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Usability Evaluation of a Hypermedia System in Higher Education

Muzafar Khan, Aleem Ahmad

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Contact Information:

Author(s):

Muzafar Khan

Address: Folkparksvagen 14:36, 372 40 Ronneby, Sweden

E-mail: muzafarkhan@gmail.com

Aleem Ahmad

Address: Folkparksvagen 18:18, 372 40 Ronneby, Sweden

E-mail: aleemahmad@gmail.com

University advisor(s):

Hans Kyhlbäck

Department of interaction and system design

School of Engineering
Blekinge Institute of Technology
Box 520
SE – 372 25 Ronneby
Sweden

Internet : www.bth.se/tek
Phone : +46 457 38 50 00
Fax : + 46 457 271 25

ABSTRACT

An effective hypermedia educational system should be easy to use and understand. Different hypermedia educational systems have been evaluated for this purpose by researchers but there is no such study of student wiki system.

To evaluate usability of a student wiki system i.e. FUKTwiki in the context of higher education, the authors adopt a multi-phased research approach. They conduct usability test of the system where graduate students are taken as subjects. The system is evaluated on the basis of results of usability test and a questionnaire specifically designed to know the subject's opinion. Further, to validate the findings a number of individual subjects participated in usability test and questionnaire are interviewed.

The authors find that for higher education, student wiki systems could prove effective in student's learning but not with current set of tools and interfaces. Moreover it is important that a system should have sufficient amount of relevant and useful educational contents. There is need to improve student wiki systems in terms of interfaces, contents, and set of tools for creating and editing pages.

Keywords: Usability evaluation, Hypermedia educational systems, Student's Learning, Student Wiki systems.

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1 INTRODUCTION

This chapter provides the brief introduction to the thesis. In Section 1.1, motivation for the thesis is described with reference to relevant studies and background knowledge. The aims and objectives are discussed in Section 1.2 of this chapter. The research questions and expected outcomes of this thesis are mentioned in Section 1.3 and 1.4 respectively. Section 1.5 describes the research methodology in brief that will further be explained in Chapter 3. Section 1.6 provides outline of each chapter of the thesis.

1.1 Background

Usability is a term referred to the interaction of user with a system. It is often measured in terms of how easy to learn and use the system and whether user is satisfied with system or not. Usability is defined as “It is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 9241-11: 1998).

Usability consists of efficiency, effectiveness, utility, learnability, memorability, safety, and effectiveness. Efficiency means how a system supports users to do their tasks; effectiveness is an overall goal that how good a system is to do that is supposed to do; and safety is about protecting users from dangerous conditions and undesirable situations (Preece et al., 2002, p. 14). Utility means to what extent a system provides right functionality that the users want to do whereas learnability of a system is easiness to learn to use a system (Preece et al., 2002, p. 16). Memorability is easiness to remember how to use a system, once learned (Preece et al., 2002, p. 17).

Different systems are designed and implemented to increase the learning of students at different levels of education. Among these, hypermedia systems are the most important developed for this purpose (Dastbaz, 2000). These are used for different purposes in many domains like engineering organizations, travelling industry, and education. Professionals of these domains manipulate heterogeneous hypermedia documents using editing tools. Hypermedia documents contain different multimedia objects that are interlinked data like structured and unstructured text, images, videos, and voice information (Scheiter and Gerjets, 2007). These systems support collaborative manipulation of hypermedia objects, addition of new documents and links are integrated without any hurdle (Scheiter and Gerjets, 2007).

According to Shapiro and Niederhauser (2004), hypermedia and hypertext are different than other traditional media because they are non-linear. They provide user flexibility of information access and higher degree of learner control than traditional media sources. A user is free to make choices and take decisions while learning through these systems.

The examples of hypermedia systems are e-books, wiki systems, and adoptive authoring systems. Wiki system is an open source and web based system. This system allows multiple users to create and edit pages simultaneously. Users are free to upload media files like audio, video and images. More than 250 wiki systems are currently available (Kramer, R., 2007) that are used by different communities and organizations for various purposes like traveling, collaboration among employees within an organization, and education. It means these are widely in use and an emerging application of hypermedia systems. Wikipedia is a free online encyclopedia that is very popular example of wiki system all over the world (Wikipedia, 2007).

Different student wikis (e.g. StudentWiki 2007 & Leeds 2007) are in use at different institutes of higher education. Their purpose is to promote the collaboration among students,

teachers and other staff for studies and extracurricular activities. For the same purpose, FUKT (FUKT, 2007) which is a student computer society at Blekinge Institute of Technology (BTH) deployed the FUKTwiki (FUKTwiki, 2007).

Usability of educational systems is an important factor in education domain. According to Granic and Glavinic (2002), lack of an appropriate usable and user-centered interface design of different computerized educational systems decreases the interface's effectiveness and efficiency. Therefore the most important goal of current research in the field of human-computer interaction is to improve the usability of such systems.

Many studies (e.g. Matera et al. 2002, Granic and Glavinic 2002 & 2004, Plantamura et al. 2006) have been conducted to evaluate the usability of these systems but according to the authors' knowledge, there is no previous study on usability evaluation of student wiki systems in the context of higher education. The authors have aim to evaluate the FUKTwiki by involving students as subjects in usability testing of the system at BTH. This study will help to evaluate the system and to determine the shortcomings regarding its usability. It will also help to determine the effects of hypermedia system on students' learning in higher education. On the basis of the results, the authors will be able to draw conclusion about the usability of the system and put recommendations for future.

It is worth mentioned that student's learning should not be mixed with learnability which is sub factor of usability. Learnability deals with learning of a system to use it whereas learning is an actual goal of a student in context of higher education. All the sub factors of usability such as learnability, efficiency, effectiveness, and satisfaction affect the ultimate goal i.e. students' learning.

1.2 Aims and Objectives

The main goal of the thesis is to evaluate usability of a hypermedia system in the context of higher education. Following objectives are defined to achieve this goal:

- Literature review of hypermedia systems particularly wiki systems and usability evaluation
- Designing and conducting usability test of the FUKTwiki
- Compiling and analyzing usability test results
- Designing post-test questionnaire
- Compiling and analyzing collected data through questionnaire
- Evaluating usability of the system
- Validating the usability evaluation through interviews

1.3 Research Questions

Following research question will be addressed during this thesis work.

- Does the hypermedia system support students' learning in higher education?

1.4 Expected Outcomes

Following are the expected outcomes:

- Description of hypermedia systems and usability evaluation
- Analysis of the system on the basis of usability test and post-test questionnaire
- Usability evaluation of the system
- Validation of usability evaluation of the system
- Discussion on the results
- Recommendations and suggestions for future research

1.5 Research Methodology

Mixed research approach as elaborated by Creswell (2003), will be adopted to conduct this research. The research will be carried out in multiple phases. In the initial phase, detailed literature review will be done to understand the hypermedia systems and usability evaluation. It will also help to select the effective procedure for usability test and criteria for evaluation of hypermedia system. The authors have an interest to collect data using ethnographic approach by getting deep into workplace to observe students while they are interacting with FUKTwiki. After conduction of initial usability test, the questionnaire will be designed on the basis of test data analysis and in a way that results can be measured quantitatively. On the basis of data obtained through questionnaire, results will be compiled and analyzed. For qualitative validation of these results, interviews with a number of individual students will be conducted. Students who are currently studying at BTH will be selected to participate in all phases of this research.

1.6 Thesis Outline

This section provides the chapter outline of the thesis.

Chapter 2 (Usability Evaluation and Hypermedia Systems) provides basic knowledge of the areas such as usability evaluation and hypermedia systems. The concept of usability evaluation and its techniques like think aloud, questionnaire, and interview are discussed in Section 2.1. Section 2.2 describes what are the hypermedia systems particularly wiki systems. Usability evaluation of hypermedia educational systems with reference to a few studies is described in Section 2.3 of this chapter.

Chapter 3 (Research Methodology) describes research methodology adopted for the thesis. Overview of the research methodology is given in Section 3.1. Literature review which is first part of research methodology is discussed in Section 3.2. Section 3.3 contains brief description of meetings with students to introduce the system. Section 3.4 provides introduction to usability test and Section 3.5 introduces post-test questionnaire. Section 3.6 is about interviews that were conducted to validate the results.

Chapter 4 (Planning and Conduction of Usability Test) is about planning and conducting usability test. Section 4.1 describes usability test planning. Section 4.2 deals with pre-test part of usability test whereas considerations about tasks description are provided in Section 4.3. Section 4.4 and 4.5 describes the selection of subjects and instrumentation for usability test respectively. Section 4.6 is about conduction of usability test.

Chapter 5 (Analysis of Usability Test) describes the analysis of usability test. Section 5.1 shows overall statistics of the test. Section 5.2 describes the observations regarding each task. The detailed analysis on the basis of these observations is conducted in Section 5.3 of this chapter.

Chapter 6 (Questionnaire Design and Analysis) describes design, distribution, and analysis of the questionnaire. Section 6.1 is about design of questionnaire whereas; distribution of the questionnaire is described in Section 6.2. Section 6.3 presents the analysis of questionnaire results that provide help to evaluate the system in a better way.

Chapter 7 (Discussion and Conclusion) contains discussion and validation assessment of the thesis. In Section 7.1, the authors discuss different issues regarding the system, its usefulness, and its evaluation on the basis of analysis and selected criteria. Section 7.2 is about validity assessment of the results obtained. Section 7.3 provides answer to the research question.

Chapter 8 (Epilogue) contains conclusion, recommendations, and future work.

2 USABILITY EVALUATION AND HYPERMEDIA SYSTEMS

This chapter provides basic knowledge of the areas such as usability evaluation and hypermedia systems. The concept of usability evaluation and its techniques like think aloud, questionnaire, and interview are discussed in Section 2.1. Section 2.2 describes what are the hypermedia systems particularly wiki systems. Usability evaluation of hypermedia educational systems with reference to a few studies is described in Section 2.3 of this chapter.

2.1 Usability Evaluation

Usability evaluation is the usability analysis of a prototype or system. Its goal is to provide feedback in iterative software development process. There might be lot of requirements for a system in an organization and different approaches can be adopted to fulfill these requirements. It is highly possible that these original goals might not be achieved despite best practices to develop the system. It might not be easy to learn and/or use and users might not be satisfied using it. Usability evaluation guides in development process to recognize and understand the problem. It helps to understand the underlying causes of the problem and plan the changes to rectify the problem. (Rosson and Carroll, 2002)

Usability evaluation is classified into two broad types such as analytic and empirical evaluation. Analytic evaluation involves modeling and analysis of a system's features and its implications of use whereas the empirical evaluation involves observation or other data collection from system users. Different methods have been introduced to conduct both types of usability evaluation. (Rosson and Carroll, 2002)

The authors of this thesis find it more feasible with an empirical evaluation in order to study the FUKTwiki. Techniques such as think aloud, observation, questionnaire, and interview are adopted in throughout this work. The selection of these techniques is motivated with their pros and cons in the following subsections.

2.1.1 Think aloud technique

Think aloud technique is introduced by Erikson and Simon (1985) to examine different problem solving strategies of people. As the name suggests users have to speak loudly while they are thinking and trying to do any specific task. In this way, observer can observe users' responses and make notes. This is a process to externalize user's thinking. If user stops speaking while performing a task, observer may interrupt the user in gentle way so that user should not feel disturbance. The occurrence of silences is major problem with this technique (Preece et al., 2002).

An alternative approach to solve the problem of being silent is working in group of two people. In this way, both users will work together and discuss with each other what they are thinking while doing the task. This technique is found very successful while working with children and to evaluate the systems that are used synchronously by multiple users or group of users. (Preece et al., 2002)

The authors will use this technique for usability test of the FUKTwiki to know students' thinking about the system in better way. This usability test will be conducted in two phases with the same technique. In first phase, individuals will perform whereas two students in each group will participate in second phase. Students will discuss with each other in second phase therefore it will help in evaluation process of the system. It will also help to observe the performance of individuals and groups of students with the same system.

2.1.2 Ethnographic Inspired Observation

Observation is an evaluation technique to identify needs of users to develop new types of products and help to evaluate prototypes. Different methods to record the observations are notes, audio, video, and interaction logs. The key tasks are to decide how to observe without disturbing the people being observed and how to analyze the data specifically when data is in large quantity like video data. (Preece et al., 2002)

Observing people while they perform every-day tasks in their workplace setting is called ethnography. It is defined by Shapiro (1995) as “In the context of human-computer interaction, ethnography is a means of studying work (or other activities) in order to inform the design of information systems and understand aspects of their use”.

The authors will observe students who will perform on defined tasks using think aloud technique. Notes will be taken by the authors and audio recording with prior permission of students will be done. These notes and audio recording will help to analyze the system.

2.1.3 Questionnaire

Questionnaire is a well known technique to collect demographic data and users’ opinions (Preece et al., 2002). Normally questionnaires are used to gather data from large number of people. Two types of questions can be asked in questionnaire. One type is called open ended questions in which respondents are free to answer in their own way. These questions are also known as subjective questions. Other type of questions is close ended questions in which respondents are limited to choose the answer among already given options. These questions are also called as objective questions. One should be very careful while designing the questionnaire because ambiguous and unnecessary questions may lead to the failure of the process and wastage of resources (Preece et al., 2002).

Questionnaire technique can be used independently as well as in conjunction with other methods such as observation and usability testing (Preece et al., 2002). Questionnaire technique will also be used in the usability evaluation process that will help to collect the information from the users about their likes, dislikes, needs and understandings regarding the system.

There are different reasons to use the questionnaires in usability evaluation. Some of which are: (Barriocanal et al., 2003)

- They can be repeatedly used in the similar applications after completion of the design.
- These are very cost effective as users can fill the questionnaires remotely or having very less interaction with the testers.
- User point of view is analyzed by the testers.
- Data gathered through the questionnaires can be used as a reliable base for comparison.

2.1.4 Interview

Interview is a technique to collect data on the topic of interest from users. Interview is also used for usability evaluation of a system. Interviews are normally categorized into structured and unstructured interviews. In general, structured interview is based on close ended questions whereas unstructured interview is based on open ended questions. Another type of interview is semi structured in which combination of open and close ended questions is asked. According to Preece et al. (2002), choice of interview type depends on the evaluation goals, the questions to be answered, and the paradigm adopted.

Interview can be conducted with individuals and/or group. Sometimes it is necessary to interview individuals e.g. in a situation where personal opinions are required or interviewee may not want to disclose his or her view. Group interviews can be conducted to discuss any

critical issue of common interest in a good and supportive environment. According to Preece et al. (2002), group interview allows discussion of such diverse or sensitive issues that would otherwise be missed.

