

The Usability and Accessibility as Quality Factors of a Secure Web Product

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Abstract

This article aims to highlight the importance of usability and accessibility as quality factors of a secure web product. The aspects of quality in the products and / or web-oriented services have reached the level of being a demand of the market and have become a differentiating factor for an increasingly demanding customer and with greater offer of services and / or products. Due to the growth and development of a large number of Web-oriented products, has led to improve aspects related to the quality of it. In this regard, the ISO / IEC 9126 2001 standards (ISO / IEC 9126-1, 2001) (ISO / IEC 9126-2, 2003) (ISO / IEC 9126-3, 2003) (ISO / IEC 9126-4, 2003), [2] in which the quality model is defined as "the opinion a user has when using a software application", which derives, precisely, from the results obtained from the evaluation of the product. On the other hand, in order to mitigate threats and vulnerabilities it is necessary to implement methodologies that guarantee that usability and accessibility in a web product is safe for any user.

KEYWORDS: Web, Security, Usability, Accessibility, Quality factor.

INTRODUCTION

The current dynamics and turbulence of businesses influenced by new technologies have allowed rapid progress and demand that the human being is informed at all times of what is happening around him, in an increasingly changing world and where information is available at any time, in any place and at any time, which is why it is required to have greater access, guaranteeing usability and accessibility as primary factors of quality.

There are a large number of definitions of the concept of Quality, but one widely accepted is that established by ISO 9000 (ISO, 2001) which defines quality as the "degree to which a set of inherent characteristics meets the requirements". These are established by users and therefore it can be said that quality is a subjective issue depending on the level of satisfaction that the user feels against the product used. The software is also subject to the evaluation of its quality, in such a way that users can establish the degree to which it meets their needs [1].

On the other hand, quality is divided into the traditional approach that is responsible for identifying and controlling quality, this is done through an inspection which shows which service is affected, the responsibility that the inspector has the

department's goal and the development to fulfill it, giving the client a quality product.

In the modern approach, it is the person in charge of prevention who verifies that the company's activities are affected and is responsible for all the members of the working group, preserving the culture and commitment to achieve full compliance with the project [3] [4].

In Figure 1, we observe the different approaches taken into account to understand the term of quality.

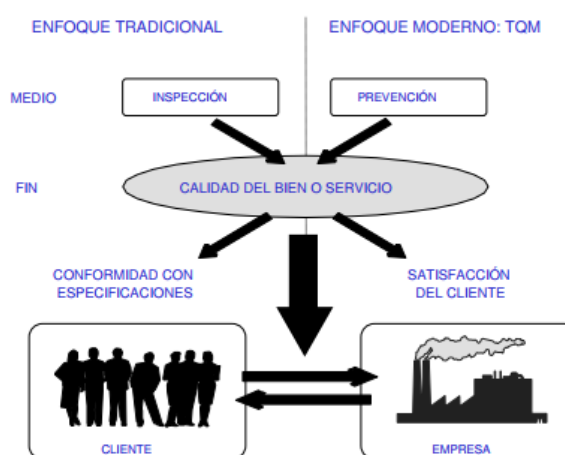


Figure 1: OpenCourseWare, U. A. Dirección de calidad.

Source: OpenCourseWare UA. [1].

In addition, a good design, reliable accessibility and knowledge of the conditions of use must be achieved in such a way that the client's perception of a product makes it possible to show that what was delivered has surpassed the expectations imagined by the client.

According to the quality model in the ISO 8402 (1986) standard, it is defined as the set of quality factors and relationships between them, which provides a basis for the specification of quality requirements and for the evaluation of the quality of the components of software. Quality models are generally structured as a hierarchy (either a tree, or a directed graph), where more generic quality factors, such as efficiency or usability, are broken down into more specific ones, such as response time or learning facility. , probably at various levels of decomposition [3].

Another concept of quality refers to the set of characteristics such as the artifact, process, or resource, which has the capacity to satisfy explicit or implicit requirements or needs, in consideration of a user profile, the quality that is applied to a

web project are some characteristics and attributes that satisfy the requirements established as the profile of a user and domain.

The quality characteristic of a Web site is in the (requirements tree) that is to say a set of attributes of an entity or specifically, of a Web artifact, by means of which its quality is described and evaluated. A characteristic can be described and evaluated by recursive decomposition into attributes. Among the features that describe quality from a certain user profile, we can cite usability, functionality, reliability, efficiency, portability, and maintainability [4] [5].

