

Usability Methodological Procedures Applied on an Institutional Site

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Abstract. This study is based on the diverse usability methodological procedures, applied during 2008 and 2010, on an institutional site and brief review in 2013. Problems reported by potential users were analyzed and then applied in a redesign of the institutional site. After redesigning, more tests were performed in an attempt to improve the usability of site. In 2013, this institutional site was updated to a new version with reorganized structure and content. Our research presents the changes, the usability improvements applied as well as other advances improved the site significantly.

Keywords: Usability tests, Institutional site, CMS.

1 Introduction

Since the IHC beginning, web designers have been trying to provide access to information, avoiding any embarrassment to final users. This study is part of an essay describing usability methodological procedures results applied over a two-year period on an institutional site of the Graduate Program in Design at Universidade Estadual Paulista, which were intended to improve usability and provide best access to graduation programs. Considering the updates in 2013, a brief review was made to verify if web designers from the institute considered this research recommendation.

The methodological procedures were characterized by steps: Starting with the review theory, which reviews topics of usability followed by laboratory applications and practical simulations with potential users that reported possible usability problems. The stages of development were characterized by prototyping and reanalyzing evaluation results, culminating in a final prototype.

These results were considered satisfactory since it was verified that the use of CMS tools in the development of institutional sites improved their levels of usability. However, the main contribution of this study is to acquire new knowledge resulting from experiments as well as the increase in issues related to interface design, usability and ergonomic information, which collaborate effectively for the development of Ergonomic Design.

2 Review Theory

2.1 Usability

How well users can use the system is functionally dimensions of usability (Nielsen, 1993):

- **Learnability:** is it easy to learn?
- **Efficiency:** once learned, is it fast to use?
- **Visibility:** is the state of the system visible?
- **Errors:** are errors few and recoverable?
- **Satisfaction:** is it enjoyable to use?

Despite the existence of dimensions of usability, users can quantify all of these measures. Usability dimensions are not standard for all classes of users, for example: inexperienced users will require more learnability whereas expert users need more efficiency.

2.2 Information Architecture (IA)

It is an expression created by Wurman in 1996, as a new discipline emerged with the aim of organizing the information flow making it clear and understandable. (Duque and Vieira, 2008). Information Architecture for a complex site requires two base characteristics: a view from final user and a view from an expert. (Morville, 1998). One classic way to organize and get the initial insights into users' mental model of an information space is to simplify generating good starting for the IA (Nielsen, 2009).

Wireframes has the function of representing schematically all the elements that make up a website. Images, texts, forms, search engines and forms can be outlined in a paper or application making the layout more understandable with its information (Oliveira, 2008).

2.3 Accessibility

In Brazil, there is a national law (number 10.098 2000, chapter VI, art. 47), which regulates the accessibility for all websites that are administrated by the government, including institutional sites. According to SEPRO (Federal Service for Data Processing in Brazil), accessibility is present in a website when the page provides access to information for a large number of users, including users that require assistive technologies such as elderly and mobile users. Especially in Brazil, there are concerns over issues ranging from slow connections to users of outdated browsers and mobile devices. These concerns may not be relevant in developed countries.

The number of visual impairment searches in Brazil is high, according to IBGE (2010), Brazilian Institute of Geography and Statistics, 528.624 recorded users were completely blind and 35.791.488 suffered some visual impairment. Considering the WCAG 1.0 (Web Content Accessibility Guidelines) from W3C, it is possible to

improve websites using the three levels of success criteria in the four principles, and develop a website to receive a higher number of users.

2.4 Aesthetic Factors that Increase Website Usability

Attractive things certainly should be preferred over ugly ones (Norman, 2004). Users will prefer attractive features, since other studies reported that screens arranged attractively are easier to use. To improve the attractive level in a website, web developers need to understand typography, worry about font size, legibility and contrast while considering indentation to structure, improving the information displayed on screen.

2.5 Search Engine Optimization (SEO)

SEO must be one of the most important elements for internet strategy (Nielsen and Loranger, 2007). Through a number of strategies, it is possible to improve the position of the site in a search result, when users type in words and phrases (Ledford, 2008). Users create many expectations, so it is necessary for web developers to provide categories, classifying website content in an organized way.

