Groupware Components as Providers of Contextual Information

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Abstract. Group work context involves many more elements than individual work context. Few researchers have tried to identify context for groupware systems. However, such models are limited to certain kind of contextual information such as location, while others more relevant for group-work are neglected. From a review of the work done in groupware, we discuss three main components for considering contextual information in groupware

1 Introduction

Although contextual information relevance has been recognized in the groupware community there have been very few attempts to characterize contextual information for groupware while most effort has been done on studying how to represent this information [6]. The Merriam Webster On Line dictionary defines context as "*the interrelated conditions in which an event, action, etc. takes place*". This definition is too general: it is necessary to determine which is the situation at hand (e.g. group work) and which are its relevant conditions. Context has been analyzed at different grains of specificity: it could describe the project (documents, projects, and processes), the group (location and members' status) or the individual (availability) [4]. Others [11] suggest the existence of three main components of the shared environment: content, team, and process structure. According to the previous works, the minimal common elements useful to determine the group context would be: people, tasks and resources, but again this approach is too general. In order to provide more insights into its definition, we have reviewed research done in the area in the last decade in order to identify the diverse contextual information that can be provided by the three main components of groupware: people, task, and resources. They are presented and briefly discussed below.

2 Groupware Components as Providers of contextual information

2.1 Group context

Some researches provide *structure* to groupware components (people, task and resources). The structure captures the work context and by being aware of it, group members can coordinate their actions smoothly. Group context can be also described through groupware elements states. Generally, a *state* describes a condition the element holds (e.g., a user *is* busy), a stage (e.g., a document *is* under revision) or an emotion (e.g., a user *is* angry). Users can determine the appropriate action to follow-up under the current circumstances or context by being aware of such states. Some researches focus on location: a user or a resource can be located inside or outside the virtual shared space. Other concepts strongly related with location are presence [13], co-presence [13], distance among group members, proximity, visibility, space and place. A *place* differs from a *space* because it is "invested with understandings of behavioral appropriateness, cultural expectations, and so forth"; hence, people context differs depending on whether they are at a theatre or in a park [12].

All these issues represent the static aspects of group context, while the dynamic aspects are represented by actions and activities. An action is an act performed by a purposeful agent, while an activity includes a series of actions that can be meaningful and is considered the minimal piece of contextual information [5]. We discuss this concerns further below.

2.2. Component 1: People

People organize themselves in various *organizational* structures (e.g. hierarchical, subgroups, communities, etc.) assigning roles and responsibilities to their members and defining control and responsibility relationships. By being aware of this structure group members regulate their interaction easing coordination, cooperation and collaboration by means of developing explicit or implicit *conventions* or protocols [15, 17, 7]. Users' availability and presence (*status*) can be obtained by always-on audio or video connections [3], by public icons [9] or by determining patterns of presence, attendance or activity [2, 6]. By being aware of their availability, group members can engage in casual or informal (not pre-arranged) interaction (also known as informal awareness [3]). Users can also be in several emotional states. By being aware of other's emotional states, group members can adjust their interaction and develop social strategies, such as approaching a colleague. Related research is also known as "emotional awareness" [8]. By being aware of *location*-related concepts (presence, distance, proximity, etc.), teammates can develop a sense of community, understand a person's situation and adapt their actions according to it. *Actions* performed by other group members can allow a person to make informed decisions about his or her own work. Actions reflect the things done by a person, or an accomplishment over a period of time, in stages. By being aware of others' actions a user

can provide teammates timely help, avoid collisions or misunderstandings [10], monitor the project progress and teammates' involvement in the global work. Research in this area is known as workspace-actions awareness [10], and active knowledge awareness [16].

2.3. Component 2: Task or Project

Workflow is a very active area of research dealing with task structuring. Tasks are strongly related to the people performing it, but workflow main concern is the automation of processes where documents, information or tasks are directed to participants according to a defined set of rules to achieve, or contribute to, an overall business goal. By being aware of task structure, group members can regulate their interaction by means of understanding how their contributions fit into the whole picture, which actions could take place or who will be affected by performing it. In CSCL, interaction states occurring in a learning scenario are also modeled [14]. Under this approach group context is modeled by taking into consideration the tasks-network assigned and performed by group members. Again, this network contextualizes the events occurring during a collaborative interaction.

2.4. Component 3: Resources

Resources can be expertise, concepts, information (e.g. documents, figures), software artifacts (e.g. a web portal), work artifacts (e.g. report templates), and representations of physical objects (a shared printer URL or a user ID). They are stored in a common repository, have a particular meaning and keep some *semantic relationships* among them. Resources can be also spatially arranged, or belong to abstract structures. Space can be a set of web pages, a geometric representation of the real world, modeled with location sensors or a graph of interconnected objects, holding semantic relationship among them, making possible to define a semantic distance. Finally, some researchers consider users' knowledge, expertise [16] or interest as a resource, and then their focus is to locate who is owner of the desired resource. The resources arrangement provides contextual information for users' actions. For instance, they can understand how the changes in a particular document impacts on others' work by knowing the documents semantically close.

3. Conclusions

The context concept has been loosely applied to groupware systems. The work reported in this paper attempts to clarify and classify the context sources applicable to the development of such systems. The components help researchers to understand which can be considered contextual elements in groupware, e.g., roles, conventions. Finally, close examination of the discussion also provides research opportunities.

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