

First Validation of Persuasive Criteria for Designing and Evaluating the Social Influence of User Interfaces: Justification of a Guideline

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Abstract. Ergonomics has often produced grids to measure the ergonomic quality of goods and services. This paper seeks to establish and validate a grid to focus on the persuasive dimensions of interfaces and their effects; a grid that is robust, reliable, useful, relevant and easy to use for ergonomists, usability engineers and interaction designers. Our purpose is to develop and validate guidelines to measure and assess the persuasive dimensions of user experiences. This research based on a criteria model will become helpful in researching and designing persuasive technology. At first we propose a criteria-based approach to measure persuasive strength of interfaces; this criteria grid includes eight criteria: Credibility, Privacy, Personalization, Attractiveness, Solicitation, Priming, Commitment, and Ascendancy. At the end, these criteria are validated by a sample of 30 experts, who confirmed that the proposed categorization of the criteria (from 71.30% to 83.25%).

Keywords: Persuasive technology, Criteria grid, Captology, Ergonomics' guidelines, Media and social influence.

1 Introduction

We are shaping technologies and at the same time technologies are shaping us. They influence us and tend increasingly to modify our behavior. Technologies are increasingly becoming social actors [2]. In organizations, software is used for an increasing range of collaborative activities, sometimes including marketing and consumer research. Consequently, a lot of research is conducted in the area of persuasive technology; persuasion is beginning to invade our technical systems, especially in the area of social networks, e-commerce, e-health or e-learning. The purpose of this chapter is to define and validate criteria to design and assess persuasion in HCI (Human-Computer-Interaction). Our objective is to propose a framework for the analysis of persuasive elements as a guideline for the design of interfaces.

To build this guideline, we relied on assessment criteria from a demonstrated theoretical basis [1, 7, 8, 10]. Theoretical background must represent a good foundation for a relevant and consistent architecture [10]. Beyond these aspects, we need models and criteria gathering all the important aspects of persuasion but also with a high level of comprehensiveness [11, 12]. We also need research to validate criteria.

In this paper, we will describe an experiment conducted with usability specialists, user experience designers, ergonomists and human factor engineers to evaluate the relevance of a structured guideline for designing and assessing the persuasive dimensions of human-computer interfaces. These guidelines could be applicable to different types of devices (website, software, game, mobile) and to wide range of applications. We will first present the theoretical background and the conceptual framework of the proposed criteria for evaluating and designing persuasive interface. Then, we will explain methodology developed to validate the persuasive criteria approach. Finally, we will analyze our results and give comments on relevance, interests, limitations and the possible refinement of this persuasive criteria guideline.

2 Usefulness of Guidelines for Designing and Evaluating Persuasive Interfaces

2.1 Brief History

Initially, computers were simply tools with great capabilities of storage and calculation of huge volume of data. Their user interactivity was limited, and there were no attempts to use them as an influence appeal. The first cases for using the persuasive power of technology took place in the 1970s. It aimed at promoting health related safe behavior in workplaces and to improve employee productivity. These studies continued during the 1980s, but the potential of persuasive technologies really started to be exploited in the 1990s with growth of successful e-Shopping sites. They invade the Web and become great success with a new competitive and innovative approach. These techniques are deployed to exploit the advantages of this media like interactivity and attractiveness. Obviously, the aim of websites creators is to increase consumer behavior.

2.2 Technology and Social Influence

Fogg [5] opened the way for the new field of persuasive technology for which he coined term captology, an acronym for “computers as persuasive technologies”. The concept of persuasion can cover a range of meanings, but Fogg defines it as “an attempt to shape, reinforce, or change behaviors, feelings, or thoughts about an issue, object, or action”. Fogg [5] presents persuasion technology as both (a) a tool, since technology can help people achieve their objective, (b) as a media interaction which creates an experience between the user and the product, and (c) as a social actor, which means that technology deals with the problem of strategies for social influence and compliance.

Persuasive technology is a medium to influence and persuade people through HCI. Indeed, technology becomes persuasive when people give it qualities and attributes that may increase its perceived credibility, privacy, personalization and attractiveness,

for example. Persuasion in HCI is at the crossroads between ergonomics, social psychology, behavioral economics, organizational management and obviously the design of user experience.

Persuasive technology has been applied to many domains. Technology development also initiates a diversification of applications. The rise of e-shopping websites in recent years is propitious to the use of persuasive methods, both in the field of design and ergonomics, trying to change purchasing behavior. This explains why marketing is a beacon for persuasion technology. eBay", a pioneer eCommerce web site, devotes its success at least partially to persuasive techniques like the seller's star ratings, which provides buyers with increased confidence that a transaction will be fulfilled. A major new field of research concerns the field of health, both in the prevention of risk, monitoring of disease, and the promotion of sport [2].

To sum up: all areas of our life can be affected by persuasion technology whether in education, health, consumption, entertainment and especially in the workplace. These elements allow us to say that it is required to develop ergonomic practices and to integrate this concept during software design process.