Interviews are usually started with a few warm-up questions that are about interviewee's background and general information. After that more related questions to the topic are asked and gradually interview session is closed with relatively easy questions and thanking the interviewee by interviewer.

The authors will conduct structured interview containing open ended questions with a number of individual students to validate the results of usability evaluation.

2.2 Hypermedia Systems

Hypermedia systems are used to structure, organize, and access information in the network of multiple connected nodes through links. Due to simplicity of its structure, hypermedia systems are used in many domains. These systems are divided into two generations. The first generation systems were based on text-only mainframe systems for helping traditional writing and reading or to gather and preserve the world's literature. The second generation systems are more than text only i.e. hypermedia systems are workstation and PC-based with enhanced support for graphics interface and other formats like: animation, audio, and video. (Hypermedia, 2007)

The hypermedia field concerns the use and design of systems that support supervision, authoring, and navigating networks of interlinked multimedia and textual information. The word 'interlinked' is very important, because same articles or documents should remain connected for the authoring and document management systems. At their simplest, these interconnections take the form of traversable links connecting a source with a destination. (Grønbaek et. Al., 1999)

2.2.1 Wiki Systems

Hypermedia systems are collaborative systems that are used by multiple users or group of users. An example of hypermedia systems is a wiki system. It is an open source and web based system. It allows multiple users to create and edit pages. Users are free to upload media files like audio, video and images. Wiki system is initially created by Ward Cunningham in 1995 who called it WikiWikiWeb (WikiWikiWeb, 2007). According to Leuf and Cunningham (2001) Wiki is defined as "a freely expandable collection of interlinked web pages, a hypertext system for storing and modifying information – a database where each page is easily editable by any user with a forms-capable Web browser client".

Wiki systems are widely used for different purposes like traveling, collaboration among employees within an organization, and education. Examples of these systems are Twiki, Squeak Wiki, Swiki, CoWeb, Plone and TikiWiki (Raman, 2006). Twiki is developed for corporate users which provide functionalities such as automatic e-mails and file attachments. TikiWiki is complete content management system and easy to install. It can be administrated even by a beginner. Wiki systems that are used in education are called student wikis. Customized student wikis (e.g. FUKTwiki 2007, StudentWiki 2007 and Leeds 2007) are available for the students of different universities to share knowledge and other activities.

2.3 Usability Evaluation of Hypermedia Educational Systems

Evaluation is an important activity to gather realistic information and usability in the development process of educational applications. Evaluation of the system is not only concerned with the user interface that can be evaluated through different parameters such as readability, aesthetic or consistency. It is also concerned about how efficiently system meets

the users' needs. Different methods are used for evaluation such as analytic and empirical methods. Developers need to assess the interface quality to find usability issues that can be solved to improve the interaction process in evaluation of educational hypermedia systems. (Diaz et al., 2002)

Many studies have been conducted to evaluate the usability of hypermedia systems including educational systems. Matera et al. (2002) have developed an inspection technique for systematic usability evaluation (SUE) of hypermedia systems. They introduced the concept of evaluation patterns named as 'Abstract tasks' which list all major inspection activities for usability evaluator. Abstract tasks help to share the inspection activities among different evaluators and it makes inspection process easy for new inspectors.

Granic and Glavinic (2002) discussed usability problems of computerized educational systems particularly Intelligent Tutoring Systems (ITS). They pointed out low effectiveness and efficiency of ITS due to its non user-friendly interface and support. They believed in improvement of systems' user interface to increase the effectiveness and efficiency. For this purpose, they developed intelligent hypermedia authoring shell called Tutor-Expert System (Tex-Sys) to make usable user interfaces.

Plantamura et al. (2006) developed a software tool called 'HyperValu@tor' to help teachers in evaluating quality of different hypermedia educational systems. They developed two versions of the system for comparative evaluation. Many users were asked to test both versions to know the improvement of tool in terms of usability. They concluded on the basis of experiment that this tool has valid support for teachers.

Usability evaluation criteria for hypermedia educational systems were introduced by Diaz et al. (2002). They divided usability evaluation of a system into two parts i.e. evaluation of user interface and usefulness of educational system. Aesthetic, consistency, self-evidence, predictability and naturalness of metaphors are selected as the factors for usability evaluation of user interface. Richness, completeness, motivation, hypertext structure, autonomy, competence, and flexibility were identified as important factors to evaluate the usefulness of educational system. They also highlighted imprecision and uncertainty while measuring these criteria and how different usability aspects can be measured effectively.

Aesthetic or interface design concerns with overall user interface of a system. It also deals with organization of contents specifically multimedia contents to enhance legibility and comprehension of concepts. Consistency is about consistent behavior of the system regarding same type of elements. System supports self-evidence if users can easily guess and understand different system functionalities or features. Naturalness of metaphors is a concept of designing the system interface to approximate the user's model to the computer model. Predictability is to what extents a user can anticipate output on the basis of inputs given to the system. (Diaz et al., 2002)

Richness is a measure of a system in terms of volume of available contents and different possible ways to do a single task. Completeness is apparently related to richness but it has quite different meaning. It means whether available contents and features are appropriate to fulfill users' needs. Motivation is an important aspect of evaluation criteria which describes whether a system has potential features that motivate users to use the system and learn knowledge for that system is being developed. Hypertext Structure is about organization of hypertext of a system that is based on some parameters like sequence, depth and node reachability. User's freedom to navigate and interact with the system is called autonomy or control and it is associated with other aspects like consistency and hypertext structure. Competence is user's ability to reach the desired goal by navigating and using the system. If a system is easy to operate and maintain, it is called flexible or compatible system to task and environment. (Diaz et al., 2002)

Information Services & Technology (IS&T) at Massachusetts Institute of Technology (MIT) offers range of services to the MIT community. These services include group reviews of websites, usability testing, accessibility testing, team-based inspection, and consultancy for usability test of products (Usability @ MIT, 2007). IS&T developed the guidelines for usability evaluation of websites (Usability Guidelines, 2007). These guidelines include usability factors such as navigation, functionality, user control, language and content, online help and user guides, system and user feedback, web accessibility, consistency, error prevention and correction, and architectural and visual clarity. It is not necessary to apply all factors to every website.

The criteria proposed by Diaz et al. (2002) will be adopted for usability evaluation of the system. The reason of selecting these criteria is because these are specifically developed for hypermedia educational systems and cover all the aspects of usability evaluation. The authors will adopt IS&T guidelines (Usability Guidelines, 2007) along with the selected criteria (Diaz et al., 2002) for designing the questionnaire. The reason for selecting these guidelines is that the FUKTwiki is a web based system and these guidelines will strengthen the usability evaluation process.

Literature review provides an overview of the relevant topics to the thesis. Usability evaluation is a process to analyze usability of a system. Numbers of methods have been introduced for this purpose. The methods such as think aloud technique, questionnaire, and interview that will be adopted during this thesis are discussed. Along with these, hypermedia systems specifically wiki systems that are used in different domains are discussed. Many studies are summarized that have been conducted to evaluate usability of hypermedia educational systems. These provide insight to various issues like low effectiveness and efficiency due to poor user interface, teachers' assistance in evaluating students, and different levels of user control to use a system properly. Criteria for usability evaluation of hypermedia educational systems is proposed by Diaz et al. (2002) and guidelines for usability evaluation of websites are developed by IS&T, MIT which are discussed in this chapter. The said criteria and guidelines will be adopted for usability evaluation of FUKTwiki.

After the literature review, it seems quite logical to develop a research methodology for the thesis. The research methodology is described in the next chapter.

3 RESEARCH METHODOLOGY

This chapter describes research methodology adopted for the thesis. Overview of the research methodology is given in Section 3.1. Literature review which is first part of research methodology is discussed in Section 3.2. Section 3.3 contains brief description of meetings with students to introduce the system. Section 3.4 provides introduction to usability test and Section 3.5 introduces post-test questionnaire. Section 3.6 is about interviews that were conducted to validate the results.

3.1 Overview

The mixed research approach as elaborated by Creswell (2003) was adopted to conduct the thesis. The research was carried out in multiple phases. In the initial phase, detailed literature review was done to understand the hypermedia systems and identify their most important usability factors in the context of higher education. This literature review helped to select the effective procedure of usability test, guidelines and criteria for evaluation of hypermedia system. On the basis of literature review, the authors selected think aloud technique (Erikson and Simon, 1985) to conduct the usability test of the system. After conducting the usability test, questionnaire was designed on the basis of test results, criteria, and guidelines selected for usability evaluation of the system. Analysis of results was made after compiling the results of questionnaire. In final phase, a number of individual students were interviewed to verify the results. Following sections provide the detail of each phase.

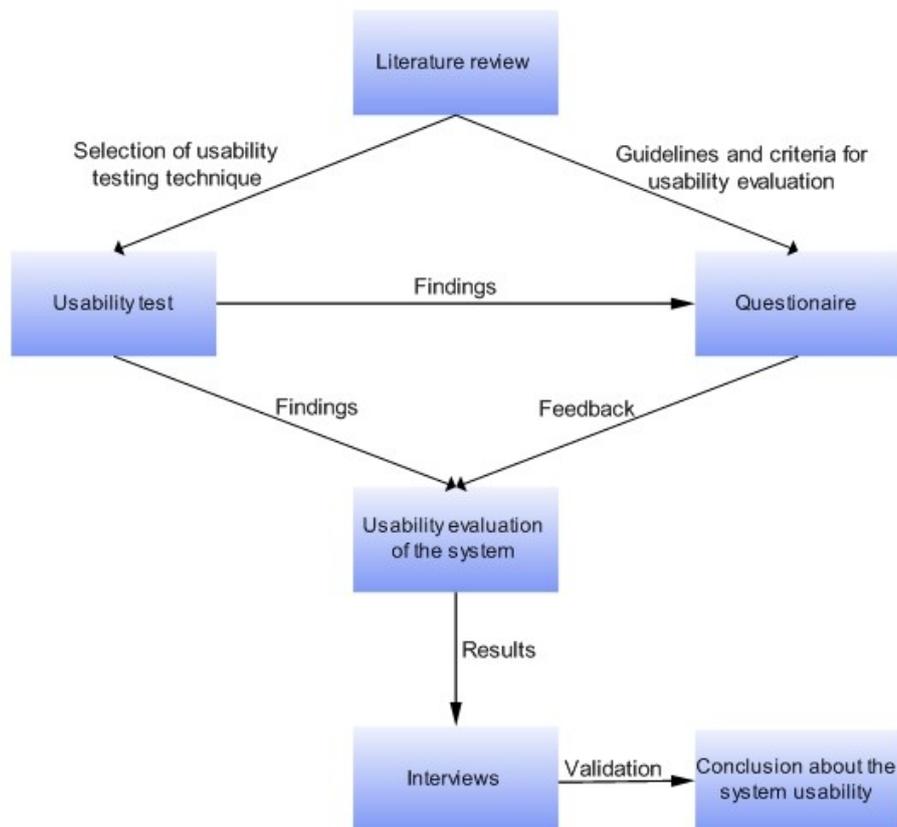


Figure 3.1 Overview of Research Methodology

3.2 Literature Review

Literature review was done in the initial phase to get the current state of research in usability evaluation and hypermedia educational systems. A systematic approach was adopted to search the literature. To find the relevant published literature, the authors defined key search

terms relevant to the topics. BTH Electronic Library Information Navigator (ELIN) was used as net surfing tool to search the available literature. The authors also selected some highly relevant journals and conference proceedings to search the relevant literature of last ten years (from 1997 to 2007). These selected journals were ACM Transactions on Human–Computer Interaction, International Journal of Human–Computer Studies, and ACM CHI Conference.

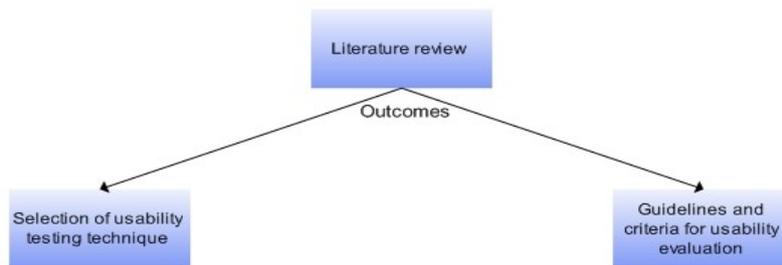


Figure 3.2 Literature Review

3.3 Informal Discussion

The authors started informal face to face discussion with fellow students to introduce the system in parallel with literature review. Students were also motivated by emails on different student mailing groups to use the system. It helped students to become acquainted with the system.

3.4 Usability Test

After literature review and informal discussions, the authors designed the usability test for the system evaluation. For this purpose, think aloud technique (Erikson and Simon, 1985) was selected and four major tasks were designed for usability test. The test was divided into two phases. Individual students participated in the first phase of usability test whereas in second phase, two students (who were friends and had mutual understanding) participated in each group. A pre-test was conducted with two students prior to the actual usability test. Observations were noted down by the authors while students were performing tasks. Students’ conversation was also recorded to validate the notes.

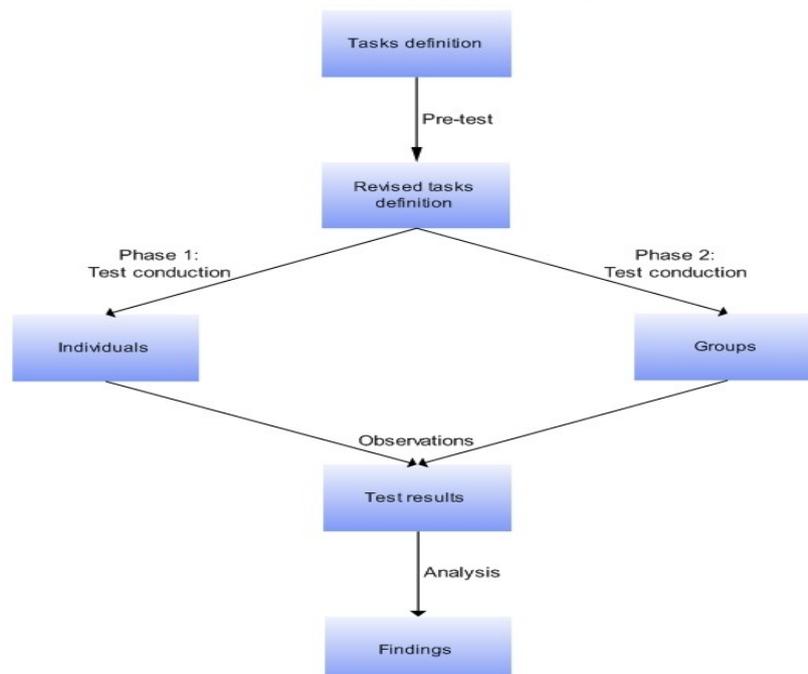


Figure 3.3 Usability Test

3.5 Questionnaire

The authors designed a questionnaire on the basis of usability test to get the students' opinion about the system. The questionnaire was distributed to all students who participated in usability test. The objective of this questionnaire was to get quantitative data about the system. The questionnaire also provided qualitative data in response of two open ended questions.

