

Internet Surfing for the Blind

By

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CERTIFICATION OF APPROVAL

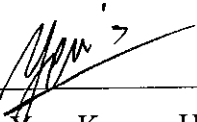
Internet Surfing for the Blind

By

Nurul Hidayah Binti Ibrahim

A project dissertation report submitted to
Information Communication and Technology Programme
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in partial fulfillment of the requirement for the
BACHELOR OF TECHNOLOGY (Hons)
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Approved by,



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UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK

July 2006

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specify in the references and the acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



NURUL HIDAYAH BINTI IBRAHIM

ABSTRACT

Digital divide has always been a barrier for blind people to access the Internet. W3C Consortium has issued several guidelines for the past few years but, these guidelines only guarantee the “technical readability” and do not ensure at all either the Web site is accessible or not by blind people. Moreover, Web designers do not test their design with blind people in mind. According to W3C, a successful Web site is the one that adapts to the needs and preferences of its audiences by customizing content to fit the users expressed desires within the constraints of available hardware, software and bandwidth. In effort to maximizing the ability of users to access information, services and resources, this document presents a Web site for the blind, and to bring some importance view to the eye of Web designers in order to create universally accessible Web site especially for the blind. It is intended to solve the Internet accessibility problems faced by this community in Malaysia. The approach is obtained by combining design features needed to develop an accessible Web site and a screen reader as an assistive technology (AT) used by the blind. The former technology is especially suited for text based Web site, while the later allow to support multimedia nature of today Web environment. The evaluation scenarios have shown that users responded well and behave as expected while navigate through the Web site.

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

1.1 Background of Study

The Internet is the most well known component of the Information Superhighway network infrastructure. The phenomenally rapid growth of the Internet is caused by several reasons. It gives individuals the ability to communicate directly, easily, and inexpensively with each other across time and space. It also increases access to diverse information and entertainment resources that are delivered quickly and economically anywhere and, most important, it facilitates interactive human communications. Besides that, the ability to transmit multimedia content overcoming time and space constraints has played a major role in stimulating the global economy and has a profound impact on the quality of life for its users. At present, there are many new applications for the Internet such as Internet shopping, Internet banking, Internet telephone and Internet television. It is also being used for education and seeking employment.

Fortunately, along with this growth, the digital divide has become a new barrier for disabilities people to confront. As the dominant Internet tool, the World Wide Web presents information in a variety of formats while it is also organizing that information through hypertext links. In today's modern Web applications, a large portion of the content is visual or based on visual perception such as tables and diagrams. Because of the multimedia nature of the Web combined with the poor design of some Web sites, many Internet surfers cannot access the full range of resources that this revolutionary tool provides. In many developing

countries such as Malaysia, the access problem is simply ignored by the designers for they do not believe that they should make the Web site accessible to persons with disabilities.

Accessibility not only meant designing for users with disabilities but it is relevant to everyone. Accessing the Web, for users with disabilities, can be difficult and sometimes very difficult in many senses. As there are many categories of disabilities, this project is mainly focused on Web accessibility problems faced by blind people.

Several companies and organizations have come out with their own approaches and technologies via which blind people can access the Internet. This organization includes GW Micro, Dolphin and Freedom Scientific. A few approaches that they are using such as text browser, screen reader, and Braille output were slightly have a few limitations and advantages as compared to the others. But, the most useful technology devised for blind users in accessing the Web nowadays, is based upon screen readers, a software tool that can read page aloud.

1.2 Problem Statement

1.2.1 Problem Identification

The “World Health Organization (WHO)”, globally estimates that 85 millions persons are blind or visually handicapped [1]. Most of them are not enjoying the benefits of the Internet because the right of blind people is simply ignored in many countries. The Americans with Disabilities Act (ADA) passed amendments in year 1990 that, “prohibit discrimination on the basis of disability in employment, programs and services provided by state and local governments, goods and services provided by private companies, and in commercial facilities” [2].

The W3C consortium, through WAI initiative, has taken the step of providing guideline in order to tell developers what that they should and should not do, in order to build a readable Web page. But, the W3C guidelines only guarantee “technical readability”, they do not ensure at all the fact that the Website is accessible by blind users, in the sense that blind users can effectively access it [3].

Although the standard of Web sites and pages has been issued, but many blind people still have access problems with most Web site. The reason for this phenomenon is many Web designers do not test the accessibility of their design with disabled persons in mind. Thus, Web site usability needs to be improved so that the blind community can benefit from this technology.

Around the world, several people especially blind people had created a forums or discussion board where they can discuss and share their problems with others associated to the lack of Internet access provided for the blind. The Malaysian Association for the Blind (MAB) had listed all the points to bear in mind when creating the Web site that can be accessed successfully by blind or visually impaired people using the available assistive technologies.

1.2.2 Significance of the Project

Ultimately, this project and the development of the Web site would bring some importance view from the eye of Web designers in order to create universally accessible Web site especially for the blind people. The blind people can also use to the fullest benefits of Internet and revolutionary tools provided for them. There are many organizations or society that will require this approach such as Malaysian Association for the Blind (MAB) and World Blind Union (WBU) Organization.

1.3 Objectives

This project aims to design and develop a Web site for the blind in which to solve the Internet accessibility problems faced by this community. With the purpose of approaching the blind ones to the universe that Internet offers, this paper are to include the approach suggested and technologies involved, via which blind users can access the Internet and surf the Web.

1.4 Scope of Study

The scope of study for this project is divided into a few sections. The Web site that is to be developed is based on several criteria as below:

1. There are four main types of disabilities which affect Web access: visual, mobility, cognitive and auditory. This project is mainly focus on the blind people to access the Web pages.
2. The target audience of this project is basically to the computer literate users.
3. The problems arise is affecting all the blind people around the world. This project concentrates to problems that arise in Malaysia.

CHAPTER 2

LITERATURE REVIEW

2. LITERATURE REVIEW

2.1 Introduction

According to the statistic prepared by the State Welfare Department, by the end of 2005, over 130 000 people registered as having disabilities in Malaysia. Four main types of disabilities which affect the Web access include visual, mobility, cognitive and auditory. Visual disabilities include blindness, low vision and color-blindness. In definition, blindness means without the power to see [4].

While character-based interfaces offered blind people the extraordinary possibility to make use of their skills in using keyboards and interacting with software tools, graphic interfaces, implying complex pages' layouts, many visual features and above all the use of the mouse have made their use of the many valuable resources offered by the Web a difficult and cumbersome task. Sound is very important for any application that has the relevancy due to this area.

In creating and developing a Web page which will solve the accessibility problems faced by the blind people to access the Internet, there are a few things that a Web designers need to be consider. In this project, it covers into two broad areas which are implementing accessible Web design for the blind followed by approaches and technologies developed by several companies or organization in the way to help blind or visually impaired people to surf the Internet.

2.2 Concept of Accessible Web Design

Analyzing the concept of accessibility design according to W3C's Guidelines [5], an accessible Web design encompasses two areas of concern which is ensuring graceful transformation and making content understandable and navigable. Graceful transformation is concerned with ensuring that content will remain intact regardless of the presence of any constraints. In other words, one should not design a Web page that work only if the user has Flash installed, JavaScript enabled, wider bandwidth, fastest connection and the latest browsers. The second area, to make content understandable and navigable refer to making the language clear and simple, and providing understandable mechanism for navigating within and between pages. Providing understandable mechanism overlaps with the domain of usability.

Accessibility, in the context of World Wide Web, means maximizing the ability of users to access information, services and resources [6]. A successful Website adapts to the needs and preferences of its audiences, customizing content to fit the users expressed desires within the constraints of available hardware, software and bandwidth. In designing pages that everyone can use requires two things:

1. Awareness of a variety user skills or preferences.
2. Knowledge of current browsers technologies.

Increasing accessibility does not mean making text-only pages or compromising design, but it means making content available in flexible ways. Every step made toward a more usable design, from providing captions for images to ensuring that pages meet comprehensive standards, count toward the ultimate goal of accessibility.

In addition, the College of New Jersey [7] put Web accessibility as the term used to describe a site that allows anyone using a Web browser to visit, have a through understanding of, and maneuver around and through all aspects of the information.

2.4 A Critical Overview on W3C Guidelines

The W3C consortium made public a first set of guidelines in May 1999. It consists of 4 major guidelines prescribing that an application should be perceivable, operable, understandable and robust. For each of the four guidelines, checkpoints (18 in total) are defined. For each checkpoint (that are considered normative) definitions, benefits and examples (non normative) are provided. Checkpoints are classified either as “core” or “extended”: to conform to WCAG 2.0, the Required Success Criteria of Core Checkpoints must be satisfied; the “extended” ones are additional checkpoints that may be reported in addition to Core conformance [3]. Below is comment in details about the guidelines, as defined by the W3C. As a reminder, while W3C address all kinds of disabilities, this paper comment into consideration of blind users only.

2.4.1 Guideline 1: Perceivable

Perceivable means to make the content perceivable by any user. Below is the core and extended guidelines with comment of it:

- 1.1 [CORE] All non-text content that can be expressed in words has a text equivalent of the function or information that the non-text content was intended to convey.

This is a concern about content. The idea is that graphic and visual content should have a text equivalent. Still, what equivalence means is very difficult to define: which words are equivalent to a painting, an image or a map? Should the text convey the look, the semantics, the emotion, or what else? It is obvious that mechanically satisfying the guideline will not ensure “real” accessibility.

- 1.2 [CORE] Synchronized media equivalents are provided for time-dependent presentations.

Time dependent presentations, with audio synchronized to changing images, for example, are clearly a major problem for blind users.

1.3 [CORE] Both [information/substance] and structure are separable from presentation.

This is an important guideline, the potential meaning of which is much deeper than the W3C guidelines seem to imply. We should remind the reader that the key problem lies with HTML where presentation is intermingled with content. In addition, the guidelines focus on presentation details (which are important) and substantially neglect the problem of presentation strategy (which is even more important than details). Furthermore they overlook the fact that for “reading aloud” a page a presentation strategy is necessary: an “oral strategy” very different from the one based on visualization (as it is the one commonly used for Web pages).

1.4 [CORE] All characters and words in the content can be unambiguously decoded.

This technical requirement, necessary and, in a sense it is obvious.

1.5 [EXTENDED] Structure has been made perceivable to more people through presentation, positioning, and labels.

This is a very ambiguous, and in a sense, incorrect guideline. It is (practically) impossible and (above all) useless to attempt to describe with words the “look” of a Web page. The reader may try this simple experiment: try to read the page of a daily newspaper to someone else. Very likely the reader will try to read aloud the semantics (e.g. “the most important news is... the second news is...”) rather than trying to describe the visual aspects of the page. So the key point is to take a different point of view: a Web page holds a deep semantics that is translated into a visual presentation. In order to make a page readable the best option is to start again from the semantics, not from the visual presentation.

1.6 [EXTENDED] Foreground content is easily differentiable from background for both auditory and visual default presentations.

In this checkpoint we spot again what we think is a major problem of the W3C guidelines: they focus on the symptoms neglecting the causes. The visual communication provided by a

Web page is a mixture of background (same for each page) and foreground (different for each page): the overall semantics of the page, conveyed by background and foreground, must be translated into an “oral” communication.

Some detailed guidelines are absolutely correct. But there is something confusing (if not wrong) about the presentation: apparently the guidelines fail to understand that the semantics of the page should be the starting point, not the way the page itself is being visualized.

2.4.2 Guideline 2: Operable

Operable means to ensure that interface elements in the content are operable by any user. Below is the core and extended guidelines followed by the comment:

2.1 [CORE] All functionality is operable at a minimum through a keyboard or a keyboard interface.

This is a necessary and obvious requirement, very important for users with operational disabilities.

2.2 [CORE] Users can control any time limits on their reading, interaction, or responses unless control is not possible due to nature of real time events or competition.

This is an important and necessary requirement. Our observation is that the corresponding implementation can be very difficult.

2.3 [CORE] User can avoid experiencing screen flicker.

We do not question the checkpoint, but it seems to be rather specific and too detailed: it could have been combined with other ones.

2.4 [EXTENDED] Structure and/or alternate navigation mechanisms have been added to facilitate orientation and movement in content.

This is a requirement concerning interactive content: every interaction provided by visualization and pointing mechanisms (e.g. the mouse) should be also made possible with different mechanisms. Important requirement, but difficult to implement; also we should work (in the research community) not at the mechanical reproduction of a visual interaction for a blind user, but to an “equivalent” solution. In other words, if normal sighted users get some “message” from a visual interaction, we should try to deliver (with different means) the “same message” to blind users, rather than trying to reproduce the interaction.

2.5 [EXTENDED] Methods are provided to minimize error and provide graceful recovery.

This is an obvious, but quite vague guideline. It is a feature desirable for all kind of users, although users with disabilities need to be especially “protected”.

We do agree with most of the recommendations, which in general are more important for users with operational disabilities, with respect to users with visual disabilities.

2.4.3 Guideline 3: Understandable

Understandable means to make the content and controls understandable to as many users as possible. Below is the core and extended guidelines with the comment:

1.1 [CORE] Language of content can be programmatically determined.

Changes of languages are more easily understood with visualization (also for visual clues as, for example, use of different fonts) than by listening. We have experimented how difficult it is to listen to a sudden change in the language being used. Beside technical details, we think that change of languages should be banned, unless if forced by a quotation.

1.2 [EXTENDED] The definition of abbreviations and acronyms can be unambiguously determined.

Again we have realized that while looking to acronyms is “usable”, listening to them makes very hard life for a user, if he can’t look at the page. We think that acronyms should always have an alternative text, just like for images.

- 1.3 [EXTENDED] Content is written to be no more complex than is necessary and/or supplement with simpler forms of the content.

This is a simplistic guideline. The problem of tuning content to the “profile” of the user is a standard one, and it has nothing to do with disabilities: a good application should always provide content of the proper level for all the different members of the intended audience.

- 1.4 [EXTENDED] Layout and behavior of content is consistent or predictable, but not identical.

Again this is a true, but simplistic, checkpoint. Moreover, for visually impaired users, the visual layout has nothing to do with the “audio” layout: therefore the suggestion of putting navigational elements always in consistent locations is useless. It would certainly be more important to tell the designer how to shape content and navigation patterns in a consistent manner. This is the weakest part of the guidelines, vague and not usable, with the exception of the references to languages and acronyms, which are clear. There is a total lack of references to design principles and to semantics that should be the most important factor in guidelines concerning understandability.

2.4.4 Guideline 4: Robust

Understandable means to use Web technologies that maximize the ability of the content to work with current and future accessibility technologies and user agents. Below is the core and extended checkpoint for this guideline followed by the comment:

- 1.1 [CORE] Technologies are used according to specification.

The use of “unofficial” features of technologies must always be avoided, not just for users with special needs.

1.2 [EXTENDED] Technologies that are relied upon by the content are declared and widely available.

Availability of the technologies required for using the application is again desirable for all kinds of users, not just for the ones with special needs.

1.3 [EXTENDED] Technologies used for presentation and user interface support accessibility or alternate versions of the content are provided that do support accessibility.

This is a dangerous guideline: if the goal is understandable, we should also realize that current technologies for accessibility (e.g. current screen readers for blind users) are not fully satisfactory. Technologies for accessibility still need a great impulse, and further research needs to be pursued. Freezing the solution to the technologies available today is very dangerous.

These guidelines are concerned with issues so general, that the specific concern for users with special needs is unclear.

2.5 Lasa Knowledgebase Tips

According to Lasa Knowledgebase Web site [9], an accessible Web site is one that can be visited by anybody. It is perfectly possible to produce an attractive, dynamic design that remains fully accessible. Web sites that are designed intelligently benefit everyone and not only people with disabilities. Five important tips provided by Lasa Knowledgebase in making the Web site accessible to blind people are as follows:

1. Is the text legible?

Contrast is the most important factor to consider when designing sites that everyone can use. Go for text and background color combinations that offer maximum contrast.

2. Does every image have 'alt-text'?

The alternative text attribute of the image tag exists to provide a description of the image for people accessing the site via speech synthesis software.

3. Is there a site map?

A site map will help visitors to get an impression of the layout of the site quickly, and will make it easier to navigate.

4. Do links make sense out of context?

Sighted people scan screens of information to locate the parts that interest them. If you cannot see, and rely on synthesized speech technology to 'hear' Web sites, you need another way to get a quick impression of the content of a page. Commonly, the access software blind people use will provide a list of all the links on a page as a means of getting the 'flavor' of the content. If a link contains only the words 'click here', its function will not be obvious if it is presented out of context.

5. Are alternatives offered for JavaScript, applets, Flash or plug-ins?

If you are writing pages in anything other than HTML, you may be excluding some people from your site.

2.6 Approaches and Technologies Developed

Various approaches have been suggested, and technologies developed, via which visually impaired persons can access the Internet and surf the Web. The following section present approaches and their limitations.

2.6.1 Text Browsers

To avoid problems of using the mouse and hypermedia, most visually impaired persons use text-based Web browsers that will ignore graphics on Web pages and allows the use of keyboard to activate hyperlinks [2]. However, since many Web designers only test their designs on popular Web browsers such as Netscape and Internet Explorer, blind user often have problems accessing such Web sites. Text browsers cannot completely solve the problems of Internet surfing for the blind.

2.6.2 Screen Readers

“Screen readers” were developed in 1980s and blind people can now access most text-based computer displays using speech generated by screen readers. However, simply reading the text and converting to human speech will not solve Internet navigation problems for blind people [2]. Screen reading is usually done in a batch mode and a real time is required for Internet navigation. Also, most “text reading” programs work independently and cannot interact with popular Web browsers.

Screen readers allow blind and visually impaired persons to use many of the everyday functions of a regular computer. Instead of viewing what is on the screen, blind or visually impaired people can listen to synthesized voice or feel Braille output on Braille display. Though the technology is both versatile and evolving, there are certain elements commonly used in Web site design that create problems for screen readers. Below are the lists of properties that screen readers can and cannot see. These lists are meant to provide a template for understanding the capabilities and limitations of the technology.

1) What screen readers cannot read

Unless they are captured and formatted as stylistic structural markup, headers, headings, lists, block text, font types and associated styles, such as bold and italics cannot be read. Images cannot be read at all unless they have ALT text. In addition, PDF files produced by Adobe 4.0 an earlier versions cannot be read.

2) What screen readers can read

Screen readers can read Word processed documents that use structural markup, tagged text such as header tag, label tags, and frames with descriptive labels. They can also read labeled form elements such as edit boxes, combo boxes, radio buttons, and lists. Images that have been given Alternative text, the equivalent of “close captioning” graphic, can also be read by screen reader.

2.6.3 Braille Printout and Braille Devices

Thirty years back, the output of computer systems was primarily conveyed to human via paper printout [2]. As blind computer users cannot read ordinary paper, they had to read computer output by touching paper specially indented with a pattern of raised dots called “Braille”. This technology was named after its investor, Mr. Louis Braille. He was a blind Frenchman and his blindness was caused by an accident in his childhood. Braille is not the only reading and writing system for the blind, but it was considered to be the best according to several independent studies. Through out the years, his system has been adopted by many countries all over world. Over 600,000 books, newspapers and magazines are printed in Braille every year. However, it is much more expensive than ordinary computer printout and special printer is required.

A Braille device is another alternate output device for the blind. A small part of image of computer screen can be generated on the device; a visually impaired person can read it quickly by touching the device and does not have to wait for the generation of Braille paper. However, Braille devices are very expensive. People with disabilities have far lower incomes than other citizens. Most visually impaired people cannot afford to buy a Braille device.

2.6.4 Screen Enlarger

It is made when the translation of pages is requested, where different properties of HTML tags of the original Web page are modified (especially tags <P>, <H>, <A>, , <DD>, <TD>) [1]. Through this property’s manipulation, size, type and style of text could be modified, adjusting it to the user needs.

2.6.5 Keyboard Adjustment

It is shown as the solution to the most important of the problems that visually impaired peoples have to face at the moment they have to interact with peripheral devices [1]. For that, based on accessibility norms related to the use of peripheral devices, some keys of easy access were defined for the visual handicapped person that provides an analogous function as the one obtained with the use of the mouse. In this case, end-users will interact with the software (specifically for blind users) by means of user interface using keyboard. Example is summarized in Table 2.1.

Table 2.1 Control keys for keyboard adjustment

Key Combination	Function
CTRL	Focus on URL input
SHIFT B	Begin reading
SHIFT S	Stop reading
SHIFT L	List the current 10 hyperlinks
SHIFT =	Move on to the next 10 hyperlinks
SHIFT -	Return to the previous 10 hyperlinks
SHIFT 0...9	Select particular hyperlinks in the current 10 hyperlinks listing. (If the current 10 hyperlink listing is from 11 to 20, 1 will be 11, 2 will be 12 and so on)
Backspace	Go back
ALT →	Go to a page ahead of the current page

2.6.6 VoiceXML

The HTML, being one of the popular markup languages to specify Web pages on the Internet, is originally to render information visually on the screen [10]. Consequently, some special communities such as visually impaired people cannot benefit from the HTML-based Web pages. Proposed by the VoiceXML forum and the W3C consortium, the VoiceXML is fundamentally designed to make the Internet content accessible via audio. In other words, VoiceXML documents render information through sequential audios. Supporting VoiceXML documents, voice browsers allow users to browse the Internet independent of visual attention, and thus make information accessible to visually impaired people.

The information on the Internet is however, dominantly formatted in the form of HTML, which is designed for traditional visual browsing and thus is not accessible to all people. In order to make information universally accessible to all people, Web designers need to present to versions of web pages, one in the HTML format and the other in the VoiceXML format. Manually maintaining a correspondence between HTML and VoiceXML documents is time-consuming and error-prone. It is therefore, desirable to automatically transform the representation of Web content from HTML to VoiceXML.

Though a screen reader can speak out the text displayed on the screen, it does not capture the structure of an HTML documents. IBM has developed a HTML-to-VoiceXML transcoder. The transcoder creates topic for selection in a VoiceXML document according to the Hn tags defined within an HTML document, and navigates to other pages of information through link tags. The approach is not extensible. Based on denotation semantics and logic programming, proposes a transcoder, which can be updated to incorporate new HTML tags through modifying the translation logic. This approach requires users to have the knowledge of translation logic.