A software product is broken down into internal, external and use quality, a clear explanation is described in figure 2.

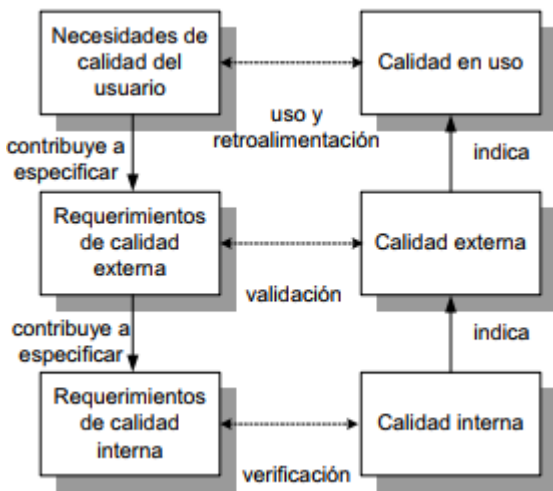


Figura 2: Quality in the software life cycle.

Source: ISO/IEC 9126

The quality in the life cycle of the software refers to the first table where it can be seen that the user's quality needs on a software product, contribute to specify (define) the external quality requirements and these in turn the requirements of internal quality. The fulfillment of internal, external and in-use quality requirements must be verified in a process that allows to evaluate the quality through the metrics. This three-tier approach covers the perspectives of the user, developer and the product itself [6] [7].

2. TOOLS AND FRAMEWORK OF EVALUATION OF THE QUALITY OF A SAFE WEB PRODUCT

Just as there are different models of quality, there are tools on the market that allow evaluating the quality of web-oriented applications. Among these, you can check the ones published on the W3C site, called validators (W3C, 2012) and that allow you to verify the HTML and CSS code of a web application. Also available is Load Impact (Load Impact AB, 2013) that simulates the access of concurrent users on the web, informing the loading speed in situations of high concurrency of visitors. However, these tools do not evaluate software quality from the

user's point of view, but instead focus on the quality of the product from the developer's point of view.

On the other hand, the automatic evaluation tools allow to improve the accessibility of a website [8] [9], thus guaranteeing its verification. For example, the automatic validators cannot check if the alternative text of the images is appropriate and if there are long transcriptions for the images that require it. In these cases, the complementary manual evaluation consists of testing HTML pages with different tools or support products, as well as verifying that part of the code that automatic tools can not verify. Many of the tools are based on WCAG 1.0, although revisions of some validators have arisen to adapt to the new regulations.

One of these tools is W3C Markup Validation Service (Figure 3), which describes the validation of HTML code of the W3C, in addition, checks the conformity of HTML documents with respect to W3C grammars and other HTML standards (XHTML, XML, MathML). There is also W3C CSS Validation Service, free tool to validate CSS style sheets alone or present in HTML and XHTML documents and check if it meets the W3C specifications, through the online version and a downloadable version, programmed in Java, and therefore, multiplatform).

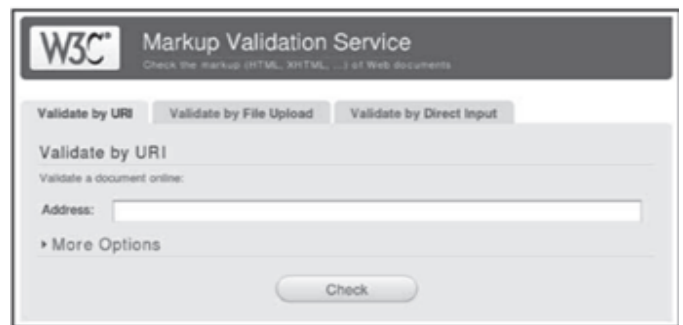


Figure 3: W3C Markup Validation Service (w3c, 2012b).

Source: Validador de Web Desing Group (2012).

The Web Design Group validator, WDG HTML Validator (Figure 4), describes the same engine as the W3C HTML validator, however, it produces simpler and easier to understand messages.

