bowling balls websites, websites that sell bowling equipments and so on. This means, Ip-atlas.com is actually not a website that teaches users how to play bowling. In fact, users have to find by themselves all the topics that might be useful for them to learn play bowling.

There are a few features exist in The Ip-atlas.com that can be used to implement IBP later. Some of the features or positive characteristics that can be seen from this system are:

1. Well organized interface.

   The interface of Ip-atlas.com is very simple, organized systematically and the fonts used are very clear. Thus, it is very easy to understand the flow and contents of the website. The website also has a nice and colorful interface. It may attract many users to browse the website since it is easy to be navigated and looks quite different than other available website.

2. Huge information provided.

   Not only that, though Ip-atlas.com only gives links to other websites regarding to bowling; but the scope of information provided in this system is very huge. Users

can see that there is all information about bowling that can be found from this system such as how to calculate the score and even the video clips that shows the techniques in playing bowling. Bowling fans can see the right movements in playing bowling by watching the video clips and they do not necessarily have to go to bowling centers.

However, there are a few system weaknesses can be found from The Ip-atlas.com that are:

1. This system does not teach how to play bowling.

   The ip-atlas.com is not a website that its main purpose is to teach users how to play bowling, but it provides links to other websites that are related to bowling. This is because, the websites provide little information on how to play bowling and the contents are more on advertising and selling stuffs related to bowling.

2. Unfriendly interface.

   Besides this website also does not has an interesting interface because it looks very simple and has wide empty spaces. Its interface also looks like a kids' website because of its color combination is not suitable for all range of users. The interface also is not interesting at all since it does not has pictures, graphics or animation and this can derive users to feel boring while browsing the system.

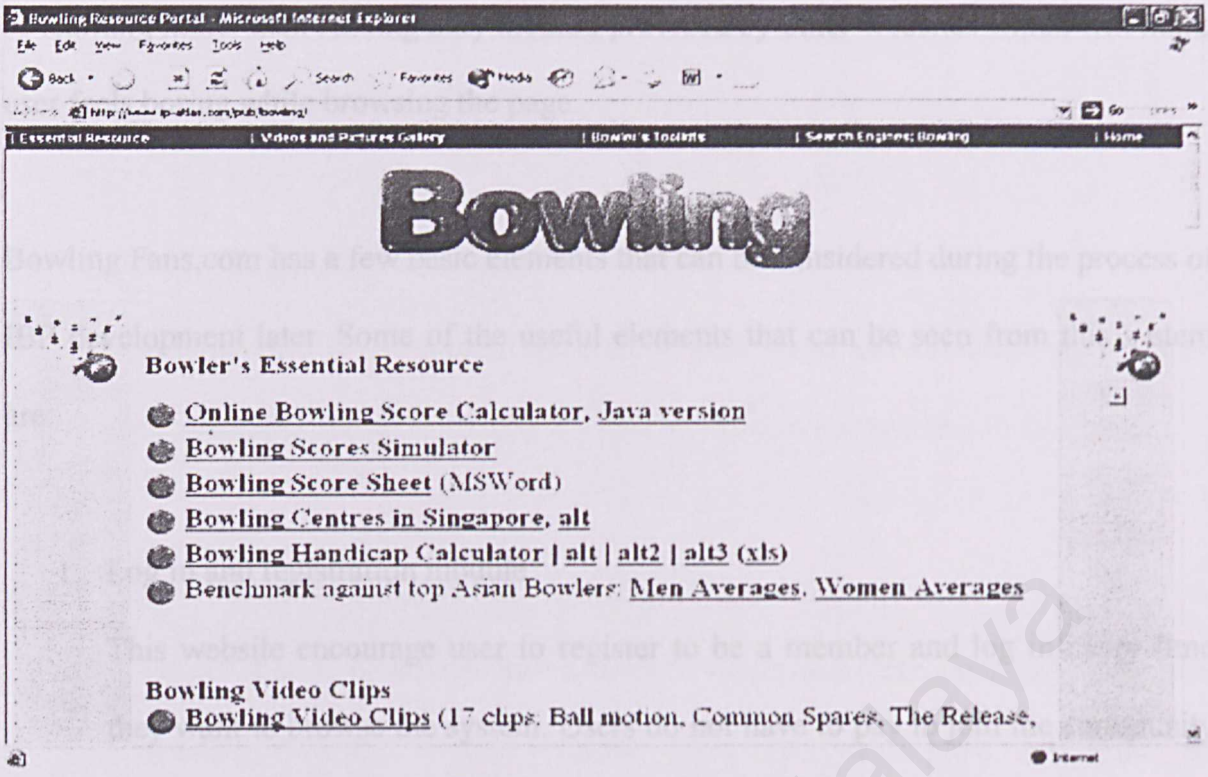

Figure 2.2: The Ip-atlas.com Website Interface

2.5.3 The Bowling Fans.com

- (URL - http://www.bowlingfans.com), 09/08/2004.

The Bowling Fans.com is a website that has been developed by American developer especially to cater the needs of bowling fans there. The Bowling Fans.com is a very resourceful website which has huge and variety information about bowling. It is not only teaches users how to play bowling but it also gives users information about bowling tournaments, links to other bowling websites, suggestions of bowling centers, places to purchase bowling equipments, tips of the day and so on. This system is basically the example of how the IBP going to be developed. However, the IBP will be focusing on the needs of bowling fans in Malaysia and the system is developed to encourage interactive learning between the users and the system itself. This will be a new method

of learning rather than reading only method provided by other websites which will make user feels boring while browsing the page.

Bowling Fans.com has a few basic elements that can be considered during the process of IBP development later. Some of the useful elements that can be seen from this system are:

1. Log in and registration module.

   This website encourage user to register to be a member and log in every time they want to browse the system. Users do not have to pay to join the community and users can gain more benefit by signing up to be a member since a few links are prohibited to those unregistered users of the website. By signing in as a member, users can browse all sections of the website provided by the administrator.

2. Feedback module.

   The website also provide feedback column for users to send their comments and suggestions about the website to the administrator. Both registered and unregistered users are allowed to use this function.

3. Updated information.

   Not only that, the website is also very reliable because the administrator will always update the information in the website. It also operating effectively since the maintenance will be done by the administrator frequently. Administrator will

log in into the system through the administrator log in module. Only administrator is allowed to make any changes towards the system.

4. Simple interface.

   The interface of Bowling Fans.com is also quite full of links and the color combinations are quite simple. It looks like it is more targeting to adult users.

5. Forum module.

   This website also provide forum module where users can post any information regarding bowling to the website. Thus, users can have discussion and consequently the website can be a huge information gathering for users to share and retrieve any information they want. This module only provided for registered users while unregistered users only can read the forum posted.

6. Article module.

   Not only that, through article module all information regarding bowling from the newspapers, other websites, magazines and so on will be uploaded by administrator and users can gain the latest information of bowling from this section.

However, there are a few system weaknesses that can be found from The Bowling Fans.com that are:

1. The website does not teach how to play bowling.

   The Bowling Fans.com is actually not a website that basically with the aim to teach users how to play bowling. It only combines everything about bowling for bowling fans to retrieve. For those who are new to bowling, they may hardly understand about the contents of the website.

2. Confusing interface.

   Besides, though the website can be classified as resourceful, but its interface looks too crowded. The arrangements of information links on the interface are not really nice and look confusing. There are also less multimedia interactive elements, less pictures, not suitable font used and dull color combinations included into the website thus making the website looks common as other available websites.

3. Unclassified information provided.

   Bowling Fans.com also does not categorized the bowling fans category thus disable users to browse which sections are suitable for them based-on their bowling performance whether they are beginner, professional or intermediate. This system is also focusing more towards professionals and adult players but not really suitable for the beginners and younger players.

4. Unrelated information provided.

The information in the website is based on overseas or United States (US) bowling resources. So, some of the information are not related for users in Malaysia for examples suggestions of bowling center where users can play bowling.

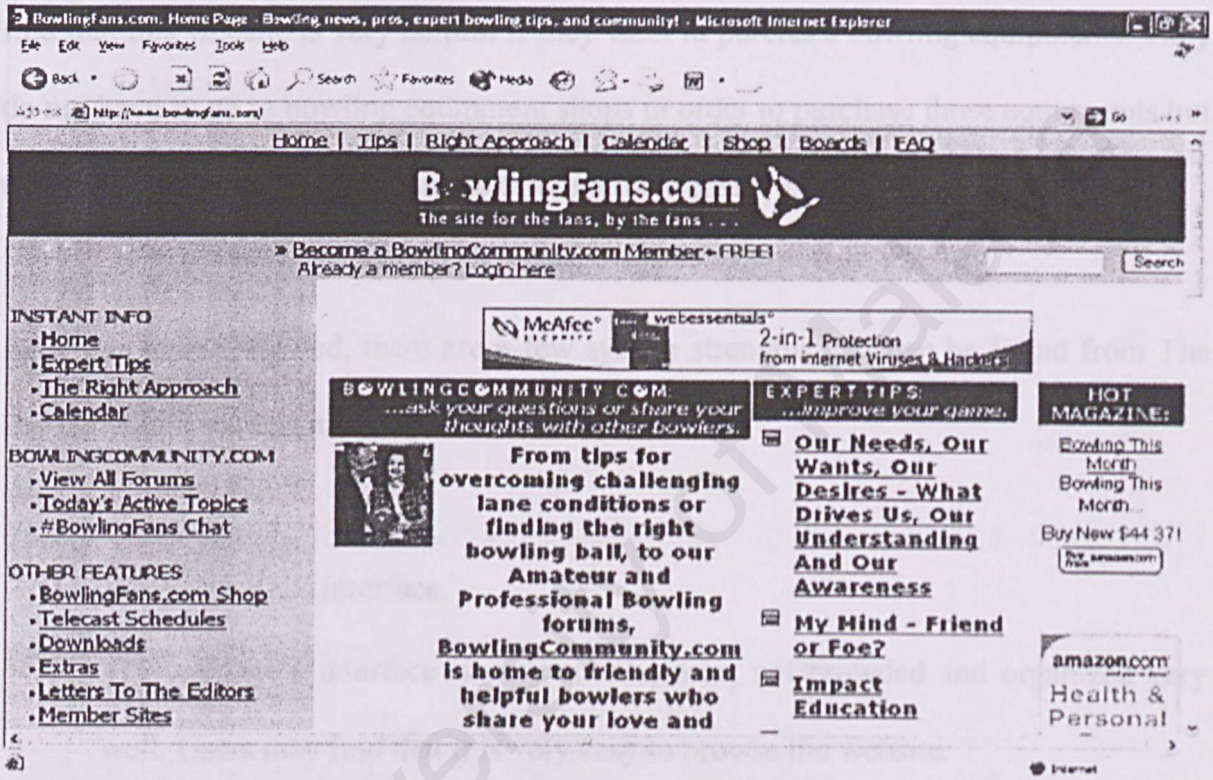

Figure 2.3: The Bowling Fans.com Website Interface

2.5.4 The Big Bowling.com

- (URL - http://www.bigbowling.com/), 09/08/2004.

The Big Bowling.com is a website which focuses on selling things related to bowling such as accessories, bags, balls, shoes and so on. However, this system does not provide any information that can help users learn how to play bowling at all. Bowling users may find that this website is very helpful if they want to purchase bowling equipments. They do not have to go to bowling equipment shops in order to purchase those equipments but they only can make the order online through the website itself.

After has been reviewed, there are a few system strengths that can be found from The Big Bowling.com that are:

1. Well-organized interface.

   This website's interface is very simple, nice, not crowded and organized very well. Users may find that it is very easy to browse the website.

2. Search engine module.

   The website also provide search engine for users to find information they want especially the products they would like to purchase.

However, there are a few system weaknesses that can be found from The Big Bowling.com that are:

1. This system does not teach users how to play bowling.

   Unfortunately, Big Bowling.com is not a website for users to learn how to play bowling. It is a website implemented to advertise bowling products for users to purchase by using credit card. Though, it does not give many choices for uses to choose the products they want.

2. Simple but boring interface.

   The website is too simple with no interesting features included. There are less pictures and interactive multimedia elements included into the system.

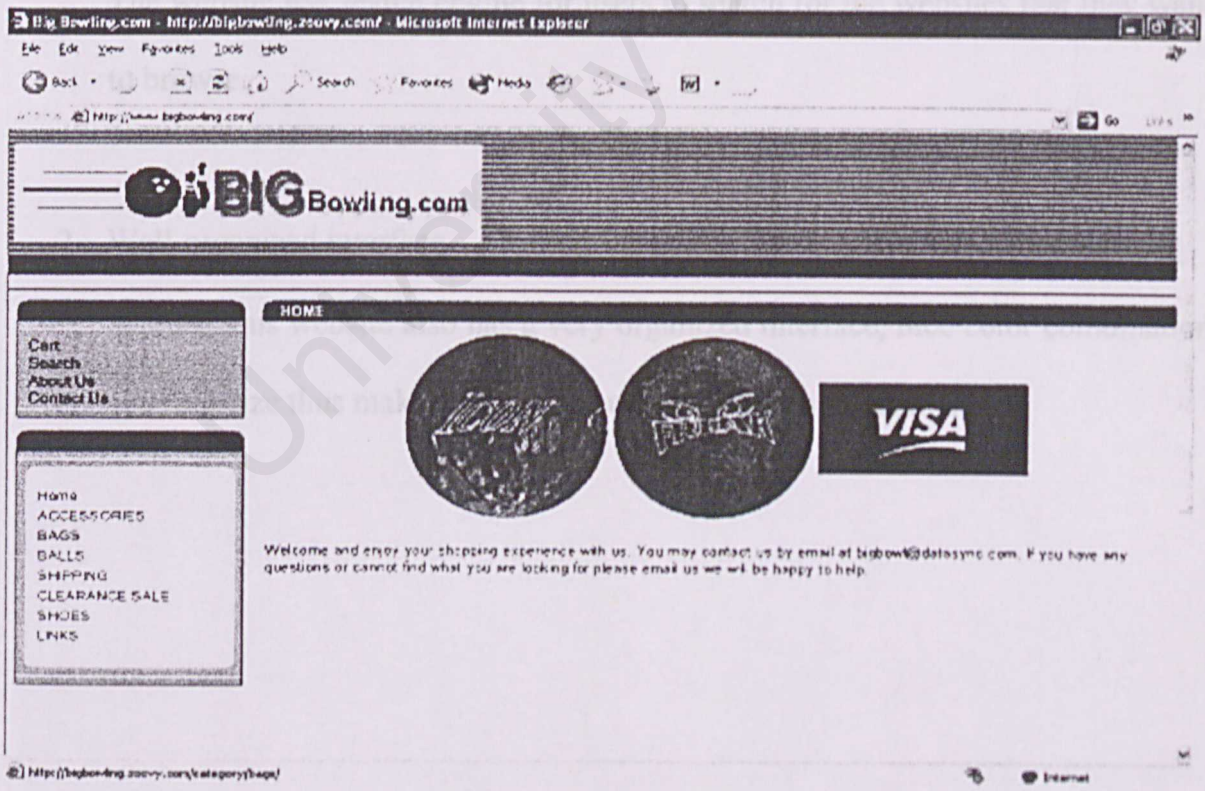

Figure 2.4: The Big Bowling.com Website Interface

2.5.5 The Keoz9.com

- (URL - http://keoz9.com/bowling/), 09/08/2004.