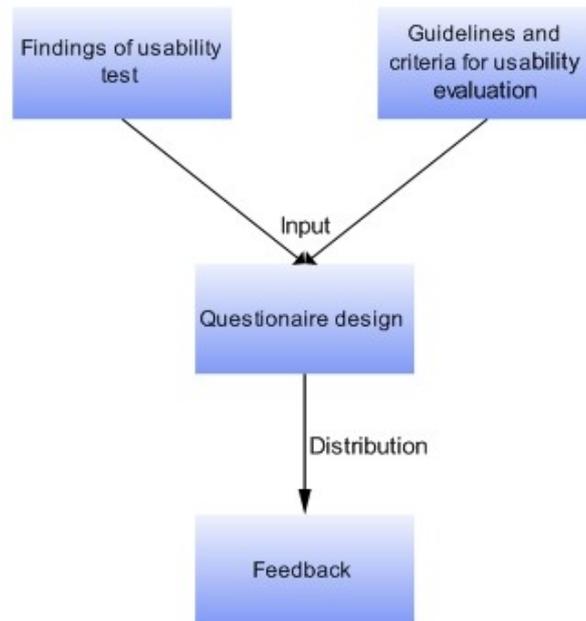


Figure 3.4 Questionnaire

3.6 Interview

In order to validate the results based on data collected through usability test and questionnaire, interviews were conducted with a number of individual students who participated in usability test and questionnaire. Open-ended questions were asked from the interviewees to know their subjective opinion about the system.

The next chapter describes planning and conduction of usability test with individuals and groups.

4 CONDUCTION OF USABILITY TEST

This chapter is about planning and conducting usability test. Section 4.1 describes usability test planning. Section 4.2 deals with pre-test part of usability test whereas considerations about tasks description are provided in Section 4.3. Section 4.4 and 4.5 describes the selection of subjects and instrumentation for usability test respectively. Section 4.6 is about conduction of usability test.

4.1 Planning for Usability Test

Usability test was designed to evaluate the system in an effective way. At initial stage of research, the authors planned to evaluate the system using questionnaire without usability test. Later on it was realized that students were not participating actively for the system and it was decided to conduct test for students' practical involvement. The authors studied literature and selected think aloud technique (Erikson and Simon, 1985), which was discussed in Chapter 2, as most suitable for this test. Test was planned to conduct in two different phases.

It was planned to conduct test with individual students in first phase whereas with group of students in the second phase. This approach was adopted to study the difference between students' performance in both of the phases. In first phase, it was planned that students could not ask the authors about task description or any other kind of help. Whereas in second phase, it was planned that students who were already friends would be taken in a group and they were allowed to discuss between them during test.

4.2 Pre-Test

Pre-test was designed to assure that tasks as given in Table 4.1, were properly defined and subjects had no difficulty in understanding all steps of each task. Two students were selected randomly for this purpose and improvements were made on the basis of their feedback. This test helped to make the task description unambiguous.

4.3 Tasks Definition

In order to execute the usability test, four tasks i.e. create login, edit page, create page, and user preferences were defined. These four tasks covered the main features of the system. By performing these tasks, subjects could evaluate the system in a better way. Subjects were observed while they were using the system.

4.4 Selection of Subjects

In the usability test, 24 volunteer students of graduate level participated. Convenience sampling (Creswell, 2003) was used for this sample selection. Pre-test was conducted with two students. In first phase of usability test, 12 students participated whereas 10 students (5 groups) participated in second phase. In both phases, all students except one belonged to computer science, software engineering, security engineering, and intelligent software systems. The remaining one student was studying in business administration program.

4.5 Instrumentation

Usability test was conducted in a natural setting where subjects performed in balanced environment i.e. neither very controlled nor free. Subjects were provided with the same computer system, physical location, and printouts of test tasks to be performed. Two web browsers i.e. Microsoft Internet Explorer (version 7) and Mozilla Firefox (version 2) with internet connection were available to access the system. Audio recording was done with prior permission of the subjects for retrieval during analysis.

4.6 Conduction of Usability Test

Usability test was performed at different timings according to availability of subjects. Each subject was briefly informed regarding the purpose of usability test; think aloud technique; and tasks to be performed. This briefing session took about five minutes with each subject. The authors participated as observers in usability test and notes were taken along with audio recording while subjects were performing on defined tasks. Start and end time of the test were noted for each subject. When a subject stopped speaking, the observers reminded him gently as he had to speak loudly. Different screen shots like main page, create page, edit page, and history page are given in Appendix 1.

Table 4.1 Usability Test Tasks

<p><u>Task 1. Create Login</u></p> <ol style="list-style-type: none">1. Click on “Log in”.2. Click on “OpenID Login”.3. Enter your FUKT-ID or OpenID and no need to perform Step 4 and 5 in this case. If you do not have any of them, perform Step 4 and 5.4. Visit https://www.myopenid.com/ to create an OpenID.5. Enter your OpenID (e.g. http://OPENID.myopenid.com/) in the FUKTwiki login page. <p><u>Task 2. Edit Page</u></p> <ol style="list-style-type: none">1. Search the topic of your interest.2. Edit the most relevant page that you find after search.3. Add few meaningful sentences about topic using text editor.4. Insert any useful external link related to this topic. (Hint: Use different options available with text editor) <p><u>Task 3. Create Page</u></p> <ol style="list-style-type: none">1. Create a new page on a topic of your interest related to an educational/school matter. (Hint: Search the topic. If a page does not exist with this title, you may create it)2. Add few meaningful sentences about topic using text editor.4. Add any image to this page using text editor. (Hint: use “upload file” feature to upload new image)5. At the end, insert an internal link for “main page” of the FUKTwiki. (Hint: Use different options available with text editor)6. Format your page using different options available with text editor. <p><u>Task 4. Preferences Setting</u></p> <ol style="list-style-type: none">1. Click on “my preferences”.2. Select skin of your own choice.3. Edit your profile and explore other features.
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The planning and conduction of usability test described in this chapter is critically analyzed in the next chapter.

5 ANALYSIS OF USABILITY TEST

This chapter describes the analysis of usability test. Section 5.1 shows overall statistics of the test. Section 5.2 describes the observations regarding each task. The detailed analysis on the basis of these observations is conducted in Section 5.3 of this chapter.

5.1 Test Statistics

Table 5.1 summarizes results of pre-test and both phases of usability test with minimum, maximum, and average time spent in each phase. It shows big difference between minimum and maximum time of task completion in both individual and group phases. In the authors' opinion, there are two main reasons behind this: first difference in time intervals for the completion of same task is due to variation in subjects' experience; second, variation in subjects' interest in performing the given tasks. Details of subjects' experience and results of the usability test are given in Tables 5.2 and 5.3.

Table 5.1 Summary of Overall Usability Test Results

Testing Phase	No. of Subjects	Average Time (minutes)	Minimum Time (minutes)	Maximum Time (minutes)
Pre-test	2	38	35	41
Individual	12	35	18	57
Group	10 (5 groups)	40	32	60

Table 5.2 indicates subjects' previous experience of using wiki systems which was asked during the test. All subjects were found familiar with Wikipedia (Main Page-Wikipedia, 2001). Out of 12 individuals, 5 and 4 had previous experience of editing and creating pages respectively. In the case of five groups, only one had experience of editing pages whereas no group had experience of creating pages on wiki systems.

Table 5.2 Summary of Subjects' Previous Experience

Testing Phase	Subject ID	Previous Experience of Wiki Systems		
		Wiki Read	Wiki Edit	Wiki Create
Pre-test	1	Yes	Yes	No
Pre-test	2	Yes	No	No
Individual	3	Yes	Yes	Yes
Individual	4	Yes	Yes	No
Individual	5	Yes	No	No
Individual	6	Yes	Yes	No
Individual	7	Yes	No	No
Individual	8	Yes	No	No
Individual	9	Yes	No	Yes
Individual	10	Yes	No	No
Individual	11	Yes	No	No
Individual	12	Yes	No	No
Individual	13	Yes	Yes	Yes
Individual	14	Yes	Yes	Yes
Group	G1	Yes	No	No
Group	G2	Yes	Yes	No
Group	G3	Yes	No	No
Group	G4	Yes	No	No
Group	G5	Yes	No	No

In Table 5.2, the Wiki Read means that subjects have experience of reading pages on wiki systems. The Wiki Edit means subjects have experience of editing pages on wiki systems.

Almost all of them have edited pages on Wikipedia but in most cases, editing is limited to text only. The Wiki Create means subjects have experience to create pages on wiki systems.

Table 5.3 Summary of Task-wise Duration and its Status

Phase	Subject ID	Total Duration (minutes)	Task 1 (minutes)	Task 2 (minutes)	Task 3 (minutes)	Task 4 (minutes)
			Status	Status	Status	Status
Pre-test	1	41	20	6	11	4
			C	U	U	C
Pre-test	2	35	5	10	15	5
			C	U	U	C
1	3	35	3	6	16	10
			C	C	C	C
1	4	46	11	11	20	4
			C	U	U	C
1	5	57	11	14	29	3
			C	U	C	C
1	6	35	11	10	10	4
			U	U	U	C
1	7	36	17	9	6	4
			U	U	U	C
1	8	18	5	5	6	2
			U	U	U	C
1	9	18	4	5	6	3
			C	C	U	C
1	10	39	12	15	8	4
			C	U	U	C
1	11	50	10	17	18	5
			C	U	U	C
1	12	36	8	13	10	5
			C	U	U	C
1	13	21	5	6	6	4
			C	U	U	C
1	14	32	10	9	9	4
			C	C	U	C
2	G1	60	13	28	17	2
			C	U	U	C
2	G2	38	8	12	14	4
			C	C	U	C
2	G3	32	5	7	19	1
			C	U	U	C
2	G4	38	8	14	13	3
			C	U	U	C
2	G5	35	7	11	12	5
			C	C	U	C

Table 5.3 shows detailed results of test including total duration, duration per task, and status of each task. In Table 5.3, 'C' stands for completed whereas 'U' stands for uncompleted status of each task. If status of Task 1 is mentioned as uncompleted, subject is unable to create login. Uncompleted status for Task 2 means subject fails to insert external link to particular page. Uncompleted status for Task 3 means subject fails to insert internal link and embed image to particular page. Task 4 is to explore different user preferences.

5.2 Observations

The authors noted down their observations while subjects performed tasks during test. These observations are classified into general and task-related observations. General observations are not specific to any task but belong to the overall system. Task-related observations are specific to the tasks. In the following sub sections, these observations are described.

5.2.1 General

In this subsection, general opinions from subjects are presented in a simple way.

- The system's response is very slow.
- Its interface is not simple and visible. It is not like conventional layout of other common web sites. There is no visual attraction for subjects.
- Main page is massive. It has lot of links to other pages which is not liked by the subjects.
- Subjects feel no control over the system.
- Searching mechanism is not efficient. It takes too much time to display results.
- Help pages are heavily stuffed that hinder subjects to read it.
- There are very limited numbers of content pages and their contents are also very less. Most of time, search returns no result. Although there are lot of pages with course titles but these pages contain no useful contents other than exam feed and course responsible information against each course.
- Subjects are also unhappy with long hierarchical structure of program and courses without any contents.
- A number of subjects comment that text size is relatively small.
- Subjects comment that more elaborated screen tips will help to understand the features. For example, it is difficult to differentiate between external and internal link features of text editor. Icons used in text editor are not very meaningful.
- According to many subjects, revision history of pages is good feature of the system.

5.2.2 Task 1

Task 1 is about creating new login in case of new user or to use login that has already been created by the user. Following are common observations during this task:

- Login interface is not very visible and simple.
- Login interface is uncommon, subjects expect normal login/password screen (conventional style).
- Login procedure is too lengthy due to involvement of other party (an OpenID server) for the user who is not already member of FUKT society.
- Many subjects face lot of difficulty to search the login link and ultimately a few subjects fail to login.
- Subjects expect username given by the institute (BTH) to be entered for login because this system belongs to school computer society. Many subjects try to login with different user names on hit and trial basis.
- Subjects search for "how to create an account" but long description makes them annoyed and confused.
- Many subjects get confused from already given string for FUKT-ID (it is user name/ID for FUKT members only) to login.
- Subjects with FUKT-ID face an error to login the system. They are unable to login using Microsoft Internet Explorer (version 7). Alternatively they use Mozilla Firefox (version 2) for this purpose.
- OpenID link is ignored by many subjects. Subjects have no idea about OpenID and do not like to read long instructions.
- After creating OpenID account, subjects still feel uneasy to login.
- After unsuccessful login attempt, verification error page shows link to main page instead of login page.

- Subjects do not feel easy to select nick/user name during login.
- No meaningful feedback or error messages.

5.2.3 Task 2

Subjects are provided with few steps to edit an existing page in Task 2. This task is defined to get familiar with the available system features and the system itself. The key observations during this task are as follow:

- It is easy to find search text box.
- Many subjects get confused while viewing the search results.
- More attractive and organized appearance of search namespaces is desired rather than current sequential appearance.
- Many subjects get confused that how and where to edit or write.
- Subjects edit those pages that are not of their interest due to lack of content pages.
- Some subjects consider “create lecture/notes” as an edit feature of the text editor.
- Text editor features have little affordance. These features are limited, difficult to use and not attractive.
- Subjects like new window (instead of same window) to open external link.
- Almost all subjects are unable to insert external link using text editor feature. Subjects insert external link (website address) as a text while editing the page.
- Subjects are confused with exam feed on different pages.
- Some subjects comment that “discussion” and “history” are not conveying their use.

