VALUATION FRAMING FOR SOCIAL SOFTWARE
A Culturally Aware Artifact

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Abstract: Despite the popularity of the so-called social software, just a small fraction of the systems launched on the Web is really successful. The diversity of users, their limitations, preferences, values and culture, are examples that indicate the complexity of developing this kind of system; moreover there is still a lack of approaches, artifacts and methods for supporting designers to deal with this complexity. This paper presents an artifact specially adapted to support designers in the task of evaluating social software, taking values and cultural issues into account. It draws on Organizational Semiotics and on building blocks of culture to shed light on this research area. The artifact was applied to the evaluation of five different prototypes of systems for supporting cross-cultural collaboration, and the results demonstrate the viability of using this artifact for supporting the evaluation as well as the design of social software.

1 INTRODUCTION

Social software can be understood as systems that allow people, in their particularities and differences, to communicate (interact, collaborate, share ideas and information), mediating and facilitating any kind of social relationship; systems whose usefulness is dependent on and whose structure is shaped by the active participation, interaction and production of content by their users (Pereira *et al.*, 2010).

The term social software is usually used in many different contexts, and different technologies are covered by it. As Lazar and Preece (2003) claim in the context of Online Communities, we can say that social software is usually a subjective matter, easy to understand and recognize, but unstable to define and measure and even more complicated to evaluate.

After the Web 2.0 advent, new applications allowing mass collaboration, communication and interactivity, such as *YouTube*, *Delicious*, *Twitter*, *Flickr*, *Facebook* among others, were developed. These systems, named social software, invite millions of users to communicate, interact, create, share and organize information. They show the "power of the collective", the opportunities and knowledge that can be generated through collaborative work and through mass interaction. Social software were considered a mark of a web paradigm-shift, where more than connecting pages and resources the web became a connection of people and organizations — a social web.

In the previously cited systems, the interaction occurs in an unprecedented scale and intensity, leading to a situation in which issues related to human-computer interaction (HCI) are extended to issues related to human-computer-human interaction in social situations. Actually, social software made it visible part of the transformations that have redefined people's relationship with technology. As Sellen *et al*. (2009) point out, people now live with technology, not just use it; they are increasingly hyperconnected, increasingly dependent on technology and the information produced by them is becoming less ephemeral.

In this sense, as technology left the context of offices and workplaces to pervade every aspect of people's personal and social lives, a broad set of factors that range from emotional and affective aspects, sociability and human values, to issues of scalability, security and performance are now in play. This new and complex scenario brings challenges that research communities and practitioners, in not only HCI, Collaborative Systems and Software Engineering, but also in Databases, Computer Networks and other areas related to technical infrastructure, have never faced before. Moreover, these challenges are reflected in the emergent interest and need for involving other

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fields that go beyond computing, such as sociology, psychology, anthropology, communication, etc.

Indeed, despite the popularity and growing in the number of users of social software, just a small fraction of these systems is really successful. Being completely dependent on their users, the success of social software heavily depends on how users feel when using them, on their interface features and on their interaction mechanisms. As Neris *et al*. (2009) suggest, for developing systems that fully meet users' requirements, we need to know users in their abilities and culture, formalizing the interaction requirements and investigating solutions of interaction/interface for the diversity. In fact, systems should reflect an understanding (and respect) about people's values, preferences, limitations and behaviors, including the way people actually interact, play, learn, work, and live in their organizations, groups, communities and other forms of societal life. Otherwise, as Ackerman (2000) asserts, the produced systems will be useless, inefficiently automating the collaboration, communication and other social activities.

Although the social software context is clearly recognized as complex and challenging, research initiatives on guidelines, methods, tools and even theories for supporting designers are still incipient. According to Hendler *et al.* (2008), a web application should be understood as a "social machine" which includes an underlying technology, but also rules, strategies and organizational structures used to manage the technology. This vision requires investigation in social software from two perspectives: as a social phenomenon in a macro level and as a technological artifact to be built in a micro one. As a consequence of these perspectives, the software development life cycle, which has been traditionally based on best practices in Software Engineering (specification, design, construction, testing, etc.), needs to be rethought. Cultural issues must be considered in an explicit and transverse way; the process has to be aware of the values of people who will be direct or indirectly affected by the development, deployment and use of the system. Similarly, traditional concepts and practices in HCI, such as usability and accessibility, need to be put into perspective and understood as technical values crucial to the project of any technological artifact.

