Chapter 5: Proposed Framework

5.0 Introduction

This chapter discusses a proposed framework to determine character and quality attributes of an academic web site using six different academic institutions throughout Malaysia. There is not much research going on this subject from the Malaysian perspective as existing models for academic web site are designed specially for foreign universities. Quality is very important factor for our Malaysian academic web site. As a developing country especially in the educational field one way of attracting projects funding, research collaboration or even foreign students is through providing an academic web site that depicts quality.

5.1 Proposed Framework

The proposed framework for designing a web site consists of the following major elements:

5.1.1 HCI principles

The importance of Human Computer Interaction HCI in to ensure a quality and usable academic web site, cannot to be taken lightly. The human-computer interface is a fundamental part of making an academic web site more successful, safe, useful and pleasurable to the user. Human Computer Interaction, or HCI, is the study, planning, and design of what happens when human and a computer work together IBM (2000).
5.1.1.1 HCI Principles for Academic Web Site

Basic HCI principles that govern software interface design also apply to designing Web sites and Web applications. A badly designed user interface can doom a software product despite its complex functionality or the power of its technology. Meanwhile a poorly designed academic web site interface, despite its impressive graphics and contents, can propel the user to another academic web site with one click of the mouse. This section discusses the quality requirement of an academic web site from HCI perspective. These requirements are seen from the following dimension that is user-centered design with focus on the user, task environment analysis, human factors focus to user interface design and guideline, and web usability.

5.1.1.2 User-Centered Design

User centered design can be used as a quality attribute to determine the effectiveness and quality of an academic web site. Users play an important role in determining the quality of an academic web site as they are the one who are going to use it. Thus evaluation of an academic web site should be done based on who are the users and their characteristics and does the academic web site meet their requirements? This can be taken as a prerequisite in determining the quality and usefulness of an academic web site as an academic web site is more effective when it is directed to specific audience niches. The following attributes can be used under user-centered design to determine quality of an academic web site from the user’s aspects.

1. **User characteristics**

This attribute includes the following sub attributes that must be considered. Examples of characteristics are user’s age group, academic background, economic status and language.
2. User types

An academic web site quality can be evaluated based on type of users that is divided into three main categories:

a. First-time users – For this type of users the following should be considered in evaluation of the academic web site i.e. does the academic web site provide and overview to understand what are the services or the information an academic web site has to deliver and what is not available, plus buttons to select actions.

b. Intermittent users – As for the intermittent user evaluation of web site quality done by determining does the academic web site provides an orderly structure, familiar landmarks and reversibility during exploration.

c. Frequent users – Are lecturer and students. For this type of users quality can determined by does the academic web site provides shortcuts or macros, compact in depth information and extensive student and staff service to their varied needs.

5.1.1.3 User task analysis

User task analysis allows the designer of a web site to learn about the sequences of events that a user may experience in reaching a goal, and providing an appropriate metaphor based design for the user. A quality web site or an academic web site should be developed based on a user task analysis. The focus on task actually is very much related to OAI model (Objects/Actions Interface model) for web design (Shneiderman, 1998). The OIA model follows a hierarchical decomposition of objects and actions in the task and interface domains and can be used as a guideline for web designers in decomposing a complex information problem and fashioning a comprehensible and effective web site. Thus this model can be used to determine the quality of an academic web site by determining whether an academic web site has included a user task analysis using the OIA model by making sure the following four sub-attributes are present in a web site:
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1. **Structured information** – Does an academic web site shows information being structured or aggregated? Structured information allows users to locate and understand information being presented on the web site. Academic institutional web site normally contains abundant information and this information needs to be structured in an orderly manner. A highly organized academic web site depicts a quality web site. Below are checklists that can be used to determine whether information is presented in a structured or orderly manner are as follows. Thus an academic web site should have adapted at least one or combination of following information organization style:
   a. Short unstructured lists
   b. Linear structures
   c. Arrays or tables
   d. Hierarchies, trees
   e. Multi-tress, faceted retrieval
   f. Networks

2. **Information action and search strategies**– enable users to follow paths through the information. Most information resources can be scanned linearly from start to finish, but their size often dictates the need for shortcuts to relevant information. An academic web site can be evaluated based on does the aggregate information actions are composed of the following actions that enables users to retrieve and benefits from the academic web site by allowing them to.
   a. Browsing
   b. Locating a term
   c. Using keyword to perform search and gain a list of information.
   d. Following cross reference from one legal precedent to another, until no new relevant precedent appear.
   e. Scanning

