Groupware Support for Student Project Teams: Issues in Implementation

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Abstract

Group projects form an important part of learning in a university environment. In this paper we discuss the types of activities involved in student group projects and present a context of use of groupware support for project teams (a behavioural simulation of an organisation - the simulation is played by computing students). In the paper we then describe the software that has been designed to support group work, an implementation procedure, an evaluation procedure and expected learning outcomes.

Keywords

ASCILITE'95, groupware, collaborative learning, behavioural simulation, Lotus Notes, computer supported cooperative work

1. Introduction

Potential employers consider the ability to do group work to be an important qualification for computing graduates. Our students can identify many advantages of participating in group work, for example, 40 students in two surveys in April-June 1995 suggested that group work:

- enables large projects to be undertaken;
- allows more variety in the design task;
- results in a more functional and polished product if the system design is partitioned correctly;
- assists all members of the group to develop their skills to a higher degree than working alone; and
- enables students to learn from each other.

Students also anticipated problems which could affect the performance of student groups, for example:

- a mismatch of goals and expectations of group members;
- differing ideas about how much work each person should or did do;
- differing perceptions, ambiguity of roles, communication problems;

- the requirement of extra time to resolve conflicts;
- the use of different ideas and methods of work and the likelihood of difficulty in decision-making;
- differing ways of communicating and contributing to group work due to cultural differences; and
- the difficulty of meetings because of problems with the choice of both the time and the location - many students are studying part time and would like to contribute to group work from their home, workplace or from on-campus - the social context which suits them at a particular time - they would like to contribute to group work "from any place at any time".

In the same surveys, students identified reasons why they would like to use information technology (IT) support for group work. Two typical responses were:

- "I would like to try it but I don't know enough about groupware to be sure of its value"
- "groupware may well be useful - we could use it to exchange data and information and to enhance discussions, particularly if a number of the group find it hard to verbalise concepts."

Although students initially had little concept of what IT support for group work might be, those who had previously gained some experience of groupware, through using the groupware product Lotus Notes, included the following reasons:

- with groupware, everybody has an equal opportunity to explain their ideas and the problem of a time and place for a meeting does not arise;
- a better end-product should be possible because everyone can contribute to it; and
- groupware support facilitates communication.

However, those with previous experience also reported practical problems and these included:

- learning the technology and getting support during its use;
- gaining access to the technology (a scarce resource on campus);
- developing a good conceptual model of the groupware provided; and
- gaining a critical mass of students who could use the technology.

2. Initial Approach

With the support of a UC Teaching Grant, the project team designed IT support for student project groups to enhance the learning process. A software platform was selected. The most successful, commercially available software to support asynchronous group work is a major client-server product called Lotus Notes. Lotus Notes has the advantage that it runs on Macintoshes, PCs and Unix workstations. It enables students to contribute to group work from on or off campus (from labs or via dial-up lines) at any time. Using this platform, design work could proceed. Five main classes of activity associated with student group projects were identified (Mandviwalla and Olfman, 1994; Collings and Walker, 1995):

- discussions of issues, content and structure of project materials;

- development and review of materials;
- storage of work in a shared repository for reference by this or other groups;
- private conversations between two or more group members; and
- task allocation and monitoring.

Lotus Notes templates for these tasks were designed to build on the group work infrastructure available in Notes. The design approach taken was to provide templates that provided a simple, coherent framework for project work. The boundaries of design were purposely drawn so that group members would encounter issues in group work. As a result, group members can participate in discussions but there is no method for closing discussions built into the software. Similarly, group members can create work for review but there is no clear way to "finalise" work. These issues are to be encountered, considered and addressed by group members. This design approach has been deliberately undertaken to raise issues, so that, after careful evaluation by participants, another iteration of design can occur.

A course to introduce students to groupware and Lotus Notes was designed. Lotus Notes was installed and we had been assured by many experts that the rest would be easy. We ran Lotus Notes courses and encouraged students to use the groupware support for their next group project. At the end of the semester it emerged that only five students had formed a group to use groupware support for their project. A survey and class discussions showed the following reasons for lack of adoption of the technology:

- it was difficult to manage the required work, new technology, time constraints and a new group, all simultaneously - hence the technology was not adopted.
- there was not enough support for setting up PCs from a remote location.
- there was no clear conceptual model of how Lotus Notes "hangs together".
- the training did not coincide with a real "need to know" and the software was not fast enough.
- there was no "critical mass" of students who felt real benefit from using the technology.
- students felt that groupware would be useful in the long term - but in the short term, the time taken to become comfortable with Lotus Notes was a hindrance.

However, students could now express the following further reasons why groupware is potentially useful:

- "I strongly agree that it is very useful because with groupware everybody has equal opportunity to explain their ideas and most importantly the problem of time and place of meetings is not there."
- "we used it significantly in our group project and it made the process much easier by facilitating communication."
- "it is most beneficial when there is a requirement to discuss ideas."
- "it would be useful to get our report into a standard format early, rather than at the end."