5.2.4 Task 3

Task 3 is the main task in which subjects are requested to create new page of their interest. Most of subjects do not perform all the given steps for Task 3. The main reason behind this failure is having no experience of creating page on any wiki system. Following are the key observations:

- Subjects look for “create new page” option on main page.
- After search results, subjects expect more visible link for “create this page”.
- The system has a distinct way to create new page as compare to other systems.
- Subjects upload the image but unable to embed it to newly created page.
- After creating and editing page, many subjects move to the “upload file” feature without saving the created page.
- Subjects expect dialog box while click on “embedded image”. Some of them expect to add full path of image that is saved on local computer.
- “Re upload file” is liked by the subject if file is larger.
- Many subjects ignore warning while uploading the file of larger size.
- After uploading file, unintentionally subjects start to edit that file page rather than the page that is created earlier by them. They are also confused with other relevant data of that page.
- A subject embeds the image that is not yet uploaded. After that, he clicks on broken link of image to upload the file. It is unusual but it works.
- Most of subjects are unable to find and use ‘internal link’ feature.
- Subjects are confused about “media file link” feature.
- Subjects like “show preview” and “my contribution” features. “my contribution” feature is liked more because subjects can view their contributions.
- Few subjects think about “watch page” feature to view the page like preview.

- Subjects get confused about “summary”, “minor edit”, and “watch page” features while creating/editing pages.
- Subjects are confused about “permanent link”.
- Subjects do not like “templates used” section of different pages.
- Subjects are unable to differentiate between valid and broken links.
- Few subjects like that text editor did not support HTML.

5.2.5 Task 4

Users can customize the system using different setting options. Task 4 is all about “my preferences” to explore these features. Following are the key observations:

- Subjects like the preferences options specifically different available skins.
- Subjects get confused due to many available options.
- Subjects like multi language support and watch list.
- Subjects do not understand “change password” option for this system.
- Many subjects do not understand the purpose of “math” menu.
- Without any changes, message is shown that “preferences have been saved”.

Before analyzing the findings, it is better to summarize the above mentioned observations. The interface is not liked by subjects. It is not attractive and usable. The idea of Open-ID login is disliked by them. Subjects with FUKT-ID cannot login using Internet Explorer (version 7) and get confused that how to login with FUKT-ID. Some subjects like help pages but most of them do not like long instructions of help pages. While searching for a specific topic, most of time they find nothing. They search for course title pages but these also have no contents except course responsible information and exam feed. Search feature is not efficient in terms of speed as well as results. Subjects get confused about how to create an external link using text editor feature. The text editor with its limited features is disliked by them. Subjects search for “create new page” option on main page. They search for “upload file” feature in editor toolbar and feel difficult to locate it. Mostly they are unable to embed the image after uploading the image. They are also unable to insert internal link for main page. They like the skin feature but it is desirable to create customized skins. They feel that user preferences are complex and these should be classified into simple and advanced options for user easiness.

5.3 Analysis

Tasks are defined to introduce main features of the system to the subjects. Think aloud technique is used as primary technique for usability test whereas the authors also take notes along with audio recording while defined tasks are performed by subjects. Body language of subjects and their comments, while performing these tasks remain key sources to analyze the system along with above mentioned observations (in Section 5.2). In the following sub sections, the authors’ analysis is given to evaluate the system and design the questionnaire for further evaluation.

5.3.1 Subjects

At first, few facts about subjects are highlighted which help to understand the analysis in a better way. All the subjects are male and have same cultural background. All subjects except one are students of computer science, software engineering, security engineering, and intelligent software systems. It means that they are very well familiar with use of computer. The average age of subjects is 27 years. The higher average age for all subjects is due to few subjects that are 43, 33, and 32 years old.

Unexpectedly groups in second phase of usability test take more average time than individuals who perform in first phase of usability test. One possible reason is that one hour

is taken by one group to complete the tasks. Otherwise 37 minutes (on average) are taken by the remaining groups. Groups are observed to find out any performance difference between individuals and groups but there are almost similar results in both phases in terms of time spent and completion of tasks.

5.3.2 Merits of the FUKTwiki

Subjects like the idea of the FUKTwiki for the studies and activities sharing between students and teachers at BTH. Besides, subjects have critical viewpoints about the system. They like few features of the system but they are not satisfied with most of features. The search feature on main page is liked by the subjects because it is visible and subjects do not face any difficulty to find it. Subjects also like “show preview” feature of the system.

The feature “my contributions” is also appreciated because one can view his or her contributions to increase the overall knowledge base of the system. Another appreciated feature of the system is no support for Hyper Text Markup Language (HTML). It makes the system more secure for instance no one can insert HTML code to redirect users to another site. Subjects are satisfied with richness of available system settings i.e. preferences options. They like different available skins for the system that help to customize the system layout for personal use. Exam feed is good feature to remain update with upcoming exams. It is also new for many subjects and they have no idea about web feed. Multilanguage support is appreciated by the subjects that increase the system’s accessibility and if a user wants to customize the system language, it can be done easily.

5.3.3 Demerits of the FUKTwiki

The most obvious problem that subjects encountered is very slow system’s response. Subjects observe that it takes lot of time to upload the system after entering the system URL (Universal Resource Locator). This slow response makes subjects annoyed. Subjects compared the system with other popular systems like Wikipedia and Its Learning (It’s Learning, 2007) that are already in their use at BTH. These systems are quite good in terms of response time. The average time to open the FUKTwiki home page is about 10 seconds whereas Wikipedia and Its Learning takes about 2 seconds. Other operations like searching and save changes also takes more time than other above mentioned systems.

Subjects do not like the structure of main page with many links to other pages. It is unnecessarily massive. They like to have the main page as simple as possible. They do not feel control over the system. For example, while editing a page, if a subject mistakenly clicks link of another page then he moves to that page without asking to save the changes.

Subjects do not like the interface and procedure for login. Many subjects feel difficulty to search the login on main page. They expect conventional login screen (username and password) at some central and visible position. Most of the subject are unaware of and do not like the idea of OpenID (How to create an account, 2007) for this system. Quite simple method of sign up and login is suggested by most of subjects. Subjects with FUKT-ID are unable to login using Microsoft Internet Explorer (version 7) and alternatively they use Mozilla Firefox (version 2). They are also confused that how to login with FUKT-ID.

The system’s feedback to subjects is not appropriate. In case of searching, the system takes too much time and its search feature is not efficient in terms of search results. Subjects expect to show the list of search results irrespective of number of pages that are found. Most of the time subjects find no page against their search string and it shows limited availability of relevant pages. Overall subjects are not satisfied with search efficiency in terms of time as well as accuracy of results.

Subjects are not satisfied with limited features of text editor available for editing or creating page. Subjects expect the behavior of text editor as other rich text editor like Microsoft Word

or Open Office. They expect to view the immediate effects of applied action e.g. if user makes selected text bold, it gets bold instantly in other text editors like Microsoft Word. But in case of the FUKTwiki, the text gets quoted and it is shown bold at run time after saving the page.

Some subjects are concerned about small text size. Help pages are very lengthy and subjects do not like to read long descriptive help. Subjects expect more elaborated screen tips e.g. it is difficult to differentiate between external and internal link features of text editor. Many subjects type the external link in the text of any opened page. They do not get an idea of inserting hyperlink for an internal or external web page. Most of them do not like icons used in text editor. According to their opinions icons are not very attractive.

Many subjects fail to insert image to the relevant page. They think to directly insert an image into the page. They expect the open dialog box by clicking on the “embed image” icon as many others applications provide it. Upload file feature does not show direct relevancy to save image. Subjects ignore this feature until they read the given hint in task description.

Subjects visit many pages with courses’ title but those pages are without any contents except exam feed and information about course responsible. They expect lecture notes by accessing the link “lecture/notes for this course” but almost all pages are without any contents. It shows that there are no contributions towards the system by teachers. Most of subjects expect that lectures are uploaded by the teachers.

Subjects expect “create new page” on main page of the system whereas the system allows it after searching for that specific title. According to subjects, the system should support this feature on main page and if user wants to create a page that has already been created then the system should give feedback accordingly.

Subjects like preferences setting but some of them become confused due to many available options. It means subjects want to keep the system as simple as possible without going into details. Some subjects get confused with math menu and they do not understand the purpose of that menu. Probably there are few flaws in the system implementation like change password option has no purpose if user is using OpenID or FUKT-ID. Similarly when subject clicks on save option without any change, message of “preferences have been saved” is shown to subject that is meaningless. Subjects with FUKT-ID face problem to login the system using Microsoft Internet Explorer (version 7) as already mentioned.

On the basis of above mentioned detailed analysis of the usability test, the selected criteria (Diaz et al., 2002), and the usability guidelines (Usability Guidelines, 2007), the authors design questionnaire and distribute it among the students. After students’ response against this questionnaire, results are analyzed. The details about design of the questionnaire and analysis of the results have been described in the next chapter.

6 QUESTIONNAIRE DESIGN AND ANALYSIS

This chapter describes design, distribution, and analysis of the questionnaire. Section 6.1 is about design of questionnaire whereas; distribution of the questionnaire is described in Section 6.2. Section 6.3 presents the analysis of questionnaire results that provide help to evaluate the system in a better way.

6.1 Questionnaire Design

The authors designed questionnaire based on detailed analysis of the usability test, the selected criteria proposed by Diaz et al. (2002), and the guidelines of IS&T Department, MIT (Usability Guidelines, 2007) for usability evaluation of the web site.

Table 6.1 Questionnaire

Sr.	Question	Scale			
		1	2	3	4
1.	Does system layout remain same when you navigate from one page to other?	Not consistent	Little bit consistent	consistent	Very consistent
2.	Do icons/links provide meaningful information while creating/editing any page?	Never	Occasionally	often	Always
3.	Do you get expected outcome whenever you perform an action?	Never	Occasionally	often	Always
4.	Do you think system provides sufficient tools to perform a desired task?	Never	Occasionally	often	Always
5.	Does the system provide customized layouts?	Never	Occasionally	often	Always
6.	Does the system provide necessary help if required?	Never	Occasionally	often	Always
7.	Are you satisfied with “search” feature of the system?	Not satisfied	Little bit satisfied	satisfied	very satisfied
8.	Are you satisfied with new user/login feature of the system?	Not satisfied	Little bit satisfied	satisfied	very satisfied
9.	Does the system provide appropriate messages in case of any error?	Never	Occasionally	often	Always
10.	How do you find the system for your academic activities?	Not Useful	Little bit useful	useful	very useful
11.	Does the system easy to understand and use?	Never	Occasionally	often	Always
12.	Do you find contents in organized manner?	Never	Occasionally	often	Always
13.	Do you find system traversable while browsing different pages or performing different tasks?	Never	Occasionally	often	Always
14.	How do you find “upload file” feature?	Not easy	Little bit easy	easy	Very easy
15.	Your opinion about the layout of main page?	Not attractive	Little bit attractive	attractive	very attractive
16.	Does main page highlight contents that you think of most importance?	Never	Occasionally	often	Always
17.	Are you willing to adopt this system for academic activities? Please support your answer with arguments.				
18.	How do you find the overall system? Please write down your suggestions for improvement.				

Questionnaire contained 18 questions in total, 16 of which were close ended questions whereas remaining 2 were open ended. The open ended questions were to know the students' opinion about the overall system and their willingness to adopt it. The authors designed closed ended questions based on Likert Scale that has been widely used (Preece et al., 2002) for evaluating user satisfaction with products. A four-point scale was used to force the participants to make a decision rather than selecting intermediate values.

The relationship of questions with the selected criteria is described in Table 6.2.

Table 6.2 Relationship of questions with the selected criteria

Criteria	Questions
Consistency	1
Self-evidence	2
Predictability	3
Richness	4, 5, and 6
Completeness	7, 8, and 9
Motivation	10 and 11
Hypertext Structure	12
Autonomy	13
Authoring	14
Aesthetic	15, 16, and 18
Adaptation	17

6.2 Questionnaire Distribution

Printouts of the questionnaire were distributed to all subjects who were selected to perform in usability test. It was distributed after one week of execution of usability test. It is worth mentioning here that all questionnaires duly filled by the subjects were collected in time. Only one participant did not reply against open ended questions. Subjects' response against open ended questions is given in Appendix 3.

6.3 Analysis

To get the concrete results, the authors perform the quantitative analysis of questionnaires. Participants' response against each question is calculated and given in percentage in Appendix 2. Key facts are described below.

46% students consider layout of the system as *consistent* whereas only 16% students disagree with it. 37% students consider its layout as *little bit consistent*.

13% students are agreed that icons *always* provide meaningful information about the functionality whereas 13% students have an opposite opinion. According to 41% students, the icons provide *occasionally* meaningful information whereas 33% students think that these *often* provide meaningful information.

According to 41% students, the system *often* provides the expected outcome whereas 8% students consider that it does not provide expected outcome. 34% students respond that it provides expected outcome *occasionally*. 17% students have view that it *always* provides the expected outcome.

The system is not easy to understand and use according to opinion of 67% students whereas 33% students agree that it is easy to use.

29% students are *satisfied* whereas 5% students are *very satisfied* with the 'search' feature. 41% students are *little bit satisfied* and 25% are *not satisfied* with this feature. It shows that majority of students are not satisfied.

54% students are *not satisfied* whereas only 25% students are *little bit* satisfied with login procedure. Only 21% students are *satisfied* with this procedure.

According to 45% students, ‘upload file’ feature is *easy to use* whereas 55% students find it difficult.

Students have different opinions about the system’s usefulness in academic activities. 37% students consider it *useful* for academic activities and 13% students have an opposite opinion. According to 50% students, it is *little bit* useful for academic activities.

62% students are *not satisfied* with organization of the system contents whereas 38% students are *satisfied* with it.

45% students believe that the system *often* provides sufficient tools to perform certain tasks whereas 17% students are *not satisfied* with tool support. According to 38% students, it *occasionally* provides sufficient tools to perform desired tasks.

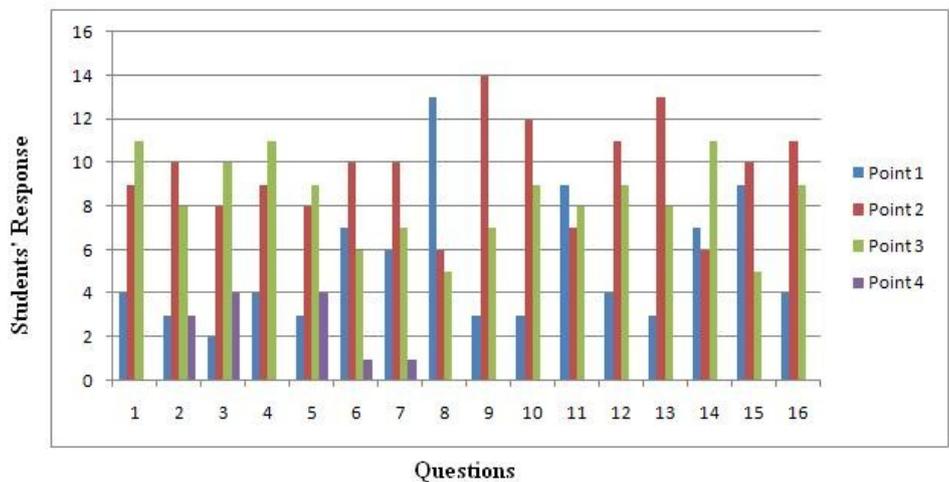


Chart 6.1 Students’ Response to Questionnaire

According to 29% students, the system provides feedback *occasionally* whereas 71% students have an opinion that it does not provide proper feedback.

