Hindawi Publishing Corporation
Advances in Human-Computer Interaction
Volume 2012, Article ID 574276, 10 pages
doi:10.1155/2012/574276

Review Article

Integrating Decision Support and Social Networks

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Received 14 July 2011; Revised 29 March 2012; Accepted 16 April 2012

Academic Editor: Arun Kumar Tripathi

We elaborate on the shifting of decision support systems towards social networking, which is based on the concepts of Web 2.0 and Semantic Web technology. As the characteristics of the relevant components are different from traditional decision support systems, we present necessary adaptations when adopting social networks for decision support within an organization. We also present organizational obstacles when adopting/using such systems and clues to overcome them.

1. Introduction

The overall objective of decision support systems (DSSs), whether individual or group based, is to counterbalance decision makers' intuition, against rational techniques or models (multicriteria decision-aiding methods for instance), in order to improve decision-making. As a side effect, using DSSs also appears to reduce decision time, enhance user satisfaction, improve the ability to explain the reasons for deciding and accepting those decisions (i.e., decision reconstruction [1]), and facilitate knowledge acquisition (see, for instance, [2–4], for further insights, as well as [5–7] for some of the process drawbacks).

Decision-making can be seen as an organizational routine [8], traditionally consisting of an organized task, which requires the contribution of cooperative groups. According to [9], such groups have specific properties and they act in contexts that are different from the ones of negotiation, in the classic sense of that term. The characteristics that distinguish the two situations arise from differences in goals and objectives convergence, power relationships and interdependencies that are normally present, the possibilities of sharing information, and relevant behaviors (not to abandon a negotiation for instance). In the context of this work, a cooperative group is constituted by individuals who wish or need to reach a cooperative solution and that, therefore, are willing to contribute to the shared understanding of a problem [10].

To support decision-making, a large deal of work has been made since the earlier personal DSS. Literature on DSS thrived all over the years, with a great deal of prototypes for research demonstration of decision models or of enhanced collaboration functionalities, with only few, though remarkable, building their way into the market ([11–14], among many others). These systems followed the research advances in databases, artificial intelligence, operational research, psychology, and, especially regarding the focus of this paper, web development, which is supported by a group of technologies commonly known as Web 2.0 and Semantic Web—the so-called Web 3.0—which present an enhanced ability to connect and automatically organize the content of information spread across multiple pages or sites [15], being the basis of social networking.

Social networking technology is changing the way common people and organizations interact and share information. Just to share a few numbers, by the time we wrote these lines, Facebook had more than 500 million users (http://www.facebook.com/press/info.php?statistics, last accessed 2011-07-05), LinkedIn: 100 million members in over 200 countries and territories (http://press.linkedin.com/about, last accessed 2011-07-05), and Twitter: around

200 million users (http://www.bbc.co.uk/news/business-12889048, last accessed 2011-07-05). Of course these numbers are not, by far, exhaustive, and the referred social networks are just some of the most popular ones, skipping other types of software that have been called as social software [16, 17], such as Wikis, blogs, and multimedia sharing. Being so, we believe it is safe to say that social networking is here to stay and that it is only natural that decision support should benefit from its possibilities.

The use of social networking for decision support is still a rather new subject, although some research has been done on determining the adequacy of social software towards decision support [18–22].

Rather than advocating a "revolutionary change" of DSS to incorporate social networking, our intent is more modest. First, we want to illustrate the potentialities of Web 2.0/3.0 towards decision-making and decision reconstruction processes. Second, from the characteristics of social networks, the ones of Web 2.0/3.0 and the characteristics of a model to support decision-making and reconstruction [23], we propose the characteristics of the components needed in a social network for decision support systems. Finally, we present organizational problems when adopting/using such systems and clues to overcome them.

The remainder of this paper is as follows: in the next section we present a literature review on organizational decision-making, Web 2.0/3.0 and Enterprise 2.0; in section three we elaborate on the fundamental activities for decision and reconstruction support, but modeled using the concept of social networking; the last section is dedicated to concluding remarks.

