

USABILITY OF WEB CONTENT MANAGEMENT SYSTEMS

by

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Abstract

The advent of internet and its increasing usage has raised the importance of web representation of an organization. Various website design techniques and tools have emerged; enabling web designers and developers to develop efficient websites with ease. However, with increasing number of users, the “usability” of these websites has become the main issue.

A web content management system (web CMS) is content management system software used for creating and managing web site content. It is used to manage and control a large, dynamic collection of web material. Web CMS is implemented as a web application which can be used to create and manage HTML content. It differs from the website building tools like FrontPage and Dreamweaver by allowing users with little or no technical knowledge to administer, develop and maintain website. Various web CMS software are developed using different programming languages. Jahia is 100% java based and open source CMS software. In this study, the usability of a university website (University of Lausanne) developed using Jahia is tested. Similarly the usability of a website (Colorado State University) developed using traditional web designing tools and technologies like HTML and ASP is tested. The results are compared to determine the usability of web CMS – Jahia.

The main objective of this study is to design an effective usability test and conduct the test with right selection of participants to determine the usability of web CMS applications.

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CHAPTER 1 - Introduction

The advent of internet and its increasing usage has raised the importance of web representation of an organization. Various website design techniques and tools have emerged; enabling web designers and developers to develop efficient websites with ease. However, with increasing number of users, the “usability” of these websites has become the main issue. “Usability” measures the quality of a user's experience when interacting with a website or any user-operated device. In general, usability refers to how well users can learn and use a product in order to achieve their goal.

A web content management system (web CMS) is content management system software used for creating and managing web site content. It is used to manage and control a large, dynamic collection of web material. Various web CMS software are available. Jahia is an open source web CMS software developed in Java. Here, the usability of a university website developed using Jahia is studied and compared to the usability of other similar websites developed using traditional website design techniques like HTML and ASP. This is an experimental study of usability of Jahia websites.

1.1 Objective

There are two objectives in this study. First objective is to study the usability testing and to design an effective test to check the usability of a university website developed using Jahia.

Second objective is to conduct the test with the right selection of participants and compare the results of test with that of other similar websites developed in HTML and ASP.

1.2 Motivation

ISO 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*”. Jahia is powerful CMS software which enables non-technical users to develop websites and manage the content of website with ease. However, the usability of these websites is an important factor in defining the success of Jahia. Usability testing can be used to determine this. Usability testing measures the responses of users in terms of time, accuracy, memory and emotional response i.e., time the user takes to complete a task, number of mistakes he/she does, how much does he/she remember after the use and how does the user feel about the tasks completed, respectively.

1.3 Document Overview

The rest of this documentation discusses web CMS in chapter 2 where the architecture and working of web CMS in general and Jahia in particular is discussed. Chapter 3 defines usability and discusses various attributes that are associated with it. Chapter 4 discusses about different usability tests, goals of usability testing and its limitations. Chapter 5 presents the actual test documents, users’ responses, results and conclusion.

CHAPTER 2 - Web Content Management Systems

Content management system is the category of software that helps to manage all unstructured information or content. This information may exist in many digital forms: text documents, images, audio and video files and many other file types and formats. Web CMS focuses on the online content targeted at either corporate website or intranet. Web CMS is implemented as a web application which can be used to create and manage HTML content. It differs from the website building tools like FrontPage and Dreamweaver by allowing users with little or no technical knowledge to administer, develop and maintain website.

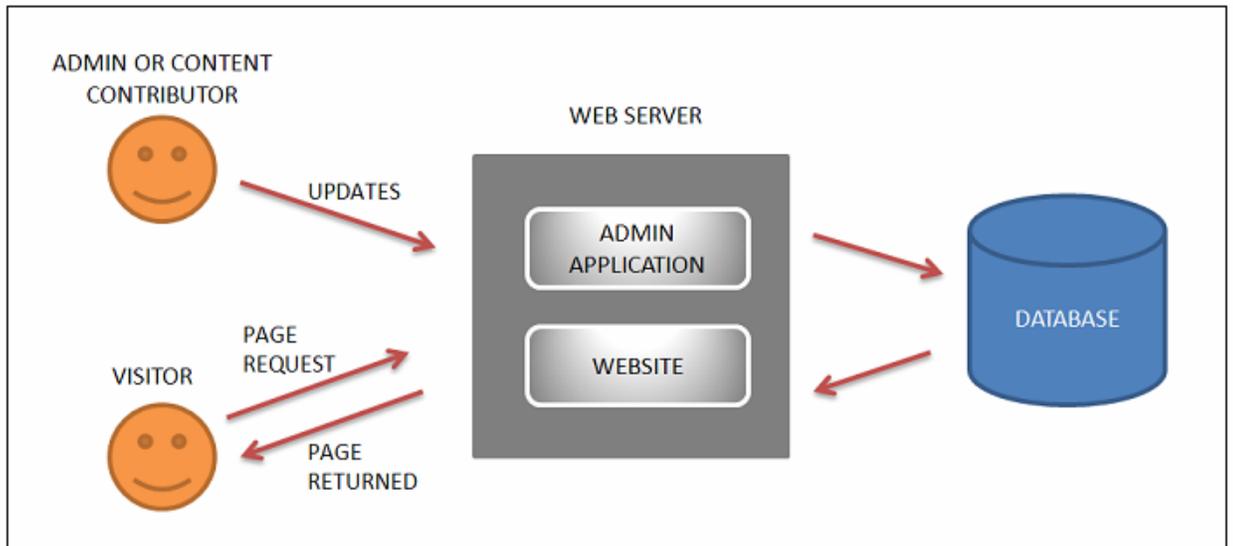
The working of Web CMS, its features and different Web CMS available are discussed in the following sections.

