Applications to Support Student Group Work

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Abstract

Group projects form an important part of learning in a university environment. Potential group members can identify learning advantages of participating in group work but also both anticipate and then experience problems which affect the performance of student groups. Students and staff at the University of Canberra have collaborated to design groupware support for student project teams. This paper discusses the types of activities involved in student group work, describes the kinds of software support that are being trialled to facilitate learning through group work activities, and summarises an evaluation procedure.

Keywords — Groupware, collaborative work, student projects, Lotus Notes.

1. Group Work Activities

1.1. Advantages and Problems

Our students are required to work in groups of typically four or five to undertake project work, for example, the development of a report or an information system. About half of our students study part-time and are rarely on campus. Our students come from a variety of cultures and countries. Group work is important for a number of reasons identified by students, staff and graduates [2], [3], and some of these reasons are that group work:

- enables projects of a realistic size to be undertaken
- reflects a requirement of employers that students be experienced in group work
- allows more variety in the design task
- enables students to learn from each other.

Potential and real problems with student group work have also been identified [2], [3] including:

- mis-match of goals and expectations of group members
- cultural differences leading to different ways of communicating and contributing to group work
- unequal contributions to group work by some members
- difficulties in meeting because of problems with both the time and possible location of meetings.

At the University, we have several ways of supporting group work including a special meeting room with an electronic whiteboard where a group of students can record and share ideas. However, additional means of support, whereby some face-to-face interaction can be replaced or supplemented by work at different times or from different places (e.g. home or work) is seen by both staff and students as desirable [2]. This paper focusses on the design and evaluation of groupware support to facilitate these activities.

1.2. Dimensions of Group Work

Group work encompasses a wide variety of activities, carried out in a variety of ways for a variety of reasons. Figure 1 summarises some of the issues. This categorisation was done collaboratively, reviewed with peer experts and is consistent with the work of Mandviwalla and Olfman [5].

Structure	Domain	Purpose	Activity
Formal Informal	Sub-group Whole group Outside group	Task performance Social, Group cohesion	Conversation Discussion Development of deliverables Records management Project management

Figure 1. Dimensions of group work.

Student group work can be structured in one of two ways:

- *Formal Group Projects*. In a formal group project, the group is jointly responsible for the production of a deliverable of some sort, e.g. a report. The composition of the group is fixed for the duration of the project, typically three to eight weeks.

- *Informal Collaboration*. Two or more students choose to work together on some aspects of their work. They are individually responsible for any deliverables (e.g. assignments). The length of the collaboration is variable (from a single discussion to an entire course), and membership of the group may change over time.

Within a formal group project, there are always areas in which informal collaboration occurs, so any groupware support must address both the formal and informal dimensions.

Group interaction is not limited to meetings or activities involving all members. It also includes activities involving only some members of the group, such as holding private conversations, or forming smaller groups to carry out specific tasks, interactions with other groups, for example comparing notes on common problems or discussing results, and contacts with other people external to the group, e.g. approaching a tutor or a Help Desk for advice.

Group interaction should not be seen as limited to the performance of the prescribed task. Groups also spend considerable effort on social interaction, and on group formation and maintenance activities. Group formation activities are critical in the early stages of any group project, and require exploration of other group members' background, abilities, and interests. Face-to-face meetings are crucial during this phase, while electronic forms of interaction may be able to play a more significant role later in the project.

In the following sections, we discuss the activities that take place during group work. The emphasis is on task-related activities in formal group projects, but the activities involved in informal collaboration, to support group cohesion, and in liaison outside the group are similar.

1.3. Typical Group Project

As a typical example of a formal group project, we will use a group having to prepare a lengthy report over a period of a few weeks. The project is assumed to be large enough to require both discussions within the group, and significant individual work on components of the final product. It is possible to identify five main classes of activity:

- private conversations between two or more group members

- discussion of issues, content and structure of the deliverable

- development and review of the deliverable

- storing work in a repository or referencing such work

- task allocation and monitoring.

The second, third and fourth of these are *operational tasks,* in that they are directly concerned with the production of the deliverable (the final report). The fifth is a *management task,* and is concerned with organising the allocation of work within the group and monitoring its progress. Figure 2 summarises the last four of these activities.

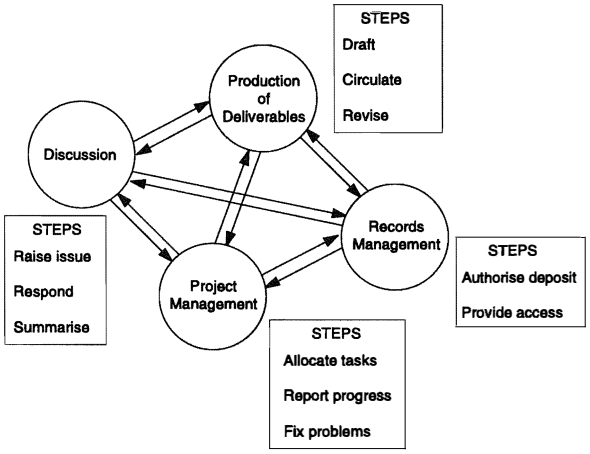

Figure 2. Activities in a group project.

Discussion

Discussions can range from brainstorming for ideas, to quite specific discussions on issues of content or style. Some management functions, e.g. definition of tasks, and task allocation, are likely to begin as discussions. A discussion may be characterised in the following way:

(1) somebody raises a question or issue for discussion

(2) other group members respond, e.g. by supplying ideas, further analysing the problem, or suggesting solutions, this process continuing (via responses to responses from all group members, including the

initiator of the discussion) until a process of resolution or exhaustion (of the topic or time) sets in

(3) somebody (perhaps the initiator) attempts to draw the discussion together by summarising the arguments and drawing conclusions, which may themselves reignite the discussion for another round (i.e. a return to step (2)).

