USABILITY COMPARISON OF MALAYSIA PREMIER POLYTECHNICS' WEBSITES

A project submitted to Dean of Postgraduate Studies and Research in partial

fulfillment of requirement for the degree

Master of Science of Information Technology

Universiti Utara Malaysia

By

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ABSTRAK

Kementerian Pengajian Tinggi Malaysia sedang menaik taraf system pengajian di politeknik untuk menjadikannya institusi pengajian pilihan pertama di kalangan calon-calon yang berminat untuk melanjutkan pelajaran. Tiga politeknik telah dinobatkan sebagai politeknik premier mulai Julai 2010 yang secara umumnya bertaraf lebih tinggi daripada 24 buah politeknik konvensional yang lain.

Selain daripada penambahbaikan daripada segi penjenamaan semula serta kurikulum dan latihan yang dinamik, penyebaran maklumat adalah penting untuk membolehkan pelajar dan orang ramai mendapatkan informasi terkini yang berkaitan dengan politeknik. Salah satu daripada cara penyebaran maklumat ialah melalui laman web yang menarik minat pengguna.

Kajian ini memberi tumpuan untuk mengenalpasti criteria kebolehgunaan yang boleh diaplikasikan dalam menilai tiga laman web politeknik premier. Setakat ini, belum ada sebarang penyelidikan yang dilakukan mengenainya. Pendapat yang biasa, reka bentuk atau susun atur laman web yang tidak berstruktur akan menyebabkan penyampaian maklumat yang kurang berkesan. Sumbangan projek ini adalah untuk mengenal pasti reka bentuk laman web yang terbaik dikalangan tiga politeknik premier serta mengenal pasti kriteria yang perlu dibaiki untuk kebolehgunaan web.

ABSTRACT

The Ministry of Higher Education is upgrading the polytechnic system in order to make it the first choice among candidates interested in furthering their studies. On July 2010, three polytechnics have been promoted to premier polytechnics which are generally of higher standard than the 24 conventional polytechnics.

Besides better re-branding exercise along with more dynamic curriculum and training, public exposure is the way to go if students and people are to know what are being offered by the polytechnics. One way of disseminating this information is through websites that are interesting and deemed as useful to users.

This research focuses on identifying the usability criteria for assessing the three premier polytechnics' websites. There is currently no research done in this area. It is a command perception that unstructured website design or layout would impede the process of information dissemination. The contribution of this paper is to identify the best website design among the three premier polytechnics and identify the criteria to be tackled for designing high usable website.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

PSPTN	National Higher Education Strategic Planning
NKRA	National Key Result Areas
JPP	Department of Polytechnic
PTSS	Tuanku Syed Sirajuddin Polytechnic
JPKK	Department of Community Colleges
PUO	Ungku Omar Polytechnic
PSA	Sultan Salahuddin Abdul Aziz Shah Polytechnic
PJB	Johor Bahru Polytechnic
TVET	Technical and Vocational Education Training
COE	Centre of Excellence
MAMPU	Malaysian Administrative Modernization and Management Planning Unit
UEMs	Usability Evaluation Methods
MVC	Model-View-Controller
PAC	Presentation-Abstraction-Control
HCI	Human-Computer Interaction
VPAT	Voluntary Product Accessibility Template
WDP	Web Design Perspective
HTML	Hyper-Text Mark up Language
MOHE	Ministry of Higher Education
UNESCO	United Nation Educational, Scientific and Cultural Organization

DYMM	*Duli Yang MahaMulia*
SIRIM	Standard and Industrial Research Institute of Malaysia
JTMK	Technology and Communication Department
JRKV	Design, Visual and Communication Department
JMSK	Mathematics, Science and Computer Department
UTMK	Information Technology and Communication Unit
SPM	SijilPelajaran Malaysia

CHAPTER ONE

INTRODUCTION

Polytechnic is one of the main channels of generating human capital; undertaking the task entrusted by the government to realize the noble 10th Malaysian Plan (RMK-10) in creating a younger generation that are educated, skilled, creative, innovative, having progressive attitude and critical thinking. Transformation Polytechnic in accordance with the National Higher Education Strategic Planning (PSPTN) and National Key Result Areas (NKRA), is a vision to improve the polytechnics in providing an alternative route to produce highly skilled human capital and adequate quality for the success of the new economy based on innovation and creativity (Yusof,2011).

The Department of Polytechnic and Community College has been restructured into two new departments namely the Department of Polytechnic (JPP) and the Department of Community Colleges (JPKK). This separation is intended to review and move towards better branding of the two institutions in terms of innovative human capital and high employability value. Nowadays, there are 27polytechnics in Malaysia which cater the education and training in engineering, commerce and services. JPP is committed to providing quality service, being efficient and customer

friendly in the following ways (a) to provide quality educational opportunities at diploma and advanced diploma level in line with current industry requirements, and (b) to ensure that the intake of students into Polytechnics in accordance with the conditions and criteria set.

Three polytechnics have been recognized as premier polytechnics and are given the autonomy to modify 30 percent of the learning modules, especially in niche subjects specified in the respective direction. These premier polytechnics are Ungku Omar Polytechnic (PUO) in Perak, Sultan Salahuddin Abdul Aziz Shah Polytechnic (PSA) in Selangor and Ibrahim Sultan Polytechnic (PJB) in Johor. With the recognition, premier polytechnics will offer diplomas and advanced diploma and degree and no longer offer certificate programs.

According to Yusof (2011), premier polytechnic will be a leading role in the transformation agenda by running programs in the field of niche or niche areas that can be the basis for the polytechnics to be upgraded to a higher level and become the industry consultant through the Centre of Excellence (COE).

Wahab et al., (2010) discussed that since 42 years of operation in technical and vocational education training (TVET), polytechnic has produced more than 300,000 semi-professional work force and middle executives in various sectors. Polytechnic has been through the evolution of education and training in line with the requirements of economic development. Polytechnic has initiated contingency measures to overcome any challenging environment that requires action beyond the ordinary operation. These measures combined various aspects of productivity,

creativity and innovation to be aligned with specific requirements in producing quality human capital needs by the country especially in the high-income economic.

Hsieh et al., (1999), said that the website is a repository of information which can be accessed through the web browser. As a premier polytechnic, the polytechnic official website is one of the items that people refer to obtain any information about that polytechnic. The official website of each polytechnic is developed and managed (updates and maintenance) by the information technology officer. This paper provides the usability comparison of Malaysia premier polytechnic's websites. According to Ssemugabi and Villiers (2007), usability is a key issue in human-computer interaction (HCI) since it is the aspect that commonly refers to quality of the user interface. Other than that, the user acceptance of a software product depends more on its usability.

Usability is very important to a product or services. Polytechnics' website is some of the services. The important features of usability are effectiveness, efficiency and satisfaction. Effectiveness refers to how well the user achieves the goals they set out to achieve using the web. While in scope of efficiency, it is the resources consumed in order to achieve their goals and the satisfaction describe how the user feels about when they use of the web.

1.1   Problem Statement

Each polytechnic in Malaysia has its own website to display the information, announcements, issues and news related to the respective polytechnics. The information technology officer is responsible in order to ensure that the polytechnic's

official website can be updated andmaintained as well as premier polytechnics. The criteria of websites have to be in accordance with the criteria prescribed by the Malaysian Administrative Modernization and Management Planning Unit (MAMPU).

It is a command perception that unstructured website design or layout would impede the process of information dissemination. Inconvenient and complicated navigation is one of the important factors that relate to the usability aspects of website that make sense to user who use them (Hassan and Li, 2001).

Poor use of the official website may cause the information transmitted through is not presented to the user. Yan and Guo (2010) also said that users will find it difficult to learn, complex to operate and not easy to understand if the usability of web is very low. Therefore, the problem of usability of the websites will cause negative impact on the development website (Yusof et al., 2010).

1.2 Research Questions

i. What are usability criteria for website?

ii. How usable are the premier polytechnics' websites?

iii. Which polytechnic is the best in terms of usability aspects?

iv. What are the criteria to be tackled for designing high usable website?

1.3 Objectives

The objectives of this study are as follows:

i. To identify the usability criteria for assessing the websites.

ii.   To measure the usability of the selected websites.

iii.   To identify the best polytechnic in terms of usability aspects.

iv.   To identify the criteria to be tackled for designing high usable website.

1.4   Scope of Research

This research will be focusing on three websites of premier polytechnics' which are Ungku Omar Polytechnic (PUO), Sultan Salahuddin Abdul Aziz Shah Polytechnic (PSA) and Johor Bahru Polytechnic (PJB) regarding to their usability of website. Target respondents of this study are the lecturers, admin staffs and students from Tuanku Syed Sirajuddin Polytechnic (PTSS). The respondents were advised to visit the three websites premier polytechnics' to examine the usability.