2.3 Importance of Guidelines to Evaluate Persuasion in HCI

The idea to evaluate persuasion technology is not well accepted because it is judged to be unusual, antisocial, time-consuming, and useless to explain to users that the computer manipulates them, etc. Over the last decade, the critical mass of research of this topic [3, 11] clearly shows the importance of the field. One recommendation for future research is to create methods for a clearer measurement of persuasive system, like cognitive walkthrough method or heuristic evaluation, specially built for the evaluation of persuasion in HCI.

The aims of the guidelines methods are to intervene early in the interface design procedure, to categorize, identify, meet the requirements and quantify usability problems dealing with persuasiveness, and finally to be integrated into a design life cycle. Guidelines give heuristics, which are stabilized knowledge on persuasion that experts in usability could use during the evaluation and design processes; usability specialists compare each element of the interfaces with principles and heuristics coming from persuasion concepts and theories.

The guidelines purpose is therefore to measure the persuasive dimensions involved in usability, to help experts to test the interface using a check-list. As this method requires a high degree of expertise, our first work [8, 9] was to complete, synthesize and establish criteria.

3 Criteria for the Assessment of Technological Persuasion

Computer ergonomics has yielded a number of criteria grids to help with the measurement of the ergonomic quality of goods and services [1]. We seek to establish a tool to focus on the persuasive dimensions of interfaces and their effects; a grid that is robust, reliable, useful, relevant, and easy to use. Our proposal is based on a bibliographic analysis and defines a grid that distinguishes forms and processes of social influence, respectively the static and dynamic aspects of the interface (tbl. 1).

Table 1. General architecture of guidelines in persuasive human-computer-interaction

Ergonomics criteria for persuasive interactions: Eight criteria to measure technological persuasions in human-computer interface							
b				b			
Static criteria				Dynamic criteria			
In interfaces, some prerequisites are necessary to promote the acceptance of an engaging process. These criteria are based on the <u>content</u> of technological influence.				Regarding dynamics, there is also a means to bring the user in a process of interaction to strengthen the <u>progressive engagement</u> of the user to the elements of its interface.			
b	b	b	b	b	b	b	b
Credibility of Interaction	Guarantee of Privacy	Personalization	Attractiveness	Solicitation	Priming	Commitment	Ascendancy and Possibility of Addiction

Most guidelines or inspection methods are intended for use by experts, so their contents must be defined (tbl. 2) and, obviously, validated; even if the process of persuasion has to be carefully analyzed both in given situations as well as in a larger technological context.

Table 2. Description of the 8 persuasive criteria

Criteria	Definition	Justification	Example
Credibility of Interaction	Giving enough information to the user enables him to identify the source of information to be reliable, expert and trustworthy.	Credibility affects use and is seen as a form of loyalty. Credibility is the combination of the perceived reliability and perceived expertise of the product.	Presenting updated information and the date of the update.
Guarantee of Privacy	Do not persuade the user to do something that publicly exposes his private life and which he would not consent to do.	Privacy is an important aspect of ethics. Respect for privacy is one of the most dominant concerns about people's behavior with internet communication.	The system should preserve wherever possible the right of a user to remain anonymous to the larger user community as well as the providers of the system.

Table 2. (*Continued*)

Personalization	Present information adapted to the user or to the user group.	Customization makes the message more relevant and the information will be integrated by the user more quickly and will better draw his attention.	Remembering the state from a user's last interactions
Attractiveness	Presentation of elements in a way that is engaging and visually appealing.	Enhancing surface is related to the persuasive design. Controlling the physical elements of the interface and maximizing the visual impact can lead to increased loyalty and create or reinforce a behavior.	The choice of colors as a reinforcement of the message.
Solicitation	To solicit user in a light way, to catch his attention with an engaging effect.	Using the information given by the user allows for opportunities to engage the user.	Display many invitations.
Priming	Trigger user interaction by creating a point of entry, stirring interest.	Priming enables the user's initial interest and interactions	Click to immediately view relevant and interesting content for free
Commitment	Reinforce repeat behavior and frequency, as well as individual engagement.	Having engaged in an inexpensive first step, it will be easier to accept the following steps, each time increasing the persuasive influence.	Improve the frequency of the final behavior or attitude expected.
Ascendancy and Possibility of Addiction	Show engaging scenario completion, follow up its influence and control its evolution over time.	The last step is the culmination of the process leading to behavior and attitude initially expected. We can then speak of voluntary submission.	The individual accepts information that he would not have accepted voluntarily.

4 Method of Validation

The aim of the study was to assess the effectiveness of our grid by using the methodology based on the comprehension and the categorization of the purposed criteria by experts in user experience.

Our grid was explained to 30 usability specialists. On average, participants had 13 years of experience ($SD=7,9$) in the evaluation and/or design of HCI. There were 10 women and 20 men. Each criterion was presented in a document with a definition, a justification, references and illustrated examples (pictures, screens, messages, etc.). Some of them were subdivided into sub criteria but the experiment was only on the 8 elementary criteria. A total of 15 interfaces from Internet, Smartphone and video games were used. 84 elements of these interfaces have been identified by multi expert judgment as persuasive elements. Each subject participated in individual experimental session.