2.1 How Web CMS works

Web CMS has a web server and a database. It comes with a set of templates that can be used to create web pages. These templates define the look and feel of the website. All the content, text and images, that is on the web pages is stored in a database. When a visitor calls a page, the template is merged with the content from database to give the complete page.

Web CMS is a web application and hence web administrator or any authorized user can update the web site through browser. This enables non-technical users to maintain the website. The working of the Web CMS is shown in the Figure 1.

Figure 1: Components Web CMS and its working



2.2 Different Web CMS

Various web CMS software are developed in programming languages like PHP, Perl, ASP.NET, Java, etc and support databases like MySQL, Oracle, PostgreSQL, etc. Also there are free-and-open source and commercial CMS software. Few examples of web CMS and its uses are discussed in the following paragraphs.

Drupal is a modular CMS and blogging engine. This free software package is developed in PHP and is maintained and developed by a community of thousands of users. It supports MySQL and PostgreSQL databases. It is used to develop different websites like community web portals, personal websites or blogs, e-commerce applications, social networking sites and so on.

Alfresco is open source CMS developed in Java. It supports databases like MySQL, Oracle, SQL server and PostgreSQL. It can be used for image management,

document management and records managements besides web content management. It is used to develop education, financial, government and publishing websites.

Jahia is 100% java based and open source CMS software. It supports Hypersonic SQL, MySQL, PostgreSQL, Oracle and Microsoft SQL server databases. Commercial editions of Jahia are also available at low cost, which supports additional features. More on Jahia, its features and technologies used are discussed in section 2.3.

There are many more web CMS softwares available with their own features which ease developing web sites and managing content.

2.3 Jahia

Jahia is open source CMS software that integrates various servers and technologies which make it powerful. The technologies used in Jahia and the features it supports is as follows.

2.3.1 Jahia Technologies and Features Supported

- Enterprise Content Management Server: This server manages the unstructured information of an organization. Jahia relies on its own content repository which manages all the content objects, their interactions (create, update, delete, import and so on) and their properties (lock, languages, permissions and so on). It uses technologies like WYSIWYG editor (based on the FCK editor), JTidy integration, AJAX powered GUI and sitemaps, SSO support and JSP templates with taglibs.

These technologies empower Jahia to provide better features like:

- i. Complete web based interface.
- ii. Multilanguage Support.
- iii. WYSIWYG editing.

- iv. Automatic sitemaps management.
 - v. Staging: Authors may create or modify content in a staging environment. The author has three possible views of his current web page: live view, draft view and edit view.
 - vi. Default set of templates: Jahia is provided with a default set of templates which can be customized to fit the needs.
 - vii. Dynamic URL checking to avoid 403 and 404 errors.
 - viii. Fields lock in/ lock out: This is used to avoid the two users modifying the same content and also to lock the fields under validation in order to let the managers review the content.
 - ix. Time based publishing: Editor can setup a start and end date on every object of content.
 - x. Versioning capabilities.
 - xi. XML import/export: The content of a site or a page can be dynamically imported or exported in an XML format.
- Document Management Server: Jahia includes a document management server which supports WebDAV protocol, a protocol that provides functionality to create, change and move documents on a server. In Jahia, the uploading and managing of files can be handled directly from the windows web folders. It uses technologies like PDFBox for indexing pdf files. The features Jahia supports are:
 - i. Index and search for files: Jahia automatically indexes all office and pdf files and allows making advanced searches in the repository of files.

- ii. Automatic thumbnail creation.
 - iii. Drag and drop the files.

- Search and Indexation Server: Jahia provides multilanguage support. Indexing the structured content which dynamically changes on the same page according to the language, mode or user is difficult. This is done by Jahia Indexation Server. It also allows us to search the content based on hidden metadata like author, validation date and so on. Search and indexation server uses Apache Lucene based kernel for implementing the required search and indexation functions. The features it provides are:
 - i. Automatically index all Jahia content.
 - ii. Give distinct search results based on the user, language or navigation mode.
 - iii. Saved searches.