The Keoz9.com is a portal that provides information and links to other website related to bowling. Some of the links are like bowling associations, bowling center, youth bowling, bowling equipments to be purchased and so on. Basically, this system is not focusing on teaching bowling fans on how to play bowling but functions more as a directory for bowling fans to search information.

There are a few system strengths that can be found from The Keoz9.com that are:

1. Search engine module.

   The website has search engine for users to search for the websites that they want to browse.

2. Well-organized interface.

   Besides, this website also has a very organized interface, nice color combination and font size thus making it easy for users to browse the content.

However, there are a few system weaknesses can be found from The Keoz9.com that are:

1. This system does not be implemented to teach how to play bowling.

   The Keoz9.com is not a website for bowling fans to learn how to play bowling so of course the website do not really resourceful in helping to serve information needed by bowling fans.

2. Unclear and interesting interface.

   The interface of the website is quite nice but the color is quite blur and the fonts is also quite small so it makes the website is hard to read and users may find the website quite dull and boring. Not only that, the website also do not has any pictures at all and no multimedia interactive elements included in the website.

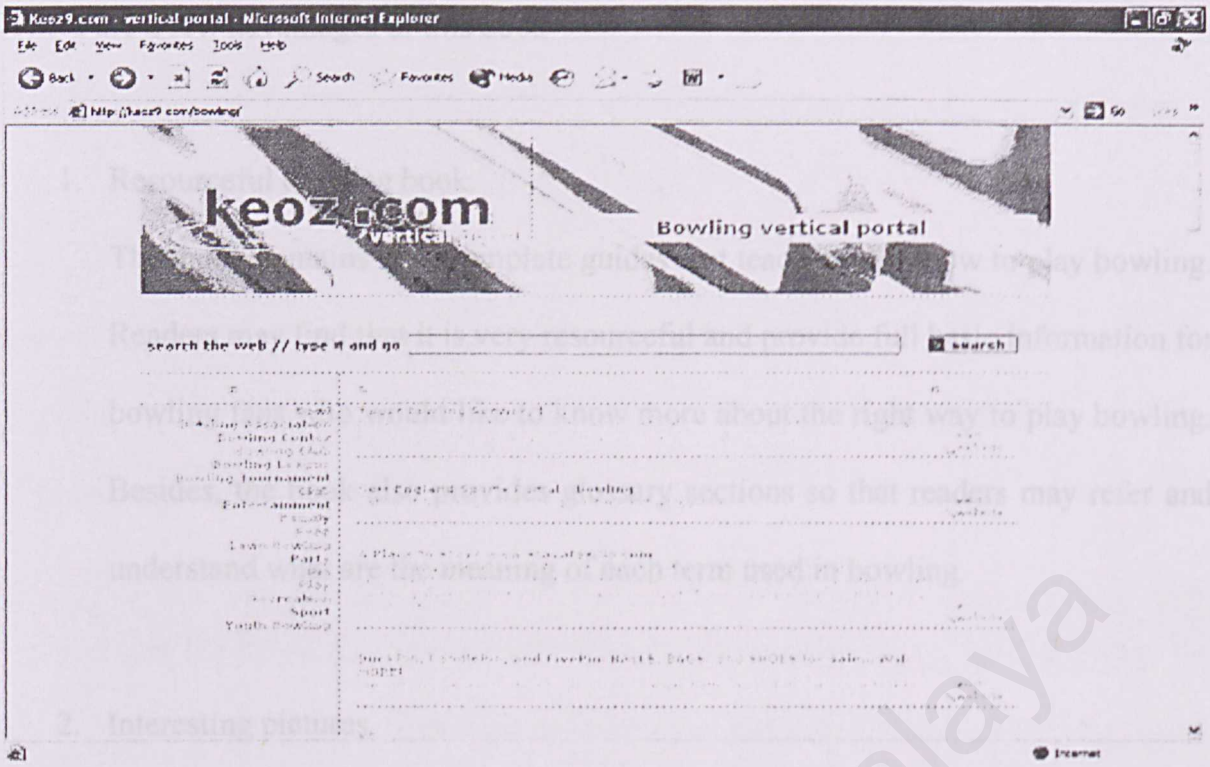

Figure 2.5: The Keoz9.com Website Interface

2.5.6 Winning Bowling: A Complete Illustrated Guide to Winning Bowling Techniques

Besides reviewing other slightly existing systems through the internet, other bowling learning method such as by using book has also been studied during the literature review process. A bowling book titled Winning Bowling – A Complete Illustrated Guide to Winning Bowling Techniques has been purchased to be used as a reference during the development of IBP.

There are a few advantages of this book

1. Resourceful bowling book.

   This book contains very complete guides that teach readers how to play bowling. Readers may find that it is very resourceful and provide full basic information for bowling fans who would like to know more about the right way to play bowling. Besides, the book also provides glossary sections so that readers may refer and understand what are the meaning of each term used in bowling.

2. Interesting pictures.

   The book also includes pictures in order to show to readers the right techniques in playing bowling. Then, readers can imitate the actions and practice them when they play bowling at the bowling center.

3. Suitable for mobility.

   Not only that, the book also very practical since it is suitable for mobility. Readers can bring the book to wherever they want and read it at their convenience time. Moreover, book can be kept for a long time and the information also will never lose. It is also available at any time.

4. No any other applications needed.

   By using the book, readers do not have to set up computer applications and other hardware in order to retrieve information about how to play bowling. This method is also very fast and easy especially for readers who are not expert in

using computer and internet. Readers who do not have internet connection at home may find that using book is more helpful rather than going to cyber café to browse internet to learn bowling.

However, there are a few disadvantages can be found when using book Winning Bowling – A Complete Illustrated Guide to Winning Bowling Techniques. The disadvantages are:

1. This book has a very less pictures and focusing more on text. Besides, the pictures and text available are not illustrated but in black and white. This makes the book is rather boring to be read and not interesting at all.

2. Limited information.

   Moreover, any bowling books not only this book; can not be updated from time to time thus the contents of the books is limited. Readers may read this book until finish however in time to come, the knowledge that the readers have might be is already out dated. So, by reading through website especially IBP, readers can gain new knowledge frequently with no limit.

3. Costly alternative.

   The book is very costly if to be compared with using the internet to get the same information. Books that come with illustrated colored pictures and hardcover are usually will cost much higher than this book purchased. This book price is RM52.00 and this is the cheapest book available.

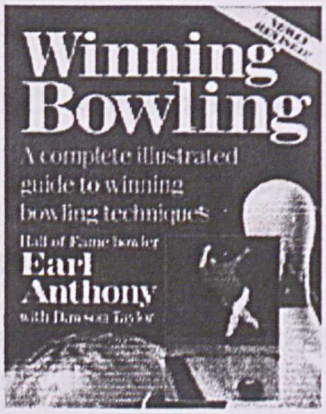

Figure 2.6: Book Purchased En-titled Winning Bowling – A Complete Illustrated Guide to Winning Bowling Techniques

Anthony, E., Taylor, D. (1994). *Winning Bowling – A Complete Illustrated Guide to Winning bowling Techniques*. Contemporary Publishing Group, Inc.

2.6 System Architecture

System architecture consists of the various component artifacts and how they fit together. The architecture of a software product might be described as object-oriented, pipes and filters, or client server.

2.6.1 Mainframe

Mainframe Architecture is not a client-server architecture. With mainframe software architectures all intelligence is within the central host computer. Users interact with the host through a terminal that captures keystrokes and sends that information to the host.

Mainframe software architectures are not tied to a hardware platform. User interaction can be done using PCs and UNIX workstations. A limitation of mainframe software architectures is that they do not easily support graphical user interfaces or access to multiple databases from geographically dispersed sites. In the last few years, mainframes have found a new use as a server in distributed client-server architectures.

2.6.2 Client-Server Architecture

Client-server architecture is a computer network system in which a central server provides data to a number of computers connected together in a network. Examples of client-server architecture are two-tier architecture and three-tier architecture.

2.6.2.1 Client Server Architecture Concept

As a result of the limitations of file sharing architectures, the client-server architecture emerged. This approach introduced a database server to replace the file server. Using a relational database management system (DBMS), user queries could be answered directly. The client-server architecture reduced network traffic by providing a query response rather than total file transfer. It improves multi-user updating through a Graphic User Interface (GUI) front end to a shared database. In client-server architectures, Remote Procedure Calls (RPCs) or Standard Query Language (SQL) statements are typically used to communicate between the client and server.

2.6.2.2 Two-tier Architecture

With two-tier client-server architectures, the user system interface is usually located in the user's desktop environment and the database management services are usually in a server that is a more powerful machine that services many clients. Processing management is split between the user system interface environment and the database management server environment. The database management server provides stored procedures and triggers. There are a number of software vendors that provide tools to simplify development of applications for the two-tier client-server architecture. The two-tier client-server architecture is a good solution for distributed computing when work groups are defined as a dozen to 100 people interacting on a LAN simultaneously. It does have a number of limitations.

When the number of users exceeds 100, performance begins to deteriorate. This limitation is a result of the server maintaining a connection via "keep-alive" messages with each client, even when no work is being done. A second limitation of the two-tier architecture is that implementation of processing management services using vendor proprietary database procedures restricts flexibility and choice of DBMS for applications. Finally, current implementations of the two-tier architecture provide limited flexibility in moving (repartitioning) program functionality from one server to another without manually regenerating procedural code.

2.6.2.3 Three-tier Architecture

The three-tier architecture is also referred to as the multi-tier architecture emerged to overcome the limitations of the two-tier architecture. In the three-tier architecture, a middle-tier was added between the user system interface client environment and the database management server environment. There are a variety of ways of implementing this middle-tier, such as transaction processing monitors, message servers, or application servers.

The middle-tier can perform queuing, application execution, and database staging. For example, if the middle tier provides queuing, the client can deliver its request to the middle layer and disengage because the middle tier will access the data and return the answer to the client. In addition the middle layer adds scheduling and prioritization for work in progress. The three-tier client-server architecture has been shown to improve performance for groups with a large number of users and improves flexibility when compared to the two-tier approach.

Flexibility in partitioning can be a simple as "dragging and dropping" application code modules onto different computers in some three-tier architectures. A limitation with three-tier architectures is that the development environment is reportedly more difficult to use than the visually-oriented development of two-tier applications.

2.7 Operating System

Operating system is a set of programs that controls the way a computer works and run other programs. Examples of operating system are Windows NT, Windows 2000, Windows XP and so on.

2.7.1 Windows NT

Windows NT is a 32-bit operating system. It is a preemptive, multi-tasking operating system, which means that the operating system controls allocation of CPU time, not the applications, stopping one application from hanging the operating system. NT supports multiple CPU's giving true multi-tasking, using symmetrical multiprocessing, meaning the processors share all tasks, as opposed to asymmetrical multiprocessing, where the operating system uses one CPU and the applications another.

NT is also a fault tolerant operating system, with each 32 bit application operating in its own virtual memory address space 4 Giga bytes which means one application cannot interfere with another's memory space. Unlike earlier version of Windows such as Windows for Workgroups and Windows 95, NT is a complete operating system. NT's other main plus is its security with a special NT file system (NTFS) that allows permissions to be set on a file and directory basis. There are actually two versions of Windows NT that are Windows NT Server, designed to act as a server in networks, and Windows NT Workstation for stand-alone or client workstations.

2.7.2 Windows XP

Windows XP is an operating system that most commonly used nowadays. This operating system has many necessary, interesting, additional and updated features if to be compared with other previously established operating system such as Windows 98, Windows 2000 and Windows ME. Users may find that by using Windows XP as a platform, all tasks can be carried out easily and faster. Windows XP is available in two types that are Windows XP Professional Edition and Windows XP Home Edition. Windows XP Professional gives all the benefits of Windows XP Home Edition plus additional remote access, security, performance, manageability, and multilingual features that make it the operating system of choice for businesses of all sizes and people who demand the most out of their computing experience.

There are many common features provided by Windows XP that are much better if to be compared with previous operating system. Windows XP has a new user interface that makes it easy to find what is needed and when it is needed. It also has a reliable foundation that can be counted on since it keeps users computer up and running when they need it most. Besides, user also can use Windows Media Player which user can use it as a single place for finding, playing, organizing and storing digital media. Not only that this operating system also allows users to easily connect and share the computers and devices from home by using network setup wizard. Whereas windows messenger provided is the ultimate communication and collaboration tool with instant messaging, voice and video conferencing and application sharing. Lastly, the help and support

center provided will make user easy to recover their computer from any problems and get help and support when they need it.