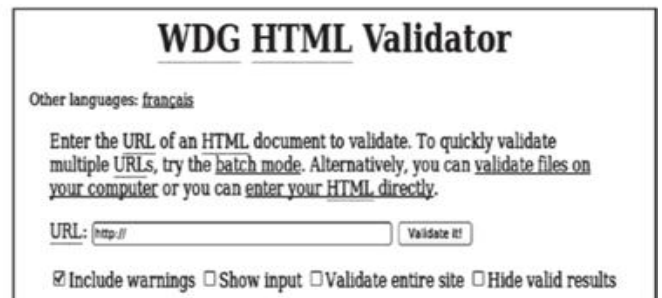


Figure 4: WDG HTML Validator.

Source: Validator of Web Desing Group (2007).

Another of the most widely used and widely known Spanish accessibility tools is TAW (Figure 5), developed by the CTIC Foundation. TAW Online (WCAG 1.0 and 2.0) is an online tool that allows you to review the accessibility of a URL, generating a report based on the page analyzed with information on the result of the evaluation. When entering the URL, it is necessary to select a level of compliance (A, AA or AAA) and select the requirements for the analysis. Only those technologies that have accessibility support can be included for compliance with WCAG 2.0, understanding technologies with accessibility support [10] if they work correctly with the support products (for example, screen readers, web browsers or others user agents).

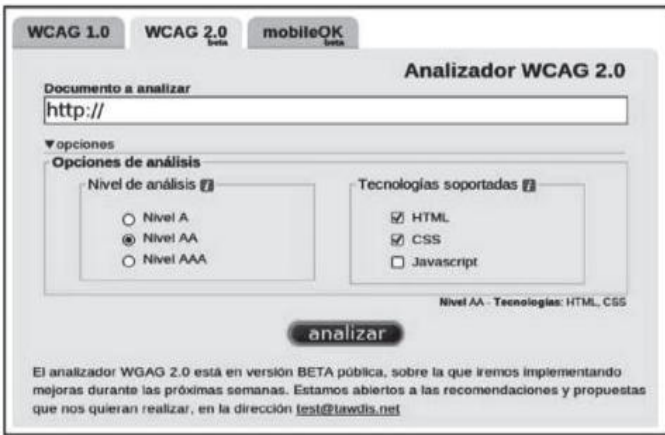


Figure 5: Taw Online.

Source: fundación CTIC (2013).

AChecker (Figure 6), is an accessibility validation tool that checks HTML pages to verify compliance with accessibility standards. Check the accessibility by entering the URL, uploading a file with the code, or enter (paste) the complete source code.



Figure 6: AChecker.

Source: AChecker/Autor (2011).

Nibbler, (Silktide, 2012), is another application developed by Silktide, which offers a disaggregated score in several criteria, and indicates how to improve in each aspect. The evaluation

can vary in each test carried out, because it chooses five random sections included in the web application, which, although it allows correcting errors and improving aspects throughout the site, does not allow the evaluator to select the sections that interest him.

At the framework level we can mention WQF: Framework to evaluate the quality of Web Applications, which also includes a quality model (WQM) and a software tool (QUCO2), developed based on that model [1].

The tool called QUCO2, proposed the design of a container for small reusable components that allow evaluating a particular characteristic. For each characteristic a scale associated with it is defined, with the possibility of defining a relative weight according to the project. In other words, generic and consolidated information is obtained on the quality of the product evaluated. The software provides different user roles: Developers, who record information related to the development process and the design of self-assessments to monitor the evolution of product quality; Quality Assessors, who perform quality evaluations from their perspective, and Clients, who manage the information generated by the system to make decisions based on it. In figure 7, the architecture of the front-end is shown. The combination of both technologies provides a user interface that is pleasing to the eye and thanks to the "responsive web design" allows its use in devices with limited screen characteristics (for example, Smartphone) without the need to redesign the interface.

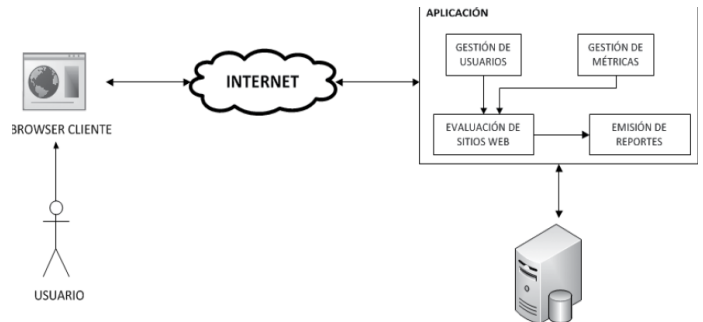


Figure 7: Diagram of the design of Front End

In figure 8, the Back End of the framework is shown (SensioLabs, 2005).

