

# Measuring the facility of use of a website designed with a methodology based on concepts of design of ontologies

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## ABSTRACT

Acceptance of a website is determined by various factors, one of the most important is the organization that allows users to access to functions, resources and information that it contains. This work consisted of a study of comparative usability between a website designed using principles of linguistics and design of ontologies and other using a strategy of a commercial product. A plan was designed and applied to evaluate the following aspects of website: ease of use, efficiency to access its information, efficacy to perform tasks and user satisfaction. Heuristic and user tests were used as diagnostic tools in usability evaluations, and an observation guide was made by an external evaluator as a complement to previous tests. The results clearly shown that is better use the proposed website design methodology. This allows to create site more structured, functional and with greater ease of access to resources that it contain.

**Keywords**—*Ontology, heuristic tests, usability, websites*

## I. INTRODUCTION

Design of website includes various stages that involve: technical development, information structure and visual design [1]. As any artifact used by humans, the design requires an architecture that is well structured, organized, functional and useful content; and that it involves from its conception usability. This is an attribute of quality that measures ease of use in user interfaces (IU) [2].

This work describes a study of usability comparative; this is oriented at end users of a website designed based on a methodology adapted based on design of ontologies [3] against a site designs with a commercial product strategy [4].

## II. DESCRIPTION OF PROBLEM

In a previous work [3], it was evaluated the usability of structure of a website planned with a methodology adapted to be assimilates more easily by designers. The results obtained confirmed a better understanding of the designers in their interaction with website structure, and improvements in aspects as efficacy, efficiency and subjective satisfaction. As next stage, it is necessary to contrast the degree of usability from end users' point of view of a website of the proposed methodology against the design of commercial option, to identify advances in ease and simplicity of use, efficiency and effectiveness in access to information, to obtain a satisfactory experience of users with website designed with our proposed methodology.

### III. SOLUTION PROPOSAL

A plan was designed and implemented to evaluate the usability of website design, using user test as known as Test of Guerrilla [5]; and with this determines issues in usage and interaction of users with the website interface. Evaluation instruments consisted of usability heuristics, [6], observation guide and usability metrics supported by: [7], [8][9], [5], [10], [11], [12], [13][14],[15], [16].

Previously to this study, two websites were designed (figure 1), these design with different methodologies [3] and [4]. To avoid certain slant with final results, both designs were implemented using Adobe Dreamweaver CS5 and HTML.