2.8 Database Management System

Database Management System (DBMS) is a system that manage, store, update, delete the data that is stored in the database. Database is the organized set of data that is stored on a computer and can be looked at and used in various ways. Examples of database are Microsoft Access 2000, My Structured Query Language (MySQL), Oracle and so on.

2.8.1 Microsoft Access 2000

Microsoft Access 2000 is one of the most commonly used database software. Microsoft Access 2000 is a Relational Database Management System. This software always comes along with Microsoft Office Software Application Package. This why this software is used by almost all of people since it is available and widely easy to get and be install.

Many people know how to use this software because it is very simple and easy to use. However, this software also has disadvantages such as it does not provide an in interesting interface. So, users usually use this software as a behind the scene part of the system.

2.8.2 My Structured Query Language (MySQL)

My Structured Query Language (MySQL) is a Relational Database Management System. A relational database adds speed and flexibility, by storing data in separate tables rather than putting all the data in one area. These tables are linked by defined relations making it possible to combine data from several tables upon request. Using a RDMS means it is possible to add, access, and process the data stored in database. 'SQL' stands for "Structured Query Language" - the most common standardized language used to access databases. MySQL is open source software. Open Source software means that the source code can easily be manipulated and modified by anyone.

MySQL is very fast, reliable, and easy to use. MySQL also has a very practical set of features developed in close cooperation with its users. MySQL is used to access databases on the internet due to its connectivity, speed and security. It was originally developed to manage large databases at a much faster speed than the solutions that previously existed.

2.9 Programming Language

Programming language is the computer language that being used in order to create functions by writing and testing the programs in the computer. The examples of programming language are Active Server Pages (ASP), Java Server Pages (JSP), Visual Basic (VB) and so on.

2.9.1 Active Server Pages (ASP)

Active Server Pages (ASP) is a technology that enables dynamic and interactive web pages to be made. ASP uses server-side scripting to dynamically produce web pages that are not affected by the type of browser the website visitor is using. The default scripting language used for writing ASP is VBScript. ASP pages have the extension .asp instead of .html.

When a page with the extension .asp is requested by a browser the web server knows to interpret any ASP contained within the web page before sending the HTML produced to the browser. This way all the ASP is run on the web server and no ASP will ever be passed to the web browser. Any web pages containing ASP cannot be run by just simply opening the page in a web browser. The page must be requested through a web server that supports ASP, this is why ASP stands for Active Server Pages, no server, no active pages.

As ASP was first introduced by Microsoft on its web server, Internet Information Services (IIS) that runs on Windows 2000/XP Pro/NT4; it is this web server that ASP pages usually run best on. Users have to install Microsoft's Internet Information Services (IIS) if they wish to play around with ASP on their own system. Lucky IIS or its micro version Personal Web Server (PWS) comes free with Windows.

2.9.2 Personal Home Pages (PHP)

PHP stands for *Personal Home Page*. PHP is a *server-side scripting language* whose primary purpose is to generate HTML content. With the current direction of the Web, it is easily being adapted to writing out all forms of XML content as well. It was originally developed as a set of server-side modules to perform some specific Web-server tasks on small, Unix-based Web servers. There are three things that make PHP popular. The first is that it is easy, easy to implement, easy to learn, and easy to use. The second is that it is free. The third is that it runs on almost any Web server on almost any platform currently available.

The core features of PHP are built around the ability to process strings and arrays, as well as to work as an object-oriented programming language. Beyond this most of PHP is a collection of modules that can be added in on the server as needed to perform a large variety of specific tasks. In other words, it is a highly customizable application, and you can keep it small by only installing as much as you need to perform required tasks.

2.10 Summary of Chapter 2

As the conclusion, this chapter is mainly about the literature review that has been done towards existing systems and book by using several types of information gathering methods. All software, hardware and other system development tools available were studied and compared in order to be chosen for the use of IBP implementation later. From the tasks that have been carried out, much information about system implementations have been gathered and all of the information will be used as a reference during coming phases.

In the next chapter, System Methodology will be carried out. In this chapter, the process of system development will be explained in detail. Each phase has its own importance in order to ensure the IBP system will be developed step by step so that the final system will be successful.

CHAPTER 3:

METHODOLOGY

3.0 Method and Methodology

Method and methodology is a common process that has to be carried out during any of system development life cycle. Method as defined in the Oxford Advance Learners Dictionary International Student Edition from page 837, is a particular way of doing something. Whereas methodology as in page 838, defined as a set of methods and principles used to perform a particular activity. Methodology is also known as a way of developing a software product, or the science of methods.

Methodology is an important aspect where objects and resources are examined and studied before developing the intended system. Methodology is composed of two root words that are 'methodos' and 'logos' that comes from Babylon words. 'Methodos' brings the meaning of a way or method. While 'logos' means knowledge of methods used to analyze or examine something. By choosing the correct methodology, the correct system analysis can be performed.

System analysis is done before the system is being implemented. This is because to ensure that the proposed system can be developed and functioned successfully. Methodology elements really play as important role because before the IBP can be developed, a method and methodology have to be chosen in order to implement the system step by step. The right methodology will give a guide on how the system should be implemented accordingly.

There are many methodology can be chosen in order to develop the IBP. In order to develop IBP, the waterfall model with prototyping has been chosen since they are really suitable and the methods are convenience to be followed. The concept of the methodology is also very practical and flexible and in the same time it is very easy to be understood by the developer. It can be the best guideline to be followed throughout the development until the completion of IBP system.

3.1 Objectives of Using Methodology

The main objectives of using methodology in system development is to examine the right way and methods that been used to find all the resources for the system. The resources are needed to extract information regarding the system that being developed and to set up methods to develop the proposed system. The most suitable chosen methodology will be a guide line in developing web-based Interactive Bowling Portal (IBP) later.

3.2 Advantages of Using Methodology

Methodology is a very important element that has to be used during the IBP development process. This is because there are many strong reasons that give advantages on why the methodology has to be followed during the implementation of IBP. The advantages are:

1. Methodology can give an idea on how the IBP should be built. This is because each methodology has its own stages so the IBP can be developed step by step according to the phases of the methodology chosen.
2. Each phase of methodology also has its own important stages and it can give fine description to the developer on what has to be done in developing the system. This is because each phase has its own important elements and major activities that will guide developer throughout all of the process of development.
3. By implementing IBP piece by piece, more system failures can be detected and solved earlier. This is because after each phase of development, the system will be tested continuously and maintenance towards any features that failed or missing can be done.
4. There are more problems can be avoided by using methodology. This is because each phase of development is independent towards each other so, any failure or changes in any phase would give impact towards other phases. System failure have to be detected earlier since it can save more times, save budget, make the system to function successfully without any failure and features missing and lastly the system can be delivered on time.

3.3 Modeling The Process and Life Cycle

3.3.1 What Is A Process?

Process is a series of things that are done in order to achieve particular result. It is a way how the system should be produced. It incorporates the methodology with its underlying software life-cycle model and techniques, the tools to be used and most important of all the individuals building the system. In developing IBP, the system itself has to go through every level of the process. Process also has its own characteristics that are:

1. Process prescribes all of the major process activities such as the stages of system development life cycle.
2. The process use resources, techniques, tools and subject to a set of constraints such as schedule to produce a final report and completed system.
3. Each of the process itself is composed of sub-processes that are linked in some way. Each process has its own hierarchy of processes so that each sub-process has its own process model.
4. Each process is organized in a sequence, so that each process is actually interrelating to each other.
5. Every process also has its own entry and exit that will tell developer when the process starts and ends.
6. Goals and objectives are set purposely for each process so that is why each process is needed to be performed.

7. By following process, developer will be guided all the way in developing the system since each process has its own principles and activities

When the process involves the building of a system, it is referred as system life cycle. Every life cycle involves following activities that are:

1. Preliminary investigation or requirement investigation.
2. System analysis.
3. System design.
4. Program design.
5. System implementation.
6. Unit testing.
7. System delivery
8. Maintenance.

3.4 System Development Method

In developing Interactive Bowling Portal (IBP), the waterfall model with prototyping model has been chosen as a set of methodology to be followed. This is because, the combination of both models might guaranty that IBP will be produced successfully. In waterfall model, each development phase has to go through series of process that are requirements are elicited, analyzed and documented before designing the system. This

means that each phase has to be completed by going through the series of process before proceeding to the next stage.

While in prototyping model, it acts as a sub-process where certain aspects of the system can be reviewed and tested to check its functionality and whether it meets the requirements. During the development process, changes towards requirements specifications might happen and thus consequently will affect system design. Thus, prototyping process will ensure that changes towards design can be altered until the users satisfy with the whole system specifications. This means that the prototyping model is aimed to ensure that the system will meet the requirements and any problems can be detected in the early stage.

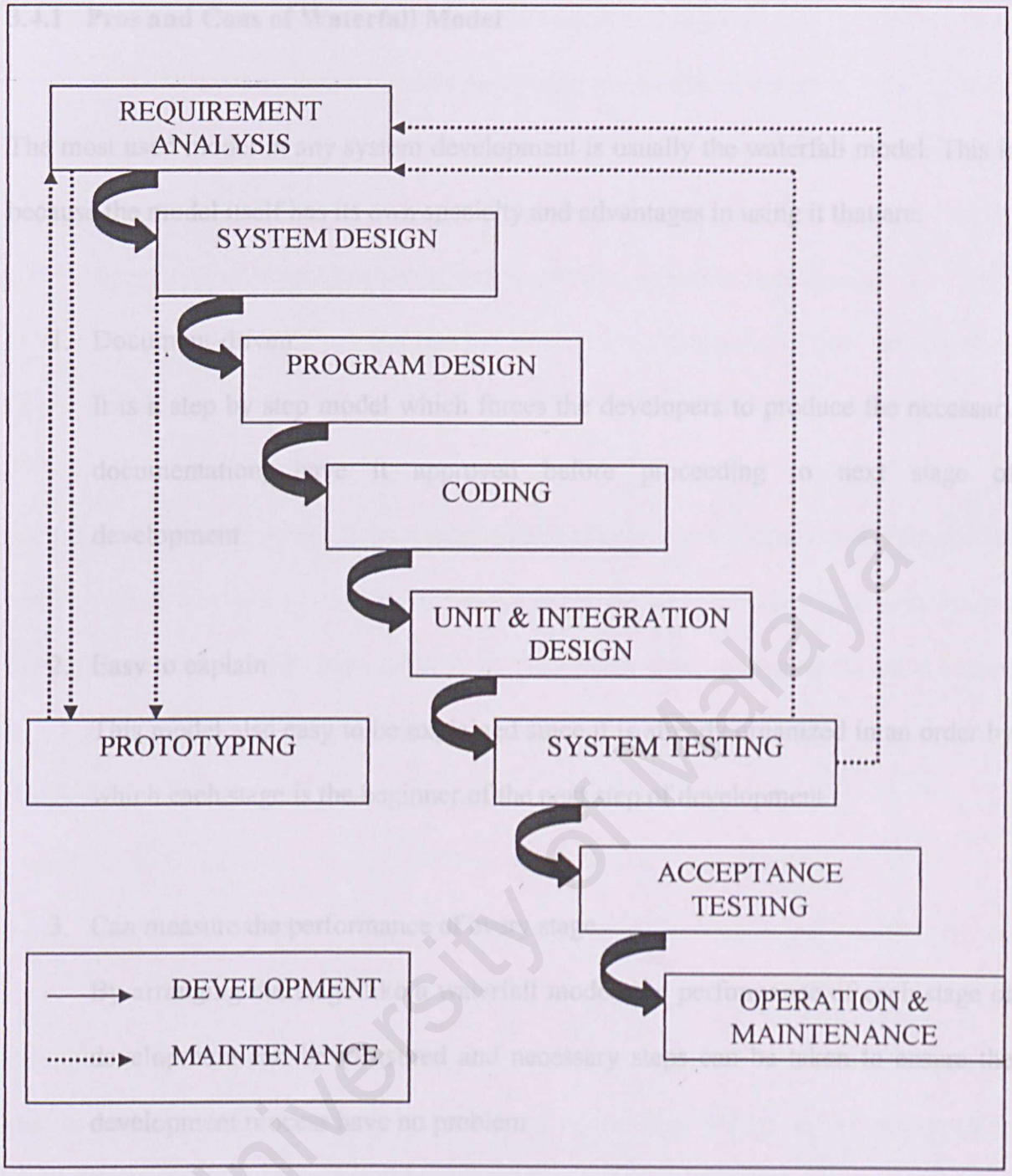

Figure 3.1: Waterfall Model with Prototyping

3.4.1 Pros and Cons of Waterfall Model

The most used model in any system development is usually the waterfall model. This is because the model itself has its own specialty and advantages in using it that are:

1. Document-driven.

   It is a step by step model which forces the developers to produce the necessary documentation, have it approved before proceeding to next stage of development.

2. Easy to explain.

   This model also easy to be explained since it is already organized in an order by which each stage is the beginner of the next step of development.

3. Can measure the performance of every stage.

   By arranging the stage like a waterfall model, the performance of each stage of development can be measured and necessary steps can be taken to ensure the development process have no problem.

However, there are also a few cons of waterfall model that have to be evaluated before choosing the model to be used in system development. The criticisms of this model are:

1. Problems are not discovered until system testing.

2. Requirements must be fixed before the system is designed.
3. Requirements evaluation makes the development method unstable.
4. Design and code work often turn up requirements inconsistencies, missing of system components and unexpected development needs.
5. System performance can not be tested until the system is almost coded.
6. Hard for the client to visualize the final product from the written specification document.