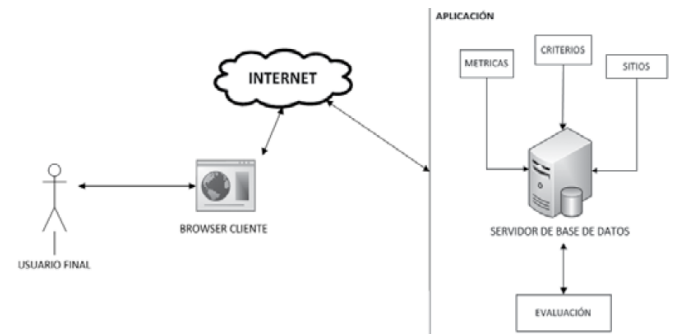


Figure 8: Diagram of the design of Back End

3. THE USABILITY ON THE WEB

Parallel to the vertiginous growth that the development on the web has had, there has been an increasing awareness that interactive programs should be more reliable for users, as well as other quality attributes attributed to software. This is the reason why the quality in use has been the subject of research and one of the aspects incorporated to the ISO / IEC 9126 standard. The primary objective of the quality in use is to provide the final user with a guarantee of the necessary requirements for its optimum utilization "(specifically in web applications). These should not only aim to make accurate information available to users, but also should guide them properly in the search and deployment, based on their objectives, skills, prior knowledge and particularities to understand or visualize information.

Pages with poor interaction designs, added to the erroneous identification of user needs, among other factors, are responsible for the loss of time when browsing the network; the exploration of content then becomes an unattractive and frustrating scenario that ends up discouraging the use of technology as it is perceived by the user as complicated and tedious.

The need to generate pleasant, effective and efficient computer systems has motivated several researches in the area of Usability applied to the Web. But finally, what these actors seek is to identify and reproduce key elements for user satisfaction on the part of an interface, and the system that supports it: Usability is not a single reflection of the interface, it is built as property of the entire system [11] [12] [13] [14].

On the other hand, until now, some Usability criteria have been applied very informally, so it has become necessary to begin incorporating them methodologically in order to simplify the process of development and correction of sites that are entrusted [15] [16] [17].

The evaluation from the perspective of the user is based on the study of the audience in two aspects considered critical. On the one hand, knowing the level of the user (child, youth, adult, senior) and on the other hand their profile (novice, intermediate and advanced), in order to establish the most appropriate usability evaluation requirements for them. The evaluation of the expert on his part is based on the combination of methods of inspection with the objective of verifying the compliance of a set of rules, and in the evaluation of the impact that the unfulfilled rules produce in the usability of the site [15] [19].

For some authors, the ISO 9241 standard (Ergonomic requirements for office work with visual display terminals - VDTs), describes the ergonomic requirements for office work with visual display terminals and explains some of the underlying basic principles [18] [19].

To specify or measure usability it is necessary to identify the goals and decompose the effectiveness, efficiency and satisfaction, as well as the components of the context of use in subcomponents with measurable and verifiable attributes:

- Efficiency: defined in terms of the accuracy and completeness with which specific users can achieve specific goals in particular environments.
- Efficiency: referred to the resources spent in relation to the precision and completeness of the achieved goal, that is, time, financial and human resources.
- Satisfaction: that evaluates the comfort or convenience and the acceptability of the work of the system for its users and other people affected by its use. The components and the relationship between them are illustrated in Figure 9.

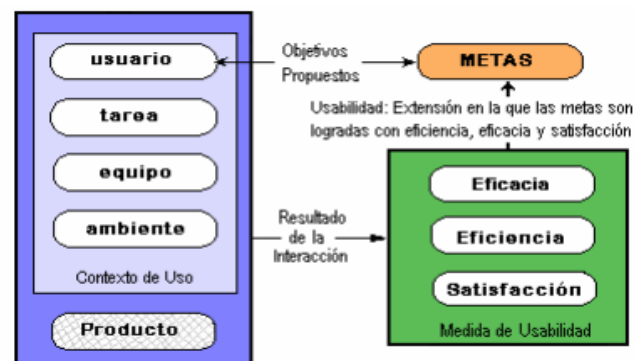


Figure 9: Usability definition framework according to (ISO 9241-11).