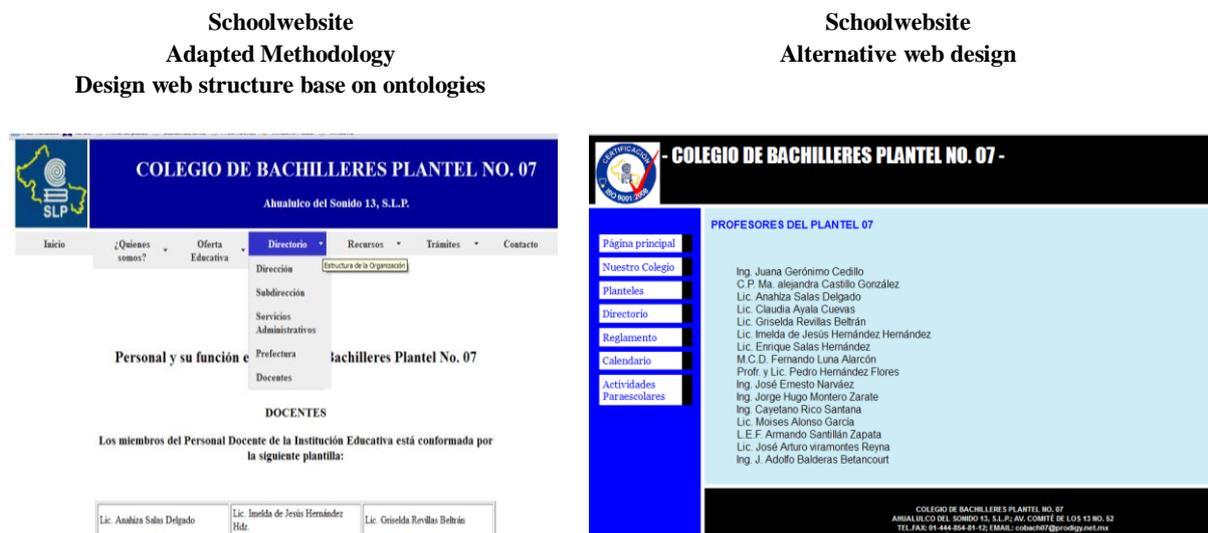


Fig. 1. School websites used in tests

#### A. Evaluation of the usability of website design applying user test

Environment in which the test were made is described below, description of end users is shown in table I, material used is shown in table II and photography of interference and distractions-free spaces that were used are shown in figure 2:

TABLE I. GENERAL INFORMATION OF THE GROUP OF EVALUATION OF THE USABILITY OF WEBSITE

General data on participant group	Description
Test date	From 20 April to 2 May 2017
Place where the test is performed	Faculty of Engineering of the UASLP, México
Type of participants	Students
Age	From 19 to 21 years old
Gender	6 women, 4 men
Participants with experience in web design	2 women, 3 men

TABLE II. MATERIAL AND THE EQUIPMENT USED IN THE USABILITY TEST OF WEBSITE

<b>Equipment</b>	3 laptops Hewlett Packard with operating system Windows 7
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	Internet browser: Internet Explorer, Mozilla Firefox and Google Chrome Projector Epson Power Lite S6+
<b>Material</b>	Electronic and printed document of exercises of No. 3 practical Case Electronic and printed document of the evaluation questionnaire Printed document of the observation guide



Fig. 2. Mechatronics Laboratory of the Faculty of Engineering of Autonomy University of San Luis Potosi.

*B. Execution user test to evaluate the usability of website*

Previously, tasks to be performed by users were designed for usability test of website, grouping these in next three steps:

**Step 1:** Provide to users specific instructions from their tasks to be performed, using an electronic and printed document. This was refined from a draft handbook used in a previous usability study [3].

**Step 2:** The users were instructed in the tasks to be executed when they accessing website, and information that they should get when they were interacting with web interface; also, it was explained to them how register information about realization of their tasks; and how to use base 7 Likert questionnaire trying to avoid in results a possible bias. Treatment of the users were with respect and kindness, gaining their confidence so that they would be willing to expose in a written or verbal form their doubts, observations and comments. As result, users were more active and more enthusiastic when they were resolving the tests. Each interaction of them with website provided relevant and timely information.

**Step 3:** During the development of the user’s test, an evaluator applied two instruments to the users: a questionnaire to check the usability of website and an observation guide to determine performance and interaction of them when using the web interface (figure 3).

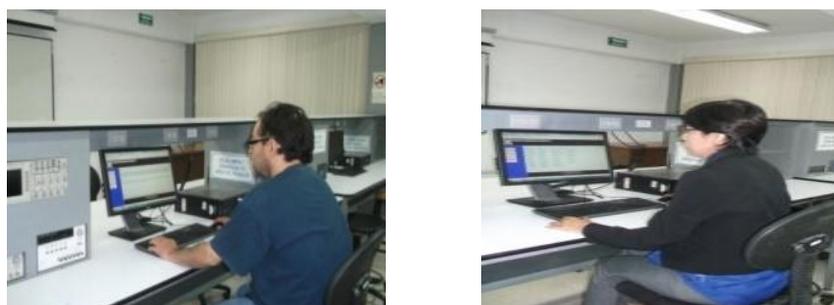


Fig. 3. User and evaluator during the usability testing of website

C. Exercises and results of usability evaluation of website applying user's test

Exercises and results of the user's test are described in detail below:

Exercise 1: The users interacted and navigated through interface of School website to familiarize with it. This exercise was important to achieve next tasks.