This waterfall model is associated with the failure or cancellation of a number of large systems. It also can be very expensive since the need of changes always known only after testing stage has been carried out. As a result, the prototyping model is known as a best method to be combined with the waterfall model to help avoid all those cons that have been stated.

3.4.2 Pros and Cons of Prototyping Model

Prototyping model is a model that allows all part of the system to be constructed quickly and to solve problem instantly. The objective of this model is to do repeated investigation towards requirements and design stages to ensure that the developer, user and customer have a common understanding both of what is needed and what is proposed. By developing the system rapidly, the inputs and outputs can be shown to client in order to ensure that the client understand and either accept or reject the system. There are also a few pros in using prototyping model that are:

1. Understanding the requirements for the user interface.
2. Examining feasibility of a proposed design approached.
3. This model allows the exploring of system performance issues along the way.
4. Prototyping model enable to detect faults and weaknesses before designing and programming phase, which is quite expensive.

However, there are also a few weaknesses of this model. These also have to be considered by the developer to know whether this model is suitable for the system that is going to be implemented or not. The cons of this model are:

1. Developer tends to develop system as fast as possible but they did not consider the quality of the system and long term maintenance.
2. Prototyping model encourage the requirements activities to reconsider and change the requirements specification, this may happen with unlimited iteration.
3. In this model, the operating system and programming madly be used for the rapid development output.

3.4.3 Justifications of Phases in Waterfall Model with Prototyping

Each phase in this combined waterfall model with prototyping model that being used for the development of Interactive Bowling Portal IBP (IBP), has its own purpose during the development process. Each phase is playing important roles that are significantly different but interrelating to each other. Following are the explanation of each system phase:

- *Phase 1: System Planning*

System planning is the early stage of system development process. During this phase, there are a few important activities been done such as to plan the activities and steps needed to ensure that the system development process is planned, well organized, scheduled and will meet the needs of the clients requirements.

- *Phase 2: Requirement Analysis*

By recognizing the requirements of the system, the system development mission will easily to be achieved. This is because, preliminary investigations towards system requirements and analysis towards general problems occurred can be carried out during this phase. Among of the problems that can be eliminated are from the aspects of information, system performance, system control, economy and time. Besides by doing the analysis, common system weaknesses can be detected and thus new elements can be created to be put into the system. These are a few examples of system weaknesses:

1. Stand-alone system and not as a web-based or online system.
2. Manual system and not computerized.
3. Not interesting interface.

So by doing requirement analysis, common system problems can be detected and steps to overcome the problem can be taken. More advantages also can be created for the system from the studies on the weaknesses.

- *Phase 3: System Design and Program Design*

  System design and program design is done depends on the scopes that has been lined during the system planning and requirements phases. The system will be designed to suit the needs of the clients and in the mean time able to perform the main purposes of the developed system.

- *Phase 4: Coding*

  Coding process is done depends on the set of programming that can ensure the system can function as how it is wanted. During this phase, all coding are inserted into the software fields that being used so that the functions can perform correctly.

- *Phase 5: Unit & Integration Design and System Testing*

  After the system has gone through the system design and coding phases, the testing towards unit and integration and testing towards the whole system will be carried out. Testing towards the system is done to detect any problems that can cause to system failure or can make the system not functioning as how it is used to be. Through the series of testing, decision can be made whether the system can proceed to the next step or changes have to be made towards the system. Evaluation on the system requirements will be revised continuously until the system can cater the need of the client.

- *Phase 6: Operations and Maintenance*

  This phase is the last stage of the system development process. During this phase, the system will be uploaded to the web server to enable user to browse the system. Usually, the maintenance will be done when the system needs to be updated or there is any problem occurred towards the system.

3.5 Summary of Chapter 3

In chapter 3, the decision of which methodology to be used in developing Interactive Bowling Portal (IBP) has been made. Through analysis that has been done, the waterfall model with prototyping is the most suitable model to be used for the system. This is because the IBP is developed step by step according to the development phases as in waterfall model. In the mean time, maintenance will be carried out continuously until the outcome of each phase is satisfied.

In the next chapter, system analysis will be carried out to list down all the requirements needed for the system. The functional and non-functional requirements needed to build IBP will be identified. This chapter will give a rough sketch on the functionality of the system.

CHAPTER 4:

SYSTEM ANALYSIS

4.0 System Analysis

System analysis is a systematic investigation of a real or planned system to determine the function of the system and how they relate to each other and to any other system. This process is aimed to analyze and refine the requirements. During the requirements workflow, all of the artifacts must therefore be expressed in a natural language that is human language. All natural languages are imprecise. While the analysis artifacts must be precise, and complete enough for the designers.

After literature review process has been carried out, many elements have been recognized and will be included into the system. The existing interactive multimedia applications, slightly similar existing software also hardware and computer applications tools being used were evaluated in order to choose the best software and hardware to be used in the IBP implementation. All of these software and hardware will be studied and analyzed since later it will give a precise pictures on how the developer should implement the system.

The development process of IBP will require many software and hardware to be used. All software has its own importance and functionalities that play important roles in order to complete each pieces of the system. Due to the constraints of IBP, developer should be able to identify all the functionalities and scopes of interactive multimedia software that being used in the system by creating a preliminary analysis. By doing this, methods can be arranged in order to develop IBP correctly and in the same time there will not be

many problems occurred. There are a few constraints in the applications of interactive multimedia towards IBP that are:

1. Multimedia software is hard to be applied by the developer without basic knowledge and skill of the software.
2. Certain media configurations and platforms also needed in order to make the software that being used functioning very well.
3. There are not many expertise and professional available and not all of them mastered in all software applications.

4.1 Information Gathering Techniques

In order to make analysis towards the implementation of Interactive Bowling Portal (IBP), the gathering of information is very important. This is because; the information gained will give a rough picture on how the system should be built. Moreover, advantages and disadvantages of any software and hardware can be gained thus the best decision can be made during the process of developing the IBP. There are a few information gathering techniques that have been used that are:

1. Discussion with thesis advisor.

   Continuous discussion has been done from time to time in order to give report on the progress of IBP development process. Moreover, advisor will give advices, comments, and suggestions and thus guide the progress of IBP development.

Decision only will be done only after discussion has been done with the advisor. Advisor is the one who gives the scopes or required how the system should to be.

2. Reference resources.

   Reference resources also have given a really big help towards the development process of IBP. Some reference resources that have been used are like books, magazines, review towards existing system and many more.

3. Documents room.

   Regular visits to document room also have helped to give huge information on how the IBP should be built. From the documents that have been reviewed weaknesses and advantages of software, hardware and even the existing system have been gathered. The information then has been evaluated before the right decision is made towards which is the right choice to be used for IBP.

4. Internet.

   Internet is also a way that where unlimited information can be retrieved from. Through internet, existing systems have been reviewed and useful features also have been listed down to be evaluated later whether it can be used in IBP or not. Since IBP is going to be developed as a web-based system so, information gathering through internet is one of the most effective techniques has been used.

5. Discussion with friends.

   Discussion with friends also has been done so that idea and comments can be changed among each other. Besides, slightly similar information also can be shared to be used along the way. Not only that, discussion with senior students that have taken this course also has helped a lot especially during decision making process. Their experiences have been used as a guide and hopefully a few problems can be avoided by listening to their advices.

4.2 Functional Requirements

Functional requirements specify an action that the target product must be able to perform. Functional requirements are often expressed in terms of inputs and outputs. Given a specific input, the functional requirement stipulates what the output must be. The functional requirements handled while the requirements and analysis workflows are being performed. Besides, functional requirements also describe the interaction between the system and the environment. Without functional requirements, the whole system will not function effectively as how it should be. Moreover, functional requirements also will guide the system about what action should be taken when the system is given an order.

4.2.1 Modules of IBP

The functional requirements consist of modules that will be included into IBP in order to achieve IBP system development objectives. The modules are actually will be the elements that create the functionality of the system later. List of functional requirements of IBP are:

- Home.

  In this section, the summary about each section of IBP will be displayed. It will give brief explanation to user the function of each section provided and thus user will be more understood on how to search for the information that they want.

- Introduction to Bowling.

  This section will give an overview to user about what bowling is all about. There are three links provided in this section that are Bowling Dimensions and Equipments, How to Score and Fitness for Bowling.

- Let's Go bowling

  In this section, the real part of teaching user how to play bowling is provided. There is information provided step-by-step to be followed up by user. In this section, many pictures will be inserted in order to give real view to user of how the actions should be done.

- Bowling History

  In this section, the story about how bowling can exist into our world today is explained. User can see how the simple game like bowling can be a very famous game being played in international game competition.

- Forum.

  Forum section is also provided in IBP. Through forum, users can upload their comments, ideas, suggestion and have discussion among each other about anything related to bowling. User also can have a look at the archive of previous forum posted by users. However, only registered user and administrator can send and upload messages in the forum. Unregistered user only allowed to review the forums displayed.

- User Name Search Engine.

  This module is provided to be used by all members of IBP to search for the name of user who has sent feedback to IBP. By using this module, the comment sent by particular user can be obtained. The comment given also can be taken into consideration.

- Feedback.

  Feedback module is also provided to be used by all users. Any users whether registered or unregistered can give comments, appraisals, suggestions and ideas

towards IBP. The administrators will read all the messages sent and take proper actions towards IBP improvements.

- Registration and login.

  Each user who wants to get into IBP will have to log in by type in their username and password before they can proceed to browse all sections of IBP. However for unregistered user, they do not have to log in and they can browse all sections if IBP but can not use certain modules provided. For unregistered user, they can use registration module to sign up to be a member of IBP. They are not allowed to join forum, play online bowling games or send forum.

- Delete, Modify and Display.

  These modules are provided in administrator domain and they are allowed to make any changes towards IBP user information. By using these module, administrator can delete, modify and display user information in IBP.

- Bowling game.

  Not only that, IBP also provides bowling game to be enjoyed by users. However, only registered users are allowed to play the games. Users will not feel boring when they browse the system and they can apply whatever they have learn by playing the games.

- Bulletin Board.

  In this section, all additional information regarding bowling will be provided such as available bowling centers and bowling shops in town. Users also can retrieve archived topics from this section.

- User's Vote.

  Other than feedback, there is also vote module will be provided in IBP. By having this module, simple and fast conclusion of user's thought towards IBP can be obtained.

4.2.2 Administrator Module

The administrator module is created only for administrator, and users are not allowed to enter the administrator domain. The modules for administrator are:

- Introduction to bowling
- Bowling history
- Home
- Sign-in and sign-up function
- Feedback
- User search name
- Forum
- Bowling game

- Let's go bowling
- Delete, modify and change user information
- User vote
- Bulletin board

4.2.3 Registered User Module

Registered user module is only for users who have signed up as a member of IBP. There are a few functions and sites that only allow authorized users to use them. The modules for members are:

- Home
- Introduction to bowling
- User name search engine
- Feedback
- Sign-up and sign-in function.
- Forum
- Bowling game
- User vote
- Let's Go bowling
- Bulletin board

4.2.4 Unregistered User Modules

Unregistered users are persons who are not register yet to be a member of IBP. They can be a new visitor of the website or just a common internet surfer. The modules provided for them are:

- Registration and login

4.3 Non-Functional Requirements

Non-functional requirements specify properties of the target product itself, such as platform constraints, respond times, reliability and so on. Some non-functional requirements may have to wait until the requirements, analysis and design workflow being performed before it can be handled. The reason is that, to be able to handle certain non-functional requirements, detailed knowledge about the target software product may be needed, and this knowledge is usually not available until the requirements and analysis workflows have been completed. However, wherever possible, non-functional requirements should also be handled during the requirements and analysis workflows. The non-functional requirements that can be found in the IBP are:

- User-friendly.

  IBP is developed to be as a user-friendly system. This is because this element can enhance the understanding of users when they browse the system. It is easy to

browse the system that is user-friendly since the elements on the interface are arranged in a structured order. Each functions provided also can guide users to go through each sections of IBP without having any difficulties in learning how to play bowling.

- Attractive Interface.

  The interface of IBP is created to be as attractive as possible. The arrangement of information, suitable colors and font used, insertion of image and so on will make the IBP very attractive. Users will also find that it is not boring to browse the IBP.

- Easy to navigate.

  Besides, some features in IBP will make user easy to navigate the system. User search engine in the system will make user easy to find information about bowling that they want to know and thus help them enhance their understanding.

- Interactive.

  IBP is an interactive system that teaches users how to play bowling. The interactivity is the element that differ IBP from any other system. Multimedia elements such as image, graphics, sounds and text are inserted into the system to make the learning process become easier and interesting.

- User satisfactions.

  The system is also very enjoyable to be used and pleasing to users. IBP is implemented to cater the needs of bowling fans in learning bowling. Besides the elements inserted into the system, the huge range of information will also satisfy the users since that can find anything that they want to know from the system. This complete system can ensure user satisfactions.

- Accuracy and reliability.

  The interface design must have high reliability element. This element can give confidence to user that the system will function correctly and effectively. The accuracy of information also is a very important factor in order to ensure user satisfaction. The system should be revised continuously to detect any error in information linking or system break down. This is because user would like to obtain correct knowledge since they are in the process of learning the right way on how to play bowling.

- Maintenance.

  Though if IBP is already uploaded into the web server, but as a good system it can be modified and maintenance can be done to it from time to time. This is very important so that the system can be updated and suits the information that needed by the user. Any problems also can be handled during maintenance process towards the IBP.

- Safety.

  In order to ensure that IBP can function in a long period of time, the safety of this system should be considered. Password is set on the system so that authorized users such as administrator and members have to log in the password every time they want to browse the system. They also have to log out after they have finishes up browsing the system. Administrator is the only person who can make changes towards the system. Non-members or guests are only allowed to browse a few sites of the system.