2. Towards Decision Support Social Network

As group decision-making support differs from personal decision-making support, escalating group decision-making support to an organizational level cannot occur without necessary adaptations. Those adjustments arise from the need of integrating multiple teams within highly collaborative and heterogeneous (though intertwined) group decision processes, making it necessary to manage the dependencies between people, processes, organizational units, and artifacts. In this context, three basic types of dependencies can be considered: flow, sharing, and adaptation. The flow arises when some activity requires the results of another activity. Sharing dependencies occur when multiple activities demand the same resource (people, machines, space, etc.). Finally, adaptation arises from the need of a proper fit among organizational activities.

As organizational activities tend to grow in complexity, so does the corresponding organizational need to formalize and normalize them. However, rather than imposing a rigid solution, formally defined processes should serve as a framework to provide structure to the individual and collective behavior [24].

It is easy to understand that decision-making benefits from the existence of an organizational structure, as long as it does not become a rigid and imposed process. Feldman and Pentland [8] describe that, within organizational boundaries, two categories/models of intertwined routines are present: the ostensive and the performative. According to the authors' view, these organizational models are a privileged source for explaining organizational flexibility, behavior, and change and, therefore, a privileged information source to assess both opportunities and constraints for organizational decision-making.

The ostensive models possess an explicit description on how processes should take place and be executed, usually followed by detailed examples, using tools such as Business Process Modeling Notation and Unified Modeling Language diagrams (namely, behavior and interaction), to describe, for instance, a workflow process. The descriptions are commonly built into manuals for performing a task or process that ostensively seeks to impose a specific and detailed way for accomplishing a task or a process.

Performative routines emphasize the description on how the tasks or processes are actually done, bringing it close to the grounded theory research approach [25]. This approach documents, records, and carefully analyzes the behavior of people, building an explanation or understanding of the processes and structures that underlie it.

If we focus on the so-called traditional decision-making process, it is easy to realize that it forces a large amount of task-structure on the group, and therefore their activities are framed by the ostensive approach, as the decision process employs an automated form of the three-phase model of intelligence, design, and choice [26], in which the process expectedly evolves from a divergent to a convergent state through a well-defined sequence, usually following an iterative process [19]:

(a) problem analysis and definition occur during the intelligence phase;

(b) divergence is supported through the generation of alternatives and, as the alternatives are evaluated by the group, the convergence process evolves;

(c) during the design phase, possible solutions to the problem are generated (divergence) followed by the merging of related ideas and elimination of redundant or irrelevant ideas (convergence);

(d) choice involves divergent evaluation of the previous idea set and convergent selection.

To broaden the utility of the previous "traditional" structure within the context of organizational decision-making (again a context of multiple intertwined decision processes and involved people), organizations should also focus on how the processes are actually done, instead of only regarding (or imposing) how they should be done, if there is a real interest in developing an adequate organizational group decision support system. The social network model [27], which we will use to ground the social network for decision support, describes the interactions that actually occur in a context where the workspace (location) is considered in a wide and rather virtual manner. As networks of information, opinions, trust, and energy are recognized as essential to organizational processes, this model identifies the key players for possible causes and potential disruptions in communication or