Based on the above surveys, which were reinforced by student interviews, (for example, see Sproull and Kiesler, 1990), we concluded that groupware to support student project team work was

potentially useful but that the first problem was to manage its introduction so that it *can* be used. The problems we encountered, as reported by students, were predictable (Grudin, 1988; Orlikowski, 1992; Cockburn and Jones, 1994) and the learning benefits could not be evaluated properly until the major issues of introducing new technology were addressed.

3. Plan for Action

Our students are interested to learn and evaluate innovative IT systems such as those that support group work "from any place, at any time". They own the technology to an extent that makes using it from home a viable proposition for about 30% of the class. All members of the class, while on campus, can also use the technology from any of our labs. However, our experience showed that students need more than just an opportunity to learn and use the technology, because an investment in time, effort and possibly money is required on top of a full workload. Hence the design team concluded that it was important for the technology to be integrated into both the complete formal and informal learning activities of a unit to provide the *raison d'etre* for its adoption. We also concluded that timing, training and support issues were critical. This led to the approach we took in July-September 1995.

3.1. A context for use of groupware support for project teams

The unit Systems Analysis G2 (a core unit in our two Graduate Diplomas in Computing and Information Systems) is based on a behavioural simulation (or role-playing game) of an organisation. We provided our group with work templates as the core of a Lotus Notes infrastructure in the simulated organisation. Students (there are 70 in the class) play roles in this organisation and use the IT infrastructure (Lotus Notes) to hold discussions and do work for the simulated organisation (called the Cultural Heritage Authority) over an eight week period. All of the information sources relevant to the game are stored in or arrive via Lotus Notes. Students belong to this organisation over a ten week period - the organisation exists over space and time. It meets formally for only two hours a week in a simulation laboratory where face-to-face meetings can be held. Students belong to the organisation no matter where they are and no matter what the time of day.

3.2 A Procedure for implementing groupware support for student project teams

We have taken the following approach with our second class of students in an attempt to address the issues raised in the first semester:

(a) We acknowledged that the introduction of technology that emphasises the primacy of group work, and the concept that it can be performed from any place at any time, requires considerable training and experience and is assisted by innovation leaders and the opportunity for reflection by all participants. To this end we did the following:

- built on the enthusiasm shown by students who had previously used the technology - they became innovation leaders in the course;
- ensured that the lecturer and tutors used the technology in classes to demonstrate its use - staff also became innovation leaders by example;
- provided training exactly when it was needed and designed around the tasks required for group work;
- provided course materials and lab time to enable proper review and experience;

- provided and reinforced a conceptual model of asynchronous group work that ensured that the technology was seen as complementing face-to-face meetings so that issues of the appropriate use of the technology are considered;

- developed an attitude of student evaluation of new ways of performing and learning about and from group work that enabled constructive outcomes from the course;

- provided a structured evaluation form and diary to assist in student reflections about group processes, the technology, and their relevance to people and organisations; and

- timed the introduction of training, access to key material, access to dial-up facilities from home and to support in a time frame that maximised the probability that the technology would be used.

(b) With the aim of ensuring that students could use their time efficiently and in a cost-effective manner, we invested further in hardware, software and support. To this end we:

- acquired another server, more modems and licences, and refined the templates;

- bought out the time of a staff member to provide extensive support;

- tuned the software so it performed very well in our environment;

- developed a manual of instructions about using Lotus Notes from home;

- ensured that students could use Lotus Notes from home as soon as they wanted to; and

- ensured that all students also used Notes on campus - that they could belong to the simulated organisation wherever they were, whenever they liked; we made sure that students also understood that they could travel during their course and contribute to the organisation from any place (literally), assuming they had their portable computer with them, and access to a telephone.

(c) We ensured that Lotus Notes became relevant and critical, for both students and staff, to all individual and group information processing activities in the class. Hence we offered multiple reasons for students to use the technology by:

- making lecture and tutorial material available on the Lotus Notes network (using the repository we had designed);

- providing a general discussion area for informal use of the software;

- enabling students to submit assignments via Notes;

- making key information for the behavioural simulation available through Notes; and

- building on the fact that students in computing courses like learning new technologies anyhow - for example, being a major client-server system in use in organisations such as the Australian Bureau of Statistics makes the product of interest to them.

We also ensured that staff used the technology to add credibility for students and to create expertise and participation in the review of student work, the collaborative development of course materials and the ability to provide feedback and help to students. All five staff associated with the unit are active users, both locally and by dial-up access; they are trainers and demonstrators of the technology; assignments are submitted and returned (as chosen by students) using this technology.

Figure 1. Asynchronous Groupware Support for Project Teams at the University of Canberra

We now have networked support for student project groups in place (see Figure 1). We have also collected data that indicates a much higher take-up rate. All students are using the technology as shown in Table 1:

	Semester 1, 1995	Semester 2, 1995
Students in class	40	70
Students using Lotus Notes	5	70
Students using dial-up access	5	20
Staff using dial-up access	1	4

Table 1. Use of groupware in two semesters, 1995.