- Portal Server: Jahia supports portal technology. It integrates Portlet Builder which allows developing new portlets with less or no technological skills. It supports SQL portlets and web portlets.

- Collaborative Suite: Collaborative Suite extends the features of Jahia portal server to deliver ready to use collaboration and productivity based features. It helps to create a discussion forum, calendar server, chat room and so on.

- Business Process Management (BPM) Server: Jahia BPM server helps to create and manage complex business process or validation workflows. These workflows can be attached to any page or content object in Jahia. The features supported include:
 - i. Manage complex workflows.
 - ii. Monitor the business processes.

- Cache Proxy Server: Jahia includes a front-end cache proxy server to reduce response time and support massive user loads. This server automatically caches and assembles HTML fragments without regenerating them from the underlying Jahia application server and database. The cache proxy server is not available in the community (open source) edition. It is available in the commercial editions of Jahia.

2.3.2 Jahia Architecture

Jahia can be divided into seven categories. Details of each category are discussed below.

1. Third Party Systems: Jahia relies on several third party systems like: a database, access to File System (since Jahia stores all the large texts or the configuration files on the file system), a front-end web server (for dynamic URL rewriting) and a LDAP server to support single sign-on (SSO).

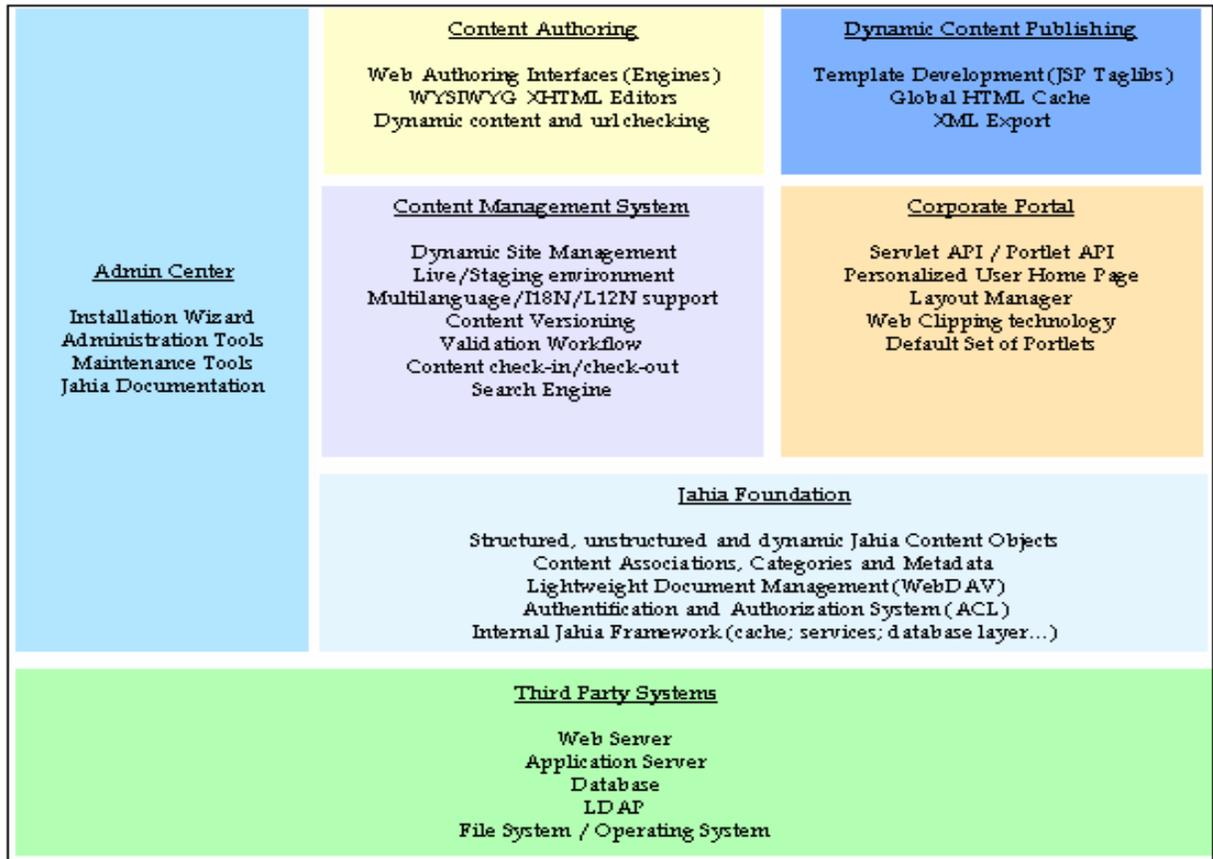
2. Jahia Foundation Server: The foundation server provides all the generic services to access and manage the various Jahia content objects and metadata. The document management layer manages all the binary files. Authentication and

authorization system provides services to authenticate and manage user permissions.