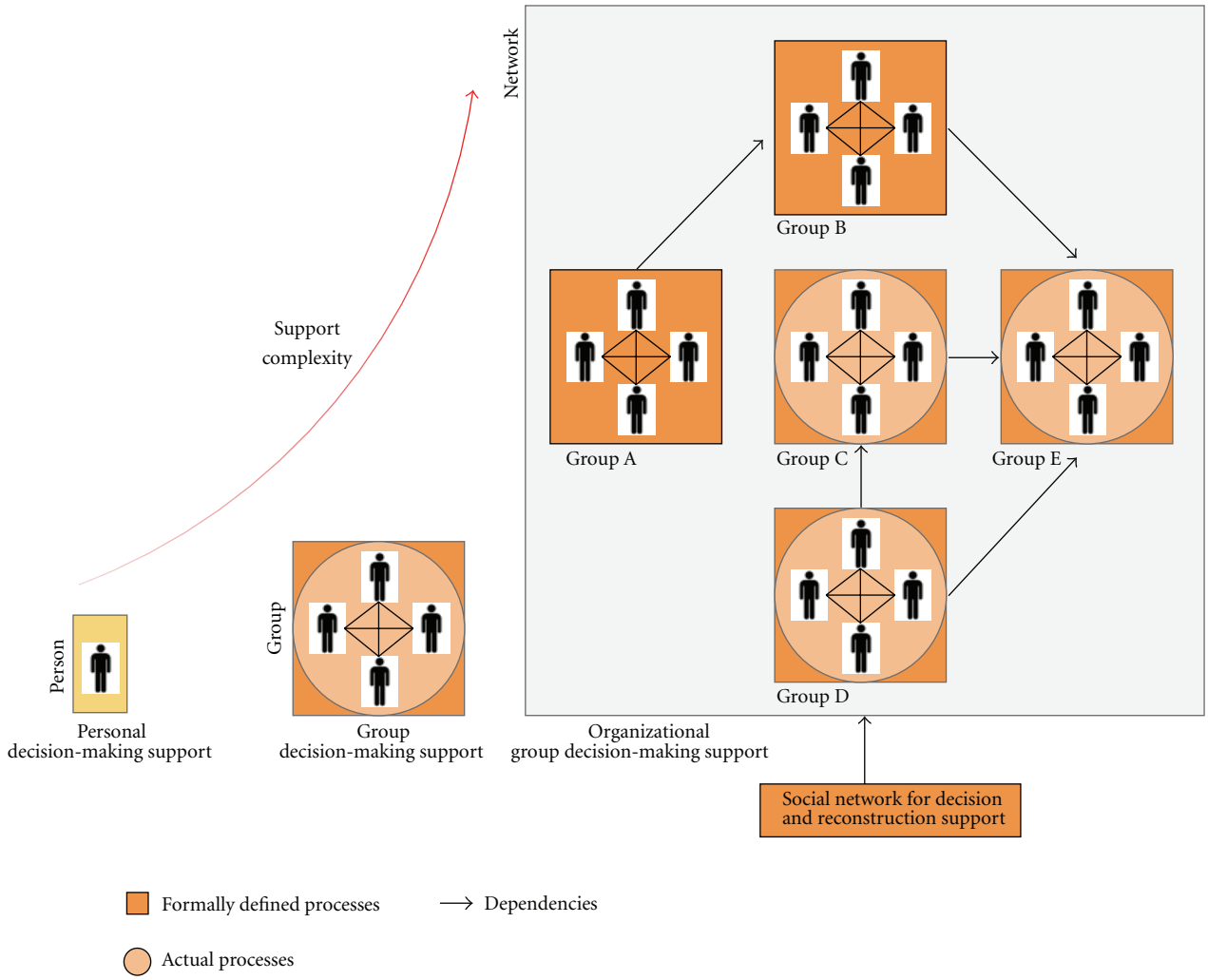

Figure 1: Using the social network model for organizational group decision-making support.

cooperation, the subgroups created on an *ad-hoc* basis, and so forth. The social network model is also used as a method or research tool [28] when studying the relationships and interactions between different actors. Although originally designed for studying players within physical contexts, in which data were collected by direct observation or surveys [29], this method began to be preferentially used in virtual and computer-mediated environments [30], gaining a significant expression in the last decade. In addition, the existing tools to support this type of collaboration are usually prepared to easily and automatically record, archive, and produce a large amount of data to analyze [31], making it very suitable to ground an effective group decision support at an organizational level. Figure 1 synthesizes the previous considerations, showing a complexity increment in group decision support, as we progress from personal decision support to an interconnected network of group decision activities. The organizational network intricacy (based on multiple teams and dependent activities) determines that ostensive approaches to decision-making may prove themselves inadequate in certain activities, determining in-group adaptation. In this case, formal procedures should be used as a framework for deciding, rather than a rigid procedure to follow. The utility of performative models, such as the social network model, is to assess actual practices and contribute for reassessing formal procedures, promoting organizational flexibility and proper support for an integrated organizational group decision support system.