4.4 Software and Hardware Requirements

In developing Interactive Bowling Portal (IBP), a few software and technologies requirements are needed in order to build the system. The chosen suitable software and hardware can make the IBP to function successfully and smoothly. The software and hardware chosen must be compatible to each other and suitable towards the purpose of developing the IBP. By using the right software and hardware too, system maintenance can be done easily and many problems can be avoided. The most important thing after all is, IBP can be delivered and can teach bowling fans widely on the internet on how to play bowling.

4.4.1 Software Requirements

Software requirements are chosen after the literature review process that has been carried out previously. Through the studied on the available software, these software are recognized as the most suitable software to be used in developing IBP.

Table 4.1: Software Requirements

No.	Software	Description
1.	Windows XP Professional Edition	Operating system used as the system platform.
2.	Internet Information Services	Web server used to upload the system into the internet.
3.	Microsoft Internet Explorer	Web browser used to browse the website.
4.	Microsoft Access	Database used to store data.
5.	Active Server Pages	Programming language used for the system.
6.	Macromedia Dreamweaver MX	Web authoring tool used to develop the IBP as a web-based system.
7.	Sparkle Flash Keeper	A software used to convert .exe flash player file to a flash movie file.

4.5 Summary of Chapter 4

In this chapter, system analysis has been carried out to examine all the components related to IBP development. System analysis is important since the right software and hardware can be chosen and thus make the system to function as how it is supposed to. Functional and non-functional requirements underlined for the system have given a sketch on how the system should look like.

In the next chapter, system design will be carried out in order to get a rough view towards the system interfaces and its relationship between each section. This chapter is very important because by preparing the prototype design, any problems and system failure can be avoided earlier.

CHAPTER 5:

SYSTEM DESIGN

5.0 System Design

System design is a phase where developer has to change information and data gained from previous chapter, system analysis to information that can be understood by the user. Screen design that has been sketched will help and give guide line to developer in developing real screen later. Developer will not out of source and the design also will avoid developer from missing any features during the development of the system interfaces.

However, the system design may change from time to time during the development process. Basically, the system design is depends on the developer creativity and imagination to ensure that the interfaces can fulfill the user needs. In designing the interfaces, suitable text, background and graphic have to be chosen in order to produce and interesting system interfaces.

5.1 Program Structure Design

Interactive Bowling Portal (IBP) is developed by using 'up-down' approach and this approach is chosen because it can divide the system into smaller components or modules. By dividing the system in this way, the modules will be easily to be arranged, controlled and managed. After each module has been assigned to its level, the design process will start with introduction module followed by other modules. Modules are designed in that way because it can give minimum effect towards the system and

relationship between each module also will be limited thus making the system easily to be modified and high in quality.

Besides, these modules are run alone between each other after they have been implemented. By doing it this way any problem, failure and features missing on each module can be detected and corrected right after that. Earlier problem detection can avoid more complicated system problems from occur later. Besides, system development will be much easier, cost can be saved, system can run successfully and be delivered on time. Lastly, these modules that designed differently from each other is to give user opportunity to retrieve only the information that they want.

5.2 Screen Design

Screen design of IBP is one of the most important elements that have to be worked out seriously. This is because, the screen can give first impression towards users and they will decide whether to move on browsing the website or not. Since the screen can affect users interest, interesting and exciting screen can guaranty that users will continuously to browse the IBP in the future. IBP itself is aimed to teach bowling fans about how to play bowling through its interactive website. For a system that used multimedia elements like IBP, it must have interactive screen according to the time that goes by.

Nice looking screen can help users to enhance their understanding towards what they have read and learned about bowling. Information also can be delivered directly and

users also tend to remember whatever information they have got easily. Besides, the system contents that arranged in a structured manner and added with helpful features like search engine will make bowling fans to feel that IBP is a very user-friendly system. IBP guides it users along the way while they browse the system. Basically, IBP has a simple, packed with contents and the interactive interface also makes the system becomes more interesting.

IBP screen has the function that allows users to choose the menu that they would like to navigate. Button is used widely as a way for users to point and navigate or get out from the page that being browsed. The button also will consistently show its link whenever the pointer is pointed to the button. Generally, user has to use mouse in order to interact with IBP.

5.3 System Design

This system design is developed to deliver information and attract interested target users to use IBP continuously. The design of IBP interface is divided into to categories that are:

1. System structure
2. System interface design

5.3.1 System Structure

System structure is one of a tool that can be used to design the system. It pictures the interaction and relationship that exists between the modules that related to each other. Following is the system structure chart and the explanation for each module in this IBP.

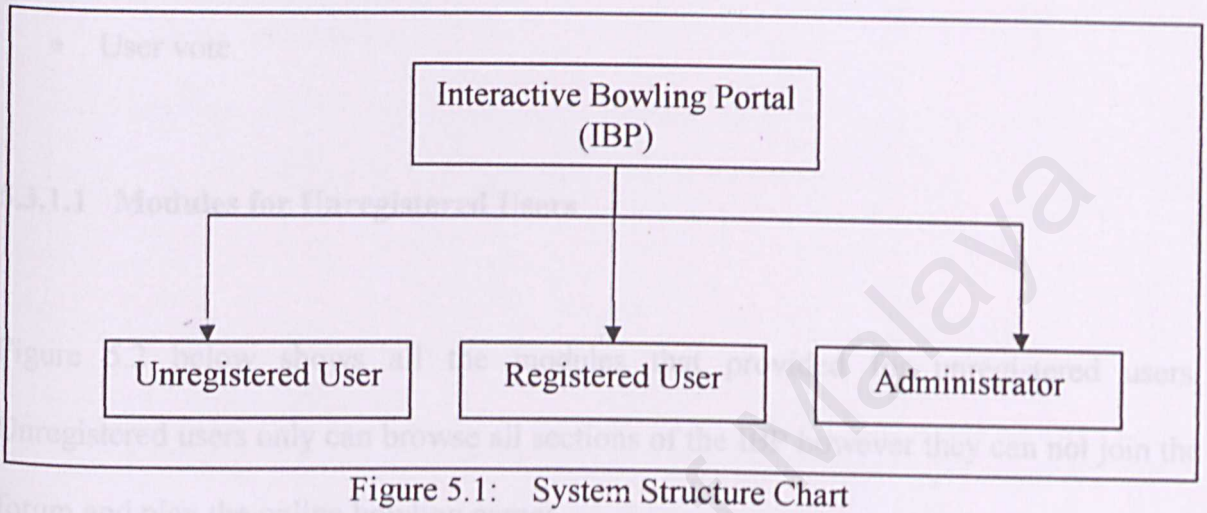

Figure 5.1: System Structure Chart

Basically, IBP system interface design is divided to three main domains that are for unregistered user, registered user and administrator. These different users need different view and domain that can be accessed. There are modules in this system and each module has its own functionality. However, not all functions can be used by all users. The modules provided in IBP as have been described in previous chapter are:

- Home.
- Introduction to bowling.
- Let's go bowling.
- Forum.

- Bulletin board.
- User name search engine.
- Feedback.
- Sign-in and sign-up function.
- Delete, modify and change user information.
- Bowling game.
- User vote.

5.3.1.1 Modules for Unregistered Users

Figure 5.2 below shows all the modules that provided for unregistered users. Unregistered users only can browse all sections of the IBP however they can not join the forum and play the online bowling games.

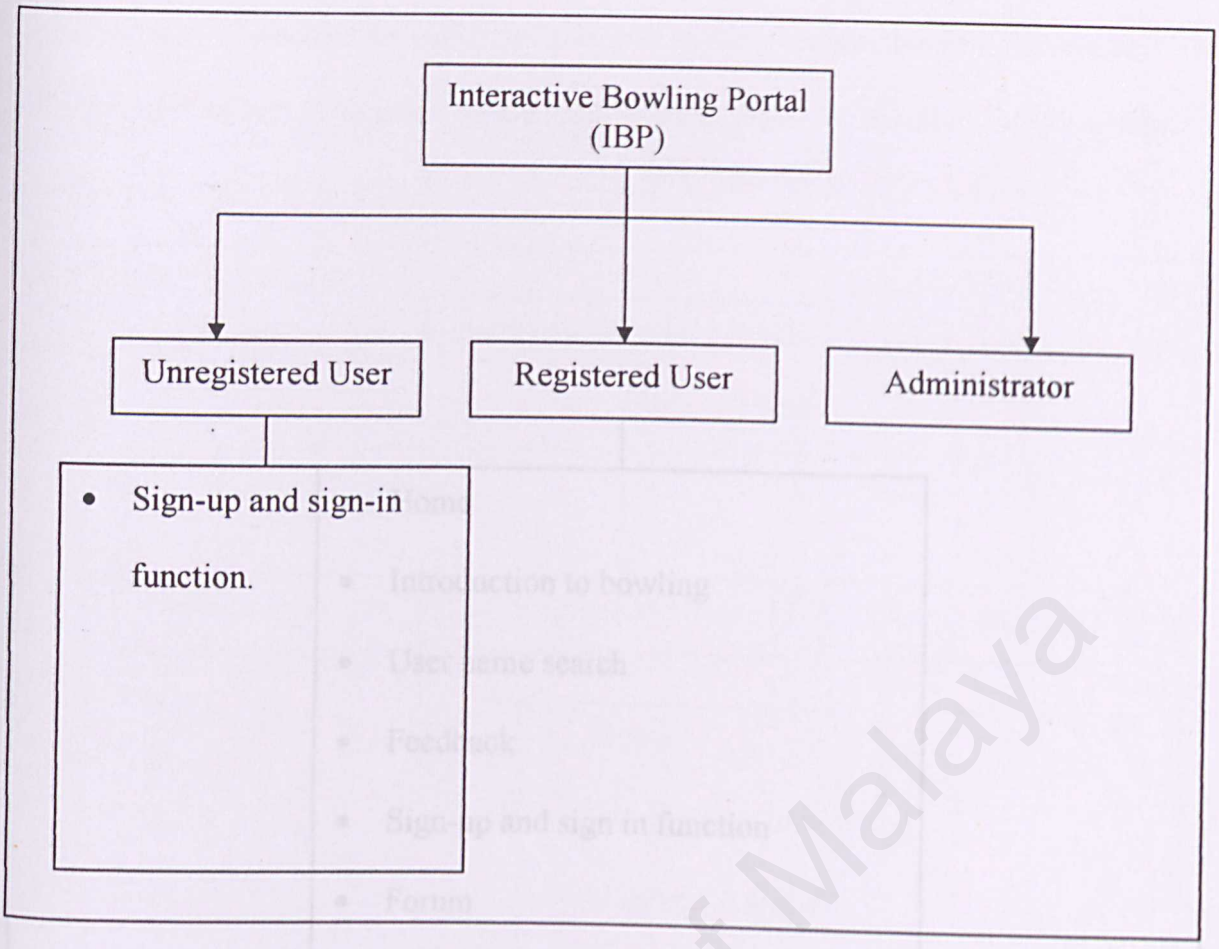

Figure 5.2: Unregistered User Modules Structure Chart

5.3.1.2 Modules for Registered Users

Figure 5.3 below shows all the modules that provided to registered user of IBP. The main differences between both users are the registered user is allowed to join the forum and play online bowling games. They can send forum and have discussion among themselves through the forum module. Online bowling games are also provided for them to enjoy the learning process in IBP. The highest marks will be stored in the database and displayed to everyone.

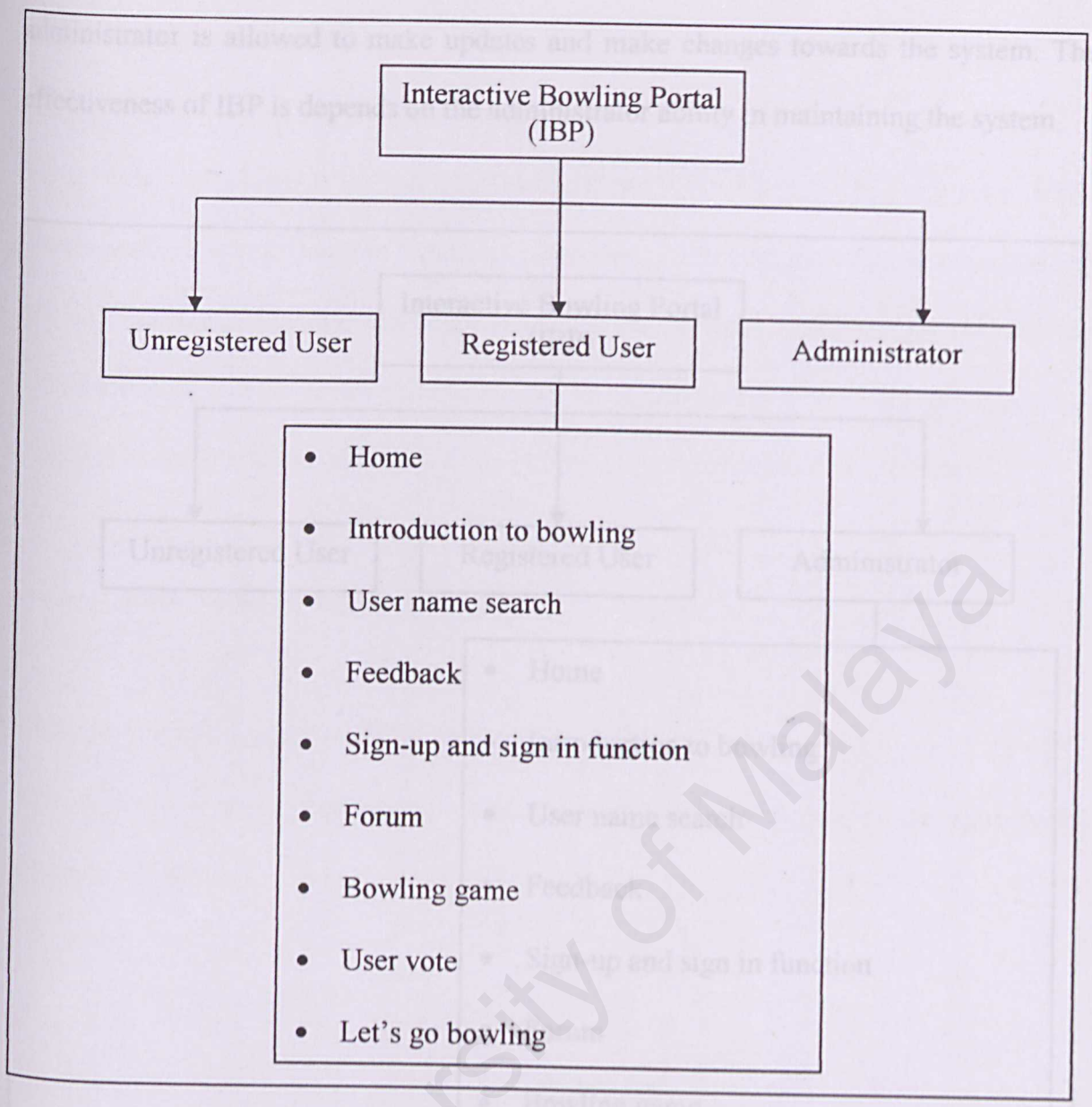

Figure 5.3: Registered User Modules Structure Chart

5.3.1.3 Modules for Administrator

The administrator is the person who controls and have full authorized towards IBP. Administrator have their own log in identification details (ID) and password to allow them to get into the IBP and do maintenance towards the system. Administrator can view the system as common user or view the system from the editing view. Only

administrator is allowed to make updates and make changes towards the system. The effectiveness of IBP is depends on the administrator ability in maintaining the system.