33% students have an opinion that the system *often* provides traversing while browsing different pages whereas according to 54% students, it *occasionally* provides traversing. In opinion of 13% students, it *never* provides traversing.

71% students are *not satisfied* with ‘help’ provided by the system whereas 29% are *satisfied* with it.

Among 23 students who respond against all questions, 13 students show their willingness to adopt the system with some changes. 10 students do not favor it for educational activities. Students also suggest improvements against the open ended question.

The overall work in perspective of the selected criteria has been discussed in the next chapter.

7 DISCUSSION AND VALIDATION ASSESSMENT

This chapter contains discussion and validation assessment of the thesis. In Section 7.1, the authors discuss different issues regarding the system, its usefulness, and its evaluation on the basis of analysis and selected criteria. Section 7.2 is about validity assessment of the results obtained. Section 7.3 provides answer to the research question.

7.1 Discussion

The system is evaluated to know about the role of hypermedia systems particularly student wiki systems in context with students' learning in higher education. To evaluate it in better way, the authors adopt a well organized approach as is evident from the thesis. In this section, they evaluate the system in terms of the aspects of selected criteria as described by Diaz et al. (2002).

7.1.1 Aesthetic (Interface Design)

In case of the FUKTwiki, students' experience is not quite good. Main page is the first interaction point of students and the system which is not admired by students. It contains lot of contents/links to other pages and its layout is not attractive. In the authors' point of view and observation, students generally like meaningful icons and rich color pages instead of text based features.

Although it is not necessary to login the system, students require login to get credit of their contributions in terms of page creation and editing. Login process is not possible without third party involvement (unless you are member of FUKT society) which creates frustration among students.

In general wiki systems support multimedia contents but currently the FUKTwiki does not provide this support except certain types of images. Multimedia contents are often used to demonstrate different specific tasks in education context therefore the system should support it.

7.1.2 Consistency

A consistent way to perform similar tasks makes it easy to learn. The system provides consistency regarding its layout and many other features like edit, create, and search. It supports learnability and efficiency because they do not need to learn repeatedly the same features of the system.

7.1.3 Self-evidence

Self-evidence supports learnability of a system and students do not need to memorize many system related things. Ultimately students focus on their primary goal i.e. learning regarding their studies through a system. The FUKTwiki does not provide self-evidence support in many features. For example to insert an image, students expect simple open dialog box whereas the system provides "upload file" feature that does not support self-evidence in itself.

7.1.4 Naturalness of Metaphors

It is a concept of designing the system interface to approximate the user's model to the computer model (Diaz et al., 2002). For example, if a user intends to use a system in leisure time to read stories then the interface should be designed like a story book. In the case of the FUKTwiki, the authors believe that there is no need of such metaphors in higher education.

7.1.5 Predictability

In case of the FUKTwiki, most of the time students do not get the expected output. For example, students type an external web link and expect it to be functional by selecting that

typed text and clicking on the “external link” feature. However in actual it does not work as expected.

7.1.6 Richness

FUKTwiki is developed and deployed recently therefore it is not rich in terms of contents or useful information for students. A system should be rich to attract users and the FUKTwiki will take time to be rich. For this purpose, it needs dedicated users who contribute on regular basis.

7.1.7 Completeness

FUKTwiki does not fulfill students’ needs in terms of different features as well as contents. For example, students are not satisfied with search feature as it takes too much time to search. It does not fetch out results on basis of relevancy against the given search string.

7.1.8 Motivation

In the authors’ opinion, the system provides facility to make quiz for self-evaluation and customized layout that are quite motivating features for students. In actual, students are not motivated to use because it is not easy to use and understand. Questionnaire analysis shows that only 37% students admit its usefulness for academic activities.

7.1.9 Hypertext Structure

The FUKTwiki needs more refinement to organize the contents as most of students are not satisfied with current setup. For example, pages related to different programs like M.Sc. Software Engineering and M.Sc. Computer Science are not simple in terms of node reachability. Currently these pages are complex structured and redirected to each other which causes confusion.

7.1.10 Autonomy or Control

In case of the FUKTwiki, only 33% students have an opinion that system often provides navigation control. The authors observed a problem regarding autonomy. For example, a student edits a page and wants to add an image to that page. When he uploads image for this purpose, he loses the edited page and cannot retrieve it.

7.1.11 Competence

Competence means that a system should support multiple interfaces and other features that can help different user groups according to their specific characteristics. The FUKTwiki is an example of wiki systems which provide the same interface to every user for creating and editing pages. On the other side, customized setting might be helpful for users to change the system layout according to their choices.

7.1.12 Flexibility

FUKTwiki is a web based and platform independent system therefore it is compatible. To access the system, students need only a web browser. Students with FUKT-ID faced a problem to login using Microsoft Internet Explorer (version 7) that seems a problem with FUKT website rather than the FUKTwiki. Anyway it should be rectified.

7.2 Validity Assessment

Validation of research results is always a necessary part of research work whether it is qualitative or quantitative. In case of this thesis, mixed research approach is adopted. However most of thesis work is of qualitative nature. The results are assessed on the criteria given by Trochim (2006). The criteria contain four different types of validity assessment for qualitative research. These criteria are discussed in the following subsections.

7.2.1 Creditability

Creditability means that research results are believable by the participants’ point of view (Trochim, 2006). To achieve creditability of the thesis, the authors plan a multi-phased

research methodology. On the basis of literature review and findings of first phase where usability test is conducted, the questionnaire is designed. Interviews are conducted with five students to validate the results of usability evaluation of the system. The detail of these interviews is given in Appendix 4. These interviews validate the usability evaluation results. After adopting this validation process, the authors are confident about credibility of the study.

7.2.2 Transferability

Transferability is to generalize qualitative research results for other contexts or settings (Trochim, 2006). In case of this thesis, the FUKTwiki is like other typical student wiki systems. It means that the system has almost same tools and interfaces that wiki systems have in general. The context is also described in detail in this thesis. These settings help to generalize the findings of the thesis.

One possible threat can be same educational system and cultural background of the subjects. In this usability test, all subjects have almost same educational system and cultural background. The test results may be different if this test is conducted with subjects having different gender, educational and cultural backgrounds. Second possible threat is that many subjects have very limited experience of wiki systems that may affect the results. Another possible threat is that the FUKTwiki does not support media files that many others student wiki systems provide. It can also affect to generalize the results for other systems that provide media files support.

7.2.3 Dependability

Dependability is about occurring of changes in the context of research over the time (Trochim, 2006). It is the responsibility of a researcher to describe these changes and their effects on research. Usability test of the FUKTwiki is conducted in different timings (morning, afternoon, and evening) according to availability of subjects. Subjects' performance may get affected during different timings of the day for instance a subject may feel tired in evening and can take longer time to perform a task as compare to the morning. Think aloud technique is adopted for usability test that makes impossible to conduct the usability test with all subjects at the same time.

The questionnaire is distributed after one week of usability test. The reason for delay is that design of the questionnaire depends on the findings of usability test. It can be a validity threat that subjects do not exactly remember different features of the system after one week of usability test. In order to minimize this validity threat, it is suggested to browse the FUKTwiki system before filling out the questionnaire.

7.2.4 Confirmability

Confirmability is the extent to which the results can be confirmed by the other researchers (Trochim, 2006). To achieve confirmability of the thesis, each phase of usability evaluation is properly documented. At first usability test is conducted in which widely used evaluation technique i.e. think aloud technique is adopted. The questionnaire is designed on the basis of criteria as mentioned in Section 6.1 that are selected from literature and guidelines provided for usability evaluation of websites.

7.3 Answering Research Question

To answer the research question, the authors proceed stepwise throughout the thesis. The conduction of usability test was primary mean to find the answer which is complemented and validated by questionnaire and interviews respectively. The authors find that student wiki systems have potential to be effective in student's learning in higher education. However the results suggest that these systems are not very effective with current set of tools and interfaces. Moreover it is important that a system should have sufficient amount of

relevant and useful educational contents. There is need to improve student wiki systems in terms of interfaces, contents, and set of tools for creating and editing pages.

8 EPILOGUE

The epilogue contains conclusion, recommendations, and future work.

8.1 Conclusion

The main aim of this thesis is to evaluate hypermedia systems particularly the student wiki systems to find out their effects on students' learning in higher education. The usability evaluation is done empirically through involving a number of graduate students in usability test. Usability test is performed in a natural setting where students perform in balanced environment that is neither very controlled nor free. The usability test is conducted in two phases to observe the performance of individuals and groups of students on the FUKTwiki in similar environment. There are almost similar results in both phases in terms of time spent and completion of tasks. On the basis of findings of usability test and literature review, questionnaire is designed and distributed among the students who already participated in the usability test. The system is then evaluated on the basis of results of the usability test and questionnaire. Validation of results is done through interviews with a number of individual students.

To the research question, the authors find that student wiki systems have potential to be effective in student's learning in higher education. However the results suggest that these systems are not very effective with current set of tools and interfaces. Moreover it is important that a system should have sufficient amount of relevant and useful educational contents. There is need to improve student wiki systems in terms of interfaces, contents, and set of tools for creating and editing pages.

8.2 Recommendations

The authors have following recommendations that might be helpful in improving the system. These recommendations are based on the observations, students' comments during usability test, analysis of the test, questionnaire results, and interviews.

The FUKTwiki has the critical issue of slow response time while searching, opening, creating, and saving the pages. It is very necessary to upgrade the system to minimize the response time.

Main page should be simpler having extremely important contents only. In the authors' point of view, 'quick links', 'featured pages', and 'FUKT' headings with all their contents (links to different pages) should be removed to make main page simpler.

Students can create and edit pages without login whereas they require login to upload file. Login procedure of the system should be changed because no student likes the idea of OpenID. The system should provide simple procedure to create login without involvement of any other party. To make the system free for all, login constraint for uploading file should be removed as Internet Protocol (IP) address is saved if user is not logged in.

Currently the system has fewer contents and there is need to find such students who are willing to create and edit pages relevant to their studies on regular basis. They can be motivated by giving them awareness to spread their knowledge and usefulness of the system for their own studies and activities. In addition to it, FUKT society might offer honorary membership to attract the students.

Searching is an important feature of the system. It should be more efficient in terms of response time, accuracy of results, and listing of results. To minimize the response time, the system needs improvement as it has already been suggested. Accuracy of results means that

search results should be displayed with respect to relevancy with search string and it can be shown in terms of percentage as other web search engines do. Currently if search returns single page, the system directly opens it instead of displaying its title in a list. There should be 'search all' option to select all namespaces like main, talk, user, and user talk in search settings.

Students' expectations are high regarding features of the text editor but it does not provide rich features. One main reason of high expectations is that many students use rich text editors like Microsoft Word and Open Office. It is desirable to add more formatting features to text editor that will facilitate students in editing activities.

Regarding 'external link' and 'show preview', these pages should be open in new tab or window instead of same window. 'Show preview' page should highlight the current changes and it should be displayed without text editor.

Students can be motivated if system provides a feature of self-design skin of the system. This feature will increase level of users' efficiency by providing them customized system layout to support their specific characteristics of use. In other words, this feature will facilitate different user groups like beginners and experts.

The authors observe that students do not perform well because most of them have no experience of creating and editing pages on wiki system. Wikipedia is very popular wiki system but most of the users use it for search articles instead of creating and editing pages. FUKT society might arrange training session on how to use the FUKTwiki. This training session can be helpful for naive students who are hesitant to use the system.

Detailed help for users is always desirable but very lengthy description is not liked by most of the users. The FUKTwiki provides heavily stuffed help pages. It is needed to keep help pages simpler and light which are easily understandable to beginners. Many users do not want to spend lot of time on reading lengthy descriptions, they like hit and trial method to perform different operations.

In general wiki systems support multimedia contents but currently the FUKTwiki does not support these contents except images. To make the system more interactive and effective, it should support audio and video multimedia contents. At the same time, the FUKTwiki must provide fast access with such rich contents.

FUKTwiki does not provide appropriate warning or error messages according to operations e.g. the system does not display any message if student moves to any page without saving changes they have made. Proper feedback is considered as an important aspect of a system. The FUKTwiki provides screen tips for different icons available with text editor. It is recommended that these screen tips should be revised and provided with more elaboration about the specific icon. It will strengthen self-evidence aspect of the system.

8.3 Future Work

This thesis is an effort to contribute in the area of usability evaluation of hypermedia educational systems. However some work related to this thesis as mentioned below, needed to be taken as future work.

The authors believe that whatever is given under recommendations might be helpful in improving the FUKTwiki. Parallel to this study, there could be another way to evaluate the usability of the system which should be more focused on utilization of network cooperative work. According to which researchers can work to find the effects of sharing school assignments and other documents on students' learning through such systems.

Most of the students who participate in usability test of the FUKTwiki have no previous experience of editing and creating pages on a wiki system. In future, this study can be conducted by selecting users with good experience of editing and creating pages on a wiki system. This study will help to compare the usefulness of student wiki system with the perspective of beginners and experienced users.