2.1. Decision and Reconstruction Support: Combining Ostensive and Performative Approaches. As already stated, the so-called traditional decision support is framed by an ostensive approach along the sequential and cumulative phases of the decision-making process. However, at the end of the process, it is not always easy to understand the rationality of the early stages, as DSSs usually "flatten" the process details, placing emphasis and focus on presenting the final decision (which is particularly visible when reporting is performed using automatic procedures). This situation presents implicit losses for organizational memory and knowledge management, especially in contexts of distributed work [1]. For instance, it seems easy to foretell that, regarding a

specific decision process, if the involved decision makers leave the organization (due to retirement, for instance) or the produced organizational memory artifacts (mainly, related documentation) are missing or deleted, it might be virtually impossible to know the reasons for a given decision. To tackle this problem, Antunes and Costa [1] define decision reconstruction as the process that allows an individual or group of individuals, whether internal or external to an organization, to understand how a particular decision was reached in the past.

Research on decision reconstruction seems to have focused on visualization tools and explanation subsystems associated with expert systems [32]. However, these systems are usually specialized in specific areas, making them unsuited to support the dynamics of a group involved in decision processes, requiring collaborative work and, as so, rather fitted for explanatory analysis.

Performing decision reconstruction over GDSSs (group DSSs) can be a way to overcome the pointed-out difficulties regarding the loss of knowledge, which remains on individuals, knowing that such systems are the natural tool to support decision-making groups. It is known that information technology, in general, fosters the creation, transfer, storage, and application of organizational knowledge. GDSSs, in particular, can facilitate knowledge tasks by capturing and storing related information and by supporting collaboration and information sharing in mutually dependent contexts. They can provide a collaborative learning environment where people can interact, create, transfer, and apply knowledge acquired and shared by groups [3]. Nevertheless, these objectives can only be achieved if the underlying information and collaboration model of such systems support more than the mere sequence of decision-making stages and, therefore, if it is able to provide adequate support for explanatory analysis.

A framework to support decision-making and decision reconstruction needs to consider some key activities [33]: supporting contributions; preserving information, structure building, supporting choice, and representing information.

A contribution is every input provided by users of a GDSS solution and every solution proposal provided by the system to the users, within a GDSS meeting. Contributions are, therefore, human or system based, reflecting an expected interactivity with the system, though deliberative or quantitative (when the decision process requires discussion and debate or a quantitative analysis).

Contribution support needs to cover a multiplicity of approaches to sustain different ways of building a collaborative discourse (according to [34]). These ways range from a simple question-reply pattern to more elaborate argumentation models supported by argumentation theory (as seen, for instance, in [35–37], among many others).

Unbinding GDSS development from any preestablished discourse structure frees the user to adopt existing structures, to combine them into new ones or even to traverse among different discourse structures. Nevertheless, in order to decrease the cognitive load in decision reconstruction, the explanation of an applied discourse structure (elements and relationships) should be made available to the final user [23].

The essential goal in preserving records is to enable reconstruction of past events. The loss of information is of course a major barrier in rebuilding decisions, in knowledge transference (tacit or explicit), and, ultimately, in formation of the organizational memory. By information loss we do not mean any technical failure in persistence but intentional acts of erasure, automatic cleaning/updating processes, summarization, and so forth. Bearing the intention to register all the steps in decision-making to foster decision reconstruction, instead of deleting information, while avoiding information overload, contributions should be marked as "active" or "inactive" (meaning that an inactive contribution represents a "deletion" but without actual information loss). Thus, it is always possible to revisit the past, reconstructing the system state at a specific moment, to better understand the evolution of decision-making.

Structuring is a common feature in decision support systems. The support is given primarily through relationships and ranking of contributions, for example, the classification into "discussions," "topics," "background information," "questions," "replies," and so on. These categories can be linked with a wide variety of meanings, including belonging, time dependence of cause-effect, algorithmic or human-based (voting, for example), and so forth. Decision-making processes can also benefit from using predefined formats for the contributions (templates) and, of course, validation rules for such formats.

Although the decision group remains cooperative, divergent contributions are expected. To deal with this situation, the systems typically provide technical support for convergence or choice. These techniques seek to reach consensus, whenever possible, in order to achieve a common group result. They can be algorithmic methods for decision support of variable mathematical complexity, or human-based as polls or surveys. It can also happen that the final results required the successive application of different techniques or an iterative application of the same technique. It is essential to keep track of the convergence process, including the used methods and the variations in groups (e.g., number and constitution) during the successive application of these methods. This increases the recording capacity for rebuilding decisions and greatly improves automatic reporting on the explanation/justification of achieved results.

