CHAPTER 3 DESCRIPTION OF QUESTIONNAIRES: REQUIREMENTS GATHERING FOR DESIGNING EDUCATIONAL SYSTEMS

3.1　Introduction

In this research, the author is concerned with the usability of learning courseware among the students in Klang Valley and Selangor. Therefore, I had to come up with the most appropriate evaluation method for this study. The main reason for evaluation is to gather requirements for designing a usable educational courseware for tertiary level students around this area.

The criteria considered to come up with an evaluation method were cost, time available to do the evaluation, availability of suitable expertise and equipment, environment of the study, access to users and the nature of the courseware themselves.

The evaluation method proposed in this particular research project is by getting users opinion (which are of course, students) with a set of questionnaires, consisting questions which are well defined using some elements in socio-constructivism and software heuristics which are presented in chapter 2.

Since the context of study is mainly for Klang Valley and Selangor students, I narrowed down my scope for a more localized design of educational system.

The questions prepared takes into account both usability and learning issues. Besides this, the aspects, which are considered, are stated below:

- Most questions are given relative weightings, such as a scale 0 till 5 , for a more precise answer.

- Focus is on educational, technical and also cultural aspects.

- Focus on socio-constructivist way of learning, which is proved to be more advantageous.

- Very generalized set of questions, which accommodates for many different subjects.

- Usage of close questions to statically analyze the results.

In this section I will discuss in more detail on the questions that are compiled in the questionnaire for evaluation of educational systems among Malaysian students. The questions are categorized into few main topics, which are discussed below. These main issues are related with the socio-constructivist view of learning, software heuristics by Nielson and also by accommodating the culture of Klang Valley and Selangor learners according to their background and also the Malaysian Education System.

3.2   User Characteristics

In the socio-constructivist point of view, the learner's previous knowledge construction, beliefs and attitudes are considered in the knowledge construction process. The learner's background and skills in this context refers to the Klang Valley and Selangor learners, therefore, in order to come up with a more usable and appropriate design, we must first consider looking at the characteristics of the target users. Issues that must be noted here are learner's levels of experience, learner's skill in using computers, and learner's English language proficiency .All these issues are described in detail as you read on.

3.2.1   User's level of experience

This is to find out whether the user has any prior knowledge in using the software. A user can be categorized as novice, basic or expert. A novice's knowledge construction will differ with the expert's construction. This is because the requirements for a novice are different from the requirements for an expert.

3.2.2   Computer skills

If the learner is not skillful in using computers, it might affect the overall purpose and benefit of using the educational hypermedia or software. The learner will not be able to explore and navigate to look for information.

3.2.3   Proficiency in English.

Language is one of the important mediums used in the communication between the user and the computer. A learner will have to understand the language used by the developer of a system to be able to use it appropriately. In my research, all the educational hypermedia or software that are being evaluated are in English, therefore, I need to check on the fluency of this language among the Malaysian learners so that I would know how much effect the language has on the usability of a particular system.

3.3   Goal/ Task Characteristics

Socio-constructivism stresses on problem solving, higher-order thinking skills and deep understanding. A usable learning hypermedia will accommodate this feature for its users, which are the Malaysian students in this context. Through some clues stated in the questionnaire, I wish to know the motivation of these students for using the system so that I will be able to know how far it is being used constructively. The options given for the students to choose are as follows:

- To gain more knowledge

- To learn new skills

- For the fun of it

- Part of course requirement in college/university

- To retrieve information to assist learning

- For problem-solving

The evaluators will be given a chance to write down his/her own purpose if it is not provided in the above list.

3.4   Social Acceptability

According to software heuristics developed by Nielson, social acceptability is one of the element is evaluating software and hypermedia usability. The social acceptability in this context means how far is the hypertext acceptable in the environment of its usage. This can be interrelated with the Malaysian culture in learning and also the socio-constructivist view of learning. For example, according to the Malaysian Education System, learning is more teacher-directed rather than learner directed. Therefore, some educational systems might be designed constructively to accommodate the constructivist learning. We have to see whether the shift is acceptable to the students here or not, to determine the usability of the particular hypertext in learning.