Values are desirable, trans-situational goals, varying in importance and serving as guiding principles in people's lives (Schwartz, 2005). Hall (1959) explains that every innovation, e.g. a social software, brings negative and positive impact to the environment in which it is introduced. Indeed, because people's values are culturally built, we argue that people's culture influences the way an innovation will be valued by its direct and indirect users, being determinant in the appropriation or rejection of that innovation.

In this paper, we highlight the importance of taking people's culture and values into account when designing and evaluating social software and present a culturally aware artifact for analyzing them: the Valuation Framing (VF) (Kolkman 1993). This artifact, from the Organizational Semiotics Theory (Liu, 2000), was specially modified for the context of social software by explicitly suggesting values related to the context of this kind of system — we are naming it VF4SS.

The paper is organized as follows: section 2 presents a brief literature review on social software; section 3 presents the VF4SS as an artifact for analysing social software, taking into account people's culture and making values an explicit issue; section 4 describes our findings when using it for the evaluation of five different projects during their design phase; section 5 presents our conclusions and directions for future research.

2 LITERATURE REVIEW

When we talk about social software we are not just talking about a specific set of technologies for which the main focus is on people. Rather, as Boyd (2007) points out, we are talking about a movement in which there are three significant changes: the first is the way technology is developed — the perpetual beta instead of locked-down versions; the second is the way participation is widespread — the network effect and organic growth; and the third is the way people behave — the focus is on connecting people and watching the subject and shared interests emerging through that instead of creating pre-defined groups.

For Webb (2004), the main particularity of social software is in the design process because human factors and group dynamics introduce design difficulties that are not obvious without considering the human psychology and nature. The success and usefulness of social software rely directly on their users and, therefore, on aspects related to the user experience, such as emotional and socio-technical factors, including how the interface was designed. Therefore, it is urgent to discuss these concepts considering human values of a mutable society where users are not only consumers, but also creators of content and programmers of *mashup*;

where the technology should allow a creative involvement and consider the emotional aspects of the user experience; and where the interaction via Web can happen anytime, anywhere and from computer systems embedded in different objects.

However, neither the traditional approaches for software development nor the methods and tools for supporting software evaluation and analysis are able to deal with social software in its complex scenario. According to Thompson and Kemp (2009), traditional methods for usability evaluation, such as Heuristics Inspection, do not consider key-aspects of social software, such as technological aspects (e.g., scalability, collaboration) and those related to the users' experience (e.g., the quality of the produced contents and the interactions among users). The authors are based on previous studies by other researchers and conduct experiments to identify aspects that, although fundamental to determine the success of an application, are often not considered.

As an effort in understanding the social software nature, Smith (2007) proposes a functional framework composed of elements (e.g., identity, groups, reputation) that have been identified by researchers and professionals interested in the design and evaluation of social software. According to those authors, social software have a set of common elements that are combined and implemented in order to produce different environments. Although a good starting point, the framework was limited to functional aspects ignoring those related to sociability, values and other cultural issues. For instance, concepts such as accessibility, autonomy and collaboration could not be forgotten or neglected in a social software design and evaluation, but the framework does not draw attention to them.

In the context of social software design, we developed a discussion regarding the elements that compose social software, approaching them in terms of informal (e.g., personal), formal (e.g., social or collective) and technical values (Pereira *et al.*, 2010), and presented a set of values identified through technical analysis and an extensive literature review. This set encompasses technical as well as ethical, personal and collective aspects, and draws attention to their differences and interactive nature. The main idea is that depending on which values are prioritized, how these values are combined and how they are technically supported, quite different environments which promote certain values while inhibit others will be produced.