In a formal group project, step (3) is very important, because the group as a whole must agree to (and "own") the conclusions from any discussion. Sometimes this process will happen automatically, but usually someone (such as the initiator) must be given or will take or negotiate the responsibility for seeing that this step is carried out. Some groupware products incorporate facilities (e.g. reporting and voting systems) to aid this process.

Production of Deliverables

The assumption here is that the overall task will be broken into a number of parts, each allocated to one member of the group. One group member may have more than one part. Exceptionally tricky parts may be allocated to more than one person to work on jointly, but even here, the responsibility will not lie with the whole group.

The activities involved can be characterised as follows:

(1) each group member develops their part of the deliverable

(2) the part is circulated to other group members for comment

(3) the document author then makes revisions based on those comment

(4) one group member then integrates the parts into a draft version of the final deliverable; steps 2, 3 and 4 may be repeated several times.

In this description, we have assumed that a single person (the author or integrator, depending on the stage) is responsible for revisions to the document. This is not always the case. Within the above scenario, responsibility for part or the whole of the final document may change hands at any time, e.g. for reasons of other work. A totally different scenario which must be supported involves a document being passed around a number of people, each of whom successively revises it. This is common when a document moves up an organisational hierarchy, being revised at each stage, or when one group member prepares a rough draft and hands it to another group member for further development.

Note that, during development of deliverables, discussions may arise regarding issues that come to light during that development, the conclusions of the discussion being incorporated into the final deliverable.

Records Management

For effective operation of the group there needs to be some sort of repository which acts as the long term organisational memory of the group. It often takes the form of a "project folder" in which any agreed standards, guidelines, design rationale and completed versions of work are kept. Work is lodged in the repository when it is seen by the group as in some way "complete", has been accepted by the group, and is no longer subject to frequent discussion and amendment. Documents in the repository may be replaced by later versions, but this is not a trivial process as it requires the group's acceptance of the changes.

Project Management

The management activities required for a project of this type are not complex, and do not need sophisticated techniques (e.g. PERT charts). However, they are a distinct process, and need to be identified as such. The activities involve:

- identification of tasks within the project
- allocation of these tasks to individuals (or subgroups) and the setting of deadlines for their completion
- monitoring of the progress of these tasks, to identify any problem areas, and taking corrective action (e.g. organising assistance) where needed.

As mentioned above, some of these activities are essentially discussions (or begin as discussions). Any management plan incorporates the conclusions from these discussions. For example, the tasks, how long they should take, who wants to perform them and who is best equipped to perform them, should all be the subject of discussion (and very likely, the same discussions that develop ideas and decide on content and structure). The management activity ensures that these issues are raised (and if necessary, raises them as a separate discussion), and records the conclusions of these discussions, i.e. what the tasks are, how long

should they take, who will be doing them. Arranging meetings falls into this category.

Thus, the sort of information that is needed concerns the activities, who is responsible for them, their status (e.g. not started, completed, waiting on some other activity, in trouble) and expected time of completion (i.e. will it be late, and if so by how much). Where a person needs information or products from another person, this system can be used as a means of alerting the group to the existence of potential or actual problems in a timely fashion.

Private Conversations

No particular structure is postulated for private conversations. The major requirement is that they are in fact private (i.e. not accessible by anyone other than the participants), and that some means to conduct them exists.

2. A Possible Implementation

2.1. General

In the discussion above, a set of activities common to most group work has been identified. Different groups will conduct these activities in different ways, and place different emphases on the various aspects of them. For software support to be effective, it must allow maximum flexibility in the group's activities, while providing assistance where it is needed. Provided that the software is not too directive, the same software should be usable for both formal and informal group activities, for task-related and group cohesion activities, and for activities of sub-groups, the group as a whole, and for communication outside the group.

Our major interest is in designing and supplying support for students to contribute to group activities at times convenient to them, from work or home as well as from on-campus [8]. This indicates a groupware product which supports a different time/different place paradigm, and which can run on or be accessed through IBM-compatible and Apple Macintosh computers. Lotus Notes is a commercially available groupware product which meets these requirements.

2.2. Lotus Notes and the Design Task

The design task required for a Lotus Notes implementation is to build on the Notes infrastructure and provide group members with a conceptual model of how group work is supported so that they can undertake the formal and informal activities identified above as part of a typical group project.

We have designed a system with four sets of forms which present a conceptual model of group work to student group members, one set for each of the discussion, development of deliverables, project management and repository activities discussed above. Private conversations are supported by the e-mail facility within Lotus Notes.

As already mentioned, the process of summarising and drawing work to a conclusion has been left undefined. Unlike some group support systems which incorporate voting and other manners of closure, Lotus Notes has no conventions or processes for this. This designed boundary of groupware support allows and requires groups to negotiate work conventions and cues to draw activities to a close. Finding out how this is done, and whether it is appropriate to provide any explicit support for this, is part of the evaluation process for the project and is a question for further research.

3. Evaluation and Project Status

Initial use by a group of four students working from home has generated real interest in and enthusiasm for the project. An extensive evaluation with 50 students is currently being undertaken. The evaluation procedure addresses whether students use groupware support and if so, for what tasks and in what ways. Students are completing pre- and post- project questionnaires about their perceptions of groupware support and will also complete a set of structured diary pages to elaborate on their use of the technology during a critical part of their project work.

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