

## A Discussion on Social Software: Concept, Building Blocks and Challenges

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### Abstract

*The possibility of developing more interactive and innovative applications led to an explosion in the amount of systems available on the web in which users interact with each other and have a primary role as producers of content — the so-called social software. However, despite their popularity, few of these systems keep an effective participation of users, promoting a continuous and productive interaction. This paper examines the concept of social software and analyzes the social software honeycomb, a framework to help in understanding this kind of system. Based on the analysis of an inclusive social network and on literature review, we revisit that framework. We argue that values should be considered in the context of social software and the framework should be extended and theoretically grounded in order to address the several challenges imposed by the “social”.*

### 1. Introduction

New applications allowing mass collaboration, communication and interactivity were developed with the Web 2.0 advent, encouraging the creation of technologies such as social networks, social search, social categorization (folksonomies), among others [1]. These technologies, developed for supporting a “social web”, are called social software, and are based on applications that enable mass interaction, communication and interaction.

Applications such as *YouTube*, *Second Life*, *Delicious*, *Twitter*, *Flickr*, *Facebook*, among others, invite millions of users to communicate, interact, create, share and organize information. These systems show the “power of the collective”, the opportunities and knowledge that can be generated through collaborative work and mass interaction. According to Webb [2], the goal of social software is to deal with groups, with ordinary interaction among people. This scenario is a bit different from the groupwork, which usually takes place in a formal setting; here, the interaction occurs in an unprecedented scale and intensity, leading to a situation in which issues related to human-computer

interaction are extended to issues related to human-computer-human interaction in social situations.

Despite the popularity and the growing in the number of users of the social software, just a small fraction of systems is really successful. To Webb [2], 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. Moreover, as Silva and Pereira [3] argue, due to the recent emergence and popularization of social software it is still necessary to understand the impacts that this new range of applications cause, both in social and technological aspects. Likewise, it is necessary to study the new challenges raised by this kind of interactive software; due its social aspects, its requirements are constantly changing, because the quantity and variety of users are very different from those found in conventional software.

Indeed, despite the lack of formal metrics to determine whether a social software has succeeded or not, the number of users and their level of activities offer significant evidences. Without users there will be no information or other kind of knowledge to be analyzed. Thus, 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. Users need to feel confident, guided, rewarded and motivated to use the application because, otherwise, there is no reason for using such systems to produce or organize information or to interact with each other.

Although the concept of social software is relatively new, discussions around the design of collaborative systems have received attention from academy since more than two decades. In Winograd and Flores [4], the authors discuss the impact of computer systems on the social relations of their users, emphasizing that this impact must be taken into account when designing a system. Ackerman [5] says that at the stage of design, the biggest challenge is social instead of technological. The author emphasizes that systems do not fully meet the requirements of sharing information, the social policy of groups, responsibilities, among others, because we do not have knowledge on how to

develop systems that fully support the social world. These statements are also valid for the social software design process, because it seems that the differences between both concepts of social software and collaborative systems (in their more general form) are in the number and diversity of users, in the amount of information created and shared by them, and in the possibilities users have of interacting with each other and with the system.

In an attempt to build a functional framework for understanding the nature and structure of social software, Smith [6] proposed a framework he named “social software honeycomb” to illustrate a list of seven elements that compose a functional definition of it. Smith’s framework is grounded on the evolution of a discussion informally developed among professionals and researchers who were interested in understanding the new dynamics, challenges, opportunities and implications of the so-called social software. Although a good starting point for analysis, the framework need further improvements and theoretically grounded discussions to help in understanding, designing and evaluating social software.

This paper revisits some definitions and discusses the social software concept. It also sheds light on Smith’s social software honeycomb [6], discussing it, pointing out its limitations, suggesting improvements and theories for grounding it. These theories, such as Organizational Semiotics [7], help in understanding and dealing with the social world. To analyze the framework, we apply it to an inclusive social network: *Vila na Rede* [8]. As a result, we show aspects, such as collaboration and emotion, which the framework is not able to address. Additionally, through a literature review, we identify additional elements that, according to researchers and practitioners, afford the social aspect of social software and can be determinant of their success. The empiric analysis of the *Vila na Rede* system and the literature review provide the basis of a new set of elements — which we call the social software building blocks.

