UNIVERSITY'S OFFICIAL WEBSITE DESIGN FRAMEWORK USING HUMAN COMPUTER INTERACTION RULES

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ABSTRACT

Nowadays, many universities use website as communication and promotion tools between end user and university. Various styles and principal being used by the formal university portal, and the design depend upon to the designer's decision. Users can see the different design style in university website. Thus, in order to make sure every single university official website has a standardize user interface designs, this research is carried out to overcome the various designs of formal university website. This thesis discusses on the implementation of new standard human-computer interaction rule for designing university official website. The main objective of the research is to create a new standard human-computer interaction rule which suitable to be use in designing university official website. Besides that, researcher has to determine all important elements which need to be included in one's university official website and create a university official website prototype. First of all, researcher do some preliminary studies on every existing human-computer interaction rule together with the design framework. Next, pre-stage survey forms are distributed to target respondent for the purpose of collecting user's preference and requirement. After gathering requirement stage, researchers start to analyze preliminary study result and pre-stage survey results. During design phase, story board and framework are formed according to collected result from previous stage. While in development and implementation stage, researchers create a brand new standard human-computer interaction rule, then implement the new rule in designing the prototype of university official website. Lastly, the prototype is test and evaluate by end user and its' result will be collect and analyze. As a conclusion, after completing every research process, researcher is able to propose a new standard human-computer interaction rule which suits to be used in designing university official website. In consequence, from the result collected in testing stage, it proves that the new standard human-computer interaction rule which being created and implemented to prototype design is being accepted by the end user. This is because a total of 50 respondents who include teenagers, former and present university students have taken part in the testing stage. From the post-survey result, every survey question which related to new standard human-computer interaction rules gets a total of over 80% agreement value. Therefore, from this value of percentage, it shows that new standard human-computer interaction rule is suitable to be used in designing and standardization of university official website in Malaysia.

ABSTRAK

Era ini, banyak universiti menggunakan laman web sebagai alat komunikasi dan promosi di antara pengguna dan pihak universiti. Pelbagai reka bentuk yang digunakan oleh portal rasmi universiti, bergantung kepada hasil pereka portal rasmi universiti tersebut. Pengguna boleh melihat reka bentuk yang pelbagai di portal rasmi Universiti. Oleh kerana itu, pengkaji menjalankan kajian ini untuk mengatasi masalah rekabentuk pelbagai oleh pereka portal rasmi Universiti. Kandungan tesis ini membincangkan kajian mengenai interaksi manusia-komputer dalam menentukan piawaian bagi pereka bentuk portal rasmi Universiti. Objektif utama kajian ini adalah untuk mewujudkan satu kerangka piawaian peraturan berdasarkan konsep interaksi manusia-komputer yang sesuai digunakan dalam mereka bentuk universiti portal laman web rasmi. Selain itu, penyelidik perlu menentukan semua elemen penting yang perlu dimasukkan ke dalam kerangka piawaian reka bentuk portal rasmi dan membuat ujikaji dalam penerimaan terhadap reka bentuk khusus bagi portal rasmi universiti. Kaedah kajian dimulakan dengan penyelidik melakukan kajian awal ke atas setiap peraturan interaksi manusia-komputer yang sedia ada bersama-sama dengan rangka kerja reka bentuk. Seterusnya, borang kajian awal diedarkan kepada sasaran responden bagi maksud mengambil keutamaan dan keperluan pengguna. Selepas mengumpul peringkat keperluan, penyelidik mula menganalisis hasil kajian awal dan keputusan kaji selidik pra-peringkat. Semasa fasa reka bentuk, papan cerita dan rangka kerja terbentuk mengikut hasil yang diambil daripada kajian awal. Walaupun dalam pembangunan dan fasa pelaksanaan, penyelidik mewujudkan satu kerangka baru peraturan piawaian interaksi manusia-komputer, kemudian melaksanakan peraturan baru dalam mereka bentuk prototaip portal rasmi universiti. Prototaip portal rasmi universiti berasaskan piawaian baru yang direka bentuk, di uji keatas 50 orang pengguna yang terdiri dari remaja dan pelajar-pelajar universiti. Hasil kajian menunjukkan 80% responden bersetuju dengan reka bentuk portal rasmi university yang baru. Oleh itu ini menunjukkan kerangka piawaian baru reka bentuk portal rasmi universtiti boleh dijadikan panduan oleh semua pereka portal universiti. Ini dapat menghasilkan reka bentuk yang seragam semua portal rasmi universiti di Malaysia.

