Towards a Functional Characterization of Collaborative Systems

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Abstract. In this paper we present major results of a detailed study about the functionalities that are present in different collaborative systems, realized as collaborative components. We have used this study to establish a methodology for the automatic generation of collaborative applications supporting group needs. The methodology is directed to any community of end users, who do not need to have any programming skills.

Keywords: CSCW, Collaborative Features, Collaborative Design, Web 2.0.

1 Introduction

Web tools such as Google sites, weblogs and wikis provide a usable interface to facilitate the configuration of a web application by an end user. Nowadays, these applications are mostly for individuals, but not for groups.

Collaborative systems (CS) design is a complex task [7], because the requirements from the end user community are critically required by the CS designers, and there is a growing number of new collaborative features (CF) available. Web end users are becoming increasingly involved and familiarized with the configuration of Web tools. Therefore, it would be desirable to have a collaborative tool to facilitate the creation of collaborative applications, which takes advantage of existing experience and facilitates end users' participation.

With the aim to automatically build collaborative applications, we have defined the concept of collaborative component (CC) as a software entity that gives functional support to individual or group actions inside a groupware environment to improve collaboration processes. A desirable characteristic of this kind of components is the independence of the environment and a wide flexibility in its configuration. The web 2.0 is a suitable environment to implement CCs and to collaboratively integrate CSs with them.

This article presents a study about the functionalities/features –that are managed by CCs– which are present in different CSs. The purpose of this study is to establish a methodology for proposing a Web 2.0 tool that provides to any community of end users the automatic generation of a collaborative application that supports its collaborative work, using a Web 2.0 CCs repository and a knowledge base of its application and use modes.

2 Study of Collaborative Features Supported by Collaborative Systems

Several authors have presented their taxonomy of CSs. Noble [10] proposes general purpose communication tools, special purpose facilitators of group processes, shared work and group sense making tools, and process support tools. Datta [8] identifies four categories based on user-needs: communication, organization, writing/editing, and engaging/networking. In the line with our approach, some collaborative processes were proposed by Bolstad [4]: planning, scheduling, tracking information, brainstorming, document creation, data gathering, data distribution and shared situation awareness, where CS categories were called to our vision of CC.

Our proposal extends Bafoutsou's work [2] and introduces a new category: the online social network one, due to the special attention of academic and industry researchers in these spaces [1, 3]. Below, the proposed five categories of CS:

File and document group handing systems: they facilitate the management of files and documents in group. They usually incorporate features such as files/documents management and storing in a central database, shared-view, individual editing and synchronous work with files/documents, as well as collective authoring and revision of these resources [2, 4]. Sometimes they facilitate basic communication services such as notifications and e-mail in form of messaging.

Teleconferencing or computer conferencing systems: they support synchronous and asynchronous discussion, messaging and audio/video conferencing [2]. They usually allow sharing files/documents, where users can see and work on them simultaneously through shared screens or shared whiteboards [5].

Electronic meeting system: they combine computer communication and decision support technologies to facilitate the formulation and solution of problems by a group [4]. According to [2] they support synchronous and asynchronous meetings. They typically provide support for slide presentations, anonymous collaborative whiteboard, meeting agenda, surveys, file/document sharing, collaborative file/document editing, application sharing, automatic generation of meeting minutes, messaging and synchronous discussion.

Electronic/collaborative workspace: the main aim of these systems is to provide teams a common working space [2]. Usually this includes a file repository, discussion support, task management, address book, and access to project workspaces.

Online social networks systems (OSN): they facilitate the linking between users, sharing and finding content, and disseminating information. According to [4], OSNs are based on a network formed by nodes which represent individuals or other entities linked by some kind of relationship, such as friendship, kinship, taste, common interests, among others. OSNs enable users to have a public or semi-public user profile, to manage lists of linked users, and to view and traverse these lists inside the system [4]. Bulletin board and synchronous/asynchronous messaging are often provided as well.

