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THE USABILITY TESTING OF OPTIMA LEARNING MANAGEMENT SYSTEM – FROM STUDENT INTERFACE



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The usability testing represents one of the successful factors to be implemented into any learning management system LMS to evaluate the examined interfaces by testing it on users. LMS might be very difficult to use by students if usability problems are not identified in early stage. Many LMS projects have failed during last few years to stay among the top existing systems. Therefore it is mandatory to conduct usability testing during the system development cycle.

To start this research we are going to deal with the general concept of learning management system LMS and shed light on the importance of ultimate LMS. And also to include important steps to be followed by selecting team of organization to choose the suitable LMS vendor, system architecture, and key factors of successful LMS's.

The main objectives of this study are to learn first the Usability Testing technique, second to design usability Test Plan for Optima LMS from students interface and to implement it into Optima LMS. Finally to find out how easily students can use Optima system.

To setup usability test into Optima LMS, it would be appropriate to create a test plan which contains a detailed description of all testing processes such as: Determining the scopes of problems and test objectives, testing methodology, creating scenarios and tasks, recruiting test participants, analyzing and reporting usability test results, and the findings will be in the form of recommendations.

The empirical part of usability testing consists of implementing the designed test plan into Optima LMS. The empirical part begins by describing the methods used for collecting data and the role of the professional software The Observer and Think-aloud technique to gather qualitative and quantitative data. After that we will address to analyze the test results from different perspectives, and to suggest recommendations of problems encountered by the users during testing to Optima system developer "Discendum".

KEYWORDS:

Optima learning management systems LMSs, usability testing, test plan, Observer Software, testing and analyzing process, recommendations.

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LIST OF ABBREVIATIONS (OR) SYMBOLS

APIs	Application Programming Interfaces
BIS	Business Information Systems
CMS	Course Management System
IaaS	Infrastructure as a Service
ICT	Information and Communication Technology
IT	Information Technology
LMS	Learning Management System
NIST	National Institute of Standards and Technology
OBF	Open Badge Factory
PaaS	Platform as a Service
SaaS	Software as a Service
SSL	Secure Socket Layer
TuAMK	Turun Ammattikorkeakoulu
Tekes	The Finnish Funding Agency for Technology and Innovation
UCD	User-Centered Design
UT	Usability Testing
WIUX	Work Informatics User Experience

1. INTRODUCTION

1.1. Problem statement and research objectives

Optima is aimed to be one of the best platforms for eLearning courses, information management, networking, and supporting learning on the job. Discendum, the optima system developer, consider it a high-quality system to be applied by users to build a perfect online environment. More than 200 educational institutions and companies have implemented Optima to support their education and projects. (Discendum 2012.)

On the other hand, the system has not been classified yet among the top learning management systems (Capterra 2014). Moreover, only a little academic literature has been written under the name of Optima. Those documents often belong to libraries of universities which have kept a right for only their users to access it. This limitation makes the case more complicated and stands as a barrier to sharing Optima research to external readers of Finnish universities.

Furthermore, a little research in usability testing was carried out on Optima, which makes it a bit difficult to collect necessary information and to fulfill my goals on study. In spite of that, Optima has improved all interfaces by merging versatile tools, flexible online environment and high security access. Similar learning management system has attracted a wide attention across the world. To talk in specific terms "Moodle serve over 70 million users". (Moodle 2013.)

After having stated the previous points, there are different questions to rise in this research. They are as follow:

- Is the Optima system easy enough to be used by students?
- Is the Optima system efficient enough for students to carry out different tasks?
- How my findings and recommendations could help the developer of Optima to improve the usability?

To get responses to the previous questions, a usability testing should be taken into consideration, to find out how real users use the system in real life, and also to learn which kind of difficulties and problems users might encounter during their daily tasks.

This thesis concentrates on students' user interface only. A usability test plan is designed based on the literature of **Carol M. Barnum** (*Usability Testing Essentials Ready, Set...Test. 2011*), and **Joseph S. Dumas** (*A Practical Guide to Usability Testing, January 1999*), and other resources has been taken into consideration as well.

1.2. Research methodology

The selected research method for this study is considered as one of the options currently available for a case researcher. And it has been widely applied in the field of business administration and information systems. Recently, the usability testing has raised a lot of positive attention in the field of education. It has gained significant results by implementing new techniques to solve problems faced in the real world. This involves the analysis of the users and performance of the system design in order to understand, explain, and improve the designed systems. (Barnum 2011, 66.)

This kind of method goes along with my study research, where I am supposed to understand the Optima system environment, and try to find usability problems encountered by the users. The challenge in this research is to design a test plan which includes test objectives, methods and scenarios. The practical part is reserved to carry out the test plan to WIUX laboratory, for a goal to observe participants and to collect data based on the selected methods.

The methods used to collect data for this study are quantitative and qualitative. Obtained data will be analysed, interpreted, and presented in form of recommendations to project stakeholders.

This research method is applicable in small sample studies as well, which fits well my usability testing study, therefore I called six participants only to conduct the empirical research into Optima LMS.

2. LEARNING MANAGEMENT SYSTEMS LMS'S

A learning management system (LMS) is a software application or a Web-based technology used for planning, managing and delivering online courses. Typically, LMS could be used to assess student performance, to support classroom teaching, and to deliver courses to a large number of students. (Ryann 2009, 2.)

LMS provides the users with a virtual space to interact and share their experiences. Features of LMS might vary from a system to another, but generally they include a registration and enrolment of students and supervisors. Such a system also involves course editing options and uploading material by teachers, downloading material and uploading assignment by students. LMS server could be accessed distantly for retrieving and updating stored data. Nowadays, LMS has the ability to be integrated with smart mobile learning platform, and gives the possibility for user to switch between multilingual support. To explain more what has been said before, we can attract the reader's attention to the following figure (IJARCSSE 2013, 998).

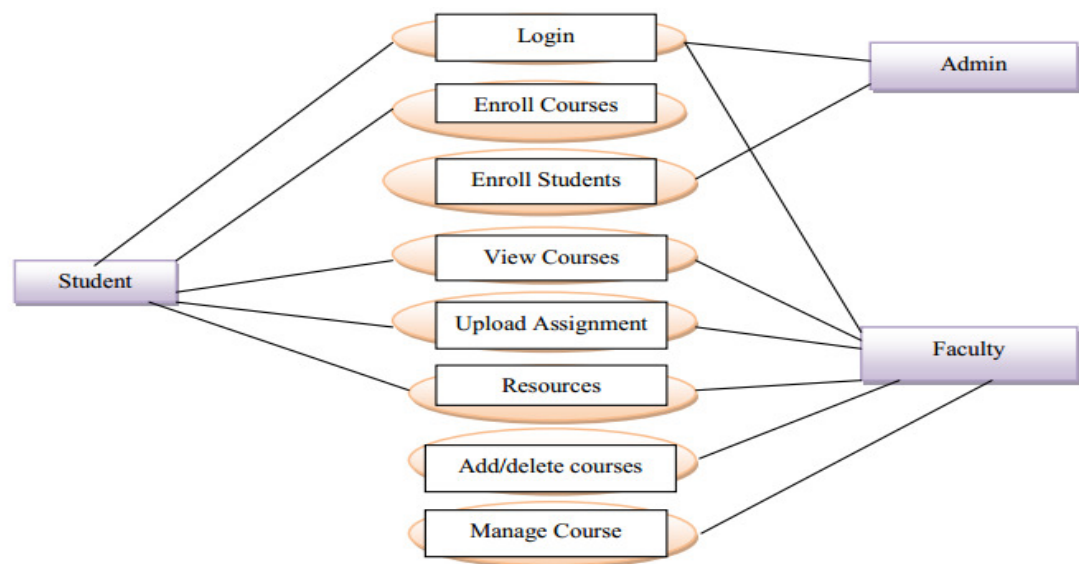


Figure 1. Interaction of LMS with various users.

As you may easily notice, the figure 1 stated above illustrates a use case diagram with a simple representation of users' interaction with LMS system, where the users could be students, administrator, or faculty staffs.

2.1. Optima LMS

Optima is a web-based learning platform that supports learning and delivers extensive training programs. It also offers opportunities to utilize different learning models and pedagogical ideas. Optima is developed by Discendum, a Finnish company, together with its customers. That company was established in 2001 for a goal to create and implement online learning management and related training consultation services.

Discendum has delivered over 200 online learning solutions to various sorts of customers such as institutions of higher education, companies and other organizations. The Company turnover of the fiscal year 2011 was approximately 1, 6 million euros. Currently company employ 18 people in cities of Helsinki, Tampere, Rauma, and Oulu. Discendum headquarters are located in Oulu. (Discendum 2012.)

Beside Optima online environment, Discendum tries to provide every possible service that their customers might need for a successful eLearning content project. Discendum has developed **Totara** LMS in cooperation with New Zealand **Totara** Learning Solutions LTD. And has also developed **Kyvyt.fi** with the partnership of **Mahara** services. All the services that Discendum has developed can benefit from the safety management, training and communication provided by **3T Results Ltd**, (3T Ratkaisut Oy). (Discendum 2012.)

Since 2008 Optima online environment has been updated three to four times every year, for a goal to bring new features and functionalities to customers and to permit the system to be compatible with internet browsers. The updates are also relevant to system information security, management tools, and web design. This shows the interest of Optima project developers towards their cus-

tomers to measure customer satisfaction and dissatisfaction by organizing regular meetings, free seminars, and workshops. (Discendum Akatemia 2012.)

Optima was among the first LMSs in Europe to support issuing and displaying Open Badges; it is based on open application programming interfaces APIs. The goal is to develop a global cloud-based service to help organizations to create and manage their own badges in a centralized repository. The Open Badge Factory OBF project was created as a powerful solution for designing, creating, managing and issuing badges in organizations, due to the increased number of Open Badges practical applications.

The project has received financing from the Finnish Funding Agency for Technology and Innovation – **TeKes**. The project software development and coordination with partners is under the responsibility of Discendum. (Discendum Open Badge 2013.)

The same point is emphasized by the next figure 2:

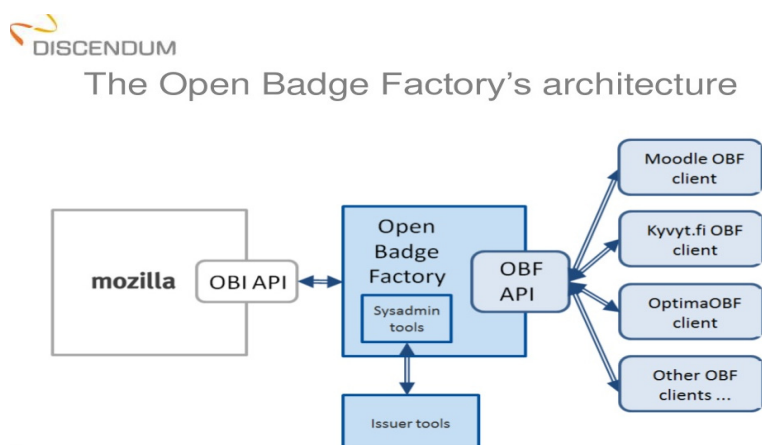


Figure 2. The Open Badge Factory's OBF's architecture (Discendum 2013).