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LIST OF ABBREVIATIONS

HCI	**Human Computer Interaction**
GUI	**Graphical User Interface**
UID	**User Interface Design**
WUI	**Web User Interface**
FAQ	**Frequent Ask Question**
UMP	**Universiti Malaysia Pahang**
USM	**Universiti Sains Malaysia**
UM	**Universitit Malaya**
UPM	**Universiti Putra Malaysia**
UKM	**Universit Kebangsaan Malaysia**
UMS	**Universiti Malaysia Sabah**
UiTM	**Universiti Teknologi MARA**
UTM	**Universiti Teknologi Malaysia**
IIMU	**Universiti Islam Antarabangsa Malaysia**
UUM	**Universiti Utara Malaysia**
UPSI	**Universiti Pendidikan Sultan Idris**
UNiMAS	**Universiti Malaysia Sarawak**
UniSZA	**Universiti Sultan Zainal Abidin**
UPNM	**Universiti Pertahanan Nasional Malaysia**
USIM	**Universiti Sains Islam Malaysia**
UMT	**Universiti Malaysia Terengganu**
UTHM	**Universiti Tun Hussein Onn Malaysia**
UTeM	**Universiti Teknikal Malaysia Melaka**
UniMAP	**Universiti Malaysia Perlis**
UIM	**Universiti Islam Malaysia**
UMK	**Universiti Malaysia Kelantan**

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter describes briefly about the university's official website design framework using human computer interaction rules. This chapter contains five sections which are the background of the project, problem statement of the project, objectives and scope of the project.

1.2 Background

Nowadays, many studies and research towards human computer interaction knowledge are being carried out. This is because in the 21st century, humans are using computer, laptop and other types of electronic device as their communicating or interaction tool. So as a result, the interactivity that occurs between human and computer are important, whereby a good interface design or effective interaction between human and computer would ease the use of users. However, on the opposite sides a poor interaction or unorganized interface design may burden the user and make them lose confidence in using it.

We knew that computer have been widely used by everyone around the world for many different purposes, together with the existence of the Internet and creation of website many types of business, company or activity program started to promote their own brand

through this method whereby creating and designing their own website. The existence of a website or web page is a huge achievement of humankind as it provides us the ability to collect and get information instantly around the world just by clicking. Thus, many big companies, businessman and others field uses, a web page to promote their own products. Besides that, in educational field school, college and universities also used such idea to develop their very own web page for promoting their institution. University's official website is a communication tool between lecturers, students and staff with university itself. Therefore, many government's universities, private college and non-government universities created their own official website for the purpose of promoting the course, facilities and other things to web page visitor. For example, University Malaysia Pahang (UMP) had its' own official web page for the students, staff, lecturer or outsider to view it. This can be proven as the UMP official web page provide many types of information, including new course offering in UMP and events or program happening in UMP.

As a result, we can know that in order to deliver the correct message towards every single user, the web designer need to ensure that the interface and interaction design of them have to fulfill the human computer interaction rules. Furthermore, the functionality or facility which will be provided on the website must be easy to learn up or ease to use (Jacob Nielsen, 1994). Moreover, every content that's being delivered to the users must be updated on every single day (Jacob Nielsen, 2000). This will absolutely make the viewers and users feel refreshing and get attracted to our web page.

1.3 Problem Statement

Human computer interaction is mean by the study and implementation of interactivity that happen between users (human) and computer. While a university's official website act as a communicator between lecturers, students and staff with the university. Thus, when creating such website, we need to make sure that every news or information that we wanted to deliver to users have to be designed or address in the correct way. Furthermore, we have to ensure that the website interface created must be moderate in terms of every aspect that being defined in the human computer interaction rules. As we

know each of the university's official website may have their own design style, thus not every single university's official website would fully fulfill all the human computer interaction rules that have been proposed before.

The problem that faced by users include difficulty in accessing the website as some of the official website is not user friendly. Follow by, the interface design of some university official websites is unattractive and it make user to lose interest towards it. Last but not least, is the content and functionality being provided by the university's official website is not enough and unorganized. This may lead the user to waste their time in searching the information needed by them.

1.4 Objective

The objectives of the research are:

i. To identify the design requirements towards university's official website based on comparison of human computer interaction technique and design framework.
ii. To develop a university's official website prototype based on the proposed framework.
iii. To propose the standard human computer interaction rules which should be apply in developing the prototype.