Table 1 shows the probability to have a particular collaborative feature (CF) in a collaborative system category (CSC). We have called to this probability feature presence index (FPI). Its value is calculated as:

$$FPI\ (CF_i, CSC_j) = \#\ CS\ in\ CSC_j\ with\ CF_i\ /\ \#\ CS\ in\ CSC_j \quad (1)$$

For instance, FPI (bulletin board, online social network) is 0,71, that is, the probability to have a bulletin board in a CS of category online social network is 0,71. In order to generate these values, we have started from the data included in the works of Bafoutsou [2] and Mayrhofer [9], and we have analyzed additional CSs.

Table 1. Functional characterization of collaborative system categories

Collaborative Systems Categories / Collaborative Features	Doc& File Group Handing	Computer Conferencing	Electronic Meeting Systems	Electronic Workspace	Online Social Network
i) Messaging/ Notification	1,00	0,30	0,65	0,71	0,94
ii) Bulletin Board	0,75	0,00	0,00	0,07	0,71
iii) Asynchronous Discussion	0,75	0,00	0,20	0,64	0,94
iv) Synchronous Discussion	0,25	1,00	0,75	0,43	0,59
v) Collaborative Whiteboard	0,00	1,00	0,75	0,29	0,00
vi) Screen/ Application Sharing	0,00	1,00	0,70	0,14	0,00
vii) Audio/Video Conferencing	0,13	1,00	0,75	0,29	0,06
viii) Surveys/ Polling	0,50	0,70	0,70	0,14	0,06
ix) Sched. Tools/ Task Manag.	0,38	0,80	0,85	0,64	0,41
x) Contact Manag./ Addr. Book	0,63	0,30	0,65	0,36	0,94
xi) Document Sharing	1,00	0,90	0,60	0,93	0,88
xii) Document Management	1,00	0,00	0,00	0,64	0,00
xiii) User ID/ Profile	1,00	0,90	1,00	1,00	1,00
xiv) Asynchronous Activity Ctrl.	0,75	0,00	0,75	0,43	0,00
xv) Synchronous Activity Ctrl.	0,50	1,00	0,90	0,57	0,42
xvi) Indexing Management	1,00	0,00	0,00	0,00	0,00
xvii) Rediffusion/ Syndication	0,88	0,00	0,00	0,00	0,94

We now provide a brief description of each CF: i) messaging communication services allow sending/receiving asynchronous messages from known senders; ii) bulletin board allows publication of messages on a public or semi-public board; iii) asynchronous discussion allows chronological organization of messages (e.g. forum); iv) synchronous discussion provides support to user discussion in real time (e.g. chat); v) collaborative whiteboard provides a shared workspace where several users can use text/graphic tools at the same time; vi) screen/application sharing provides a screen shared by several users that usually have some control; vii) audio/video conferencing, communication services with audio-video capabilities; viii) surveys/polling allows applying forms or elements for decision making (e.g. votes); ix) scheduling tools/task management allows managing tasks and organizing them over time; x) contact management/address book allows the organization of contacts with others users or organizations; xi) document sharing allows to manage personal or shared lists of files and documents, usually asynchronously; xii) document management extends the capabilities of document sharing with centralized organizational mechanism, versioning and change control; xiii) user id/profile allows managing a user identification and profile with information about preferences and interests; xiv) asynchronous activity control allows managing of historical information about user

interaction with the system (e.g. awareness mechanisms like historical reports); xv) synchronous activity control allows managing of real time information about user interaction with the system (e.g. awareness mechanisms like radar view); xvi) indexing management facilitates the process of finding resources, and xvii) rediffusion/syndication offers summary information views that can be shared with other systems.

3 Conclusions and Future Work

In this article we have presented a study showing the likelihood of having a collaborative feature (CF) in a collaborative system category (CSC). These probabilities can give us evidence about how important is any CF in a CSC. The CFs of each CSC constitutes a CFCSC vector that describes the functional characteristics of the CSC.

We are working on using this study to establish a methodology and a Web 2.0 tool that provides to any community of end users, who don't need programming knowledge, the automatic generation of an application that supports its collaborative work, using for this purpose the above CFCSC vectors as a configuration guide. This Web 2.0 tool is called REUSES (Rapid End-User Synthesis of Collaborative Systems). REUSES uses mashup technology to integrate tailored collaborative systems with collaborative components using the Metadepth code generator [6].

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