As Friedman (1996) asserts, the cost to disseminate a technology is insignificant when compared to the cost to develop it; moreover the values embedded in its implementations are deep, systematic and easily disseminated. To her, although the neglect of moral values in any organization is disturbing, it is particularly damaging in the design of computer technology, because, unlike people with whom users can disagree and negotiate about values and their meanings, they hardly can do the same with technology. In this sense, the set of values suggested in (Pereira *et al.*, 2010) can support designers, evaluators and analysts to keep values in mind mainly when the project of a social software is in its early phases; when they need to evaluate a social software and do not have any guide; or even when there is no time or resources for carrying out a deep analysis regarding the values involved.

Regarding values in technology design, Friedman *et al.* (2006) present the Value Sensitive Design (VSD): a methodology for involving human values in the project of technologies. Although pioneer in bringing the subject of values to scene, this methodology is concerned mainly with values of moral nature and still needs artifacts and tools for supporting designers to use it in a practical context. In fact, Harrison *et al.* (2007) and Sellen *et al.* (2009) highlight the need for developing and publishing studies in order to support designers and evaluators to deal with the complexity and different requirements that current technologies have. In agreement to them, Miller *et al.* (2007) state that if designers and developers in fast-paced and bottom-line oriented industry settings are to account for values, they must be provided with light-weight and principled methods to do so.

Adopting this view and arguments, we classified the values identified in the context of social software (Pereira *et al.*, 2010) according to their cultural nature and incorporated them into the VF artifact (Kolkman 1993) creating the VF4SS. The next section presents both artifacts and shows how they can be used for evaluating social software through the lenses of values and cultural aspects.

3 THEORETICAL AND METHODOLOGICAL BASES

According to Hall (1959), humans operate at three different levels: informal, formal and technical. Each level is present in any situation, but one will always dominate in a given instant of time. Sometimes, the shifts (and boundaries) between these levels are subtle and rapid, but understanding these shifts is the

basic requirement to understand the process of change.

In the Organizational Semiotics (OS) theory (Liu, 2000), an organization and its information system are considered a social system in which human behaviours are organized by a system of norms. In this theory, any technological artifact (e.g., a social software) is embedded in a formal system which, in turn, exists in the context of an informal one. The Semiotics Onion is an artifact of the OS that represents Hall's (1959) three levels (see Figure 1): the **informal**, where the organizational culture, customs and values are reflected as beliefs, habits and individual behaviour patterns of its members; the **formal** in which rules and procedures are created to replace meanings and intentions; and the **technical** that represents the computer system situated within the formal level.

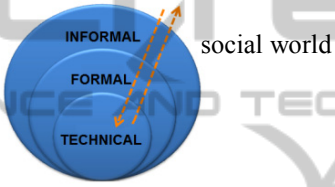

Figure 1: The semiotics onion.

Traditionally, the design process of technological artifacts occurs regardless the formal and informal aspects of organizations and the society. That is, technological innovations are produced and delivered for people to use them even without a clear perception of their utility and potential impact: it starts and finishes in the core of the Semiotics Onion. Grounded on OS theory, Baranauskas (2009) claims that we need discard this limited view in favour of one that understands the design process from a social perspective (see Figure 1): "*as a movement that starts in the society, crosses the informal and formal layers of signs, towards the construction of a technical system, returning and impacting the society*". In summary, to design systems that effectively meet users' demands, that understand and respect their culture and values, we need to see the world through the lenses of these users, taking into account and articulating the three levels represented in the Semiotics Onion; we need a new Science of Design aligning system development with social practices with the end user.

Besides the Semiotics Onion, the OS theory provides methods and artifacts, such as the Stakeholder Identification, Semiotics Ladder and Ontology Charts, that allow considering the social world from the articulation of problems stage to the modelling of computer systems. These methods and artifacts support designers in understanding the social world and formalizing it, moving from outside to inside the Semiotics Onion in order to produce a computer system. Following we present the VF, an artifact of OS created for assisting in the identification and understanding of the cultural (and social) dimensions of a product (technological or not) and its impact on people and their values.

3.1 Valuation Framing

Every innovation brings negative and/or positive impact to the environment in which it is introduced (Hall, 1959). There are people in that environment who suffer this impact, trigger others, and confer values upon such an innovation. Indeed, as Kolkman (1993) declares, people are always involved and attaching values to the systems we create because, otherwise, it would be useless in having these systems.