Optimum is one of the clients of OBF applications beside other learning management systems. Open Badges can be issued anywhere and managed in one place. Actually, there are many Optima Badges such as Optima Expert, Optima Admin, Optima Training, and Optima Workshop. The Discendum Company's

ambition in future is to continue promoting the concept and methods of Open badges in Finland and around Europe. (Open Badge Factory 2014.)

2.2. Open source LMS

Open Source is software licensing philosophy where the source code is open and free to be modified by anyone. While it has already a few decades of history, it is just recently that it has gained wide-spread acceptance. Since the last economic crisis began, many organizations have become more interested in Open Source solutions, as open software tends to be free of charge to both private and commercial users, free of licensing and subscription fees. Learning Management Systems are not different from other software in this respect. The open source LMS design can be easily modified by user, giving a possibility of adding new features and to solve problems that might occur without contacting system owner. (Chaudhari 2012.)

Open Source LMS can also be used as a social learning platform, by creating an online community through LMS users. With the increasing number of available Open Source LMSs, it can be sometimes challenging for organizations to choose the suitable platform; especially that every new LMS brings a feature set slightly different from the previous ones. In an opinion of a certain people the LMS which seems to be the most successful is the most popular on social media. But in fact it is not all the time true. Every system developer has aimed to market their product in a way they considered most effective, and it is up to organizations implementing such solutions to select the suitable solution. Consequently, no single vendor has dominated LMS market. Each one's targets may vary depending on the type of solutions they provide, and often the targeted organizations are universities, multinational corporations, government agencies...etc. (Chaudhari 2012.)

Moodle LMS is the unquestioned leader in the field of free, open-source platforms. This claim is based on a survey made by Capterra which is a free service used by millions of people to help businesses find the right software and solu-

tions that could meet their specific needs. The superiority of Moodle has been established based on criteria related to total amount of customers, total active users, total online presence, and type of use which could be academic, corporate or both. (Capterra 2012.)

2.3. Steps of selecting an LMS

Organizations should be aware beforehand of how well the selected LMS solution could help them reach their future targets; otherwise the obtained results might be inappropriate. Often the results of implementing an LMS system into whatever type of organization can be analysed only after it has been fully adopted by end users. It is only then, when it can be evaluated by experts in the field to find out how did it fit in the structure of organization. (Zeiberg 2014).

It has become increasingly difficult to discriminate between the suitable LMSs for the organization. There are hundreds of available LMS solutions in the IT market; each one differs from another in terms of form and content. Therefore selecting a LMS to be implemented into a given organization can be considered as a challenging decision.

In any case, there are tips and steps to be followed before the conclusion of contract of the purchase, among them (Zeiberg 2004.):

- Researching the most suitable LMS vendors in the market by screening specific functional criteria of the selected system based on the organizational requirements and budget reserved for this solution. To some extent it is difficult to find an LMS solution that will correspond to all the organizations' needs, making it inevitable to modify some original functionalities of the system and to find a compromise solution between LMS seeker and vendor.
- Assessment of the designed LMS solution that will meet organizational goals, which in turn will include data collection and analysis process in the areas of training and learning, system integration and technical re-

quirements. Additionally, right people from relevant business areas should be involved in this project to ensure well-chosen LMS.

- Organizing the product demonstrations makes sure that all project stakeholders and IT professionals are attending the demonstrations otherwise you should call vendor for more than one presentation.
- Narrowing down the list of LMS vendors you are expecting to order, and eliminate those ones that are outside of your range of demand. Additionally, customers should check portfolio of products to obtain sufficient information in system architecture, interoperability and integration and system security.
- Implementing an LMS for the first time inside organization or replacing existing one, will certainly touch a side of business functionality. This in turn requires a preparation for a probable changes either relevant for learning new material or business practice processes.
- Selecting the final LMS vendor represents the crucial phase by the organizations selection team and other stakeholders. It is also important to check the vendor references and to negotiate the contract terms and level of services.
- The last step is implementing the LMS into organization. It is very important to develop a communication channel between IT staff and LMS provider to limit the responsibilities of each party.

3. THE CONCEPT OF USABILITY TESTING

3.1. What is usability?

The ISO standard on ergonomics of human-computer interaction (ISO 9241) defines usability as: "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." This definition is still wider and it includes three important elements to be defined as well based on the usability goals. (ISO 2012).

Specified users: Concerns the persons to whom the product is designed for.

Specified goals: Are the shared goals between the users and product.

A specified context of use: Is the environment where the product should work by the users.

Usability can be used for various purposes like a website, tools, mobile devices, software application, or anything designed for people.

Whitney Quesenbery' has given an easy definition to remember, denoted by 5Es:

Effective:" How could the user could complete the task and reach the goals?"

Efficient: "How fast can the task be done?"

Engaging: "How is the interaction between users and system, and how satisfied are they about it?"

Error tolerant: "How many errors do the users commit? How easily can the users remedy them?"

Easy to learn: "How easy could the user accomplish the basic tasks for the first time they encounter a new product or service?" (Quesenbery 2004.)

3.2. What is usability testing?

Usability testing represents all activities that focus on observing users testing a product or service in certain working conditions. The goal for observer is to watch, listen and take notes while the participants are trying to complete tasks.

The ultimate purpose is to identify usability problems, collect qualitative and quantitative data and to determine participants' satisfaction and dissatisfaction with the product or service. Generally the usability testing takes two forms (Barnum 2011):

Formative testing: While the product is still in the development process, with a goal to diagnose the problems and try to fix them before representing it to the consumers.

Summative testing: commonly when the product is finished, with a goal to validate if the product meets the consumers requirements. (Usability 2014.)

In the beginning I thought that usability testing is an easy process to learn. But later when I got engaged in the project, I discovered that it consists of a series of tasks which need to be developed and a range of methods to learn in order to conduct an effective usability test. Among these methods were: Creating test plan, recruiting usability test participants, analyzing and reporting usability test results, and formulating suitable recommendations based on the results of the test.

During this chapter I will try to focus on the theoretical part of usability testing of Optima LMS. I will also follow the essential steps to achieve a good testing with the available resources.

3.3. The purpose of usability testing

Usability testing became a necessary factor for a website to survive in the competitive, networked environment. Often the web visitors are not willing to devote considerable amount of time and effort to understand what the site offers for them in terms of information or service. They might leave the website as soon as they encounter difficulties in using it or run into a web interface that fails to convey what it is trying to present. In case the freedom of choice of the end user is restricted (i.e. the system/website has been imposed on them as a platform used in the organization's infrastructure), such a lack of understanding can lead to unnecessary frustration. Therefore usability testing should be integrated into

any system to support users and to identify problems based on their experiences. (Nielsen 2012, 77.)

There are many reasons which make testing Optima system from student interface perspective an enticing project. There is no comparison with Moodle CMS in terms of usability testing research. Optima has almost the same features as Moodle and it has been used for a long period of time by our school educators and students, but it has not gained similar adoption rate as Moodle yet. Nevertheless, it has achieved success (measured in user base).

The other reason for this work was to detect problems related to the use of Optima, and try to elicit ways to solve them, in order to enhance the quality of service in usage. It is important to remember that the process aims not at testing the user but rather testing the Optima system itself. (Discendum 2012.)

Additionally, the number of users of Optima has increased rapidly during last few years, and the system has become more recognizable both in business and at universities. Some of them benefit from their services provided by Optima regularly, while the others are hardly familiar with it. It is important, therefore, to recognize the heightened attention towards Optima system by various organizations and realize how satisfied they are with it. (Discendum 2012.)

3.4. What to test?

It is quite important to identify the testing interface of Optima LMS to focus more on users' behavior and their interaction with the system. Student's interface has been selected to be tested in this usability testing in order to understand their experiences with the system and to determine whether the usability of it matches their expectations and supports their goals.

It is evident, that students are more prone to encounter usability problems and difficulties in comparison to the other users. Additionally, it is easier to involve students in testing process than supervisors, due to their more relaxed sched-

ules and willingness to cooperate in the non-standard tasks. Besides, students have wider experiences with similar learning management systems, either from their previous courses or from similar systems they encountered in their daily life. Therefore, they can bring an extra value to the testing. Finally the number of students using Optima system in Finland is higher compared to other interface users.

4. USABILITY TEST PLAN FOR OPTIMA LMS

The test plan for usability testing documented the entire essential test planning steps and methods that will be used. The test plan for Optima LMS will be presented as a formal report not only to record all the important activities related to the tested interface, but also to figure out how the system would be tested. The final report will be as a part of my final thesis work and it will be addressed to Optima LMS system developer "**Discendum**".

The test plan will include the sections below; some of them which are already defined in this report of thesis are not going to be repeated again whereas the other ones are the following:

- Title page
- Table of Contents
- List of Illustration, Abbreviation & Figures
- Executive Summary
- Problem Statement and Test Objectives
- Methodology
- User Profiles
- Participant Incentive
- Screeners
- Scenarios & Tasks
- Evaluation Methods
- Test environment and Equipment
- Presentation of Findings
- Pre-test Questionnaire, Post-task & Post-test Questionnaire
- Recommendations
- Appendices

4.1. Problem statement and test objectives

The main objectives of this research are to learn first about usability testing as a technique. Second, is to create a test plan for Optima LMS from students interface and to implement it into WIUX Laboratory. Finally, to discover how easy it was for students to use the Optima system after they had achieved the proposed tasks within a predetermined time frame.

Furthermore, it is important to examine if the system design works as intended and meets the users' expectations. In addition, to identify serious usability problems which might be related to system navigation, work functionality, message errors and system features. As an additional target it is important also to explore if Optima LMS is effective and efficient, by knowing how users can find information they need to complete tasks without help, and how they could successfully sign up to the system without major difficulties. After the participants get acquainted with system, they will face advanced tasks to explore their experiences in the system features.

It is not possible to test every task that could be done with the system. This is due to many constraints such as nature of research and limitation of human and monetary resources.

Scenarios and tasks have been created to help determine what meant to be learned. By observing six selected participants who matched the testing profile to achieve tasks in the Work Informatics User Experience WIUX Laboratory in Turku ICT building. The participants were divided into two subgroups. The members of the first group, experimented and having a great deal of computer knowledge, have been using at least Optima LMS. While the members of the second group were highly experimented users with detailed knowledge of computer; they must have used Optima LMS beside other distance learning system. Both groups had to be interested in taking a distance learning course or program. (See user profile, table 1, page 28).