The paper is organized as follows: section 2 discusses several definitions literature brings to the term “social software” to clarify the meanings behind it, and describes the framework from its origin to its conception as the social software honeycomb; section 3 presents the *Vila na Rede* system and presents an analysis about its resources, features and the participation of users, discussing the elements considered by the system; section 4 revisits the framework and proposes new elements to it; section 5 suggests three changes in social software regarding their elements and design process; section 6 presents our conclusions and directions for future research.

## 2. Social Software: Literature Review

The term “social software” is used in many different contexts, and different technologies are underlying it. Inspired by Lazar and Preece’s [9] discussion on online communities, we can say that social software is usually a subjective matter: it is easy to understand and recognize, but it is unstable to define and even more complicated to measure.

One of the first definitions for the term (and one of the most broadly discussed) was given by Shiriky [10] as “software that supports group interaction”. Klamma *et al.* [11] in the context of educational technologies assume, generally, social software as “tools and environments that support activities in digital social networks”, while Smith [12], presents it as “software that allows people to connect through a computer-mediated communication”.

In a more detailed view, Chatti *et al.* [13] define social software as tools for augmenting human social and collaborative abilities and as a medium for facilitating social connection and information interchange. Kolko *et al.* [14] go beyond web applications and consider mobile devices as social devices, “in the degree to which they mediate social relationships, social networks and manage the circulation of culture that sustains such networks”.

Many authors argue that social software is a poorly defined concept [11, 12, 14]. In part, it is because technologies, tools and social concepts are mixed and not clearly explained. Several systems such as *Wikipedia*, *Facebook*, *Youtube* and *MySpace* are broadly accepted as social software. In the same way, *Wikis*, *Blogs* and *Social Networks* are also included in this category. *Wikipedia* is a *Wiki*, but is it considered social software because it uses *Wiki* technology or because of the way it is used? Therefore, we can notice that the classification criteria vary not only according to the technologies used and the features implemented, but also with pragmatic aspects of usefulness and applicability.

Other point commonly mentioned [7, 15, 16] is that the Internet has always comprised a network of individuals connected through social technologies. Some of them, such as e-mail, chats and forums are long ago available. However, McLoughlin and Lee [15] argue that “current social software tools not only support social interaction, feedback, conversation and networking”, but they also have features of flexibility and modularity enabling collaborative “remixability”. Remixability is defined by the authors as “a transformative process in which the information and media organized and shared by individuals can be recombined and built on to create new forms, concepts, ideas, mashups and services”.

According to Dron [16], one useful way to distinguish social software from earlier forms of mediated communication is in comparing some of its key features. For instance, compared with chat

rooms, discussion forums, mailing lists, etc., social software scales very well, gaining strength from large numbers of users. That is, while the examples above tend to become overloaded once a certain number of participants has been exceeded, usually, social software can offer additional benefits, such as organization or collective knowledge emergence. Dron still points out that social software is “organic and self-organizing”, underpinned by dynamics that parallel natural processes; “evolutionary”, replicating the successful and diminishing the unsuccessful; “stigmergic”, signs left in the environment communicate something to others who leave further signs; that “emergent structure” is formed from bottom-up control rather than top-down design.

It is necessary, however, to distinguish between social technologies and social software. Social technologies correspond to technologies such as, social network system, wiki system, social bookmarking system, etc., that allow the instantiation of the social software (*Facebook*, *Wikipedia*, *Delicious* to cite a few). But it is the way an application is instantiated and the way it is used by its users that will really bring social software to life. Indeed, as Boyd [17] argues, when we talk about social software we are not just talking about a specific set of technologies in which the main focus is on people. Rather, we are talking about a movement in which there are three significant changes: the first is the way technology is developed, e.g., the perpetual beta instead of locked-down versions; the second is the way participation is widespread, e.g., the network effect and organic growth; and the third is the way people behave, e.g., the focus is on connecting people and watching the subject and shared interests emerging instead of creating pre-defined groups.

In this context, we see social software 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.

## 2.1. The honeycomb framework

Based on an idea from Morville [18] for a framework to show the facets of user experience, Smith [6] proposed a framework to illustrate a list of seven elements that give a functional definition to social software (see Figure 1 [6]).