Values are defined by Friedman (1996) as something that a person, or a group of people, considers important in life; and by Schwartz (2005) as trans-situational goals that vary in importance and serve as guiding principles in people's lives. According to him, a particular value may be very important to one person but unimportant to another because, as Hall (1959) shows, it depends on the person's culture, being culturally developed and negotiated.

A culture consists of many patterns of behaviour that relate to each other in complex ways. In this context, each stakeholder group has a cultural system that governs how it will value an innovation: different stakeholders may react differently to the proposed innovation (Liu, 2000). For instance: the introduction of electronic payment systems through credit card. The stores, customers, employees, banks, card management agencies, insurance companies, IT professionals, and even criminals, are direct or indirectly interested and/or affected by the innovation and, consequently, are groups of stakeholders. These stakeholders may belong to quite distinct subcultures with different set of values so that the innovation tends to have rather different impacts on their lives.

Understanding the potential impact of the introduction of an innovation, however, requires that designers are aware of the reactions of these groups of stakeholders. Kolkman (1993) argues that if an innovation is inserted in each group accordingly, probably no serious problems will occur. Nevertheless, sometimes there may be conflicts and

designers will be able to anticipate the reactions of stakeholders only if they could see the world through the lenses of these stakeholders. The VF helps in carrying out this kind of analysis by supporting the identification and understanding of the cultural dimensions of a product (see Figure 2).

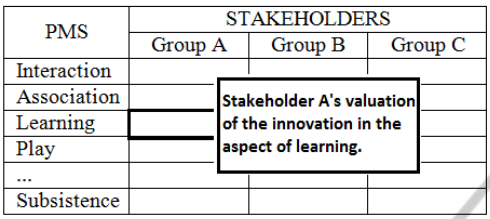

Figure 2: The VF – adapted from (Liu, 2000).

According to Hall (1959), there are 10 areas, which he calls Primary Message Systems (PMS), which allow mapping any culture: Interaction, Association, Learning, Play, Defense, Exploitation, Temporality, Territoriality, Bisexuality and Subsistence. The author explains that each culture develops values in regard to these areas. For instance, values in bisexuality center around preferred style of dressing, jobs, sports, and so on, of men and women. For the VF, Kolkman (1993) renamed "Defense" to "Protection" and "Bisexuality" to "Classification". Indeed, the scope of Classification goes beyond the notion of gender; it encompasses issues of age, instructional, social and economical levels, etc.

The basic principles of the VF are: all the stakeholders identified in a project are accustomed to have, in their cultural settings, a range of behaviour patterns divided into the 10 areas. The analyst's work consists of questioning, predicting and hypothesizing how the innovation can affect/is affecting these stakeholders regarding these areas. For instance, in the case of credit card systems, the stores' employees (stakeholders) could see the innovation as a threat in the sense they do not know how to operate the new machines introduced in their environment (learning); on the other hand, the manager could perceive this innovation as an unnecessary operational cost, once it requires firing and hiring more employees and/or training them. The other groups of stakeholders will also value the innovation from a different perspective. In this sense, the way we discuss, understand and deal with the values and cultural systems of each stakeholder group will determine whether such an innovation will be appropriated or rejected by them.

According to the exposed, we see the VF as a powerful artifact for enabling designers to anticipate and deal with cultural issues in the context of the project of any innovation. However, using this artifact is not a trivial activity because it requires knowledge in anthropology and social sciences. This knowledge is necessary so that designers are able to understand the areas that compose a culture and recognize the values related to each one.

As Sellen *et al*. (2009) point out, traditionally, the curricula in Computer Science do not direct much effort in order to enable its students regarding social issues. This fact makes it even more important the research and work with multidisciplinary teams that can contribute with different visions to a project. Although a desirable scenario, multidisciplinary teams are not always possible or viable. In the example of credit card systems, it would be more practical for designers to understand some of the 10 areas and their related values because the stakeholders and the values involved are more tangible and easy to identify. That is, the problem space is, at least in parts, well-known to them. However, in the project of social software it is even more complicated to know exactly what must be taken into account. For instance, what are the values related to the aspects of temporality, territoriality or association? Also, what values come into play when the innovation is not a tangible device but a computer system usable through different objects?