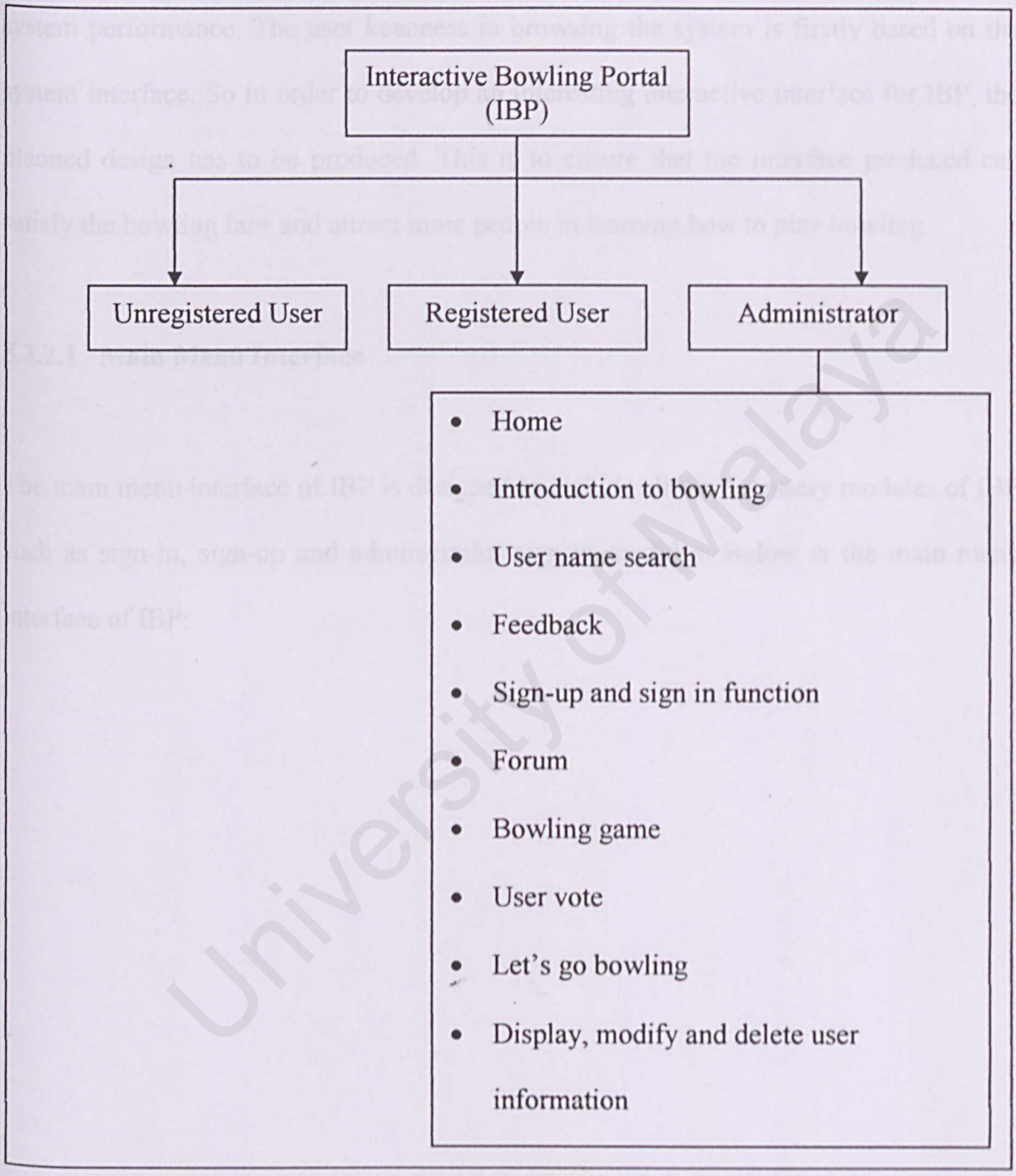

Figure 5.4: Administrator User Modules Structure Chart

5.3.2 System Interface Design

System interface design is an important element and it plays a really big role towards the system performance. The user keenness in browsing the system is firstly based on the system interface. So in order to develop an interesting interactive interface for IBP, the planned design has to be produced. This is to ensure that the interface produced can satisfy the bowling fans and attract more people in learning how to play bowling.

5.3.2.1 Main Menu Interface

The main menu interface of IBP is designed to include all the necessary modules of IBP such as sign-in, sign-up and administrator sign-in modules. Below is the main menu interface of IBP:

Figure 5.5: Main Menu Interface

5.3.2.2 Login Interface

Every user who wants to browse the system, they are required to log in their ID and password or else they will not be allowed to browse the whole sections of the system. Prototype log in interface of IBP is as below:

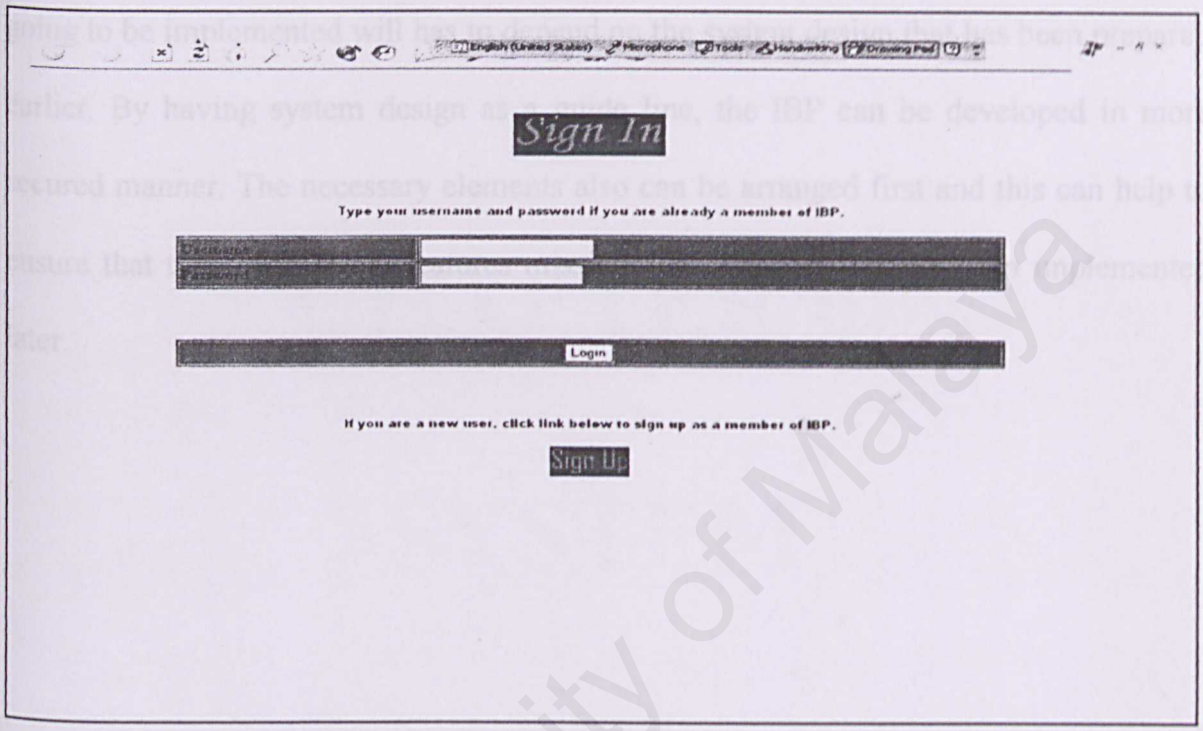

Figure 5.6: Login Interface

5.4 Summary of Chapter 5

During the process of system design, the prototype design of system interface has been made. Besides, the flow of information and relationships between each module in the system has been designed. System design is very important since the system that is going to be implemented will has to depend on the system design that has been prepared earlier. By having system design as a guide line, the IBP can be developed in more secured manner. The necessary elements also can be arranged first and this can help to ensure that there will be no features missing after the system have been implemented later.

CHAPTER 6:

SYSTEM IMPLEMENTATION

6.0 System Implementation

Implementation is the process of translating the detailed design into code. From the Collins English Dictionary page 736, implementation comes from the word implement that brings the meaning of 1) a piece of equipment; tool or utensil, 2) something used to achieve a purpose, 3) to carry out, put into action, perform 4) to supply with tools and 5) to complete, satisfy or fulfill. The implementation of Interactive Bowling Portal (IBP) system has been carried out during December of 2004 until March 2005. The implementation of IBP is done by firstly referring the proposal report of IBP system.

The implementation of IBP consists of a few important tasks. Firstly, the suitable programming language, the database and web server that are going to be used have to be identified. Then, the configuration setting on the computer has to be changed in order to provide a suitable environment for the implementation of IBP. This is important to ensure that the software being used and the machine or the computer system itself is compatible to each other and thus, there will be no problem to run the IBP system in the future.

6.1 Enhancement and Changes to the System

In the proposal of IBP, it has been planned and stated about how the IBP is going to be implemented such as in the matter of hardware, software, the programming language that are going to be used and so on. However, there were some changes have been done

along the way during the implementation of IBP. There were also a few changes and enhancement has been done towards the modules that going to be implemented in the IBP.

6.1.1 Changes on the Database

At first, it has been planned that the IBP system is going to be implemented by using My Structured Query Language (MySQL) database. MySQL is a famous open source database software that already widely being used in many organizations today. This is because of its stable functionality, big data storage ability and easier to be used if to be compared with any other common database software. However, MySQL is actually more suitable to be used with Personal Home Pages (PHP) programming language and Apache web server. This package of software is more suitable to be run in Windows NT operating system environment.

However, the computer that was going to be used to implement IBP is using Windows XP Professional operating system. The configuration setting of the operating system has to be changed first in order to allow MySQL to function well in the Windows XP Professional environment. Unfortunately, there was a problem to change the configuration setting of the computer; the MySQL software downloaded from internet also seems hard to be used. This is because it requires user to use command to create the database and this is of course hard to be done for new developer who never has experience in using this software.

So, Microsoft Access database software has been chosen to store all information entered by users and administrators. Microsoft Access is simple database software and it is already provided in every computer that is using Windows operating system. Moreover, the data of IBP that needs to be stored in the database is very small and the using of Microsoft Access database is already enough.

6.1.2 Changes on the Web Server

In the beginning, it has been decided that Personal Web Server (PWS) will be used to make the connection between the database and the interface. This is because the development of the system will be done on another computer that has been installed with Windows XP Home Edition operating system. However, the operating system then has been changed to Windows XP Professional Edition because this operating system provides more features and the IBP system itself can be transferred into any other computer in the faculty since almost all computers are using Windows XP Professional Edition operating system. So, Internet Information Services (IIS) is the most suitable web server to be used to run the IBP system. This web server is one of the features provided in every Windows XP Professional Edition operating system.

6.1.3 Changes on the Modules in IBP

In the proposal report of IBP, it has been planned that IBP will be implemented together with several functions to enhance the usefulness of IBP itself. The functions were Introduction of Bowling, Bowling History, Let's Go Bowling, Bowling Game, User Feedback, Bulletin Board and Forum. However, the Forum module and Bulletin Board module have not been provided in the IBP system. This is due to lack of time to implement those two modules. Although the functional requirements of IBP are not fully fulfilled but there are another two new modules included into IBP that are Send Your Vote module and User Search Name module.

Send Your Vote module gives the chance to users to send their vote towards IBP system. By having this function, user's thought and satisfaction towards IBP can be observed and necessary actions can be taken in order to improvise IBP. Whereas User Search Name module allows user to search the name of users who has sent feedback. Then the feedback sent by searched user can be obtained and take into consideration.

6.2 Development Environment

The development for the IBP consists of both hardware and software configuration. Using the appropriate hardware and software is an important factor in determining the successfulness of the system.

6.2.1 Hardware Configuration

Hardware is very important things needed in order to make the system functions. Hardware acts as a platform from where the system can be launched and operated. The minimum hardware specifications needed for IBP are:

- Minimum 486 MHz CPU.
- Processor Intel(R) Pentium(R) 3 or later.
- 192MB of RAM.
- 1.5 GB of available hard disk or more.
- Monitor capable of super VGA 800x600 pixel resolution (millions of colors and 1024x768 pixel resolution recommended) or higher resolution.
- Keyboard.
- Mouse.
- Modem with minimum 33.6Kbps or higher speed modem, or a network connection.
- CD-ROM Drive.
- 3 ½ Floppy Drive.