The first appearance of the social software elements is found in Stewart Butterfield’s discussions in 2003 [19], when he argued that social software “is software that people use to interact with other people, employing some combination of the following five devices: Identity, Presence,

Relationships, Conversations and Groups”. To the author, the key idea behind social software is that “by using technology we can reinvigorate interest and participation in the democratic process”. In 2004, Webb [2] extended Butterfield’s list adding two other elements he judged important to social software: Reputation and Sharing. In 2007, Smith [6] created the social software honeycomb aiming to provide a basis for understanding the functioning of social software and, consequently, for determining the elements that should be considered when designing them. Each honeycomb element can be basically understood as follows:



Figure 1. Social software honeycomb

**Identity:** a unique identifier of a user within the system — something that represents his/her “me”. The “self” of individuals; the expression of elements of a person’s personality and individuality (who is the person over the space and time) For instance: a user’s profile.

**Presence:** are resources that allow knowing whether certain identity is online, sharing the same space at the same time. For instance: the user is online in the system.

**Relationship:** it is a way to determine how users of the system can relate\are related to each other. For instance: at *Facebook* the relationship is friendship, at *Twitter* it marked by followers and at *Delicious* by fans.

**Reputation:** it is a way of knowing the status of a user in the system, either a collective opinion from other users or a statistical measure of the system. For instance: who is trustworthy, who produces good information, who are the top collaborators, etc.

**Groups:** it refers to the possibility of forming communities of users who share common interests, preferences, ideas, opinions, and so on. For instance: a group of people who study the social web.

**Conversation:** are resources for communication among users (synchronous and/or asynchronous). For instance: instant messages, emails, forums, etc.

**Sharing:** it refers to the possibility of sharing objects that are significant, important, useful or of users’ interest. For instance: documents, photos, music, posts, etc.

The identity appears at the centre of the framework because, according to Smith [6], it is the most basic requirement of any social system. One may understand from this structure that not all

software has all of these elements. Actually, according to examples shown by Smith, we found out that systems usually have three or more of such elements, but have a main focus on only one or two of them. For instance, considering the *YouTube* system under the framework perspective (see Figure 2), we could say it focuses on the “sharing” element: the main purpose of users in the system is to share videos—posting and watching videos. Additionally, the system implements the elements of “identity”: users have their profile with favorite videos and added videos; “conversation”: users comment and respond to comments about the videos; “groups”: the system provides resources for the formation of groups and channels in which users can join and participate; and “reputation”: the system implements a collaborative scheme of reputation over the comments posted in videos and the videos themselves in order to identify and avoid spam and promote the best ones.



Figure 2. The *Youtube* elements

Although a good starting point in defining a conceptual framework to assist in the understanding of social software, the framework elements are far from being exhaustive and complete. Following, we explore the framework by analyzing the *Vila na Rede* system. This analysis identifies the elements considered by the system, explains aspects of how these elements were implemented, and shows which points are not being covered by the framework.

### 3. *Vila na Rede*: an inclusive social network

*Vila na Rede*<sup>1</sup> is an Inclusive Social Network built for and with Brazilian citizens. The system is a result of a project which aimed at studying and proposing solutions to the challenges of interaction and user interface design on systems related to the exercise of citizenship, contributing to the promotion of a digital culture in society. The *Vila na Rede* was conceived to be a “social network system that provides user with a welcoming environment in which they feel comfortable and can identify themselves with; a system that makes sense to the users” [8].

The main difference of *Vila na Rede* when compared to other social network systems is that it was conceived with and for users with low exposition to the digital culture, considering their limitations and abilities, resulting in a system that is part of their social context of life. The system was

designed taking into account what Baranauskas [20] calls Socially Aware Computing: “the theory, artifacts and methods we need to articulate to actually make the design socially responsible, participatory and universal as process and product”.

The *Vila na Rede* system (see Figure 3) is an environment in which its users can announce products and services, ideas, or events, communicating with each other (synchronous and/or asynchronously) by using different media (audio, video, image) that are transversal to the system. The content produced in the system remains open (unless users choose to keep it private), making it possible for anyone to browse and access information regardless of registration. However, for posting, commenting or collaborating with others, previous registration is required.