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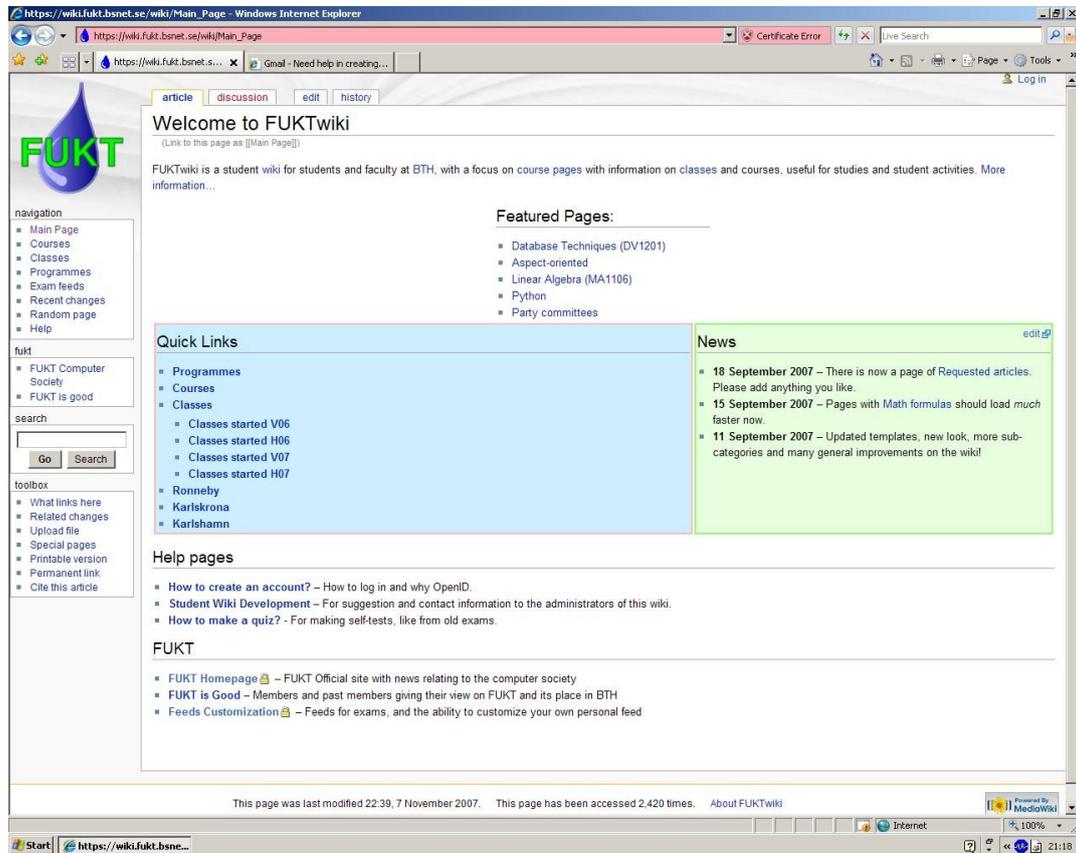
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Web Resources

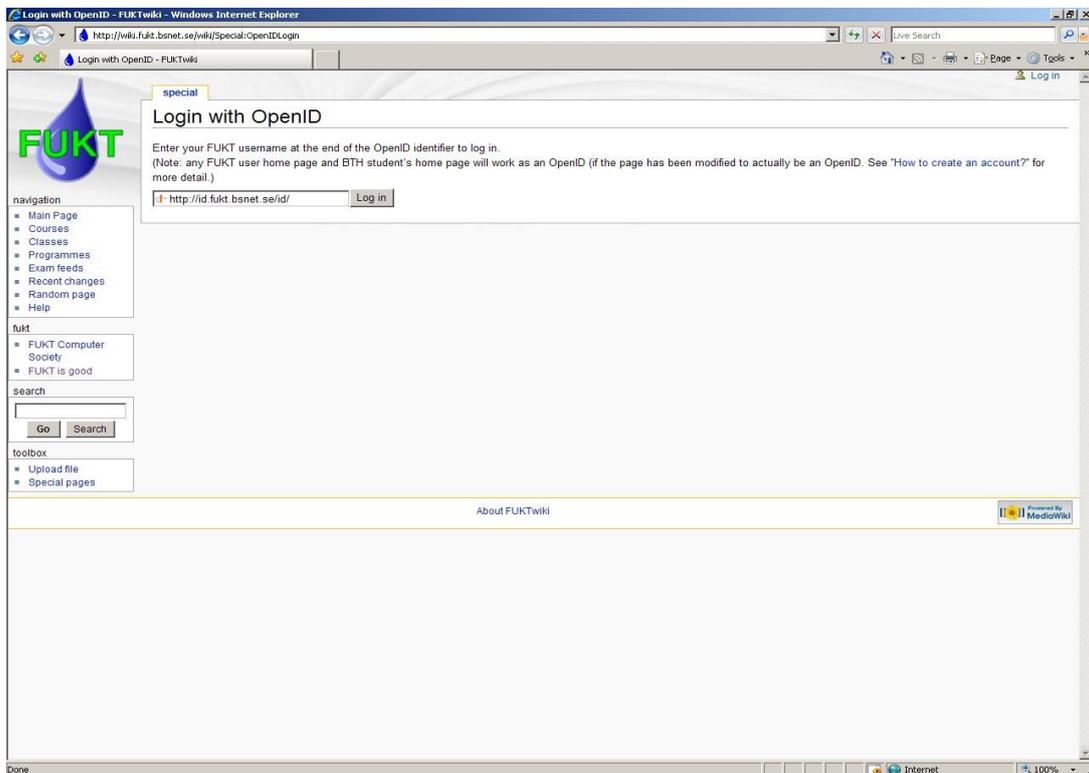
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Wiki Wiki Web. (2007). Retrieved November 17, 2007, from Wiki Wiki Web:
<http://c2.com/cgi/wiki?WikiWikiWeb>