Innovative methods must be developed if visually impaired people are to have uninhibited access to the Internet. A cheaper and more reliable output method for the blind is necessary. Below is example of Web site that accessible for the blind people. (<http://www.mab.org.my>)

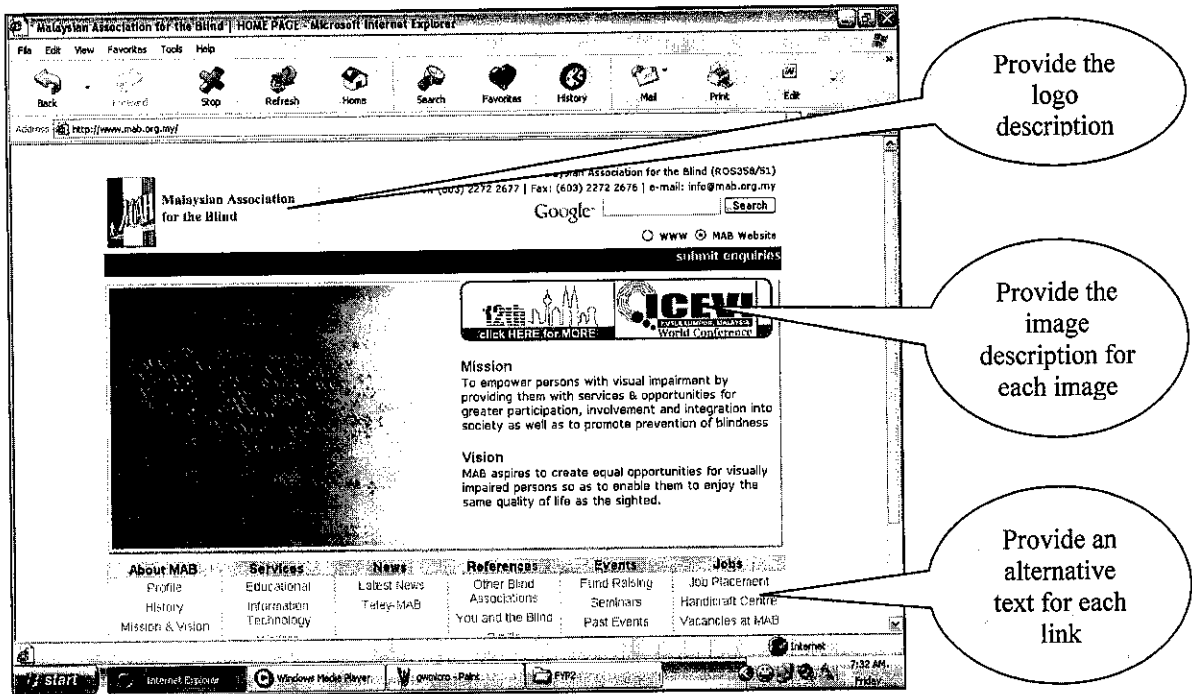


Figure 2.1 Example of accessible Web site

CHAPTER 3

METHODOLOGY

3. METHODOLOGY

3.1 Introduction

Methodology framework is divided into three sections which are project development phase, research phase and prototype development phase. In the project development phase, it includes planning, analysis, design, development and evaluation phase. Figure 3.1 shows the methodology flow for this project.

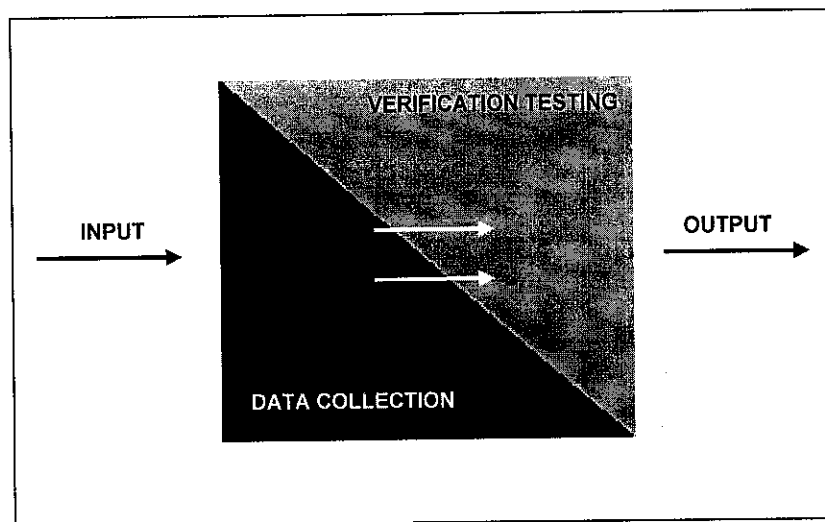


Figure 3.1 Methodology flow

Methodology flows from the initial phase to the completion of the final phase. It allows for a separation between data collection and verification testing of and on that collected data. The flow can also determine the precise points of when to extract and when to insert data.

Each phase has a relationship to the one before and after it. Each phase has inter-relation aspects to other phases. Overall, this project begins with an input that is ultimately on the chosen area of study and ends with a so called a prototype.

The methodology framework contains five different phases. Figure 3.2 shows the overall phases involve in this project development. In planning phase, it describes the nature and concept of the project which includes requirements for the project, characteristics and summary of the project, special features, alternatives, and studies of the project. This phase is used as the baseline against which to monitor the project progress and cost stage by stage. By preparing a number of alternatives, it will help to ensure the feasibility of the project.

The next phase is on analysis part where the main purpose is to analyze and then organize data or information gathered. When the analysis phase of project ends, the particular project manager or designer should know what the prototype looks like, how it functions, and how it is designed. The extensive information gathering and analysis of this phase provides extensive details on each of these aspects of the project. The final stage of the analysis phase is to organize this information into documents that will guide the work during the rest of the project.

In design phase, the information organized in the project analysis phase will be used to create all the design documents. The users and technical resources should be involved through out the process to ensure all the requirements are incorporated into design. The design document will undergo various stages of reviews and approvals before moving on with the development phase.

During the development phase, it will convert the deliverables of the design phase into a complete and executable prototype. Although much of the activity in this phase addresses the source code that make up the prototype, this phase also put in place the hardware, software and other important elements of the overall system. The prototype then shall be tested stage by stage in a systematic manner.

The final part is evaluation phase. This is where the prototype will be evaluated by the targeted audience which is in this case, the blind people. Then, the overall project plan will be reviewed such as clarifying the purpose of the project, project's timeline and requirements.

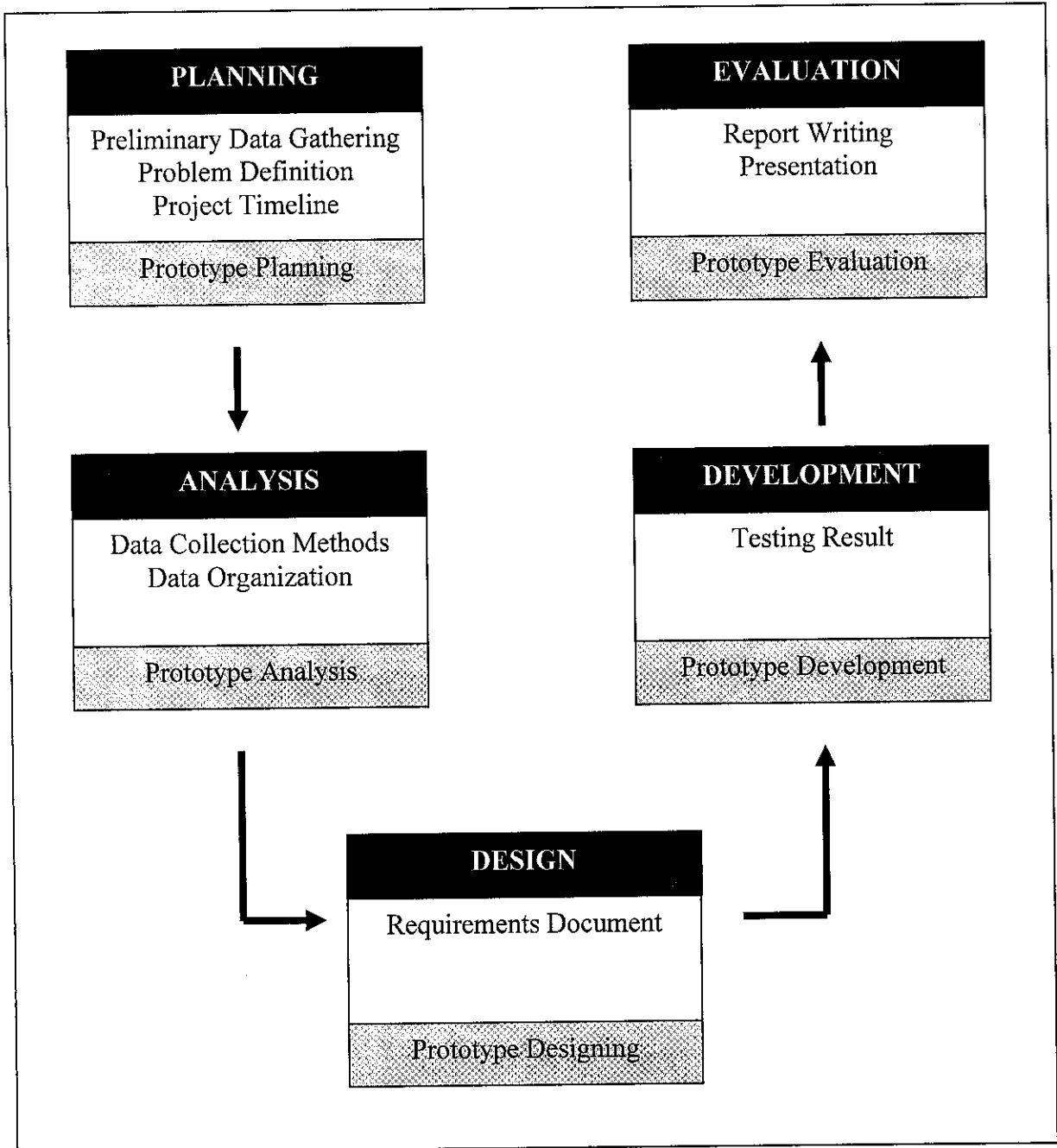


Figure 3.2 Methodology framework

3.2 Planning Phase

Many of the plans essential to the success of the entire project are created in this phase. As shown in Figure 3.2, this is the first steps that need to be done before move into the analysis phase. Activities that includes in this phase are preliminary data gathering, problem definition and plan for project's timeline. To ensure that the prototype provide the required capability on time and within budgets, project resources, activities, schedules, tools, and reviews are defined.

As the baseline in monitoring the project progress, information should be gathered from trusted and latest sources such as document from the previous research project, journals, books or articles. The final output then is used to define problems, objectives and scope of the project. Each project should provide the necessary back up as an alternatives solution if any problems occur during the project development phase. The back up plan is supposed to be at each sub-module for each step taken. The created plans are then reviewed and updated throughout the remaining project development phases.

3.3 Analysis Phase

This phase will begin when the previous phase documentation has been approved. Documentation related to user requirements from the planning phase shall be used as the basis for further user needs analysis and the development of detailed user requirements. Based on the preliminary data gathered, it will be used in defining the next data collection methods where the project shall be define in more detail. The detailed analysis will then acts as the backbone to the entire finding in order to produce a proper and meaningful project.

There is one main issue need to be taken into consideration which is navigation by sound. Originally, when the Web was created, online content was entirely text-based and quite easy for assistive technologies such as screen readers and Braille interpreters to convert to a usable format for blind people. The development of a Web such as audio and animations has increase the difficulty for the blind to surf Internet. But, by using a simple and understandable sound navigation, almost all problems faced by the blind can be solved.

Once the research question has been determined, the next step is to identify which methods will be appropriate and effective. The methods chosen to collect data must be determined from an extensive literature search to clarify the available tools. With that, various methods or techniques to collect the information have been used in this project:

1. Documents.

These secondary sources of information are gathered based on previous research and case studies from books, journals or articles from the Internet. The advantages of secondary sources are in terms of cost economical and time saving when acquiring information. This information is very valuable in supporting throughout the research development phase.

2. Interviews.

Interviews are most often used to gather detailed information as the guidelines for a project development phase. An interview is a conversation between two or more people where questions are asked to obtain information about the interviewee. Interviews can be divided into two rough types, interviews of assessment and interviews for information. In this phase, it is used to obtain information on how blind people use technologies nowadays as a tool to guide them surf the Internet.

An interview has been arranged with the representative from Malaysian Association for the Blind (MAB), Mr. Silatul Rahim Dahman, who is also an assistant manager for ICT Department. He has been able to spend some time by explaining problems faced by blind people regarding the Web accessibility issues, characteristics of accessible Web site and example of accessible Web site.

People who are blind could not see images, but they can read text. Whatever is conveyed visually has to be conveyed textually. Based on the interview, the following are a number of elements that need to be considered by the Web designers in designing an accessible Web page:

(a) Graphics have to be labeled.

This feature is easy to understand for sighted people who implement it, because they realize that since blind people could not see, they need textual descriptions of images. If they are not labeled, screen reader will simply say “graphic” or “graphic” and its file name.

(b) Buttons have to be labeled.

The most commonly used buttons are the “back” button, which allows a user to go back to the previous web page, and the “submit” and “cancel” buttons. Buttons are tricky because they often have text written on them, but the text is a part of the graphic and therefore the screen readers could not get any information. Even though the button may convey some information to the sighted people, it may mean nothing to the screen reader users. When it is unlabeled, it will be read simply as “button” when users land on it, rather than “submit button.” With that, it is hard to know which button users are on.

(c) Tables need to be properly marked.

This is often poses a challenge for sighted people, because they can see the text which is the content of the table. They usually think that since the table is build of text, it surely must be accessible. They forget that while they instantly absorb the layout of the table and can easily discern information from it, people who use screen readers have no way of knowing whether the information they are reading is related to a given header or to several headers, unless it is properly marked.

(d) Forms have to be labeled.

A form often poses the same problem. They look like text elements and thus it may seem that there is no accessibility issues involved. There are no rules on how to design a form and the form labels such as first name, phone number or gender may appear to the left of the edit field and will be read by screen readers, but they may also appear to the right, on top or

below it. While a sighted user takes a glance at it and knows right away which labels correspond to which edit fields, the screen reader users have no way of telling it, unless the labels and the edit fields are matched.

(e) Keyboard access has to be provided.

People who use screen readers are unable to use the mouse. Therefore, it is important to make sure that all the elements can be accessed with the keyboard. It is more of a problem in software applications written in various programming languages. HTML pages pretty much take care of that problem. There is, however, a way to improve the keyboard access on web sites for faster navigation.

When designing a Web site, the following elements should also be considered:

(a) Clarity of content.

This is the W3C standard drafted for people with learning disabilities in mind. But, anybody would benefit from it. W3C stated that the Web site should be error-free in terms of grammar, its purpose and content should be clear to the readers.

(b) Consistency.

Consistency helps everyone and not just blind people or other disabilities people. Additional elements which may appear on every page of the Web site include:

- 1) Navigation menu helps a user to easily go to other places on the Web site. Typically it would have links such as “home”, “about us”, or “contact us” and links in between that depends on size of the Web site and the purpose for each menu.
- 2) Page last updated that stated the last time the Web page have been moderated.

- 3) The company or organization logo with a description attached to it.
- 4) Title page appears as a window title and helps to identify the Web page. It is especially useful if there are several different Web pages open at the same time.

(c) Skip navigation link.

The accessibility standards say that it has to be present anywhere on the web site, when there are repetitive links. It helps to navigate faster through the Web site, because it allows a user to skip the repetitive links and jump directly to the content of the Web site. The link does not have to be called “skip navigation.” It may as well be called “skip to content,” “go to main content,” and others. The idea remains the same which is to allow the user to navigate faster by skipping through the repetitive links.

The design features listed below are not required by any accessibility standards at this point, but are a nice addition to accessible Web site:

(a) Access key.

Access keys can be assigned to any link on the page. Instead of going with the tab key through the menu items, one can press a key combination. If you choose to do that, you need to provide the users with the information what the specific key combinations do.

(b) Tab order.

Although a navigation menu on the right side of the page is not a standard is not a standard, but it is a valid option. If this happen, the user has to go through many other link before gets to the navigation menu. In this case, it is possible to assign a tab order to every link on the page.

(c) Bread crumbs.

Bread crumbs are a great solution for complex Web sites. They show a user their structure up to the point to which the user has gotten into it. It is very easy to implement, since they are simply links as well as regular words.

Prototype design is supported by information gathered from the above research activities. The sounds, icons and information provided as well as issues which have been highlighted above needs to be taken into consideration. A detailed problem statement is then generated after analyzing the drawbacks which might occurs.

3.4 Design Phase

During this phase, the information arranged in the analysis phase is used to create the design documents. The objective of this phase is to transform the define requirements into a complete, detailed specifications for the project to guide the work of the development phase. Design phase activities would include the following define the Web site structure and creation of the design overview.

3.4.1 Structure and Navigation

It is essential to organize Web pages into a logical order and to allow users to know whereabouts they are on the Web site at any given time. In addition, it is a good idea to not to have any pages more than three clicks from the Home page. Figure 3.3 show the Web site structure and navigation for this project.

As shown in Figure 3.3, the main branch is Home page which also known as the index page. The page in the second tier which is News, Activities, Gallery, JobSearch and Contact Us should be included in the navigation bar. The third tier may or may not to be included in the navigation bar. For this Web site, the first group of third tier which are Exergy, MAB, We Care and Charity Dinner are linked to the Gallery page. These linked pages are used to display and describe a few pictures taken from activities that Exergy Corporation involved in.

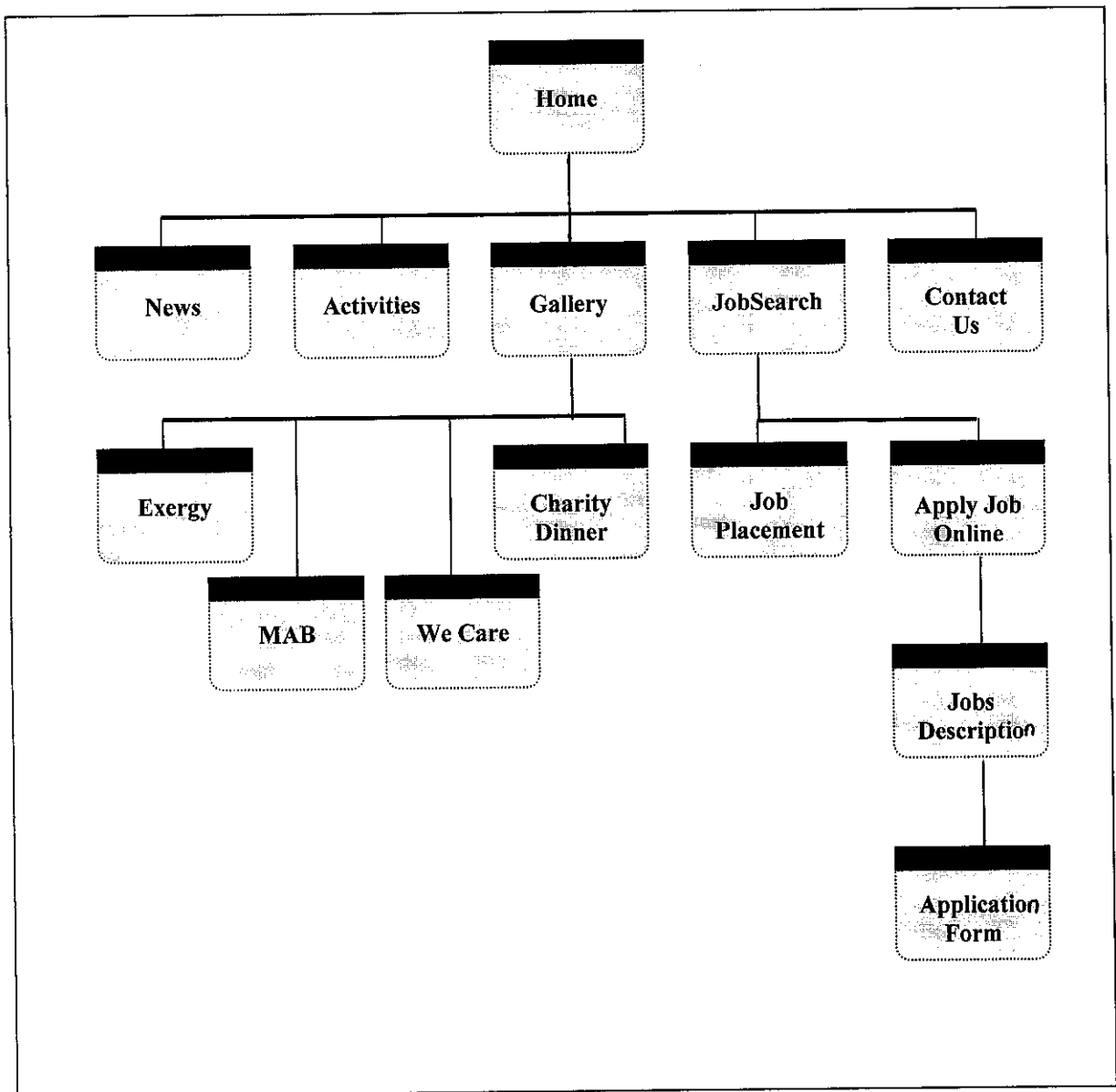


Figure 3.3 Web site structure and navigation

The second group from the third tier which is Job Placement and Apply Job Online are linked with the JobSearch page. Linked further to the Apply Job Online page is Job Description followed by Application Form. The main purpose of this page is to enable blind people to search for a suitable job that can fit with their skills and experiences. For Apply Job Online, it listed all the available jobs which is then linked to the detailed requirements for the job. If user interested to apply the job, the next button will be linked to the application form. This is where user need to fill in the form with a resume attached.

3.4.2 Creation of the Website Design

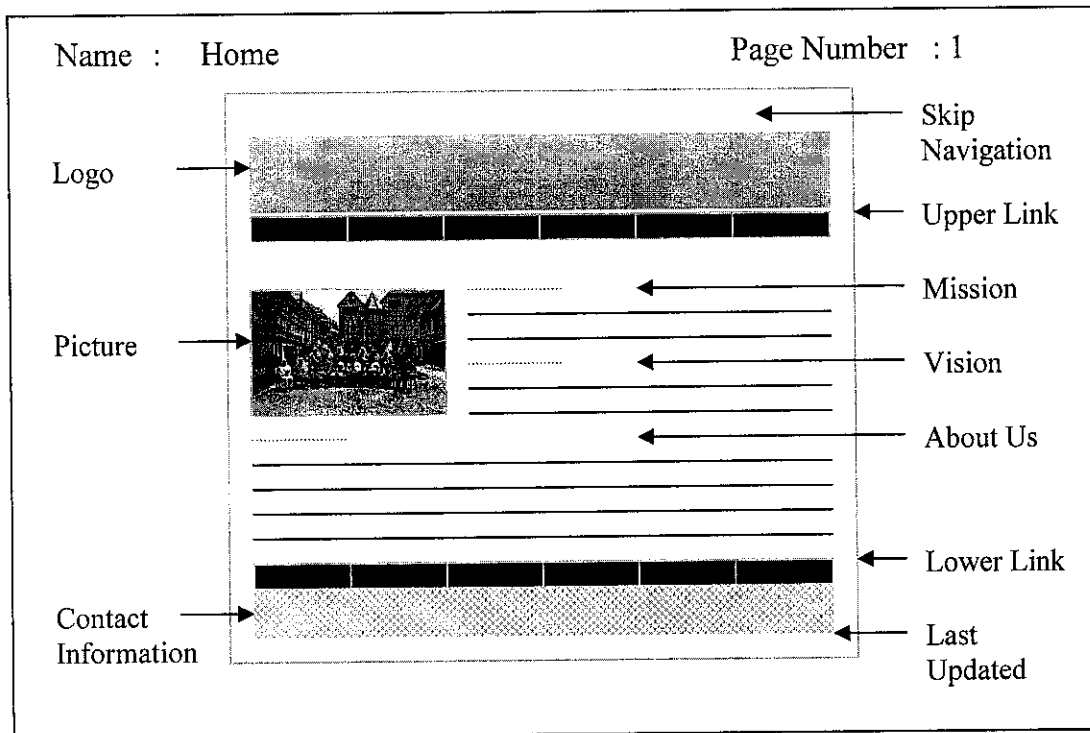


Figure 3.4 Storyboard for Home page

A Web design storyboard is the process of making a rough outline of what the Web site will include before it is actually created. It is used to organize thoughts and content. Figure 3.4 shows an example of storyboard for Home page. This page act as the main branch which invite viewers to enter the Web site. The goal of this page is to make it colorful and eye catching.