1.5   Significance of Study

The result of this study is to identify which is the best among three website design of premier polytechnics in such of the criteria of usability criteria for assessing the web. From this study also, will produce a suggestion to improve the usability criteria of premier polytechnics official web. Although many evaluation of website usability have been done, but there is no standardized of web site evaluation, therefore the research may be as references in doing further research in future.

1.6   Research Schedule

The research has been done according to several steps which are categorized to complete the project. The first step is fulfilling the requirements which are to determine the title and define the problem statement of the research, the research question, the objective of the research and the scope itself. After obtaining agrees

from a supervisor about the research, the next step is doing the literature review. In literature review, the researcher must collect and read the journals or reading materials that is related to the research topic. Then the proposal was submitted and presented. After that, the researcher wills distribute the questionnaire to respondent. After collect the data from the respondents, then they will evaluate and analyses all data that have been collected. The last step is to prepare the documentation based on the materials. The research schedule of the research is shown in table below:

Table 1.1 : Research Schedule

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Requirements	▓	▓												
Literature Review	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓		
Proposal		▓	▓											
Data Collection				▓	▓	▓	▓							
Data Analysis							▓	▓	▓					
Documentation	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	

1.7 Summary

General overview of each chapter is described in this section. This report consists of five chapters which are introduction, literature review, methodology, results and findings followed by conclusion and recommendations.

The introduction describes the overview of this project which is focus more on objectives, problem statement, research questions, scope, significant of study and research schedule.

Meanwhile, chapter two present the literature review which is described main concept of usability comparison of Malaysia premier polytechnics' website that is focus more on usability and usability problems are stated in chapter as well. Then it followed by the concept and definition of comparison, accessibility and evaluation model. This chapter also describes the background of polytechnic. Some examples are providing in related work.

The methodology in chapter three clarified the types of methodology which is being applied in this project. SCANMIC model approach has been adopted in this study while giving overview of the information.

Chapter four provides results and findings of this study, while the last chapter represents conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1   Introduction

This section will discuss the analysis of the previous research about usability comparison of website. Then, it focuses on the usability criteria for assessing the website.

Usability is an important aspect of the overall quality of interactive applications and it is a very broad concept in system design. Usability is referred to the extent to which the product that will be used by the specific users to achieve the objectives with effectiveness, efficiency, reliability, learn-ability, remember-ability and satisfaction on the websites and relate to how well the users accomplish what they set out to do and how efficiently the user can do (Yusof et al., 2010; Liu, 2008).

2.2   Usability: Concept and Definition

Usability evaluation is defined as systematically collecting data, in order to have a better understanding of users and how user group use the product to perform a specific task under specified condition (Liu, 2008).

Ssemugabi and Villiers (2007) argued that the usability evaluation is defined as gathering information about the usability or potential of that system, in order to assess it or to improve the interface. They use usability evaluation methods (UEMs) to determine usability problems. Meanwhile, according to Ludger (2009), usability can be analysed into two parts which are traditional analysis of usability and automated analysis of usability. In traditional analysis, the researcher said the usability can evaluate with interview method, cognitive walk through and think aloud method. However, in automated analysis, they are implemented a server from the service provider which is supported by web 2.0 application.

In the 2010s, a research done by Yan and Guo at Chongqing Three Gorges University revealed that to improve the usability of web design, it is usually adapted from design evaluation process. The web usability design includes three main elements which are research users, web design and usability evaluation.

While according to Hearst and Ivory (2001), suggested that usability is an important part of user interface design which contains also three main processes, designing, prototyping and evaluating. The researcher also said that the usability has three common activities include capturing the data,analysing the data and criticizing the data (give the suggestion or improvement).

Mills (2002), in his research suggested that usability is carefully identifying and serving the user's needs, providing qualitative decision-support information, keeping information and current data, and focusing on user convenience. Meanwhile, the usability also defined the attractiveness and user satisfaction with website interface,

beyond simple questionnaires to calculate users' ratings of such variables (Sutcliffe,2002). This definition shows that usability depends on the usage context which can be specified by users, their tasks, the environments in which they use the product in, the devices they use, and the application itself.

2.2.1   Definition of Web Site Usability Problem

Skov and Stage (2010), discussed that the average developer has not adopted this concern for website usability, and usability specialists are not involved until late in development, when most substantial changes are too costly to implement the web. There are several areas of software development where the limited integration of usability efforts is apparent. Conventional usability evaluation is very expensive, time consuming and it requires usability specialists. This is incompatible with web developments, which were many websites are designed and implemented in fast-paced projects which include by information architects, web developers, graphic designers, brand and content strategists.

The users will find the problem for a certain website when they use their own. Poor website usability is not dependent only on assessing the web but it is also through:

- Failure to identify user needs and desires.
- Failing to turn them into specific design goals.
- Failing to validate emerging designs before launch.

2.3   Web Design: Concept and Definition

Web design can be defined as a complex mix of text, links, graphic elements and formatting consider the following advantages which are download and read faster,

better for accessibility, more conducive to search engine, adaptability, easy to develop and maintain it. To develop web interface design, the designer must refer from the graphical user interface. Web design also must be committed to the users' needs and to make sure that the web can complete the user's tasks successfully (Yan and Guo, 2010).

Thung et al., (2010), argued that the design patterns are available to maintain the development process and it will enhance the usability of websites application. The researcher focuses on two architectural design patterns which are Model-View-Controller (MVC) and Presentation-Abstraction-Control (PAC). While in navigational design patterns, they had analysed on navigation observer, navigation strategy, news, pagination and set-based navigation. Regarding to Wang and Huang (2009), in their study defined that the design is an essential for websites which is can helps users to understand the structure of content better, and influence the first impression as well.

However, the web design is one of the contributions that will create a usable interface which is designed based on design patterns. There is also a requirement for techniques to recognize whether the design conformsto human-computer interaction (HCI). UI Model will provide an effective base for HCI design patterns, but it is also not descriptive enough for visualization purposes (Aminzaden and Salem, 2010).

2.4 Comparison: Concept and Definition

According to Soto-Acosta and Merono-Cerdan (2006), to compare website development, organisations that have been selected for the study are different in size

and types of company. The website developments have their similar issues such as the financial, technology and personnel resources.

2.5   Accessibility: Concept and Definition

Accessibility is a very important criterion and has been examined by prior research which focuses on how to make web content more accessible to people. It also defines the target levels of accessibility. To evaluate and improve the websites design, the formal modelling was chosen and it is mostly a qualitative. However, the website design can be applied to different domain, for example e-commerce or e-shopping (Yen et al., 2005).

Meanwhile according to Sun and Wen (2008), accessibility will evaluate from four principles coming out from Barrier-free evaluation model. The four principles are the corresponding evaluation indexes, following some certain standardization process, respective weight by quantification and dispositions of the accessibility. The website is more convenient in accessibility aspects when the design of the page is compatible with the assistive technologies.

Accessibility also means that the users with disabilities or lack of knowledge can perceive, understand, navigate and interact with the web; in fact, they can even contribute or communicate to the web. Other than that, it should also not disrupt or disable accessibility features on other products and operating systems (Wakimoto and Soules, 2010).

2.6   Evaluation Model: Concept and definition

Hassanzadeh and Navidi (2009), argued that the evaluation of website accessibility revealed that a major part of the research conducted on this topic has been based on technical methods and system evaluation through automatic means of control, while lack of manual evaluation and analysis of web sites is clearly evident. Although automatic evaluation is fast and convenient, it fails to address every factor that needs to be considered when evaluating the accessibility of a web site and does not encompass some of accessibility factors.   In these study, the researcher evaluated types of evaluation re-evaluated which are technical evaluation and evaluation of user's experiences.

In technical evaluation the tools was automated which scan all pages of a given web site and evaluate it according to the check points of either the guidelines of the world wide web consortium. Automation evaluation method does not need proficiency and experience from the users. It also requires very short time, if users want to evaluate a website. While in the evaluation of user's experience, evaluation has done manually by the experts who have full knowledge of web design and accessibility. It is very cost effectiveness and can identify several barrier shave web access for users with different capabilities.

In 2008, a research done by Liu at Wuhan University of Technology revealed that the evaluating procedures have five stages as listed below:

- Decide when we should evaluate our website

   The process of designing the website would be separated into five stages which are (1) to understand the users' requirement, (2) to complete the

framework of the website, (3) to construct the website, (4) to test the usability of the website and (5) to put the products out. However, the web usability should be evaluated in earlier stage because they want to identify the problem. It is also in order to save money and less improvement.

- Gather information

  The users usually observe the website in their natural environment. Then they evaluate the usability of website and identify their advantages and disadvantages. Usage loges also will help the evaluator if they want to do some follow up, so that they can provide some information via questionnaire, interview or brainstorm.

