

Usability Assessment in the Multicultural Approach

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Abstract. In order for products to be marketed successfully, product designs should accommodate users' cultural differences. Considering these aspects, various authors have already pointed out the need for studies in cultural usability. The main objective of this paper is to identify culture usability elements for product design. First, we have selected associate usability studies with culture, specifically for cases applied to product design. The next step is to identify variables and methods used in a cultural and usability context. We characterize the usability research into practical elements, in order to then apply summative and formative usability methods. Next, we differentiate the type of knowledge involved in the variables: explicit or tacit knowledge. Finally, we discuss a possible preview of the system variables culture and usability within the concept of a complex system.

Keywords: usability, culture, usability test.

1 Introduction

In recent years, the Brazilian economy has grown significantly, and international partnerships in areas like education, energy, transfer of technology, are increasing, especially with Germany. Culture plays an increasing role in the interaction, acceptance and learnability, especially of digital products. The trend is the rise of digital products in several applications mainly that require input from the user. In order for products to be successfully marketed, product designs should accommodate users' cultural differences. Considering these aspects, various authors pointed out the need for studies in cultural usability [4], [5], [7], [8], [9], [12]. The importance of cultural usability is growing with the increasing numbers of different national and ethnic groups that use information technology on a daily basis. Confirming the importance of culture is given on the concepts. In the ease operation of everyday products, the cultural factor is described as an important element established [6].

Culture is understood as a complex concept that can be both a structure and a process [5]. From this perspective, we can consider that usability, in a cultural context, is derived from a complex system. As a result, these cultural variables should be treated as elements of a complex system [2]. In a complex system, understood according to the General System Theory (GST), the user (as a living organism), is in

constant transformation in the universe, changing and altering the environment and itself [2]. We can observe various elements concerning a complex system [1], [3], [13] using previous culture and usability studies. The most important elements used to describe this complex system are cognition and perception. Cognition and perception vary between different cultures, and cultural practices encourage and sustain certain kinds of cognitive processes, which then perpetuate cultural practices. Following GST [2], it is correct to say that a user's cognitive process can, at the same time perpetuates and turns continuously. When seeing culture and usability as a complex system, we need to look for all elements, as TGS is a general science of wholeness. The main objective of this paper is to identify culture usability elements for product design, considering it as a complex system. In the present context, this work is contributing to the studies of usability under cultural approaches in the use of comparable products in two different contexts (Brazil and Germany).

2 Steps of the Development Study

First, we discuss the following question: which variables are relevant to understanding the cultural aspects relative to usability context? To answer this question, we have collected associated studies on culture and usability that have been published in scientific congresses or journals in the past 15 years. Our goal is to provide selected usability studies associated with cultures from differently languages, especially those cases applied to product design. In the next step, variables and methods previously used to assess culture and usability context were identified. After reading the articles, we characterized the usability research into practical elements in order to classify them in a certain design group with suitable characteristics. We consider two types of usability evaluation, summative and formative [14]. The formative usability test is used to identify or to diagnose the conceptual design (project phases), while the summative usability test is applied to check the finished product or part of them (prototype or product in market).

3 Development of the Study

Firstly, it is important to clarify how the term "culture" is understood for researches in a usability context. Culture is defined as a phenomenon which is essentially dynamic and intimately linked to the process of social and economic development of a society [12]. According to another viewpoint, researchers believe that there is a causal chain running from social structure to social practice to attention and perception to cognition. This concept is being applied within the Nisbett's Theory, based on logics vs. dialectics and a cognitive perception [4], [9]. Cultural Models of Use (CM-U theory) as opposed to psycho-physiological approaches were proposed centered on social-cognitive approaches to usability by the authors in [3], [10], [13]. Hofstede's Cultural Model [1], can help identify some main elements for the structural analysis of a cultural context through his parameters: PD- Power distance / CI Collectivism X individualism/ F/M- Feminine x Masculine UA Uncertainty X avoidance and

CO- confusion X orientation. Elements of this model can also be used separately, for example, the power distance was used to evaluate the cultural effect on structured interviews [15]. Another method used is the Culturability Inspection Method (CIM), in which Identifying Cultural Markers are applied to software's summative usability [9]. Cultural diversity in industrial design has been identified by symbolical, practical and technical products requirements [12]. Another conceptual model proposed is based on design preferences and interface acceptance: "Modified Technology Acceptance Model" [13]. Table 1 shows an overview of the cited studies, including main characteristics and possible applications of the method / technique to acquire knowledge about intercultural aspects on usability. The concepts of three studies are most appropriate for summative usability, another three for formative usability. Another four studies have concepts that which can be applied to both formative and summative usability tests.