Figure 3. The *Vila na Rede* System

The main features offered to the users are: i) users can publish and browse announcements of products, services, events and ideas. ii) They can use multimedia resources embedded in the system in their announcements: a user can take a picture and have that picture directly on the announcement; make short movies to show their things or to explain something using LIBRAS (Brazilian Sign Language) — and/or upload files with images or videos. iii) All announcements can be commented and the user who creates it can choose if his/her announcement will be publicly available or not. iv) Users can collaborate with others by adding information/media in someone else’s announcement. v) There is a meta-communication mechanism that uses multiple media for supporting users in using the system. vi) It is possible to select or choose all announcements which contain audio to create a playlist. vii) Users can see who is online in the system and chat with other users using text, webcam, sending files, etc. viii) The system allows users to adjust the interface according to their preferences (i.e., graphic layout) or needs (i.e., content size). ix) There is a feature called Virtual Presenter who reads the content posted by the users in the system and allows (not/partially) literate or visually impaired users to access the information. The system also shows data about visitants, new

<sup>1</sup> <http://www.vilanarede.org.br>

registered users, comments on advertisements, and so on. See Figure 4 for some examples.



Figure 4. *Vila na Rede*'s features

Looking at Figure 4, the detail "1" indicates the resource developed for supporting users in taking their pictures. They do not need to have knowledge about how to organize/search files in an operating system in order to post a picture: it is enough to have a webcam. The system already captures the image and displays it for the user to choose whether to post that picture or capture another. The detail "2" refers to the meta-communication feature in multiple media (audio, video, pictures or LIBRAS) that explains how the system can be used, the resources available for use and their functionalities, and that supports users in a contextualized way at the moment they are performing a task. The Virtual Presenter who reads the content of announcements to users is also viewed in this feature. Detail "3" marks an interface component that triggers the meta-communication function of the feature "online users". Whenever a user clicks on the "i", an explanation about the related feature is presented. Detail "4" shows the features that allow users to adjust (tailor) the interface according to their preferences (e.g., change the menu, text size, color contrast, etc.), and detail "5" marks a feature that enables users to navigate on the screen without using the scrollbar. This feature was created due to a difficulty that users who were not familiarized with computer systems had in using the browsers' scrollbar.

According to the features presented, in the following section we identify the elements of the Honeycomb framework that are being considered in the *Vila na Rede* system.

### 3.1. The honeycomb elements analyzed in the *Vila na Rede*

The most important aspect of *Vila na Rede* is its simplicity, its attention to the diversity of competencies (e.g., literacy) and limitations of its prospective users, their specific needs, including affective and emotional aspects. Considering the Honeycomb framework to evaluate the system (see Figure 5), we can see it focuses on the conversation and sharing elements (in dark gray color), also implementing the elements of identity and presence

(in light gray color). The elements not explicitly considered appear in blank.

The conversation and sharing elements are visible mainly through the announcements posted by the users. Users effectively interact, communicate and collaborate with each other, sharing not only products, services, events or ideas, but also their culture, preferences, interests, expectations and their context of life. Conversation is also considered via the resource of chat, in which a user can talk directly to other users who are online in the system.



Figure 5. *Vila na Rede*'s elements

The element of identity is explicitly implemented through a resource of users' profile, which shows information about who the user is, how to contact him/her, who are their "godfather" in the system (the user who supports or invited them to use the system), etc. Moreover, the way the elements of conversation and sharing are implemented reinforces the creation of a virtual identity in the system, because the awareness of what users say and post, with whom they interact, and what they are doing, influence the perception of them about themselves and of other users about them. Finally, the element of presence is perceptible through a mechanism that shows the users who are online in the system allowing the synchronous communication among them.

It is important to notice that although the elements of reputation, groups and relationship are not being explicitly considered in the system, they can be perceived in users' participation and history. Reputation is something built from users' comments, announcements and collaboration; and a reputation of a user is recognized by others according to the quality of his/her participation in the system. In this case, despite the absence of a resource for representing reputation explicitly, this element emerges from users' interaction, implicitly influencing the future interactions among them and the way they want to be seen in the system. Similarly, the element of relationship is not made explicit; nevertheless it can be identified through a graphical feature that shows who are talking to whom in a given instant of time, and groups can be identified mainly through the comments and the collaboration of users in each others' announcements.

*Vila na Rede* was designed with users involvement during the whole system development process, and the need for these elements were not identified. Consequently, there was no reason to

overload users with resources they do not need or that do not make sense to them.

#### 4. Discussion

In the previous section we applied the Honeycomb framework to analyze the *Vila na Rede* system. Here, we do the opposite and use the system as a way of evaluating the framework.