- Choose the right technique

  There are many techniques for evaluating the website such as usability testing, heuristic evaluation, cognitive walkthroughs, focus group, thinking aloud and questionnaire. In usability testing, the evaluation can be done in the testing stage when the website has been created. While cognitive walk through is the technique have a team of evaluator do a tasks with the websites uncover process and work flow flaws and inconsistencies.

  Focus groups technique is all the evaluator must have well in communication so that they can get trusts each other and can ensure that the discussion focus on the design of the website. In this technique, the evaluator can learned much about information, including those which are vulnerable to be neglected and some deep-seated problems can be exposed. Thinking aloud technique,

users' cognitive and behaviour processes can represent the usability problems of that website.

- Evaluate the website

  After evaluate and choosing the suitable technique, then the evaluator will evaluate the website. The most important criteria that the evaluator must consider are don't evaluate too much times and moral issues.

- Analysis in depth, and apply results to actual designing

  Then the evaluator do the analysis depend on the data collected. The analysis of data impact to evaluate.

2.6.1 User Experience Model

Wang and Huang (2009), in their study defined that the experience of the system happens during the interaction with the system. The website performance is successful when designer always emphasis the technology aspects and information delivery is most important to create a website. They are also must through users' experience to understand the user needs is a key element of website design to understand it thoroughly. User experience model can be implemented by taking the experience of a user of a system as a criterion for evaluating. Based on the model, the aspects evaluated under the usability are efficiency, satisfaction, error rates and learn ability. Below is the figure showing the user experience model that is adapted from Wang and Huang (2009).
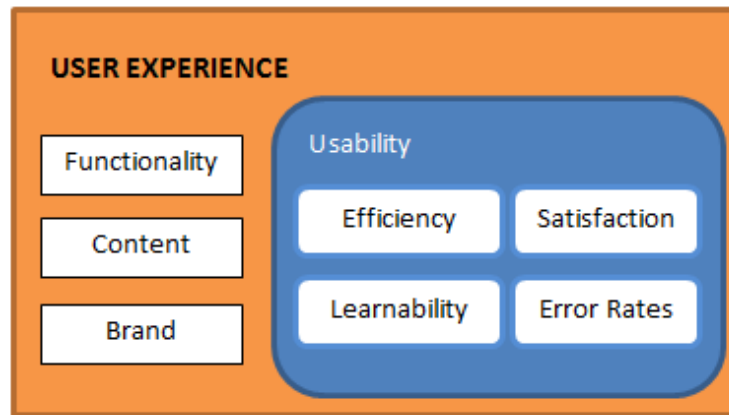
Figure 2.1: User Experience Model (Source:Wang and Huang, 2009)

2.6.2 Heuristic Evaluation

Heuristic Evaluation is usability from engineering field which is suitable for finding the usability problems in web site design. This model also involves having a small set a evaluators which is three to five evaluators who evaluate the interface of web site and judge the its compliance by recognized usability principles, suggested by Nielsen (Salleh,2006).

According to Granizo et al., (2011), the heuristic evaluation consists of a systematic evaluation in which a group of at least four expert evaluators analyse a software system, on the base of a set of usability principles also called heuristics evaluation.

2.6.3 Voluntary Product Accessibility Template

Wakimoto and Soules (2010), in their research suggested that Voluntary Product Accessibility Template (VPAT) is based on Section 508 and it is designed to help comparison products on the basis of this template. Actually, the VPAT is specially used to conduct preliminary assessments about the availability of commercial products and services with features that support on accessibility. However, the

criteria listed in the VPAT may also be associated with the criteria for assessing the usability on website. Table 2.1 below shows the summary explanation of VPAT criteria recommended by Section 508 Reference Guide: 1194.21 Software Applications and Operating Systems.

Table 2.1: Voluntary Product Accessibility Template (VPAT) (Source : Wakimoto and Soules, 2010)

CRITERIA	EXPLANATION
Accessibility features	Products do not disrupt or disable accessibility features on other products and operating systems
On-screen focus and tracking	User can easily track movements between objects (e.g. cursor is visible and can identify user's position when using TAB or ARROW keys to move between objects)
Information about user interface elements	All visual information is also available to AT (e.g. all images and objects have alt-tags, text labels, etc.)
Consistent meaning of images	Images mean the same thing throughout the product (e.g. an image of a printer means print whenever the image is used in the product)
Availability of textual information	Text information is available to AT (e.g. the product interfaces with operating system, so font attributes can be changed within the product)
Contrast and colour setting	Product conforms with operating system's display setting
Animation	User can select a non-animated mode to display information supplied by the animation (e.g. alternative text is provided)
Colour coding	Colour is not the only means of providing information
Variety of colour selections	If product allows user to change contrast and/or colour settings, it provides a range of colour and contrast selections

Flash or blink frequency	On-screen blinking should be non-existent or very fast or very slow
Interaction with electronic forms	Electronic forms are accessible to AT (e.g. user can complete entire form using AT)

2.6.4 Web Design Perspective

Yusof et al. (2010), discussed that the Web Design Perspective (WDP) is one of the usability technique. This evaluation technique is more efficient and effective than the heuristic evaluation. Web usability is very complex and wide ranging. WDP considers four aspects which are:

- Conceptual – conceptual elements

- Presentation – characteristic of interface element and layout

- Navigation – how the information access element is associated

- Structural – the architectural structural of the application components

All the considerations above come from a few factors. The factors are (1) the loading and response time, (2) navigation problems, (3) concreteness of message and (4) the efficiency of the system to support the user to perfume tasks. The table below enlists the ways to measure the web usability evaluation.

Table 2.2: The criteria of Web Design Perspective (Source :Yusof et al., 2010)

USABILITY CRITERIA	WAY TO MEASURE
Learn-ability	The time users takes to perform their particular task
User satisfaction	Measure through the user satisfaction after using the system via the survey instruments
Reliability	The capability in completing the task correctly
Efficiency	The way users use the system in completing their task

2.6.5   Barrier-free Evaluation Model

Sun and Wen (2010), described that barrier-free evaluation model is specially created for disabled people but it can also be used for general users. It is to make sure that the users feel more convenient to use the website. This model has four indicators in evaluation method which are (1) the barrier-free web content, (2) multimedia information accessibility, (3) the web page navigation accessibility and (4) web page and assistive technologies compatible accessibility. Below is the indicators that have been evaluate in barrier-free evaluation model:

Table 2.3: Barrier-free Evaluation Model (Source: Sun and Wen, 2010)

TYPE OF INDICATORS OF WEIGHT	
Web page content accessibility	Use international and domestic formal technologies and guidelines
	Use clearest and simplest language for a site's content
	Font, size and colour accord with the reading habits of people and give choice of font size
	Information conveyed with colour can be by through text and mark
	Foreground and background colour combination provide sufficient contrast
	Use tables of good typeset
	The proper use of markup language and style sheet
	The user can control the time-sensitive content changes
	Site can be visited consistently and stably
	Provide simplified HTML (text) for non-broadband users

	Pages can be compatible with new technology
Multimedia information accessibility	Provide alternative information for audio, video or other non-text elements
	Synchronize voice and video of time-based multimedia information
	Don't use the multimedia which is too long or not necessary
Web page navigation accessibility	Provide concise and consistent navigation mechanism
	Website should provide a internal search engine
	Don't limit users to return to the previous site or don't target the website which users don't want to visit
	Provide a way to allow users to skip repetitive navigation links
The compatibility accessibility between web page design and assistive technologies	Design the web page which is compatible with the assistive technologies
	Use the transitional solution

2.6.6 Scanmic Model

Hassan and Li (2001), described that the SCANMIC model have seven criteria of web usability which is identified based on the usability, context and relevancy. The SCANMIC model is as depicted in figure 2.2.

Figure 2.2: SCANMIC Model

2.6.6.1 Screen Design

According to Hassan and Li (2001), the main aspect of design is screen design which is divided into four categories namely space provision, choice of colour, readability and scan ability such as in table 2.4 below. In space provision, it refers to proper allocation space for functions. It also provides the content display to help usersto focus while using the website.

The developer must use proper colours to improve the user's learning ability and ease of use in addition to attract the users to visit the website. While the readability is most important factor because it is provide a readable content which is in the selection of font, leading and legibility, page appearance, word and letter spacing and typographic colour. Scan ability is representing as readability too.

Table 2.4: List of Web Usability Criteria for Screen Design (Source: Hassan and Li, 2001)

SCREEN DESIGN	
Space allocation	• More space for contents than to other display elements (e.g: menu bar, advertisement banner)
Choice of colour	• Sharp colour contrast between text and its background • Use of colour to differentiate between functional areas with content display area. • Non excessive use of colour for text except for photos and graphics
Readability	• Different text sizes to differentiate between titles • Use of fonts that are easy to read • Avoidance of background images in the content display area
Scannability	• Clear titles and subtitles for each pages • Clear headings, sub headings for text • Use of typography and skimming layout (e.g: bold fonts and highlighted words)

2.6.6.2 Content

Content is one of the important elements in websites. The content must provide the information needed by the users because that is what motivates the users to visit a particular websites. When the users can use or searchspecific information related on the website, it will make them more comfortable and convenient (Hassan and Li, 2001).