The first thing that must be taken into consideration is skip navigation link. On each page, the skip navigation link will be is to be put at the top of the page, either in regular text or an image, visible or invisible. In this project, it will be put as an image that has the same color as the background color in order to make it invisible. The key is to make sure that the link is the first item that screen readers hear and the first item that keyboard users tab to.

Other important elements that to be included in this Home page are page last updated, logo description, heading and navigation bar. For the logo description, it defines the color, shape and font of it.

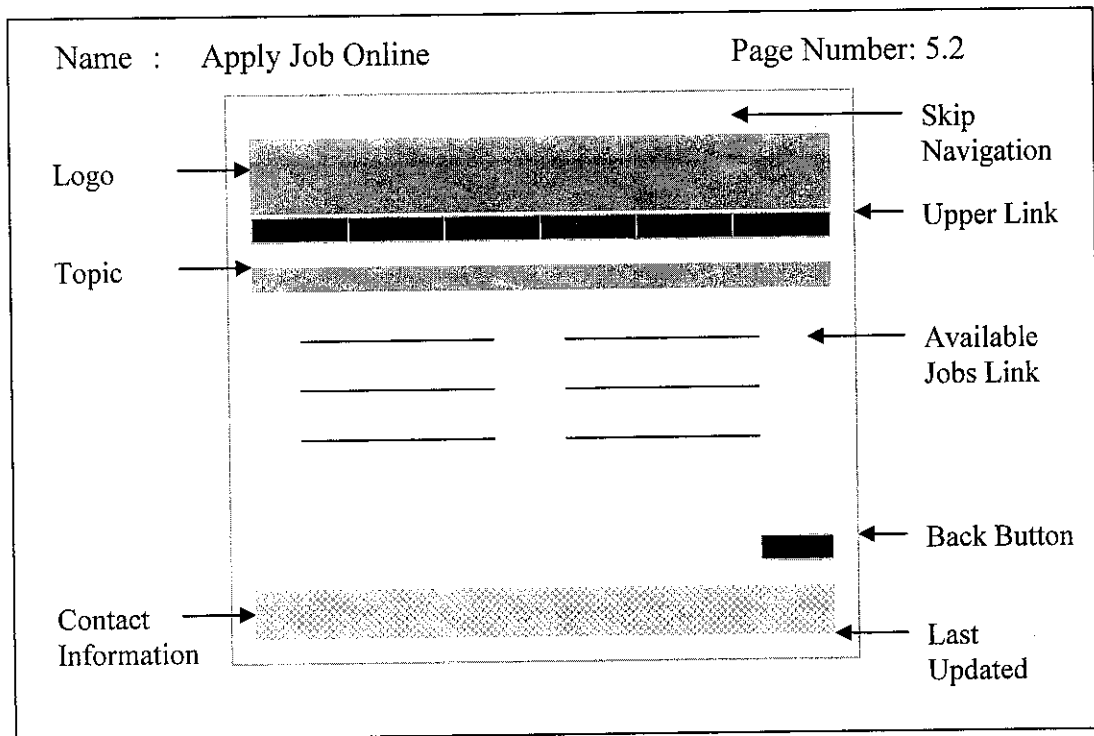


Figure 3.5 Storyboard for Apply Job Online page

This page is included in the third tier whereby it linked to the JobSearch page. The purpose of this page is to list down all the available jobs offered by companies around Malaysia. The next page will then display all the necessary information about the job such as location, skills needed, experience required, salary and others. Each job in the list is the one which have been reviewed and short listed by the company to suit with the ability of blind people.

As shown in Figure 3.5, consistency is implemented to this page as compared to the Home page. There is still a skip navigation link that will skip the repeated links and go straight to the main content which is the page's topic. Under this topic, it listed all jobs available with number of offers in a bracket situated beside it. Besides state the job, it gives the user a picture of the jobs market for the blind nowadays.

Back button will be placed at the bottom right of the page. It is used to gives options to the user, either to use the Internet Explorer back button, the Web site back button or other keyboard access key.

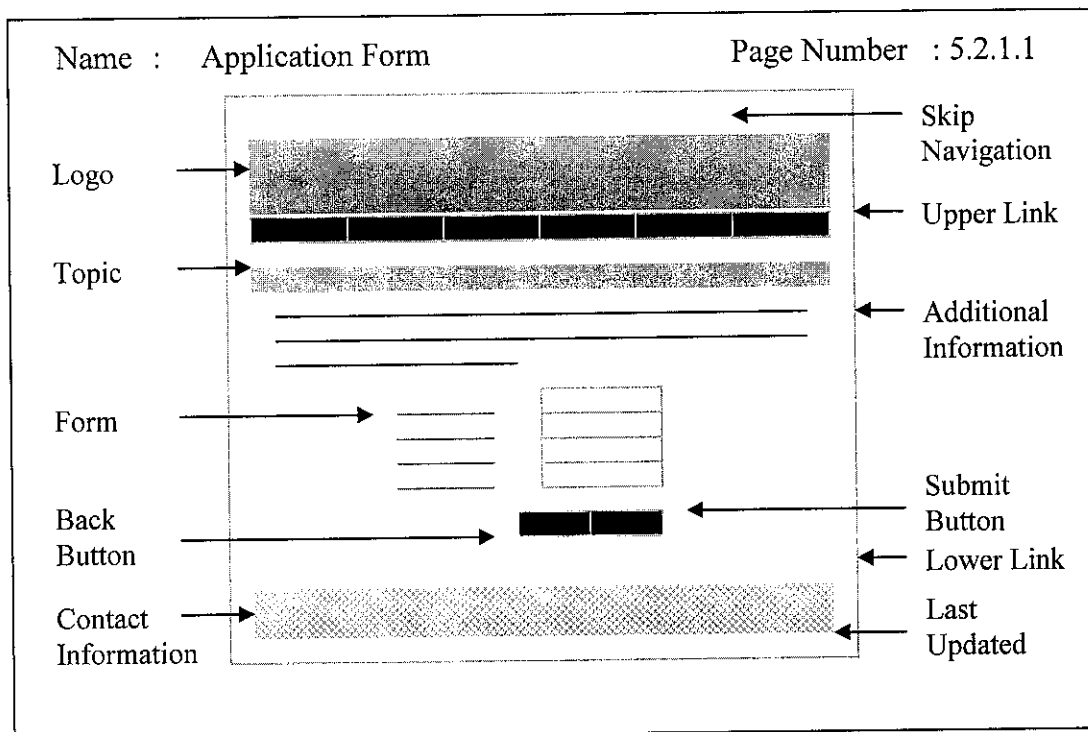


Figure 3.6 Storyboard for Application Form page

An objective of this Web site is to help blind people search for jobs through online. With that, in order to get the required information from users, they will need to fill in the form provided in this page. Information which are required to be filled by user are first name, middle name, last name, IC number, gender, home phone number, e-mail address and the applicant's resume. The application will be processed in two weeks and any further notice or information will be informed to the applicant through phone and e-mail. Figure 3.6 shows the storyboard for the Application Form page.

The main characteristic that needs to be taken into consideration is the form need to be labeled. Screen readers have no way to describe the exact information that needs to be put into each and every input area unless the labels and the edit fields are matched. By using "id" code, no matter where the edit area are, screen readers will directly read the linked label attach to it. Access key, also known as a keyboard shortcut also will be used in this page. This allow users to decrease the time spend to go through each label back and forth repeatedly.

3.5 Development Phase

The process of Web site development can be divided into different life cycle steps. This can help to format the work effectively, and the requirements can be adopted to achieve maximum quality. As shown in Figure 3.7, there are seven steps that need to be done in this project. But, it would include only four steps after the design phases which are development, content writing, coding and testing. The remaining phase will be done during the evaluation of the project development life cycle.

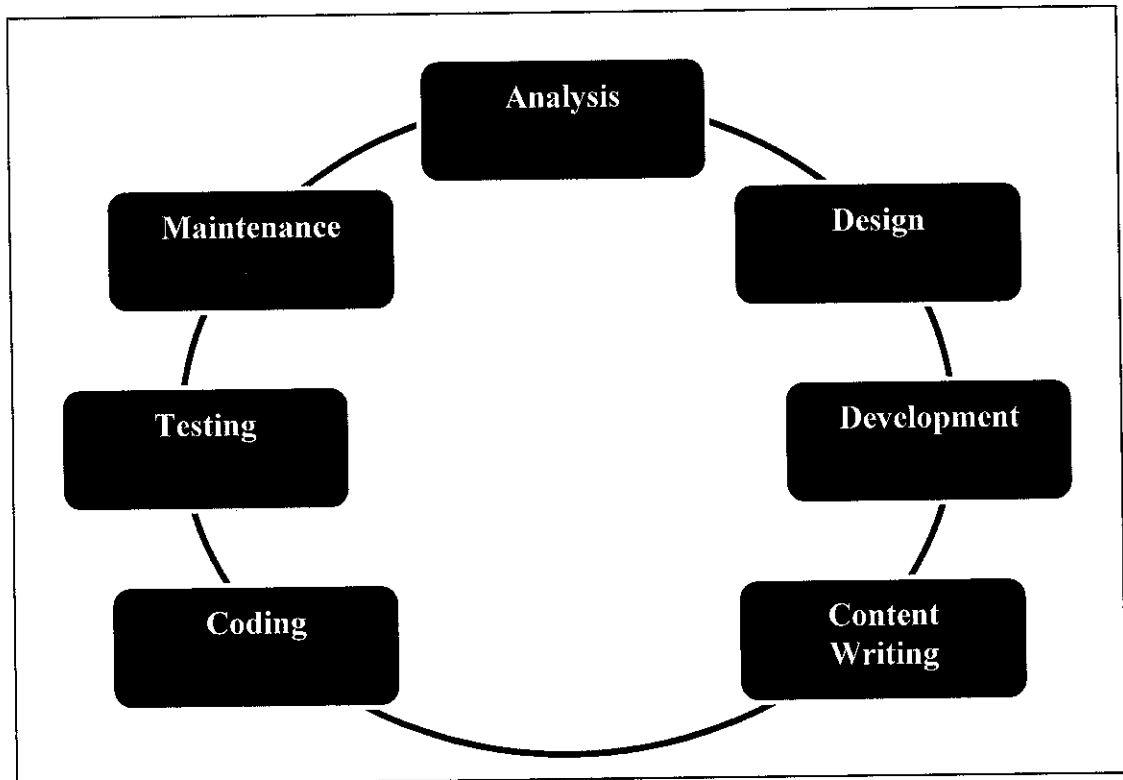


Figure 3.7 Web site development process

3.5.1 Website Development Process

During the development phase, normally the layout and navigation will be designed as a prototype. Users will be shown around three to four pages of the Web site with all images and navigation. A lot of suggestions will be received from users which will need a few changes. All the changes will be freeze before moved on into the next phase. Users can communicate their comments or feedback on the design through e-mail, fax or telephone.

The content writing phase is necessary mainly for the Web sites. Activity which needs to be done in this phase is to write a relevant content to the Web site. By adding the text in the design template, it surely will help to utilizing it. The grammatical and spelling check should be over in this phase too. The important part that needs a focus from designer is the JobSearch as it is the main objective to build this Web site.

Coding phase is where programming takes place. Designer must understand the design and navigation define in the design and development phase earlier. During this phase, designer will incorporate the design templates and content into a working Web site. This phase also request a number of test plans as well as technical documents. For this project, the coding which will be used is in HTML language. Detailed information on the purpose of using HTML language instead of other language will be explained in software and hardware requirements part.

Unlike software, Web based application need intensive testing, as the application will always function as a multi-user system with bandwidth limitations. Some of the testing which should be done integration test and load test. After doing all the testing, a live testing is necessary for the Web site application as it touched on the accessibility issues. A live testing would include preliminary testing and post testing. After the preliminary testing, designer might requires a few changes to the Web sites such as the interface, colors, elements used and others as suggested by the users, which is the blind person. The post-test will be done after finished the improvement part. Detailed information on the testing part will be explained in the next project development phase, evolution phase.

Web site will need quite a frequent update to keep them fresh. This is where the page last updated takes place. Designer, as mentioned before in analysis phase, need to state the last updated date of the Web site as it inform not only to the blind people but also the normal either the content of the page is new or out of date. Besides that, designer need to done an analysis again and all other life cycle steps will repeat. Among the page that regularly need to be updated are News and JobSearch page.

3.5.2 Overview of the Website

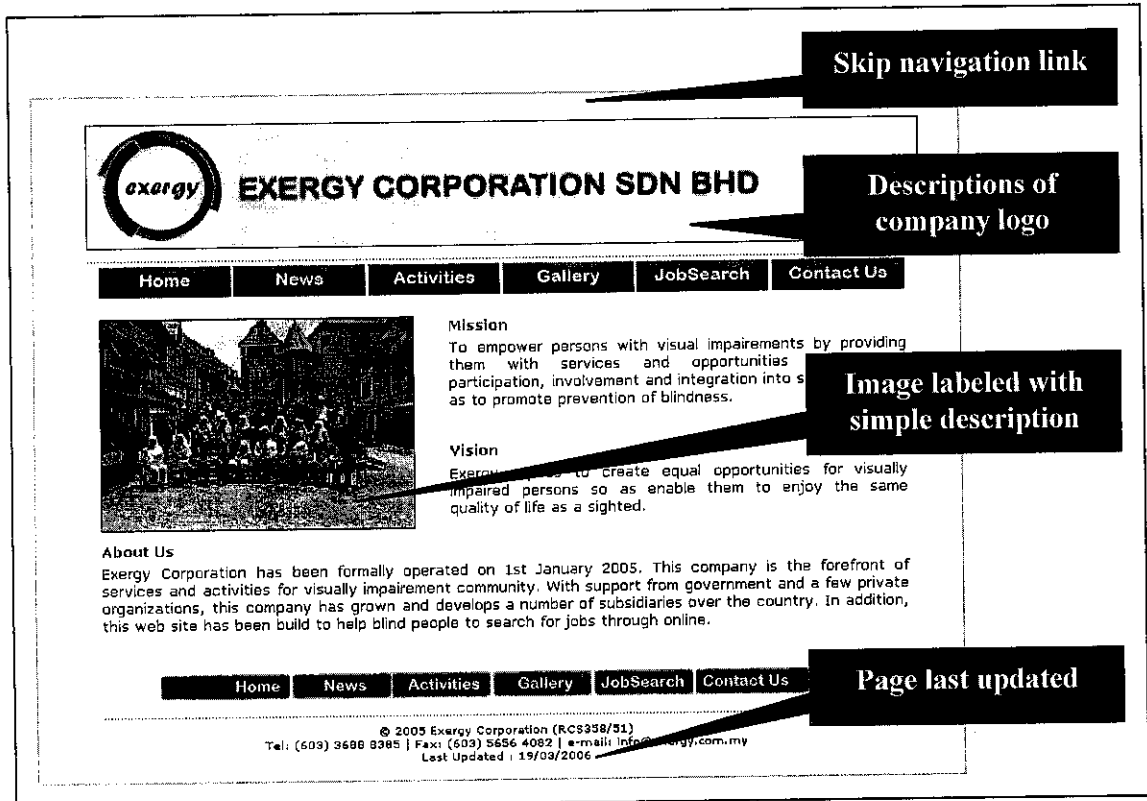


Figure 3.8 Overview of Home page

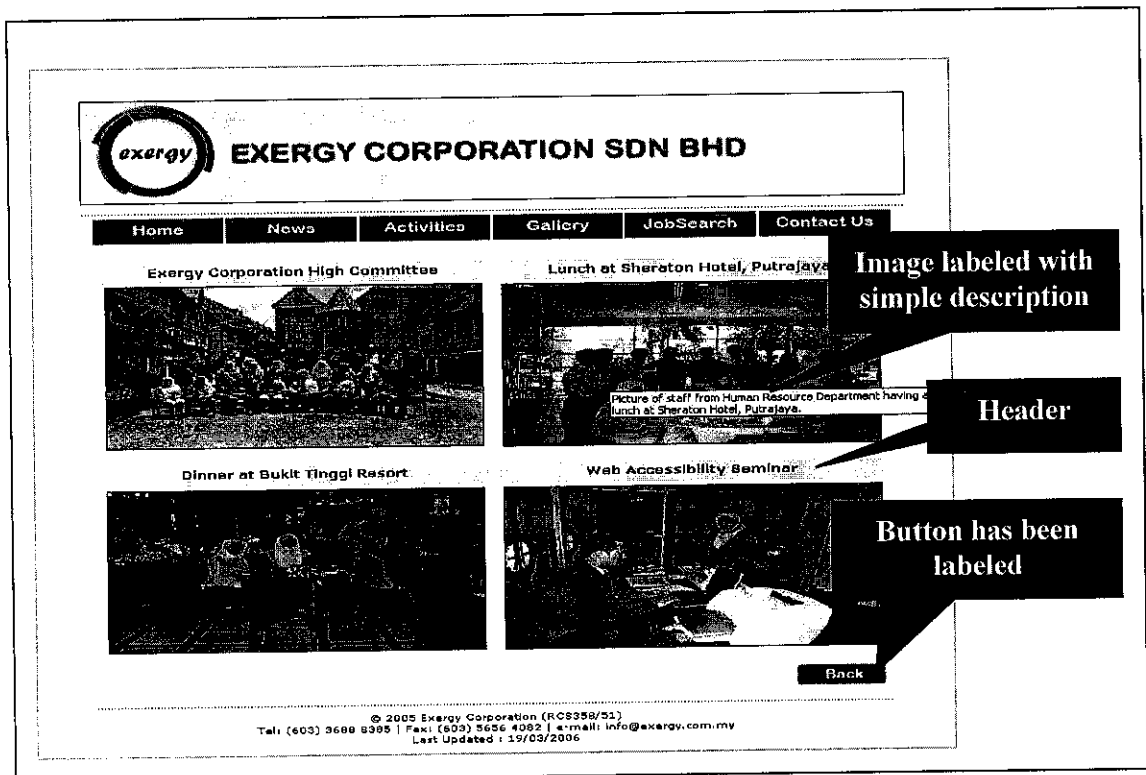


Figure 3.9 Overview of Gallery page

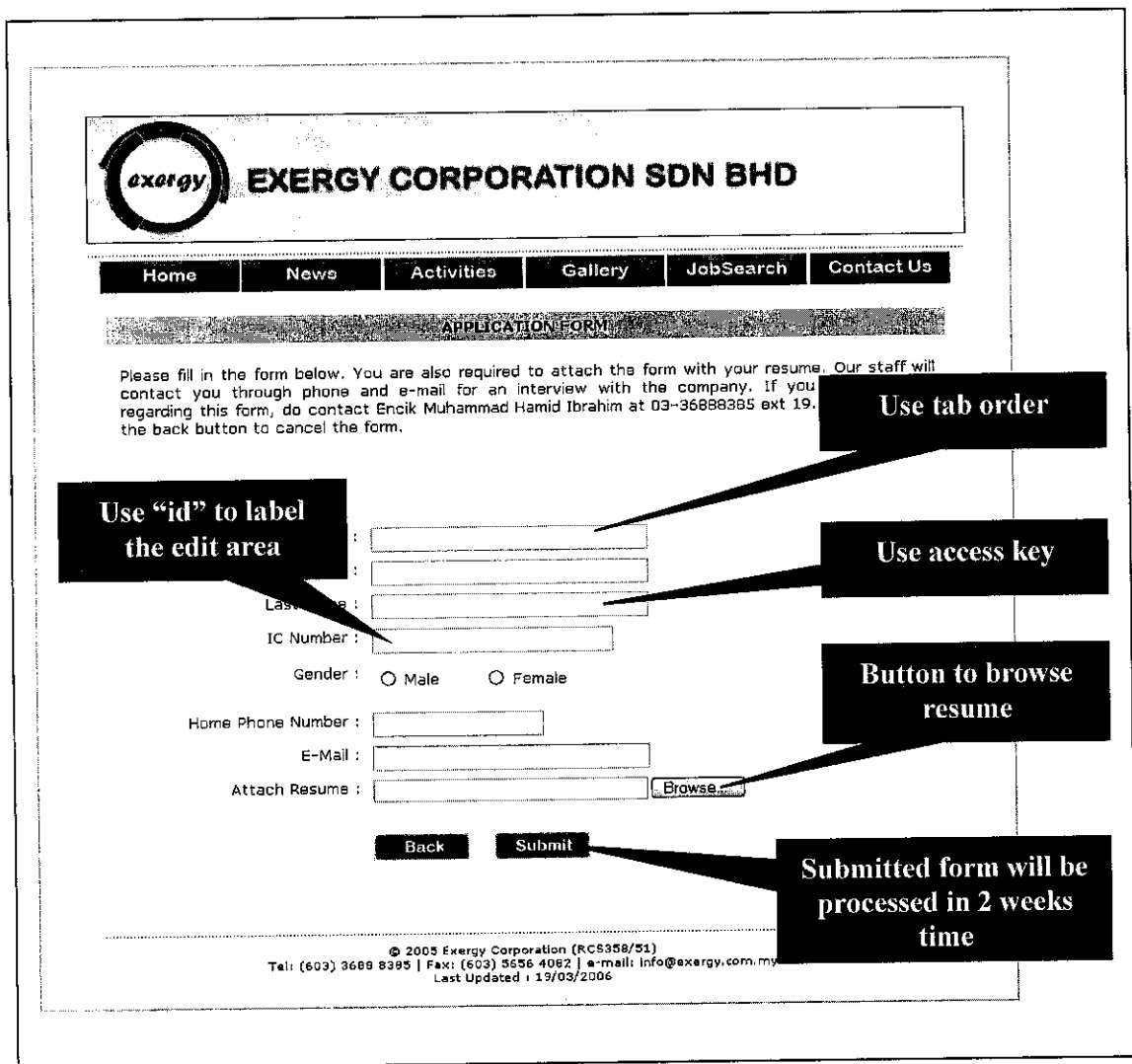


Figure 3.10 Overview of Application Form page

Consistency is important for users. It makes site easier to use because users do not have to learn new trick as they move around. By looking at Figure 3.8 and Figure 3.9, consistency have been applied throughout both pages where location for skip navigation link, company logo and navigation bar are at a constant place. Users will face trouble if designer moved any of these repeated elements to different location.

Blind user could not know either the position of the edit area is at the top, left or below the label. With a correct labeling technique, as shown in Figure 3.10, it will not only help blind user to fill in form correctly, but also to make them move from one label to another label easily by using the access key which also known as a keyboard shortcut.

3.6 Evaluation Phase

Evaluation is a continuous process that occurs at all phases of project development. This project development allows continuous improvement of the prototype by implementing the evaluation techniques at any point along the process and not only during the completion of the project. Evaluation of the project is the process of determining either the project can achieve its objective or not. As shown in Figure 3.11, a number of testing has been implemented to evaluate the prototype which is the Web site:

1. Preliminary Test.

This test is conducted after the first version of the Website has been produced. The purpose of this test is to measure between the designer's level of understanding with the degree of accessibility required by users which also known as user requirements. As a number of blind people are needed to run this test, Malaysian Association for the Blind (MAB) is the best place for it. With the help from Mr. Silatul Rahim Dahman, a preliminary test has been done successfully at the MAB Cyber Café. Although only a few people came out to run the test, but the information gathered from the test are very useful. Below are a few suggestions being pointed out in the test:

- (a) Provide skip navigation link.
- (b) It is best to provide an access key.
- (c) Use heading for each articles.
- (d) Provide description for the company logo.
- (e) At the lower link, it is better not to put the vertical bar in between.
- (f) Add information for jobs requirements.