Indeed, regarding social software there are neither knowledge nor ways (or experience) for anticipating stakeholders' reactions, so that dealing with a so diverse range of stakeholders with quite different cultural systems become a very costly and complex task. In these cases, the need for light-weight and principled methods that support designers in seeing through the lenses of each stakeholder group are emphasized. In the next section we present an effort in this direction: a VF specially adapted to guide designers in dealing with values involved in the context of social software.

3.2 A Valuation Framing for Social Software

The main goal in creating an adapted version of the VF for the context of social software is to support designers in the understanding, analysis and evaluation of such systems. As explained previously, traditional methods for software evaluation do not draw attention to cultural aspects and the original VF is not an easy to use artifact by designers who do not have experience in social (cultural) issues.

The VF4SS includes an additional column named "Values" that suggest at least one value for

each one of the 10 anthropological areas (see Figure 3). These values are results of a previous research which aimed at identifying the values involved in the context of social software (Pereira *et al.*, 2010). We must highlight that the list of values is neither exhaustive nor complete; indeed, our main concern when creating it was to find a balance between letting it as comprehensive and diverse as possible without making it overly complex or detailed.

PMS	Value			STAKEHOLDERS		
	P	S	T	Group A	Group B	Group C
Interaction	Identity					
	Norms					
Association	Conversation, Trust					
	Relationship, Groups					
Learning						
	Meta-communication					
Play	Emotion and Affection					
	Aesthetic					
Defense	Informed cons. Reputation					
	Security					
Exploitation						
	Object, Ownership					
	Accessibility, Usability					
Temporality	Presence					
	Availability, Awareness					
Territoriality	Privacy, Visibility					
	Portability, Scalability					
Classification						
	Adaptability					
Subsistence	Autonomy, Reciprocity					
	Collaboration, Sharing					

Figure 3: VF4SS – valuation framing for social software.

To be included into the VF4SS, each value had to satisfy three conditions: 1. be classifiable into one of the 10 areas; 2. be discussed without referring to other values (or areas) and, paradoxically, 3. have relationships with other values (or areas) influencing and being influenced by them. These conditions were inspired in those used by Hall (1959) when defining the 10 building blocks of culture (areas).

In addition of being classified into the culture's areas, each value was also classified through the Semiotics Onion according to the level that represents its predominant state. Therefore, values were classified at the **informal** (mostly values of [P]ersonal and ethical nature), **formal** (collective or [S]ocial values where there is some rule or system of norms), or **technical** level (values that can be understood as attributes of quality or special features of [T]echnology). Although this distribution is not complete for some areas, the spaces corresponding to the three levels remain explicit in the artifact (Figure 3) in order to encourage designers to identify new values and think on the possible manifestations of each area in each three levels.

Embedded in the original VF, these values favor designers, evaluators and analysts to keep values in mind, helping them learn how to use the artifact itself and situate themselves with respect to what they must investigate and consider in each area. To situate our discussions in a practical context, in the next section we present an experiment in which the VF4SS was applied to the evaluation of five different projects.

4 THE CASE STUDY

Aiming at verifying the acceptance and applicability of the VF4SS, the artifact was used in the evaluation of five different projects related to the prototyping of systems for supporting cross-cultural collaboration. This context was an ideal setting for assessing our artifact due to the explicit need for dealing with cultural aspects and, consequently, with values. These projects were developed in a postgraduate course called "Topics in User Interfaces: Semiotics of Human-Digital Artifact Interaction" in which the Organizational Semiotics theory was used as an approach for the development of information systems. The group of participants was formed by 16 designers divided into five groups: G1 (formed by designers: D1, D2 and D3), G2 (D4, D5, D6), G3 (D7, D8, D9), G4 (D10, D11, D12) and G5 (D13, D14, D15, D16).

From the five projects for supporting cross-cultural collaboration, the Project of G1 was related to sporting events; the Project of G2 and G3 were related to gastronomy and culinary practices; the Project of G4 was related to musical tastes and compositions and the Project of G5 to residential tourism. This variety was useful because it favoured the diversity in terms of stakeholder groups, cultures, values, and also system's features.