CONTENT	
Scope	• Suitable language for audience • Up-to-date publication (e.g: news, articles) • Archive of previously published materials • Contents provided meet the expectation of target users
Accuracy	• High quality writing (e.g: good grammar)
Authority	• Information on authors and other documents • References or sources of text and other documents • Background of information of institution/organization /owner of the site (e.g: logo, name, address)
Currency	• Up-to-date contents
Uniqueness	• Option for output/print format when appropriate • Choices of language for multi-ethnic audience • Choice of media type for a particular information (e.g: text only, audio or video) • Information of warning on file type and size for downloading
Linkages	• Clear distinctions between internal and external links • Links to other relevant sites (e.g: state, local branches)

2.6.6.3 Accessibility

Hassan and Li (2001) described that the word accessible means that the users would not only be able to get connection to the websites and it is also available to browse all content. The higher level of accessibility means that the higher level of usability

23

of websites. The most important criterion in accessibility is loading time which represents the amount of work that a computer system performs.

Table 2.6: List of Web Usability Criteria for Accessibility (Source: Hassan and Li, 2001)

ACCESSIBILITY	
Loading speed	• Acceptable loading time (about 10 seconds depending on the content)
Browser compatibility	• Compatible contents for all main browser (e.g: Internet Explorer, Mozilla Firefox, Google Chrome) • Compatible contents between different versions of the same browser • Compatible display for different screen types (e.g: black and white, palm top and digital TV)
Search facility	• The use of local search facility especially for medium and large web sites.

2.6.6.4 Navigation

Good navigation in a website is comparable to a good road map. When a website possesses a good navigation, the users will know where they are, where they have been and where they can go from their current position (Hassan and Li, 2001).

Table 2.7: List of Web Usability Criteria for Navigation (Source: Hassan and Li, 2001)

NAVIGATION
• Menu/list of key categories of contents in the main page
• Menu/list of key categories of contents in all sub pages
• Links to the main page from all sub pages
• Accurate/unbroken links
• Use of sitemap
• The wording for each category of content is meaningful to users

- Contents should be grouped into a small number of key categories (about 7)
- Small number of steps/links to arrive at particular information

2.6.6.5 Consistency

The users will feel unfamiliar when they view the website for the first time. However, the users feel familiar with the web environment if the web maintains the consistency. The consistency will depend on how the developer design the web weather they put the menu bar at the top of the screen, while others might use a horizontal hypertext button at the bottom of the screen. The design consistency is important to speed up user's learning and usability of that website level (Hassan and Li, 2001).

Table 2.8: List of Web Usability Criteria for Consistency (Source: Hassan and Li, 2001)

CONSISTENCY
• Consistent page layout (e.g: screen size for content display, banners and menu bar)
• Consistent use of text in terms of its type, font size and colour
• Consistent use of navigational aids (e.g: menu bar, button and links in terms of graphics metaphor, size and colour)

2.6.6.6 Interactivity

Interactivity is the dialog that occurs between a human being on websites and a computer program. However, in this study, it was representing the features in a website that enable two-way communication between users and site owners or other pre-assigned personnel.

Hassan and Li (2001), discussed that the feature allows the users to give feedback and comments on related websites. The examples of interactivity features that will

evaluated are email, guess book and online forum. The users will leave their message so that the site owners will read and reply the message.

Table 2.9: List of Web Usability Criteria for Interactivity (Source: Hassan and Li, 2001)

INTERACTIVITY
• Availability of features for user's feedback about the site (e.g: web master's email address and online form)   • Availability of features for sharing views and discussions (e.g: e-forum, net conference and net chatting)   • Availability of entertainment features (e.g: online games and puzzles)

2.6.6.7 Media Use

Media is the one of communications elements. Use of media on the development websites will keep users attention and used effectively. Indirectly the media use can enhance the usability level of website. Usually, the developers add in some multimedia elements into the website such as graphics, images, animation and audio. But the excessive media consumption on the website can course the heavy utilization of media elements consumes the server's hard disk space and the length of loading time (Hassan and Li, 2001).

Table 2.10: List of Web Usability Criteria for Media Use (Source: Hassan and Li, 2001)

MEDIA USE	
Continuous/time-based media (audio, animation and video)	• Control features for continuous where appropriate (e.g: reply, control volume and turn off) • Alternative access (e.g: text version) to any information presented through continuous media • Avoidance of looping animation to prevent

	user's distraction • Use of continuous media to suit content (e.g: demonstration, instruction and speeches)
Static media (graphics, images, pictures)	• Labelling of all static media especially those used menus and icons • Use of thumbnails to display photos • Use of static media to enhance the information being presented • Non excessive use of static media in all pages

2.7   Polytechnic: Concept and Definition

Esa et al., (2009) acknowledges that the polytechnic institute is a technical college under Ministry of Higher Education (MOHE) which are dedicated to provide the platform and opportunity for members of the society to improve their vocational and technical skills. In particular, polytechnic also become second chances for those SPM leavers to further study and also to get them ready before they join the work force.

Meanwhile, the students who joint polytechnic in diploma engineering usually, graduate with their diploma proficiencies in technical skills. This will provide them with wider opportunities to get place in industrial sector while some of them pursuing degree in engineering in local universities (Masek and Yamin, 2009).

According to Yusof (2011), polytechnic is also responsible for providing the talent to the economy and not merely employees in order to generate high-income economy, sustainable development and nature of inclusiveness. At the same time, polytechnics also have to produce skills that enable the graduate think the entrepreneurial and

prepare them as future leaders which are capable of dealing with more complex problems and rapidly changing.

2.7.1   Background of Ungku Omar Polytechnic

Malaysian Ministry of Education which was supported by United Nation Educational, Scientific and Cultural Organization (UNESCO) that was launched the pioneer polytechnic, Ungku Omar Polytechnic in the year 1969. The Malaysia government was allocated some of budget to make Ungku Omar Polytechnic become reality. The polytechnic was named after the late Dato' Professor Ungku Omar Ahmad, who was very dedicated in his valuable contributions to the Malaysia, especially in the field of medical research.   UNESCO was assigned with the responsibility of planning and executing the polytechnic's construction on an area of 22.6 hectares' at Dairy Road, Ipoh. Initially there are 28 local lecturers, assisted by 14 foreign lecturers which are from Canada, United State of America, Germany and Japan. Niche area of PUO is program of Mechanical Engineering (Air Conditioning and Refrigeration) and Shipping Engineering. Figure 2.3 shows the main page of Ungku Omar Polytechnic website.

Figure 2.3: Website of Ungku Omar Polytechnic

28

2.7.2 Background of Sultan Salahuddin Abdul Aziz Shah Polytechnic

Sultan Salahuddin Abdul Aziz Shah Polytechnic (PSA), formerly known as the Polytechnic Shah Alam which is situated in Shah Alam, the capital of Selangor. PSA was in augured on March 8, 2002 by the Sultan of Selangor, Sultan Sharafuddin Idris Shah. The polytechnic was named after the late *DYMM Seri Paduka Baginda Yang Dipertuan Agung* XI from Selangor. PSA is known by the title "Polytechnic Super Active", have been hailed as the first polytechnic who got certified MS ISO 9002:1994 from Standard and Industrial Research Institute of Malaysia (SIRIM) in September 1999. Niche area of PSA is program of Electrical Engineering (Medical). There were six departments in PSA which are Mechanical Engineering Department, Civil Engineering Department, Electrical Engineering Department, Commerce Department, Mathematics, Science and Computer Department and General Studies Department. Figure 2.4 below shows the main page of PSA website.

Figure 2.4: Website Sultan Salahuddin Abdul Aziz Shah Polytechnic

2.7.3 Background of Johor Bahru Polytechnic

According to Dato' Seri Mohamed Khaled Bin Nordin, Minister of Higher Education Malaysia said that Johor Bahru Polytechnic (PJB) was developed in the Seventh Malaysia Plan (RMK-7) at a cost of RM 155.52 million under World Bank financing. PJB is polytechnic's ninth in Malaysia after PSA. Nowadays, PJB has a total of 438 academic staffs and 113 non-academic staffs. Niche area of PJB is program of creative design and industrial design which is teach the students to develop creative technology and graphic design, fashion and apparel design and industrial design. On December 15, 2011, the name was changed from Johor Bahru Polytechnic to Ibrahim Sultan Polytechnic in conjunction by the name of *DYMM* Tuanku Johor. Figure 2.5 shows the main page of PJB.