The activity rate is high for the students using Lotus Notes in semester 2. In semester 2, students in Systems Analysis G2 belonged to one of two groups. Group 1 (which met in the day time to play the behavioural simulation and had a majority of full-time students) had 33 students, group 2 (which met at night to play the behavioural simulation and had a majority of part-time students) had 37 students. An analysis of the use of the main discussion database for each game in week 6 showed many sessions (occasions when a student logs on to Lotus Notes), and that part time students appear to make very high use of "out of hours" access to it ("out of hours" means between 6.00 pm and 8.00 am on weekdays or at any time in the weekend) (see Table 2). The whole class (of 70 students, 20 of whom had dial-up access) made 104 dial-up calls to Lotus Notes over this one-week period. From this it would appear that the approach to implementation in second semester has been successful. A full evaluation is being undertaken.

	Game 1 (daytime - 33 students)	Game 2 (night time - 37 students)
Log on sessions (total)	148	89
"Out of hours" sessions (as Percentage of total)	59 (40%)	72 (80%)

Table 2. Total Usage of Lotus Notes During Week 6 of Semester 2, 1995.

4. Evaluation Procedure

The evaluation procedure addresses whether students use groupware support and if so:

- how useful is it?
- how does it affect group work performance in terms of task quality and member satisfaction?
- to what extent is it used to replace face-to-face meetings?
- are there other types of group work for which uses can now be identified for groupware support?
- what effect does groupware support have on student learning and performance?

Our initial surveys have been inconclusive about benefits and learning outcomes because very few students have been involved. Students in semester 2, 1995 are completing pre- and post- project questionnaires about their perceptions of groupware support for project work and are also completing a set of structured diary pages to elaborate on their use of the technology during a critical part of their project work.

Our groupware design should support both formal and informal group work amongst students in any course at the university. Although our example here shows its use in quite a structured and intense environment, we have also introduced the same templates to a group of 25 students with disabilities who like to work from home. In this case we are evaluating more informal and *ad hoc* use of the technology. Students are proving imaginative in their use of the technology for informal group work.

5. Learning Outcomes Expected

From the previous sections it is clear that we are undertaking a large scale innovative project to provide groupware support for student project teams so that students can contribute to group work "from any place, at any time". We have suggested that there are several possible learning outcomes that could be expected from this and our evaluation aims to begin to assess this. Some potential learning outcomes are as follows (the set was created by students and staff in consultation with learning experts and the literature, e.g. Sproull and Kiesler, 1990).

5.1 Learning through and about groups

The project enables student-controlled learning by facilitating participation of all team members in the tasks of the unit. The use of groupware will enable a collaborative search for new ways of structuring group work. As the group, as an entity, is not well understood, this will enable students to reflect upon it as a learning structure. It will also foster speculative inquiry into the use of information technology in democratising group work.

5.2 Learning about communication structures in organisations

The project facilitates student understanding of communication structures within organisations and the impact of frontier technology such as groupware on these structures. The activities undertaken reflect organisational processes so that students can evaluate the relevance of their projects to their professional field. As systems analysts, designers, programmers and managers, students can reflect on the effect of new technologies and their method of introduction by experiencing this as clients and users of the technology. In using the technology to assist in the task of systems analysis and design, they can review the impact of the technology on their own work processes and jobs. They can examine their understanding of the role of the IT professional in organisations, considering their role in the design of business processes, workflows and jobs. Alternatively, for students in other fields, they can evaluate the relevance of the technology to their own work or interests.

Through this, students will explore the influence of computer-mediated communication on the organisation when constraints on when and where work is done are removed. Alternative forms of work, for example, telework, can then be understood and designed.

5.3 Evaluation of social impacts, the effect of the technology on processes and outcomes

Through this project it is anticipated that students will have the following personal (social, satisfaction, product-enhancing) outcomes. Students are asked to assess these for themselves and their group(s).

- students experience greater satisfaction in contributing to group work because they can do so at a time and place which is convenient (using both face-to-face meetings and electronic ones).

- a better product results from a team project augmented by computer-mediated communication because all members can contribute - especially those who find it difficult to contribute to face-to-face meetings (through shyness, cultural differences or through the need to consider and reflect before contributing).

- whereas face-to-face meetings are important and IT professionals must learn face-to-face meeting skills, unnecessary meetings can be reduced by computer support for group work, and for production of higher quality product through a process which becomes fully documented.

- all participants have the opportunity to plan and use their time effectively; travel time and the economic (and often social) burdens of travel are reduced.

- design decisions are recorded when using this communication medium; this means that the history of a project can be referenced as part of the process of developing repeatable, quality procedures.

6. Conclusion

This paper has presented the design and implementation of asynchronous groupware support for student project teams. It describes an evaluation procedure and expected learning outcomes. Future work will include refinement of the support provided based on evaluations and analysis of usage. Future work will also include the provision of groupware support to students and staff to enhance committee work, meetings, informal and formal group work activities, and a study of the impact of groupware on the development, to maturity, of an organisation.

7. References

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