When the evaluation activity started, each group had completed the documentation and had finished the prototyping of the first increment of their systems — see Figure 4 for an example. The main

goals in evaluating the prototype from designers' point of view were to identify: i) the impact the produced system could cause in its different stakeholder groups; ii) the possible conflicts between these groups; and iii) the values involved in the system and the way these values were being technically supported or promoted. On the other hand, the two main goals of this activity from our point of view were: 1. to identify if the VF4SS would help designers in evaluating social software; and 2. to verify whether the values suggested would make sense to designers and what other values should be included or removed.

Figure 4: Prototypes produced in the Project 1 (G1).

The evaluation activity was carried out as follows: the identification of all stakeholder groups involved in the project was already carried out through the use of another artifact from OS: the Stakeholder Identification diagram (Liu, 2000). This artifact distributes the stakeholders in different categories ranging from the actors directly involved in the project to the community who will not necessarily use the system but can be affected by it. In this context, in the **first** step designers should select 3 different stakeholders groups and place each group in a column of the VF4SS (see Figure 5). In order to ensure that the system's cross-cultural nature was explicit, the groups should be from different cultures (e.g., Italian, Japanese and Russian) and from different levels in the Stakeholder Identification diagram.

In the **second** step designers should look at the values suggested in the VF4SS and mark those they were already considering in their project. In the **third** step, designers should analyse and discuss the importance of each value and the impact it could cause on each stakeholder group. In the corresponding cell of the artifact, designers should indicate how that value was being technically supported in the project. Finally, in the **fourth** step designers should analyse if there would be any conflict in the way each value was being supported in the system according to the different stakeholder groups. If any, they should indicate how the conflict could be treated.

Area (PMS)	Value			STAKEHOLDER		
	Personal	Social	Technical	Translator (Brazilian)	Amateur Cook (Japanese)	Culinary School (French)
1. Interaction	Identity			Translator's profile informing the languages he is fluent, the content he has translated and his/her ranking compared to other translators.	Cook's profile, including his/her tastes, culture, published recipes, followed recipes and comments on them.	School's profile, including its gastronomy style, its website, courses, published recipes, followed recipes and their evaluation.
	Norms			System's use and copyright terms. It is possible to translate recipes and evaluate the translation accomplished by others.	Copyright terms; usage policy; This stakeholder can publish and evaluate recipes.	Copyright terms; usage policy; This stakeholder can publish and evaluate recipes and divulgate gastronomy courses.

Figure 5: VF4SS filled in the Project 2 (G2).

As background material for supporting the evaluation task designers were supplied with: i) guidelines explaining the four activity's steps; ii) the VF4SS both in press and digital format; iii) a document containing a simplified explanation of each area; and iv) a table containing a description and an example for each value suggested in the artifact. As activity outcomes, each group should fulfil the VF4SS, answer a survey related to its applicability, redesign the system according to their discussions and share their findings with the other groups.

4.1 Activity's Main Findings

In general, the evaluation of the projects through the VF4SS provided us data, insights and evidences that show the viability of using this artifact for social software evaluation as well as social software requirements elicitation and design. Following, we present some findings and highlight some results regarding our case study.

From designers' point of view, the activity outcomes confirmed our expectations regarding (i) VF4SS's usefulness for identifying the impact caused by the system on its different stakeholders. All groups reported that VF4SS was determinant in the process of discussing the challenges, difficulties and even opportunities for each stakeholder group regarding the system being prototyped. The VF4SS and its areas enabled designers seeing (or at least, trying to see) the system through the lenses of different stakeholders who would be affected by the system in different ways. For instance, D10 declared that "*the Valuation Framing brought us* [G4] *a*

better understanding about the impacts that the introduction of our system could bring to musicians, producers and fans". In this project, questions related to copyright, property and privacy that could be affected by the system usage were put into scene by the VF4SS.

Another point also indicated by the VF4SS was (ii) the identification of possible conflicts between the stakeholder groups. In some cases the solution to conflicts was achieved through the specification and design of other features in the system, while in other situations it was understood as a new norm, rule, or even as a system limitation. Some interesting examples are: "*Sponsors want a greater emphasis on their advertisements, while readers want a clean interface; Advertisers want to post any content, while the moderator have to supervise them*" (G1); "*A negative rating for a recipe by the users can bother the system's sponsor*" (G3); "*When musicians are composing a song in a private mode, their fans should not be able to view it. The system must offer features that enable them to manage the visibility of their productions*" (G4).