1.5 Scope

This research will emphasis on creating a university's official website prototype where all requirements come from the study, evaluation and comparison between those existing official websites together with the human computer interaction rules. In this research, the researcher will be only focusing on Government Institute Higher Level which mean by local universities such as University Malaya, University Sains Malaysia, University Malaysia Pahang and others. Along this process being conducted, the writer would use the survey form, questionnaire and observation method to collect, examined,

study and understand the feedback from users. Moreover, observation and comparison of the GUI (Graphical User Interface) techniques being used by the university's official website will be done. This action enables researcher to take it as a reference when designing suitable framework for creating the prototype. Several techniques of GUI (Graphical User Interface) like Shneiderman's 8 Golden Rules, Norman's 7 Principles and Nielsen's 10 Heuristics will be study by the writer. In order to make it as guidelines which help researcher in creating a good and best prototype for the university's official website. During the research being carried out, the writer will use several kinds of software and computer languages for inventing or creating the prototype. This includes using the software Microsoft Visual Studio 2010, together with the computer language ASP.NET, Visual Basic, HyperText Markup Language (HTML) and Cascading Style Sheet (CSS).

1.6 Thesis Organization

This thesis contains of six (6) chapters.

Chapter 1 is discussing about introduction of research which includes problem statements, objectives and scope.

Follow by, chapter 2 will be discussing about literature review of the research.

Next which is chapter 3 study methodology of the research will be discussed.

In chapter 4 the design of the framework and prototype will be shown. Follow by, implementation of the research will be discuss.

As in chapter 6 results and discussion that being carried out throughout the research will be included.

Lastly in chapter 7 a conclusion will be given on the whole research process.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter briefly discusses on existing literature related to the proposed project. First of all, the researcher will introduce to the concept of Human Computer Interaction (HCI). Next, a brief description on each heuristic evaluation technique will be included. As for the third section, information regarding on graphical user interface (GUI) and user interface design (UID) will be introduced. Lastly, some techniques related to graphical user interface (GUI) or user interface design (UID) and general principle of user interface design are being written in this chapter.

2.2 Human Computer Interaction (HCI)

The improvement of technology and the Internet had contributed many advantages to every different field and people around the world. As technology is improving rapidly on every single day, their contribution toward each field have also been changing day by day. For an example, websites are emerging as a key component of an organization's survival in our globalizing competitive world [1]. This condition goes in the same way for educational field whereby improvement and changes are being applied on it. As a conclusion with the revolution of technology and education field, the website had been used as a representative of communication tool between university, student and lecturer. Nowadays, creating a

functional website is insufficient this is because both interaction and interface design component are equally important as functionality. According to Jorgensen et al., (2008) user interface has been around since the invention of a computer, or even before the field of Human Computer Interaction (HCI) started. However, before having a deep understanding towards the importance user interface, knowledge of human computer interaction (HCI) is needed to be acknowledged by the researcher.

Human Computer Interaction (HCI) is the study of interaction between people (users) and computers. It is concerned with understanding, designing, implementing, and evaluating user-interface so that a good interaction can occur between human and computer. According to P. Zhang (2006), she said that HCI is a design that produces a fit between user, machine and required services in order to achieve a certain performance both in quality of service. Thus the main goal of having human computer interaction is to improve the ease of existing products and explore new paradigms using computer. Furthermore, it can help in building a better product for the use of human beings. Since human computer interaction is the study of interactivity between human and machine, thus knowledge for both machine and human side are needed. As has been mentioned in the previous paragraph, the researcher will not be only focusing on human computer interface design, however the researcher would also be focused on user interface design. Human computer interaction (HCI) is the relation of user and computer system. The whole progress of HCI is form of interactions of the system with interface and the interface with the user. As a conclusion in order to help in improving the interactivity occur between users and computer, knowledge of human computer interaction and user interface design are being needed. Therefore, every golden rule and heuristic techniques found under human computer interaction and user interface design are essential for the researcher.

2.2.1 Shneiderman's 8 Golden Rules

Shneiderman's 8 Golden Rules were design by Ben Shneiderman an American scientist at Human Computer Interaction. He had proposed the 8 Golden Rules in order for

improving the usability of an application by providing a well designed interface towards users.

2.2.1.1 Strive for Consistency

As we know using computer the users have to carry out many actions such as clicking, pointing, dragging and placing. These several actions maybe need to do by users in a repeated cycle, so it will form a habit for a given interface environment. Therefore, to prevent increment of cognitive load it is vital that the interactions have to be reliable but also consistent across all interfaces constituting a task. According to Theo Mandel the principles of consistency are principles which make interface design be consistent includes sustain the context of the user's task, maintain consistency within and across products, keep interaction results the same and lastly provide aesthetic appeal and integrity. Follow by, consistency in presentation where enable users to read and see information or objects in the same logical, visual or physical way in the product, Next is consistency in behavior which mean the way of an object works or function should be same at everywhere. Lastly is the consistency in interaction techniques, example shortcut keys provided should work in a similar program, as users expect to have the same results when interacting with different object with the same interaction techniques [2]. The first rule in 8 Golden Rule- strive for consistency is meant by the interface design must be consistent on every single level. Furthermore, this consistent sequence should also be applied to graphical user interface (GUI) environment. Besides interface design, every commands, actions and terminology which will be implemented on the products must be in consistent sequences throughout the whole designing process. For example, screen layout size, color, font style and those menu buttons need to be consistent from one screen to another.