3. *Content Management System:* CMS supports Multilanguage (internationalization I18N and localization L12N); the Live/Edit/Preview modes and the built-in workflow engine to move from one mode to another and content versioning. Further, CMS has an integrated search engine.
4. *Corporate Portal Server:* Jahia offers personalized home or group page features to create portals. A complete layout manager interface lets users to personalize their own web pages and move/resize their portlets. Jahia comes with pre-built web applications like discussion forum, FAQ, Time Sheet and so on. Since the applications are open source, it helps developers to see how they are implemented and create their own applications.
5. *Content Authoring:* Jahia provides several GUIs to help users input and manage content. These interfaces are called “engines”. Each content object will have its own custom engine i.e., a date field will launch a date picker interface while a text field will launch WYSIWYG HTML editor. Before storing into the file system, the inputted HTML text is parsed by JTidy to remove some tags (like). The hard coded links are directly managed by Jahia.
6. *Dynamic Content Publishing:* Jahia dynamically aggregates all the content objects including static content and dynamic portlets and renders them through JSP template. XML export feature allows outputting a page or a content object in XML which can be reused elsewhere.

7. Admin Center: Admin center provides administration and maintenance tools. It provides central control of multiple virtual web sites from single interface; site language settings, administration of users and groups and other low-level database and cache management.

Figure 2: Jahia Architecture [15]



2.3.3 Advantages of Jahia

Jahia includes various servers and technologies which provide various features and hence making it a powerful CMS. All the features listed in section 2.3.1 can be considered as benefits. Further, Jahia is well documented and also provides online guided tours.

CHAPTER 3 - Usability

Usability measures the quality of a user's experience when interacting with a website or any user-operated device. In general, usability refers to how well users can use a product in order to achieve their goal. Usability is not a single, one-dimensional property of a user interface. It has multiple components. Usability is associated with five attributes. Details of these attributes are discussed in this chapter.

3.1 Usability Attributes

Five attributes of usability are *learnability*, *efficiency*, *memorability*, *errors* and *satisfaction*. [1]

- *Learnability*: The system should be easy to learn so that the user can get his work done in less time.
- *Efficiency*: The system should be efficient to use so that once the user learns to use it, a high level of productivity should be possible.
- *Memorability*: The system should be easy to remember so that a user, who returns to the system after some period of not using it, is able to use it without learning everything again.
- *Errors*: The system should have low error rate, so that users make few errors when using it. When users make an error, the system should recover easily.
- *Satisfaction*: The system should be pleasant to use. The users should be satisfied by using it.

CHAPTER 4 - Usability Testing

Usability testing is a means of measuring the quality of a user's experience when interacting with a website or any user-operated device. Usability testing measures the responses of users in terms of time, accuracy, memory and emotional response i.e., time the user takes to complete a task, number of mistakes he/she does, how much does he/she remember after the use and how does the user feel about the tasks completed, respectively. Basic elements of the test, different test types, goals and limitations of usability testing are discussed in this chapter.

4.1 Basic Elements of the Test

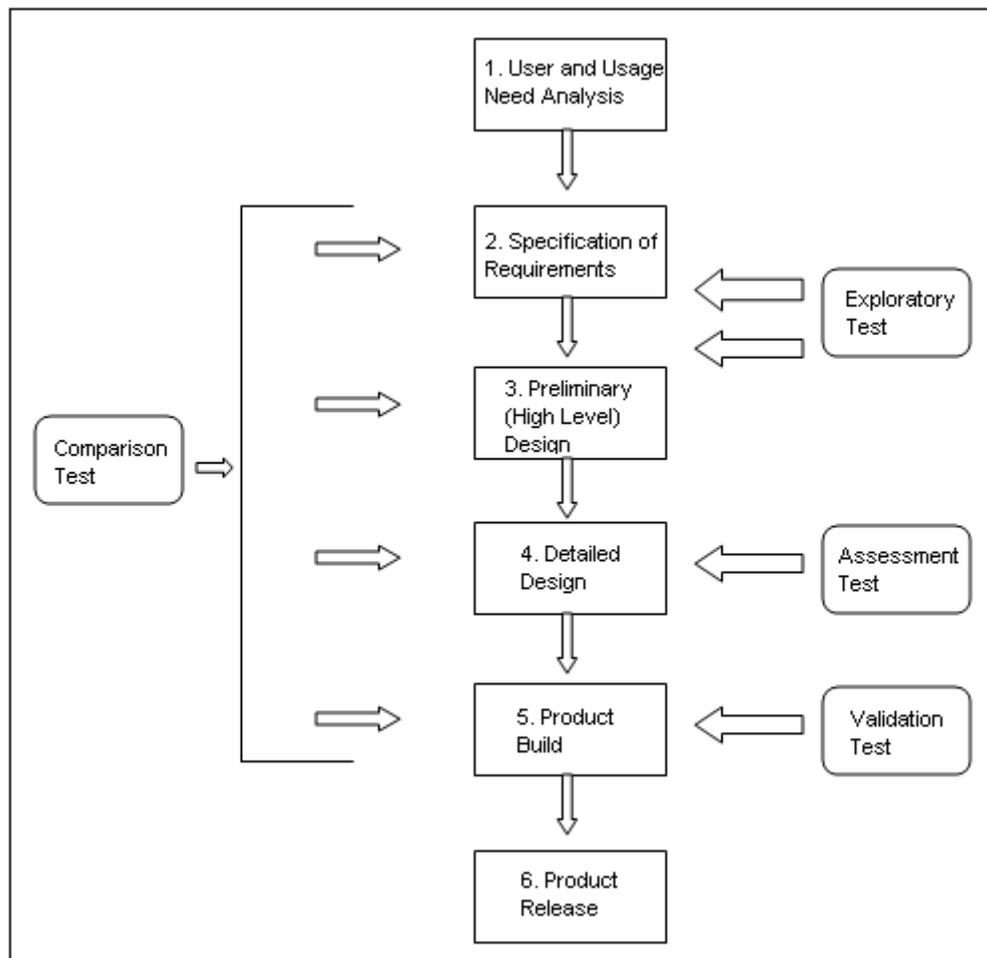
1. Development of problem statements or test objectives.
2. Use of a representative sample of end users which may or may not be randomly chosen.
3. Representation of the actual work environment.
4. Observation of end users who either use or review a representation of the product.
5. Collection of quantitative and qualitative performance and preference measures.
6. Recommendation of improvements to the design of the product.