2.6 CMS (Content Management System)

An easy way to connect all of the topics mentioned is using a CMS, which consists of a series of programming pages connected to a database. CMS provides superior flexibility and easy user interface with many options to customize the website and open source code. There are two areas in a CMS: private and public, private representing the management area (administrator area) and publicly visible area (front-end area) (Verens, 2010). Government and institutions in Brazil use this system.

2.7 Usability Tests

Usability tests are used to decrease or eliminate user frustration and create a good relation between organization and user, increasing the quality of product (Rubin and Chisnell, 2008).

- **Heuristic Evaluation:** applied by experts that use criteria of usability. For example the 10 Usability Heuristics for User Interface Design (Nielsen, 1995). Five experts can identify 75% of usability problems (Preece et al 2005).
- **Formative Evaluation:** applied with final users can be tested in a prototype or implementation, framing problems for next iteration of design and evaluating a preliminary effective of the project (Rubin and Chisnell, 2008).
- **Field Study:** applied with final users in a real context with real tasks. Users perform a number of tests with little moderator interaction.

For evaluations with users, it is necessary to test plan and define tasks to be presented to users. The test plan is detailed as follows:

- Purpose, goals, and objectives of the test
- Research questions
- Participant characteristics
- Method (test design)
- Task list
- Test environment, equipment, and logistics
- Test moderator role
- Data to be collected and evaluation measures
- Reports contents and presentation

The best results of usability tests come from testing no more than five users and running small tests. The number of usability problems can be found in the function below (Nielsen, 2000):

$$N(1-(1-L)^n) \quad (1)$$

Where N is the total number of usability problems, L is the proportion of usability problems discovered while testing a single user (average value of L is 31%). A total of 15 users is necessary to attempt to find 100% of the usability problems, and five users are needed to find 85% of the problems, resulting in a good number to fix in a redesign. In the second test, five users will discover most of the remaining 15% of the original usability problems, according to authors.

3 Applying Methodological Procedures on Institutional Site

According to the IHC practice, final users are the main stakeholder to contribute during the design process. Even UNESP has an institutional site for students of design, there is no data concerning usability tests applied during the development of



Fig. 1. Institutional Site (accessed on 21st October, 2009)

current design. This research made its first evaluation in 2008, the results are present in this paper. Consent Terms were signed during the research according to Norma ERG-BR 1002, Code of Ethics of the Certified Ergonomist (ABERGO, 2003).

The first evaluation was a **Heuristic Evaluation** with two experts (5 and 2.5 years of experience), only to map the big problems and elaborate a better test plan. This test was mainly based on 10 Usability Heuristics for User Interface Design (Nielsen, 1995) and other references: (Cybis, 2007) and (Preece et al 2005) generating a list of 21 items to rate user satisfaction, where 5 indicated very satisfied and 1 dissatisfied. The average of satisfaction of all 21 items was 2.28, considered to be a low satisfaction rate.

Table 1. Heuristic Evaluation – answers from an expert

Principle	Satisfaction Level
1 Visibility of system status	(1) <input checked="" type="radio"/> (3) (4) (5)
2 Match between system and the real world	(1) (2) (3) (4) <input checked="" type="radio"/> (5)
3 User control and freedom	(1) <input checked="" type="radio"/> (3) (4) (5)
4 Consistency and standards	(1) <input checked="" type="radio"/> (3) (4) (5)
5 Recognition rather than recall	(1) (2) <input checked="" type="radio"/> (4) (5)
6 Error prevention	<input checked="" type="radio"/> (2) (3) (4) (5)
7 Flexibility and efficiency of use	(1) <input checked="" type="radio"/> (3) (4) (5)
8 Aesthetic and minimalist design	(1) <input checked="" type="radio"/> (3) (4) (5)
9 Help users recognize, diagnose, and recover from errors	(1) <input checked="" type="radio"/> (3) (4) (5)
10 Help and documentation	<input checked="" type="radio"/> (2) (3) (4) (5)
11 Easy to learn	(1) (2) (3) <input checked="" type="radio"/> (5)
12 Tempting	(1) <input checked="" type="radio"/> (3) (4) (5)
13 Grouping / distinction of items	<input checked="" type="radio"/> (2) (3) (4) (5)
14 Legibility	(1) <input checked="" type="radio"/> (3) (4) (5)
15 Cognitive and perceptual load	(1) (2) <input checked="" type="radio"/> (4) (5)
16 Informational density	<input checked="" type="radio"/> (2) (3) (4) (5)
17 Adaptability	(1) <input checked="" type="radio"/> (3) (4) (5)
18 Compatibility	(1) (2) <input checked="" type="radio"/> (4) (5)
19 Clickable is clickable	(1) <input checked="" type="radio"/> (3) (4) (5)
20 Attractive Layout	(1) (2) <input checked="" type="radio"/> (4) (5)
21 Consistency	(1) (2) <input checked="" type="radio"/> (4) (5)