Four scenarios were planned for this testing; each one contains three tasks to be accomplished in a predetermined time frame. After the participant had fin-

ished the scenario he or she was given the post-task questionnaire, and then the next scenario. The advantage to proceeding one scenario at a time was that I was able to interact with the participant between the scenarios. I was also able to control the number and the order of the scenarios, especially that laboratory was often booked by other people.

The empirical part has been an attempt to deal with the following points:

- Website layout: How easily can users understand the website layout?
Could the users browse the contents of courses easily?
Which kind of help could they gain from the Help icon?
- Procedure for accessing the optima system: Optima Login process
- Entering personal information and access to the desired degree program.
- Does the access process to the website require reasonable and suitable information of users? Do users understand all the words during the login process? If not, which part was unclear?
- Navigation: Can users find the efficient navigation when they are willing to create a new topic?
- Satisfaction and Dissatisfaction: Which features do users like better?
Which ones do they dislike?
- Advanced Options: How to find the number of object in the workspace of BIS degree program? Find the total members of users and supervisors?
- Saving a specific lecture material from Master's Thesis course to your computer desktop.
- How many Cloud services can optima users benefit from? Which are they?

4.2. User profile

It was crucial to know the selected students for the testing, and how well they fit in to the testing environment. Naturally, it was important to have a description of the user's experience in details to combine it with proposed scenarios and testing goals. Typically the participants played a great role in the interaction between the tested system and scenario. That information helped a lot know about the users' behaviour and somehow it had to be identical to the individuals who would actually use the Optima system.

Based on the literature of Jacob Nielsen, the experienced web users are in better in physical movements such as using mouse and scrolling. They are confident at clicking a link and less afraid that they will select the wrong icon. Frequently they prefer to use search engine and can easily reach their searching goals. Often, they are able to learn how to do repeated tasks quickly. In contrast, when the same users visit unfamiliar website, they are often confused about the web design and information architecture. They get easily disappointed by the smallest usability problems either related to the system navigation or the use of the system features. (Barnum 2011, 146.)

Commonly, the experienced web users are expecting to have web objects in a specific location on the website:

Back to home: in the upper left corner of the page.

Site search: on the upper right corner.

About us: in the footer...etc.

And often the users like to act instead of reading; they are somehow in a hurry to reach their goal. Therefore, these notes have to be taken into consideration to find out if the Optima system is designed to support the users' fast action to get something done.

The table 1 presents a general description of selected user profile for this usability testing:

Table 1. Profile description of experimented and highly experimented users.

	Experimented	Highly Experimented
Language	Able to read & Speak English.	Able to read & Speak English.
Age	Between 18 – 55	Between 18 – 55
Optima Experience	Must have used Optima LMS for 1 year at least.	Must have at least 1 year experiences with Optima LMS & similar distance learning system
Computer Skills	Basic experience with email, computer, & using application in networking environment.	Detailed knowledge of email, computer, & using application in networking environment.
Sex	Male & Female	Male & Female.
Internet Use	Minimum 2hour/day for internet use (or 12h/week), searching for information, sending emails, downloading files, shopping, & social network.	Minimum 5hour/day for internet use (or 30h/week), searching for information, sending emails, downloading files, shopping, social network.
Education Level	Undergraduate students must have interest of taking online degree program or course.	Undergraduate students must have interest of taking online degree program or course.
Citizen	Finnish or Foreigner.	Finnish or Foreigner.
Computer	Must own a computer.	Must own a computer.

4.3. Methodology

4.3.1. Participants

For this usability testing I planned to test six participants who fit my user profile, based on Jacob Nielsen who claimed that best results come from testing five to six users. It was described by a mathematical model where “**U**” states for the proportion of uncovered problems, where “**P**” is the probability of one subject identifying a specific problem, and “**n**” is the number of subject or test sessions. (Nielsen 1990, 266.)

$$U = 1 - (1 - p)^n$$

I planned to recruit participants by myself through Professional Social Networking Group and school friends, because no budget was reserved for this testing to recruit through an agency. It took me a lot of time to screen the potential participants and to schedule them based on their working timetable and lab reservation.

The testing was conducted in Work Informatics User Experience WIUX Laboratory of Turku University in ICT building. This presented an ideal testing environment for Optima LMS (See test environment and equipment). But before I conducted the final testing, I preferred to use the walkthrough method to walk and talk through material and to setup the lab equipment. In addition, it was important to conduct the pilot two days before the first test session to see how the participant would interact with scenarios and testing equipment, and to add minor changes which in fact did not affect the scenarios.

4.3.2. Length of sessions

The total length of each individual session lasted approximately one hour. It started with thanking the participant for accepting the invitation and introducing in brief the purpose behind the testing and the importance of concentration on the test. What is more, I explained the testing process to the participant and I described the Think-aloud technique so that he or she could share with me his or her thoughts and any questions or concerns'. Participants had to fill and sign a video consent form and pre-test questionnaires in advance to permit me work with recorded material. (Barnum 2011.) (Appendix 1 & Appendix 4).

Immediately after the completion of each scenario the participant had to fill the post-task questionnaire. Finally, after the participant had completed all the scenarios, it was time for the post-test questionnaire and a short interview to allow participant rate the overall experience. The total length of each session was divided as:

- 10 minutes: To welcome the participant and go through pre-test questionnaire.
- 10 minutes: Reserved for Scenario 1 & post-task questionnaire
- 10 minutes: Reserved for Scenario 2 & post-task questionnaire
- 15 minutes: Reserved for Scenario 3 & post-task questionnaire
- 10 minutes: Reserved for Scenario 4 & post-task questionnaire
- 5 minutes: Reserved for post-test questionnaire and short interview

4.3.3. Quantitative & qualitative data

In this usability testing the data collection was a combination of both quantitative and qualitative methods, aiming to provide the research with an understanding of the participants' experiences and to support the testing goals. For the quantitative method I focused onto some performance measurements of the users' actions and activities during tasks by counting:

- The time spent during navigating.
- Time spent finding information in the manual.
- Time spent to remedy from errors.
- Time to finish tasks.
- Number of wrong icon choices.
- Number of repeated errors. (same error repeated)
- Number of search in the table of contents in each visit to the manual.
- Number of calls to the help desk.
- Observations of confusion & frustration.
- Optimal path to complete a task.

Furthermore, a preference data was taken into consideration during this test by receiving feedback from Post-task questionnaires immediately after each scenario. And also a Post-test questionnaire at the end of all the scenarios using participants rating of tasks and the questions were such as:

- How easy it is to use and learn the Optima system?
- How easy it is to achieve tasks?
- How easy it is to find information from the manual and the system?
- Are you interested to participate into Optima LMS?

As an observer of this usability testing I tried to encourage the participants to use the Think-aloud technique as they were working in their proper environment to obtain qualitative data from them. This shed light on the nature of the problems they experienced as well as on what pleased them. I also captured their spontaneous comments on my notes. After they had completed all the scenarios Post-test questionnaires were delivered to the participants to enrich the qualitative feedback for our testing. Those were more like open-ended questions, including new questions that came out during my observations of the users. (Barnum 2011, 212.)

4.4. Scenarios and tasks

During this usability testing I created four different scenarios, each one included three tasks and each scenario was related to the next one. So, twelve tasks had to be completed in session length of approximately one hour and the participant had to complete the previous task to proceed to the next. Also I designed pre-test questionnaire to be answered and handed back before the testing session started. Four post-task questionnaires had to be answered sequentially and immediately at the end of each scenario. And post-test questionnaire to be filled after the participant had done all scenarios to get a general feedback from the testing process overall.

After I had designed the scenarios and had performed a pilot test two days before, the path became a bit clearer to conduct the final empirical testing session. The final forms of scenarios were as it is shown below:

Scenario 1 (10 minutes)

You are thinking of participating into distance learning study program in Turku University of Applied Sciences. You heard that the degree program offers students a good selection of courses and study module. It provides students with up-to-date knowledge and skills as well as to prepare them for lifelong learning. You will visit the Optima learning management website (<https://optima.turkuamk.fi/>), and without clicking to any icons have a look and tell us:

Task 1: What does the website layout suggest to you?

Task 2: Did the website provide you sufficient information in English?

Have you understood all the information provided by the website?

Task 3: You have decided to switch the language into English, to make the search more easy and understandable for you. Please select the English language and explain your reactions?

What do you think you would have to do to access your account into optima website? Do you think that the website guided you to the right link?

Scenario 2 (10 minutes)

The school gives you right to access the student account as a seeker for Master's degree program in Business Information Systems, to find out how you could manage to use the Optima system.

Task1: Go to the Optima website and try to login, to reach your desired degree program?

User account: **1103122**

Password: **Yhammouc.76**

Task 2: Let's assume that you have succeeded to login to your study program by following the steps 1- 4 below:

Step 1: Select one of the icons to login (**Haka/Login**),

Step 2: Select Turku University of Applied Sciences as a Home Organization Login to **Turun Ammattikorkeakoulu - Haka Login**.

Select the degree program **YAMK** (Ylempi Ammattikorkeakoulututkinto / Master's degree).

Step 3: Enter the user-name and password to login.

User account: **1103122**

Password: **Yhammouc.76**

Step 4: Select **YAMK & BIS – Business Information Systems** to enter your degree program.

Task 3: Let's assume that you liked the degree program and you want to apply for it. To do that you have to pass the entrance exam, by reading pre-task material and writing your thesis proposal. Browse the existing courses and course material for this degree program, and tell us:

- How easily did you understand your Optima account layout?
- Would you use Optima LMS if you got accepted by this degree program, or would you prefer another?
- How easily did you find information by the help of help icon?

Scenario 3 (15 minutes)

To meet the admission requirements to BIS degree program in Turku AMK you have to pass the written exam, and oral exam.

Task 1: For the written exam you are supposed to create a new topic into Master's Thesis folder under the subject name of: Name of participant / Nina Sillanpää

Task 2: You have to send your thesis proposal to your supervisor Hammouche Youssef, and write, or upload into body text field the thesis proposal. The thesis proposal exists as a Pdf document in:

My Computer → Kingston (Memory stick) → Thesis Proposal.

Task 3: For the oral Exam you are supposed to enter the Room of **Adobe Connect Pro** for Turkuamk as a **Guest** to start your online communication and

chat with your supervisor and other candidates. For a goal to discuss your thesis proposal and to keep your chances to pass the entrance exam.

Guest Name: **Participant name**

Scenario 4 (Advanced Option; 10 minutes)

Now, after taking both the written and oral exam, and making a bit more familiar with the website; you would like to explore more information about:

Task 1: Total number of existing users and supervisors for this degree program and the creation date? “*Object Tools* icon”.

Task 2: How many **Cloud services** can Optima users benefit from? What are they? “**Your Space** icon”.