4.2 Types of Test

Depending on when the test is conducted during the product development lifecycle there are four types of usability tests. *Exploratory test* is conducted in the preliminary stages of development life cycle, when the functional specifications and early

models are being developed. *Assessment test* is conducted in the midway of the development cycle, after a high level design of the product is done. *Validation test* is conducted late in the development cycle. It takes place much closer to the release of the product. *Comparison test* is not associated with any specific point in the development life cycle. Different tests and when they are conducted in the development life cycle is depicted in the following figure.

Figure 3: Different types of usability tests [2]



4.2.1 Exploratory Test

Exploratory test is conducted quite early in the development cycle. The product is still in the preliminary stages of being defined and designed. The project team would be both developing the functional specifications and early models of the product or the specifications phase is done and the design phase is about to begin. Besides verifying the assumptions made about the product, this test also helps to verify the assumptions made about the user.

4.2.1.1 Objective of the test

The main objective of the exploratory test is to evaluate the effectiveness of preliminary design concepts, also known as the user's conceptual model of the product. For example, consider using task-oriented guide of a software product, the technical writers might want to explore the high level issues like:

- Overall organization of the subject matter.
- Accessibility of the proposed format.
- Whether to use graphical or verbal approach.
- Anticipated points of help access.

These high level issues not only verify the assumptions made about the product but also verify the assumptions made about the user. Some of the user-oriented questions that an exploratory test would try to answer might be:

- What do users think about the product?
- Are the operations and navigation of the user interface intuitive?
- What type of prerequisite information does a user need to use the product?

- Which functions of the product are easy to use and which will require either help or written documentation?
- How should the table of contents be organized to accommodate both novice and experienced users?

4.2.1.2 Methodology

This test involves a high degree of interaction between the participant and test monitor. The participant is shown an example situation or a screenshot and then asked to talk through the assumptions and expectations. The purpose of this test is to identify points of confusion encountered by the participant and then to walk-through what would help them. Further, the participant is asked for their ideas about how to improve confusing areas. In this test, the interaction between participant and test monitor is more when compared to other tests.

4.2.2 Assessment Test

The assessment test is the most typical type of usability test conducted. Of all the tests, it is probably the simplest and most straightforward for the novice usability professional to design and conduct. Assessment tests are conducted either early or midway into the product development cycle, usually after the fundamental or high-level design or organization of the product has been established.

4.2.2.1 Objective of the test

The purpose the assessment test is to expand the findings of the exploratory test by evaluating the usability of lower-level operations and aspects of the product. If the exploratory test works on the skeleton of the product then the assessment test works on

the next step i.e., design. Assuming that the basic conceptual model of the product is sound, this test examines and evaluates the implementation of the concept. Rather than exploring the intuitiveness of the product, here the interest is in seeing how well a user can actually perform a realistic task and in identifying specific usability deficiencies that are present.

4.2.2.2 Methodology

Assessment test is referred to as an information-gathering test. The methodology of this test is a cross between the informal exploration of the exploratory test and the more tightly controlled measurement of the validation test. Unlike the exploratory test, the participant is asked to perform tasks rather than simply walking through and commenting on screens, pages and so on. The test monitor will lessen the interaction with the participant since there is less emphasis on thought processes and more on the actual behavior.