6.2.2 Software Configuration

The software tools used for the system development are vital to the successful implementation of the IBP. Through the studied on the available software, this software is recognized as the most suitable software to be used in developing IBP. The software specifications used in the development of the system are listed below:

Table 6.1: Software used to develop IBP

No.	Software	Description
1.	Windows XP Professional Edition	Operating system used as the system platform.
2.	Internet Information Services	Web server used to upload the system into the internet.
3.	Microsoft Internet Explorer	Web browser used to browse the website.
4.	Microsoft Access	Database used to store data.
5.	Active Server Pages VB Script	Programming language used for the system.
6.	Macromedia Dreamweaver MX	Web authoring tool used to develop the IBP as a web-based system.
7.	Sparkle Flash Keeper	Software used to convert .exe Flash Player 5.0 file to Flash Movie file.

8.	Adobe Photoshop 7.0	Graphic software used to manipulate pictures and image to be better.

6.3 Descriptions and Coding of Each Module in IBP System

Even though in the previous chapter it has been explained about each module and functions that are planned going to be put into IBP, but here are the detail explanation about each module exactly developed in IBP and how the IBP system itself is functioning:

6.3.1 User Sign-In Function

IBP functions as a system that requires user to become a member first before they can browse all sections of the system. They have to enter the correct username and password every time they want to get into the IBP website. This website is only allowed to registered user to browse because only by that way the real number of users who seriously want to learn how to play bowling can be estimated. If the user did note enter the correct username and password, they will be asked to sign up to be a member first or sign in again by using correct username and password.

6.3.1.1 Coding of User Sign In Function

```
<form ACTION="<%=MM_LoginAction%>" method="POST" name="login" id="login">
 <table width="75%" border="1" align="center" bordercolor="#FFFF00" bgcolor="#0099FF">
  <tr>
   <td>Username</td>
   <td><input name="username" type="text" id="username" maxlength="8"></td>
  </tr>
  <tr>
   <td>Password</td>
   <td><input name="password" type="password" id="password" maxlength="8"></td>
  </tr>
 </table>
 <p> </p>
 <table width="75%" border="1" align="center" bordercolor="#FFFF00" bgcolor="#0099FF">
  <tr>
   <td><div align="center">
    <input name="Login" type="submit" id="Login" value="Login">
   </div></td>
  </tr>
```

```
</table>
<p> </p>
</form>
```

6.3.2 User Sign-Up Function

There is also a sign-up function provided for user who would like to be a member of IBP. When the user tries to sign up as a new user, they have to enter their own username. If the username is actually has been used by another user, another sign up page will be displayed and user also will be told to choose another username. This is because only one user can use one specific username at in IBP system.

6.3.2.1 Coding of User sign Up Function

```
<form ACTION="<%=MM_editAction%>" METHOD="POST" name="sign up" id="sign up">
 <table width="75%" border="1" align="center" bordercolor="#FFFF00" bgcolor="#0099FF">
  <tr>
   <td>Full Name</td>
   <td> <input name="full  name" type="text" id="full  name" size="40"></td>
  </tr>
  <tr>
   <td>Username</td>
```

```
    <td>  <input  name="username"  type="text"  id="username"  size="40"
maxlength="8"></td>
   </tr>
   <tr>
    <td>Password</td>
    <td>  <input  name="password"  type="password"  id="password"  size="40"
maxlength="8"></td>
   </tr>
   <tr>
    <td>Email</td>
    <td> <input name="email" type="text" id="email" size="40"></td>
   </tr>
 </table>
 <p> </p>
 <table  width="75%"  border="1"  align="center"  bordercolor="#FFFF00"
bgcolor="#0099FF">
  <tr>
   <td> <div align="center">
     <input type="submit" name="Submit" value="Submit">
    </div></td>
  </tr>
</table>
<p> </p>
```

```
<input type="hidden" name="MM_insert" value="sign up">
</form>
```

6.3.3 Administrator Sign-In Function

Not only that, one of the most important parts here is the module for administrator to sign in before they can further to make any changes towards IBP. There are two administrators that are admin1 and admin2. Admin1 has fully authorization towards IBP system. The admin1 is allowed to view display of user information, modify and delete user information whereas admin2 is only allowed to view display of user information only.

6.3.3.1 Coding of Administrator Sign In Function

```
<form action="<%=MM_LoginAction%>" method="POST" name="admin" id="admin">
<table width="50%" border="1" align="center" bordercolor="#FFFF00" bgcolor="#0099FF">
 <tr>
  <td width="32%">Administrator Username</td>
  <td width="68%"><input name="username" type="text" id="username" maxlength="8"></td>
 </tr>
 <tr>
```

```
  <td>Password</td>
  <td><input name="password" type="password" id="password" maxlength="8"></td>
 </tr>
</table>
<p> </p>
<table width="50%" border="1" align="center">
 <tr>
  <td bordercolor="#FFFF00" bgcolor="#0099FF"><div align="center">
   <input name="SubmitAdmin" type="submit" id="SubmitAdmin" value="Log In">
  </div></td>
 </tr>
</table>
<p> </p>
</form>
```

6.3.4 Bowling Game Module

In the Bowling Game Module, there is a game downloaded from the internet named Flash Arcade Lanes. This game is actually in .exe Flash Player 5 format. In order to insert the game into the system, this file has to be changed into a not .exe Flash Player file format. So, after a few researches and testing, a kind of software can be used to convert the .exe flash player file into a common flash player file format. The software is downloaded from the internet and it is called Sparkle Flash Keeper. Only after the

conversion process, the game can be inserted into the system and when it is run; the game can be executed and be played by user.

6.3.4.1 Coding of Bowling Game Module

```
<object classid="clsid:D27CDB6E-AE6D-11cf-96B8-444553540000"
codebase="http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.cab#version=6,0,29,0" width="492" height="450">
  <param name="movie" value="game/bowling.swf">
  <param name="quality" value="high">
  <embed src="game/bowling.swf" quality="high"
pluginspage="http://www.macromedia.com/go/getflashplayer" type="application/x-shockwave-flash" width="492" height="450"></embed>
 </object>
```

6.3.5 User Feedback Module

This module is provided for user to send comment to IBP administrator regarding their experience after using IBP. They can send positive and negative comment so that the features and characteristics of IBP can be improvised and enhanced in the future. Not only that, user also can view back all the feedback that has been sent by other users.

6.3.5.1 Coding of User Feedback Module

```
<form ACTION="<%=MM_editAction%>" METHOD="POST" name="form1">
 <table width="80%" border="1" align="right" bordercolor="#FFFF00"
bgcolor="#0099FF">
  <tr>
   <td width="25%"><div align="justify">Name </div></td>
   <td width="75%"> <input type="text" name="textfield"></td>
  </tr>
  <tr>
   <td><div align="left">Email</div></td>
   <td> <input type="text" name="textfield2"></td>
  </tr>
  <tr>
   <td><div align="left">Comment</div></td>
   <td> <textarea name="coment" cols="80" id="coment"></textarea></td>
  </tr>
</table>
<p> </p>
<p> </p>
<p> </p>
<table width="13%" border="0" align="right" bgcolor="#0099FF">
 <tr>
  <td>
```

```
    <div align="center">
      <input type="submit" name="Submit" value="Submit">
      <input name="Reset" type="reset" id="Reset" value="Reset">
      </div></td>
  </tr>
 </table>
 <input type="hidden" name="MM_insert" value="form1">
</form>
```

6.3.6 User Name Search Module

Any user who browses the Sent User Feedback page, that is the page of which all comments sent by other users will be displayed; they also can use the User Name Search Module linked from this page. This module is provided for users who would like to search the name of any user who has sent feedback to IBP website. After the name has been entered, the comment sent by name searched user will be displayed. This module is important because if let say the comment sent is very important, the comment can be take into consideration and the user also can be contacted through his email.

6.3.6.1 Coding of User Name Search Module

```
<form name="form1" method="get" action="DisplayUserName.asp">
<table width="50%" border="1" align="center" bordercolor="#FFFF00"
bgcolor="#3399FF">
```

```
  <tr>
    <td> </td>
    <td><div align="center"></div></td>
    <td> </td>
  </tr>
  <tr>
    <td>Type User's Name</td>
    <td><input name="search" type="text" id="search" size="35"></td>
    <td><input name="Search" type="submit" id="Search" value="Search"></td>
  </tr>
  <tr>
    <td> </td>
    <td> </td>
    <td> </td>
  </tr>
</table>
<div align="center">
  <p> </p>
</div>
</form>
```

6.3.7 Send Your Vote Module

In this module, four categories of vote is provided and user can select one of it in order to categorized the IBP website based on their satisfaction after using IBP. The four selections of vote are "Has no idea at all", "Less information and quite boring.", "Contains many information but has to be improvised." and "Very interesting and resourceful.". User also can view the total of each vote sent by users from the User's Vote link provided in this page. From the total of vote sent by users, necessary steps can be taken as a corresponding of what has been thought by the users of IBP.

6.3.7.1 Coding of Send Your Vote Module

```
<form name="form1" method="post" action="">
<table width="43%" border="1" align="center" bordercolor="#FFFF00"
bgcolor="#0099FF">
  <tr>
    <td width="36%"><label>Has no idea at all.</label>
</td>
    <td width="64%"><font color="#000000" size="2" face="Arial, Helvetica, sans-
serif"><strong><%=(undi_total)%></strong></font></td>
  </tr>
  <tr>
    <td><label>Less information and quite boring.</label>
</td>
```

<td><%=(undi2_total)%></td>

</tr>

<tr>

<td><label>Contains many information but has to be improvised.</label>

</td>

<td><%=(undi3_total)%></td>

</tr>

<tr>

<td><label>Very interesting and resourceful.</label>

</td>

<td><%=(undi4_total)%></td>

</tr>

</table>

Number of users voted is <%=(AllVote_total)%>

5

</form>

6.4 Summary of Chapter 6

In this chapter, a report about the IBP system implementation has been made. Even though in the previous chapters, the hardware and software that are going to be used during IBP development has been stated; however during the real implementation of the system there have been quite a lot of changes done. The changes are covering from the tools required to implement the system to even the system design and functional requirements. So, in this chapter the real and confirmed tools that have been used and the characteristics of developed IBP system have been stated. The coding of programming language that makes the system run also has been included for future reference.

In the next chapter, the report about system testing towards IBP system that has been carried out will be reported. The testing stage is one of the most important stages in any system development process. By doing testing, any error can be detected and thus can make the IBP system to function correctly as expected.

CHAPTER 7:

SYSTEM TESTING

7.0 Introduction to System Testing

Testing is an integral component of the software process and an activity that must be carried out throughout the life cycle that is at every stage of system development process. Testing is actually comes from the word test which from Collins English Dictionary page 1052 that brings the meaning of 1) to ascertain (the worth, capability, or endurance) of (a person or thing) by subjection to certain examinations or 2) a method, practice, or examination designed to test a person or thing. The goals of software testing is mainly on error detection which involves identifying errors within the system, error removal that is eradicate the mistakes that previously existed in the system and error tracking that is finding and correcting the errors itself.

7.1 Type of Testing

Essentially there are two types of testing that are execution-based testing and non-execution-based testing. Execution based testing is done by reviewing on the documents that have been written. Before any document is produced, a few studies and researches have been carried out so that more information can be gained and less error or faults will be done. Thus, the number of problems arise also can be reduced. Whereas in execution-based testing, the modules codes in the system can be run. Error can be detected when the result obtained does not appear to be as how it should be or expected earlier. Sometimes, if there is no reaction or no output retrieved, it also means that there must be something wrong with the code being used. So if these situations happen, something has

to be done to track where the error in the code document is. In developing IBP, both types of testing methods have been carried out along the way of implementation process.

7.2 Unit Testing

Unit testing means to test a single group of code that runs only one function. As for example, in IBP system it contains several functions such as feedback function, vote function, sign-in, sign-out, sign-up, and administrator's functions. The tests carried out by executing each module coding statements first and then the output retrieved is analyzed whether it matched expected output or not. Below is one of the units testing that has been conducted towards user sign-in module:

This is the module of user sign-in. Every registered user has to enter correct username and password. A user has already been a member of IBP and she is using username "rina" and the password is "230183". While in second situation, a user that is not a member of IBP tried to sign-in by using username "siti" and password "aishah".

Table 7.1: Unit Testing on User Sign-In Module A

No.	Input	Output Retrieved	Expected Output
1.	Username: rina Password: 230183	Page Welcome to IBP will be displayed and user is allowed to browse IBP.	Page Welcome to IBP will be displayed and user is allowed to browse IBP.

Description: The output retrieved is same as the expected output. This means the coding statement for this function is correct.

Table 7.2: Unit Testing on User Sign-In Module B

No.	Input	Output Retrieved	Expected Output
2.	Username: siti Password: aishah	Page Sorry you are not allowed to browse IBP will be displayed. User is asked to sign-in again using correct username and password or sign up first if she is not an IBP member yet.	Page Sorry you are not allowed to browse IBP will be displayed. User is asked to sign-in again using correct username and password or sign up first if she is not an IBP member yet.

Description: The output retrieved is same as the expected output. This means the coding statement for this function is correct.

7.3 Integration Testing

Integration testing means each new code artifact must be tested when it is added to what has already been integrated. The key point here is first to test the new code artifact and then to check that the rest of the partial product continues to behave as it did before the new code artifact was integrated into it. Below is one of the integration testing that has been conducted on user feedback module.

Table 7.3: Integration Testing on User Feedback Module A

No.	Input	Output Retrieved	Expected Output
1.	Name: Sara Email: sara@hotmail.com Comment: Interesting website.	In the db1.mdb Microsoft Access database, in table Feedback; this new comment is inserted.	The newly sent comment should be inserted in the database.

Description: The coding statement of this module is correct so no correction have to be done.