Task 3: You are supposed to upload your certificates and Curriculum Vitae CV into Master's Thesis-Thesis return box. Your certificates & CV exist in:

My Computer → **Kingston (Memory stick)** → **My Certificates & CV.**

As Name: **Participant Name**

Satisfaction and Dissatisfaction: Which sides of Optima LMS do you like better and which sides do you dislike?

Closing (5 minutes)

It's considered as the last phase for participants to accomplish the post-test questionnaire.

4.5. Test environment and equipment

At the beginning I was wondering, do I really need a formal lab to do usability testing? How much time and effort would I need to learn about the process of usability testing? Do I need to be present with the participants to do usability testing, or could I do it remotely?

Fortunately, Work Informatics User Experience WIUX Laboratory of Turku University in ICT building presented an ideal testing environment for many kinds of products and services like mobile devices and websites. The lab was divided into two-rooms, the first one was reserved for the participants and the second

one was the controlling room where the logger observes the user and records the activities for later review.

Unfortunately, for this testing environment I conducted the testing alone, therefore nobody would be present in the control room. After I had set up all the testing devices I moved to the testing room with the participant to start the testing process. This two-room lab had a one-way mirror between the participant room and the control room. There was plenty of equipment in the lab some of it would not be in use during my testing process, and the things I used were:

- Video camera: to record the session and to revisit situations that wasn't clear at the testing time.
- Video mixer / mixing board: to capture what was on the participants computer screen. And to make that as the main recording image. With a small picture-in-picture P-P of participants face one the corner of computer screen.
- Observation PC with Encoder
- Preview monitor.
- Monitor loudspeakers.
- Logging software: Media Cruise & Observer 5.0 from Noldus (to collect, manage, analyse, record activities and present the observational data).
- Microphone: for recording all voices coming from participants or computer.



Picture 1. Work Informatics User Experience WIUX laboratory of Turku University in ICT building, two-room lab with one-way mirror between the rooms.

5. EMPIRICAL USABILITY TESTING IN OPTIMA LMS

After I had completed a usability testing plan into Optima LMS and had set up the schedule that suited my situation and knowing the individuals who would be involved in this testing. It was time for me to learn how to use the laboratory equipment and to be familiar with using Observer software for collecting, managing and analyzing the observational data. Additionally, I had prepared two processes before the final testing the first one was to **walkthrough** all the material and to figure out how everything worked together. This was my first testing project in the lab and I was conducting the lab alone and playing the roles of usability testing team which in fact was supposed to include: Moderator, Logger, Observer, Technician, and Help desk.

Some small changes needed to be done concerning the original test plan but it did not affect the main objectives of this testing. The second process was to conduct a **pilot** to test the test and to adjust the testing elements with the real user. This pre-practice helped me for testing the rest of participants and results were quite significant.

5.1. Data collection

In this usability testing the data was collected via combination of both quantitative and qualitative methods, to provide my research with an understanding of the participants' experiences and to support the testing goals. These definitely helped me to improve the testing quality of Optima LMS. For this research professional tool such as "**The Observer**" software was integrated to collect, manage, analyze and present the observed data.

The recorded videos of the participants during testing environment were stored in data profiles to be retrieved and analyzed later. Of course I was not planning to use all of the data I had collected during the recording and observation pro-

cess, but I focused on the most interesting performance measurements of users' actions and activities during tasks by counting:

- Problems encountered during the login process
- Number of encountered problems during testing (problems related to navigation error, system error, language selection).
- Time and rate of completing tasks
- Number of help requested by participants to complete tasks either by calling to helpdesk or by searching in the manual.
- Problems related to website layout and lack of editing features.

Besides, a qualitative data had been collected during this test through receiving feedbacks from Post-task questionnaires immediately delivered after each scenario. Also after they had completed all the scenarios, Post-test questionnaires were delivered to the participants to enrich the qualitative feedback for the testing. Those were more like an open-ended question, including new questions that came up during my observations of the users, such as:

- How easy to find information from the manual and the system?
- How useful is the video conference?
- Does Optima need more editing tools?
- How are the participants interested to participate into Optima LMS?

As an observer of this usability testing I tried to encourage the participants to use the **Think-aloud** technique. This has become more common in educational research and usability testing so as to collect data in real time and to better understand better the test design for the system. Think-aloud was used by the participants as they were working in their proper environment. This shed light on the nature of the problems they encountered during testing. In this way I captured their spontaneous comments and everything that the participant said without interrupting them.

5.2. Test results and analysis

After I had finished the testing process, and had collected data through Think-aloud technique, quantitative methods and qualitative methods. Next step was to lay out an analyzing plan of the findings and to understand the meaning of the data. Before I go to the findings log exported from The Observer software, I prefer to explain more systematically the list of findings during the whole testing process by categorizing them to **Top negative** findings, and **Top positive** findings. To talk in specific terms, the figure 3 below simplifies the multiple sources used in this usability testing to find the real problems with Optima LMS. (Dumas 1999.)

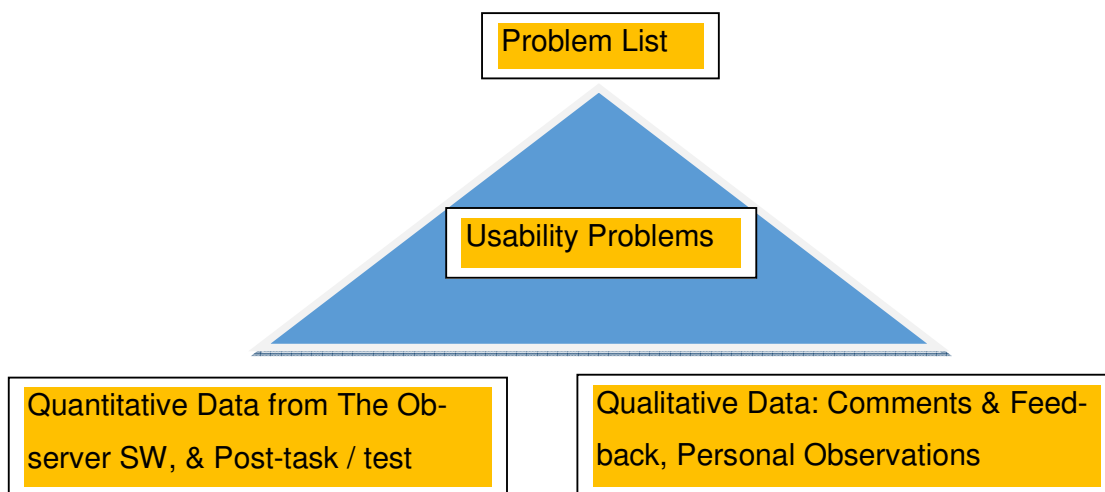


Figure 3. "Triangulating" Multiple sources used in this usability testing to find the real problems with Optima LMS.

5.2.1. Top negative findings

Based on the tasks achieved by the participants during the testing period, I summarized the top negative findings as follow:

- Website Layout and Login Process

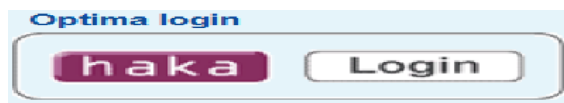
Problem 1: The Optima website layout is very ordinary; it does not seem to be as an educational website.

Problem 2: Website did not provide enough information in English, clear interference between English and Finnish language.

Problem 3: Switching the language to English linked the participant to a totally new website; it looped from Finnish to Finnish language without direct link to English and no clear message informs you how to recover from an error. I found out that there is no English translation of Optima website.

<https://optima.turkuamk.fi/>  <http://www.turkuamk.fi/>

Problem 4: Participants were confused about login button, they were supposed to select **HAKA** or **Login**; while both of them were image buttons having the same effect. The word of Haka was not recognized by the majority of participants and it was defined nowhere.



Problem 5: In order to access Optima account users had to follow a long login process to authenticate themselves. Additionally the participants were confused either they had to select Turku University of applied sciences or TAMK University of applied sciences (Tampere).

In order to access the resource you must authenticate yourself.

Turku University of Applied Sciences

Remember selection for this web browser session.

In order to access the resource you must authenticate yourself.

TAMK University of Applied Sciences

Remember selection for this web browser session.

Problem 6: Some participants were wondering why I have to select again my university name, while I already specified my university name as turkuamk on the searching address: <https://optima.turkuamk.fi/>

Problem 7: The login process was too long, complicated, and not trusted. They all remarked that each login step put them into a strange web address:

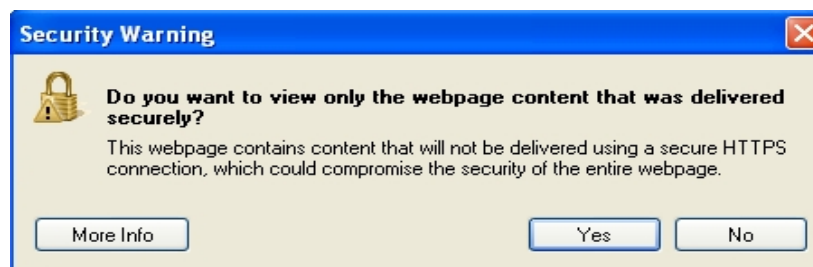
1. <https://optima.turkuamk.fi/> (Select Haka Login)
- ➔ 2. <https://haka.funet.fi/shibboleth> (Select your organization: Turkuamk)
- ➔ 3. <https://idp1.turkuamk.fi/idp/Authn/UserPassword> (Enter UN & PW)
- ➔ 4. <https://optima.turkuamk.fi/loginmenu> (Select YAMK)
- ➔ 5. <https://optima.turkuamk.fi/learning/id16/bin/user> (BIS – Business Information Systems)

- System features and editing options

Problem 8: The functionalities of Optima within Google Chrome and Safari browsers were limited. It is recommended to use the newest version of Mozilla Firefox and Microsoft Internet Explorer browsers.

Problem 9: Difficulties to update Optima website due to the used browser settings or school proxy server for a security reasons.

Problem 10: Optima uses a highly secured service called Secure Socket Layer SSL protocol. Each time the user clicks a link provided by other group members, the web browser warns the user that the page content does not include SSL security. This is confuses the user of the pages security or tasks to be achieved. The warning message is not constructive; it does not provide the user with enough information about how to solve the problem.



Problem 11: Creating and importing a new form object requires always Java plugin; with very limited editing options, and complicated way to paste text into text field.

Problem 12: Although the sender has addressed the message to a specific recipient from the contact list, a notification message appears to inform the sender that the message will be read by everyone on the discussion list.

The screenshot shows a web interface for composing a message. At the top, there is a label "Addressed to" followed by a dropdown menu containing the name "Hammouche Youssef". Below this, a yellow warning box contains the text: "Please remember that list messages are public. Even if you choose individual user as recipient, the message can still be read by everyone on the discussion list." At the bottom of the form, there are two buttons: "Publish" and "Cancel".