4.2.3 Validation Test

The validation test is usually conducted late in the development cycle and it is intended to certify the product's usability. Unlike the first two tests, which take place in the middle of a very active and ongoing design cycle, the validation test takes place much closer to the release of the product.

4.2.3.1 Objective of the test

The objective of the test is to evaluate how the product compares to some predetermined usability standard either a project-related performance standard or a historical standard or even a competitor's standard of performance. The intent is to

establish that the product meets such a standard prior to its release, and if it does not then to establish the reasons why. Another major objective of the validation test is to evaluate how all the components of a product work together. This is called integration validation test.

4.2.3.2 Methodology

Prior to the test, benchmarks for the tasks of the test are either developed or identified. Participants are then given tasks to perform with either very little or no interaction with a test monitor and the resulting completion efforts are monitored. The resulting quantitative data is analyzed and the timings over the benchmark are identified as problem areas.

Compared to an assessment test, a validation test requires more emphasis on experimental rigor and consistency, since important quantitative judgments about the product are made.

4.2.4 Comparison Test

Comparison test is not associated with any specific point in the product development life cycle. In the early stages it can be used to compare several different interface styles via an exploratory test to see which has the greatest potential with the proposed target population. Toward the middle of the life cycle, a comparison test can be used to measure the effectiveness of a single element, such as textual or pictorial buttons are preferred by the users. Towards the end of the life cycle, a comparison test can be used to see how the released product stacks up against a competitor's product.

4.2.4.1 Objective of the test

The comparison test can be used in conjunction with any of the other three tests. It is used to compare two or more alternative designs or to compare the product with a competitor's. The comparison test is used to establish which design is easier to use or learn, or to understand the advantages and the disadvantages of different designs.

4.2.4.2 Methodology

The basic methodology involves the side-by-side comparison of two or more alternative designs. Performance data and preference data are collected for each alternative, and the results are compared. The best results are obtained by including widely different alternatives rather than very similar alternatives. During this test, the participant is forced to really consider and observe why one design is better and what aspects make it so.

4.3 Limitations of Testing

Even though the usability test is expected to accomplish the task of identifying a product's usability problems or determine the usability standards of a product, it has limitations. Testing does not guarantee or prove that a product is usable. The reasons are:

- Testing is always an artificial situation.
- Participants are rarely fully representative of the target population.

In spite of these limitations, usability testing when conducted for appropriate reasons at an appropriate time can certainly help in identifying potential problems and the means to resolve them. This reduces the risk of developing an unstable product considerably.

CHAPTER 5 - The Actual Test

In this study, comparison usability testing is used. The usability of website of University of Lausanne (http://www.unil.ch/central/page2192_en.html) developed using Jahia, web CMS is studied using a usability test. A similar test is conducted on the Colorado State University website (<http://welcome.colostate.edu/>) and the results of both the tests are compared to determine the usability of Jahia applications. The steps followed in this process are:

- Develop test plan for University of Lausanne website.
- Conduct the test with right selection of users.
- Develop a similar test plan for Colorado State University website.
- Conduct the test with right selection of users.
- Compare the results in terms of number of difficult tasks, time taken to finish the task, responses given by the user and the level of satisfaction in using the websites.

5.1 Developing the Test Plan

In this step, three documents are prepared, *User Details*, *Usability Test or Task Based Test* and *Exit Test*.

5.1.1 User Details Document

User Details document helps to take the demographic information of the participant. This information can be used to analyze the results. The document is as shown below.

Figure 4: User Details Test

User Details:					
1. Name:	_____				
2. Type:	Parent	Student	Faculty	Visitor	
3. Grade Level:	High School	College	Undergraduate	Graduate	
4. Years Using the Web:	_____				
5. Age Group:	<=17	18-24	25-34	35-44	45-55 over 55
6. How often do you use internet?					
	Daily	Weekly	Monthly	Occasionally	Never

5.1.2 Usability Test Document (Task Based Document)

This document is the core of the usability test. During this test, the participant sits in front of the computer with the appropriate starting page on the browser. The test monitor then verbally leads the test subject through a series of questions or tasks. For each task there is a series of clicks. If the user does not follow this path, then the test monitor notes the clicks the user makes. Also, the user's comments when performing the task are noted. The difficulty of the task is rated depending on the effort and time the user takes to finish it.

- A difficulty 0 indicates the user follows the correct series of clicks and finishes the task without much effort.
- A difficulty 1 indicates that the user does not follow the correct series of clicks and finishes the task with little effort.

- A difficulty 2 indicates that the user does not follow the correct series of clicks, finishes the task with difficulty and feels frustrated.
- A difficulty 3 indicates that either user did not finish the task or performing the task results in an error page.

The participant is further asked to make any suggestions to make the task easier.