The first point we want to highlight is related to the framework usefulness. In the way it was conceived by Smith [6], the framework brings a set of elements commonly found in systems that connect people, such as Learning Management System (LMS), collaborative systems or social network sites. It is useful in remembering a designer, or evaluator, what resources are interesting to consider when designing/evaluating a system which is intended to be social. However, it does not allow identifying other important elements (e.g., collaboration) nor to understand if a specific application characterizes social software. Considering the definition of social software presented in section 2, the framework does not draw attention to key issues such as users' diversity, needs, or other social aspects. Therefore, just implementing some of (or all) the framework elements does not imply that the system is social or supports, mediates, facilitates social relationship. On the other hand, as shown in the *Vila na Rede* analysis, a system can be social even not explicitly considering half of the framework elements.

Indeed, if we consider a LMS system like *Moodle* and try to identify which elements it implements, probably, we will recognize most (if not all) the elements. However, researchers on educational technologies such as Chen *et al.* [21], Dalsgaard [22] and Roberts and McInnerney [23], are convinced that LMSs are not capable to support learners in an interactive and effective learning process. There are several different arguments justifying such statement but one is strongly mentioned: LMSs focus on content instead of on people. Nevertheless, Dalsgaard [22] points out LMSs' efficiency regarding administrative issues. According to him, these systems can support the management of courses and their activities, favoring their centralization and organization in a top-down format. Indeed, its focus is on courses and activities, and the other elements such as group (e.g., a class), relationship (e.g., colleagues) and conversation (e.g., forums) are all implemented in order to support the system goal: managing these courses and activities. In a system where the focus is on people, e.g., a social network, identity is the core element.

Consequently, classifying LMSs as successful or unsuccessful is a subjective matter that depends on the purpose and expectative of their users: LMSs can be an excellent option for managing contents and activities while fail in providing a social experience

that could lead to effective learning from a constructivist perspective. Thus, choosing the right elements and the right way of implementing them is a key-point, because this will influence the interaction of users with the system and with users themselves.

Actually, for being able to help designers and evaluators in understanding social software and in projecting it, the framework needs to be theoretically grounded and expanded with new elements. For Norman [24], people learn social skills, but machines, systems or other technological artifact need those skills being designed into them. This means that it is not enough to choose some elements, implement them, build a system and deliver it to users hoping they will like and use it. It is not enough to group people together and tell them to share their knowledge and collaborate; people need to see a clear benefit in using a system or carrying out a task, otherwise they will not spend their time doing it. But understanding these social requirements is possible only if designers could see the system through the lenses of its users and their cultural particularities.

In this sense, as Neris *et al.* [25] highlight, we need to know users in their abilities, formalizing the interaction requirements and investigating solutions of interaction/interface for the diversity. Systems should reflect an understanding on how people actually live and work in their organizations, communities, groups and other forms of collective life, otherwise, as Ackerman [5] asserts, the produced systems will be useless, distorting the collaboration, communication and other social activities.

According to the discussion exposed in this section, following we present additional elements to the framework identified in the analysis through the *Vila na Rede* system and reinforced by literature review; in the next section we present a paradigm-shift in the way these elements should be understood.

##### 4.1. New elements in discussion

For the literature review, we selected three journals and three conferences according to their tradition and importance in the areas of Computer Science (focusing on HCI) and Education (due to the growing discussion about the design of technologies for supporting teaching and learning promoted by social interaction). The selected journals were: *Computers & Education journal* and the *British Journal of Educational Technology (BJET)* due to their tradition and impact factor, and *Journal of Educational Technology & Society*, by explicitly considering the aspect of "Society" and having special issues devoted to the topic of social software. The *International Conference on Human-Computer Interaction (HCII)*, *Conference on Human-Computer*



*Interaction (IFIP TC13-INTERACT)* and *Conference on Human Factors in Computing Systems (ACM CHI)* were selected in order to consider the three most important and comprehensive international conferences in the field of HCI.

Initially, the investigation considered all the scientific papers published over the past 5 years at the conferences previously mentioned and over the past 10 years at the selected journals that were found based on the following keywords: *web 2.0*, *social web*, *social software*, *social network* and *life-long learning*. Also, papers published in other journals and conferences indexed with the same terms were considered. From this investigation we identified 43 papers relevant to our research, and from these papers we reached some new elements. Following, we present the elements that agree with our findings in the analysis of the *Vila na Rede* system.