Exercise 2: The users navigate through the website, to search information about the personnel that work in this institution, he selected in his interaction with website an element (a relationship found) and returned to the main concept.

Exercise 3: The users navigated through the website and found links on the different proceedings of institution. He recorded at least two procedures in the format provided and returned to home page.

Exercise 4: The user in his interaction and navigation through website, found concepts that make up infrastructure of school website. He documented at least two elements related to this task and returned to the start point.

Exercise 5: The user agreed and interacted with website to search and find information about the educational offer, careers or training offered by institution.

General results derived from user's test exercises are described in figure 4, this shows the percentage of completed tasks.

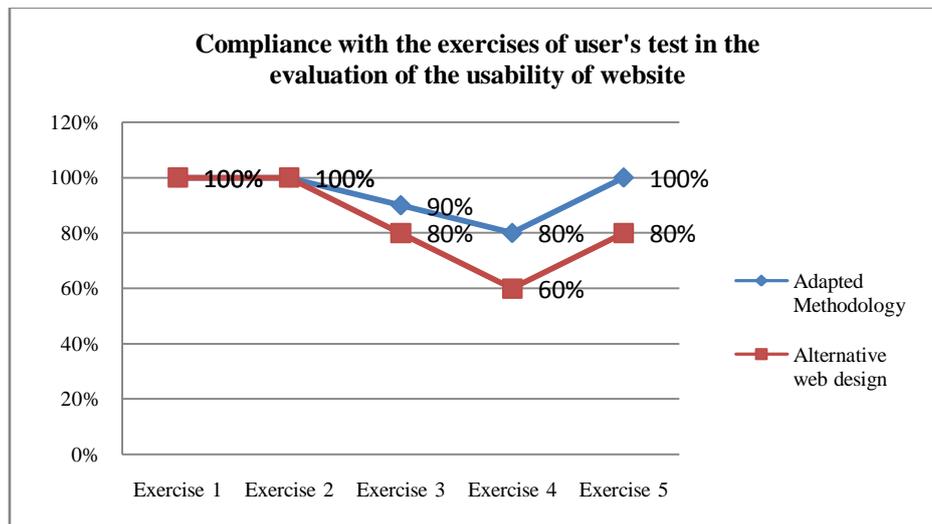


Fig. 4. Compliance of exercises of user's test in the evaluation of the usability of websites

In figure 5, overall average of clicks that users gave during performance of user's test exercises is displayed.

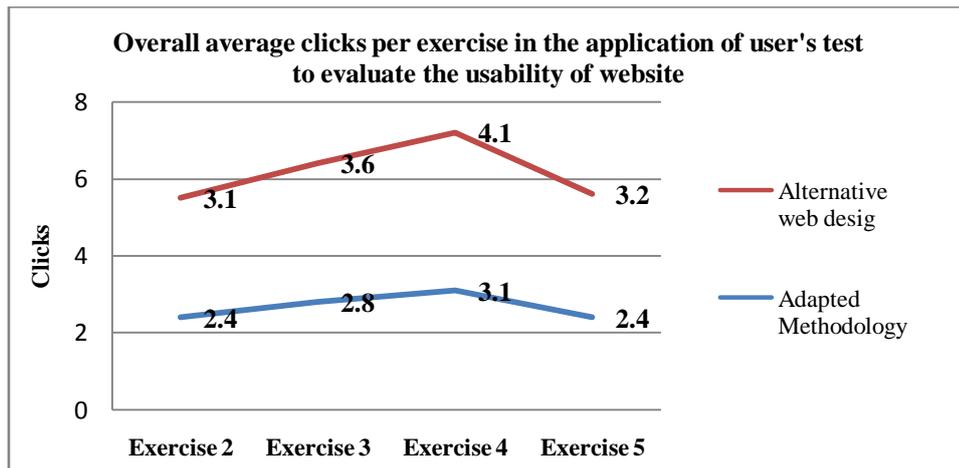


Fig. 5. Overall average clicks per exercise

After of test's end, users answered questionnaire (using Liker-7 scale), and their results are described in table III. The global average represents the degree of subjective satisfaction of users to perform the exercises of user's test in their interaction with websites.