Finally, the VF4SS was also successful in supporting designers (iii) to identify the values involved in the project and the way these values were being technically supported. For instance, in the Project 2, the VF4SS led designers to think about the differences in the profile feature according to the stakeholder group and to redesign the system for reflecting these differences. In the same project, designers identified the need for mechanisms to encourage the participation of users as a way to technically implement the value of "Emotion and Affection". They proposed features that took into account the different needs and expectations of stakeholders. For instance, the feature for encouraging the participation of the "Translator" (of recipes) was prototyped as a scheme of credits (cash prizes were cited as an alternative) while the feature for the "Culinary School" was prototyped as the possibility for free announcements in the system.

According to designers' feedback and our own observations during the execution of the projects, we could perceive the VF4SS as an artifact capable of generating fruitful discussions among designers, allowing them to exercise a critical thinking regarding the whole impact of the solutions they are designing. This artifact contributes effectively to the development of products compatible with the values of the people they are intended for instead of the values of their designers. In doing so, it also contributes to a proper deployment of the product in the target environment: if a product reflects an understanding and respect to the values of its different stakeholders, then, it has better chances of being appropriated by these stakeholders. These findings are naturally extended to the original VF.

From the point of view of our research, we confirmed our hypothesis regarding (1) the utility of the VF4SS for assisting designers to evaluate social software, and also regarding (2) the relevance and benefits of the values suggested in it (i.e., whether the values suggested would make sense to them).

First, according to the survey designers answered after the valuation activity, 60% found the values very useful for the system evaluation; 40% found them useful; and none answered they are neutral, unhelpful or useless. According to D4, the suggested values assisted the group (G2) in carrying out the evaluation task because they were a starting point. Because they had no previous experience with cultural issues, if no values were suggested they could get lost without knowing what to do or how to proceed. Therefore, the values suggested in the VF4SS are important not only to support designers in carrying out the evaluation of their projects, but also in learning how to use the artifact itself.

Second, in the survey designers suggested no additional values to the 28 presented in the VF4SS. Using designer's words: "*we identified no values to be included in the framework*" (G1); "*the table* [with values' description and examples] *is generic enough for fitting any value into the available options*" (G3); "*the suggested values were capable of expressing in a complete way what we seek and discovered*" (G2). Other evidence that the values suggested into the VF4SS made sense to designers was the percentage of values that were effectively considered or discussed (pointed out as important) in the Projects — see Table 1. Designers from G3 considered 82% of the values suggested in the VF4SS but did not approach new values for their project, while designers from G1 identified all the values being expressed in some way. On the other hand, in the G2, G4 and G5 groups, designers were explicitly considering 39%, 57% and 79% of the values, respectively, when the evaluation took place. But, while filling the VF4SS they recognized the importance of including new values and discussed how these values could be technically supported in their systems.

Table 1: Values considered in each Project.

Group	G1	G2	G3	G4	G5
Values considered	100%	39%	82%	57%	79%
Values discussed	100%	61%	82%	61%	100%

We should highlight, however, that considering more or less values is not just a question of designers' choice but also of the project context and scope. Consequently, these data do not suggest the values as a definitive and exhaustive set but that they made sense to designers, were useful in promoting critical discussions and met their needs in the context of their projects.

An interesting example from G2 is related to the value of "meta-communication" which was not considered by designers during the system's prototyping. However, because the VF4SS suggested this value in the cultural aspect of "Learning", designers started discussing how their system could technically support it and identified that each stakeholder group had different views and different needs regarding this value. For instance, the stakeholder "Translator" would need support to understand how the collaborative translation would work; the stakeholder "Gastronomy school" would need support to learn how to use the system for publishing, searching and evaluating recipes; and the stakeholder "Amateur cook" would need support through a resource other than text for teaching him/her how to cook the recipe. Thus, designers decided to implement the value of meta-communication through the use of tutorials and videos placed in the system's interface; e.g., each recipe should have a video showing a step-by-step of how to cook it. After these specifications, the system documentation was updated and the prototype was redesigned in order to include the new features.