Table 1. Research aspects on cultural usability research

Author	Characteristics	Type usability test
Barber & Badre, 1998. [1]	-Inspection / Collect remote information.	Summative usability
Ono, 2006. [12]	-Inspection / Interviews with industrial designer.	Formative usability
Nisbett & Masuda, 2003 [9]	-Theory / Discussion -Cultural differences in attention and perception.	Summative usability
Chu et al, 2005. [4]	-Experimental.	Summative usability / Learnability
Clemmensen, 2009.[3]	-Theoretical / Conceptual / Structural model-usability.	Theoretical basis (Formative and Summative Usability)
Tholacius, et al , 2009.[10]	-Research perception / Satisfaction Questionnaire.	Formative usability
Evers & Day, 1997. [5]	-Perception of the design elements with usability elements.	Formative and Summative Usability
Q Shi & Clemmensen, 2007 [13]	-Subjective aspects preparation / definition of usability testing.	Structural elements (Summative/Formative)
Vatrapu; Quiñones, 2006. [15]	-Experimental / subjective aspects involved in usability testing.	Formative and Summative
Olaverri-Monreal; Bengler, 2011. [11]	-Tools to implement cultural factors in the Design.	Formative Usability / HTA

The knowledge theory divides knowledge into two separate parts: tacit and explicit knowledge, [16]. Tacit knowledge is described as acquired knowledge, for example, when someone bases a decision, they cannot describe why and what they did. Contrarily, explicit knowledge can easily be written down and transferred to other persons.

Identifying the type of knowledge involved in the variables is very helpful to executing an intercultural usability test. Table 2 shows grouped variables founded in the literature and shown in Table 1. We define visible variable’s elements which can be easily represented in formal language as explicit knowledge in cultural usability studies. Table 1 identifies two variables that can be easily shared with explicit knowledge: cultural marks knowledge and task elements.

Tacit knowledge is better suited for three types of variables that are not observable in formal languages such as: feeling elements, social-cognitive process and structural elements of usability tests. Tacit and explicit variables can also be found together. These variables have not been discriminate by the authors, because the main objective of this study was to collect and characterize the cultural variables.

Table 2. - Researchers’ variables found on culture and usability context

Explicit knowledge	Tacit knowledge
<p>Cultural marks knowledge</p> <p>Metaphors /Specific Icons/ Specific Colors/ Grouping/ Language/ Geography/ Orientation/ Sound/ Font/ Links/ Regional/ Shapes/ Architecture/ Cultural diversity in industrial design, in relation to symbolical, practical and technical requirements of products/ accuracy rates from the object-recognition phase</p> <p>Task elements</p> <p>Data come from analysis: Tasks and instructions, number the usability problems found/ performance/ time of information’s display, number of mouse moves or clicks/eye-movement patterns/ effectiveness</p>	<p>Feelings elements</p> <p>Perception usability : visual appearance of a System / weight; frustration, fun, and usefulness of systems; and ease of use.</p> <p>Socio-cognitive process</p> <p>Uncertainty/ avoidance;-need for significant others; parallel versus sequential actions; diffuse versus specific; particularism versus universalism; collectivism versus individualism; high context versus low context; transference; complex spatial area on the visual scene; Focal object information X contextual Information/ Attention to the Field (background) Affordances’’ in the Environment/ Esthetics.</p> <p>Structural elements/ usability test</p> <p>Overall relationship between user and evaluator in Task analysis. Considerations about characteristic’s evaluator. Evaluator’s cultural background: foreign evaluator and local evaluator. The communication patterns of local pairs and distance pairs. Cultural profile of the interviewer.</p>

4 Discussion

It is a challenge to introduce usability parameters for products in the global market. When considering the wholeness of the culture in terms of a usability system to make decisions about a feedback loop in a design process, we look at it as a complex system.

We need to consider too the distinct design phases (conception, development and prototype) and finally the user contact phase, where we could include all information, perceptions and knowledge about the product. These phases have different needs on information feedback loops. The process of developing innovative products require methods of formative usability mainly if it has demands for globalization markets, and the cultural elements can affect directly or indirectly a product usability. The surveys analyzed contribute for formative usability in both phases of knowledge, for example; [10] tacit knowledge (feelings elements in perception/satisfaction questionnaire; [11] explicit knowledge (task elements); and [12] explicit knowledge (cultural marks). The classical frame of knowledge, the “iceberg”, show us of the top the explicit knowledge and of the bottom the tacit knowledge, but culture is not static like iceberg, is dynamic and changes. The dynamic and the real complexity of the system can be observed in the table 2, where the variables were treated and grouped by similarity but the comprisement of variables is huge. The cultural usability system includes variables such as feelings, socio-cognitive process, and also objective and subjective structural elements on usability test. This allowed us to identify the level of complexity on intercultural usability. We envision further studies with a larger number of the surveys of others authors.

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