TABLE III. OVERALL RESULTS OF THE SUBJECTIVE SATISFACTION OF USERS WITH RESPECT TO THE DESIGN OF WEBSITE

Usability aspects	% Global average Adapted Methodology	% Global average Alternative web design
Consistency	93.6 %	85.7 %
User' control	92.2 %	82.2 %
Visual presentation	92.9 %	84.3 %
Handling and recovery from errors	92.9 %	78.6 %
Reducing memory load	91.4 %	85.0 %
Overall satisfaction	91.1 %	80.7 %
Guide and help	91.4 %	75.7 %
Using relationships	90.0 %	86.5 %
General average	91.94 %	82.34 %

The comments of users highlight the ease of navigation to access contents and elements that structure both sites designs, however, results of subjective satisfaction questionnaire demonstrate (table III) that users expressed greater pleasure towards ease of use and functionality of the website designed with the adapted methodology, considering that this was useful and helped them to complete their tasks more quickly and fewer clicks.

*D. Usability evaluation results of website using an observation guide*

In the development of usability test, an evaluator estimated and recorded data obtained by users when performing the user test exercises. Geometric mean was chosen to resume usability metrics derived from the calculation of each one of aspects and attributes evaluate in the tests (Table IV).

TABLE IV. GLOBAL RESULTS IN THE EVALUATION OF METRICS AND USABILITY ASPECTS OF WEBSITE,

Usability Metrics	Attributes * Time measured in minutes (min.)	Geometric mean per aspect		Percentage	
		Adapted methodology base on ontologies	Alternative web design	Relative score between two web designs	Improvement between two web designs
Success	Success	95.4	90.9	104.9	4.9
Content	Time taking the task, min. *	43.3	51.7	119.4	19.4
	Errors	9.8	14.2	144.3	44.3
	Knowledge memory	80.4	60.3	133.2	33.2
	Memory of memory	85.6	79.5	107.6	7.6
	Time to remember, seconds	1.9	3.7	192.2	92.2
Efficiency	Functioning in the tasks, min.	4.8	5.7	119.5	19.5
	Time spent in errors, min.	8.7	17.1	195.8	95.8
	Frequency to go for help	67.8	75.7	111.5	11.5
Efficacy	Tasks completed at 100%	90.7	81.4	111.3	11.3
	Partial tasks	9.2	18.5	200.1	100.1
	Success	95.4	90.9	104.9	4.9
	Time to complete the task, min.	4.8	5.7	119.5	19.5
	Time spent on errors, min.	8.7	17.1	195.8	95.8
	Frequency to go for help	67.8	75.7	111.5	11.5
Usersatisfaction	Utility-control, minutes	34.5	30.1	114.3	14.3
	Liking for exercises	85.5	68.1	125.6	25.6
	Frustration or displeasure for exercises	14.4	31.9	220.7	120.7
	Help in the completion of tasks	84.7	72.2	117.2	17.2

In figure 6, is observed the evaluation of efficiency of websites to access and to search information.