In fact, the VF4SS not only supported designers in the task of evaluating the system they were projecting, but also made they think on new requirements and features that were missing or could be included in their systems. By suggesting values, the VF4SS incited designers to discuss and consider aspects that were being neglected. Therefore, it proved to be a useful artifact also for requirements elicitation. Some feedback from designers confirms this assertion:

D2: "*I would find it very interesting to apply this artifact* [VF4SS] *for requirements elicitation. The reason is quite simple: it enables those involved in the development process to see, or try to see, through the eyes of other stakeholders involved in the project they are proposing. As a developer, I feel that a lot of rework is caused by developing systems without thinking of people who will actually use it*";

D3: "*The VF4SS is very interesting because it forces us to imagine the system through the view of different stakeholders, making designers think whether the values are being addressed in the proposed project according to these different stakeholders. This activity resulted in new requirements identified. So, in my opinion, it is a very important activity to be performed at different times within a project, from requirements elicitation to the system evaluation*";

D5: "*VF4SS is, in my opinion, a great tool not only for evaluating the design of a system, but also to identify important requirements*";

D9: "*The VF4SS was the tool that I found most interesting in the whole process. It allows checking for any conflicting requirements between the various stakeholders and makes it possible to deal with this information so that such conflicts do not hinder the development of the project*";

Grounded on the results briefly discussed in this section, we are convinced of the viability of using the VF for the evaluation, and also for the requirements elicitation, of any technological artifact. Specifically in the context of social software, the VF4SS showed to be a promising artifact for supporting designers in dealing with the complexity imposed by the social context of these systems. Indeed, this artifact can be used in research projects as well as industrial settings favouring discussions around cultural aspects while guiding and capacitating designers regarding social subjects. Finally, this study also contributes to validate the relevance of the values in the context of social software we identified in (Pereira *et al*., 2010).

5 CONCLUSIONS

The design of social software still demand approaches, artifacts, methods and tools for reflecting and dealing with the social nature that characterizes it. In fact, there is even a lack of theoretically grounded approaches for investigating this kind of system. Moreover, although clearly recognized as important, there are few initiatives in literature related to values in technology. In the present paper we shed light to this scenario proposing the VF4SS, an artifact specially adapted to the context of social software. As a byproduct but equally important, we introduce and articulate key concepts and theories, such as the three levels in which humans operate, the ten basic building blocks of culture and the Organizational Semiotics theory with some of its artifacts.

The results obtained from the evaluation of five prototypes of systems situated in the context of cross-cultural collaboration indicate the benefits of using the VF4SS for evaluating as well as designing social software. Nevertheless, some important points still remain open and can be seen as a research agenda in the area. For instance, the VF4SS

produces results essentially qualitative making their analysis more difficult and their interpretation more subjective. Although its goal is to bring out aspects that are difficult to identify and cover areas that traditionally receive little attention, e.g., values and culture in technology, studies on possible means of formalizing and measuring its results are welcome.

Values are intertwined to each other through complex relationships and these relationships need to be clarified. Thus, it is difficult to involve values in the project of technologies if they are considered in isolation. When considering (or neglecting) a certain value, other values can be positive or negatively affected. For instance, depending on the way the value of meta-communication is being technically supported in a project, it can affect differently the value of accessibility, either making it more difficult (e.g., offering only explanation through sounds) or promoting it (e.g., offering multiple media, such as text, images, video, sound).

Consequently, besides the identification of the relationship among values, if we are to offer resources for supporting designers to understand and involve values in their projects, we also need suggest how these values could be technically supported in their systems. For instance, autonomy is a critical value especially in systems related to the exercise of citizenship, and it has a clear relationship with the values of accessibility, usability, identity, emotion and affection, and so on. Mapping this value to a technical feature is a challenging task not even always possible.

Finally, although a key artifact, the VF4SS alone is not enough to guarantee an effective consideration of values in social software design. Indeed, as the experiment described in this paper showed, other artifacts, methods and tools are needed in order to allow the articulation and involvement of values during the different stages of a system development (e.g., the stakeholder identification artifact). We are naming value-oriented approach (VOA) such set of tools and artifacts we are investigating in ongoing and further research.

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