2. Post-Test

After done some improvement based on the comments or feedback from users in preliminary test, a second test will be conducted. Normally, in developing a system or a Web site, a test need to be done repeatedly to make sure that the contents is updated along with the technology's growth. Result for this test is discussed in the next chapter.

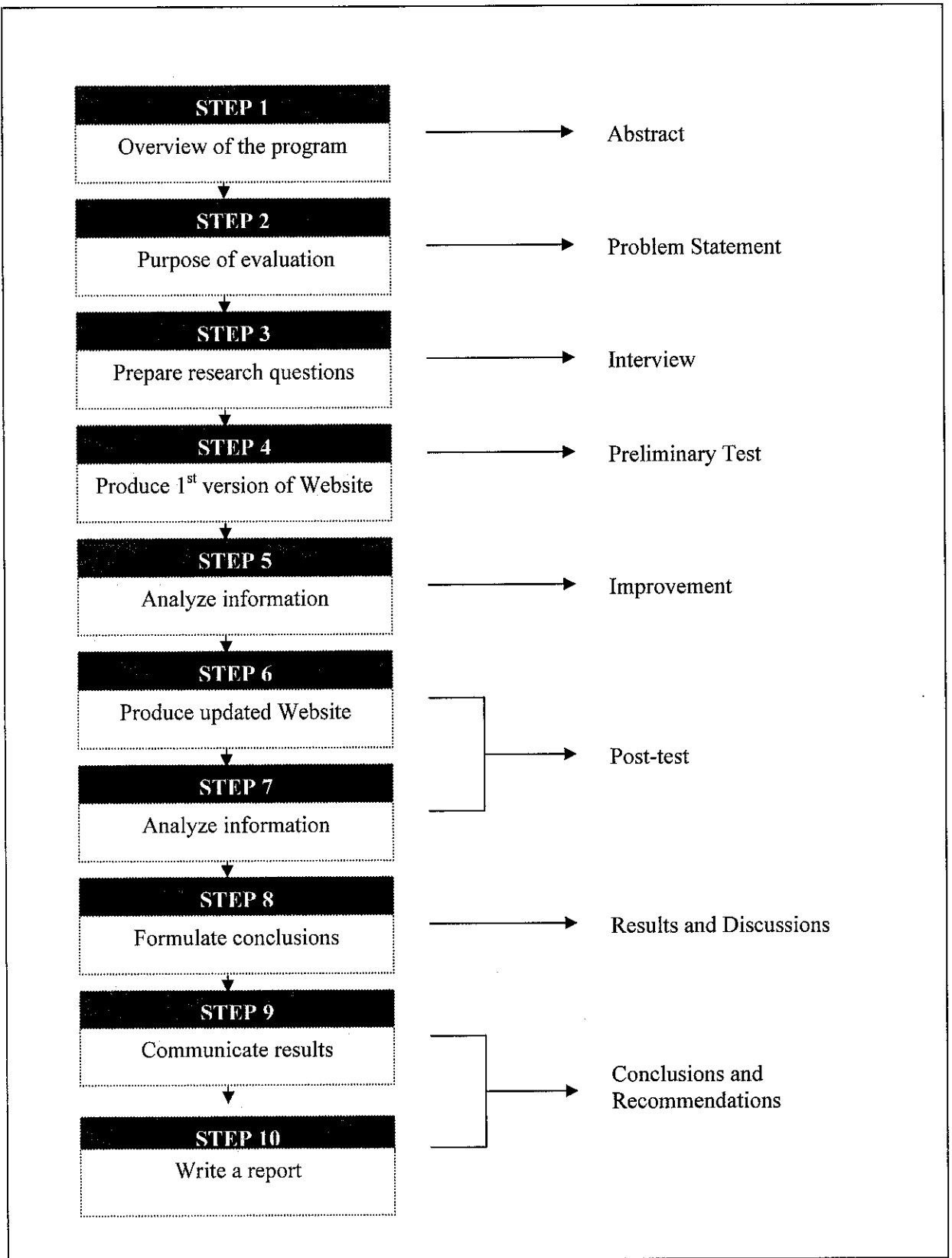


Figure 3.11 Overview of evaluation process

3.7 Software and Hardware Requirements

In deciding which tools to be use for the project, there are four factors that needs to be analyze and they are cost constrain, time constrain, reliability and availability of the product. Based on all these four factors, two products or software have been choose as the main tools for this project:

1. Dreamweaver MX

It is the industry-leading web development tool that enabling users to efficiently design that develop and maintain standards-based websites and applications. With Dreamweaver MX, web developers go from start to finish, creating and maintaining basic websites to advanced applications that support best practices and the latest technologies. As for this project, Dreamweaver MX is used to develop a HTML Web pages.

2. JAWS

It is the most popular screen reader worldwide, JAWS[®] for Windows[®] works with any PC to provide access to today's software applications and the Internet. With its internal software speech synthesizer and the computer's sound card, information from the screen is read aloud, providing technology to access a wide variety of information, education and job related applications. JAWS also outputs to refreshable Braille displays, providing unmatched Braille support of any screen reader on the market. Besides that, JAWS is popularly accepted in Malaysia.

CHAPTER 4

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

4.1 Introduction

The presentation and discussion of the result is the heart of the report. The first purpose of this section is a well-organized and objective presentation of the results. By using tables and figures that show the results will sufficiently support description for readers to interpret them quickly and accurately. The second purpose is discussion of the results together with their analysis in order to show that the information is warranted.

As pointed out in Chapter 3 under evaluation phase, a few testing have been conducted to ensure that prototype developed provide Web designers with a means of accessing particular elements that target users acquires. Referred to that, this chapter has been divided into two smaller sections that are preliminary test and Web site improvement. Under these smaller sections, the procedure, requirements and results is discussed for further analysis and evaluation.

Above all, there are number of elements need to be considered before setting up for a testing. These elements are already being mentioned in the previous chapter. To summarize it, these are all incorporated elements need to be take into account by Web designers and they are graphics, buttons and forms have to be labeled, tables need to be properly marked, keyboard access has to be provided, clarity of content, skip navigation link, access key, tab order, bread crumbs and last but not least is consistency which includes navigation menu, page last updated, the company logo with a description attached and the title page.

4.2 Preliminary Test

A preliminary test is needed in the early development phase of project's planning for learning about the products, providing concepts, testing various scenarios against the prototype and validating solutions. By using information gathered from this test, it then will be used as a baseline for further testing and development.

4.2.1 Preparation for the Test

The first step need to be done before move on with the test is to obtain management approval from Head of Business Information Systems/Information & Communication Technology Department, Dr. Ahmad Kamil Mahmud. To acquire it, a formal letter has been written to En. Silatul Rahim Dahman (MAB) through Pn. Hasiah Omar@Mohamed to undergo a preliminary test for final year project. Subsequent to that, confirmation has been done with En. Silatul Rahim on the date, time and venue of the test. In addition, other requirement is to accommodate around five to ten people. A brief detail of the preliminary test is listed as follow:

Date : 2nd March 2006 (Thursday)
Time : 10.00 a.m.
Venue : Cyber Café, MAB

After selected the venue for the test, it is the time to start accessing the software and hardware requirements. A few documents have been written down for a successful testing process. These documents include Test Environment, Test Procedures, Test Plan Identification and Questionnaires. All this documents are attached under Appendices section.

During the test, En. Silatul Rahim managed to accommodate four people including him to do the test. Among the four, two of them are partial sighted and the rest are blind. En. Silatul Rahim chooses to ask them to do the test in order to get different opinion from dissimilar groups of blindness.

4.2.2 Preliminary Test Evaluation Results

Based on the questionnaire assembled during the preliminary test evaluation done at Malaysian Association of the Blind (MAB), the whole participants have had an experience using the Web that is especially designed for blind user. For instance, Web site of MAB that provide information on latest news or activities handled by them. Besides that, Overbrook School for the Blind (OBS) also provide information regarding varies opportunities available for blind people.

Furthermore, all of them agree that the current interface provided by those Web sites is effective enough for them to travel from one page to another. But, none of them ever tried to search job through Internet and it would be good if it can be implemented and used especially by the blind. Most of them usually used Internet to be aware of what is going on, local or international. They also use the Internet as a medium to communicate between each other around the globe.

As technology evolved, they are a lot of screen readers that available over the market nowadays. For instance, JAWS from Freedom Scientific, Window Eyes from GW Micro, LookOUT from Choice Technology, and Hal from Dolphin. Each of them has their own criteria to attract and serve their customers. However, based on answer given by all of the four participants involved, they would prefer using JAWS instead of others. Besides popular in Malaysia, majority of them used it as it is easy to obtain and interact with.

The answers from them are also varies when it come to suggestion because they came from different groups of blindness. Partial sighted for example can see what on screen although they have to keep their eyes closer to screen every time they wanted to read the content. Unlike the blind, they can either depend fully on screen or use screen readers to read it out loud. While for the blind, they are fully depend on screen readers and keyboard access to interact with the interface. This is when the element of sound is most important for them to navigate through the Web site.

In evaluating the Web site, there are five elements which being the focal point in the early development of this Web site. It includes graphics, buttons, tables, forms and keyboard access. All these features are important for Web designers in achieving the basic knowledge to an accessible Web site. The questionnaire rank the accessibility level for each element from one up to five where one is for minimum level of accessibility while five is for achieving the expected level of accessibility. Below are results in graph presentation followed by the detail evaluation and discussion.

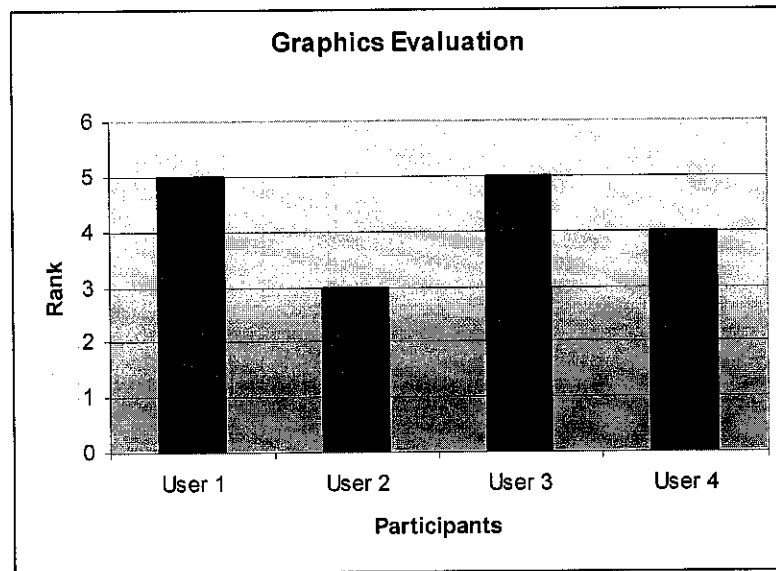


Figure 4.1 Graphics evaluation

The first element that being evaluated is graphic. Graphic in this case, refers to any products of graphics art or images. In the early stage of Internet development, the Web application is all in the text based format. Unlike today, the World Wide Web presents information in variety of formats. A large portion of the content is visual or based on visual perception such as tables and diagrams. Since blind people incapable to see the graphics, they need textual description of images. All the graphics need to be labeled or otherwise screen reader will simply read it as 'graphic' or 'graphic' with the file name.

A shown in Figure 4.1, all of them has the same opinion to rank graphics above the average value which is 2.5 and the total average value are 4.25. Based on the result, participants found that the graphics are effective and can be recognize easily by them. Further analysis shows that participant number two rank graphics at three because of a few thing. This

participant blind and particularly focuses more on Gallery page. A problem occurs whereby the participant confuse between the link to another additional Gallery page with link where participant can save and print the images. A few suggestions are gained towards improving the Gallery page which is discussed further in improvement part.

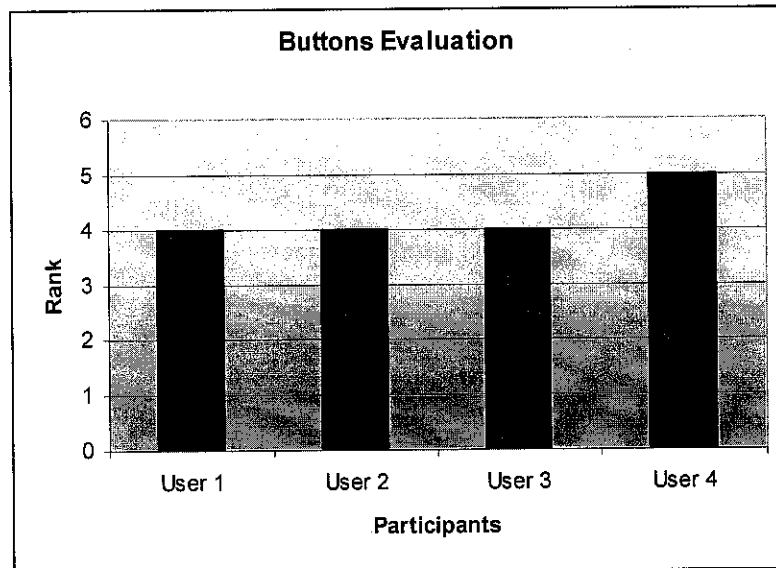


Figure 4.2 Buttons evaluation

This evaluation is followed by the second element that is buttons. In graphical user interfaces, a button is a small outlined area in a dialog box that can be click to select an option or command. It is similar to banners but smaller and appear only in index pages and several may appear on the lower part of the lateral menu bar. For this Web site, there are buttons on every page that navigate through the Web site. These buttons include menu buttons, previous and next buttons, and attach resume buttons.

As shown in Figure 4.2, the whole participants position buttons at the effective level of accessibility whereby the total average value is 4.25. Nowadays, there are number of ways to create buttons and the most commonly used button is 'back' button. Buttons are tricky because they often have text written on them, but the text is a part of the graphic and therefore the screen readers could not get any information. Even though the button may convey some information to the sighted people, it may mean nothing to the screen reader users.

Similar to graphics, blind people need to have a textual description of buttons. Buttons need to be labeled or otherwise screen reader will simply read it as 'button' when user land on it rather than 'back button'. With that, it is hard to know which button users are on. This problem is also faced by two of the participants and both of them are fully blind. It happens when participants tried to used the attach button to attach their resume with the form provided. Screen reader simply read the button as 'button' rather than 'attach resume button'. They never notice the purpose of the button and in the end, skip to submit button. However, they satisfied with the overall buttons.

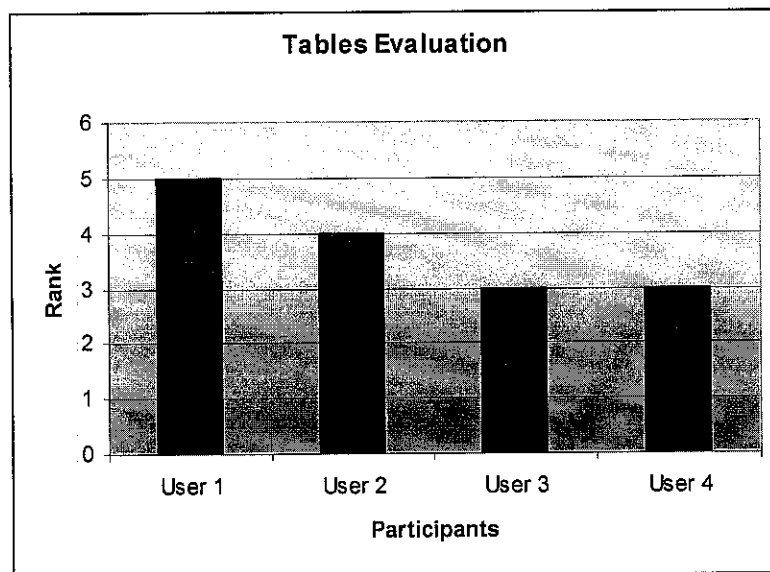


Figure 4.3 Tables evaluation

The third element is table which refers as an orderly columnar display of data. It is divided into rows, and each row is divided into data cells. A data cell can contain text, images, lists, paragraphs, forms, horizontal rules, tables and others. For this Web site, a table is used in Activities page where it displays the date and venue for activities that had been and will be organized by Exergy Corporation. Based on the result from Figure 4.3, it shows that participants satisfying with the information provided by the Web site.

Since table is build out of text, Web designers usually think that it surely accessible. However, people who use screen readers have no way of knowing whether the information that they are reading is related to a given header or to several headers, unless it is properly

marked. In the other part, the '<thead>', '<tbody>' and '<tfoot>', which is elements used to design a table are seldom used because of bad browser support.

During the evaluation process, a question has been asked by one of the participants. Participant gets mixed up between table used for layout and table assigned to convey the information. In addition to that, it is still satisfying for Web designer to use tables to define the layout on the content of Web site but, it would be really helpful if Web designer use other available methods.

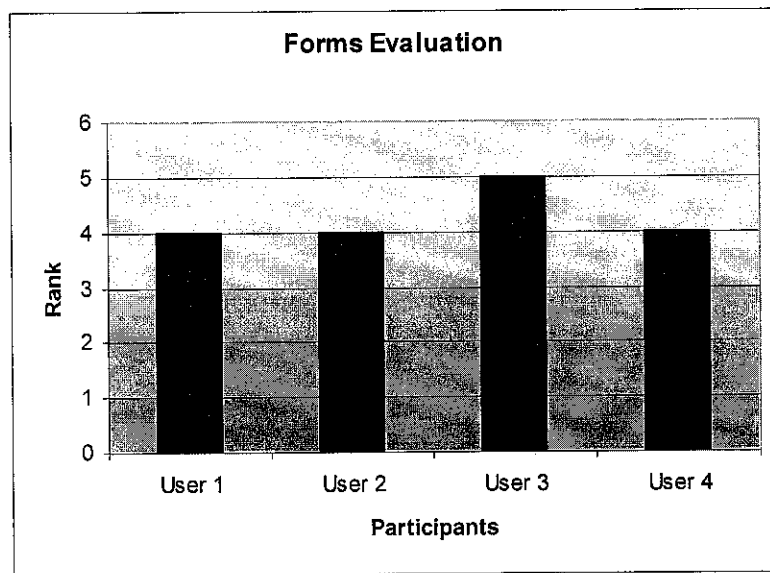


Figure 4.4 Forms evaluation

The fourth element is a form which in this Web site is refers to as types of application in an online form used to apply jobs available. Applicant need to submit the form along with the resume attached within the form. Form often poses the same problem like table that is, it builds out of text elements and thus, it seems like no accessibility issues involved. Unlike sighted people, screen reader users have no way to tell which fields the labels correspond to unless the labels and the field are matched.

Based on result shown in Figure 4.4, generally all participants really do satisfy with form provided in the Web site, although they faced a little problem dealing with one of the button includes in the form.

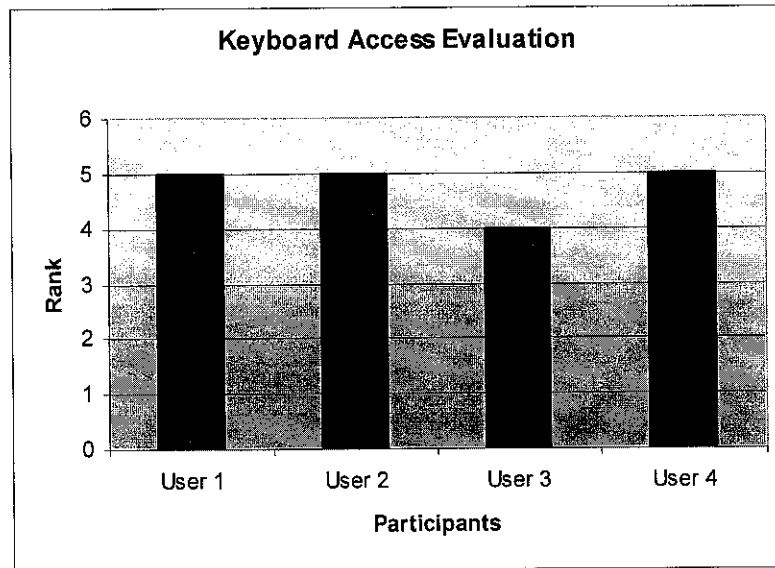


Figure 4.5 Keyboard access evaluation

Keyboard access to active elements of a page is important for many users and in this case people who use screen reader that unable to use a mouse (pointing device). It is important to make sure that all elements can be accessed with the keyboard. Web designers may include features that allow users to bind keyboard strokes to certain actions. It is more of a problem in software application written in various programming languages. However, HTML language allows Web designers to specify keyboard shortcuts in documents via 'accesskey' attribute.

As shown in Figure 4.5, the whole participants really satisfy with keyboard access provided by this Web site. However, this Web site does not provide 'accesskey' to users especially when filled in the form at Application Form page. For further improvement, En Silatul Rahim prefers if this Web site can provide 'accesskey' or a short cut to move from one field to another.

Based on Figure 4.6, between all these five elements discussed before, keyboard access is the element that nearly reaches the maximum level of accessibility with total average value of 4.75. In conclusion, improvements need to be done in order to increase the accessibility level of the Web site. This is discussed later in improvement part.

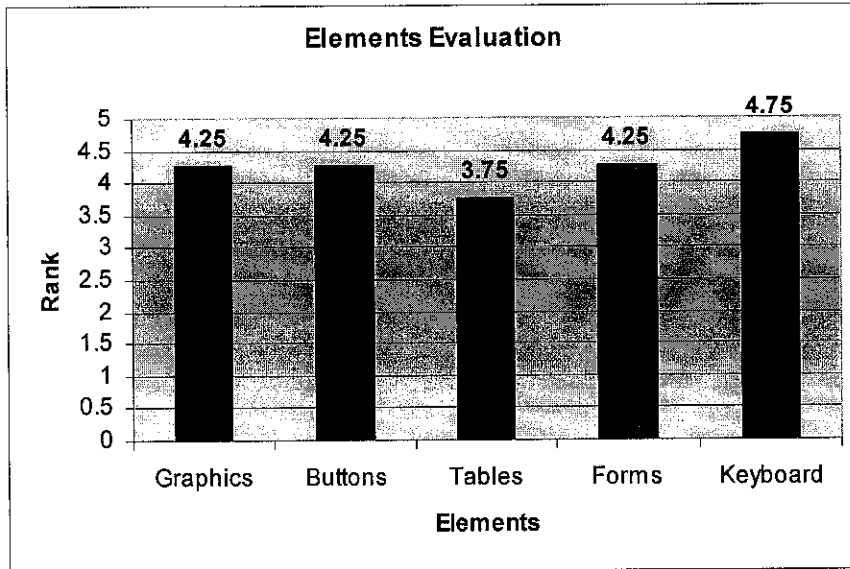


Figure 4.6 Elements evaluation

People who do not use any alternative devices can benefit a lot from the accessibly designed web sites. A clear organization of a Web site will make navigation of any computer user faster and more efficient. It is true that these users will not benefit from a properly marked up table or forms, but these elements will not look any different because of the markup, but will attract a bigger audience to a the web site.

4.3 Website Improvement

During preliminary testing process, a few suggestions to improve the Web site accessibility level had been gained from participants. Besides received comments on the current elements available in the Web site, there are a few other additional elements that not required by any accessibility standard at this point but are a nice addition to accessible Web site.

4.3.1 Title Page

Title page which appears as a window title helps to identify the Web page. It is a main tool to attract new visitors from search listing and to help the existing users to locate the specific pages that they need. The title page contained within the HTML '<title>' tag and is almost always used as the clickable headline for listings on Search Engine Result Pages (SERP).

Title page is also used as default entry in the Favorites when users bookmark a site. In this case, it is good to begin with the company name, followed by a brief description of the Web site. Since the title page is sued as the window title in the browser, it is also used as the label for the window in taskbar under Windows. This means, advanced users will move between multiple windows under the guidance of the first one or two words of each page title.