Problem 13: The components of a new topic are not in the correct order, after the user had entered the subject name, had written the message, and had selected the recipient name; a notification message appeared late to remind him/her that the message would be read by everyone.

Problem 14: The only option to send a message to a specific person from the contact list is to send it as an email. The problem here is that you have to write the recipients email address. The system doesn't allow the user to add or import new contact. Additionally, you cannot upload any attachment to this email, and all fields are mandatory to be filled.

Problem 15: The workspace content is not well organized and named in such way that the user could easily understand the structure of course material, it requests many clicks from homepage to get the task done.

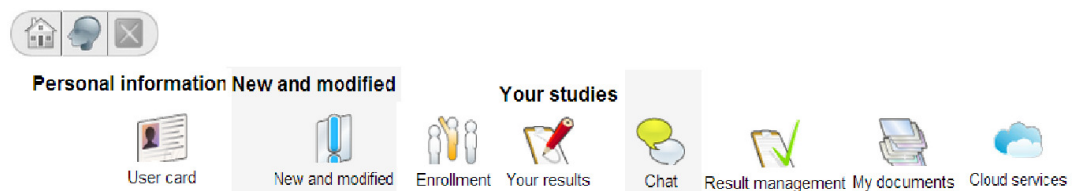
Problem 16: The Optima headlines and text does not present a clear picture to the users, and it did not encourage them to have a deep look into the system features. Moreover, the page layout is not attractive with white background and black text.

Problem 17: Some users were confused in selecting the right **Adobe Connect Pro** from workspace, the first one was under the link of: <https://turkuamk.adobeconnect.com/> and the second one was under the link of: (optima.turkuamk.fi/...../AdobeConnectPro).

5.2.2. Top positive findings

Based on the tasks achieved by the participants during the testing period, I summarized the top positive findings as follow:

- Some participants liked the system and considered it good for delivering online courses and recording automatically all interactions between students and teachers.
- Adopting Adobe Connect Pro into Optima granted an added value to the system, by permitting the student to access later the recorded lecture in audio and video version.
- Many participants have been quite satisfied of using Optima workspace-Your Space, it provides the user with a lot of personal information and interesting features, and they consider it also as an interaction channel between the student and the teacher.



- A few people considered that Optima is compatible with most aspects of study, students can carry out courses or projects in workspaces, also they can enroll to different degree courses and all are gathered under one optima account.

- Security level in Optima is extremely high, and loading process of documents and graphics is very quick and safe.
- Overall, Optima is a simple and easy to use, and the interaction with optima does not require a lot of effort with nice precise features, and it is very beneficial for students.
- The table 2 summarizes the level of Top negative & positive findings by all participants during this usability testing of Optima LMS, but without including the log results based on the Observer software. The rating scale used for this table is represented as follows:

High "H": Means how highly participant liked the item-subject.

Medium "M": Means that item-subject represents the middle condition for participant.

Low "L": Means that item-subject is classified in the lowest position.

Table 2. The level of top positive-negative findings by participants.

Subject	Item	Participants					
		P 1	P2	P3	P4	P5	P6
Usability	Optima system was easy to use	M	L	M	L	H	M
	Interaction with Optima does not require a lot of effort	M	L	M	M	H	M
	I find Optima more efficient to use	H	M	H	M	H	M
Learnability	Optima System was easy to learn	H	L	M	M	H	H
	Overall, using Optima need much time to learn	L	M	L	M	L	L
Reliability	Optima is stable	H	M	H	M	H	H
	Optima is reliable	H	H	H	H	H	M
	Optima is trusty	H	M	H	M	H	H
Accessibility	The logon process was quickly and easily expressed	M	L	L	L	M	L
	The access process was easy and reasonable	M	L	M	L	M	L
Efficiency	Optima helped you to achieved tasks with accuracy.	M	L	M	M	H	M
	Optima helped you to achieve tasks in a short time	L	L	M	M	M	M
Satisfaction	Very satisfied of using Optima	M	L	H	H	H	H
	I find Optima as a successful LMS system.	H	L	H	M	H	H
Security	Optima have ability to achieve accepted level of risk.	H	M	M	M	H	H
	security levels adopted in Optima is exaggerated & complicated	M	H	M	H	M	M
Functionality	Optima component provide good functionality	M	L	M	L	M	M
	Optima documentation have described clearly the user needs	L	L	L	L	M	M
Confirmation	Features provided by Optima was better than your expectation	M	L	H	H	H	M
	overall, I recommended other Universities to use Optima.	M	L	H	M	H	H

5.2.3. Findings log from the Observer

After I had finished my observations of the recorded videos, The Observer software automatically created a data profile which helped me to filter the data based on my research objectives. For this purpose I had planned to measure the most important actions and activities such as the following:

- ✓ Task completion rate
- ✓ Time on task
- ✓ Problems & help required by all the participants.

Additionally, I have selected the **elementary statistics** as an analysis function for this usability testing, to provide me with various tables and calculations such as: Total & average duration, rate of success or failure of completing task, and number of problems and requested help.

- Task completion rate

The table 3 is the result log from the Observer software during the testing session. It represents the success of participants to accomplish the four tasks in a certain Conditions, and the completion rate is divided as follows:

100% represent the task completion without any help.

75% represent the task completion with basic help.

50% represent the task completion with help in the majority of steps.

25% represent the partial completion of task.

0% represents the failure of the participant to achieve task.

Table 3. The completion rate of each task by all participants.

Participant	Task 1	Task 2	Task 3	Task 4	All Tasks
Participant #1	100 %	50 %	75 %	75 %	75 %
Participant #2	100 %	100 %	50 %	50 %	75 %
Participant #3	100 %	50 %	25 %	50 %	56 %
Participant #4	100 %	50 %	50 %	50 %	63 %
Participant #5	100 %	100 %	25 %	25 %	63 %
Participant #6	100 %	50 %	75 %	25 %	63 %
Success Rate	100 %	67 %	50 %	46 %	66 %

It is apparent from table 3 that all participants managed to complete the task 1 without any help. The result taken from the task 2 indicates that only two participants have succeeded in completing the task and others found difficulties on the majority of task process. This confirms what we have previously cited in top negative findings **problems 4, 5, 6, and 7**.

The success rate by all participants in task 3 became 50% less than task 1 and 17% less than task 2. This explains for us that the functionalities of Optima system require a plenty of improvement mainly in editing options and organizing the workspace content for a goal to help users achieve tasks in optimal conditions.

The task 4 represents an advanced option in this usability testing. After the participants became more familiar with Optima system, I tried to explore how they were capable to accomplish this task. So my expectations were correct, neither one of participants managed to complete the task without help nor the success rate decreased from the previous tasks.

The figure 4 illustrates clearly the rate of completion tasks by all the participants, together with indication rate of each task.

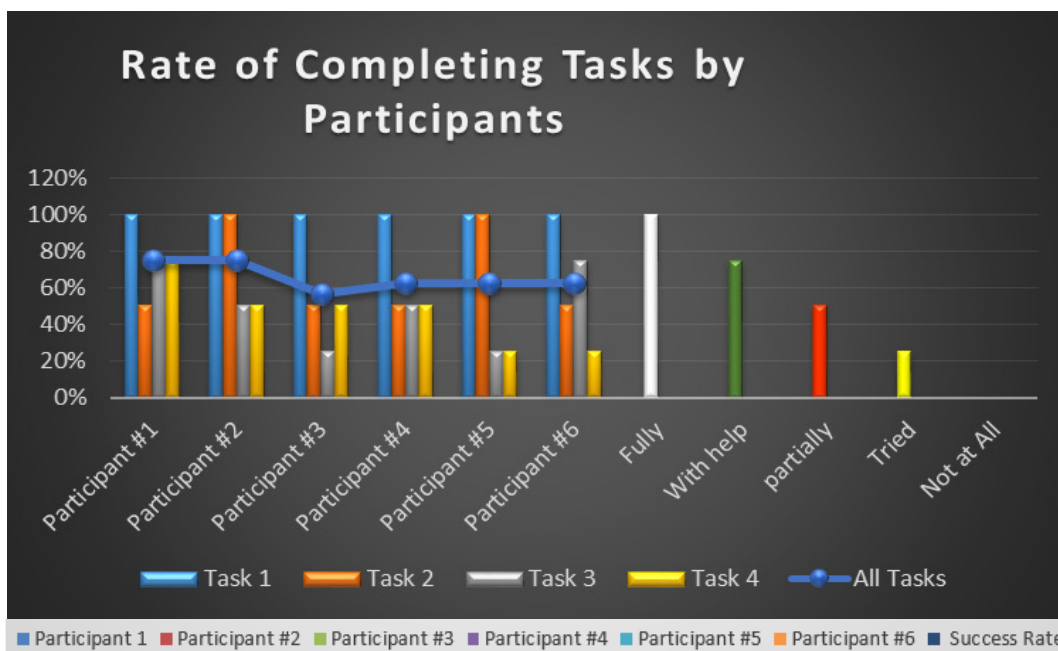


Figure 4. Graphical view of completing tasks by participants.

- Time on task

The results obtained from The Observer software indicate the recorded time (in Second) of completing different tasks by all participants. The reserved time during this usability testing was 10 minutes for task 1, task 2, and task 4. But, for the task 3 was 15 minutes to have all work done. (Table 4. Total duration in Second of Completing Four Tasks by Six Participants).

All the participants managed to perform task 1 within the predetermined time frame. Whereas, only half of the participants approximately succeeded in completing task 2 and 3 within determined time; for the reasons I already cited in "Task Completion Rate".

Unfortunately, none of the participants were able to finish task 4 with the advanced options; it took the longest time to complete task with an average duration of 1031 seconds (approximately 17 minutes), and the completion times ranged from 782 (approximately 13 minutes) to 1494 seconds (more than 24 minutes).

Table 4. Total duration in Second of completing four tasks by six participants.

Observation	Task 1	Task 2	Task 3	Task 4	All Tasks
Participant #1	225.52	781.64	764.52	782.36	2554.04
Participant #2	560	486.88	926.4	977.48	2950.76
Participant #3	512.72	613.64	1278.2	841.64	3246.2
Participant #4	519.04	1287.8	1076.32	874.76	3757.92
Participant #5	324.96	508.68	1502.8	1494.36	3830.8
Participant #6	501.01	922.52	1048	1219.48	3691.01
Total Duration	2643.25	4601.16	6596.24	6190.08	20030.73
Average Duration	440.54	766.86	1099.37	1031.68	3338.45
Reserved Time	600	600	900	600	2700

Furthermore, the total empirical duration spent by six participants to achieve four tasks during this usability testing, exceeded the total duration decided in the test plan, within value of: **20030 - 16200 : 3830 seconds (more than 60 minutes). (16200: 60 * 45 * 6)**. 60 Stands for converting minutes to seconds. 45 Stands for total length of all session. And 6 Stands for total number of partici-

pants.