2.2.1.2 Enable Frequent Users to Use Shortcuts

As it was mentioned just now when using the product users tend to repeat the same actions so frequency of use had been increase. Thus, users might feel tired on repeating the same action as a result user's desires to reduce the number of interacting and pace of interaction have been occur. In order to solve this problem, shortcut keys, function keys or

hidden command can fulfill the needs of users. By knowing and applying those abbreviations and macro facilities towards the product, it will ease the use of an expert user. In conclusion, user won't have to repeat those boring and tired action anymore after knowing the shortcut keys.

2.2.1.3 Offer Informative Feedback

It is essential that after users have carried out every single step or process informative feedback should be provided. This is to allow users know which process have been done by them and which state they are currently on. Users have the right to know and see the consequences of their actions throughout the process. If informative feedback is not being provided, user might get confused and disoriented. For frequent and minor actions, the response can be modest, on the other hand, infrequent and major actions, the response should be more substantial [3].

2.2.1.4 Design Dialogs to Yield Closure

The interactions which occur between human (users) and computer is just like having a conversation towards each other. As an example, when user had completed the actions, there will be shown a message box to inform the user. The designer should bear in mind that when they are designing the product, it is crucial that the task which are going to be carried out must be well organized in correct sequence and being organized into three different stages, a beginning, a middle and an end. After each stage had been done by users, informative feedback provided by the system makes operator to feel satisfied after accomplishment and a sense of relief. Moreover, the dialogs also act as a signal to drop contingency plans and options from their minds, and an indication that the way is clear to prepare for the next stage of actions [3]. On other words, is that to make sure users know when the task is at its end as they need to have feeling that the task has been reached.

2.2.1.5 Offer Error Prevention and Simple Error Handling

In order to fulfill this rule, design a system or form whereby users cannot make a serious error. If the user makes a mistake, clear, precise and concise information about that error should be received by the user. Thus, after knowing the mistake being done by the user, they are able to perform easy steps in helping them undo their mistake. Besides that, when errors are being made the system should have the ability to detect the error and offer simple, comprehensible mechanisms for handling the error [3].

2.2.1.6 Permit Easy Reversal of Actions

Besides offering error handling and informative feedback towards the user, it is also important that user are being permitted to undo what they have done before, whether it is in the nature of an error or not. Since the users are allowed to undo their mistake or error, thus it encourages exploration of unfamiliar options. The units of reversibility may be a single action, a data entry or a complete group of actions [3].

2.2.1.7 Support Internal Locus of Control

This is to make the user feel in charge of the computer or the system when the system gives responds to their action. By having this interaction the satisfaction of user will be high and they won't feel that using the computer and the system is hard, thus they may take the initiative to proceed to the next step as they felt confidence in using the computer. In conclusion, design the system to make users the initiators of actions rather than the responders [3].

2.2.1.8 Reduce Short-Term Memory Load

According to Miller's Low he suggests that human can only store an average of 5-9 pieces of information in their short-term memory within 15-30 seconds time of duration. Therefore, it is possible that to make everything be simple and free of memory burden

towards users. For example, instead of asking the user to key in their course name it is more advisable that presenting or providing options towards users for them to choose between it. As a result, the display or interface must be kept simple, multiple page displays are consolidated, window-motion frequency be reduced and last but not least sufficient training time be allotted for codes and sequences of actions [3].

2.2.2 Norman's 7 Principles

Norman's 7 Principles suggest that actions should be performed in a cycle, such as establishing a goal, executing the action and evaluating the results. In the year 1988 Donald Norman had created or proposed seven rules which help in simplifying the design work of designing the user interface and provide ease between the interaction of users and computer. His main goal of having this rule is for transforming those difficult tasks into simple ones.

2.2.2.1 Use Both Knowledge In The World and Knowledge In The Head

This principle give a brief idea that, people tend to work better when they got the knowledge regarding on the task that they will be carry out later. In this principle, the knowledge needed can be divided into two types which is knowledge in the world where it can be easily gained by visual or others sense inspection. While the other type which is knowledge in the head, whereby it gained from experience and previous encounters. One of the example of proving that product or system whether it is fulfill to this principle, we can see whether there occur words or menu like contact us, FAQ (Frequent Ask Questions) and home. Just by having this few simple words together with the knowledge in world we are able to know and interpret how the links function.