Using an open source Brazilian screen reader, DOX-VOZ, the two experts performed a basic **accessibility test**, based on W3C recommendations in WCAG 1.0. Camtasio Studio 6.0 tool was used to record and map the journey made by the reader, followed by the professionals evaluating pages using an online accessibility validator, daSilva, which is similar to original W3C version, but in Portuguese.



Fig. 2. daSilva accessibility Validator (accessed on 21st October, 2009)

Table 2. Average of errors and warnings in DaSilva validator

Priority 1	Priority 2	Priority 3	Number of evaluated pages	
Errors	9.6	Errors 32.6	Errors 1	7
Warnings	27.4	Warnings 99.8	Warnings 87.2	

Screen reader was not able to read menu sub item, due to incorrect HTML tag structure.



Fig. 3. Sequence of navigation using DOX-VOZ (accessed on 21st October, 2009)

The research **Field Study** was applied in two groups: undergraduate students of design as well as postgraduate pupils. The first group was composed of 24 students, 15 males and nine females, average age 20.08 (SD 1.1). The second group was composed of seven students, one male and six females, average age 27.57 (SD 3.82). Camtasia Studio 6.0 tool recorded all users' navigation for each task. A moderator included a series of basic instructions before starting the evaluation.

The questionnaire used for the first group featured three tasks related to postgraduate program applications: Task 1 - Find areas of research, Task 2 - Find registration template and Task 3 - Find postgraduate agenda program.

Table 3. Results from group 1

Task 1		Task 2		Task 3	
Success	45.8%	Success	20.8%	Success	37.5%
Unsuccessful	54.2%	Unsuccessful	79.2%	Unsuccessful	62.5%

The questionnaire used for the second group also included three tasks related to postgraduate activities: Task 1 - Find existing research groups at design program, Task 2 - Find template of a report and Task 3 - Find document to require Master's qualification.

Table 4. Results from group 2

Task 1		Task 2		Task 3	
Success	100%	Success	-	Success	57%
Unsuccessful	0	Unsuccessful	-	Unsuccessful	43%

Task 2 encountered big problems related to browsers, users didn't know how to download a document on computer desktop. In order to avoid any user embarrassment, this task was cancelled. After analyzing recorded videos, it was clear that information in the institutional site was dense, and users had difficulties to find information.

An **Aesthetic factors** evaluation was applied to 20 computer science undergraduate students, two females and 18 males, average age 21.6. The questionnaire had aesthetic factors list with satisfaction indicators, 1 to indicate unsatisfactory and 10 to indicate very satisfactory.

Table 5. Results from computer science students

Aesthetic factor	indicator
Typography of page	6.85
General Layout	7.25
Distribution of elements on page	6.9
Page colors	8.25

After evaluations, a redesign of the institutional site attempted to improve information architecture of site and correct usability problems found. Using **Card Sorting** techniques, 15 users collaborated to restructure left menu on institutional site, the new structure reduced 21 items menu to seven items listed below, translated to Portuguese:

- Program (Apresentação do Programa)
- Curriculum (Estrutura Curricular)
- Search Areas (Linhas de Pesquisa)
- Selection Process (Processo Seletivo)
- Agenda/Calendar (Agenda/Calendário)
- Document Templates (Modelos de Documento)
- Students Benefits (Auxílio Discente)

The prototype was developed in Microsoft Expression Blend + SketchFlow tool, trial version, and submitted for a **Formative Evaluation** with 11 users, average age 29.09, six females and five males, users are members of a IHC public e-mail group. For this context, two tasks to be done in both environments were selected; prototype and Institutional Site. Task 1 was to find a template of research plan and Task 2 was to find all requirements to conclude a Master's degree in the program.

The prototype also received a satisfaction score bigger than the Institutional Site, in a scale until 10, prototype received 7.91 and Institutional site 4.82. The second version of the prototype was developed in a CMS named Joomla. This CMS was chosen to resolve some problems related to accessibility, SEO (easy application of friendly URLs names) and also given that CMSs have many modules that can be installed easily such as internal search, dynamic menus and a simple management to update content in an organized site structure categorized by topics. For accessibility, CMSs include shortcuts to main content, easy fields to input images alternative texts and recommended HTML structure for a better screen reader navigation.