Figure 2.5: Website Johor Bahru Polytechnic

2.8   Summary

This chapter describe the literature review of this study. It was focusing on the usability evaluation, it definition and concepts, methods and models that relevant to

the usability web are discussed well. Then, the related works of the study is also discussed using the criteria given. After the literature review, the evaluation model for usability web of premier polytechnic is proposed, the identification of each usability evaluation criteria and its measure is described.

In next chapter, the methodology of this research is presented.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1   Introduction

Research in common sentence refers to a search for knowledge. Once can also define research as a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation and systematized effort to gain new knowledge. Research methodology is a method that creates research which is a systematic way to get the research.

3.2   Methodology

The research methodology helps the researcher to organize and conduct their research using the recommended techniques to become successful research. The research methodology was adopted form Mohammed, 2010. In his research, he introduced four steps which are summarized below:
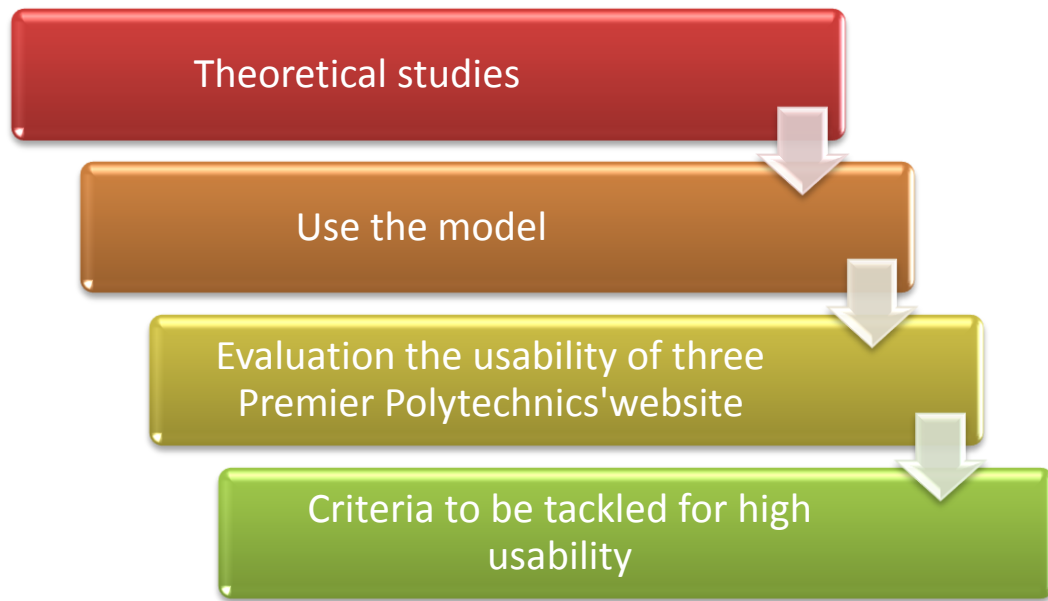
Figure 3.1: Research Methodology (Source: Mohammed, 2010)

3.2.1 Theoretical Studies

In these phase, the researcher has determines the problems, research questions, research objectives and scopes for the research so that the background of the study is known. Then the title will create based on the problem given. While the literature review will be done on the related topic in term of usability of web, accessibility, evaluation, web design, comparison and polytechnics through the journals, reports, proceeding, books, articles, website and other materials. So, the aim of this study isto identify which is the best among three website design of premier polytechnics in such of the criteria of usability criteria for assessing the web. From this study also, will produce a suggestion to improve the usability of premier polytechnics official web.

3.2.2 Use the Model

In these phase, the usability evaluation model for web-based will be construction on related criteria. Based on the literature review, there are many general usability

33

evaluation models. Premier Polytechnics' also have their own requirement or criteria to be satisfied. The model proposed by Hassan and Li, 2001 is very useful for the comparison of usability on premier polytechnics'. The model named as SCANMIC. There are seven criteria that have been divided in the evaluation which is described briefly below:

- **Screen design**

  Content of website should be structured and designed in such a way that users will find information easily and effectively

- **Content**

  The content provided should be useful, relevant and up-to-date.

- **Accessibility**

  Having good design and useful content are inadequate without considering the accessibility factors. That is means that the website should take into consideration of whether the information is accessible to all target users who use different technology to access the internet.

- **Navigation**

  Good navigation will help users find information easily and quickly especially for large amount of information.

- **Consistency**

  Consistency in design is vital in determining user's familiarity in term of navigation icons, colouring scheme and page structure.

- **Interactivity**

  Users should be provided with interactivity elements such as giving response, feedback and searching for information.

- **Media Use**

    The use of multimedia elements could enhance information presentation if used properly.

3.2.3   Evaluation the usability of three Premier Polytechnics' website

The model of usability comparison of premier polytechnic will divide into two steps in this phase, which are data collection and data analysis.

3.2.3.1 Data collection

In this phase, questionnaires are chosen to be data collection to identify usability criteria for assessing the web among three premier polytechnics. This method will make sure that the data process was intended to be facilitated, making it easier, faster and more accurate. While according to Liu (2008), questionnaires are effective tools for reaching a wide audience. It can be used to gather information in the early stage for desingning and can be used to evaluate an existing website.   Meanwhile, Williams (2003), said that the questionnaires are used in a wide range to getting information about the opinion and behaviour of individuals due to the topic that to ensure the data collected is meaningful.

The target group of the questionnaire are the students, lecturers and administration staff from the polytechnic which are acts as user to get the information and announcement. Respondent cannot be selected among those who study or work at one of premier polytechnic because to avoid bias. So students and employees of PTSSwere selected as the respondent. They are from different races, gender, age and job position to get the feedback to the usability from all criteria and thus ensure the

accuracy of data collected. Each respondent must evaluate three premier polytechnic website so that, the result will more balance and fair.

3.2.3.2 Data analysis

In this phase, the data collected from the questionnaires will be observation and analysed to get the results. The software Microsoft Excel 2010 will be used as the tools to produce the results from analysis.

Ssemugabi and Villier (2007), described that the data will be collected and analysed to compare the usability web in design and accessibility. Data analysis is a time that consuming and difficult process because the researcher has to examine and interpret the information. The analysis data involves three steps which are organizing the data, summarizing the data and interpreting the data (Salleh, 2006). The comparison will be made between the official website, PUO, PSA and PJB to find the best usability of that websites.

3.2.4 Criteria to be tackled for high usability

The last phase of this study is to identify the criteria to be tackled for high usability of website. To achieve satisfying web usability, it is related to the design aspect of website that make sense to people use them. It is also not allows to navigates easily and conveniently but also helps the user to find the particular information (Hassan and Li, 2001). So the better criteria to be tackled for high usability is using SCANMIC model that recommended by Hassan and Li (2001).

3.3   Summary

This chapter summarizes the methodology of this study that is shown four steps. The

data collected by using questionnaire, then analysed the data using Microsoft Excel

2010.

In next chapter, the results and findings of this research will be explained.

CHAPTER FOUR

RESULTS AND FINDINGS

4.1   Introduction

This chapter presents the results and findings of the usability comparison of three premier polytechnic's websites. The results obtained from the analysis performed on the data collected from respondents. As mentioned earlier, the usability of websites was compared on three premier polytechnic's which are PUO, PSA and PJB. The questions are related on evaluation criteria that are displayed in Figure 2.2 in chapter two. The results of the criteria of usability comparison website are represented by using column graph.

4.2   Respond Rate

The questionnaire was distributed 150 target respondents in PTSS which are included students, lecturers and administration staffs. However, the researcher only received the feedback from 93 out of 150 respondents and 85 (60.7%) are valid only 8 are not valid because the questionnaire collected is not answered complete. Questionnaire was divided into two sections which are general information and questions of usability comparison of Malaysia' premier polytechnics with 30 questions. The respondents have to mark tick (√) at their answer to evaluate the web sites. The

answers were separated into four likert scale: 1= Strongly disagree, 2=Disagree, 3=Agree, 4=Strongly agree.

The researcher distributed the questionnaire in PTSS, and it takes three weeks to collect the questionnaire back. The questionnaire also has been written in Malay and English to convenient the target respondents. The despondences must have the experience and knowledge in information technology. So the lecturers and students which are related on information technology field were selected in this study such as from Information Technology and Communication Department (JTMK), Design, Visual and Communication Department (JRKV), Mathematics, Science and Computer Department (JMSK) and the staffs' administration from Information Technology and Communication Unit (UTMK).

4.3 Demographic Profile of respondents

The demographic profile of the surveyed respondents is presented in Table 4.1. The total sample for the survey consists of 85 respondents. The gender distribution of the survey respondents is 38.8% males and 61.2% females. It is shown that most of the respondents are female because most of them are female students. The results also reveal that 71.8% (61) are students, 25.6% (22) are lecturers and 2.4% (2) are administration staffs which are respondents aged between 18 and 37 years. Table 4.1 shows the demographic profile of respondents.