For blind people, it is especially useful if there are several different Web pages open at the same time. If all the title pages start with the same words, it then would severely reduce the usability and accessibility of the Web site.

4.3.2 Image Description

It is beneficial to provide a text equivalent for every non-text element which includes images, graphical representation of text, image map regions, animations, applets and others. In HTML language, it can either used 'alt' or 'longdesc' to describe these non-text elements. In Gallery page, a short text equivalent does not suffice to adequately convey the function or role of pictures displayed. Solution to that is by using a 'longdesc' attribute as suggested by one of participants in previous preliminary test.

4.3.3 Consistency

A consistent user interface is one that presents the same options in the same way on all of the pages of the site. The earliest studies on computer interface consistency reported that tasks performed using more consistent interfaces resulted in a reduction of task completion times, a reduction in error and an increase in users satisfaction. A more recent study also found that leaning time decreased as consistency increase. In order to increase the accessibility level of the Web site, there are two important elements placed under consistency and they are page last update and the company or organization logo with description attached to it.

Page last updated refers to the date when the information was put on the Web site, when it was revised or when it was last reviewed for accuracy. For more precise information, users can view the source code which has entries for data created, data modified and date valid. For blind people, they use this information to know either it is an anonymous information or not. A screen reader user use logo description as an alternative to help them identify and recognize the company's Web site.

4.3.4 Skip Navigation

When a sighted user visits a web page, a quick visual skimming of the page provides an understanding of the page layout. From that point, user is able to move directly to the needed information. Assistive technology (AT) is much different. A screen reader will read word by word through each section and this includes alternate text for images, all hyperlinks available and any text. Although the content is still accessible, but it might be frustrating to users of assistive technology.

Providing links that allow the user to skip directly to content and avoid the navigation would likely enhance the accessibility of a Web site. Web designers are recommended to use skip navigation link for people who use screen readers and text-browsers. Unlike sighted people, these people does not use mouse and depend on tabbing in order to make progress through an interface. With a skip links feature, it might lighten the amount of work that they have to do.

The law does not specify whether the link has to be visible or not, but in many occasions, Web designers or clients prefers to have the link invisible. This is done by inserting a graphic of only one pixel and describing it as 'skip navigation' or by inserting a regular link but with identical background and foreground color. The problem with this technique is that it does not always work as expected. Some screen readers do not speak material that is marked display (none or visibility hidden) and others depend on how the style is specified. To solve this problem, a Web designer could make it invisible by using transparent graphics.

4.3.5 Access Key

Access keys are keyboard shortcuts that are intended to help users who have difficulty in using pointing devices such as a mouse. They are intended to simplify navigation for people using special devices such as screen readers by delivering quick access to important links.

Users that can view a full Web page already have this quick access because important links can be made to stand out on the page using numerous visual methods. While for screen reader users, they can then press a keyboard shortcut to go straight to the navigation, rather than having to go through many links. The access keys are read out next to each link when it read through the page.

4.3.6 Tab Order

Tab order which also refers as tab indexing is designed to make tabbing through the site easier but also to provide users with access to the Web site by using the keyboard only. It also uses to give focus to elements in an order that follows sequences and relationships within the content.

Furthermore, by adding tab index into a form, users who depend on assistive technology can move from one field to another by tabbing. It is possible to assign a tab order to every link on the page in order to avoid user from going through many links before gets to the navigation menu.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This research began with brief overview on new barrier confronted by blind people with the growth of Internet and concept of an accessible Web site. The reason for this phenomenon to happen is many Web designers do not test their design with blind people in mind. Thus, Web site usability needs to be improved so that the blind community can benefit from various revolutionary tools available nowadays.

In producing an accessible Web site for the blind, a research has been done to provide detailed information on how blind people navigate through Internet with the early and current assistive technology offered over the market. Besides Braille language, navigation by sound appears to be the main medium for the blind to visualize the text and perceive information from the Web. Various approaches suggested and technologies developed till today such as text browsers, screen readers, Braille devices, screen enlarger and keyboard adjustment.

In addition, there are numbers of elements need to be considered by Web designers in designing an accessible Web page. These elements include graphics, buttons, forms and tables need to be labeled and keyboard access has to be provided. There are also design features that would be a nice addition to a Web site that are clarity content, consistency, skip navigation link, access key and tab order. It is essential for Web designers to design a Web site with blind people in mind as they also have the right to access information, services and resources available over the Internet.

5.2 Recommendation

Throughout the development of screen reader software, researcher still found a few drawbacks at each of the screen reader available over the market. For instance, JAWS which is the best available option to visually impaired people, shows numerous weakness such as does not work with any Adobe products, Netscape Navigator or Outlook Express, pop-up are especially annoying and hard to deal with, nearly impossible to navigate through complicated Web pages and a crash of JAWS renders the entire computer useless until it is rebooted.

For that reason, further research need to be done to enhance the available screen reader or to develop new software that can fulfill the desires of the blind. Besides that, industries should produce alternatives software to a screen reader such as Super Nova which contains screen reader, screen magnifier and Braille support, that is still cost reasonable and user friendly.

The purpose of World Wide Web Consortium (W3C) is to develops and maintains the protocols used on the Web to insure interoperability to promote universal access. Although there are series of accessibility standard that has been introduced by W3C over the past few years, but there will still be a problem occurred by different Web language such as PHP or ASP unlike HTML or XML which is the standard language used by W3C.

Realizing on that, W3C should provide a new accessibility standard that encompasses all Web languages available nowadays. It is not only beneficial to W3C itself, but also to people with disabilities, Web developers and developer of assistive technology. Although with different use of language, users can easily access the Internet without facing any other problems between the assistive technology used and language of the Web site.

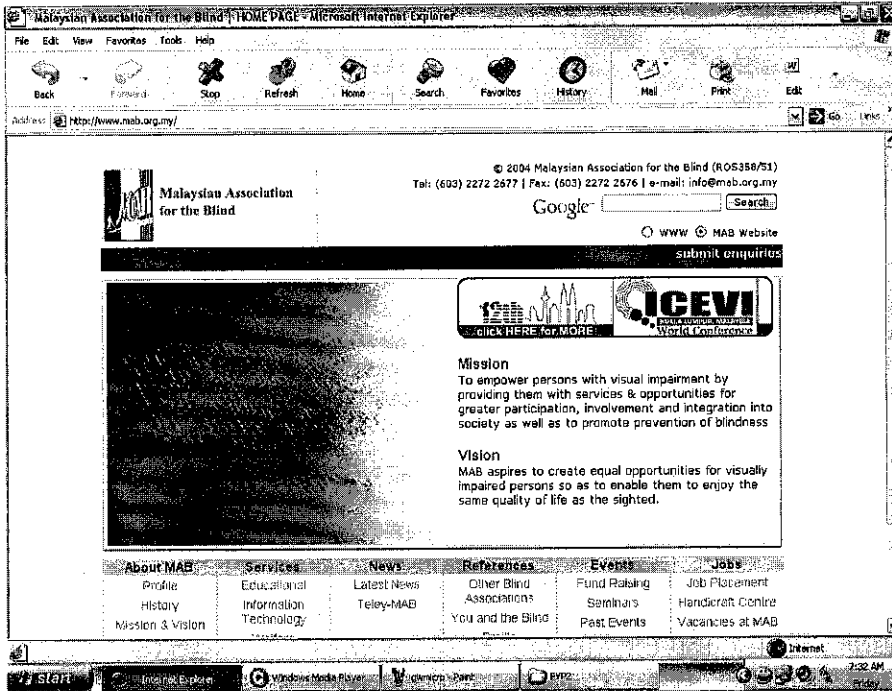
Besides combining the elements need in designing an accessible Web site with technologies developed, a more in-depth research into the human information processing should be done. By combining the elements of human information processing into the current research, it would create new ideas or points in developing an accessible Web site not only for the blind, but for all type of disabilities.

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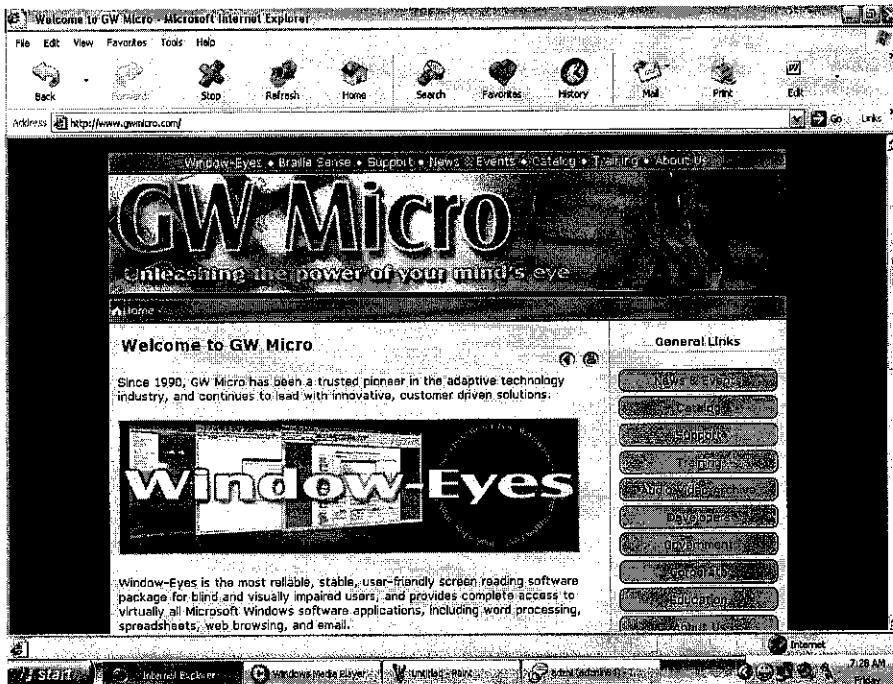
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APPENDICES

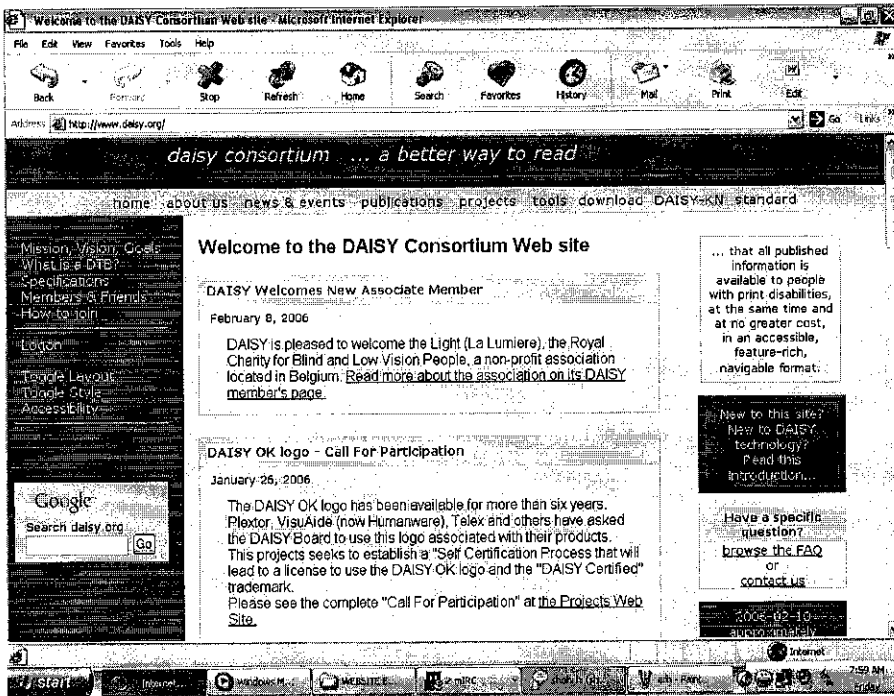
APPENDIX 1	Examples of Accessible Website
APPENDIX 2	Examples of Non-Accessible Website
APPENDIX 3	Website Storyboard
APPENDIX 4	Overview of the Website
APPENDIX 5	JAWS Manuals
APPENDIX 6	Preliminary Test Procedures
APPENDIX 7	Preliminary Test Questionnaires
APPENDIX 8	Pictures from Interview Session
APPENDIX 9	Pictures from WECARE Program



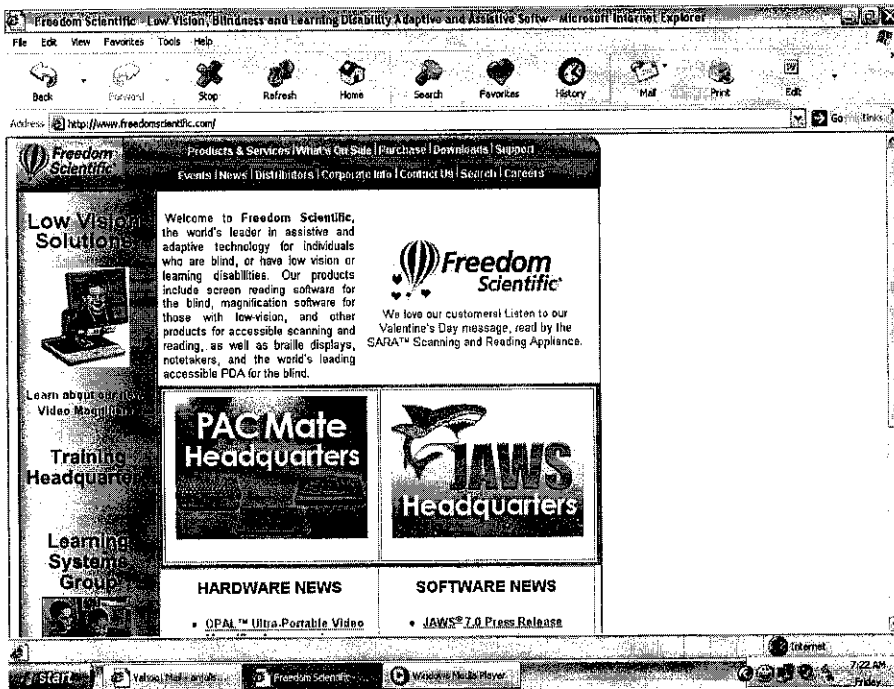
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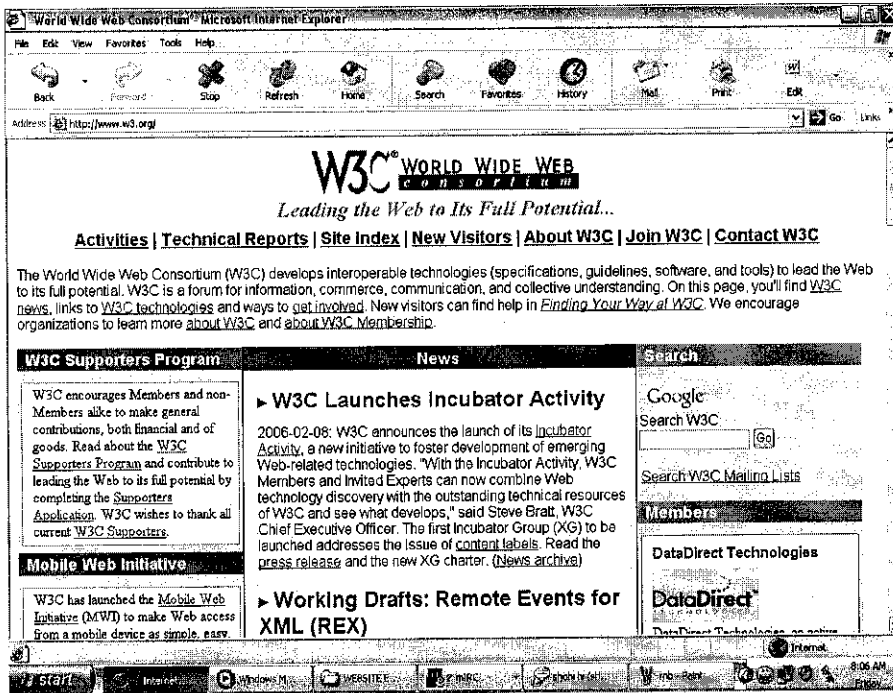
GW Micro (www.gwmicro.com)



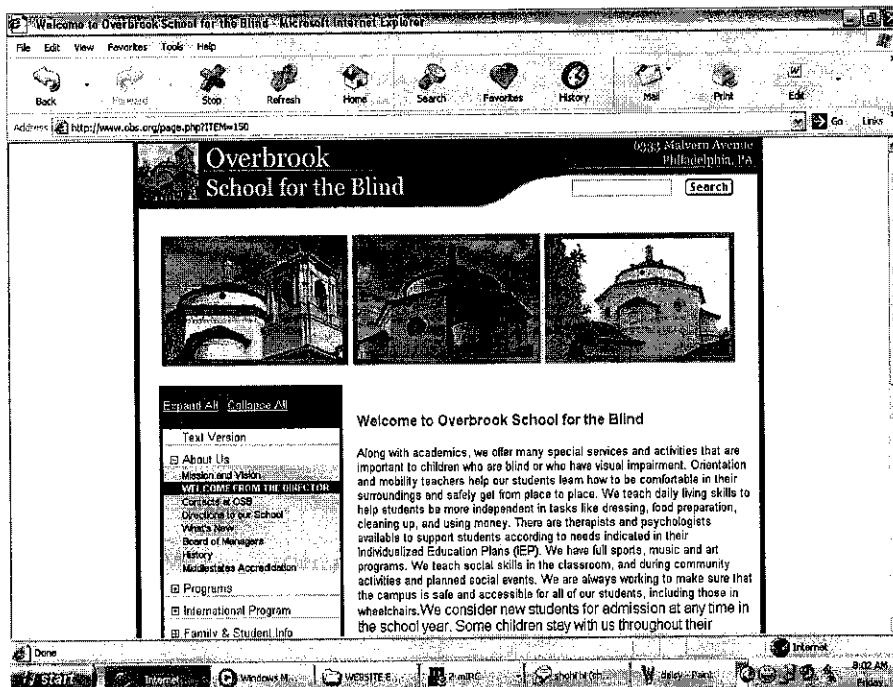
Daisy Consortium (www.daisy.org)



Freedom Scientific (www.freedomscientific.com)



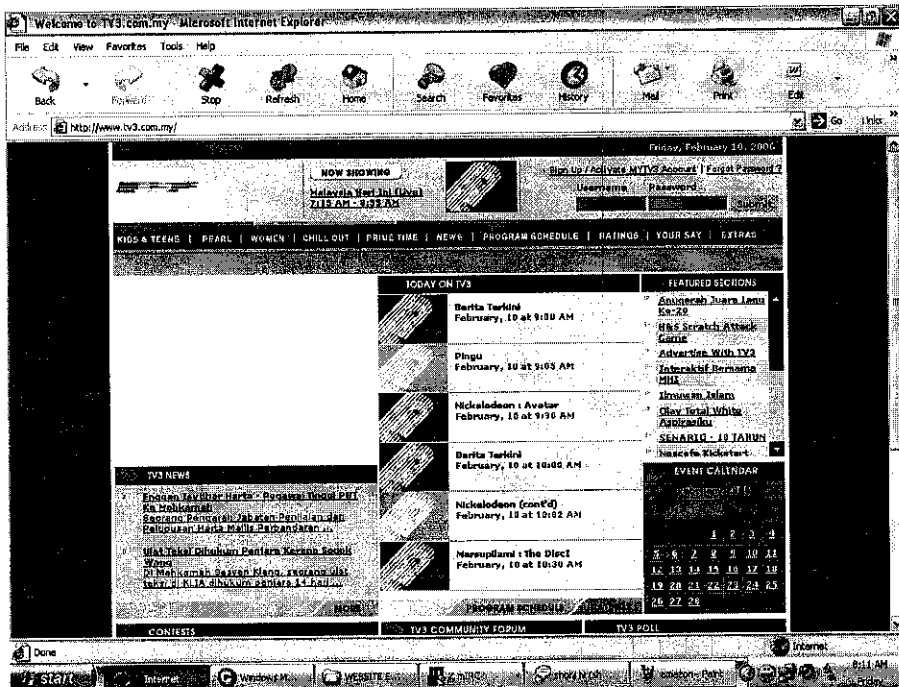
World Wide Web (www.w3.org)



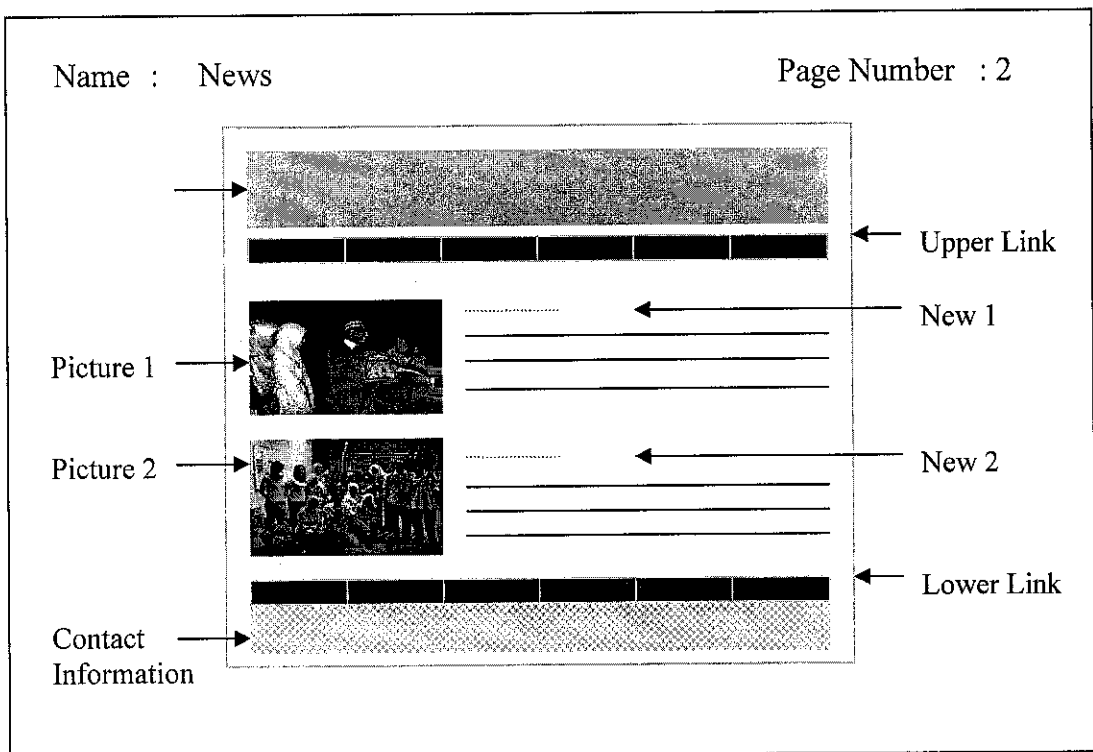
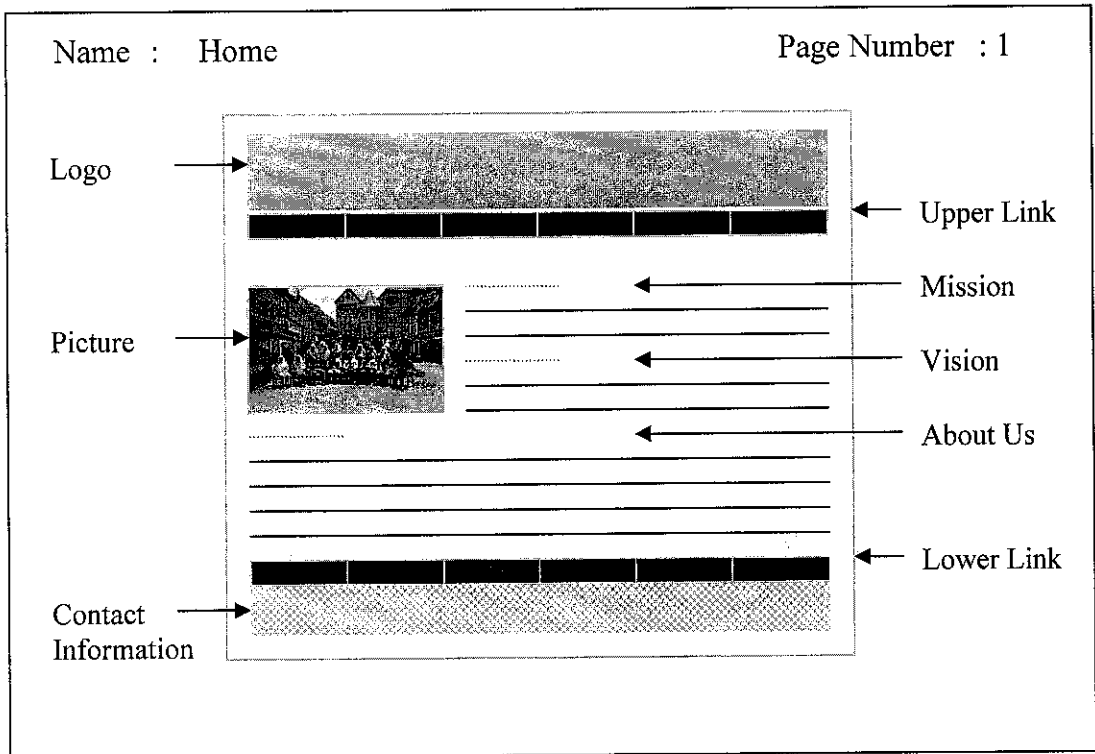
Overbrook School for the Blind (www.obs.org)