In the socio-constructivist point of view also, exploration is a favoured approach in order to encourage students to seek knowledge independently and to manage the pursuit of their goals. But, the question now is, whether this approach is acceptable in the culture of Klang Valley and Selangor students.

3.5   Practical Acceptability

Given a system is socially acceptable, we can further analyze its practical acceptability into various category including traditional category such as cost and reliability, and the category of usability, where it's a question of how well users can use the functionality.

3.5.1   Traditional category

3.5.1.1   Reliability

According to the software heuristics defined by Nielson, [48] reliability of a software means it must have few bugs and follow its specification correctly. A system, which is not reliable is not preferred by users most of the time due to time factor and trust on the feasibility of the system. A system that does not work well is often regarded as unproductive, especially if it is an educational system. In an educational environment, students are required to finish a certain amount of work in a given time, therefore, the reliability feature is important to give them a fast response to finish their work on time. Due to this factor, as system failure often kills the students interest in using it, I have considered the reliability of an educational system to make a good decision for choosing and designing a usable system for learning.

3.5.2   Usability category

According to software heuristics defined by Nielson, usability is associated with five parameters: These parameters are interrelated with socio-constructivism.

3.5.2.1   Easy to learn

Easy to learn here means [48]: -

- The hypertext or software is easy to learn.
- Users are quickly able to understand the most basic commands and navigation options and use them to locate wanted information.
- When users enter an information base for the first time, they are immediately able to understand the first screen and to browse it from.

- Users are quickly able to learn the basic structure of the hypertext network and where or how to look for specific information.
- Users of educational system can learn the session without having to familiarize themselves with the entire hypertext or software structure.
- The contents of the information base are easy to understand.

A system which is easy to learn and not complex may give the students more room for learning the concepts of a study. Therefore more stress can be given for learning a specified subject rather than learning to use the interface itself. As easy to learn interface allows learners to explore the system to seek knowledge independently and to manage the pursuit of their goals.

3.5.2.2   Efficient to Use

Given that users want to find a certain piece of information, the software or hypertext is efficient if the user gets to it quickly or soon discover that it is not in the information base. When the users arrive at a node, they are quickly able to orient themselves and understand the meaning of the node in relation to their point of departure [48].

Efficiency can be measured by measuring the reading speed on computer screens and on printed form [49, 50]. In the questionnaires, I have set a question, which will ask the students about their experience in learning the same subject using a computer and book. They are asked to rate the system according to the speed of learning compared to books or other printed form. A scale up to 5 is given for the students to choose.

With this, I would be able to determine the efficiency of the software according to student's perspective.

3.5.2.3   Easy to Remember

The ability of casual users to return to using the system without having to learn everything all over again is of course extremely relevant for the usability of software. Just consider how often you return to a printed book you read some time ago to check some fact. It is very likely that users of hypertext or systems would also want to return to specific hypertext documents some time after the initial reading. And there might be also hypertext systems offering facilities which one would only need in rare circumstances and which one would therefore always use as a casual user. [48]

In this study, I have asked the students to use a system/hypertext, which they have left for a week or so, so that they would be able to answer the question regarding ease of remembering more precisely. They would be able to return to the system without much problems and errors and with better performance if the system is easy to remember.

3.5.2.4   Few Errors

Users will rarely follow a link only to discover that they really did not want to go wherever the link leads. In case users have erroneously followed a link, it is easy for them to return to their previous location. Users can in general easily return to locations where they have been, in case they decide that some lengthy digression

should be abandoned. If this is the case, users using the system experience very few

errors.[48]

Users are asked to make conclusions about their experience in using a particular

system. If they experience frequent errors while using the system, it is likely that

they are not used to the system or find it difficult to use. Again, a scale from 1 till 5

is given to rate the frequency of errors experienced by users.

3.5.2.5   Pleasant to use

Pleasant to use in this context means, users prefer using the computer system to

existing alternative solutions such as paper or others. Users are rarely frustrated with

using the hypertext engine or software. Users feel that they are in control with

respect to the hypertext or software and that they can move about freely rather than

feeling constrained by the system. [48]

It is almost impossible to directly measure users' satisfaction with a system.