Table 4.1: Demographic Profile of respondents

		Frequency	Percentage
	JMSK	10	11.8
Department	JRKV	7	8.2
	JTMK	67	78.8

	UTMK	1	1.2
Gender	Male	33	38.8
	Female	52	61.2
Race	Malay	82	96.5
	Chinese	1	1.2
	Indian	1	1.2
	Others	1	1.2
Age	18-22	58	68.2
	23-27	11	12.9
	28-32	14	16.5
	33-37	2	2.4
Job Position	Lecturers	22	25.9
	Admin	2	2.4
	Students	61	71.8

4.4 Usability Evaluation Result

The result of this study is referred to the seven usability criteria that adopted from the SCANMIC model from Hassan and Li (2001).

Below is the result that the researcher got from the analysis for each criterion. The previewed data are combination of respondents who were voted to agree and strongly agree. The researchers conclude that the respondents were agreed when they choose agree and strongly agree.

4.4.1 Analysis of Screen Design in Three Premier Polytechnics'.

Table 4.2 below shows the analysis from respondent due to screen design in three premier polytechnics'.

Table 4.2: Analysis of Screen Design

No.	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	More space for content than to other display element	69	61	57	81.2	71.8	67.1
2	Sharp colour contrast between text and its background	74	69	68	87.1	81.2	80.0
3	Different text sizes to differentiate between titles	74	65	68	87.1	76.5	80.0
4	Use of fonts that are easy to read	83	70	65	97.6	82.4	76.5
5	Clear titles and subtitles for each pages	75	66	64	88.2	77.6	75.3
	TOTAL	**375**	**331**	**322**	**88.2**	**77.9**	**75.8**

Legend: The data obtained from agree +strongly agree = agree

Table 4.2 above describes the result of comparison in three premier polytechnics'. The previewed data are combination of answered from respondents who are voted for agree and strongly agree. The criterion of screen design has five elements that evaluated. There are 375 (88.2%) respondents agreed with PUO's website on these criteria. PSA and PJB websites obtained the vote around 331 (77.9%) and 322 (75.8%). The value 375 comes out from the sum of each item evaluated. All the criteria have been monopolized by the PUO's website. There are significant differences between the three websites shows the PUO's website have more space for content than to other display element, so that the screen design doesn't look like crowded. They also use the contrast colour between text and background which are white and blackand it would be easy to read and understand the information.

4.4.2 Analysis of Content in Three Premier Polytechnics'.

Table 4.3 represents the analysis from three premier polytechnics' that focus on website content.

Table 4.3: Analysis of Content

No.	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	Up to date contents	74	69	69	87.1	81.2	81.2
2	The scope of the content is suitable for users	76	69	71	89.4	81.2	83.5
3	The language used is simple	76	73	68	89.4	85.9	80.0
4	Have the option to print format	30	71	66	35.5	83.5	77.6
5	Choice of media type for the particular information	74	63	69	87.1	74.1	81.2
	TOTAL	**330**	**345**	**343**	**77.6**	**81.2**	**80.7**

Legend: The data obtained from agree + strongly agree = agree

From the table 4.3, the researcher can conclude that the respondents agreed that PSA's website is usability more than two others website based on content criteria. The total of votes for PSA is 345 (81.2%). The different votes between PSA and PJB are only two. But the gap is very different between PUO, 330 votes (77.6%) compare to two others. Although the PUO had concurred four from five criteria in content which areup to date contents, the scope of the content is suitable for users, the language used is simple and choice of media type for the particular information but PSA still get the highest votes for the content criteria. This situation happened because PUO obtained the lowest votes for criteria print format. The most important criteria is up to date the contents because the user always want to search the latest information and news about the polytechnics.

4.4.3 Analysis of Accessibility in Three Premier Polytechnics'.

Refer to table 4.4 below which are described the analysis of accessibility on website.

Table 4.4 : Analysis of Accessibility

No.	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	Acceptable loading time (about 10 seconds depending on the content)	65	54	60	76.5	63.5	70.6
2	Compatible contents for all main browser (e.g : Internet Explorer, Mozilla Firefox, Google Chrome)	75	68	70	88.2	80.0	82.4
3	The use of local search facility	67	64	74	78.8	75.3	87.1
	TOTAL	**207**	**186**	**204**	**81.2**	**72.9**	**80.0**

Legend: The data obtained from agree + strongly agree = agree

Table 4.4 above describes that the respondent agreed with PUO is the best for accessibility website which is 207 (81.2%) votes. The value of 207 is total up from three items that evaluated. The respondents choose PUO have more acceptable in loading time (about 10 seconds depending on the content) and it is also compatible contents for all main browsers such as Internet Explorer, Mozilla Firefox or Google Chrome. PSA obtained the lowest answered due to acceptable in loading time because the website used large capacity homepage banner, then it takes time to loading the page. However, for local search facility on website, the gaps between three websites werevery close because all three of website has the local search facility. These comparison shows that the PUO is leading in accessibility criteria usability web site. Hassan and Li (2001) discussed that the accessibility defined that the users would be available to browse all the content in the website. The higher degree of accessibility means that the higher level of usability.

4.4.4 Analysis of Navigation in Three Premier Polytechnics'.

Table 4.5 is explained about the navigation criteria one from three premier polytechnics'.

Table 4.5: Analysis of Navigation

No.	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	Menu/list of key categories of contents in the main page	75	71	68	88.2	83.5	80.0
2	Menu/list of key categories of contents in the sub page	73	75	68	85.9	88.2	80.0
3	Links to the main page from all sub pages	71	73	73	83.5	85.9	85.9
4	Use of sitemap	70	70	32	82.4	82.4	37.6
5	Contents should be grouped into small number of key categories (about 7)	69	67	60	81.2	78.8	70.6
6	Have quick links to achieve certain information	66	65	64	77.6	76.5	75.3
	TOTAL	**424**	**421**	**365**	**83.1**	**82.5**	**71.6**

Legend: The data obtained from agree + strongly agree = agree

Table 4.5 above, describes that the comparison on navigation criteria usability web site among three premier polytechnics'. The respondents also choose PUO's website as the highest which is 424 (83.1%) votes, followed by PSA which obtained 421 (82.5%) votes and PJB is 365 (71.6%). However, the respondents give answers seems like average for the questionnaire but significantly there is different gap because PJB do not have sitemap facility. Wen and Yi (2008), discussed that the navigation are facilitated byoptimizing website linkage structure that can reduces thenumber of steps to locate user's target to the web pages.

4.4.5 Analysis of Media Use in Three Premier Polytechnics'.

Table 4.6 shows the analysis of media use among three premier polytechnics'.

Table 4.6: Analysis of Media Use

No	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	Repeated animation disturb the user to obtain information	75	71	68	88.2	83.5	80.0
2	Use of continuous media to suit web content (e.g: demonstration, instruction)	73	75	68	85.9	88.2	80.0
3	Use the menu/button static on the web	71	73	73	83.5	85.9	85.9
4	Use of thumbnails to display photos	70	70	70	82.4	82.4	82.4
5	Use of static media to enhance the information being presented	69	67	60	81.2	78.8	70.6
	TOTAL	**358**	**356**	**339**	**84.2**	**83.8**	**79.8**

Legend: The data obtained from agree + strongly agree = agree

Table 4.6 above describes that 358 (84.2%) is referred to the PUO's website which is obtained the highest vote for agree in media use criteria in website. The value of 358 is total up from three items that evaluated. PSA obtained 356 votes (83.8%) and PJB is 339 (79.8%). The highest vote from the item evaluated is 75 (88.2%) discussed that the respondents agree that repeated animation will disturb the users to obtain information. Sometimes, use of excessive media will cause the web usability decreases. Item number four that is evaluated is using the thumbnails to display photos get 70 (82.4%) vote from respondents for each polytechnics. The gap between PUO and PSA becomes closer. The respondents agree that the usability on media use is rewarded to PUO the difference in two votes from PSA.

4.4.6 Analysis of Interactivity in Three Premier Polytechnics'.

Table 4.7 present the analysis of interactivity which is between users and website.

Table 4.7: Analysis of Interactivity

No.	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	Availability of features for user's feedback about the sites (e.g: webmaster's email)	63	66	56	74.1	77.6	65.9
2	Availability of features for sharing views and discussion (e.g: e-form, net conference and net chatting)	61	63	56	71.8	74.1	65.9
3	Availability of entertainment features (e.g: online games)	50	49	46	58.8	57.6	54.1
	TOTAL	**174**	**178**	**158**	**68.2**	**69.8**	**62.0**

Legend: The data obtained from agree + strongly agree = agree

Table 4.7 shows the comparison of three premier polytechnics'in interactivity criteria to evaluate the website. PSA obtained the highest vote 178 (69.8%), while PUO and PJB get 174 (68.2%) and 158 (62%). In usability of interactivity, there are three criteria that evaluated and PSA is leading with two out of three. PSA obtained 66 (77.6%) answered agree in availability of features for user's feedback about the web sites through webmaster's email and 19 (22.4%) disagreed to the criteria. There were 63 (74.1%) respondents agreed in availability of features for sharing views and discussion such as net-chatting or e-forum.Then 50 (58.8%) respondents realize that PUO is very availability of entertainment features in their web sites.