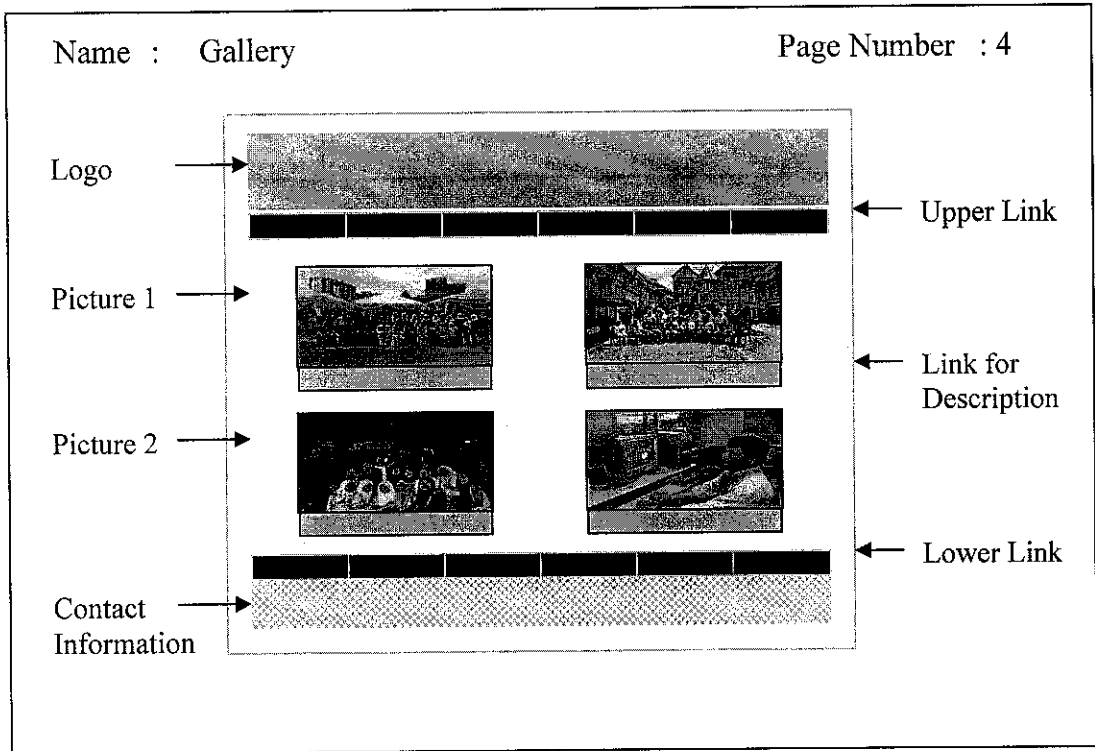
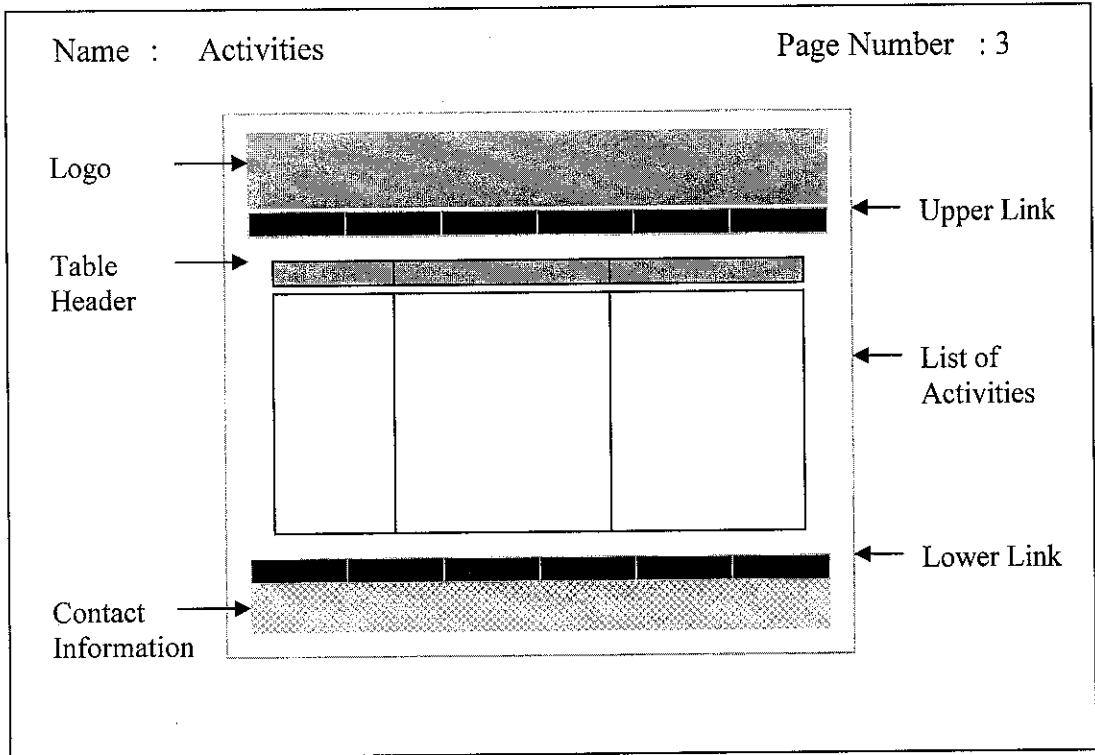


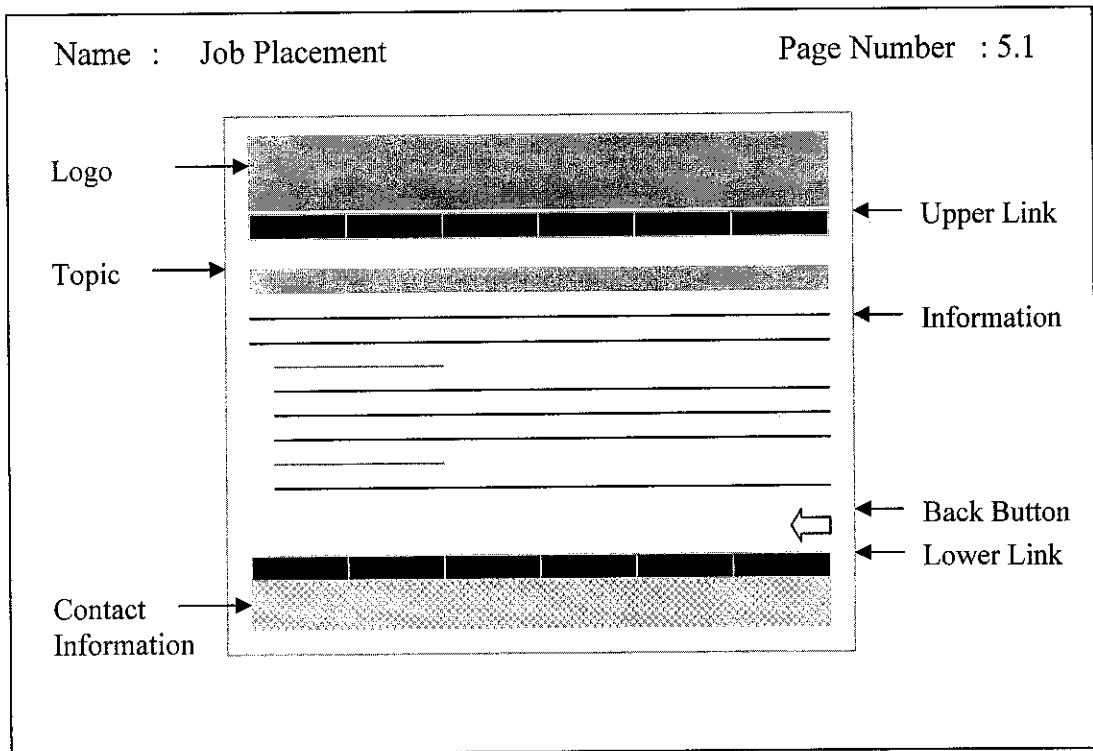
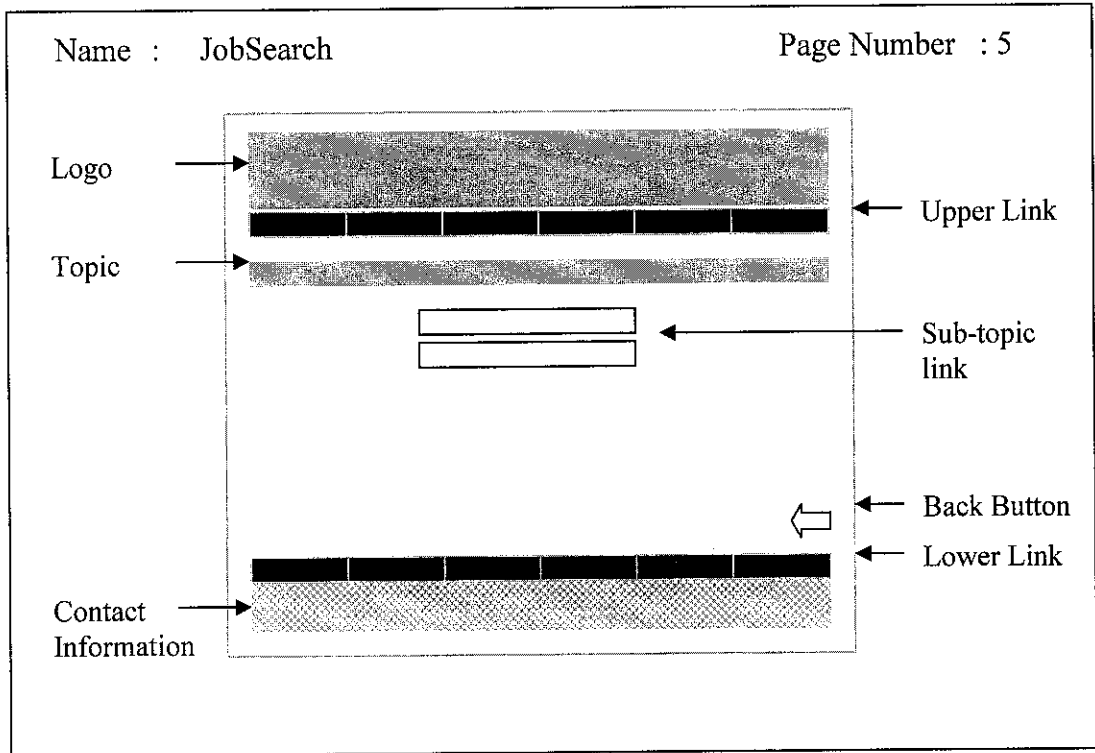
ntv7 (www.ntv7.com.my)

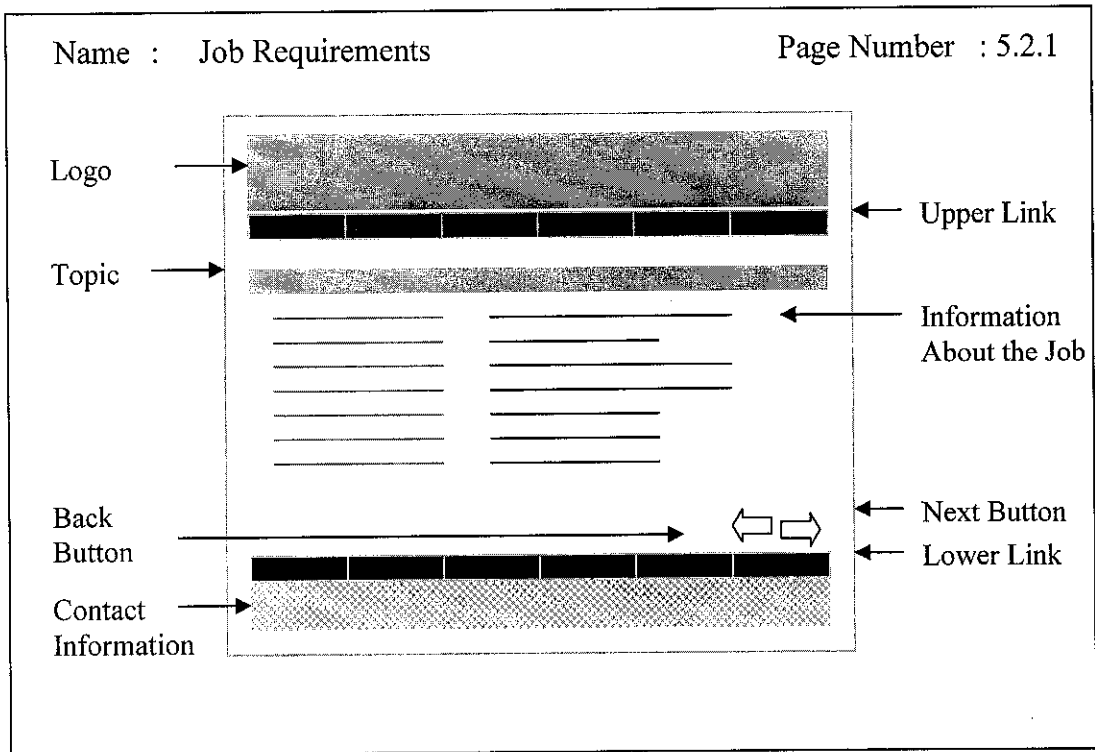
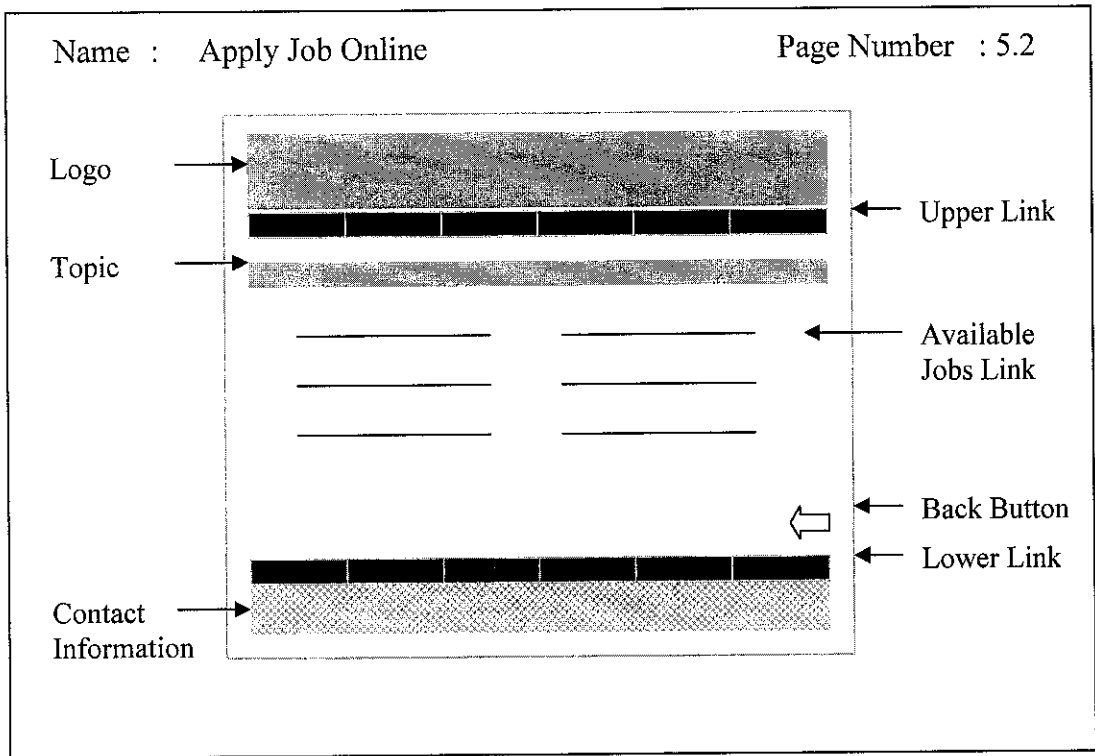


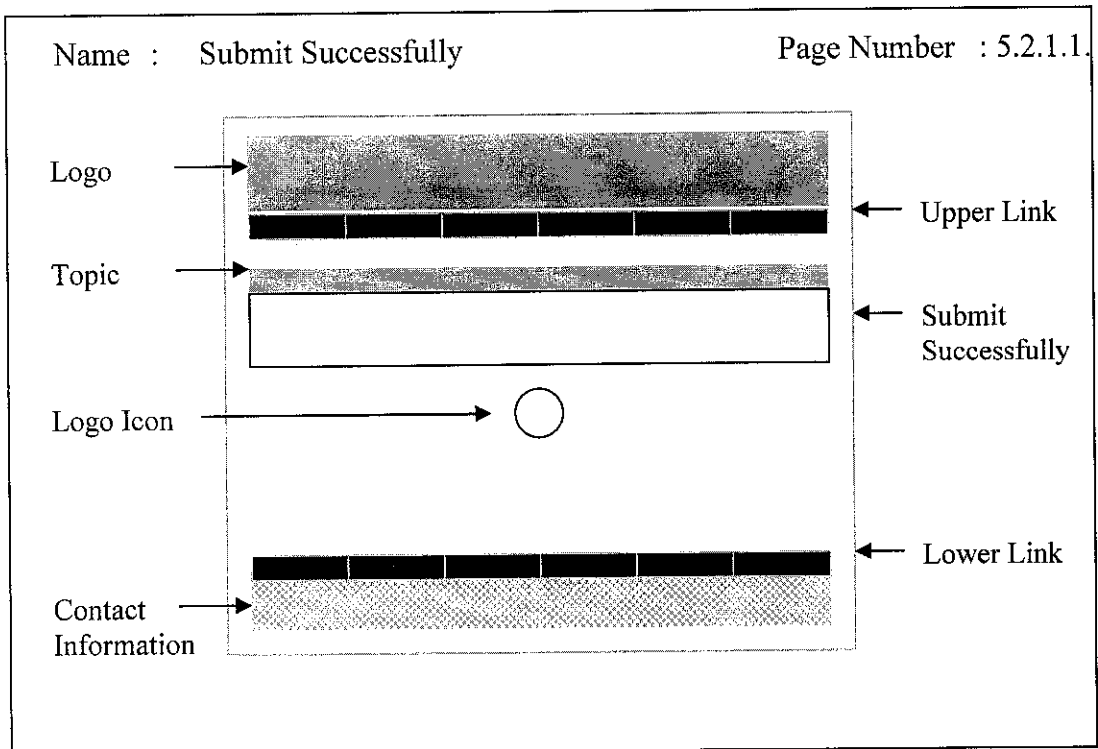
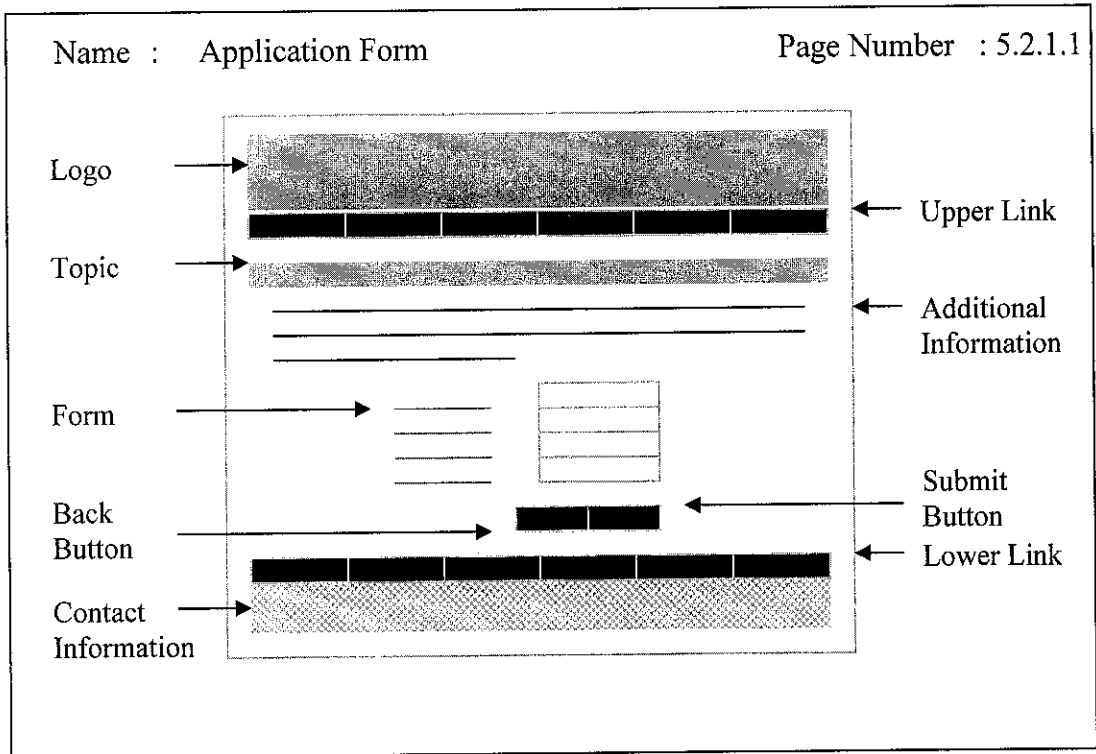
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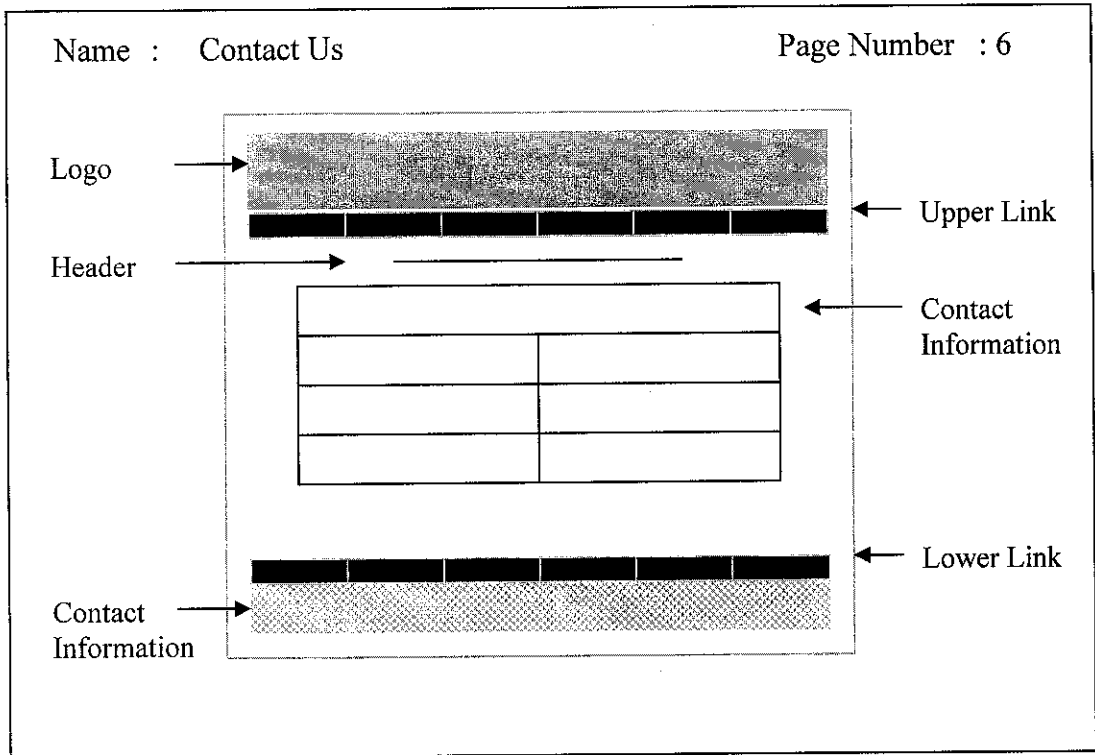















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Mission
To empower persons with visual impairments by providing them with services and opportunities for greater participation, involvement and integration into society as well as to promote prevention of blindness.