The above does not mean that a decision agent cannot gather information about past decision-making processes in traditional GDSSs; however, they usually do not recognize their relations. The responsibility to grasp the impact of their mutual interconnections is still human. We stand that decision-makers need to understand how past decisions affect present decision-making, and therefore such processes should be interconnected, so the reasons why the previous decision-makers acted, as they did, becomes easy to understand.

The relationships between the discussion elements, covered by the information model, also have to provide the necessary basis for its visual representation. In order to enhance the utility of the visual representation in decision reconstruction and especially to respond to different information needs and cognitive styles of decision reviewers,

a combination of tools for filtering, sorting, selecting, and displaying multiple relationships becomes a need. The important point is that this type of functionality must be viewed as a toolkit that different types of groups with different applications can adjust to their needs [34].

As stated before, connections ensure structure, sequence, authoring details, and all association between contributions, especially regarding discourse or argumentation attributes. All of that provides the basis for a "frame-to-frame animation" instead of a "final photo" representation, in spite of the fact that it is doubtful that a single way to visualize a GDSS discussion is attainable (or even desired).

2.2. Embedding Web 2.0/3.0 into the Process. The aforementioned interconnections force us to think of an underlying model for GDSSs as a network of people and artifacts, which are created over time. Such a network needs to encompass information, opinions, knowledge, and decision-making capacity. As so, they engender more widespread patterns of collaborative work and can be marked by increased levels of disagreement or conflict [19]. We find these concepts directly related to social networking and the underlying Web 2.0/3.0 support.

The term Web 2.0 is used to describe applications that take advantage of the network nature of the web, encourage participation of community members, and are inherently social and open, aiming at enhancing information sharing as well as fostering collaboration [38].

The popularity of the term Web 2.0 echoed the common people and called for a set of technology that puts users at the center of the applications [39, 40]. There is a clear change on how technology is used: the application is what users make of it, and so, the more users you have, the better the application becomes. It involves a major conceptual shift on how information is created, validated, managed, shared, and consumed. Essentially, Web 2.0 applications add a multitude of users who are responsible for all this information management activities.

The term Web 2.0 classifies applications such as Wikipedia, Facebook, YouTube, Weblogs, Microblogging, social bookmarking services, and so forth, which are also termed as social software [20]. Although social software and traditional GDSSs are clearly related in terms of their objectives (enhanced collaboration, information sharing, and knowledge acquisition), in an organizational perspective they present major differences: traditional GDSSs present a "top-down" approach, expressing its ostensive character (GDSSs are usually designed to deliberately guide the interactions of groups in decision-making processes), while in social software users, in the public internet, generate the content and define both the rules and reasons for usage [41], and thus social software approach is essentially "bottom-up".

The term Semantic Web [42], considered by many an evolution of Web 2.0—hence the term Web 3.0 [43]—though there are many detractors of this expression, means a set of technologies that includes ontologies, software agents, and rules of logic. These technologies can greatly improve the ability to connect and automatically organize the content of information spread across multiple pages or sites [15]. While Web 2.0 focuses on humans, mostly by providing efficient platforms for information sharing, the Semantic Web focuses on machines, by providing machine-processable information [38], especially through semantic languages and tools for ontologies and metadata management [44].

The base of Web 3.0 applications resides in resource description framework (RDF) for providing a mean to link data, which has been created from multiple websites or databases. With SPARQL, a query language for RDF data, applications can access native graph-based RDF stores and extract data from traditional databases [45]. Web ontology language (OWL) is another language which can play a main role in the applications of Web 3.0. OWL and RDF are much of the same things, but OWL is a stronger language with greater machine interpretability than RDF. OWL is built on the top of RDF but comes with a larger vocabulary and stronger syntax than RDF [46].

2.3. Enterprise 2.0. Companies have begun to explore and apply Web 2.0/3.0 technology and concepts in their intranets. These applications are known as Enterprise 2.0, a term coined by [47] which embeds an enormous potential for improving information and knowledge management within organizations. The term itself represents the adoption of social software in an enterprise context, referring to the phenomenon of a new participatory corporate culture (with regard to communication and information sharing), which is based on the application of various types of social software technologies [20] and on a gradual and permanent change in the way information is created, organized, distributed, retrieved, and applied [48].