Fortunately, I had expected the changes on the time reserved for each participant during this testing, and I devoted extra time as a precaution to complete my testing process in perfect conditions. The figure 5 gives an overview of the time spent by six participants to complete the usability testing tasks, and the indicated numbers on the graph are only for task 1 and for task 3.

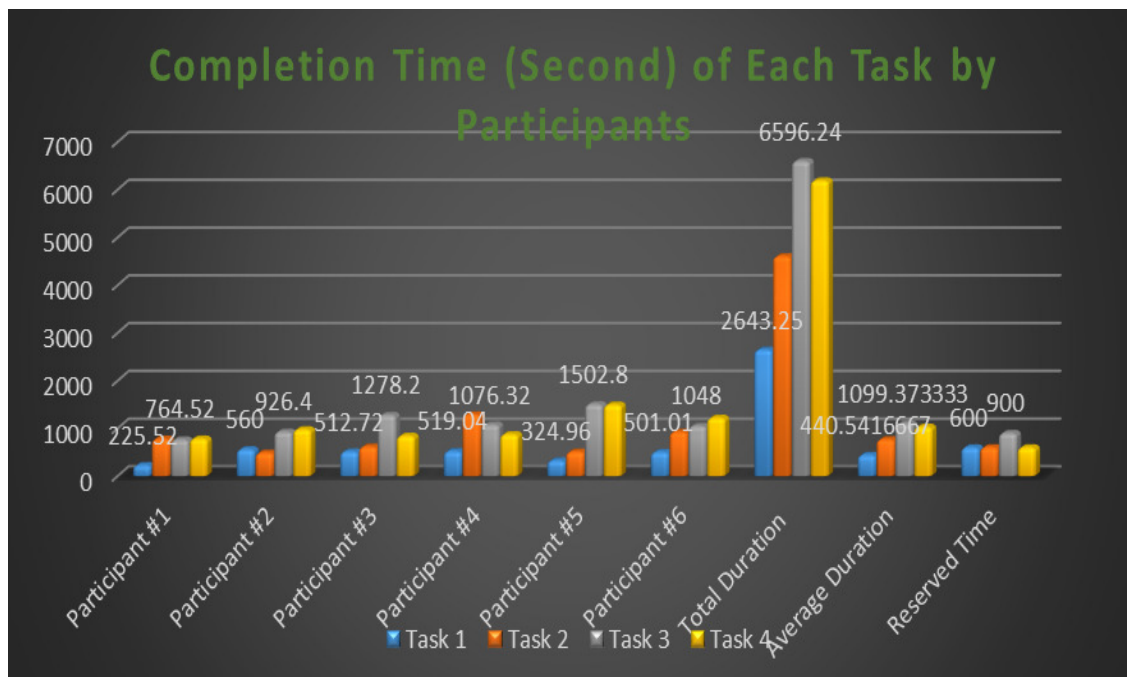


Figure 5. Graphical view of completion time (in Second) of each task by participants.

- Problems and help required

The intent of this paragraph is to present the top severity of problems that users experimented, and the help requested during testing period. The table 5 below shows the number of times participants committed major mistakes due to system navigation or error clicks, and also how often they requested help either by searching on help material or calling helpdesk. Moreover, the word **confused** in this table stands for a situation that participant was unable to think with clarity or to understand the meaning of the task. It also explains also the situation where users were uncertain about the paths they should take to reach their goals.

Those once were mainly confused by how to find course material, where to go to search for help and where to select the right icon.

The table 5 summarizes the observed data during all the usability testing hours (approximately 6 hours). In theory, each recording hour needed approximately 6 to 8 hours for re-observing users and recording their behaviors.

Table 5. Number of problems encountered and help required by participants through all tasks

Participants	Task 1				Task 2				Task 3				Task 4				All Tasks
	Confused	error click	wrong path	need of help	Confused	error click	wrong path	need of help	Confused	error click	wrong path	need of help	Confused	error click	wrong path	need of help	Problems & Helps
P.1	2	0	0	1	2	0	0	1	4	4	3	2	2	6	3	2	32
P.2	1	0	0	1	2	0	2	3	3	3	3	2	3	7	2	2	34
P.3	3	0	1	1	1	1	0	1	2	16	4	2	2	4	3	2	43
P.4	3	0	0	1	3	0	0	1	4	8	3	1	6	8	4	2	44
P.5	1	0	1	1	2	0	1	1	3	0	2	0	4	10	2	2	30
P.6	1	0	0	1	1	0	1	1	6	19	8	3	3	13	2	3	62
Total	11	0	2	6	11	1	4	8	22	50	23	10	20	48	16	13	245

The results obtained from task 1 were more or less similar for all the participants, where they were mostly confused by the website layout, switching language and terminology used on the site. **See Problems 1, 2, & 3.** The scores on findings in task 2 were a bit similar than in the previous task. We remarked that the help needed and the navigating into wrong path increased slightly with two points. This is due to the login process and authentication demanded to access optima system. **See Problems 4, 5, 6 & 7.**

In the contrary, the tasks 3 & 4 represented a critical juncture in this usability testing. The result reported that most participants encountered big difficulties in completing those two tasks, regardless of whether the tasks were difficult or not. However the confusion and cases of needed help were twice higher than the previous tasks. This was due to various factors: The functionality of Optima system, to the difficulties of understanding website architecture, and to the usability

of existing objects in Optima workspace.

Additionally, the related problems to the error click and wrong path was incomparable with the existing ones in the previous tasks. The recorded numbers on the table 5 are the best proof of how well the participants interacted with tasks, and how difficult it was it for the users to perceive the efficiency of Optima workspace. **See Problems 8 - 17.**

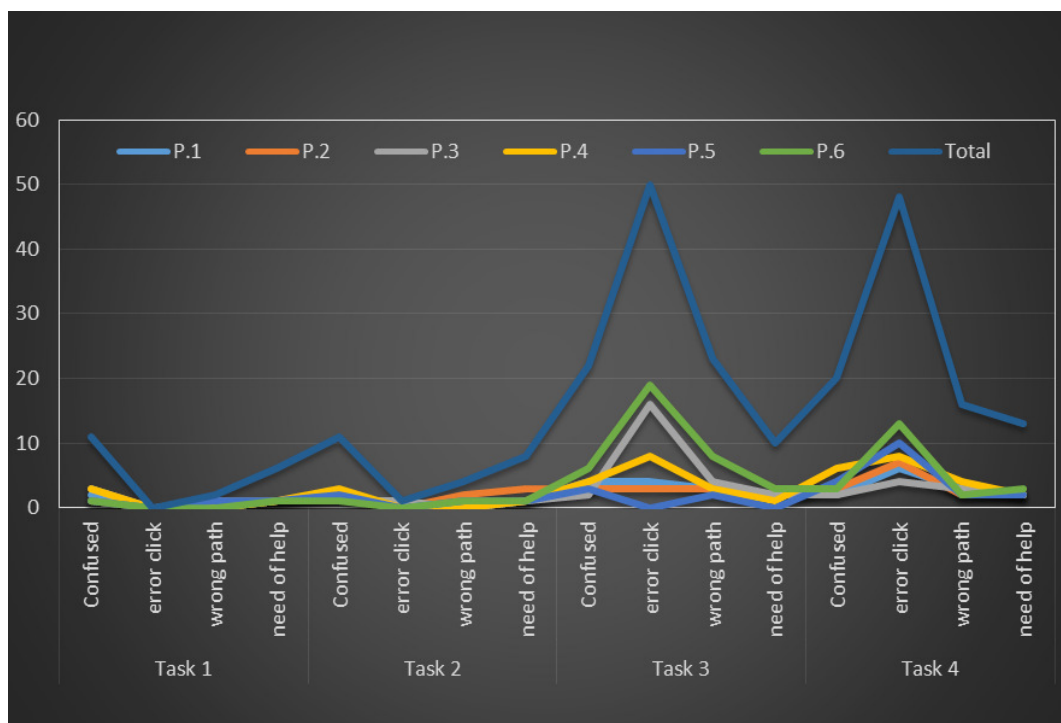


Figure 6. Graphical view of problems encountered and help required by all participants during testing.

On the other hand, 245 was the total number of problems encountered and help required by all participants throughout all tasks. I divided them into three groups. The first one is composed of three participants and they faced around 30 problems. The second group is composed of two participants and they faced around 40 problems. And the last group is composed of one participant only and he faced around 60 problems.

5.2.4. Presenting results based on post-task and post-test questionnaires

Two types of questionnaires conducted during this usability testing of Optima LMS worked well during my testing. They provided me with different kind of information, and helped me to understand more about the participants' behavior and their experiences with Optima system before and after the testing. Answering those questionnaires took extra time from them especially that I had requested to get immediate feedback after they had completed each scenario. I was a bit afraid that this way of testing might reduce their ability to confront series of questions particularly that post-task questionnaire included 22 questions for the four scenarios, and 10 questions for the post-test questionnaires. Happily, all participants were highly motivated to go forward with all kinds of questions and to share with me all their experiences without hesitation to give straight opinions.

The tables 6-19 below summarize the results collected from test participants based on Post-task and Post-test Questionnaires. Each table contains a set of data that was elicited from six participants. Participants marked their opinions as an agreement or disagreement for each question, based on a range from strongly agrees to strongly disagree (very easy to very difficult, very helpful to not helpful, not interest to high interest, strongly recommended to not recommend):

Three out of six participants found out that Optima website layout was somewhat difficult to understand, and three others found out the website layout is neither easy nor difficult to understand (Table 6).

Table 6. Rate how easy or difficult was to understand the website layout?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1				✓	
Participant 2				✓	
Participant 3				✓	
Participant 4			✓		
Participant 5			✓		
Participant 6			✓		

Four out of six participants found the quality of the information not helpful after they switched language to English, and two others considered somewhat not helpful (Table 7).

Table 7. How would you rate the quality of the information you found after you switched the language to English?

Test Participant	Not helpful	Somewhat not helpful	Neither helpful nor not helpful	Somewhat helpful	Very helpful
Participant 1	✓				
Participant 2	✓				
Participant 3		✓			
Participant 4		✓			
Participant 5	✓				
Participant 6	✓				

Three out of six participants found difficulties to select the right login icon, and three others considered somewhat easy (Table 8).

Table 8. How easy or difficult was it for you to find the right login icon?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1			✓		
Participant 2					✓
Participant 3			✓		
Participant 4				✓	
Participant 5		✓			
Participant 6				✓	

Almost all participants agreed that the website did not provide necessary information and help to login (Table 9).

Table 9. Does the website provide you necessary information and help to determine which icon you have to select (HAKA or LOGIN) to login, and steps to be followed to achieve your study program?