Therefore, the author used a method of measuring user satisfaction by asking the

users themselves to report their satisfaction. This is done by having a question in the

questionnaire to state their level of agreement such as " Are you satisfied with the

system?" on a 1-5 scale.

3.6   Appropriateness

The content of the software must be appropriate with age of the target users and also

compatible with the school or University curriculum. In the Malaysian Education

system, for the past many years, teachers with the help of books and other printed

form have delivered education to students. Therefore, with the new era of Information Technology, the method has been changed to accommodate the usage of computers for learning. In order to accommodate this new shift, the content of the software must be compatible with the syllabus so that students stay in the right track. Thus, it is important for the student to evaluate the education system with regard to the appropriateness of the syllabus being taught.

3.7   Method of Delivery

As discussed in the previous paragraph, the method of delivery of information in Malaysian schools and Universities has been through printed form and more teacher-directed. Therefore, the shift from printed forms to educational systems and from teacher directed to learner directed must be well adapted by the Malaysian students. With regard to this, it is therefore important to get the students opinion about this new method of delivery. With this, I can conclude how far computer systems have succeeded to replace the old method.

3.8   Functionality

A program has a functionality error if something that a user reasonably expects it to do is hard, awkward, confusing or impossible [51]. If the interface consist excessive functionality, means, it consists of too many functions in one interface, which are very hard to learn, and easy to forget how to use It also requires too much documentation, too many help screens and too much information per topic.

Functionality of a system can be interrelated with the socio-constructivist view of learning. If user errors are likely but the error messages are too general, we can

conclude that the system does not provide an insight on how to find the solution, which is very important in the socio-constructivist view of learning.

A system's functionality is a core feature for its usage. Issues such as excessive functionality, information overloads and error messages will determine how the functionality of the system affects the student's interest and productivity from a particular system. The questionnaires proposed in the research, consists of all the questions related to the issues mentioned earlier.

3.9   Communication

This section describes errors that occur in communication from the program to the user [51].

3.9.1   No onscreen instructions.

How do you find out the name of the program, how to exit, and what keys to press for help?

3.9.2   States that appear impossible to exit

How do you cancel a command or back up in a deep menu tree? Programs should allow you to escape from undesired status. Failure to tell you how to escape is almost as bad as not providing an escape path.

3.9.3   Wrong, misleading, confusing information

Every error trains you to mistrust everything else displayed by the program. Subtle errors that lead readers to make false generalizations, such as missing qualifications and bad analogies, annoy testers more than clear factual errors because it's harder to get them fixed.

3.9.4   Spelling errors

Programmers don't worry too much about their spelling mistakes, but they are very important for users. Therefore, it is important to determine if there are any spelling mistakes in the educational system.

3.9.5   Invalid metaphors.

Metaphors make the computer system seem similar to something you already know. They are good if they help the user predict the behavior of computer and bad if they lead the user to incorrect predictions. Metaphors that are inappropriate for Malaysian culture might lead to confusion and dissatisfaction among the Malaysian learners. Software of hypertext used by the Malaysian students are normally designed for global concern and not specifically designated to a special group of people. Therefore, it is important to ask the students themselves about their perception about the metaphors used in the educational system.

3.9.6   Confusing feature names.

A command name "save" shouldn't erase a file; nor should it sort one. If a command name has a standard meaning, in the computer community or in the English language, the command must be compatible in the computer community or in the

English language; the command must be compatible with its name. Names that are not appropriate in the Malaysian environment for learning, if used extensively might also create problems for the students. The program should not refer to the same feature by different names. Users will waste much time trying to figure out the difference between "shadow" and "drop shadow" when the programmers uses both to mean the same thing.

3.9.7   Information overload.

The information in the software or hypertext is too technical and too detailed to the extent of confusing the answers you are looking for. Are the details useful? These are the questions that need to be asked to the students who are using the system to see if the system is overloaded with information.

3.9.8   Help text and error messages.

Messages must be short and usage of menu is necessary for further details. Inappropriate emotional tone. e.g. exclamation (!) marks can be interpreted as scolding. Violent words may be frightening or distasteful. Learners who experience this might be discouraged to use the system and lose interest in the program.