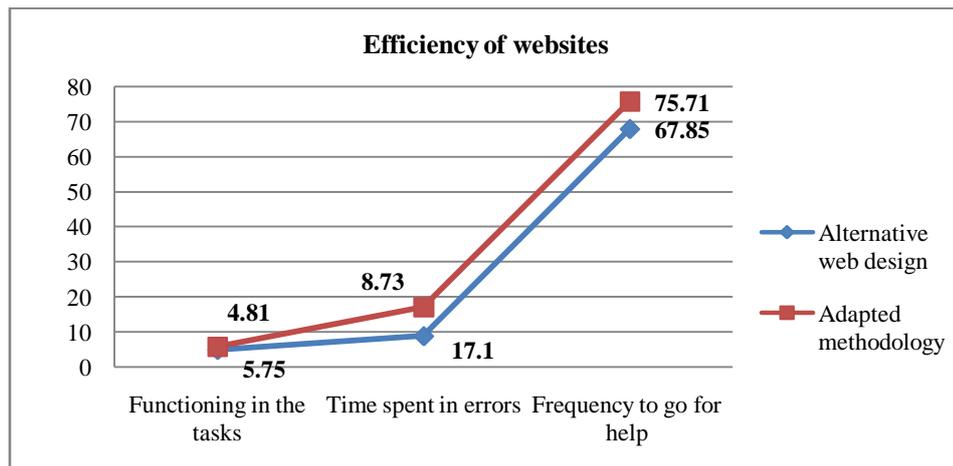


Fig. 6. 1 Geometric mean of efficiency in the usability evaluation of websites

In figure 7 is shown the evaluation of the efficacy of websites, with the adapted methodology is obtained a success of 95.46% and in fulfillment of the tasks a 90.72%.

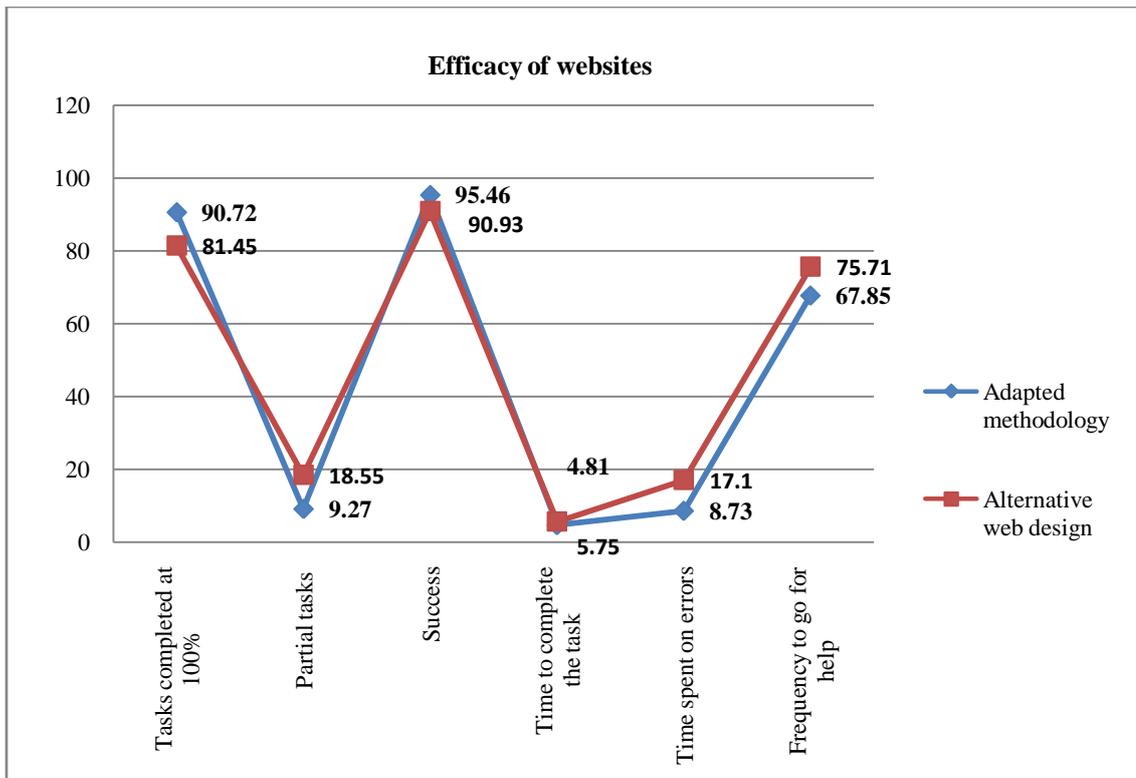


Fig. 7. Geometric mean of efficacy in the evaluation of websites

In figure 8, evaluation of the user's satisfaction in their interaction and access to websites is observed.