Test Participant	Not helpful	Somewhat not helpful	Neither helpful nor not helpful	Somewhat helpful	Very helpful
Participant 1		✓			
Participant 2	✓				
Participant 3		✓			
Participant 4			✓		
Participant 5			✓		
Participant 6		✓			

Three out of six participants found that courses and course material were well organized, and three others found difficulties to understand how folders are organized (Table 10).

Table 10. Rate how the courses and folders for course material were organized?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1	✓				
Participant 2				✓	
Participant 3				✓	
Participant 4				✓	
Participant 5	✓				
Participant 6		✓			

Four out of six participants found the Optima account layout easy to be used.

Whereas, one participant found it difficult (Table 11).

Table 11. How easily did you understand your Optima account layout?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1	✓				
Participant 2			✓		
Participant 3				✓	
Participant 4	✓				
Participant 5	✓				
Participant 6		✓			

Five out of six participants found difficulties to get information from the help material, and only one found it easy (Table 12).

Table 12. How easily did you find information by the help of help icon?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1				✓	
Participant 2				✓	
Participant 3				✓	
Participant 4				✓	
Participant 5		✓			
Participant 6				✓	

Two out of six participants found difficulties to get information from Object tools, and two others found it a bit easier (Table 13).

Table 13. Rate how easy or difficult was it to find information from Object Tools?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1				✓	
Participant 2			✓		
Participant 3				✓	
Participant 4		✓			
Participant 5	✓				
Participant 6			✓		

Only one participant out of six found the information easily from Your Space, but another one found it difficult, while the rest of the answers were neutral (Table 14).

Table 14. Rate how easy or difficult was to find information from Your Space?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1					✓
Participant 2			✓		
Participant 3			✓		
Participant 4			✓		
Participant 5	✓				
Participant 6			✓		

Five out of six participants found Adobe Connect helpful to improve the quality of Optima LMS (Table 15).

Table 15. Could you rate how useful the Adobe Connect is to improve the quality of Optima LMS?

Test Participant	Not helpful	Somewhat not helpful	Neither helpful nor not helpful	Somewhat helpful	Very helpful
Participant 1					✓
Participant 2		✓			
Participant 3				✓	
Participant 4				✓	
Participant 5				✓	
Participant 6				✓	

Three out of six participants were interested of using Optima LMS, whereas two others were slightly interested (Table 16).

Table 16. Rate how you are interested of using Optima LMS?

Test Participant	No Interest	Low Interest	Neutral	Moderate Interest	High Interest
Participant 1				✓	
Participant 2		✓			
Participant 3		✓			
Participant 4			✓		
Participant 5				✓	
Participant 6				✓	

Two out of six participants were willing to recommend Optima LMS to other Finnish universities', while three others were not really willing to recommend (Table 17).

Table 17. Rate how you would recommend other Finnish universities to adopt Optima LMS for their distance study program?

Test Participant	Not Recommended	Recommend with reservation	Neutral	Probably recommended	Strongly Recommended
Participant 1		✓			
Participant 2	✓				
Participant 3	✓				
Participant 4			✓		
Participant 5				✓	
Participant 6					✓

Almost all participants found difficulties to recover from a mistake (Table 18).

Table 18. How easy was it to recover if you made a mistake?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1				✓	
Participant 2				✓	
Participant 3				✓	
Participant 4		✓			
Participant 5				✓	
Participant 6				✓	

Four out of six participants found difficulties to figure out the correct icon selection to achieve task (Table 19).

Table 19. How easy or difficult was it to figure out the correct icon selection and the process to achieve a task?

Test Participant	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Participant 1					✓
Participant 2				✓	
Participant 3				✓	
Participant 4		✓			
Participant 5				✓	
Participant 6			✓		

Overall, additional comments about Optima system that all the participants shared with the interviewer can be stated below:

Test Participant 1: Optima system should provide students with more information to help them to understand the system features with fewer clicks to find what they are looking for.

Test Participant 2: In my Opinion Optima is not good enough learning system for distance study, it has to be easier to be used by students, and system architecture needs much improvement.

Test Participant 3: Use understandable English and help icons in order to support the applicants. Need some more improvement!

Test Participant 4: Much better if school organizes a short training course of how to use Optima system to facilitate the starting of usage and to simplify the hidden Optima features.

Test Participant 5: A nice system overall with nice precise features, very beneficial for students.

Test Participant 6: It's a good system for study material and social interaction between teachers and students, with abilities to use video conference. Optima system needs more editing options and tutoring lecture is needed for new students.

6. USABILITY RECOMMENDATIONS FOR OPTIMA LMS DEVELOPERS


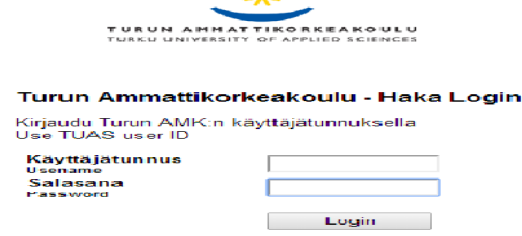
Now that I have completed the analyzing process and I have defined a series of problems encountered by the users during the usability testing of Optima. The coming turn is to suggest solutions to Discendum developer of Optima system how to fix at least partially the problems found during this testing. And also to give priority to the recommendations on the basis of the easiest problems to be fixed first, till the more complicated ones. Naturally, I am not going to work with Optima designers and team of technical communicators' to solve the problems found. But I will be available to give my opinion and advice if they request it from me, and after that my usability testing mission will be over in this level.

Since, the Optima system developers are not directly concerned with this testing, my recommendations will be generally addressed and not very specific. The time devoted for this research represents a negative factor in determining the type of recommendations; otherwise I would like to be a part of the developers' team to design new solutions for the Optima. Below is a summarized list of the most important recommendations based on usability testing for the Optima LMS to be addressed to system developers.

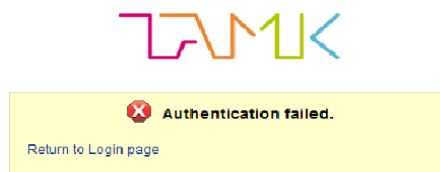
Recommendation 1: It's pretty good that Optima system is highly secured, but in opposite the logging process is quite long and it requests from user to re-enter the same information. The case here is the website address (optima.turkuamk.fi) then the system will ask the user again to select school from the list in order to access the resource. This easily confuses and discourages them of the websites authentication. And also I recommend decreasing the security steps followed by the users by creating a single and strong authentication and by limiting the navigation from unknown website address to another.

Recommendation 2: The selection between Tampere or Turku universities of applied sciences from the drop down arrow might confuse the web visitors

which one to select especially that both of schools almost have the same abbreviation TAMK.

Tampere Universities of Applied Sciences TAMK	Turku Universities of Applied Sciences TAMK
 <p>The screenshot shows the TAMK login interface. At the top is the TAMK logo and the text 'HAKA'. Below that is a blue header 'TAMK kertakirjautuminen'. The login form contains two input fields: 'Tunnus' (Username) and 'Salasana' (Password), followed by a 'Kirjaudu sisään' button.</p>	 <p>The screenshot shows the login interface for Turun Ammattikorkeakoulu (Haka). It features the university's logo and name in both Finnish and English. The login form includes fields for 'Käyttäjätunnus / Username' and 'Salasana / Password', with a 'Login' button.</p>

The problem might be more serious if the users have selected the wrong school and entered the personal authentication. An error message of "**TAMK Authentication failed**" will appear without specifying the nature of mistake. This log in process might be repeated again and again if the users are not aware where the fault lies. Till the optima system blocks the users account and requests from him/her to contact the help desk in order to re-activate the Optima account. My recommendation here is to mitigate the duplication of authentication process. To provide users with sufficient information on what happens in case of wrong school has been selected or faulty personal authentication has been entered. Additionally, the location of information on the screen design must be visible easily for the users, and to clearly separate the Finnish and English languages not to mix between them.



Recommendation 3: Provide a clear distinction between Optima system design and the content added by teacher or student. In this way, reader can easily separate between sources of information added on the left side of the screen and other on the right side.

Recommendation 4: Clearly delineate between courses and the material of courses, and include a visible message to user if a new file or topic has been added to Optima. Also mark as an un-read file and send notification for not answered topic and for the assignment deadline.

Recommendation 5: Conduct some training session and consultancy services for new users, to reduce time consumed by each one for achieving task and to understand easily features of optima system.

Recommendation 6: Generate an error message box to inform users about their mistakes, especially if they fail to provide all required information for creating new subject or searching for help.

Recommendation 7: Optima system must permit the users to create a privacy message to a specific recipient from the contact list. Not to be read by everyone on the discussion list. Otherwise users will prefer to use another application to communicate with each other

Recommendation 8: Re-organize the component of creating a new topic in such way that it could be in the correct order and easy to use by the users.

Recommendation 9: Optima system should improve the features of compose window for writing and responding messages. For example when you start typing an email address, the address box should give a list of options from new contact. You can add a carbon copy, formatting button to change the font and text elements. Attaching a file should be also a bit easier either by a simple navigation to a file or by just drag and drop it into the body text of the message. Other features to be added as well such as check spelling, insert emoticons, increase data storage space...etc.

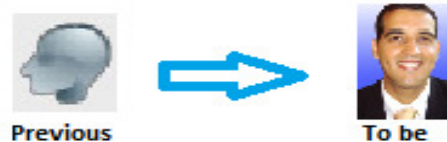
Recommendation 10: To include some analysis tools, which will help students to quickly and easily get an assessment of their participations into course assignments, to let them know how well they contribute to submit new topics and to share opinions with other colleges?

Recommendation 11: Students should be encouraged to create their own profile including photos, personal description, social discussion forum, glossaries, and progress within a course.

Recommendation 12: Grades of courses can be viewed on one page of Optima website. There is no necessity for students to follow their gradebook in separate website "SoleOPS". I think it would be much more practical to integrate some of SoleOPS features to Optima LMS such as study guide, courses feedback, exam enrollments, and yearly plan.

Recommendation 13: Optima LMS supports only a few media content files to be displayed from the resources. It would be much advantageous if it supported other types of media files such as audio and video formats, PowerPoints, flash, files to be stored locally or remotely, files which can be uploaded from server and managed.

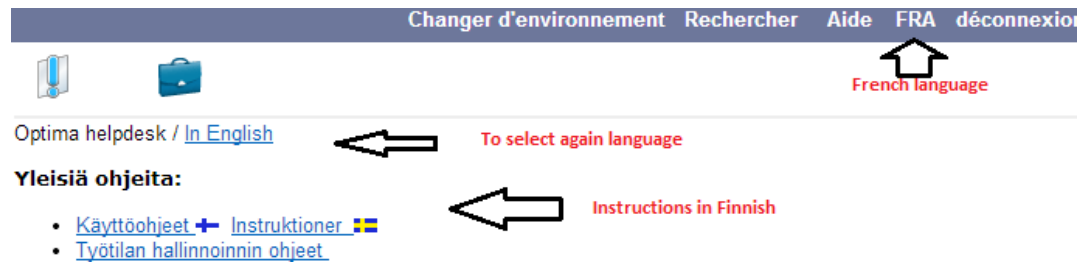
Recommendation 14: Considering that many students are participating in certain course, it would be very practical if the posted document would have the authors' photo attached to it, together with a sight of the previous written articles.