4.4.7 Analysis of Consistency in Three Premier Polytechnics'.

Table 4.8 below shows the analysis of consistency among three premier polytechnics'.

Table 4.8 : Analysis of Consistency

No	Questions	Agree			Percent (%)		
		PUO	PSA	PJB	PUO	PSA	PJB
1	Consistency page layout (e.g: screen size for content display, banner)	71	57	66	83.5	67.1	77.6
2	Consistency use of text in term of its type, font size and colour	72	64	67	84.7	75.3	78.8
3	Consistency use of navigational aids. (e.g: menu bar, buttons)	77	68	69	90.6	80.0	81.2
	TOTAL	**220**	**189**	**202**	**86.3**	**74.1**	**79.2**

Legend: The data obtained from agree + strongly agree = agree

Based on the table 4.8 above, there were 220 (86.3%) respondents agreed that PUO's website is very consistency in three of usability criteria and 35 (13.7%) respondents disagreed. The total of agree vote for PSA is 189 (74.1%) and total of disagreed is 66 (25.9%). PJB obtained 202 (79.2%) respondents answered agree and the balance answered disagreed.All the criteria have been monopolized by the PUO's website. But the gap is very different between PUO and two others. These criteria will cause that the user will feel more familiar to the web site and make them comfortable and easy to use.

Table 4.9: Usability comparison MalaysiaPremier Polytechnics' Website in Seven Criteria

No.	Usability	Agree		
		PUO	PSA	PJB
1	Screen design	375	331	322
2	Content	330	345	343
3	Accessibility	207	186	204
4	Navigation	424	421	365
5	Media use	358	356	339
6	Interactivity	174	178	158
7	Consistency	220	189	202
	Total agree	**2088**	**2006**	**1933**
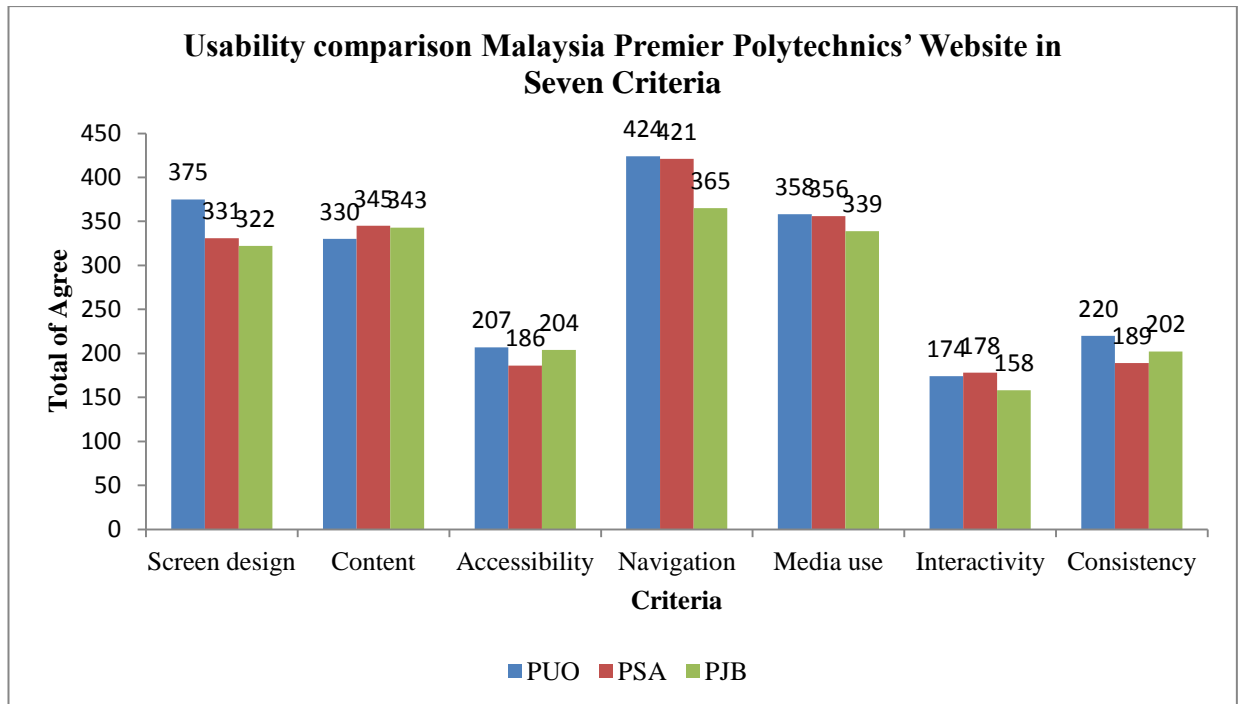
Figure 4.1: Usability Comparison Premier Polytechnics' Website

Based on the table 4.9 and figure 4.1 above, it shows the usability comparison between three website of premier polytechnics' via table and column graph. The usability of that websites was evaluated on seven criteria which are screen design, content, accessibility, navigation, media use, interactivity and consistency. PUO's website has achieved the highest vote among the others two premier polytechnics', PSA and PJB.

PUO obtained total vote that respondents agree for the whole criteria is 2088, meanwhile PSA gets total vote is 2006 and PJB gets 1933. The table and figure also concluded that PUO has concurred five out of seven criteria which are screen design (375), accessibility (207), navigation (424), media use (358) and consistency (220). However, PSA is leading on content (345) and interactivity (178). The different total agrees between PJB and PSA is 73, PSA between PUO is 82 and PUO between PJB is 155. Although PJB gets the lowest scores, PJB's website has their own specialty

which obtained votes higher that PUO's in content criteria, 343 votes than 330 votes. Based on the analysis of usability research on this study, the researcher can make the conclusion that the most usability official website is PUO.

4.5   Criteria to Be Tackled For High Usability

From the data analysis of the usability evaluation result comparison among three Malaysia premier polytechnics' website, there are weaknesses that need to be improved.   There are three criteria identifiedwhich is low usability in this study which are accessibility, interactivity and consistency. The following criteria must be emphasized in usability website:

- Accessibility

  Criteria of accessibility usually related on images, animation, audio or video uploaded in the website. For the images format, the administrator can divide the images inone selected page such as gallery or reduce the capacity or size of the pictures. Besides that, do not use the longer animation. Repeated animations will disturb the user to obtain information. It will course the lowest accessibility to the websites.

- Interactivity

  Beside leave a message on the customer feedback form, administrator can also provide chat rooms so that the users want to ask any question to the administration. If at that time administrator is online, they can answer the questions.

- Consistency

    A problem with web site design is lack of consistency. To overcome this problem, the administrator must keep on using the font styles consistently especially simple font such as Arial or Verdana which are wide and easy to read. Don't use too many different fonts in one page.

4.6   Summary

This chapter presents the results and findings of the study. The result of each criterion is presented and shows the comparison between three premier polytechnics'. The data comes out with the total agreed and the percentage from seven criteria that evaluated.

In next chapter, the conclusion of this study will be made.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1   Introduction

The study aims on the topic of design comparison of premier polytechnics (PUO, PJB and PSA) website which focuses more on the criteria of usability criteria for assessing the web. The three premier polytechnics' website must demonstrate high performance compared to the other 27 polytechnics because they are representation in all aspects, including the official website. The usability is an important indicator of quality of the interactive information technology product or system (Yan and Guo, 2010). The result's research is referringto the usability of web and it can be guidance as the subject for further research next time.

5.2   Achievement of Research Objectives

As mentioned in the chapter one, the objectives of this study are: (i) to identify the usability criteria for assessing web, (ii) to measure the usability of the selected web, (iii) to identify the best polytechnic in terms of usability aspects, and (iv) To identify the criteria to be tackled for designing high usable website.The following presents the achievement of the research objectives:

Research Objective 1:

To identify the usability criteria for assessing web.

The results are discussed in chapter three. The usability criteria that used to evaluate the usability web are screen design, content, accessibility, navigation, media use, interactivity and consistency. Each criteria will evaluated based on the questionnaire as stated in Appendix A.

Research Objective 2:

To measure the usability of the selected web.

The results are discussed in chapter four. The results obtained from the analysis performed on the data collected from respondents.The data that used to measure the usability of web is combination of respondents who were voted to agree and strongly agree. The researchers conclude that the respondents who tick ($\sqrt{}$) at agreed and strongly agree means that are agree. Besides that, the data also represent in percentage.