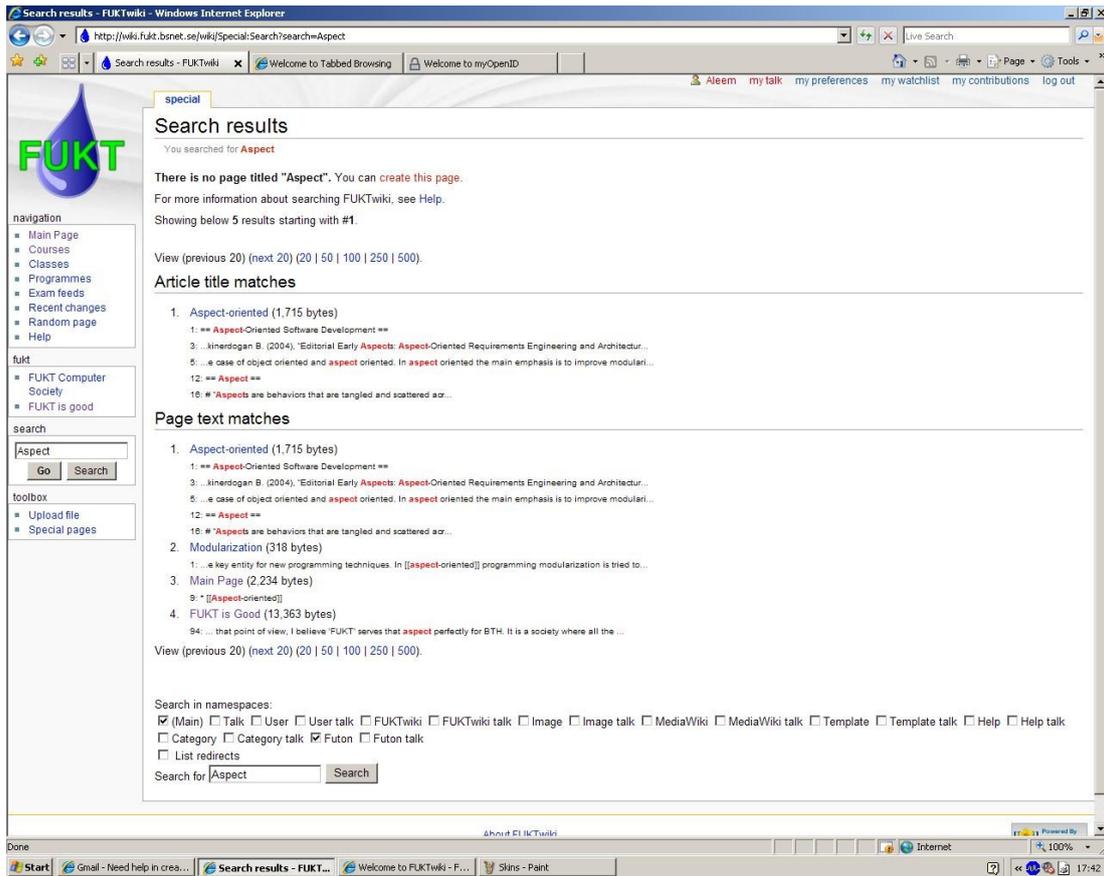
APPENDIX 1: SCREEN SHOTS OF FUKTWIKI



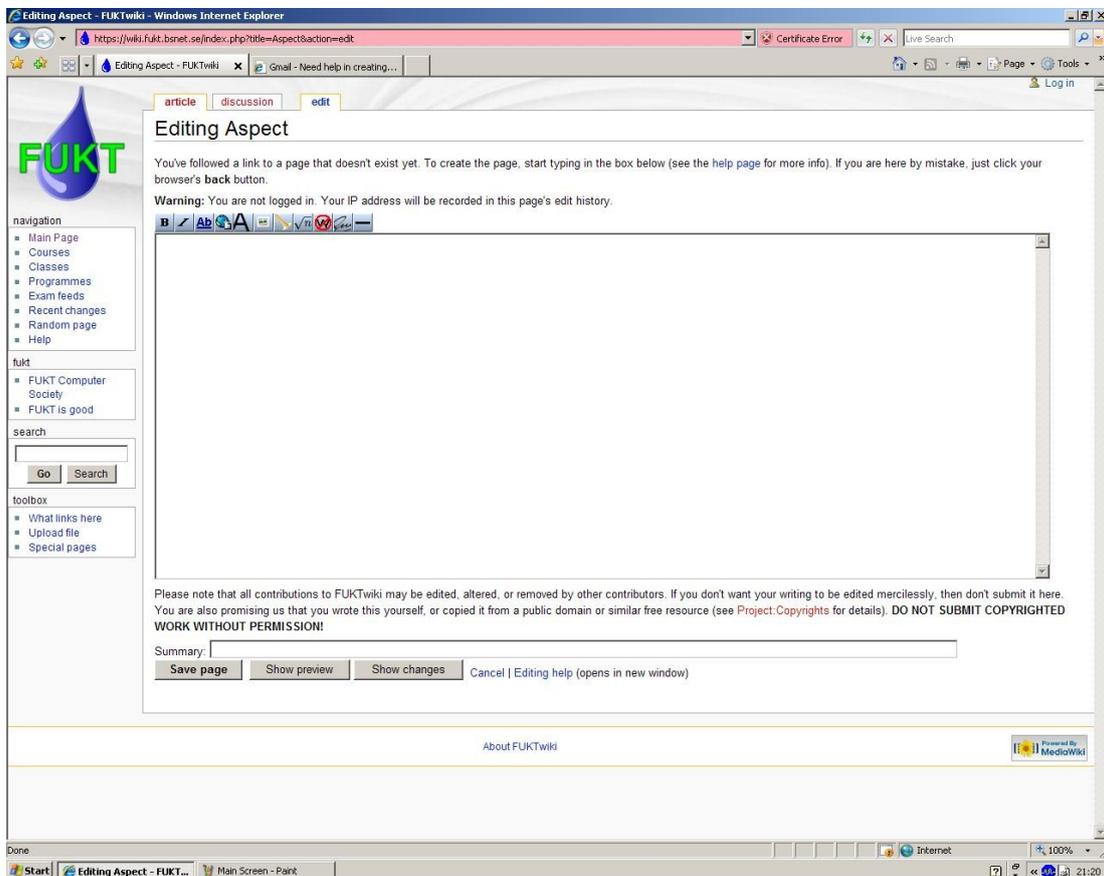
Screen 1. Main Page



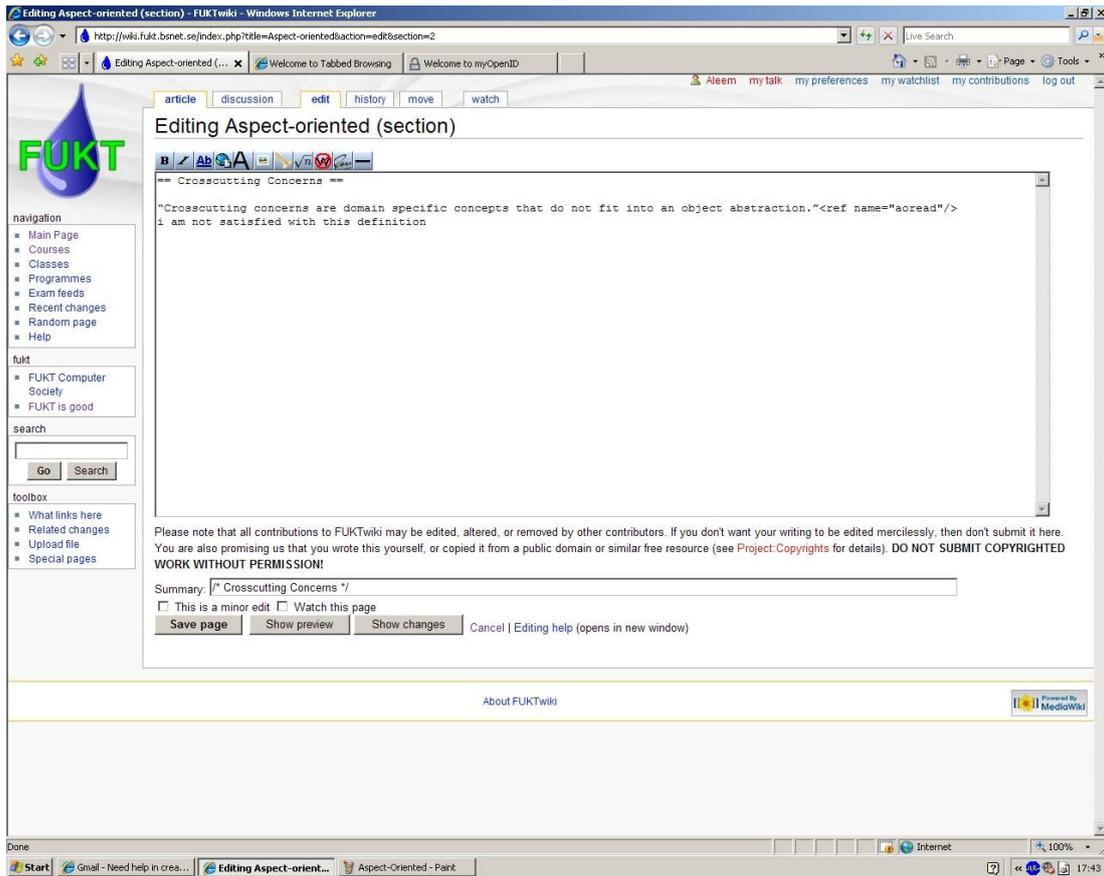
Screen 2. Login Page



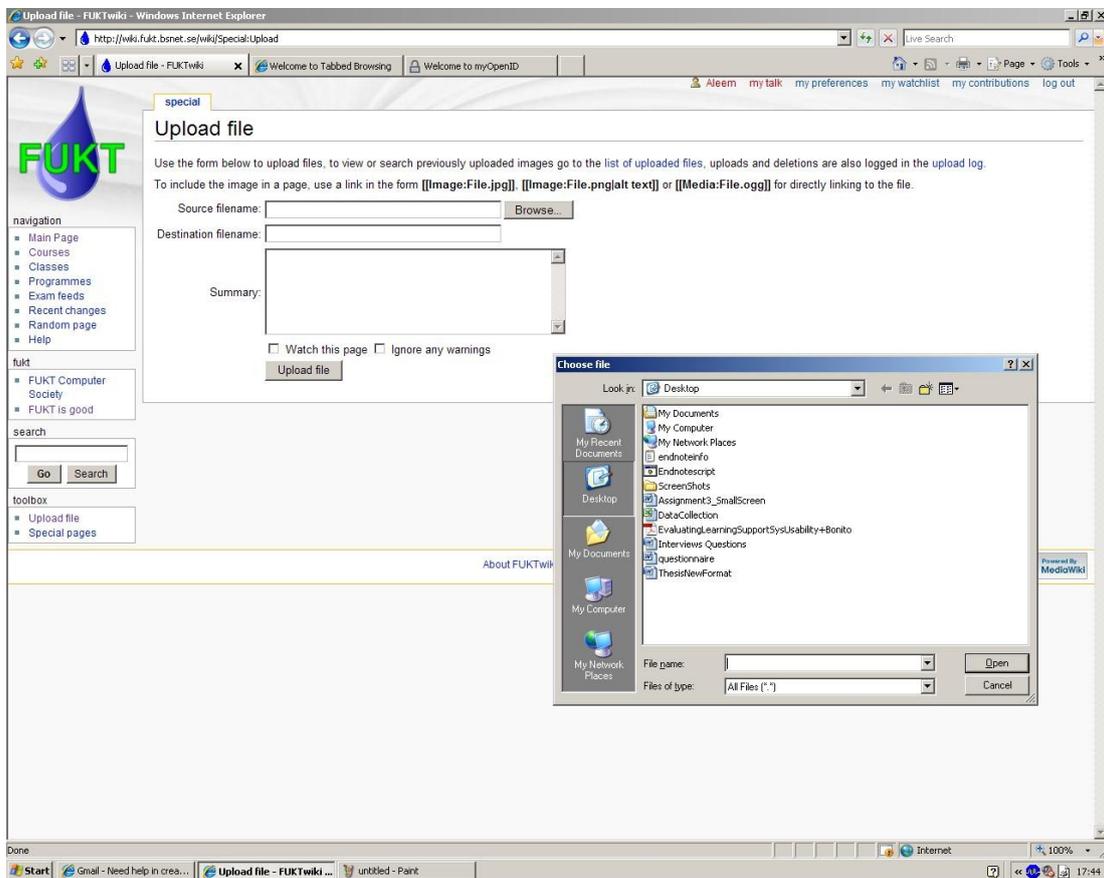
Screen 3. Search Results Page



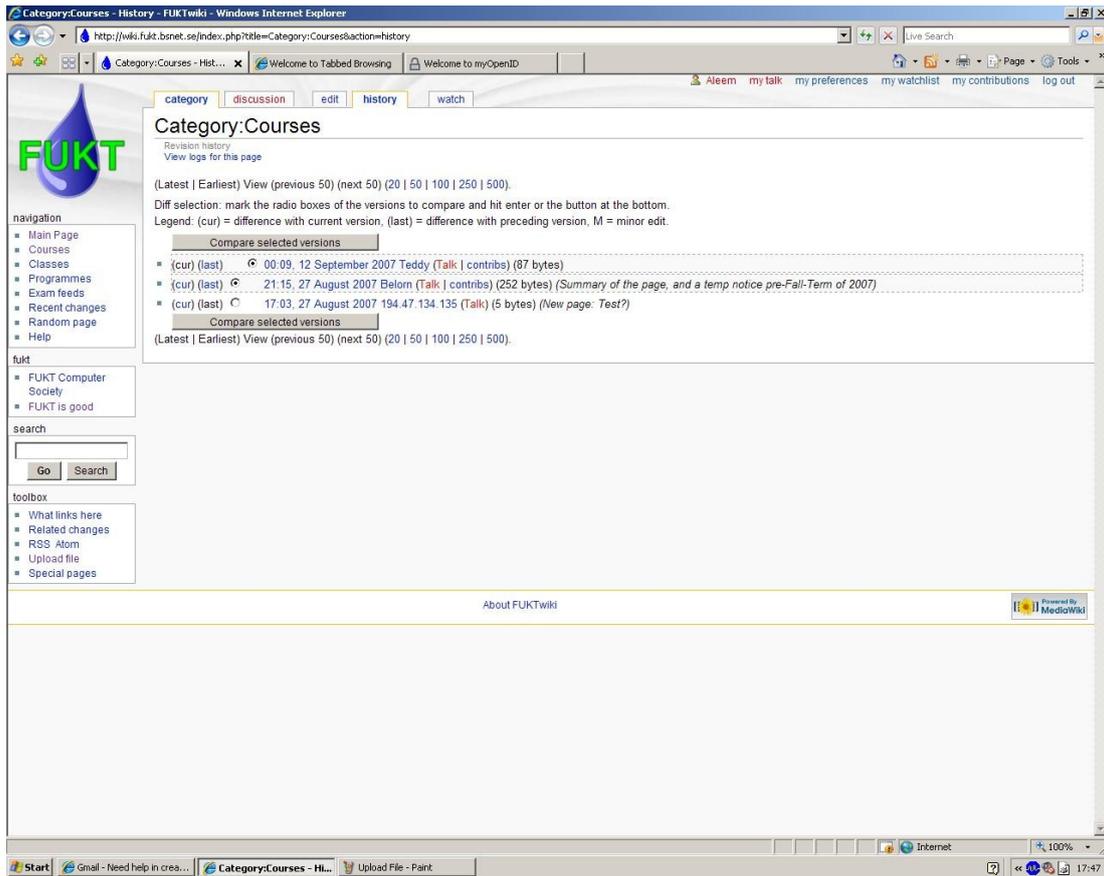
Screen 4. Create Page



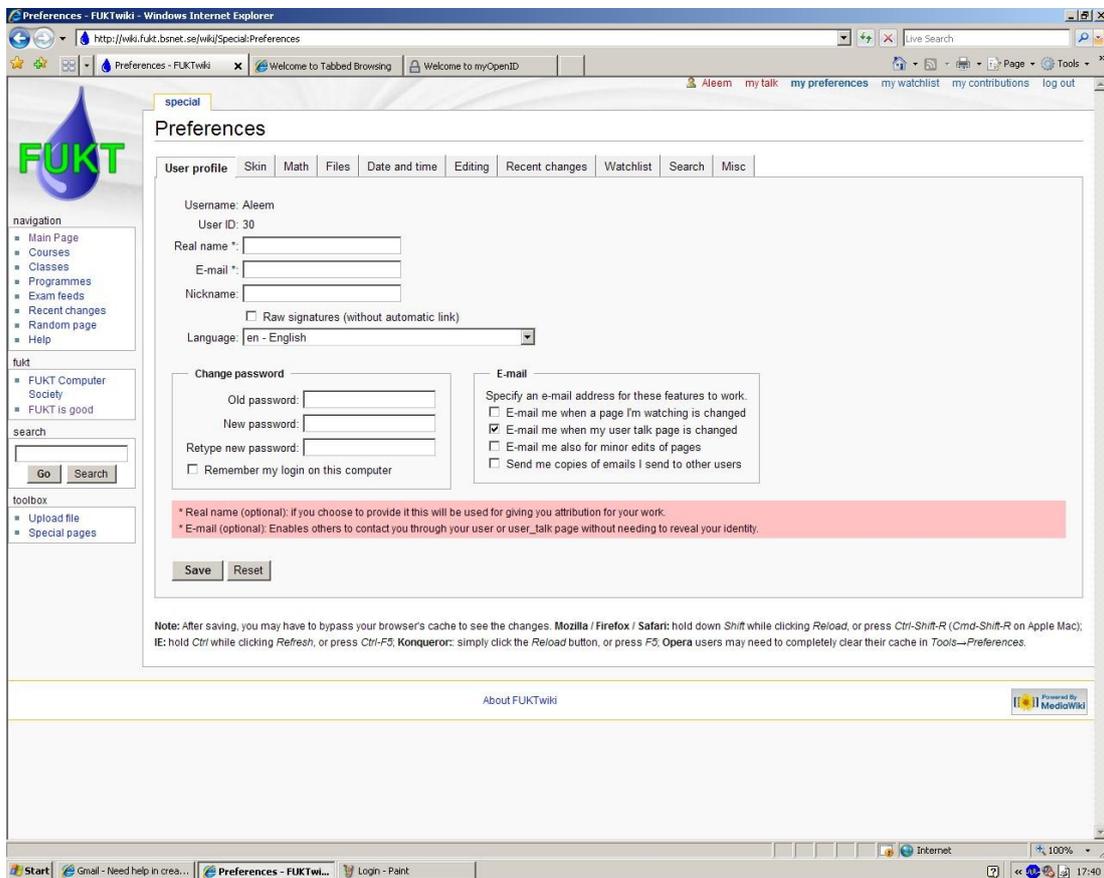
Screen 5. Edit Page



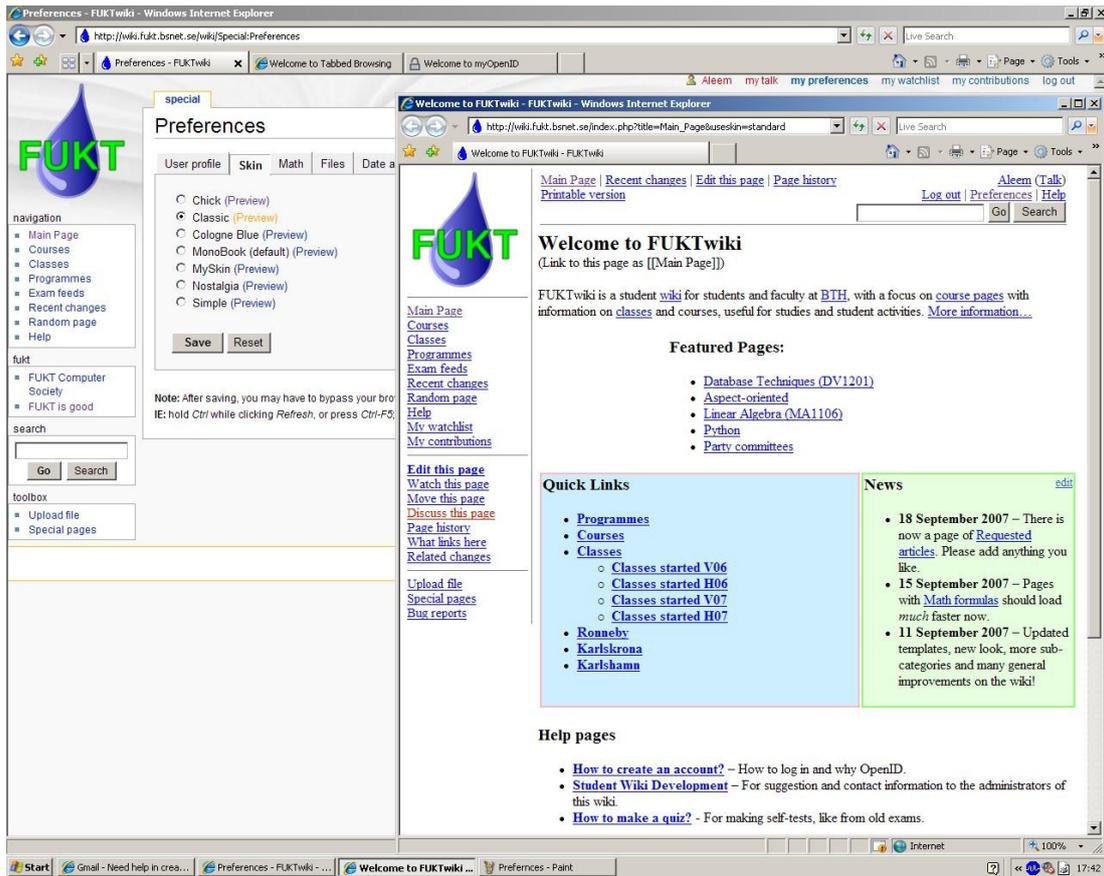
Screen 6. Upload File



Screen 7. History Page



Screen 8. Users Preferences Page



Screen 9. Screen Preferences

APPENDIX 2: QUANTITATIVE RESULTS DRIVEN FROM PARTICIPANTS' RESPONSE

The following table shows participant's response in percentage against each question.

Question No.	Scale (Participant's response in percentage)			
	1	2	3	4
1	17	37	46	0
2	13	41	33	13
3	8	34	41	17
4	17	38	45	0
5	13	33	37	17
6	30	41	24	5
7	25	41	29	5
8	54	25	21	0
9	13	58	29	0
10	13	50	37	0
11	37	30	33	0
12	17	45	38	0
13	13	54	33	0
14	30	25	45	0
15	38	41	21	0
16	17	45	38	0

APPENDIX 3: ANSWERS TO QUESTION 17 AND 18 OF QUESTIONNAIRE

This appendix contains responses to question 17 and 18 of the questionnaire.

Question 17: Are you willing to adopt this system for academic activities? Please support your answer with arguments.

Answer 1: I will certainly adopt and use this system for academic activities but the thing is its very hard to use. So one can't spend his time in just learning how to use this system.

Answer 2: I am agree its very useful for academic activities. The students share the new, recent research information among. Establish a good coordination, different opinion among the student and teacher.

Answer 3: Yes, I am willing to adopt it, if the system login me easily. It will be a good practice, if all the people share their knowledge through this system. But this system is not easy to use.

Answer 4: With its present functionality it is not up to the level of my satisfaction as a user. So if it is improved and populated with large database of different terms and keywords then I will be comfortable with it.

Answer 5: No, I am not going to adopt this system because it's really hard to work on this system. If you want to search something then this system takes a lot of time and after that you can't find 100% of your required information.

Answer 6: No, I am not willing to adopt this system for academic activities. Because I, have itslearning.se I think it's enough for me. There is no need to switch to another site.

Answer 7: Yes, If the system through study and analyzed. Menus to say that it required refinement.

Answer 8: Yes I am, because the facilities it intends to provide are mostly of use during academic activities. However the current layout needs to be improved.