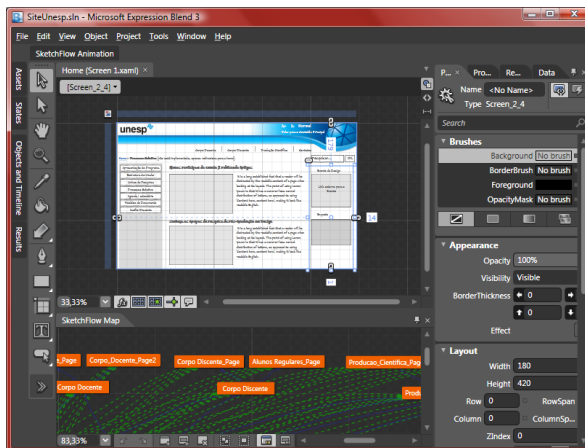


Fig. 4. Microsoft Expression Blend + SketchFlow workstation

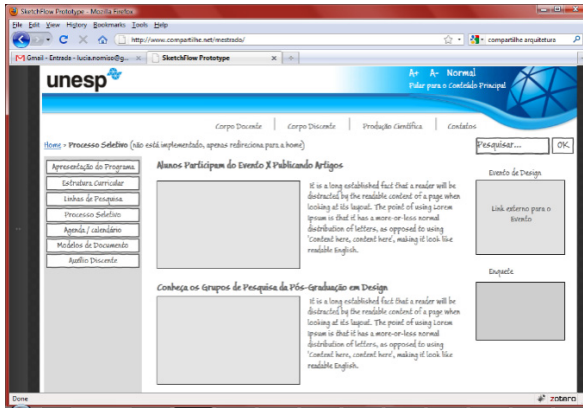


Fig. 5. Prototype version 1

Table 6. Results from Formative Evaluation

Task 1	Success %	Task 2	Success %
Prototype	63.7%	Prototype	72.7%
Inst. Site	72.7%	Inst. Site	45.5%



Fig. 6. Prototype version 2, developed with Joomla

Final Formative Evaluation was applied in the second prototype version. Fourteen users were invited: three females and 11 males, average age 25. Evaluation had three tasks: Task 1 - Find when course was approved by CAPES (Coordination of Improvement of Higher Education Personnel), Task 2 - Find a professor responsible for a specific discipline and Task 3 - Figure out how many disciplines are necessary to conclude the Master's degree.

Table 7. Results from group 1

Task 1		Task 2		Task 3	
Success	100%	Success	86%	Success	93%
Unsuccessful	0	Unsuccessful	14%	Unsuccessful	7%

Joomla aided in a efficiency content update on the Institutional site, allowing edition of existing pages and creating new pages with rich elements such as photos, internal search tool and polls.

In 2013 the Institutional Site was updated (<http://www.faac.unesp.br/#42,42>), few changes was applied in this new version:

- Left menu increased to 26 items menu (21 previously)
- Content is basically the same
- Breadcrumb, for a better navigation
- Button to increase font (button increases line height, but not font size)
- No friendly URL (<http://www.faac.unesp.br/#42,42>)

4 Conclusion

The evaluations applied between 2008 and 2010 demonstrated usability problems and a number of these are easy to correct. The involvement of end users was most productive and made the difference to correct usability problems. After collecting data, moderators spent additional time talking to users informally so as to gather details on personal opinion and identify different necessities for each user. At this stage it was possible to conclude that information architecture was the big problem. A total of 93 potential users took part in the surveys. The final evaluation on the prototype demonstrated a reduction of user frustration and confirmed the real necessity of end users in usability evaluations. Using Joomla CMS, the corrections were briefly implemented. CMSs have a base structure for websites that already have W3C recommendations on back end code with a friendly development.

All evaluation results are available in the same domain (<http://www.faac.unesp.br/#119,441>), few changes have been applied in the new version. Left menu increased to 26 items (21 previously), when collected results demonstrated that information architecture was appointed as a big usability problem, and many users were not able to find necessary information on the website. Furthermore, it is expected that this research will contribute to connect issues related to interface design contributing effectively to the growth of the subject.

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