Source: ISO 9241

ISO 9241, defines usability in terms of the quality of work of a system in use, which depends on all the factors that can influence the use of a product in the real world: organizational factors (work practices, location or appearance of a product), individual differences between users (cultural factors and preferences), experience, etc.

The ISO/IEC 9126 (Software Product Evaluation - Quality Characteristics and Guidelines for the User) standard defines usability as an attribute of software quality. The term is used to refer to the ability of a product to be easily used. This corresponds to the definition of usability as part of the quality of the software, with the quality of the software defined by the standard as:

"A set of software attributes that are sustained in the effort needed for the use and in the individual valuation of such use by a set of users declared or implied".

In ISO 9126-1, usability is analyzed in terms of its comprehensibility, learning, operability, interactivity and complacency, as described below [18] [19].

In Figure 10, the key quality factors are shown in accordance with ISO 9126 [ISO91], and the inclusion of usability as a quality factor [19] [20] [21].



Figure 10: Factores de Calidad

Source: Usability as a quality attribute of software ISO/IEC 9126

4. ACCESSIBILITY ON THE WEB

Accessibility in a secure web product should be addressed to all types of users [22] [23] and should not make the errors that arise with the use of the internet for people with disabilities, therefore, accessibility is to provide flexibility for accommodate the needs of each user, their preferences and / or limitations. In the world we find population groups that have some functional limitation that prevents them from accessing facilities that they would like, should or have the right to access.

In Figure 11, you can see a group of people with disabilities interacting with hardware devices.



Figure 11: People with different levels of disability.

Source: <http://www.google.com>

It is important to note that accessibility is provided by a combination of hardware and software, the first provides the physical mechanisms to overcome certain disabilities and the second provides the effective way to access the functionalities

and information for these devices and other programs (eg a Web navigator). The aforementioned Technical Specification refers only to the aspects of software components. There are also mechanisms and tools that adapt to the computer (preferably focused on the Web) that facilitate the use of people with disabilities [24].

In order to have an objective accessibility, it is necessary to know the different interfaces for the users with this type of disabilities, this in order that they can interact with the different systems; It is the task of the interface that manipulation is easier and more pleasant. Studies conducted with users show the need for adaptable interfaces that allow the control of devices and services through interoperable systems integrated in an intelligent environment [25].

Another is cognitive accessibility, these interfaces regulate the user-application dialogue through a series of procedures that include available orders, navigation procedures, etc. These elements fit into a model of the task to be performed, which is usually explained as a metaphor for the same activity carried out without the help of the computer.

The universal design or design for all [26], the interfaces are designed thinking of a standard person with all the physical and cognitive capacities, which frequently leaves out the collectives of people with "special needs". The universal design, also known as design for all, aims to design interfaces that do not present accessibility barriers. For this it is necessary that the interface supports the use of alternative interaction devices, appropriate to the physical capabilities of each user.

Regarding the need to take into account the diversity of cognitive abilities, it is necessary, for example, to limit the need to memorize data, use diverse metaphors appropriate to the diverse cultures and previous experiences of users and produce coherent and intuitive navigation systems (we can see that designing according to standards favors the design for all). It is

not only accessibility for people with disabilities, it is 'Design for All'. Examples include people with slow modems that disable images, people surfing the Web while driving a car, and even doctors accessing the Web while their hands are busy with surgery.

CONCLUSIONS

The usability has a great amount of definitions, for which according to the different authors these are focused on the importance of a good interface design, through which the user interacts. A concept closely linked to usability is accessibility. This no longer refers to the ease of use, but to the possibility of access.

The concept of usability can be defined, also as an attribute of quality of an application, consequently, as a discipline or approach to design and evaluation.

We can also conclude that Web design and development is focused on the User as a multidisciplinary methodological framework, so in practice it should ideally be applied by interdisciplinary development teams and, thus, it is characterized by assuming that the entire process of Design and development of the website should be conducted according to the user, according to their needs, characteristics and objectives.

The ease of access is another feature that a Web-oriented product should have, allowing easy navigation and portability to different environments.

We can consider the quality in use as the capacity of the software product to allow specific users to accomplish specific tasks with productivity, effectiveness, security and satisfaction, in certain use scenarios. The objective of a product is that it has the necessary and sufficient quality to meet the explicit and implicit user needs.

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