Regarding the creation of information and contrarily to the traditional GDSSs "top-down" approach, Enterprise 2.0 stands for a "bottom-up" approach where information is produced by mass collaboration of peers. This is a major shift, as normally users have little opportunities to change or influence organizational information structures [47].

In Enterprise 2.0, organizational information becomes more democratic, surpassing the existence of fixed and institutional links and directories, through taxonomies over information objects, but performed by ordinary people—the so-called folksonomy—who create or work with certain information and freely add labels (tag) in the way they think more convenient. This "bottom-up" approach can be very useful for separating and finding information, using Semantic Web techniques.

As for information distribution, it changes the usual "push" pattern (automatic delivery of information to a client or application) to a "pull" pattern (in which the client or user will seek the information deemed necessary). It is therefore a proactive approach with regard to obtaining information, avoiding receiving unsolicited information [48].

The information recovery (or demand) depends on the way it is organized and classified. The use of *folksonomies*, ontologies, software agents, and social classification of information relevance (through registered classifications performed by past information users, according to their

perceived relevance) provides a larger spectrum of possibilities in searching and recovering relevant information. Historically it is known that, as organizations grow, it becomes increasingly difficult for people within them to find a particular information resource, not only because of their number and diversity but also derived from the fact that such resources are usually stored under a formal and rather fixed organizational taxonomy [48]. Enterprise 2.0 technologies can make large organizations more searchable, analyzable, and navigable, making it easier for people to find precisely what they are looking for [47].

Finally, the application of information changes from a rather anonymous, personal one-way publication and use, to a more social use, allowing for instant feedback and two-way communication about information. The usage of the information itself can add new information [48].

Regarding organizational decision-making and decision reconstruction, rather than a completely different approach, the concepts of Enterprise 2.0 complement it quite well. The unstructured nature of decision-making is very well suited for the *adhoc* nature of social networking based on different tools, depending on the problem in hand, with users organizing information according to the problem itself, rather than a preformatted way of collaboration that might not be appropriate for every single case. This situation fits rather well the early stages of the decision-making process [22].

This, however, does not mean that more structured approaches cannot be used within the social network (e.g., multicriteria decision-aiding, voting, statistical models). However, due to the social network nature, their use is not bounded by an organizational view on how the decision processes should be made but rather on users' agreement to do so, making the decision process more dynamic and flexible. Moreover, the interconnection of users' contributions and their classification (tagging) offer enhanced possibilities for decision reconstruction using Semantic Web technologies.

3. A Social Network for Decision and Reconstruction Support

The change in the nature of the medium and the more active role of users require both technological competences and new business models for companies. On one hand, users need to acquire individual expertise to select, reflect, and redistribute online content on the basis of the quality of the given information, and, on the other hand, companies need to acquire organizational competence to react to user-generated content and to interact with peer groups in their respective business domains.

The activities considered as fundamental to support a collaborative group involved in the decision process will be, in what follows, modeled after the concept of social networking. The issues that we have considered more relevant are people, content, structure, and representation.

3.1. People. Social network applications rely on its users to create a single data source, quite difficult to replicate because it is difficult to replicate the contents and structure that are generated over time, as the outcome of the interaction between users and between them and a system. One of the key issues is to develop a critical mass of users that create, update, and share knowledge on a regular basis [49].

Born after 1995, Generation Z, the so-called *netizens* [50], comprehends social networking as the usual way to establish relationships, and it is expectable that they will work as they socialize: on-line. Their concepts of space, place and cultural identity have changed radically. English, or a kind of English, has become the *lingua-franca* [50]. The global economy, networked, with pervasive connections, is the context in which this generation will live in the future. When Generation Z arrives to the labor market, it is expected that in the future those models, as well as Web 2.0/3.0 technologies, will be adopted very quickly within the organizational culture of companies.