As for evaluating academic web site based on search strategies the following four-phase framework search strategy that can be combined together with information actions
mentioned above can used. The four-phased search strategy contributes to quality of an academic web site through enabling search process for users from different levels more visible, comprehensible and controlled by the users.

a. **Formulation** on an academic web site includes the following:

i. Source: database of information, XML documents.

ii. Fields for limiting the source: structured fields such as year, media or language, and text fields such as titles or abstracts of document.

iii. Phrases to allow entry of names or concepts

iv. Variants: to allow flexibility of search constraint such as case sensitivity, stemming, partial matches, phonetic variants, abbreviations or synonyms.

b. **Action that may be executed**

v. Explicitly, by a button with a consistent label, color and size.

vi. Implicitly by changes to a parameter of the formulation phase which immediately produces a new set of search results.

c. **Review of results** – that allows users to do the following:

vii. Read explanatory messages.

viii. View textual lists.

ix. Manipulate visualizations.

x. Control of the size of the results set and which fields are displayed.

xi. Change sequencing 9 alphabetical, chronological, relevance ranked, etc).

xii. Explore clustering (by attribute, value, topics, etc)

d. **Refinement**

xiii. Meaningful messages guide users in progressive refinement.

xiv. Changing search parameters should be convenient.

xv. Search results and the setting of each parameter can be saved, sent by email, or used as input to other programs.
3. **Metaphors for interface objects** - Appropriate metaphors help viewers switch to a correct mental setting and set correct expectation. Consequently, the degree of comprehension of the Web site is increased. This attribute can be used to evaluate the quality of academic web sites by:
   a. Appropriate metaphor usage for the concepts or tasks being represented
   b. Metaphors at pixel level detail
   c. Usefulness of metaphor as a support tool for information seekers.

4. **Handles for interface actions** - Academic web sites should display appropriate action plans based on visible actions handles such as the labels, icons, button, or image that allows users to compose their action plans conveniently from a series of clicks and keystrokes. Below are list of actions plans that can be used as a guideline for academic web sites:
   a. Searches are made explicit with buttons.
   b. Searching for academic articles or journals are made explicit and other plans for search such as searching by date, language or publisher could also be made more visible by a form fill – in interface or by widget attached to the display of a catalog record.
   c. Turned page corner to indicate next page
   d. A highlighted term for a link
   e. Magnifying glass to zoom in or open outline
   f. Filters to show progressive query refinement
   g. Funnels to show sorting
   h. Pull down menu item
   i. Descriptive text fields
   j. Feedback buttons
   k. Help buttons
5.1.1.4 Human factor in user interface design and guideline

User interface plays an important element in determining success of a web site and indirectly contributing to a web site quality. The following attributes in this section can be used to measure academic web site quality:

1. **Consistency** – An academic web site should shows consistency in the following aspects:
   a. Terminology – e.g. same terminology used for the same button appearing in another web page.
   b. Menus and buttons – consistency in term of:
      1. Labels
      2. Grouping or order of menu
      3. Menu item represents same actions when activated
      4. Size
      5. Color
      6. Font
   c. Layout
   d. Prompts
   e. Help screens

2. **Error Handling** – An academic web site quality should be evaluated based on its error handling capabilities by looking at whether the following factors are present:
   a. Easy reversal of action – The academic web site should be able to allow user to do undo their actions such as in form filling or navigation aspect.
   b. Offer error prevention and simple error handling – The academic web site should be able to detect any errors made by the user for example in form filling
   c. Support internal locus of control – The academic web site provides sense of user being in control.
d. Effective error messages – Clear and precise instructions given to user for recovery from an error.

3. **Informative feedback** –
   a. Academic web site should be able to provide informative feedback for all user interactions.
   b. Any indication for time elapses for information feedback – e.g. indication in terms of image, icons or textual if system could not respond within few seconds.

4. **Information Representation** - Academic web site contains abundant information and information should be represented in a way that that user can extract important information easily. The attributes that need to be considered for this part are:
   a. Positioning of information: Important information positioned at top easily viewable. Less important information positioned at bottom. Information appearing in the academic web site are presented in logical order.