2.2.2.2 Simplicity The Structure of Tasks

This principle's aim is to create a system or website that have simple task. This is because the easier the tasks which will be perform by users in the future it can help in avoiding use of excessive memory load. Besides that, task is meant to be as simple as

possible in order to avoid complex problem solving. If the task conducted by users is way too complex and difficult, users might end up getting frustrated and eventually stop doing it. The designer has the responsibility to break a difficult or complex task into an easy one so that users are able to solve and complete it in a blink of eyes. This is to ease the usability of user and for fulfilling user's requirement where every task structure must be in simplicity form.

2.2.2.3 Make Things Visible: Bridge The Gulfs of Execution and Evaluation

Visibility play an important role in the aspect of design, thus when designing an interface it is important to have visible features and always inferring the right or precise message to users. The meaning of bridge the gulfs of execution and evaluation is meant by making things to user so they know what actions should be taken by them next. Whereby the gulf of execution is to prove whether the system provide action which correspond to the intention of user, while gulf of evaluation is to ask does the system provide a physical representation that can be directly perceived and that is directly interpretable in terms of intentions and expectations of user [4]. After user executed an action the result will be shown immediately. It is crucial to make sure that a system should have actions which match user's intentions [4]. In conclusion, an effective interface design is that the interface can clearly show what the system can do and how it is achieved. Besides, the system will also enable user to see clearly the effect of their action towards the system.

2.2.2.4 Get the Mapping Right

Mapping actually is a technical term which means the relationship between two things or it can be said as the relationship between moving a control and the results in the real world [4]. So the principle of get the mapping right is to represent user intention should be map clearly onto the system controls. Then the controls, slider, dials would reflex the task. For an example the way of using a mouse, when user move the mouse forward on the mouse pad, the cursor will move upon the computer monitor whereby we are actually mapping the movement of the mouse to the movement of cursor.

2.2.2.5 Exploit the Power of Constrains, Both Natural and Artificial

The word constrains is mean by the limit which occur towards the perceived operation of a device. Constrains in designing principle can be categorize into few different types which are physical constrain, semantic constrain, cultural constrain and logical constrain. During the process of creating an interface or system it is important that the designer bear in mind that constrains are things in the world which would make it impossible to do anything. Therefore only with the correct action in the correct way only can solve the problem and proceed to the next step. In conclusion, designer must remember to use good visibility and feedback to overcome every single constrain that might face by users.

2.2.2.6 Design for Error

Every first time user may have undergo certain types of error and make a mistake action while using the system. Thus, designer had the responsibility to predict what error might be faced by user and create a solution or design recovery for that particular error. Design should allow human error to be occurs as this can let the user understand causes of the error and try to minimize them. Besides that, designer must make undo action be possible, follow with making error be easily discovered by user so that they can fix up at the first time [4]. This principle act exactly same as the offer error prevention and simple error handling rule in Shneiderman's Rules.

2.2.2.7 When All Else Fails, Standardize

By standardizing the interactive design and layout of an activity, we are actually helping users by making it easier for them to repeat the activity. Sometimes the interactions which occur between user and computer are not in a simple structure, besides it might not be easy mapping. Therefore, we can support the user by always presenting the interaction in same way. Standardization principle eventually help first time user to adapt to the use of a

new system in a short time period. Moreover, user won't be having difficulty when using the product so user gains confident and able to take control over the system easily.

2.2.3 Jacob Nielsen 10 Heuristic of Usability

The purpose of heuristic evaluation is to find and help identify usability problems in user interface design. It specifically involves evaluators examining the interface and judging its compliance with recognized usability principles (Source: Wikipedia). Jacob Nielsen's heuristics rules may be the most-used usability heuristics for user interface design, together with Rolf Molich they have proposed 10 Heuristic of Usability in 1990 where it is finally being released in 1994. Jacob Nielsen 10 Heuristic of Usability is actually a general principle that can be used by designer will creating user interface design. It is known as heuristic this is because the rules are more in the nature of rules of thumb than specific usability guidelines.

2.2.3.1 Visibility of System Status

When user is conducting a task, it is good to let the user know their current state and what have been done by them previously. Thus system should always keeps users informed on every process that be going on, by providing informative and appropriate feedback within a reasonable time.

2.2.3.2 Match Between System and The Real World

The language, words, phrases and concepts use in a system should be understand by users where meant by a system have to speak the user's language rather than system-oriented terms which might be difficult to be understand or interpret by users. In order to match with the real-world conventions, the designer should make information appear in a natural and logical order.