The usability test document for University of Lausanne website is shown below. A similar test conducted on the Colorado State University website.

USABILITY TEST (University of Lausanne)

1. You are interested in knowing various degrees offered in the field of economics. How do you go to the web page of department of economics?

Series of Clicks:

Home Page → Institutes and Departments

User does not follow the path. User's Clicks:

Users Comments:

Suggestions to make task easier:

Rate Difficulty of Task: 😊 😐 ☹️ 🚫

 0 1 2 3

2. You are now specifically interested in the course work of bachelors/masters degree in Economics and Business Studies. How do you get to the details?

Series of Clicks:

Institutes and Departments → Economics and Business Studies (Faculty of) → Course Programs 2006 – 2007

User does not follow the path. User's Clicks:

Users Comments:

Suggestions to make task easier:

Rate Difficulty of Task: 😊 😐 😞 🚫

 0 1 2 3

3. Any available scholarships?

Series of Clicks:

Other Information → Scholarships

User does not follow the path. User's Clicks:

Users Comments:

Suggestions to make task easier:

Rate Difficulty of Task: 😊 😐 😞 🚫

 0 1 2 3

4. Information on admission requirements?

Series of Clicks:

Future Students → admission sans maturite`

User does not follow the path. User's Clicks:

Users Comments:

Suggestions to make task easier:

Rate Difficulty of Task: 😊 😐 ☹️ 🚫
0 1 2 3

5. Details of the services offered to the students like orientation, library, sports and other activities.

Series of Clicks:

University Home Page → Students guide → Student Services

User does not follow the path. User's Clicks:

Users Comments:

Suggestions to make task easier:

Rate Difficulty of Task: 😊 😐 ☹️ 🚫
0 1 2 3

6. Information regarding place to live: on campus/ off campus.

Series of Clicks:

Finding a place to live → Accommodation

User does not follow the path. User's Clicks:

Users Comments:

Suggestions to make task easier:

Rate Difficulty of Task: 😊 😐 ☹️ 🚫
0 1 2 3

5.1.3 Exit Test Document

At the end of the test, the participant is asked to take an exit test. In this test the opinion of the participant on the website, its navigation and any problems. Further he/she is asked about any confusing features, what he/she like or dislikes about the website and any suggestion on making the website better. The exit document is shown below.

Figure 5: Exit Test

1. What features of the University of Lausanne website were vague or confusing to you, if any? _____
2. What is your impression about navigating the site? Does it seem easy or difficult? What makes it that way? _____
3. What did you like best about the site? _____
4. What did you like the least? _____
5. Do you think some people would have problems using the web site? What kinds of people? What kinds of problems? _____
6. Would you like to make any other comments about the website? _____

5.2 Selection of Participants

The selection of participants whose background and abilities are representative of the product's intended end user is a crucial element of the testing process. Considering that the test here is performed on the university websites, the end users will be

- Students at with different educational level browsing the website to get the information about a specific department like the courses, any admission requirements, scholarships awarded and so on.
- Parents of students who are interested in looking at the details of the university, various departments and details of any specific department that they might be interested in looking at.
- General Visitors.

Here, the test is performed using five users. *“The best results come from testing no more than 5 users and running as many small tests as you can afford.”* – Jakob Nielsen. The details of the five users who have taken the test are:

- *User 1:* College student of age between 18 and 24 years, with more than two years of browsing experience and who uses internet occasionally.
- *User 2:* Graduate student of age between 18 and 24, with more than six years of browsing experience and who uses internet daily.
- *User 3:* Parent, who is a graduate, age more than 55, has 5 – 6 years of browsing experience and uses internet occasionally.
- *User 4:* Parent, who is an under graduate, age more than 55, does not have much browsing experience and uses internet occasionally/never.

- *User 5*: Visitor, who is a graduate with more than five years of browsing experience and uses internet daily.

5.3 Conducting Test

Each participant is first asked to fill the *User Details* form. Then the participant is verbally asked to perform the tasks listed in *Usability Test* form with the university website’s home page as the starting page on the browser. Finally he/she is asked to fill out the exit form. The usability test is repeated for the second university.

5.4 Results

For University of Lausanne website, the difficulty each user has faced for finishing the tasks is given in the following table.

Table 5.1 Difficulty each user has faced finishing the tasks (Univ. of Lausanne)

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
User 1	0	1	0	2	2	0
User 2	0	0	0	0	1	0
User 3	0	1	0	1	2	0
User 4	0	1	1	1	2	0
User 5	0	1	0	0	2	0

Task 1 was finished by all the users with no difficulty. Most of the users finished task 2 with a little difficulty. Definitions of the navigation links were confusing to the users. They clicked “Bachelor” and “Master” links instead of “Course Programs 2006 - 2007”. A screenshot of such the scenario is shown in figure 5.3. Task 3 was finished

successfully by most of the users. Task 4 was difficult to few users as the description of the admission requirements was not in English but in French. Most of the users found it difficult to finish task 5. The users did not navigate back to the university home page from department page. Template of department page was similar to that of the university page and hence they assumed that they were already in the university home page.