A usable system for learning will have the above problems minimized and solved, if possible. It is important for a Malaysian student to answer relevant questions to the above matters so that I could come up with a better solution especially for the Malaysian learners.

3.10   Display Layout

The screen should look organized. It should not be cluttered. Different classes of objects should be displayed separately, in predictable areas. There are many guidelines for display layout, but they boil down to this: it should be easy to find what you want on the screen. [51]

The issues in the display layout that must be considered are organization of screens, screen layout and colour. According to the heuristics defined by Nielson, a usable system must have all the features defined below:

3.10.1   Organization of screen.

Makes it easy for the user to find out what is on the screen.

3.10.2   Screen layout.

Balancing of screen and alignment of rows and columns makes the screen look good.

3.10.3   Usage of colour.

Bad colour combination can be distracting and makes the screen look busy. Usage of colours must be standardized throughout the application.. If colour is the only differentiator between items, then what would happen to a colour blind or someone using monochrome monitor?

3.10.4   Menu Navigation

There should be appropriate menus to allow users to move back to previous menu, move to the top of menu structure and leave the program at any time, able to jump to any topic you want. It should support undo and redo [32].

The features mentioned above could be incorporated with the Malaysian culture. Usage of colour, which is not so suitable, could lead to sensitivity to some students, who believes in a particular culture. The same goes for metaphors and icons. Systems that are designed for global use might not consider beliefs of a certain culture. Therefore, students who feel insulted in any way with the system will not appreciate it. In order to eliminate this, we need to come up with an educational system that embeds the Malaysian culture in its design.

Besides this, in the socio-constructivist view of learning, learning situations, environments, skills, content and tasks are relevant, realistic, authentic and represents natural complexities of the 'real world' [52]. Therefore, an educational system must be build on this basis for better performance and higher productivity.

Students are asked to evaluate the layout by getting their opinions on certain features of the layout as mentioned above. From this we are able to make a conclusion on the acceptance of the layout of a particular educational system.

3.11   Program rigidity

Program rigidity in this context refers to the appropriateness of the system for novices or whether it is novice friendly. Program optimized for novices, break tasks into many small, easily understood steps. This is to ensure that the system is suitable for those students who do not have any prior knowledge in the field of study.

3.12   Navigational issues

With respect to navigational issues, our hypermedia or educational system and their user interfaces should accommodate Barbara Allen's (1985) five ETCH IC commandments. The user should always be able to answer the following questions.[48]

   I.   Where Am I ?

  II.   How did I get here?

 III.   What can I do here?

 IV.   Where can I go to ?

  V.   How do I get there?

Users can get frustrated with the systems that are confusing and which can make them lost because they do not know where they came from, where they should go, or even how to exit the program. Users get frustrated with this experience, frequently losing sight of their original purpose in using the hypermedia or system.

3.13   Lesson Structure

In the socio-constructivist view of learning, lesson structure must be clearly defined according to its principals to ensure the system's desirability for learning. Activities, opportunities, tools and environments are provided to encourage metacognition, self-analysis, self-regulation, self-reflection and self-awareness. Learners are also provided with the opportunity for apprenticeship learning in which there is an increasing complexity of tasks, skills and knowledge acquisition.

Below are the guidelines a system must follow so that it adopts a socio-constructivist view or learning, as mentioned in the previous section.

    I.   There is a structured lesson to teach specified objectives.

   II.   A detailed description on how to perform a specified skill is provided.

  III.   The lesson contains useful examples.

  IV.   Enough exercises are provided for adequate practice.

   V.   Feedback is provided about required response.

  VI.   When appropriate, feedback is explained in detail.

Students are asked to revive the lesson structure of a particular system to see if it is defined according to the guidelines above. Otherwise, the system would be regarded as not constructive enough for the students to learn a lesson.

3.14   Conclusion

This particular evaluation method was used in this research project to assist the author get a more precise feedback on the usability of current educational systems that are being used by the Klang Valley and Selangor tertiary level students in colleges and Universities around these areas. The set of questionnaires was given to a number of students while they use a particular educational system. The results were analyzed statistically so that the author could come up with a solution for a more usable design for these students.

The results of the questionnaires can be generalized to serve as requirements for the development of a new educational system for Klang Valley and Selangor tertiary level students.