Vision
Exergy aspires to create equal opportunities for visually impaired persons so as enable them to enjoy the same quality of life as a sighted.

About Us
Exergy Corporation has been formally operated on 1st January 2005. This company is the forefront of services and activities for visually impairment community. With support from government and a few private organizations, this company has grown and develops a number of subsidiaries over the country. In addition, this web site has been build to help blind people to search for jobs through online.


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Charity Dinner at Equatorial Hotel, Kuala Lumpur.

This charity dinner was held at Equatorial Hotel, Kuala Lumpur on 29th November 2005. Objective of this charity dinner it to donate 80% of the money will be donated to Sekolah Menengah Khas Setapak, Kuala Lumpur. The rest will be used to support other activities which involved disable people to interact with their surrounding.




We Care program at Universiti Teknologi PETRONAS (UTP).

This charity event is a collaboration between UTP and UUM for blind kids and family from Pulau Pinang, Perak and Selangor. This event involved nearly to 50 students from UTP and UUM. Exergy Corporation was also invited. An exhibition booth is open started from 9.00 a.m till 5.00 p.m. A few activities showed by the blind people such as typing in Braille, internet surfing, introduction to Braille and many more.

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DATE	VENUE	ACTIVITIES
15/11/2005	Persatuan Pemulihan Orang-Orang Cacat, Selangor.	Charity Event
24/11/2005	Kolej Islam Sultan Haji Ahmad Shah (KISAS), Pahang.	Charity Event
29/11/2005	Hotel Equatorial, Kuala Lumpur.	Charity Dinner
3/12/2005	Universiti Teknologi PETRONAS, Tronoh, Perak.	Charity event in collaboration with UUM
8/12/2005	St. Nicholas School, Pulau Pinang.	Charity event in collaboration with USM
20/12/2005	Persatuan Pemulihan Orang-Orang Cacat, Wilayah Persekutuan.	Job Opportunities Seminar
31/12/2005	Universiti Putra Malaysia, Serdang, Selangor.	Charity event with students from St. John Institution, Kuala Lumpur.

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Activities page



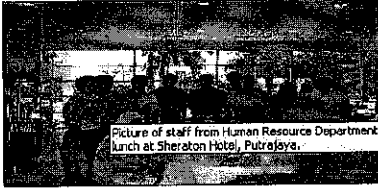
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Exergy Corporation High Committee




Lunch at Sheraton Hotel, Putrajaya




Picture of staff from Human Resource Department having a lunch at Sheraton Hotel, Putrajaya.

Dinner at Bukit Tinggi Resort



Web Accessibility Seminar



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Gallery Page

The screenshot shows the JobSearch page of the Exergy Corporation website. At the top left is the Exergy logo, a circular emblem with the word 'exergy' inside. To its right is the text 'EXERGY CORPORATION SDN BHD'. Below this is a horizontal navigation menu with buttons for 'Home', 'News', 'Activities', 'Gallery', 'JobSearch', and 'Contact Us'. The 'JobSearch' button is highlighted. Below the navigation menu is a dark horizontal bar with the text 'JOB SEARCH' in white. Underneath this bar are two links: 'Job Placement' and 'Apply Job Online'. At the bottom of the page is another navigation menu identical to the one above. Below the navigation menu is the copyright information: '© 2005 Exergy Corporation (RCS358/51)', contact details 'Tel: (603) 3688 8385 | Fax: (603) 5656 4082 | e-mail: info@exergy.com.my', and 'Last Updated : 19/03/2006'.

JobSearch page

The screenshot shows the Job Placement page of the Exergy Corporation website. It features the same Exergy logo and 'EXERGY CORPORATION SDN BHD' text at the top left. Below is a navigation menu with buttons for 'Home', 'News', 'Activities', 'Gallery', 'JobSearch', and 'Contact Us'. The 'JobSearch' button is highlighted. Below the navigation menu is a dark horizontal bar with the text 'JOB PLACEMENT' in white. The main content area starts with the heading 'YOU CAN GIVE THEM THE CHANCE!' followed by a paragraph: 'Employers who wish to employ visually impaired person can do so by contacting Exergy Job Placement Unit, Encik Muhammad Hamid Ibrahim and Puan Norlaili Ismail through this number 03-36888385 ext 19 or 21.' Below this is the section 'Benefits to Employer:' with a numbered list of four items: 1. Double deduction is give to muneration (wages) paid to blind or other disabled workers under the Income Tax. (Deduction for the Employment of Disabled Persons Rules 1992). 2. All purchase of equipment for disabled persons are exempted from import duty and sales tax. 3. The Social Welfare Department provides launching grants for lower income group to venture into business. 4. 1% quota of jobs are reserved in Government Department for disabled persons. Below the list is the section 'Exergy Job Placement Unit :' with a numbered list of five items: 1. To carry out job opportunity surveys in relation to industrial and commercial posts in public and private sectors 2. To seek placement of trained disable persons in employment 3. To provide follow-up and after-care service, concerning their jobs and general welfare 4. To make loan of equipment to disable workers needed for their employment 5. To explore new job opportunities in the competitive job market for higher learning disable people. At the bottom right of the page is a 'Back' button.

Job Placement page

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PROFESSIONS

- [General Clerk](#) (6)
- [Teacher](#) (1)
- [Library Assistant](#) (2)
- [Tutor](#) (2)
- [Brailist](#) (4)
- [Hospital Assistant](#) (2)
- [Plantation Worker](#) (4)
- [Computer Clerk](#) (5)

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Apply Job Online page

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REQUIREMENTS FOR GENERAL CLERK

Job Title : General Clerk
Start Date : As soon as possible
Location :

- Dynavest Sdn. Bhd. at Johor
- RB Land Sdn. Bhd. at Seremban
- Results Integrated Sdn. Bhd. at Shah Alam


Experience : No
Skills Needed : Microsoft Office
Education : Minimum SPM
Salary : RM 800 - RM 1000

If interested, please fill in the form on the next page.

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Jobs Requirement page

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APPLICATION FORM

Please fill in the form below. You are also required to attach the form with your resume. Our staff will contact you through phone and e-mail for an interview with the company. If you have problem regarding this form, do contact Encik Muhammad Hamid Ibrahim at 03-36889385 ext 19. Please click at the back button to cancel the form.

First Name :

Middle Name :

Last Name :

IC Number :

Gender : Male Female


Home Phone Number :

E-Mail :

Attach Resume :

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Application Form page


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THANK YOU!

Your application will be processed in 2 weeks time. For further information, do contact Encik Muhammad Hamid Ibrahim at 03-36888385 ext 19.


Click on exergy icon below to go to JobSearch main page.



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Successful Submission page

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If you have any enquires, do contact any of these numbers:

SELANGOR

Idea Tower I, UPM-MTDC, Technology Incubation Centre One,
Lebuhr Silikon, 43400 Serdang, Selangor Darul Ehsan.
Tel: 603-3688 8385 Fax: 603-5656 4082
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Contact Us page

DESKTOP KEYSTROKES

1. For reading text :

Say character	NUM PAD 5
Say character phonetically	NUM PAD 5 twice quickly
Say prior character	LEFT ARROW
Say next character	RIGHT ARROW
Say word	INSERT + NUM PAD 5
Spell word	INSERT + NUM PAD 5 twice quickly
Say prior word	INSERT + LEFT ARROW
Say next word	INSERT + RIGHT ARROW
Say current line	INSERT + UP ARROW
Spell current line	INSERT + UP ARROW twice quickly
Say prior line	UP ARROW
Say next line	DOWN ARROW
Say current sentence	ALT + NUM PAD 5
Say prior sentence	ALT + UP ARROW
Say next sentence	ALT + DOWN ARROW
Say paragraph	CTRL + NUM PAD 5
Say prior paragraph	CTRL + UP ARROW
Say next paragraph	CTRL + DOWN ARROW
Say to cursor	INSERT + HOME
Spell to cursor	INSERT + HOME twice quickly
Say from cursor	INSERT + PAGE UP
Spell from cursor	INSERT + PAGE UP twice quickly
Say all	INSERT + DOWN ARROW
Fast forward during a say all	RIGHT ARROW
Rewind during a say all	LEFT ARROW
Say ASCII or Hexadecimal value	NUM PAD 5 three times quickly
Say color	INSERT + 5
Say font	INSERT + F
Say text and attributes	ALT + INSERT + DOWN ARROW
Start skim reading	CTRL + INSERT + DOWN ARROW
	CTRL + INSERT + SHIFT + DOWN ARROW
Skim reading dialog box	INSERT + WINDOWS + DOWN ARROW
Display skim reading summary	WINDOWS + C
Copy selected text to FSClipboard	

2. For temporarily changing voice rate :**When not using say all :**

Decrease voice rate

ALT + CTRL + PAGE DOWN

Increase voice rate	ALT + CTRL + PAGE UP
During say all :	
Decrease voice rate	PAGE DOWN
Increase voice rate	PAGE UP
Restore normal voice settings	INSERT + ESC
Informational :	
Interrupt speech	CTRL
Say window title	INSERT + T
Say window prompt and text	INSERT + TAB
JAWS find	CTRL + INSERT + F
JAWS find next	INSERT + F3
Say top line of window	INSERT + END
Say bottom line of window	INSERT + PAGE DOWN
Say selected text	INSERT + SHIFT + DOWN ARROW
Get application version	CTRL + INSERT + V
3. For mouse simulation :	
PC cursor	NUM PAD PLUS
JAWS cursor	NUM PAD MINUS
Invisible cursor	NUM PAD MINUS twice quickly
Route PC cursor to JAWS cursor	INSERT + NUM PAD PLUS
Route JAWS cursor to PC cursor	INSERT + NUM PAD MINUS
Tether JAWS to PC	CTRL + INSERT + NUM PAD MINUS
Restrict JAWS cursor	INSERT + R
Left mouse button	NUM PAD SLASH
Left mouse button lock	INSERT + NUM PAD SLASH
Right mouse button	NUM PAD STAR
Right mouse button lock	INSERT + NUM PAD STAR
Drag and drop	CTRL + INSERT + NUMPAD SLASH
Say active cursor	ALT + DELETE
Say cursor type	CTRL + INSERT + SHIFT + C
Mouse down	ALT + SHIFT + DOWN ARROW
Mouse left	ALT + SHIFT + LEFT ARROW
Mouse right	ALT + SHIFT + RIGHT ARROW
Mouse up	ALT + SHIFT + UP ARROW
4. For dialog boxes :	
Say default button of dialog	INSERT + E
Say current control hot key	SHIFT + NUM PAD 5

Read current window	INSERT + B
Say window prompt in text	INSERT + TAB
Read word in context	INSERT + C
Open combo box	ALT + DOWN ARROW
Close combo box	ALT + UP ARROW
Select multiple list items	CTRL + SHIFT or CTRL + SPACEBAR
Unselect all but current	CTRL + \
Read list view column 1 through 10	CTRL + INSERT + 1 through 10

5. For accessing Help :

Screen sensitive Help	INSERT + F1
Keyboard Help	INSERT + 1
JAWS Help for applications	INSERT + F1 twice quickly
Hot key Help	INSERT + H
Window key Help	INSERT + W

6. Miscellaneous JAWS keystroke :

Adjust JAWS verbosity	INSERT + V
Adjust Braille settings	CTRL + INSERT + B
Switch synthesizers	CTRL + INSERT + S
Interrupt speech	CTRL
Custom highlight assign	CTRL + INSERT + H
Refresh screen	INSERT + ESC
Screen echo toggle	INSERT + S
Typing echo toggle	INSERT + 2
Pass key through	INSERT + 3
Select symbol to print	INSERT + 4
JAWS window	INSERT + J
JAWS find	CTRL + INSERT + F
JAWS find next	INSERT + F3
JAWS find previous	INSERT + SHIFT + F3
Shut down JAWS	INSERT + F4
Say active configuration name	INSERT + Q
Say program comments	CTRL + SHIFT + C
Run JAWS manager	INSERT + F2
Virtualized window	CTRL + INSERT + W
Select scheme	ALT + INSERT + S
Select language	CTRL + WINDOWS + L
Select synthesizer	CTRL + INSERT + S
Minimize all applications	WINDOWS + M

Copy selected text to FSClipboard

WINDOWS + C

7. For accessing JAWS utilities :

Create a prompt

CTRL + INSERT + TAB

Graphics labeler

INSERT + G

Start auto graphics labeler

CTRL + INSERT + G

Set frame top left

CTRL + SHIFT + LEFT BRACKET

Set frame bottom right

CTRL + SHIFT + RIGHT BRACKET

CTRL + SHIFT + LEFT BRACKET twice
quickly

Set frame to window

CTRL + INSERT + C

Clear initial values

INSERT + F2

Run JAWS manager

INSERT + 6

Configuration manager

INSERT + D

Dictionary manager

INSERT + 9

Frame viewer

INSERT + 8

Keyboard manager

INSERT + 0

Script manager

INSERT + 7

Window class reassign

CTRL + INSERT + F1

Screen sensitive Help technical

CTRL + INSERT + F2

Say special Window classes

INSERT + X

Say frame at cursor

8. Working in tables :

Moving within tables :

Say current cell

ALT + CTRL + NUM PAD 5

Cell to right

ALT + CTRL + RIGHT ARROW

Cell to left

ALT + CTRL + LEFT ARROW

Cell below

ALT + CTRL + DOWN ARROW

Cell above

ALT + CTRL + UP ARROW

First cell

ALT + CTRL + HOME

Last cell

ALT + CTRL + END

First cell in column

ALT + CTRL + SHIFT + UP ARROW

Last cell in column

ALT + CTRL + SHIFT + DOWN ARROW

First cell in row

ALT + CTRL + SHIFT + LEFT ARROW

Last cell in row

ALT + CTRL + SHIFT + RIGHT ARROW

Reading tables :

Say current cell

ALT + CTRL + NUM PAD 5

Read current row

INSERT + SHIFT + UP ARROW

Read from start of row

INSERT + SHIFT + HOME

Read to end of row
Read current column
Read from top of column

INSERT + SHIFT + PAGE UP
INSERT + SHIFT + NUM PAD 5
INSERT + SHIFT + END

LAPTOP KEYSTROKES

1. For reading text and information :

Say prior character	CAPS LOCK + M
Say next character	CAPS LOCK + PERIOD
Say character	CAPS LOCK + COMMA
Say character phonetically	CAPS LOCK + COMMA twice quickly
Say prior word	CAPS LOCK + J
Say next word	CAPS LOCK + L
Say word	CAPS LOCK + K
Spell word	CAPS LOCK + K twice quickly
Say prior line	CAPS LOCK + U
Say next line	CAPS LOCK + O
Say line	CAPS LOCK + I
Spell current line	CAPS LOCK + I twice quickly
Say prior sentence	CAPS LOCK + Y
Say next sentence	CAPS LOCK + N
Say sentence	CAPS LOCK + H
Say prior paragraph	CAPS LOCK + CTRL + U
Say next paragraph	CAPS LOCK + CTRL + O
Say paragraph	CAPS LOCK + CTRL + I
Say to cursor	CAPS LOCK + HOME
Say from cursor	CAPS LOCK + PAGE UP
Spell to cursor	CAPS LOCK + HOME twice quickly
Spell from cursor	CAPS LOCK + PAGE UP twice quickly
Say all	CAPS LOCK + A
Say selected text	CAPS LOCK + SHIFT + A
Say color	CAPS LOCK + 5
Say font	CAPS LOCK + F
Say text and attributes	ALT + CAPS LOCK + DOWN ARROW
Say top line of window	CAPS LOCK + SHIFT + Y
Say bottom line of window	CAPS LOCK + SHIFT + N
Report battery level	CAPS LOCK + SHIFT + B
Say ASCII or Hexadecimal value	CAPS LOCK + COMMA three times quickly
Say current table cell	ALT + SHIFT + COMMA
Move to prior table cell	ALT + SHIFT + M
Move to next table cell	ALT + SHIFT + PERIOD
Move up one table cell	ALT + SHIFT + Y
Move down one table cell	ALT + SHIFT + N
Start skim reading	CTRL + CAPS LOCK + DOWN ARROW

Skim reading dialog box	CTRL + CAPS LOCK + SHIFT +DOWN ARROW
Display skim reading summary	CAPS LOCK + WINDOWS + DOWN ARROW

2. For mouse simulation :

PC cursor	CAPS LOCK + SEMICOLON
JAWS cursor	CAPS LOCK + P
Invisible cursor	CAPS LOCK + P twice quickly
Route PC cursor to JAWS cursor	CAPS LOCK + APOSTROPHE
Route JAWS cursor to PC cursor	CAPS LOCK + LEFT BRACKET
Restrict JAWS cursor	CAPS LOCK + R
Left mouse button	CAPS LOCK + 8
Right mouse button	CAPS LOCK + 9
Left mouse button lock	CTRL + 8
Right mouse button lock	CTRL + 9
Drag and drop	CAPS LOCK + CTRL + 8
Say active cursor	ALT + DELETE
Mouse down	ALT + SHIFT + DOWN ARROW
Mouse left	ALT + SHIFT + LEFT ARROW
Mouse right	ALT + SHIFT + RIGHT ARROW
Mouse up	ALT + SHIFT + UP ARROW

3. For temporarily changing voice rate :

When not using say all :

Decrease voice rate	ALT + CTRL + PAGE DOWN
Increase voice rate	ALT + CTRL + PAGE UP

During say all :

Decrease voice rate	PAGE DOWN
Increase voice rate	PAGE UP
Restore normal voice settings	CAPS LOCK + ESC

Informational :

Interrupt speech	CTRL
Say window title	CAPS LOCK + T
Say window prompt and text	CAPS LOCK + TAB
JAWS find	CAPS LOCK + CTRL + F
JAWS find next	CAPS LOCK + F3
Say top line of window	CAPS LOCK + SHIFT + Y
Say bottom line of window	CAPS LOCK + SHIFT + N

Say selected text	CAPS LOCK + SHIFT + A
Get application version	CAPS LOCK + CTRL + V

4. For mouse simulation :

PC cursor	CAPS LOCK + SEMICOLON
JAWS cursor	CAPS LOCK + P
Route PC cursor to JAWS cursor	CAPS LOCK + APOSTROPHE
Route JAWS cursor to PC cursor	CAPS LOCK + LEFT BRACKET
Left mouse button	CAPS LOCK + 8
Left mouse button lock	CTRL + 8
Right mouse button	CAPS LOCK + 9
Right mouse button lock	CTRL + 9
Drag and drop	CAPS LOCK + CTRL + 8
Restrict JAWS cursor	CAPS LOCK + R

5. For dialog boxes :

Say default button of dialog	CAPS LOCK + E
Say current control hot key	CAPS LOCK + SHIFT + COMMA
Read current window	CAPS LOCK + B
Say window prompt in text	CAPS LOCK + TAB
Read word in context	CAPS LOCK + C
Open combo box	ALT + DOWN ARROW
Close combo box	ALT + UP ARROW

6. For accessing Help :

Screen sensitive Help	CAPS LOCK + F1
Keyboard Help	CAPS LOCK + 1
JAWS Help for applications	CAPS LOCK + F1 twice quickly
Hot key Help	CAPS LOCK + H
Window key Help	CAPS LOCK + W

7. Miscellaneous JAWS keystroke :

JAWS window	INSERT + J
Refresh screen	CAPS LOCK + ESCAPE
Adjust JAWS verbosity	CAPS LOCK + V
Run JAWS manager	CAPS LOCK + F2
Shut down JAWS	CAPS LOCK + F4

Minimize all applications
Window list dialog
Select a system tray icon dialog
Say system time
Graphics labeler
Auto Graphics labeler
Pass key through

WINDOWS + M
CAPS LOCK + F10
CAPS LOCK + F11
CAPS LOCK + F12
CAPS LOCK + G
CAPS LOCK + CTRL + G
CAPS LOCK + 3

WINDOWS KEYSTROKES

1. General windows keystrokes :

Get Help	F1
Open the Start Menu	WINDOWS or CTRL + ESC
Switch between open applications	ALT + TAB
Open the shortcut menu	APPLICATIONS or SHIFT + F10
Minimize all applications	WINDOWS + M
Find a file or folder from desktop	F3
Move to first item on the taskbar	WINDOWS + TAB
Open Windows Explorer	WINDOWS + E
Open run dialog	WINDOWS + R

2. General Windows application keystrokes :

Exit the active application	ALT + F4
Open the application control menu	ALT + SPACEBAR
Move to the menu bar	ALT
Move between menus	ALT , ARROW KEYS
Choose a menu item	ENTER
Open a child window control menu	ALT + DASH
Cancel or close a menu	ESC or ALT

3. For working in dialog boxes :

Move through dialog controls	TAB
Move backward through dialog	SHIFT+TAB
Move to another page	CTRL+TAB
Reverse direction through pages	CTRL+SHIFT+TAB
Select or deselect in list view	SPACEBAR or CTRL+SPACEBAR
Toggle a check box ON/OFF	SPACEBAR

4. For working with text :

Move one character left	LEFT ARROW
Move one character right	RIGHT ARROW
Move one word left	CTRL + LEFT ARROW
Move one word right	CTRL + RIGHT ARROW
Move to beginning of line	HOME
Move to end of line	END
Move one paragraph up	CTRL + UP ARROW
Move one paragraph down	CTRL + DOWN ARROW