Figure 6: Definitions of links in navigation

The screenshot shows the website header with the UNIL logo and navigation links: UNIL Accueil, UNIL Actualités, and UNIL. Below the header is the title 'Faculté des Hautes Etudes Commerciales (HEC)'. A breadcrumb trail reads 'You are here: UNIL > HEC > Presentation'. The left sidebar contains a navigation menu with the following items: Home, About HEC Lausanne, News, Programmes (dropdown), Masters, Research, Associations, Useful, Future Students, Current Students, Companies, Any public, and Intranet. The 'Programmes' dropdown is expanded, showing a list of links: General rules, Credits system ECTS, The professors, General studies plan, Courses programmes (circled in green), Courses list, Exams timetables, Courses Timetables, Bachelor, Masters (circled in red), Doctorates, Continuing education, Part-time education, and Others informations. The main content area is titled 'Presentation' and contains the following text: 'HEC Lausanne conceives teaching as promoting the a in-depth understanding and of mastery.', 'HEC promotes the ability to decide and act by', a bulleted list: 'applying concepts and through collective behavi', 'working on real life projects and as interns,', 'taking into account questions of finality and ethi', and 'HEC promotes in-depth understanding of the', 'individual and of collective behavior', a bulleted list: 'functioning of companies as well as of economic', 'economic, social and political environments and', 'role & responsibilities of the manager,', and 'HEC promotes mastery of the', a bulleted list: 'methods and tools necessary to produce a problems', and 'tools and approaches to solve these problems.'

For Colorado State University website, the difficulty each user has faced for finishing the tasks is given in the following table.

Table 5.2: Difficulty each user has faced finishing the tasks (Colorado St. Univ.)

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
User 1	0	3	1	0	0	0
User 2	0	3	0	0	0	0
User 3	0	2	2	0	1	0
User 4	0	2	2	0	1	0
User 5	0	1	1	0	0	0

Task 1 was performed with no difficulty by all the users. Task 2 resulted in error for User 1 and User 2. User 3 and User 4 could get to the list of courses but the list was not organized. All the courses with course name starting with E were listed. It was difficult to understand which of the courses in the list were of economics department. Also, there was no link back to economics department. This made the next task, task 3 difficult for the users. After getting back to the department website, task 4 was performed with no difficulty. Task 5 was performed with no difficulty by three users. User 4 and User 5 could find the link back to the university home page with a little effort. Task 6 was performed with no effort. Tasks 2 and 3 which needs navigation back and forth the pages was difficult as the link from course page to department website is missing.

5.4.1 Problems faced by users

University of Lausanne:

- Spelling and grammatical errors in the content.

- Contents of few pages are not available in English.
- When the users click department link in the university website (whose contents are in English), the department website is displayed in French. The users need to select English for the content to be in English.
- The same template for university website and department website is confusing. Hence the users did not navigate back to the university home page from department page for task 5.

Colorado State University:

- Clicking on the courses link from the department website resulted in error for few users.
- Users who could get to the courses page found the list unorganized. All the courses starting with E were listed. It was difficult to differentiate economics courses from the rest.
- Link back to the department website from the courses page is missing.

5.4.2 Features users liked

University of Lausanne:

- Look and feel of the website.
- Organized list of departments.
- Navigation is easy.
- Users could finish all the tasks.
- Content is available in more than one language.

Colorado State University:

- Different templates for department and university websites.

- Navigation is easy except for some missing links on few pages.

5.4.3 Suggestions by users

University of Lausanne:

- Definition of links in navigation needs to be clearer to avoid confusion.
- All the content must be available in English.
- Different look for university and department websites.
- Spelling and grammatical errors should be reduced.

Colorado State University:

- Courses should be listed according to the department.
- Content should be more organized.
- Links to navigate back and forth the pages so that the user is not lost when browsing through the website.

5.5 Conclusion

The participants of the usability test find it easy to navigate and get the information on University of Lausanne website. The availability of content in more than one language is an advantage. However, the translation of content from French to English resulted in many spelling and grammatical errors. This affected the ease with which the users could possibly finish a given task. The organized content on the website helped the user to get the required information with no difficulty. Links to navigate back and forth the pages ensures that the user is never lost when browsing the website. Since Jahia performs dynamic URL checking to avoid 403 and 404 errors, no errors or missing pages resulted when the user was taking the test. No task was with difficulty level 3. Hence the

University of Lausanne website, a website developed using Jahia, is more usable when compared to the website developed using traditional web designing tools and techniques like HTML and ASP.

Jahia helps to develop more usable websites with organized content and fewer errors, besides enabling non-technical users to administer, develop and maintain websites and complex applications.

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