Integrating Semantic Web and Web 2.0 Technologies for supporting Collaboration Engineering

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Abstract

In this paper we present ongoing research about a supporting framework that improves Group Support Systems (GSS) for Collaboration Engineering (CE). CE uses a pattern design approach which allows groups with no design skills, and only limited facilitation skills, to design and execute efficient and effective collaboration processes. Our research tries to use Web-based GSS technologies to support the CE approach. We assume that Social and Semantic Web technologies could enhance CE providing relational (formal rules) and shared information (community experiences). This leads to a new GSS approach that supports groups in designing and executing a collaboration process considering users contributions for a structured collective knowledge sharing process.

1 Introduction

Collaboration is a social and interactive process, where participants join efforts toward a group goal. The outcomes of a collaboration process can be affected by individual, group-related, organizational and social factors.

1.1 Collaboration Science

Collaboration Science studies these factors and develops concepts and methods that support collaboration work by assisting a group in combining the potential and expertise of the participants. A technical support is represented by a Group Support System (GSS) that offers a variety of tools that link a group via computers and assists them in structuring activities and improving communication [Nunamaker *et al.*, 1991]. This group-oriented framework allows the participants to work collaboratively toward a goal via the web by sharing and creating information simultaneously. However, research indicates that facilitation is a key success factor in the use of GSS [Nunamaker *et al.*, 1997], as it is difficult for groups to appropriate the GSS technology by themselves. Experience is necessary for the design of a collaboration process, its implementation in a GSS, and the facilitation during the process itself. For this reason, organisations use professional facilitators, who are experts in the design and execution of collaboration work and can improve group productivity. Skilled facilitators can be expensive and as a result most organisations cannot benefit from facilitation intervention [Briggs *et al.*, 2003]. The challenge is to find a way to design and execute an efficient and effective GSS-based collaboration process, which places no design skills, and low demands on the facilitation skills of the group.

1.2 Collaboration Engineering (CE)

Collaboration Engineering (CE) is an approach to designing and deploying collaboration processes for high value tasks which are a frequent part of routine work practices of an organisation [De Vreede *et al.*, 2005]. An example is the innovation process which creates substantial value for organizational stakeholders. CE intends to enable an organisation to increase the quality of collaboration for this kind of recurring mission critical task in the organisation. The premise of this approach is that for recurring collaboration processes, ongoing professional facilitation support is too expensive. Therefore, the preparation and design is done by a collaboration engineer (expert facilitator). The resulting design can be transferred to a practitioner (a domain expert in the organization), who should be able to guide a group of participants to achieve its goal in a satisfying way. The requirements for the collaboration process design, are recognized by the practitioner who has no deep knowledge in designing the process, and only limited facilitation skills. Therefore, CE uses a pattern approach to subdivide and classify collaboration processes into five key patterns of collaboration, which together form a pattern language for group collaboration [De Vreede *et al.*, 2005]:

1. ***Diverge**: Move from having fewer to having more concepts.*

2. ***Converge**: Move from having many concepts to a focus on and understanding of a few deemed worthy of further attention.*

3. ***Organize**: Move from less to more understanding of the relationships among concepts.*

4. ***Evaluate**: Move from less to more understanding of the benefit of concepts toward attaining a goal relative to one or more criteria.*

5. ***Build Consensus**: Move from less to more agreement among stakeholders so that they can arrive at mutually acceptable commitments.*

These collaboration processes (called thinkLets) are "named, packaged facilitation interventions that create a predictable, repeatable pattern of collaboration among people working together toward a goal" [De Vreede *et al.*, 2005]. Research has shown that practitioners who know the specification of a thinkLet can predictably and repeatable engender the pattern of collaboration a given thinkLet is intended for, even without any facilitation expertise [De Vreede *et al.*, 2005]. We assume that these properties of CE could be improved with a Web-based GSS technology. The main challenge in our research is therefore to develop a conceptual design that implements an instance of a collaboration process with GSS and provides design guidelines for an appropriate facilitation support by practitioners with limited facilitation skills.

GSS research requests to reduce the cognitive costs of searching for, assimilating, and remembering the information as well as to create a common ground for interaction among several cultures for global teams [Nunamaker *et al.*, 1991]. We think that from a practical perspective, this condition can be considered not only for the execution of a collaboration process, but also for its design. Therefore, we assume that a combination of CE with Semantic Web (for the formalization of the information representation) and Web 2.0 (for sharing information between groups and members) applications is an appropriate way of adapting information for supporting the design and execution of these collaboration processes. This combination would minimize conceptual load for inexperienced collaboration engineers and practitioners.