Move to top of next page	CTRL + PAGE DOWN
Move to top of previous page	CTRL + PAGE UP
Move to beginning of document	CTRL + HOME
Move to end of document	CTRL + END
Scroll up or down one screen	PAGE UP or PAGE DOWN
Select one character left	SHIFT + LEFT ARROW
Select one character right	SHIFT + RIGHT ARROW
Select one word left	CTRL + SHIFT + LEFT ARROW
Select one word right	CTRL + SHIFT + RIGHT ARROW
Select to beginning of line	SHIFT + HOME
Select to end of line	SHIFT + END
Select to beginning of document	CTRL + SHIFT + HOME
Select to end of document	CTRL + SHIFT + END
Select all	CTRL + A
Undo	CTRL + Z
Delete current character	DELETE
Delete prior character	BACKSPACE

5. For working in Windows Explorer :

Delete selected file or folder	DELETE
Rename selected file or folder	F2
Refresh window	F5
Switch between tree view and list	F6 or TAB
Go up one folder level	BACKSPACE
Open file or folder properties	ALT + ENTER
Untruncate columns in list view	CTRL + NUM PAD PLUS

6. Using the Clipboard :

Copy selected file or text to clipboard	CTRL + C
Cut selected file or text to clipboard	CTRL + X
Paste contents of clipboard	CTRL + V

HTML COMMANDS

1. General commands :

Back a page	ALT + LEFT ARROW or BACKSPACE
Forward a page	ALT + RIGHT ARROW
Move to address bar	ALT + D
Read address bar	INSERT + A
Move JAWS cursor to address bar	INSERT + A twice quickly
Virtual HTML features	INSERT + F3
Activate mouse over	INSERT + CTRL + ENTER

2. Links commands :

List links	INSERT + F7
Next link	TAB
Prior link	SHIFT + TAB
Next visited link	V
Prior visited link	SHIFT + V
Open link	ENTER
Open link in new window	SHIFT + ENTER
Next non link text	N
Prior non link text	SHIFT + N

3. Headings commands :

List headings	INSERT + F6
Next heading	H
Prior heading	SHIFT + H
First heading	ALT + INSERT + HOME
Last heading	ALT + INSERT + END
Next heading at level	1 through 6
Prior heading at level	SHIFT + 1 through 6
First heading at level	ALT + CTRL + INSERT + 1 through 6
Last heading at level	ALT + CTRL + INSERT + SHIFT + 1 through 6

4. Forms commands :

Move to first form field	INSERT + CTRL + HOME
Move to next form field	F
Move to prior form field	SHIFT + F
Move to last form field	INSERT + CTRL + END

Move to next button
 Move to prior button
 Move to next combo box
 Move to prior combo box
 Move to next edit box
 Move to prior edit box
 Move to next radio button
 Move to prior radio button
 Move to next check box
 Move to prior check box
 Enter forms mode
 Exit forms mode
 List of form fields
 List buttons
 List combo boxes
 List edit boxes
 List radio buttons
 List check boxes
 Enter or leave multi-select mode

B
SHIFT + B
C
SHIFT + C
E
SHIFT + E
R
SHIFT + R
X
SHIFT + X
ENTER
NUM PAD PLUS
INSERT + F5
CTRL + INSERT + B
CTRL + INSERT + C
CTRL + INSERT + E
CTRL + INSERT + R
CTRL + INSERT + X
SHIFT + F8

5. Tables commands :

Move to next table
 Move to prior table
 Select table
 List tables
 Jump to table cell
 Return to previous cell
 Read current cell
 Move to and read next cell
 Move to and read prior cell
 Move to and read cell above
 Move to and read cell below
 Move to and read first cell
 Move to and read last cell
 Read next row
 Read prior row
 Read current row
 Read from beginning to current cell
 Read from current cell to end of row
 Read current column
 Read from top to current cell

T
SHIFT + T
F8
CTRL + INSERT + T
CTRL + J
CTRL + SHIFT + J
CTRL + ALT + NUM PAD 5
CTRL + ALT + RIGHT ARROW
CTRL + ALT + LEFT ARROW
CTRL + ALT + UP ARROW
CTRL + ALT + DOWN ARROW
CTRL + ALT + HOME
CTRL + ALT + END
WINDOWS + DOWN ARROW
WINDOWS +UP ARROW
WINDOWS +COMMA
INSERT + SHIFT + PAGE UP
INSERT + SHIFT + HOME
INSERT + SHIFT + NUM PAD 5
INSERT + SHIFT + END

Read from current cell to bottom

INSERT + SHIFT + PAGE DOWN

6. Frames commands :

Next frame

M

Prior frame

SHIFT + M

List frames

INSERT + F9

Next frame

M

7. Elements commands :

Next same element

S

Prior same element

SHIFT + S

Next different element

D

Prior different element

SHIFT + D

Next element

SHIFT + PERIOD

Previous element

SHIFT + COMMA

Select entire element

F8

Display element information

SHIFT + INSERT + F1

Display detailed element information

CTRL + SHIFT + INSERT + F1

Activate mouse over

INSERT + CTRL + ENTER

8. Others commands :

Create custom label

CTRL + INSERT + TAB

Move to next place marker

K

Move to previous place marker

SHIFT + K

List, go to, or modify place markers

CTRL + SHIFT + K

Move to next list

L

Move to prior list

SHIFT + L

Select list

F8

List all ordered, unordered

CTRL + INSERT + L

Move to next item in a list

I

Move to prior item in a list

SHIFT + I

Reload web page

F5

Refresh JAWS virtual mode

INSERT + ESC

List toolbar buttons

INSERT + F8

Route virtual to PC cursor

INSERT + DELETE

Virtual cursor toggle

INSERT + Z

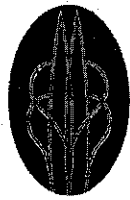
Personalize web page

SHIFT + INSERT + V

JAWS find next

F3

JAWS find previous	SHIFT + F3
Jump to line	J
Return to previous line	SHIFT + J
Move to next division	Z
Move to prior division	SHIFT + Z
List divisions	CTRL + INSERT + Z



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PRELIMINARY TEST FOR FINAL YEAR PROJECT

TITLE	: INTERNET SURFING FOR THE BLIND	TEST : 1
DATE	: 2ND MARCH 2006	DAY : THURSDAY
TIME	: 10:00 AM – 12:00 PM	

TEST PROCEDURES:

Notes : P = PASS, F = FAIL

STEP	ACTION	RESULTS	P/F	REMARKS
1	Click the Home button	Display Home page		
2	Click the High Committee picture	Display larger the High Committee picture		
3	Go back to Home page	Display Home page		
4	Click the News button	Display News page		
5	Click the Activities button	Display Activities page		
6	Click the Gallery button	Display Gallery page		
7	Click at We Care at UTP picture	Display larger the We Care at UTP picture		
8	Go back to Gallery page	Display Gallery page		
9	Click the JobSearch button	Display JobSearch page		
10	Go to Job Placement page	Display Job Placement page		
11	Click back button to go to JobSearch page	Display JobSearch page		
12	Go to Apply Job Online page	Display Jobs Available page		
13	Click General Clerk job	Display Requirements for General Clerk page		
14	Click next button to go to Application Form	Display Application Form page		

	page			
15	Key in First Name	'First name'		
16	Key in Middle Name	'Middle name'		
17	Key in Last Name	'Last name'		
18	Key in IC Number	'IC number'		
19	Choose Gender	'Gender'		
20	Key in Home Phone Number	'Phone number'		
21	Key in e-mail address	'E-mail'		
22	Click at browse button to attach resume	'Resume'		
23	Click Submit button to submit the application form	Display Thank You page		
24	Click at EXERGY icon to go to JobSearch page	Display JobSearch page		
25	Click the Contact Us button	Display Contact Us page		
26	Click the Home button	Display Home page		



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QUESTIONNAIRES FOR FINAL YEAR PROJECT

TITLE	: INTERNET SURFING FOR THE BLIND	NO : 1
DATE	: 2ND MARCH 2006	DAY : THURSDAY
TIME	: 10.00 AM – 12.00 PM	

GENERAL QUESTIONS:

1. Have you had any experience using the Web which is especially designed for blind user?
 - Yes
 - No
2. How do you find the interface?
 - Effective
 - Not effective
3. Have you had any experience using Web to search jobs?
 - Yes (Go to question 4)
 - No (Go to question 5)
4. Does it really help you find the job?
 - Yes
 - No

5. Which screen readers you usually used to access Internet?

- JAWS Professional
- Windows Eyes
- MAGic Professional

QUESTIONS ON EXERGY CORPORATION' S WEB SITE:

6. How do you find about the Web site?

- Accessible
- Average
- Not Accessible

7. What is your opinion on apply job through online?

- Good
- Average
- No need

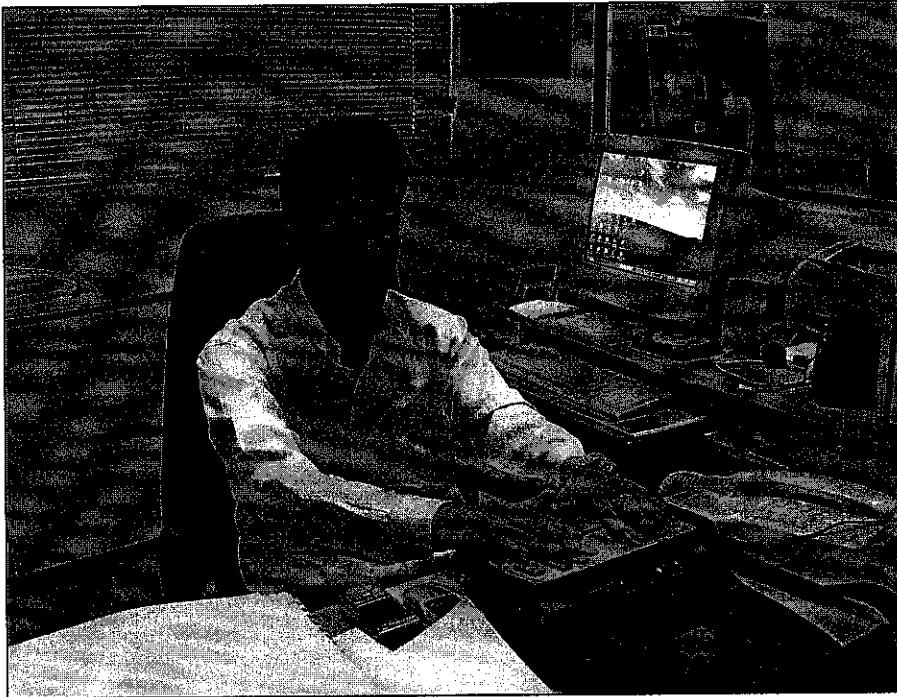
8. How do you find about the following elements of the Web site? (Rank 1 – 5)

ELEMENTS	1	2	3	4	5
Graphics have to be labeled					
Buttons have to be labeled					
Tables properly marked					
Forms have to be labeled					
Provide keyboard access					

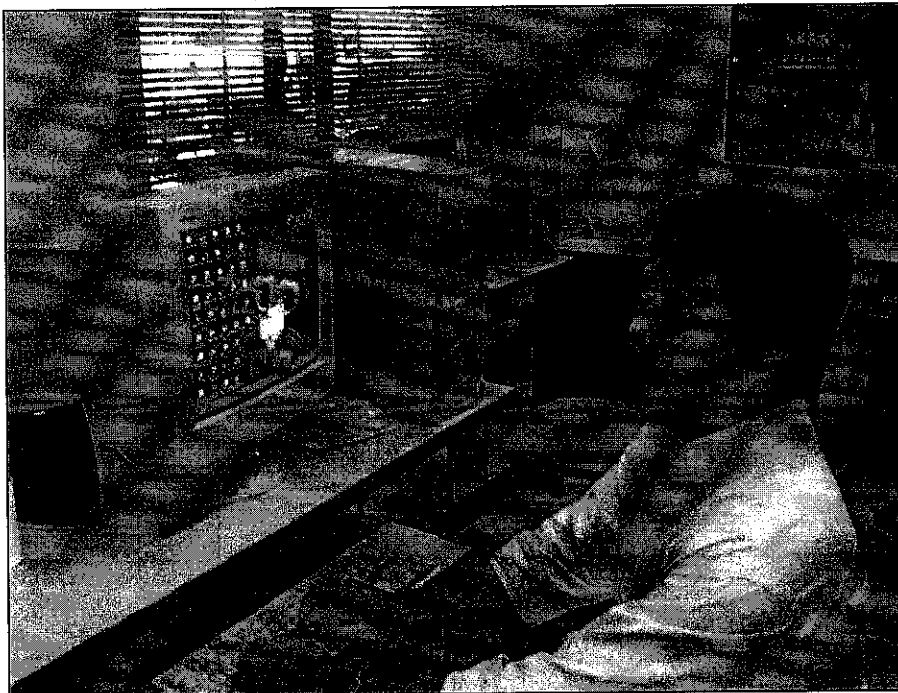
9. What is the most expected things do you look for on Internet?

- Jobs
- Entertainment
- News
- Information
- Others : _____

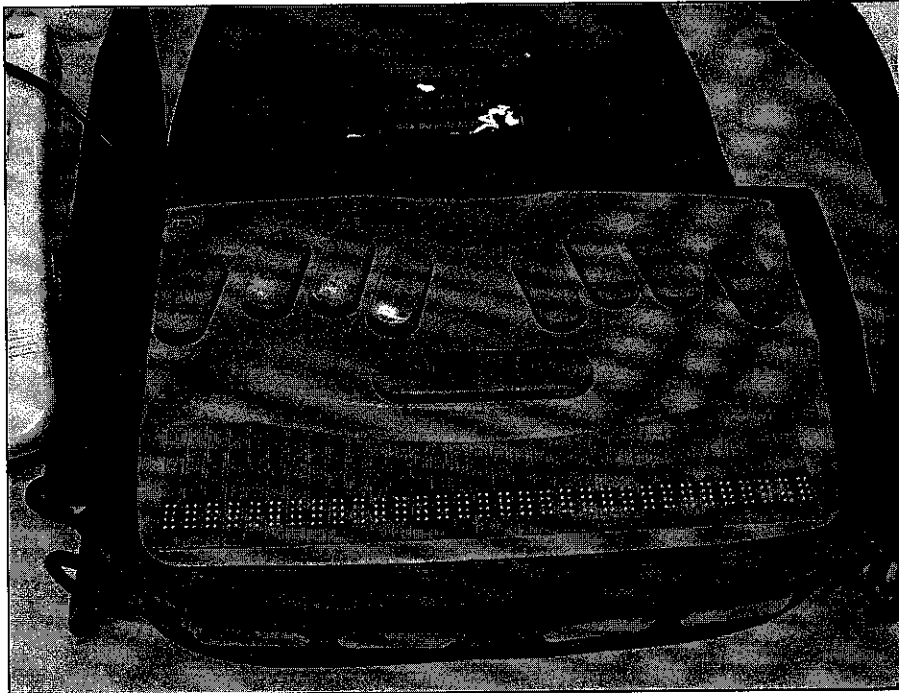
10. Any suggestions to improve accessibility level of the Web site?



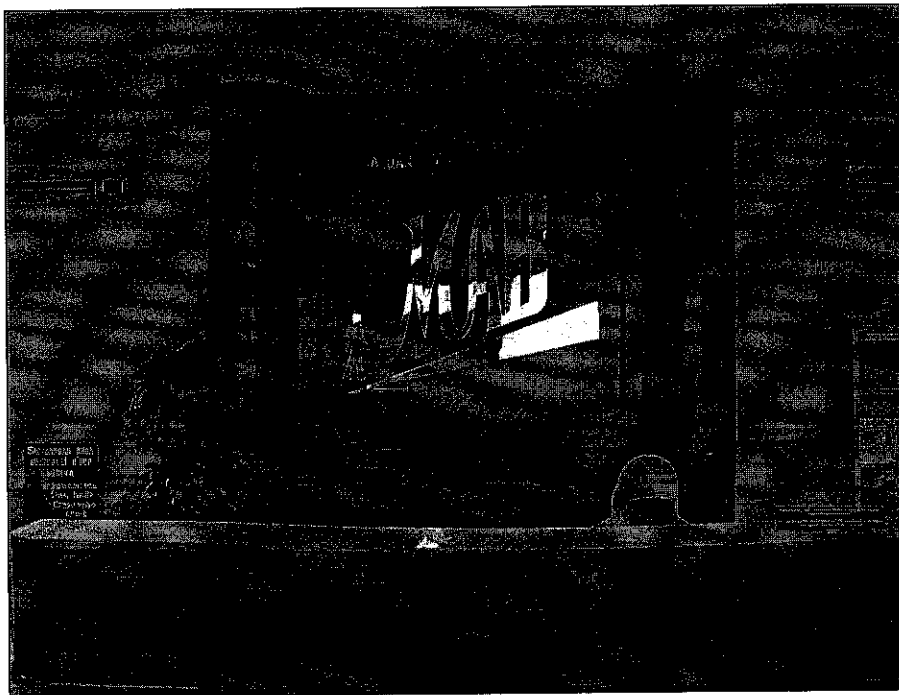
En. Silatul Rahim shows how to use Braille display



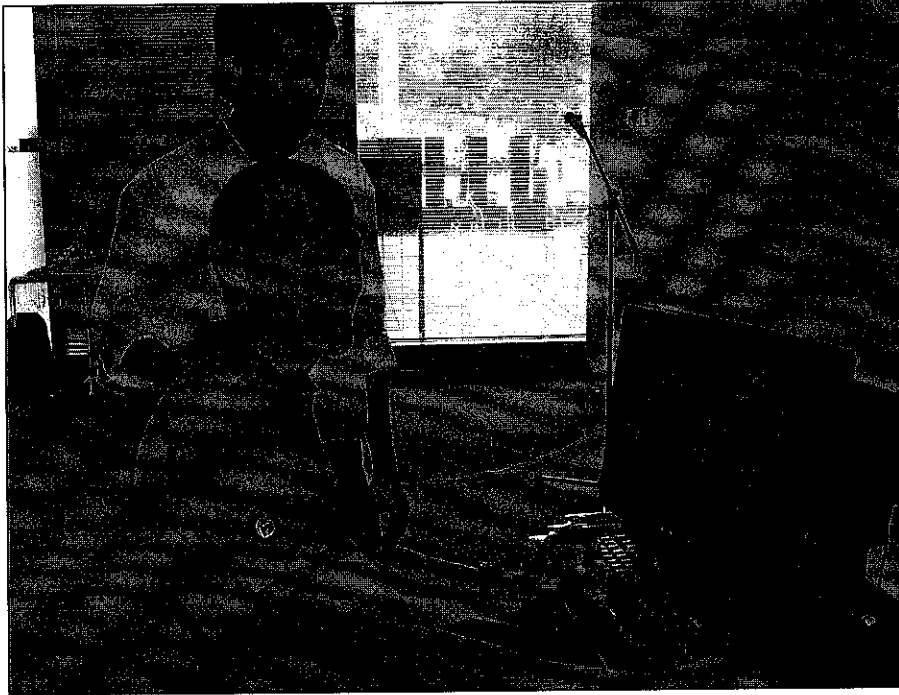
En. Abbiyan shows how blind people use screen reader



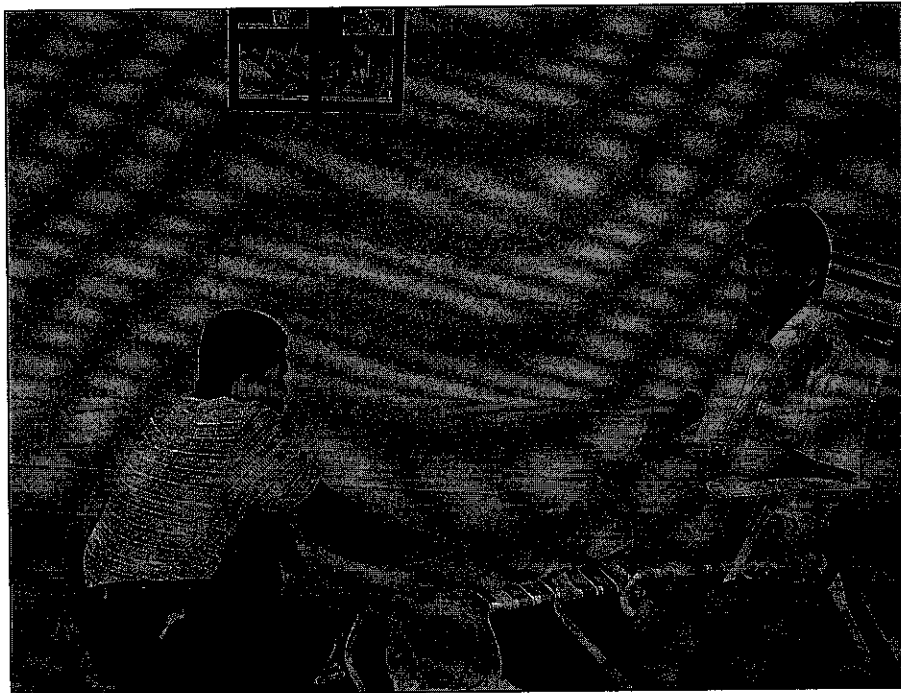
Braille display



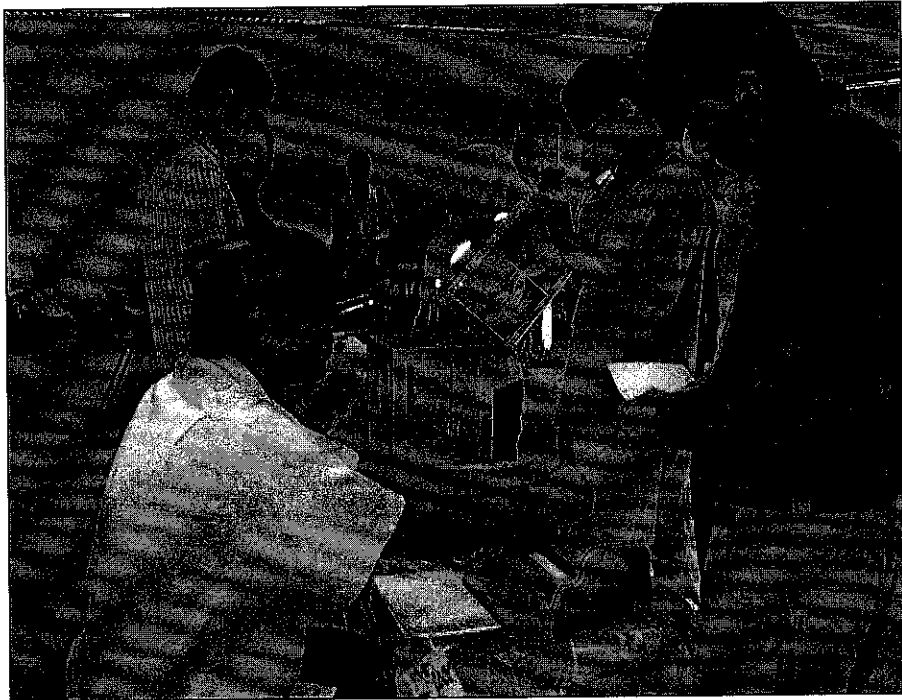
Malaysian Association for the Blind (MAB) reception counter



A student from WECARE program shows how to use JAWS



A blind people is giving a message service to a student



A blind people is typing one of the student's name in Braille



A blind people is playing congkak with one of the student