According to [51], motivation is necessary to actively involve people in knowledge creation and transference. This motivation can be intrinsic—the pleasure and satisfaction obtained from the experience—or extrinsic, based on the perception of the associated value with the activity. Reasons already identified in the literature include to obtain personal satisfaction, to help others make their job easier, to avoid duplication of future efforts, to increase information access, to enhance job security or career advancement, to improve their reputation, to increase their influence, and to achieve economic rewards, affiliation and belonging, power/prestige, and entertainment [52, 53].

According to [21], social network decision-making must explicit the notion of decision making trust, as friendship, *per se*, does not identify people as good decision makers. In organizational decision-making and in work-related social networking, processes are expected to be more formally structured and serious. Factors such as the familiarity with the technological features and communication tools of the social network site, or satisfaction with past interactions with other community members, are much more important antecedents for online trust than mere acquaintance or friendship [52].

Although the social network model advocates that users share the same relative importance in information creation and that the network of users self-coordinates its activities, GDSS literature has demonstrated the benefits, in efficiency and simplicity, of having a facilitator or coordinator within a decision group [6, 54, 55]. This means that even within a social network scenario, the attribution of different social roles to users might be beneficial for the decision-making process. The facilitator role is usually determined by hierarchy and organizational function (e.g., a senior manager and the head of a department), a situation that might not be the best if the chosen person lacks the necessary skills or competence to ensure such functions. Within the social network setting, roles (in general) should be socially attributed by the people participating in a specific task or decision process, promoting a "right person for the right task" culture.

Nevertheless, if the collaborative work culture is absent and employees are not prepared to share information and to

trust each other, a decent enterprise platform based on Web 2.0 technologies might end up without having a critical mass of employees adopting the tools for communication [56].

3.2. Contents. User's contributions are the key element of content, whether in traditional GDSS or in social networks. In both scenarios there is the possibility to associate metadata to information resources—the so-called tagging. In addition, ratings according to certain argumentation models can be made available or be created by the users. The use of semantic techniques to support this activity may also be available. As referred before, within social networks, tagging allows users to create *folksonomies*, that is, allows them to freely classify information, without the need for a preexisting information structure, in which information resources need to be fitted.

Although tagging is recognized as an user-based task, a social network for decision and reconstruction support needs to ensure an automatic tagging feature to emphasize the issues of temporal information (time stamp) and those relating to the authorship of the content, even if it results from contributions of multiple users.

Munson [53] mentions some of the difficulties in creating content for multiple users that must be addressed and overcome. A recommended way to overcome these inhibitions is to ensure that contents are not seen as a single document, but as a set of written contributions, whose evolution is clearly expressed. Regarding organizational decision-making, this feature promotes a synergic effect (the overall is greater than the contribution of the parts), while drastically changes the notion of information authorship and, consequently, the rewarding procedures within a company's human resources policies.

In order to promote responsibility and to prevent liability issues, it seems important to ensure that within organizational decision-making based on social networking, and as in a usual GDSS organizational environment, the decision group (the people actually responsible for deciding and making thing happen) is known and identified by the company, even if they are allowed to contribute anonymously or even to get opinions from users outside the organization.

Another important issue is the validity of the contents. There is a need to perfectly characterize "inactive" content, as well as previous versions of information resources, in order to allow the reconstruction of the information evolution, as well as the reasons or causes for that evolution, within a context where contents can be seen as perpetually being in a "beta" version [39].

When thinking of associated creation and maintenance costs of lesser-used content, especially in decision-making processes that occur infrequently or with a low perceived impact, social networking also provides changes in usual conceptions. Traditionally, the cost to create and maintain information with little use (or demand) is considered too high in face of its expected future profitability. In a social network for decision and reconstruction support, the costs of creating and maintaining any kind of information are diluted; that is, it changes the typical approach of fixed costs, as they become irrelevant since the system is already mounted and used. Classic management textbooks stand that the organization needs to focus on those few products that are highly demanded to ensure greater profitability, by reducing the individual amount of fixed cost incorporated by each product. This rule of thumb changes when we consider systems based on the concepts of Web 2.0 and social networking, as they aim at making information niches more accessible to their users and at exploiting the economic value of those niches [39, 49].

In social networking users are expected to cooperate without control mechanisms. Within an organizational context, however, this approach is not problem-free. The problem stems unavoidably from the alignment of organizational expectations with the users' ones. These expectations are inseparable from existing organizational culture and ecology of communication (use of notifications, mailing list, meeting scheduling procedures, reports, memos, etc.), hierarchy, required (or perceived) security level to access information [57], and the expected outcomes from specific decision-making processes.