Table 7.4: Integration Testing on User Feedback Module B

No.	Input	Output Retrieved	Expected Output
2.	Name: Sara Email: sara@hotmail.com Comment: Interesting website.	In the Sent Users' Comment page, this comment is not been displayed.	User can view all comments sent by all users in page Sent Users' Comment.

Description: Even though the feedback module has functioned correctly but, the data can not be displayed in Sent Users' Comment page. So, coding statement correction on this page has to be done.

7.4 System Testing

Once the integration process is complete, the product as a whole is tested; this is termed system testing. For IBP, when the system development has been completed the IBP is transferred to another computer in the faculty. This is because the computer is more stable to run the completed system. All the connections between database and interface have been set up back in that computer. In order to ensure that the system is functioning well, the system is execute using Internet Explorer through local host. All connections were checked and each links were tested too. Besides, the data stored in the database also has been observed whether there were any changes if any modifications of data

have been done through the IBP interface. If there were any failure or the system did not display correct page or output, correction and changes towards the coding and connection string will be done. After several systems testing, it can be confirmed that the system is functioning successfully because every single links display correct page, every data stored are changed every time modification is made and the interface elements such as pictures, flash text, animation pictures are displayed.

7.5 Summary of Chapter 7

In Chapter 7, all testing towards IBP system that has been done are reported. Testing process is done all the way of system development until the IBP system is completed. The testing process is very important because from here only the error and faults that have been done can be detected earlier and corrections and modifications towards the system can be done. System testing not only to ensure that the coding of each module is correct but the environment of system development also must have to be in appropriate condition. By avoiding as many faults as possible, less problems will occur and the IBP system also can function successfully.

In the next chapter, system evaluation of IBP system will be reported. Since the system is already completed and testing has been done towards it, a few results and conclusions can be done towards the system. System evaluation is very important since it can tell how successful the system is and how the system can be improvised for future needs.

CHAPTER 8:

SYSTEM EVALUATION

8.0 System Evaluation

System evaluation is basically accessing and reviewing the Interactive Bowling Portal (IBP) system from the time of conception until it is tested and released. The main purpose of system evaluation is to establish that the IBP system requirements have been met while establishing the system's assets and strengths. System evaluation also uncovers the limitations of the IBP as well as discussing the future enhancements to be included into the system. Not only that, all problems occurred while developing the system and ways to overcome them also will be stated in this chapter. System evaluation is done after the IBP system has gone through several system testing and been evaluated by lecturer and the moderator.

8.1 IBP System Strengths

IBP is a system that been created to teaches bowling fans how to play bowling correctly. Even though we can find quite similar system available in the internet, but IBP have several special characteristics that differentiate it from any other software. The strengths of IBP system if to be compared with other bowling systems are:

8.1.1 Ease of Control and Manipulation

The IBP is a web-based system that functions as a portal with the aim to provide as many information as it can to bowling fans. The structure and design of IBP system is

very organized where all information is categorized in suitable section or module. This makes IBP very easy to be updated and makes it very easy to control the system. Not only that, the modules provided in IBP such as the delete, display and modify modules provided for administrator makes the data, design and structure of the IBP system easily can be manipulated by the administrator.

8.1.2 User-friendly

Besides, IBP is also a user-friendly system. This is because the interface of the system is quite colorful and the buttons are well placed which makes user very easy to navigate the system. The structure of information provided also very systematic and user will find that it is easy for them to read the content of the website. At the Home page of IBP, summary about each section of IBP is provided. This also can give overview to user about how the IBP system is all about and thus will guide them in browsing the IBP website.

8.1.3 Database Transparency

IBP system also provides database transparency ability. It is said so because some functions required user to enter information such as comment, username, password email, vote and so on. They do not have to insert the data through the database and it is similar for them if they want to view the information, they can view it from the interface. While for administrator, they can do modification to edit user information through the interface too.

8.1.4 Security

IBP system required user to sign-up to be a member first before they can browse all sections of the system. Besides, only authorized administrator is allowed to do modifications towards IBP design and structure. This is important because it can avoid unauthorized and uncontrollable access towards IBP system. Sometimes, unintended user browses the internet not to search for information from the website they are browsing but, just to hack and make damage towards the website. So, by requiring IBP users and administrator to sign in first at least can reduce the free access of unauthorized user into IBP.

8.1.5 Maintenance

Maintenance towards IBP system is easy to be done thus making the maintenance work can be done frequently. The design and concept structure of IBP system is simple and very organized. This makes the system maintenance work such as information update and modification to be done in a short time. Moreover, the system itself is developed by using common software like Microsoft Access and Macromedia Dreamweaver MX. This software is commonly used by everybody and it is quite easy to use this software.

8.1.6 Very Helpful

IBP system is very resourceful because it contains much information about how to play bowling. The teaching modules are organized based on chapter step-by-step so that user

can easily understand to learn how to play bowling. This website also not as any other bowling website that can be found from the internet that almost all of them more on selling and advertising bowling equipment and bowling centers. The entire website also developed by non-Malaysian while IBP is developed by Malaysian who is more understands about the needs of Malaysia bowling fan.

8.2 IBP System Limitations

Even though IBP system was designed to the best of abilities, it does however have a few limitations such as listed below:

8.2.1 Not Very Interactive

Even though IBP system is actually should function as an interactive system but, IBP system is not that interactive. The content of the information are quite huge but the way of its representation is less interesting. The modules that allow interactivity between the system and user have to be added such as forum module and bulletin board module. By having these to modules, user can interact with each other and change their information regarding bowling. More multimedia elements also have to be inserted into the system such as animated pictures, bowling movie, animated texts and so on.

8.2.2 Lack of Guideline Information

Not only that, from the interface of IBP, it can be seen that there is lack of information for IBP user in terms of how to use IBP. There should be more notice or example in every necessary interface of IBP such as sign-in page, sign-up page, feedback page and so on. Pictures or other elements also can be inserted into the pages rather than leaving the page looks empty or blank.

8.2.3 Less Interesting Interface

Besides, the interface of the system also is quite less interesting. Even though the interface does look nice but it should be improvised so that it suits every level of bowling fans that browse IBP. The interfaces also must have interrelation between each other. Logo of IBP also can be created to be put on the main page of IBP.

8.3 IBP System Enhancement

Although the IBP system has fulfilled its requirements but, there is still room for future enhancements and development of the system as listed below:

8.3.1 Forum Module

In the future, the forum module has to be developed into the system so that it can expand the interactivity of the system. User can change their opinion and have their discussion regarding bowling through the forum module.

8.3.2 Bulletin Board Module

Not only that, bulletin board module also has to be developed into the system so that additional information regarding bowling such as bowling centers in town, bowling shops in town, bowling tournaments being held and so on can be published. News regarding bowling such as Malaysia bowling player also can be provided through bulletin board module. All topics will be organized in the system based-on monthly basis and user also can browse the archived topics.

8.3.3 Improvements of Interface

The interface of IBP also has to be changed so that it can look more interactive and interesting. There should be more animated pictures, movies, and animated texts inserted

into the system. These elements can attract more users to be a member of IBP and thus more interested to learn how to play bowling.

8.3.4 Use More Stable and Reliable Software to Develop IBP

IBP also can be developed by using other software rather than Macromedia Dreamweaver MX and Microsoft Access Database software. This is because those software are very common and its functionality are quite limited if to be compared with other advanced software. The use of the latest software also can guarantee the successfulness of IBP system in the future.

8.4 Problems Encountered

Honestly to say, there were so many problems encountered starting from the day of development itself until even the development of the system has been completed. The problems that have been faced are:

8.4.1 Not Familiar with the Programming Language

The programming language that has been used to develop IBP is Active Server Pages (ASP) VBScript. It was quite hard to use this programming language at first since it has never been used and never been thought before. Fortunately, the Macromedia Dreamweaver MX software allow user to develop system by using design view feature.

This makes the development process much easier. However, it is very important to understand and know how to use the programming language since some of the development problem can not just be handled by using design view tool.

Solution: Learning how to use the ASP VBScript programming language from books is a very effective way. Besides, there is also websites that teach how to use this programming language and the notes also can be retrieved from those websites.

8.4.2 Lack of Information Regarding Bowling in the Internet

Although internet is known as the best information resource but, it was very hard to search for necessary information on how to play bowling from the internet. The information of bowling available widely in the internet is all about where to play bowling and where to buy bowling equipments. Other bowling websites also do not provide enough and complete information that can teach bowling fan how to play bowling.

Solution: There are quite a number of books that teaches how to play bowling can be found in the book stores. The books are varies in sizes, colors, and contains colored pictures or black and white pictures. Even though almost all of the books are quite expensive but, contents of the books are very resourceful.

8.4.3 Lose of Documents and Software Installed

As has been known, the development of IBP system has been done at the faculty since the computers are always in good condition. This is because the computers are always connected to the high speed internet which makes the searching for information and the download of software from the internet can be done in a very short time. Not only that, the computers also always been updated with Windows update and free of viruses that can harm the system that is being implemented in the system. However, the computer being used has to be shared with a few numbers of students who are also doing their system development on the same computer. This makes the using of the computer is quite limited and the individual system information also is exposed to other users. More badly, there was student who deleted the documents and software being used to develop and execute to run IBP system in order to run her system. This make IBP system can not be run and the connection between database and interface also has been corrupted.

Solution: In time to come, the number of students also will be arising so the computers also should not be shared by a larger number of users. So, more computers have to be provided for students who are going to implement their system for thesis purpose.

8.4.4 Unstable Software

The IBP system has been implemented by using Macromedia Dreamweaver MX because this software is widely available and easy to be used. However, this software is very sensitive and not stable at all. Even though it can provide many features but because of its multi-functionality ability, this software has become not stable. It is just suitable to develop interface by suing this software but Dreamweaver actually can not handle database at all. This is even agreed by senior programmer of Malaysia Airlines System and other senior programmers too. For example, even though the connection between the Dreamweaver and the Microsoft Access database has been done, but the connection tends to corrupt if the system is installed into other computer even though the computer also has the software being used by IBP. Sometimes, the IBP system also can not function properly even though the connection is said has been successful.

Solution: In the future, IBP should be developed by using other software such as MySQL, Apache, Swish and so on. The latest the software the better it can make the ibP to function properly.

8.5 Knowledge Gained

From the works that have been done towards IBP system development, there are many knowledge has been gained along the way. Some of the knowledge gained are:

8.5.1 Knowledge on Additional Software Tools

In order to develop IBP, all of the software used has to be studied first. This is important to ensure that the system can be developed smoothly and fewer problems will be occurred. The learning of each software programs makes the knowledge and understanding towards the software has been increased.

8.5.2 Good Graphical User Interface Design

Not only that, in developing the IBP system; the interface of the system has to be design to be interesting. This is because the user who browses IBP will not be attracted by the content but the interface will attract them first. With this thought in mind, it has inspired that interesting interface has to be produced consequently the using of the Macromedia Dreamweaver MX software has thought how to produce a good interface design.

8.5.3 Skills in Gathering Information and Fact

In order to ensure that IBP system is full with beneficial information, a few researches and studies have been conducted so that much information can be retrieved. Time by

time, proper techniques and procedures in searching information has actually been practiced. The skills in gathering information and fact have been learned and this skills can be very helpful in the future to come.

8.5.4 Learning to Work Independently

Besides, from IBP system development works too the ability to do research and make decisions without depending wholly on others proved to be a worthy skill. This thought self-sufficient and not to rely solely on one particular resource only but to gather information from various sources and analyze them thoroughly.

8.5.5 Skills in Writing Documentation

A system is never completed without proper documentation. Therefore, writing a documentation that is complete, comprehensive and systematic is important in relaying information to the user about the system's requirements and functionality.

8.6 Summary of Chapter 8

In this chapter, the evaluation of the IBP system has been carried out. This evaluation is done based on the observation towards the system implementation process until the system is complete. The evaluation reported also gathered from the lecturers during the IBP system presentation day. System evaluation helped to determine the limitations and problems encounter during the system development and future enhancements that can be carried out to the system as well as knowledge gained along the way.

User Manual

Here is the instruction on how to use and browse the Interactive Bowling Portal (IBP) system:

1. Sign-up first to be a member of IBP.
2. Once you are signed-up, the registration successful page will be displayed in 10 seconds.
3. That page will disappear and the main page of IBP will be displayed again.
4. Sign-in using the username and password that you have just registered just now.
5. Then the page welcome to IBP will be displayed.
6. Lastly, you are allowed to browse all sections of IBP.
7. When you are finish, just log-out from any page that you want to.
8. The log-out link is provided at every page.

References

Internet References:

1. - (URL - http://www.bowlingmuseum.com/), 08/08/04.

2. - (URL - http://www.thebowlingportal.com/), 09/08/2004.

3. - (URL - http://www.ip-atlas.com/pub/bowling), 09/08/2004.

4. - (URL - http://www.bowlingfans.com), 09/08/2004.

5. - (URL - http://www.bigbowling.com/), 09/08/2004.

6. - (URL - http://keoz9.com/bowling/), 09/08/2004.

7. - (URL - http://www.microsoft.com/), 10/08/04.

8. - (URL - http://www.kinokuniya.com/), 11/08/04.

9. - (URL - http://forums.deveshed.com/), 30/08/04.

10. - (URL - http://www.macromedia.com/), 31/08/04.

11. - (URL - http://www.softartisans.com/), 31/08/04.

11. - (URL - http://www.adobe.com/), 01/09/04.

12. - (URL - http://www.dynamicdrive.com/), 12/02/2005.

13. - (URL – http://www.topendsports.com/), 15/02/2005.

14. - (URL - http://www.mtbc.org.my/), 17/02/2005.

Book Reference:

1. Anthony, E., Taylor, D. (1994). *Winning Bowling – A Complete Illustrated Guide to Winning bowling Techniques*. Contemporary Publishing Group, Inc.