Research Objective 3:

To identify the best polytechnic in terms of usability aspects.

The analyzed data were represented by the tables and column graph on chapter four. Based on that analysis of usability research on this study, the researcher can make the conclusion that the most usability official website is PUO because the website got the highest marks of usability criteria which are screen design, accessibility, navigation, media use and consistency.

Research Objective 4:

To identify the criteria to be tackled for designing high usable website.

The results are discussed in chapter four. The criteria which are to be tackled for high usable website for premier polytechnics' are accessibility, interactivity and consistency. These weak criteria are derived from the analysis that has been done to improve the usability of websites.

5.3   Limitation

This research is focused on usability comparison three Malaysia premier polytechnics' websites. The respondent that targets to answer the questionnaire is lecturers, admin staffs and students at PTSS. This analysis from the questionnaire will be more effective if the respondents itself frequently use the website.

5.4   Future Work

It is recommended that for future research, this study should be done in large sample and it will involve many respondents which help the researcher to get the accurate data. It is also recommended that the best usability premier polytechnic which is PUO will compare the website usability with PTSS websites' using added usability criteria.

Besides that, from this study the researcher can use the true user to answer the questionnaire such as SPM (Sijil Pelajaran Malaysia) school leavers. This is because students will access the website to get information about their studies on related polytechnic website. The website can be measured accurately when the user is a first time used.

5.5   Summary

This chapter discussed on all the objectives of this study and the findings. The study has reached the objectives and gets the output. The limitation of this study is the respondents who answered the questionnaire will be more effective if the respondents itself frequently use the website. The future works for this study is this research should be done in large sample data. Besides that, the researcher can compare the usability of the best premier polytechnics' with PTSS. The researcher can also use the true user to answer the questionnaire such as SPM (Sijil Pelajaran Malaysia) school leavers so that we can get the accurate data for this research.

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Appendix A

Soal Selidik / *Questionnaire*

Kajian ini bertujuan untuk mengumpul maklumat mengenai Perbandingan Kebolehgunaan Laman Web Politeknik Premier (*Usability Comparison of Malaysia Premier Polytechnics' Website*) iaitu Politeknik Ungku Omar (PUO) www.puo.edu.my, Politeknik Sultan Salahuddin Abdul Aziz Shah (PSA) www.psa.edu.mydan Politeknik Johor Bahru (PJB) www.polijb.edu.my. Anda telah dipilih untuk menjadi responden untuk soal selidik ini.Semua maklumat hanya akan digunakan untuk tujuan penyelidikan sahaja; maklumat peribadi anda tidak akan disiarkan.

This study is aimed to collect the information on Usability Comparison of Malaysia Premier Polytechnics' Website for Politeknik Ungku Omar Polytechnic (PUO) www.puo.edu.my, *Sultan Salahuddin Abdul Aziz Shah Polytechnic (PSA)* www.psa.edu.my *and Johor Bahru Polytechnic (PJB)* www.polijb.edu.my. *You have been selected to become a respondent for this questionnaire. All the information will only be used for the research purpose; your personal information will not be published.*

BAHAGIAN A : MAKLUMAT AM / *SECTION A : GENERAL INFORMATION*

1. Maklumat peribadi/*Personal information*

Jabatan/*Department* …………………………………………………………

Jantina/*Gender* …………………………………………………………

Bangsa/*Race* …………………………………………………………

Umur/*Age* …………………………………………………………

Pekerjaan/ ☐ Pensyarah/ ☐ Pentadbiran/ ☐ Pelajar/
Job Position   *Lecturer*   *Admin*   *Student*

Bahagian ini merancang untuk mendapatkan pendapat anda tentangketiga-tiga laman web. Sila tandakan (√) pada jawapan anda di tempat yang disediakan dengan menggunakan skala berikut :

This section plan to get your opinion on the three websites. Please tick (√) in your answer in the space provided using the following scale :

PUO = Politeknik Ungku Omar/*Ungku Omar Polytechnic*

PSA = Politeknik Sultan Salahuddin Abdul Aziz Shah/ *Sultan Salahuddin Abdul Aziz Shah Polytechnic*

PJB = Politeknik Johor Bahru/*Johor Bahru Polytechnic*

1= Sangat tidak setuju;   2= Tidak setuju;   3= Setuju;   4= Amat setuju;

1= Strongly disagree;   2= Disagree;   3= Agree;   4= Strongly agree;

Rekabentuk Skrin/*Screen Design*	PUO				PSA				PJB			
	1	2	3	4	1	2	3	4	1	2	3	4
1. Lebih banyak ruang untuk kandungan daripada elemen paparan lain (cth:menu bar, advertisement banner) *More space for content than to other display element (e.g : menu bar, advertisement banner)*												
2. Warna berbeza antara teks dan latar belakang *Sharp colour contrast between text and its background*												
3. Saiz teks yang berbeza untuk membezakan antaratajuk *Different text sizes to differentiate between titles*												
4. Penggunaan font yang mudah dibaca *Use of fonts that are easy to read*												
5. Tajuk dan subtajuk yang jelas bagi setiap muka surat *Clear titles and subtitles for each pages*												

Kandungan/*Content*	PUO				PSA				PJB			
	1	2	3	4	1	2	3	4	1	2	3	4
1. Kandungan yang sentiasa dikemaskini *Up to date contents*												
2. Skop kandungan web sesuai untuk pengguna *The scope of the content is suitable for users*												
3. Bahasa yang digunakan adalah mudah. *The language used is simple*												
4. Mempunyai pilihan untuk format mencetak *Have the option to print format*												
5. Pilihan jenis media untuk maklumat tertentu *Choice of media type for the particular information*												

Kebolehcapaian/*Accessibility*	PUO				PSA				PJB			
	1	2	3	4	1	2	3	4	1	2	3	4
1. Loading masa yang boleh diterima(kira-kira 10 saat bergantung kepada kandungan) *Acceptable loading time (about 10 secs depending on the content)*												
2. Kandungan sesuai dengan semua pelayar utama (cth : Internet Explorer, Mozilla Firefox, Google Chrome) *Compatible contents for all main browser (e.g : Internet Explorer, Mozilla Firefox, Google Chrome)*												

3. Penggunaan kemudahan carian tempatan *The use of local search facility*												

Sambungan/*Navigation*	**PUO**				**PSA**				**PJB**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1. Menu/senarai kategori utama kandungan dalam halaman utama *Menu/list of key categories of contents in the main page*												
2. Menu /senarai kategori utama kandungan dalam halaman sub *Menu/list of key categories of contents in the sub page*												
3. Mempunyai pautan ke laman utama daripada semua halaman sub *Links to the main page from all sub pages*												
4. Menggunakan sitemap *Use of sitemap*												
5. Kandungan perlu dikumpulkan ke dalam sebilangan kecil kategori utama(kira-kira 7) *Contents should be grouped into small number of key categories (about 7)*												
6. Mempunyai links yang cepat untuk mencapai maklumat tertentu *Have quick links to achieve certain information*												

Penggunaan Media/*Media Use*	**PUO**				**PSA**				**PJB**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1. Animasi yang berulang menganggu pengguna untuk mendapatkan makluamat *Repeated animation disturb the user to obtain information*												
2. Penggunaan media yang berterusan sesuai dengan kandungan web (cth:demonstrasi, arahan) *Use of continuous media to suit web content (e.g: demonstration, instruction)*												
3. Penggunaan menu/butang yang statik pada web *Use the menu/button static on the web*												
4. Penggunaan thumbnails untuk memaparkan gambar *Use of thumbnails to display photos*												

5. Menggunakan media statik untuk meningkatkan maklumat yang dibentangkan *Use of static media to enhance the information being presented*												

Interaksi/*Interactivity*	**PUO**				**PSA**				**PJB**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1. Mempunyai criteria untuk maklum balas mengenai pengguna (cth: e-mel web master) *Availability of features for user's feedback about the sites (e.g: webmaster's email)*												
2. Mempunyai ciri-ciri untuk berkongsi pandangan dan perbincangan (cth: e-form, net conference and net chatting) *Availability of features for sharing views and discussion (e.g: e-form, net conference and net chatting)*												
3. Mempunyai ciri-ciri hiburan (cth: permainan dalam talian) *Availability of entertainment features (e.g: online games)*												

Kosistensi/*Consistency*	**PUO**				**PSA**				**PJB**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1. Susun atur halaman konsisten (e.g: saiz skrin untuk memaparkan kandungan, banner) *Consistency page layout (e.g: screen size for content display, banner)*												
2. Penggunaan jenis teks, saiz teks dan warna yang konsisten *Consistency use of text in term of its type, font size and colour*												
3. Penggunaan yang konsisten untuk pelayaran bantuan (cth: menu bar, butang) *Consistency use of navigational aids (e.g: menu bar, buttons)*												