The first phase of experiment consisted in learning the 8 criteria. Individuals were invited to read the definition document, the justification and were encouraged to give special attention to examples. In the second phase, participants were asked to evaluate 15 interfaces from commercial, education, ecology, business, social network and entertainment field and randomly presented. The participants were allowed to consult the document with description of each criterion but without any examples. The material tested was static interfaces. Limitation is due to the fact that the inspection was on non interactive system.

The score of correct identification was calculated for each criterion.

5 Results Analysis: The Relevance of the Persuasive Criteria

The mission of the evaluators was to note and comment any persuasive aspects of the 15 interfaces occurring during the use of our grid and to judge the method. They suggest the following analysis.

The global score of correct identification is 78.8% (fig. 3). Identification was considered correct if it was in line with the experts during the pre-test.

The results show that using the grid makes it possible especially to detect problems linked to the persuasiveness of multimedia interfaces; the problems linked to the dynamics criteria (long time effects) are more difficult to define, in particular the addictive process.

From this study, the results indicate that the criterion that should be improved is the last dynamic criterion: Ascendency. In fact, the last dynamic criterion is the achievement of a persuasive process. Most of the time it could not be shown on a HCI but only observed in real life (like stop smoking for health website) or interpreted by some elements on the screen (like time overconsumption in video game in user profile page.) Some superficial modifications are needed to other definitions, especially on wording aspects and by providing more typical examples to illustrate each criterion. This would remove the issue about heuristic evaluation being unable to measure the “ascendency” towards a final goal.

In addition to our results, we will discuss the fact that the acquisition of new concept from marketing, design and, even social psychology are not simple. It was difficult to allow the participant to understand the dynamic process by non interactive and static screens. Despite the improvements needed (Ascendency criteria), the results are very encouraging.

Table 3. Correct identification table

Static criteria (83.25%)	Credibility	81.5%
	Privacy	90.7%
	Personalisation	82.9%
	Attractiveness	77.9%
Dynamic criteria (71.30%)	Solicitation	75.3%
	Priming	75.4%
	Commitment	76.7%
	Ascendancy-Addiction	57.8%

The validation is based on an expert's method evaluation. In this case, the number of experts is fairly high ($n=30$): usability specialists, ergonomists, interface designers. Besides this, in the majority of cases when an interface is designed, the potential users are relatively well-known: the method is applied strictly and systematically. In real multimedia projects, the knowledge of the user is often limited and the diversity of the public targeted greatly hinders the generalization of reasoning on the potential defects in persuasive interfaces. In particular, the estimation of the degree of severity of "Ascendancy-Addiction" proved to be more or less impossible for some evaluators.

That said, all persuasive aspects could not be reduced to a criteria set. It requires more knowledge on the task, the use context and more information on user specificities. In short, our grid is one inspection methods with which an expert analyses and criticizes the persuasive dimensions of an interactive system to be evaluated.

6 Conclusion

The main aim of interactivity is to provide the users with a coherent interaction structure that is to say to enable them to accomplish their goals using a path that is both efficient and satisfactory. During this interaction process, users are often influenced by technological frames which try to manipulate their opinions, their choices, and a satisfactory level of compliance. Persuasive technologies try to provoke interest and action. The measurement of persuasion in HCI is, consequently, critically important for understanding how persuasive design could influence user goals and expected outcomes, in a way that removes both real and perceived obstacles and enables a closer match with user goals and outcomes expected by a system's designers.

The intention of this study based on an experimental identification task was to evaluate the definition of our criteria grid proposal used to help experts to better evaluate or design persuasive interface. Our evaluation guideline aims at covering what we call the persuasive strength of interactive system. This strength could be described in 8 elementary criteria: credibility, privacy, personalisation, attractiveness, solicitation, priming, commitment, and ascendancy. The evaluation of this guideline shows the criteria considered to be relevant to inspection methods usable in persuasive interfaces.

Persuasive criteria cover all aspects that try or aim to influence users. It takes into account all the dialogue form that the interaction between user and software could have. It tries to be predictive in the sense that it helps to diagnose a probable attitude

or behaviour. These criteria could also serve as guidelines to guide the choice of interaction design, graphic design, electronic messages, and user experience as well. The performance of inspection tools must take into account user profile and situation diversity and this method must surely be supplemented by other evaluation methods but results of this experiment are encouraging to keep on validation of the grid in other ways.

Usability inspection is the generic name for methods that inspect the usability of the user interface. In this paper, we showed that a grid for evaluating persuasion in HCI is not only interesting, but useful to design and evaluate user experience. We also underline that a validation of persuasive criteria could be done. Especially, we present a guideline and show that our eight criteria could be used for evaluating the ergonomic quality of user interfaces. The criteria help experts to identify more persuasive elements in interfaces. The design of an interactive system is an iterative process, and evaluation is an imperative component of this development. For this reason, evaluation has been the subject of numerous studies and much research in the scientific community concerned with HCI [6]. Many evaluation methods and techniques exist but persuasion is out of the scope of inspection. This research should help to integrate persuasive criteria to usability inspection tools.

Acknowledgments. The authors wish to thank Michael Thompson, Director of Product Management at SAP, for his numerous insightful comments on previous versions of the paper.

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