2 Current Research: A Web GSS Framework

Before discussing the idea of combining a collaboration framework with Social and Semantic Web applications, we first want to introduce our approach that is a Web-based GSS framework. We use the object-oriented approach of a thinkLet to create a Group Process Modeling Language (GPML) [Knoll *et al.*, 2008] that implement the pattern design approach of CE with a GSS by describing the data of collaboration processes in a compact representation. These reusable collaboration processes can be flexibly adapted for different contexts. The GPML uses the element thinkLet as a process template to create the collaboration patterns [De Vreede *et al.*, 2005] explained above. These patterns illustrate information about the order and type of the activities of a participant, the type and the value of the data elements that can be used and the influence of events on the collaboration process. By configuring the process information a process template can be adapted to a group goal. In this case, the defined activities of the thinkLet will be adapted. The GPML divides a collaboration pattern into repeatable atomic activities (like *to create a new contribution*, *to select a contribution from a list of contributions* or *to read information about the group task*) which represent a template of a user interface for an atomic activity of a participant [Knoll *et al.*, 2008]. By using atomic activities, the GPML can define personalized processes for the participants of a group. In this case the GPML differentiate between a sequence of activities of an individual participant and a group of participants which illustrates concurrent processes of participants with different roles.

Our first application of the GPML is a Web-based GSS for the first stages of an innovation process (the generation and selection of ideas) that links a group via the Internet and implements the activities of a collaboration process via a website [Knoll *et al.*, 2009]. This prototype is based on a framework that develops data structures and functionalities for design, execution and data management of a collaboration process. The GSS supports asynchronous communication, anonymous contribution and group-wide access to all entered contributions. Currently, the GSS uses text data as the medium for communication and presentation of information, stimuli, ideas and decisions. Processes like idea generation, clustering, selection and decision making are implemented as different collaboration processes which can be adapted and combined to the first stages of an innovation process. XML is used to define the elements of the GPML and the related configuration. The prototype provides functionalities to upload and store different templates into a library of collaboration processes. A practitioner can select a collaboration process and configure the GPML elements to a given group setting. However, the possibility of creating a "collaboration process" is static. In this case, the collaboration engineer and practitioner has no support at all, so that he/she has to decide, which elements have to be connected with another or how a process has to be adapt, trusting only his/her experience. For this reason, we think that the embedding or linking GPML to web based concepts – either from ontologies or dynamic Web 2.0 tools or services – would strongly extend the flexibility of collaboration processes.

3 Future Research: A Social and Semantic Web-based GSS Framework

Instead of only proposing a classic *static* access to the information, where a word is used to only express one concept, without taking into account its context, we want to use an ontology model for multi-criteria access [De Luca and Nürnberger, 2009]. An ontology is a formal specification of a conceptualization of a domain of interest [Gruber, 1993] that specifies a set of constraints that declare what should necessarily hold in any possible world. Ontologies are used to identify what "is" or "can be" in the world. It is the intention to build a complete world model for describing the semantics of information exchange, which nicely fits the needs of the GPML defined collaboration processes [Knoll *et al.*, 2008], where ontologies could be used to facilitate knowledge sharing and reuse. In this case, we want to enable collaboration engineers to use ontologies for creating and combining collaboration process templates. Here, a collaboration engineer can use a concept, its properties and the relationships between the concepts for creating new "configuration rules" that can be applied to the collaboration process. (For example the concepts atomic activities: (a) *to create a new contribution* and (b) *to explain the group goal* and the concept social group factor: (c) *to reduce production blocking* can be combined to the configuration rule: to support *c* use the sequence *b, a*.) Therefore, ontol-

ogy for a collaboration process template will define selection and design rules for the participant's activities in connection to different group and meeting structures. We decided to redefine the elements of the GPML and their relations included in "configuration rules" with RDF/OWL expressions (http://www.w3.org/TR/owl-ref/). This syntax should support a collaboration engineer in creating a template of collaboration processes for its execution with the Web-based GSS.

The resulting templates developed by the collaboration engineers will be made available for the practitioners, who can adapt them for specific groups and meeting structures. The selection process could be supported by tagging the template of a collaboration process with different parameters like *the tasks, the goals, the group size* and *the process time*. Also the collaborative Web-based GSS could help the practitioner in giving roles to the participants, specifying different individual activities. In addition, the practitioner could add information like *the motivation*, *the relationships between the participants* and *the professional level* to better schedule every individual participant in the group. In this way, the collaboration process is accelerated, adapted for different needs, and the practitioner would benefit from the changes and the new information produced by their and different groups. In order to integrate such resources with a Social and Semantic Web-based GSS implementation, we think that a form to define these requirements should be provided as well as a selection of different process templates that fit every single practitioner request.

We assume that the existing GSS could be improved with Social Web functionalities that influence the social factors such as *distractions*, *production blocking, social loafing* and *evaluation apprehension*. For example, during the collaboration process, a group could use feedback or competition tools to reduce social loafing. By connecting these technologies as applications for a GSS and defining rules for their use adapted to the collaboration pattern, the participants could be supported in creating and sharing information and ideas for collaboration work. These rules could consider parameters like *the time estimation*, *the conceptual ideas* and *the related results* of a thinkLet. These properties could be retrieved from already existing ontologies, browsed by all participants and integrated in the collaborative work, so that a real dynamic collaboration process could take place.

4   Conclusions

In this paper, we discussed the possible integration of Social and Semantic Web technologies with Collaboration Engineering and Group Support System. These applications could be used for supporting groups in designing and executing a collaboration work. We showed different ideas of integration discussing how our framework for a Group Support System would allow users to access processes in a collaborative way, sharing experiences and solutions with the newest Social and Semantic Web technologies. In the future work, we will include different other scenarios, analyzing more deeply how ontologies and Web 2.0 applications have to be implemented for GSS.

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