Many executives and managers support (at least in principle) the idea of encouraging free interaction and knowledge sharing as a form of innovation, added-value creation, and competitive advantage building. But in many situations this approach is not properly implemented. In general, performance is rather measured by what each user has achieved, than for what they shared or to the extent they have helped others. When it comes to information, individuals are usually held responsible for its accuracy and timely deliverance, thus possessing an underlying idea of obligation and control: this situation is not compatible with the vision of collective creation of information.

The existing hierarchy, especially middle management, is threatened by the attitude of freedom in the creation and access to information. A strong hierarchy becomes an obstacle for adopting any technology that advocates open collaboration. Being a communication channel itself, the social network carries the possibility of a real disruption in organizational communication and of the hierarchy itself.

Finally, there are legal and ethical reasons for preserving information confidentiality in organizations. As so, we stand that a social network for decision and reconstruction support requires different privacy levels (open to all: public internet based; organization only: intranet based; and by invitation: extranet based). These different levels come with great uncertainty on the real possibilities for implementing all its features, as Web 2.0/3.0 are known to be hacker-prone [46]. Careful planning and implementation need to be carried out so that functionality, privacy, and security do not become compromised.

3.3. Structure and Representation. Threaded structures, decision trees, hyperbolic graphs, knowledge maps or even plain reports, and charts are just some of the most common representation schemes within GDSSs. Also, GDSSs usually impose some type of collaborative discourse [34], ranging from simple question-reply patterns to more elaborated

structures based on the argumentation theory [35, 58–62]. The type of selected discourse structure is usually thwarted to every type of discussion or discussion phase or section. The solution, once again, embeds GDSS of the already-referred ostensive character. When planning the needed elements for an effective and easy-to-do decision reconstruction, it is clear that someone trying to make sense of previous decisions, and looking for its reasons, a person, who we will name as a decision reconstruction agent, will have to follow the intrinsic logic of the imposed discourse structure. This situation stiffens the decision reconstruction process as it does not take into consideration the decision reconstruction agent's cognitive preferences.

In social networks, users will adapt their discourse structures and strategies to tackle a problem, in a problem-to-problem basis, making the contribution support more flexible (although the use of contribution templates can be proven beneficial). Their representation is also potentially enhanced by user-tagging and the use of the Semantic Web techniques. These techniques provide a wide range of ways to analyze and exhibit information. Top-down, statistics, cluster and detailed cluster, comparison, usage analysis, normal and hyperbolic graphs and trees, hierarchical, cross-reference, and metadata analysis are just some of the possible views [63–65]. A social network for decision and reconstruction support should transparently embed these techniques into tools, making them available to non-Semantic-Savvy users.

The enhanced possibilities for visually representing information not only foster the decision reconstruction support but also enhance knowledge discovery and a much more interconnected view of organizations and processes [64].

4. Conclusions

Having realized that social networking is not a passing craze as well as its pervasive nature, it is easy to understand that today, and more than ever, there is an enhanced possibility for cooperative decision-making. However, and especially regarding organizational processes, the technology for such cooperation, based on Web 2.0/3.0, imposes different behaviors from the ones traditionally expressed in decision support literature.

In this paper, we presented three main axes where such changes will be felt: in people, contents, and structure/representation of information. Although all the changes ultimately derive from the technological evolution, being able to take advantage from it still remains a human-based issue. If organizations insist on avoiding social networking, by merely considering it a means for distracting human resources, and on imposing a formalized approach to organizational procedures, namely, decision-making, it can be said that they will hamper exciting possibilities for innovation, flexibility, and group dynamics.

Nevertheless, enforcing social software in enterprise contexts still seems rather visionary (some could even say naive). It is important not only to consider which organizational procedures could benefit from it but also to understand the necessary adaptations to public social networking within the organizational context, as the benefits of the social network model should not outweigh underlying organizational security, information privacy needs, liability, and ethics.

Acknowledgment

This work has been partially supported by FCT under Project Grant PEst-C/EEI/UI0308/2011.

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