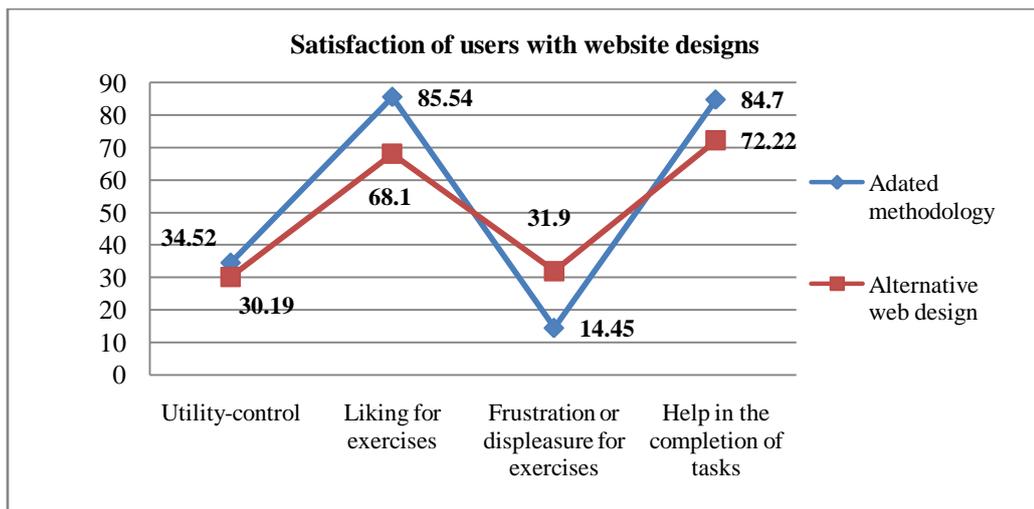


Fig. 8. Geometric mean of the subjective satisfaction in the usability evaluation of websites

Finally, considering the previous aspects (table IV), geometric mean of results show an improvement of 29.9% between websitedesign of the adapted methodology and the alternative web design (table V).

TABLE V. GEOMETRIC MEAN RESULTS IN THE VALIDATION OF USABILITY OF WEBSITE

Usability metrics Evaluated in website design	Geometric mean per usability metrics of relative score	Improvement between the design of website of adapted methodology and the alternative web design
Success	104.98	4.98 %
Content	136.60	36.6 %
Efficacy	135.22	35.2 %
Efficiency	137.73	37.7 %
Satisfaction	138.86	38.8 %
Geometric mean of usability metrics between website of the adapted methodology and the alternative web design	129.97	29.9 %

#### IV. CONCLUSIONS

Techniques applied in evaluating of the usability of websites were based on user-centric design (UCD)[14], this required implementing valuation instruments and involving potential users to test their interaction with website. Different evaluation methods used in usability test, such as heuristic test and user test helped us to understand and know participants interests, their needs of information, their subjective perception and observations. These methods favored to understand fulfillment heuristics and usability metrics in websitedesign, and so that we need concrete information about facility of use, efficiency, efficacy and subjective satisfaction; as well as main problems and limitations of the design, and the proposal to optimize this toward a better experience for users.

The results obtained in the usability test of website with the heuristic test, the observation guide and usability metrics give validity to the affirmation that using the methodology [3] in the design of web structure, provides a more accessible, simple and intuitive interface to the final-user. This improves efficiency in search of information because its structure is organized, coherent and consistent; therefore, this ensures efficiency of website's operation to facilitate navigation to the users, allow them to access more quickly and less time to elements and content of pages; and it provides satisfaction to the users during their interaction, adapting website to theirs real needs of search.

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