5. **Match between web environment and the real world**
   Any web site including academic web site should speak users’ language, with words, phrases and concepts familiar to the user, rather than technical terms. To ensure quality of an academic web site the following should be taken into consideration:
   a. Use standard menus for standard actions – (Help, open, close, save, save as.., print, Undo, Copy, Cut, Paste, Clear)
   b. Organize menu items in logical order (alphabetic, size, grouping)
   c. Menu items can be activated or inactivated according to possible options in the current situation.
6. **Meaningful interface and icon** – It is important to ensure that the interface is easy to use and learn. Meaningful interface can be seen from the following aspects:

   a. Command names – Commands names have to be meaningful and appropriate to its usage.
   b. Standard menu texts need to be easy to understand – The menu heading make clear type of information found in that menu.
   c. Meaningful icon – the icons used in the web site should be appropriate and meaningful in terms of:
      - Context
      - Task
      - Form of representation
      - Underlying concept.
      - Icon labels

5.1.1.5 Web Usability

Web usability is often associated with effectiveness that is the accuracy and completeness with which users achieve specific goals. It is also related with users’ ease of finding information and learning abilities. Web usability is an important factor in academic web site. The quality of an academic web site does depend on its usability. The following criteria can used to measure academic web site usability.

1. Errors in information
2. Frequency in error rates
3. Download times - It is slow due to large multimedia files and useless Java scripts and plug-ins.
4. File sizes
5. The information is disorganized and poorly structured.
6. Pages are cluttered.
7. Site maintenance and updates
8. Annoying pervasive banner ads.
9. Web design user centered. – Concepts discussed in user centered design above can be applied to evaluate web usability.
10. Human factors in user interface design and aesthetic – can also be used as an indicator to determine web usability. This is because a well designed user interface increases users satisfaction and their learn ability.
11. Efficient URLs
12. Number of mouse clicks not to many until it might annoy the user
13. Contact human help – email? Web form?
14. Use of help files
15. Plenty of information
16. redundant information
17. Multimedia and images used appropriately to enhance web usability not to distracted users attention which may lead to dissatisfaction.

5.1.2 Quality Characteristics and Attributes for Academic Web Sites

This paper by Olsina et al (1999) has been explained in detail in the literature review section chapter two. This paper has outlined quality criteria to understand, assess, and improve the quality of Web-based systems focused on academic web sites.

The fundamental idea or core concept of this is as follows:

1. The evaluation model has contributed in terms allows us to analyze and draw conclusions about the state-of-the-art of academic sites quality, from the current and prospective student’s point of view.
2. Evaluation methods and techniques needs to be look from both qualitative and quantitative aspects.
3. Categorization of Web-site sub-characteristics and attributes into six standard characteristics, which is described with minimal overlap, software quality requirements. Quality may be evaluated in general by the following characteristics: usability, functionality, reliability, efficiency, portability, and
maintainability. These high-level characteristics provide a conceptual foundation for further refinement and description of quality. The quality tree can be referred in the literature review section.

Thus this paper plays a significant role or contribution in coming up with a more refine framework in assessing quality of an academic web site. The main ideas from the quality tree will be used in proposed framework.

5.1.3 2QCV2Q: A model for web site design and evaluation

The 2QCV2Q model has been described in detail in the literature review section. This model is mainly use to evaluate quality of a web site using the seven loci or dimensions. The seven loci constitute the general framework of the “quality models”, which is independent of the sites under analysis.

The first dimension, Identity, regards the image that the organization projects and therefore all elements that come together in defining the identity of the owner of the site. Content and Services refer, respectively, to the information and services available for users. Location regards the visibility of a site; it also refers to the ability of the site to offer a space where users can communicate with each other and with the organization. Maintenance comprises all activities that guarantee proper functioning and operability of the site. Usability determines how efficiently and effectively the site’s content and services are made available to the user. Feasibility includes all aspects related to project management.

Weight is then applied to each of the attributes in the seven loc that is essential for evaluation process. This can be considered as the significance or strength of the model as it proposes the idea of quantitative evaluation. The quantitative method, as its name implies, uses a numeric scoring system.
5.1.3.1 Importance of quantitative evaluation in determining quality of academic web site

A formal evaluation process such as quantitative evaluation is desirable when evaluating or comparing quality of academic web sites. This is because a formal evaluation process adds credibility to the final decision and removes or lessens the perception of a biased or arbitrary selection.

For the proposed framework in this study, some of the ideas from this model will be extracted. The main idea will be on quantitative evaluation. Basically there is three main method in quantitative evaluation using weighing system:

1. Band Method
2. Desirability Ratio Method
3. Assigned Point Method

The advantages and disadvantages of the methods listed above are mentioned in literature review. For the purpose of this study the Band Method would be used together with the proposed work. This method is chosen as it is the easiest to use especially when it involves a large number of attributes that needs to be evaluated and this scoring method is intrinsically meaningful without further interpretation. Furthermore it allows evaluators flexibility to exercise their judgment.