**Object:** in further discussions about Smith's framework, Wal [26] suggested new elements, such as "object" and "collaboration", and agrees with Zangestrom [27] that an important element missing is the Object. Knorr-Cetina [28] addresses the individual and the object as central elements in a process of social interaction (an object-centred sociality): objects around which discussions occur, the focus is maintained, the talks begin, among other social interactions. Actually, the social object being built/modified is determining which elements should be considered and how they should be considered (e.g., in *Youtube* the object is video, in *Delicious* it is bookmark, and in *Vila na Rede* it is an announcement). Depending on the object, the elements needed to support it and the way these elements should be technically implemented will vary significantly. In Smith's framework the "object" is not made explicit; it is behind the scene, as the thing people "share" in the social software.

**Collaboration:** this element refers to resources that allow users cooperate with each other; working together on the same object. For instance: users cooperatively create, edit and evaluate an article in a *Wiki* [23].

**Emotion and Affection:** it is related to feelings, people sensations such as welfare, pleasure, fun, engagement, boredom, disappointment and other aspects related to users' experience. For instance: users' fear of suffering discrimination because of information published in their profile. [24, 29].

Neris *et al.* [25] emphasize that what makes the design of social software so complex is surely the heterogeneity of users who can interact with the system and through the system in their social contexts. Thus, the framework needs to help in understanding what maintains the collaboration, the participation and the effective interaction among users, because in a social software there should be a symmetric relation in the sharing of the object, regarding who gets the benefits of the task. People

have a natural tendency to collaborate, participate and interact, because it is a way to define their space, to build their identity in face of others and the world. However, users must have some benefit, feeling motivated and compensated for investing their time and effort interacting with others and producing content in these systems. Consequently, the framework needs to draw attention to the users' affective, emotional and cultural aspects. These aspects were considered in *Vila na Rede* since its design, but the original Smith's framework would not be able to represent them through combination of its elements.

**Adaptability:** it refers to features that allow users to modify a system according to its context of use; flexibility to adapt the system's interface to situations of use that have changed or are unexpected. For instance, users can add/remove shortcuts to the system most frequently used features [16, 25]. Regarding this element, the *Vila na Rede* system also indicates that a system should be adaptable (tailored) to the users diversity (skills, preferences, limitations, age, experience, etc.), and this is another point not covered by the honeycomb framework.

**Usability:** this concept refers to interfaces that are consistent, controllable and predictable, easy to use and satisfactory. The system cannot require users a high level of expertise in the use of computers. [9]

**Accessibility:** is the capability of supporting a heterogeneous set of users with distinct skills, preferences, needs, and motor and cognitive limitations [30]. For instance: the system provides alternative registration for users that do not have an e-mail account; the system has a feature that reads the content of an announcement for the users.

The Honeycomb framework does not address the usability and accessibility concepts which are critical in social software. If users could not use or have difficulties in using a poor designed system, probably they would not use it. In this context, it does not matter if a system implements the framework's elements in several ways, if it not accessible and usable, it will fail in being social.

During our literature review we verified that the concept of accessibility is almost absent from discussion. Isaias *et al.* [31] and Tsai *et al.* [32] discuss the need of providing easy access and favoring the participation of people, but their arguments are not related to the development of accessible systems or technologies; the only research in which we identified an explicit concern regarding accessibility was Hernández-Ramos [33]. The author analyzed 25 awarded research projects in technology for education and identified that the most impactful projects were not those developed using the top technologies, but those that had a clear purpose and were developed in order to solve a specific problem for the widest possible audience.

This negligence with accessibility reveals more than an additional element to the framework; it represents a lack regarding the development of technologies and solutions for the diversity, which can be accessed by everyone. Accessibility is especially important in systems related to the exercise of citizenship, where the technology cannot discriminate or deprive citizens of their rights. In this sense, if we understand accessibility as a right of people instead of a technology's attribute, naturally, we will see that this negligence points to something that we must be mindful: human values.

Despite the limitations presented in this section, the Honeycomb framework was a good starting point in understanding social software. Its expansion with new elements, some of them suggested in this section (object, collaboration, adaptability, usability, accessibility and affective and emotional aspects) and its application within theoretical grounded basis can make it more adequate to the social software context. However, we reinforce that this framework usefulness to the design and evaluation of social software should address the view of a Socially Aware Computing [20]. Otherwise, the fulfillment of users' social demands will be missing.

## 5. The paradigm shift

If we are to develop social software according to Baranauskas' approach [20] we need to change the way we understand the elements that compose them and the way we design these systems. Here, we can highlight three points.