Answer 9: This is a good idea, but due to availability of 'Wikipedia'. I am not sure that "FUKTwiki" will grow and attracts people. FUKTwiki could have been a successful idea if the user has find any new and more easy to use way of search. User friendly interface and better searching will give it more popularity.

Answer 10: As far as my knowledge is concerned, this system has not any single attraction except it has been launched by BTH and as a BTH student I will use that. I will not adopt this system as a frequent user because I can search and solve all if my problems at its parent system.

Answer 11: Yes, but to adopt this s\w, one should have an experience of using such type of s\w in advance. A new user may face difficulties while using this. After solving this issue one can use it as learning tool like a Wikipedia.

Answer 12: Yes this is a very good system. We can use for academic activities because it is just like Wikipedia. It's a free encyclopedia any one can edit the page. We can also use in a same manner.

Answer 13: This system cannot be adopted for fully academic activities, but it can support to some extent. The activities like information sharing, student can develop pages easily according to their interest, assignments can also be shared to provide guidelines to others etc features are also useful.

Answer 14: No, because the functionalities of the system are limited to certain task. The layout isn't attractive. It's difficult for me to get familiar with it until I have worked with 8-10, times. I am not sure whether it's updated regularly or not. If yes, then how would I have to know its update?

Answer 15: The system certainly is a step forward in making learning easier and it provides a useful way to share knowledge and information. I am willing to adopt this system for mu academic activities with minor changes in the ways it operates. The system will enhance the concepts of knowledge sharing in any enterprise and certainly is a better way of learning and experience sharing.

Answer 16: In my opinion this system may help to perform academic activities. When most of students will use this system regularly then other students will find the required current information regarding their courses that are studying and are planning to study for future work.

Answer 17: I will not support this system. This is the most difficult systems which I have ever seen. There is no help. There is no way for exit. End user can be stuck in the system.

Answer 18: To much extent the system is very useful in order to have definitions and concepts of some terminologies. But the source is not a reliable one because any one is allowed to put his own definition on any topic, how could we come to know which one is better.

Answer 19: This system has several problems. This system can be a good system if it provides course related information customized to a particular user. This includes the courses has been taken, his assignment deadlines etc.

Answer 20: No! The reason behind is I feel some hectic to use this and It is not easy for me to create and operate my own account. Only Firefox can do so. There is authentication for the information updated upon it is except the schedule and school activities.

Answer 21: Presently, the current contents are not enough, but I am sure to use it if more stuff is added (with rectification) and more user friendly interface.

Answer 22: Too useful for academic activities due to everyone can share his knowledge with other which may help others in anyway. That may urge students to write articles and other research activities.

Answer 23: I am willing to adopt this system. It will be very useful for academic activities. Anyone can take help from it to find any information to academics. It is a quick way to find required information. There are not so many systems yet available of such kind.

Question 18: How do you find the overall system? Please write down your suggestion for improvement.

Answer 1: I found the system usability very hard and difficult. The system should be more attractive, search feature should be improved, create user/login etc should be done easily.

Moreover, I would say that the system should self explanatory and by adding some extra features for ease of use and attraction.

Answer 2: The overall system is complicated not much easy to learn. Being a computer student we find way to some extent but it's very difficult to other technology student like Business Administration, social sciences.

Answer 3: Need updation in page layout. Name of this site must be easier to remember. Easy to login (make this usable). More help and support is required from the system "I like its white background" and idea of sharing the articles and materials related to different courses is good.

Answer 4: System lacks implementation with respects to the Human Computer Interactions principles that's why not a good and attractive one for me. Read principles and effective web design (Searched on Google design: WebDesignTalkfest.pdf) from Google.

Answer 5: It's pretty good but I am not satisfied with this. It should be more user-friendly. Front/Main page of the system is not impressive, it should be more attractive. The position of icon login is not satisfactory. It must be somewhere downside.

Answer 6: I think overall system is not satisfactory. For improvement, first of all the user registration process should be improved. Secondly the overall look should be more attractive. The system should create some reasons, to attract new users.

Answer 7: Overall system is very difficult to understand, especially for new user. Make it simple and easy to use.

Answer 8: The purpose of the system is meaningful. The features it provides are somewhat sufficient. The language of information/instruction is not appropriate (sometimes not meaningful or descriptive and misleading) and needed to be improved according to technical writing skills. Tasks like registering as new user and adding a page might be improved and be made more user-friendly. Outlook of the main page gives a nonprofessional notion e.g. spacing between menu tags is not consistent they are not drop down, left side information/links are not appropriate and sufficient etc. It needs a lot of improvements. Overall I rate the system in the range that needs up to 62% improvements

Answer 9: On a first glance FUKTwiki seems very much complicated. I think it will be good if there are less user options in the front screen or main page. Other options can be provided to user by creating different pages. Design of user interface should be user friendly. There should be a designated person who check and verify the edited or updated information and after reaching certain limit to edition, every further change should need an OK signal from that designated person. In this way I think user can get more reliable information.

Answer 10: I found overall system as a non mature product. There are no. of complexities involve to adopt these types of system. The searching is very slow even for a new users it is hectic job to create its user and to use its features. It's an improvement searching mechanism should be fast and flexible also interactivity feature should be provided. This system has to provide case to the user to perform its functions.

Answer 11: The overall system is little bit attractive, but it should be is such a design that the user can choose his content of interest easily. Also visible commands for creating and editing a file. Easy to login that is all users can see, what is doing. Overall system is useful of course but for those who are also very use to such software.

Answer 12: Overall system is quite good but one thing is needed to improve is that whenever anyone create a new page, the system should display message that your page is created and also take some authentication about the article like proof references etc.

Answer 13: The overall system can be graded as average. Improvements are especially needed in edit pages. There are very few options in toolbar. The main page template should also be made more attractive. The 'help' feature can also be extended to provide more details to users.

Answer 14: Well, It's a very good approach towards such a system helping students to find there course relevant material very easy. One can improve the system by looking and feeling good of interface, extending search features, News and update sections, language selection, advance search system/tips, putting a button to select Acc. Useful error messages, lost login, which's online/surfing.

Answer 15: I found the concept or idea of the system very interesting and useful. However, in my opinion, it could be made more user-friendly. In the help menu (for instance) all the working of a system should be mentioned. It could be made slightly more attractive by adding pictures or animations that can overall provide user with the environment of true learning.

Answer 16: At the moment there is less information available at the system due to lack of users/students. If most of students try to provide information regarding different courses in good way then it will attract other students as well. Students should try to use system for their own guidance and to help other new users to use system for their help/guidance. When number of users will increase then system popularity will also increase. There should be time to time meetings with students to improve the system (mean feedback from student will help to improve the system)

Answer 17: This system is very poor. This system should be user-friendly. They should adopt some design patterns like ephemeral feedback etc. This system is light but it is very difficult to user for end users. Proper design pattern will help the system.

Answer 18: I remember, I just tried to change the color theme but all the look of the system was new for me with changed location of buttons. It was totally new look, I think it should change color only, not the look.

Answer 19: The system is not user friendly. It should provide help features.

Answer 20: It is a nice site; developer did a very good job. I think it can be more attractive if they add some graphics, improve some "look and feel" of the main page. It can be more user-friendly if they use icons rather than the text and add some animations. Overall it is a good site for sharing the information.

Answer 21: Search facility needs more attention. Rich text editor should be standardize and more user-friendly. New user registration system should be easy. More user-friendly navigation is required. Rectified data should be published.

Answer 22: Overall structure was fine, pretty understandable. There are improvement possibilities to make it more interactive.

Answer 23: The overall system is good. The accuracy of uploaded information must be done regularly. The format of other pages should also be colorful like main page. The registration procedure for creating the login must be short and little bit easy. RSS is not working or formatted properly to provide the overview of website and latest updates of website.

APPENDIX 4: INTERVIEWS

STUDENT 1:

Question 1: What was your first impression of the system?

Answer : The first impression of the site shows that it is like ‘Its Learning’ of BTH or any other educational institute.

Question 2: What are the merits/benefits of the system in your opinion?

Answer: This system is equally beneficial for the students of BTH as well as students of other educational institutes. It is helpful for students to get information on particular course or topic like in Wikipedia. Users can easily get information from the system.

Question 3: What are the demerits/drawbacks of the system in your opinion?

Answer: At the moment, contents are not rich. System needs proper advertisement and motivation to get more users. Further, it seems there is no mechanism in the system to validate the contents.

Question 4: How do you compare FUKTwiki with any other educational system?

Answer: I have used different educational system like ‘Idenet’, ‘Drupple’ and ‘Its Learning’. But these are restricted to a particular educational institute. FUKTwiki seems open for all which is very useful thing.

Question 5: How to improve the system to make it useful for your studies?

Answer: It can be more useful, if it is recommended by university teachers officially like ‘Its Learning’ LMS. In addition to it, more participation from teachers and students of other universities is required.

Question 6: How important is it the system support collaboration between students in their learning efforts?

Answer: Such systems help students in their learning if their contents are useful.

STUDENT 2:

Question 1: What was your first impression of the system?

Answer: This system seemed copy of Wikipedia system. I thought that it is useless if I can get the same information on Wikipedia. Its login procedure was very difficult. When Google provides very efficient search, there is no use of such system.

Question 2: What are the merits/benefits of the system in your opinion?

Answer: It represents BTH community and it is good for community sharing. Students might be satisfied if they find articles of their interest but currently there is no such information.

Question 3: What are the demerits/drawbacks of the system in your opinion?

Answer: Its response time is too slow. Once student gets late response, he never visits again because other more efficient systems are available. Secondly its pages contain too much information that is unnecessary. Thirdly login procedure is quite difficult that should be simple.

Question 4: How do you compare FUKTwiki with any other educational system?

Answer: If I compare it with ‘Its Learning’, that system is very good. They provide simple operations for different tasks and useful information is easily accessible.

Question 5: How to improve the system to make it useful for your studies?

Answer: To improve FUKTwiki, courses information should be in detail. Login procedure should be simple. In my opinion, it should be the same username and password that is provided by BTH to every student. This system should be more interactive and it should provide proper feedback.

Question 6: How important is it the system support collaboration between students in their learning efforts?

Answer: Its support is very limited. Wikipedia provides more support comparatively.

STUDENT 3:

Question 1: What was your first impression of the system?

Answer: In usability point of view, it is not reliable. Information is not properly displayed. It is difficult to search the contents as compare to other systems such as Gmail and yahoo. Its idea to help students in education is excellent. Structure of its pages should be simple.

Question 2: What are the merits/benefits of the system in your opinion?

Answer: It is beneficial for students who need information regarding some topics. It is easy for students to get contents. It helps in collaboration and interaction between users. Students may get new information easily.

Question 3: What are the demerits/drawbacks of the system in your opinion?

Answer: It should be simpler like Google. Creation of new user is complicated. There was a problem while using upload file. Contents should be properly referenced during editing page.

Question 4: How do you compare FUKTwiki with any other educational system?

Answer: 'Its Learning' is just giving us information regarding contents of courses and its schedule. Only authorized person can access the contents. FUKTwiki is good for students studying in different universities to collaborate research and data. Exchange of ideas is beyond the universities and countries.

Question 5: How to improve the system to make it useful for your studies?

Answer: Contents of pages should be categorized e.g. courses and then its time table, course contents. It is simple and easy to understand. It should also include icons for the functionalities.

Question 6: How important is it the system support collaboration between students in their learning efforts?

Answer: Students can easily and in better way collaborate with each other if this system properly developed.

STUDENT 4:

Question 1: What was your first impression of the system?

Answer: When I firstly see at the system I thought it is like Wikipedia. This system seems to be good for incoming events and courses. System was user friendly and easy to use.

Question 2: What are the merits/benefits of the system in your opinion?

Answer: Advantages of the system are that students can easily add new resources links and upcoming events. It also helps to find new resources regarding studies. Users can also share the events and activities with each other.

Question 3: What are the demerits/drawbacks of the system in your opinion?

Answer: Main disadvantage of the system is that it does not provide the authenticated sources. It is possible for everybody to make changes in the contents without any authenticity. Login functionality is not easy and there is no proper feedback in case of incorrect user and password.

Question 4: How do you compare FUKTwiki with any other educational system?

Answer: As compare to other educational system alerts for upcoming events are missing in FUKTwiki. Other systems provide online collaboration between users. Courses are easy to browse and search in other systems. It is also easy to register the user on other systems as compare to FUKTwiki system.

Question 5: How to improve the system to make it useful for your studies?

Answer: System can be improved if the interface of the system is attractive. There is also need to improve the search feature. The sources should be authenticated.

Question 6: How important is it the system support collaboration between students in their learning efforts?

Answer: In my point of view, it is not important.

STUDENT 5:

Question 1: What was your first impression of the system?

Answer: The first impression of the system was like; someone took a good start to support students and teachers. It would be very useful for students and provide useful information about different topics related to studies.

Question 2: What are the merits/benefits of the system in your opinion?

Answer: There are many benefits of the system; especially it can be very helpful for students. Students can find very useful information related to different topics. These topics can be in general category, on which someone wants to learn and there she can find other useful links, which can provide more detailed information about the topic.

Question 3: What are the demerits/drawbacks of the system in your opinion?

Answer: As I have not so much experience of systems like FUKTwiki, so when I tried to make new pages in FUKTwiki I found some difficulties. The main drawback I found was, no help related to creation of new pages. Another drawback which I found is related to login pages. When I tried to login in system, it asks for 'OpenID' login, and I totally did not understand what is this ID. I put enough time to log in the system.

Question 4: How do you compare FUKTwiki with any other educational system?

Answer: FUKTwiki is very useful and valuable system especially from students' point of view. Students can write pages according to their interests, also upload their assignments and it can be made a very useful platform for both faculty and students. Everything starts from somewhere, as now everyone knows about Wikipedia. So if students start to focus on this system, it can go to a high level.

Question 5: How to improve the system to make it useful for your studies?

Answer: There are some suggestions which can be helpful.

- More help pages should be written which provide good information for a first time user.
- Login problems should also be handled and an easy way should be introduced so that user can enter easily in the system. Because if a new user comes and she found so much

difficulty even log in the system then there are very less chances that she will come back.

- Main page can also be made more attractive so that user feel good when visit for first time.
- Categorization of different topics on main page also made in a way that it looks very attractive for users.
- Toolbar which is presented in FUKTwiki for creation of new pages includes very less collection of tools. More tools can be added in toolbar, for more proper formatting of new pages.

Question 6: How important is it the system support collaboration between students in their learning efforts?

Answer: According to my opinion, it is very important for the system to support collaboration between students. Students can share information using this platform and can discuss different problems related to studies, programs, assignments and many other different aspects.