5.1.4 Information evaluation and management on academic web site

Academic web site quality mainly relies on its quality of the information. The quality of information meanwhile relies on the how the information is being managed. Thus for the proposed framework it is necessary to include attributes that will be used to test the accuracy and reliability of information being presented in the web site as well as information management issue.
5.1.4.1 Information evaluation

As mentioned above quality of an academic web site is determined mainly by its content. Discussion on model that can be used to evaluate information on a web site has been carried out in the literature review. However the models discussed are for general web site. Thus for the context of this study a set of attributes needs to be generated specifically to evaluate information or content in an academic web site especially targeted for Malaysian academic institutions. It is suggested that to evaluate information the following attributes needs to be considered:

1. **Scope:**
   a. Purpose of the web site. It is identified that an academic web site should have the following purpose of its existence:
      i. Provides general information of an institution
      ii. Courses/ Program offered
      iii. Staff information and human resource information and activity
      iv. Institutional facilities
      v. Activities carried out in the university or faculty
      vi. Academic publication
      vii. Faculties information
   b. Is the site inward-focused or outward-directed in its linking?
      (disinformation is often self-referencing)

2. **Audience:** Audience is a key factor in evaluating site information. Information needs to be at a level that the user can understand and assimilate it. Information which is too complex or too simple is often useless.

3. **Credibility:** As commercial activity has increased on the Web, marketing has also increased. Many "information" sites are thinly disguised marketing or public relations efforts created by interested corporations. Identifying the credibility of the academic web site can go a long ways toward understanding the bias (if any) present in the creation of the site.
Here are some examples of questions that need to be answered in order to achieve acceptable level of credibility.

a. Are there headers, footers, or background "watermark" which could establish a relationship to an institution?
b. Is there any contact number / e-mail of the Web master of the site?
c. What can you determine about the site by reading its URL? Is the suffix ending with edu?

4. **Currency:** Currency is of vital importance in academic field as it is very competitive nowadays. Every institution is trying to offer courses with latest technology application to ensure quality education. Currency not only deals with academic web site information but it also includes currency in terms of research and publication produced by the institution. The questions listed below need to be answered initially

a. When was the site created?
b. When was it last updated?
c. Does it include the date when the information was gathered?
d. Is there a date of copyright?
e. Or a date that the research was conducted?
f. Is there a publication date from a conference or another journal?
g. How up to date are the links?

5. **Other related issues:** Stability of information, ease of use in terms of both convenience or organization and speed of connection

5.1.5 **Information evaluation and management**

As a new medium, the Web has been widely accepted, from the scientific, social to the academic world. The quality of information or content in an academic web site depends on who and how the information is being handled. Furthermore web information management has the long-term effect of distributing the maintenance and workload to
any number of people in the organization, keeping operational costs down. Frequency of errors in content posed in academic web site can be reduced too by distributing content management to staff who are expert in the content rather than the administrator or web designer handling it alone. It is also suggested that frequency of errors can also be reduced when information or content is separated from design as being discussed in the literature review section. The following guideline can be used for this section to determine a quality and error free academic web site:

1. Is the information and design on academic web site maintained separately?
   f. This can be seen from the coding of the web site whether the information is being exported from another medium.
   g. Or is there any software used that enables the design/layout, site/page structure, and document content to be brought together automatically.

2. Does staff that possess specialized knowledge work provides and maintain content of an academic institution?

3. Availability of quality control being carried out by the each faculty head or other content examiner to ensure and control the quality of content.

5.1.6 Cost, budgets, technical significance, and other requirements

The tools and techniques that have been developed in HCI field have contributed immensely towards decreasing costs and increasing productivity. Savings were attributed to decreased task time, fewer errors, greatly reduced user disruption, reduced burden on support staff, elimination of training, and avoidance of changes in web site after release. Thus in order to evaluate an academic web site from this perspective might seem difficult. However HCI based web site development can be used as a benchmark to roughly conclude that the above factor has been considered.

Besides the cost factor and technical there are issues that follows needs to be considered:

1. Browser compatibility – can the academic web site be viewed in different browsers without loosing or unable to display some information?
2. Can the academic web site be viewed with minimal system requirement – e.g. display of at least textual information?

3. Software or scripting language used to develop the academic web site – the cost increases if a web site is develop using software or scripting language that is difficult to master.

5.2 Summary

Figure 5.1 provide a complete and accurate quality evaluation especially for Malaysian academic web site. This diagram depicts five major components that are suggested for holistic evaluation academic web site quality.
Figure 5.1 Proposed framework to determine quality of academic web site