**First**, we must be aware that every innovation brings negative and positive impact to the environment in which it is introduced. In this context, we need to move from a perspective of technical (or functional) elements only, to a perspective in which technical, formal and informal (social) aspects are intertwined in each element. **Second**, we must understand that culture influences the way innovation will be valued by its direct and indirect users regarding its impact. In this sense, the elements that compose social software must be understood as values: values of different nature and with different relationships instead of functional elements codified in a software. **Third**, we need discard our view of a design process in which technological innovations are produced and delivered for people using them even without a clear perception of their utility and potential impact, and adopt one that favors the understanding of the social world and that sees people, organizations, process, rules and norms as part of a whole information system.

Regarding the first point, human operate on three distinct levels: the informal, formal and technical [34]. Each is present in any situation but one will prevail at any instant in time. In the Organizational

Semiotics (OS) theory [7] an organization and its information system are considered a social system in which human behaviors are organized by a system of norms. The Semiotics Onion [35] is an artifact of the OS that represents these three levels (see Figure 6): the **informal**, where the organizational culture, customs and values are reflected as beliefs, habits and individual behavior 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 [25]. Therefore, any technological artifact is embedded in a formal system which, in turn, exists in the context of an informal one.



Figure 6. The semiotics onion

The structure represented by the Semiotics Onion calls attention to the need for i) considering elements that are manifested in each of the three levels and ii) approaching the elements from each level in a connected way. For instance, in the previous section we evidenced the existence of elements in the context of social software that are manifested in the informal (emotion and affection), formal (collaboration) and technical level (accessibility). Neglecting elements placed in any level prevents designers from understanding the elements and their relationships in a general way. On the other hand, if we are to consider these elements, we must approach and deal with them in the three levels simultaneously. For instance, identity is an element related to personal (informal) aspects of users that are reflected on/by the social world. However, this element also has a formal aspect, such as a formal definition of what it means or a set of norms and rules that model its components; this formal aspect can support understanding the way this element is established in people or organization's culture and in creating a technical representation of it as a feature in a computer system, e.g., a user's profile.

The Values Theory [36] defines values as desirable, trans-situational goals that vary in importance and that serves as guiding principles in people's lives. In 2007, researchers from academia and industry from different countries and with different knowledge bases (e.g., computing, design and social sciences) met in Seville, Spain, to discuss the area of HCI in 2020 [29]. Among the main questions raised at this meeting one was strongly mentioned: the need of keeping human values in the core of HCI.

Each culture develops specific values that influences the way people will see a technological



innovation [34]. 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 us challenges that were not faced before. Therefore, regarding the second point we highlight the need of approaching the elements involved in the context of social software in terms of values: informal, formal and technical values that are situational, interconnected and bound to cultural aspects. These values should be discussed and charted according to the way they are supported, promoted or inhibited by technologies [29] and also according to way they are related to each other. As discussed in the previous section when suggesting accessibility as a new element, identity, groups, collaboration, adaptability should all be considered in terms of values. Privacy, security, autonomy, reciprocity, portability, etc., are other possible candidates because they also seem to be important to users and, therefore, critical in the context of social software.

The third point refers to an understanding of the design of social software from a social perspective (see Figure 6): "as a movement that starts in the society, crosses the informal and formal layers of signs, towards the construction of a technical system, returning back and impacting the society" [20]. In summary, to design systems that effectively meet users' demands, accessible, and that reflect the values of the people they are intended for, we need a new Science of Design aligning system development with social practices with the end user.

## 6. Conclusion

The process of designing social software is highly complex because we must consider human factors, group dynamics, social, psychological and cultural aspects to understand how to design a system that effectively satisfies the needs of its users and that really meets the demands imposed by the social context. In this paper we have focused on social software design and understanding. First, we reviewed some definitions to the social software term and presented a constructed meaning for it. Further, we introduced the Honeycomb framework and, based on an analysis of an inclusive social network and grounded on a literature review, we revisited this framework discussing its elements and suggesting new ways on it.

The main points we highlighted in this paper were the need of considering elements manifested in the informal, formal and technical levels of information; the perception of these elements as values bound to cultural aspects of people, groups, organizations and their environments; and the view of social software

design from a social perspective. As a challenge, we point out the need of developing theories, methods and artifacts that support designers in placing values at the core of the design of any technological artifact. Theories and concepts such as Organizational Semiotics [7], Socially Aware Computing [20], Object-Centred Sociality [28] and Values Theory [36] motivated our discussion in this paper and are good candidate for grounding future investigations.

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