Recommendation 15: All the activities related to Optima request from users to log into system first. It would be easier if the user could post to Optima's account or receive a feedback from it via personal email account. Also sending or receiving message to existing users could be filtered according to different statuses such as their belonging to the working group, their interest in the project, and sensitivity of the subject...etc.

Recommendation 16: Optima website provides the user interface with eight languages, but the help instructions are available on three languages only.

Additionally, even if the user has selected his/her favorite language from the menu bar, the help icon material keeps reminding always two languages: Finnish and English. It will ask the user again to select the instruction language. It is recommended to add the missing user interface languages in Optima help material, and the system should switch automatically the language in all workspaces.



Recommendation 17: Adobe Connects Pro could bring an added value to Optima LMS. It would be more practical to include this tool for all the courses by recording the lectures in video format, and enabling students to review the lectures as long as they need.

Recommendation 18: School relies onto **Discendum** Optima provider to maintain the system, and to provide support when problems occur. So the system should be designed in line with school education strategy, and needs of students to present a perfect working environment.

Recommendation 19: Optima Mobile could be a good service to be developed by system owner for the users' benefit to provide access from mobile devices anywhere and at any time. And to synchronize automatically all data with Optima account on users' mobile devices.

7. DISCUSSION

7.1. Summary

The usability testing research in Optima LMS started by learning the theoretical aspects from the literature of Carol M. Barnum "Usability Testing Essentials, Ready, Set...Test!" and other topics relevant to my research. The book provided me with many interesting information to design and execute a test, analyze the test data, and provide an effective report with recommendations to Optima system developer.

The empirical part was conducted in Work Informatics User Experience **WIUX** laboratory in Turku ICT building. This led me to learn how to use the laboratory equipment and how to setup up the lab, how to configure the Observer software for collecting, managing and analyzing observational data. (Barnum 2011.)

It was the challenging part of this research where I had to pass first the usability testing written exam. Then develop a test proposal, develop a test plan, carry out the test sessions in the WIUX laboratory, data analysis, and finally usability testing report. In practice the empirical part should be done in groups of two students at least and typical time for testing is around two months. Unfortunately, I conducted the testing alone; nobody was in the control room. After I set up all the testing equipment and started recording, I moved to the testing room with participant to continue the testing process.

At the beginning I thought that the usability testing technique is quite easy technique to be used into Optima LMS to find out how easily students can utilize the functionalities provided by the system to help them organize their study. And to discover if the system provides enough opportunities for students to engage in their study program and to apply their knowledge into practice. After I got involved to the testing process, I discovered that there is a wonderful methodology of how to do usability testing step-by-step with a lot of case studies explaining different experiences in the field.

Optima LMS vendors mentioned on the Discendum website that they provide users with an easy-to-use features and tools to build the online environments. And helpdesk would help users to realize all the benefits from online learning. I discovered afterwards that this article had been published in the year of 2012; after that around fourteen updates had been occurred in the optima LMS. Either related on the new features of the system, information security, management tools, or workspace improvement. And no single usability testing research has been mentioned on the website material to inform the reader about the efficiency and effectiveness of the interfaces. Rather than telling them that the system is easy-to-use and supports your learning goals in the best possible way.

I think Optima vendors should have used the usability testing method continuously and support academic researchers to be involved in similar testing, by helping them explore their knowledge in the field and enriching search engine of the internet with sufficient articles of Optima. (Discendum Akademia 2012.)

To sum up, the present paper has been an attempt to learn first the usability testing technique that I tried to deal with from two points: Theoretically and practically. Concerning the theoretical background, I managed to design usability test plan for Optima LMS according to Carol M. Barnum. The empirical part was devoted for carrying out the test plan in WIUX laboratory. Finally, I found out that the Optima system was neither easy nor difficult for students to be used.

7.2. Future research

There is no doubt that usability testing becomes a necessary condition for a learning management system to survive. Web users prefer an easy website to be used. With an easy access to the website's information and the possibility to use all system features with simple clicks. In order to evaluate the usability of Optima LMS a heuristic research is needed. In addition to that, a future research could include also the evaluation of ISO 9126 to Optima LMS.

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APPENDICES

Appendix 1: Pre-test Questionnaire

Pre-test Questionnaire

We would like to thank you for being a volunteer for Usability Test into Optima LMS; We will work to make sure the test environment is educative and pleasant for you.

The results from our Usability Test will be used for improving the ease of use of Optima system from student interface.

The testing will take place in February 25, 2014 from 16:30 - 18:30, and the usability test will require one hour of your time.

Name: _____

Phone Number: _____

Profession/Education Level: _____

Citizen: _____

Age: 17-20 21-30 31-40 41-50 51 or above

Sex: Male Female

Could you please answer the following questions before the testing begin?

1. Do you use the internet? Yes (Experimented) No (Novice)

2. How many hours per day are you browsing internet?

Less than 1h

1-2h

2-4h

4-6h

6-8h

more than 8h

3. How long have you been using email?

Less than 6 months (Novice)

6 months to 2 years (Novice)

2 years to 4 years (Experimented)

More than 4 years (Experimented)

4. Does your work computer network oblige you to log in with a user ID and a password?

Yes (Experimented)

No (Novice)

5. If you answered “Yes”, the strength of the password is?

Easy to guess “names & numbers”

less than 8 letters, “no characters”

At least 8 characters "letters, numbers, & symbols”

6. Have you visited before a *Learning Management System LMS* website?

Yes

No

7. Are you interested in distance learning?

Yes

No

8. If you answered "Yes", what are your top criteria in choosing distance study? Please list at least three criteria.

9. What courses or degree programs are you highly interested to study it online?

10. When studying online, what kind of interactions are you expecting to get in parallel with classic study?

Appendix 2: Post-Task Questionnaire

Post-task Questionnaire

Scenario 1:

1. What does the website layout suggest to you?

2. Rate how easy or difficult was to understand the website layout?

Very easy,

Somewhat easy,

Neither easy nor difficult,

Somewhat difficult,

Very difficult

3. What do you think you would do to access your account into optima website?

4. Did the website provide you sufficient information in English? Have you understood all the information provided by the website?

5. How would you rate the quality of the information you found after you switched the language to English?

Not helpful 1 2 3 4 5 Very helpful

6. Does the link guide you to the same Optima website?

Yes

No

Scenario 2:

1. How easy or difficult was it for you to find the right login icon? Very easy,

Somewhat easy,

Neither easy nor difficult,

Somewhat difficult,

Very difficult

2. Does the website provide you with necessary information and helps to determine which icon you have to select (HAKA or LOGIN) to login, and steps to be followed to reach your study program? Not helpful 1 2 3 4 5 Very helpful

3. Does the access process to the website require reasonable and suitable information for you?

Yes

No

4. Have you understood all the words during the login process? If not, which part you did not understand?

5. Rate how easy the courses and course material folders was organized?

Very easy,

Somewhat easy,

Neither easy nor difficult,

Somewhat difficult,

Very difficult

6. How easily did you understand your Optima account layout? Very easy,

Somewhat easy,

Neither easy nor difficult,

Somewhat difficult,

Very difficult

7. Would you use Optima LMS if you got accepted to this degree program, or you prefer others?

Scenario 3:

1. *Navigation:* Can you find the efficient navigation when you have created new topic, write a comments or upload an assignment?

2. Have you discovered any error message while you tried to upload your assignment, or to address your message to specific recipient?

3. Do you think that Optima LMS offers enough editing option to the student? What could be added as a new feature to Optima to improve the student interface?

4. How easily did you find information by the help of help icon?

Very easy,

Somewhat easy,

Neither easy nor difficult,

Somewhat difficult,

Very difficult

Scenario 4:

1. Rate how easy or difficult was it to find information from Object Tools?

- Very easy,
- Somewhat easy,
- Neither easy nor difficult,
- Somewhat difficult,
- Very difficult

2. Rate how easy or difficult was to find information from Your Space?

- Very easy,
- Somewhat easy,
- Neither easy nor difficult,
- Somewhat difficult,
- Very difficult

3. Could you rate how useful the Adobe Connect is to improve the quality of Optima LMS?

Not helpful 1 2 3 4 5 Very helpful

4. Which things seem to be easy or difficult for you to upload documents from your computer to your return box?

5. List any additional comments about the Optima system?

Appendix 3: Post-Test Questionnaire

Post-test Questionnaire

1. Which sides of Optima LMS do you like much and which sides do you dislike?

2. Rate how you are interested in using Optima LMS?

No interest /need

Low interest /need

Neutral

Moderate interest /need

High interest

3. Rate how you would recommend other Finnish universities to adopt Optima LMS for their distance study program?

Not recommended

Recommend with reservation

Neutral

Probably recommend

Strongly recommend

4. What was the most difficult task or scenario? Why?

5. Do you think that you would need the support of a technical person to be able to use this system?

6. Are there too many steps required to get tasks done?

7. How easy was it to recover if you made a mistake?

- Very easy,
 Somewhat easy,
 Neither easy nor difficult,
 Somewhat difficult,
 Very difficult

8. How easy or difficult was it to figure out the correct icon selection and the process to achieve a task?

- Very easy,
 Somewhat easy,
 Neither easy nor difficult,
 Somewhat difficult,
 Very difficult

9. Could you please share with us your suggestions for improving Optima LMS?

10. Overall, Do you have any additional comments about the Optima system that you wish to share, please feel free to write it in the space below?

We would really like to thank you for your time and insights you have given us today!

Appendix 4: Usability Testing Video Permission Form

Usability Testing

Video Permission Form

Usability Testing

Video Permission Form

I hereby give my permission to be videotaped as part of my participation into **Optima LMS Usability Testing Research** usability test conducted **February 25, 2014**, at the The Work Informatics User Experience **WIUX** Laboratory in the **ICT** building at Turku University of Applied Sciences.

Only my first name may be reported in association with the session results.

I understand and consent to the use and release of the video recording to the Usability Center and to the client. I further understand that the video recording and any highlights extracted from the recording may be used for review by the client and by the Usability Center. Representative video excerpts may also be used within presentations to the school supervisors and students, at professional meetings, and as part of research.

I give up any rights to the video recording and understand that the recording may be used for the purposes described in this release form without further permission.

I understand that if for any reason I do not want to continue I can leave at any time during this recording session.

Printed Name

Date & Place

Signature