Using Computer Mediated Communications to Enhance the Teaching of Team Based Project Management

John Lamp, Chris Goodwin

Faculty of Business and Law
Deakin University
Australia
Email: {John.Lamp}{goody}@deakin.edu.au

Abstract

The teaching of project management using a team of teams approach was developed at the University of Tasmania and has met with considerable success. In 1998 this technique was introduced, modified for local requirements, at Deakin University. The opportunity to incorporate the use of the computer mediated communications system, which was implemented by Deakin to support their off-campus students, in this on-campus unit was taken. This paper reports on the success of this program and the lessons learned from it.

Keywords

IA01 IS Curriculum, EE02 IS Project Teams, CB0904 Communications Software

INTRODUCTION

The teaching of project management is a fundamental part of providing a properly comprehensive information systems education. This is recognised in *IS'97 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems* (Davis et al, 1997) which allocates a course on Project Management and Practice as one of the ten specified courses.

Additionally, recent research has identified some specific areas that are seen to be lacking in the teaching of systems analysis and design. These include:

- preparing for and conducting interviews with users
- evaluating new systems against user requirements
- training users; and
- designing, developing and implementing databases. (Misic & Russo, 1999)

Current systems development is a team based process in which most of the above concerns can be addressed. Working in teams has been shown to enhance understanding of a subject and develop positive intergroup relations and desirable prosocial behaviours, which help with the transition from tertiary education to employment. (Blignaut & Venter, 1998) Groupware systems are designed to improve communication while alleviating negative reactions. (Kamel & Davison, 1998) The use of groupware to support the process has also been identified as incidentally providing the source of communications metrics for the development process. (Dutoit & Bruegge, 1998)

The team of teams approach to teaching project management allows for large project management classes to be conducted in a cost effective manner and is discussed in the following section. The use of the team of teams approach to teaching project management on the Waurn Ponds campus of Deakin University was enhanced through the use of FirstClass

(SoftArc, 1999), the computer mediated communications (CMC) environment adopted by Deakin for off-campus students, by on-campus students enrolled in MSC303 Information Systems Project. The original motivation for using CMC was to assist the teams in being able to meet and share material asynchronously. At the University of Tasmania, a number of separate technologies had been used together to derive the same benefits: email lists, IRC, file servers. This had met with limited success. By using FirstClass, with its single consistent interface for all such functions, it was hoped that the use of CMC would be easier and more effective.

THE TEAM OF TEAMS APPROACH TO TEACHING PROJECT MANAGEMENT

The complexities of modern information systems development projects and the wide range of technologies that could be encountered in the process of delivering such a course pose significant challenges. In particular, there are two areas that the team of teams approach attempts to address; the experience of:

- working on a significant project with a real client; and

- developing communication and interpersonal skills of value in a team development environment.

The team of teams approach to the teaching of project management was initiated at the University of Tasmania and is fully described elsewhere. (Keen et al, 1998) The approach seems to scale well and has been successfully used with classes ranging from twenty to eighty students. Each year the IT Project course has been taught at the University of Tasmania, a different project topic has been used. These project topics and objectives are chosen to be

- relatively open ended

  Students are encouraged to strive to achieve as much as possible in the time permitted, rather than being limited by the project goals.

- challenging

  The topic and scope of the project is chosen to extend the students well beyond their previous experience in practical assignments.

- aimed at the production of proof of concept systems, rather than fully developed solutions

  The systems developed by the students need to be fully tested, but do not have to reflect the full functionality and employ all of the live data of a commercially developed system. In all other aspects, however, the nature of the problem and the expectations of the students are structured to be as realistic as possible.

Each project has a specific, real client, to whom the project results are to be delivered. This client is chosen by the course coordinator as part of the project design, and may be from industry or from within the University. The nature of the projects undertaken by the students have to be of a scope that allows for significant progress within the thirteen week semester.

Students are strongly encouraged to be client focussed throughout the project by adoption of the following criteria:

- Close interaction must be maintained with the client throughout all phases of the project

- The client and students have joint ownership in the project and its outcomes

- All key decisions affecting the output of the project must be made in consultation with the client

Further, the project teams are expected to resolve their own interpersonal problems through conflict resolution and negotiation techniques. They may not pass these problems on to the client. The course coordinator acts as a mentor, and only intervenes in matters of an interpersonal or team-work nature when absolutely necessary.

At the commencement of the course students receive a one sentence outline of the project from the course coordinator. All subsequent project and requirements definition is obtained directly from the project client.

While the teams of teams approach has met with considerable success, one aspect, that of arranging meetings at mutually convenient times for all students working in such large teams, has posed some difficulty. At the University of Tasmania a number of generic network tools were used to create a support environment which would allow asynchronous communication, and thereby reduce the need for team members to have face to face meetings. This was effective, but required students to become technically competent in a number of applications, each with differing interfaces and security requirements.

COMPUTER MEDIATED COMMUNICATIONS AT DEAKIN UNIVERSITY

Deakin University was established in 1974 with a charter to provide both campus based and distance education opportunities for school leavers and mature age learners throughout Australia. It rapidly gained a reputation for excellence in distance education programs, delivered via high quality learning resources that promoted interactivity between learner and subject matter. Postal mail and the telephone were the most commonly used methods of interaction between staff and distance learning students, and communication between these students. New communication technologies developed during the late 1980's offered solutions to some of the pedagogical problems caused by geographical isolation and pilot use quickly established the potential of CMC to enhance the learning environment for distance learners in all Faculties at the University.

The Faculty of Business and Law began using CMC in its postgraduate programs in 1993 to provide dial-in or network access to electronic mail, bulletin boards, the Library catalogue and an online Library request service. Academics also began using CMC to help create a collaborative learning environment for distance education students which incorporated small group interaction without the constraints of time and place. This Asynchronous Learning Network (ALN) significantly enhanced the educational dialogue opportunities for these students. Evaluations at Deakin (Thompson 1994) and other educational institutions around the world indicated the benefits of enhanced educational and social dialogue through increased interaction between students, and the opportunity to work collaboratively to build knowledge and understanding of course content (Harasim 1989; Mason and Kaye 1990; Bates 1991, D'Souza 1991; Kaye 1991; Boston 1992; Rich 1992; Lewis and Hedegaard 1993, Hiltz 1994; Mason and Kaye 1994).

The difficulties of using the prototype text-based system, accessed via terminal emulation software, limited its use. However the positive outcomes stimulated interest in developing a more sophisticated CMC system with an easy to use graphical interface and point and click functionality. Over the next few years Deakin used a customised bundle of commercially available software to provide access to networked services through standard TCP/IP Internet connections. For the Faculty of Business and Law's collaborative learning model, the key teaching tool in the package was FirstClass, a computer conference system from SoftArc Inc.

This system is also used by the UK Open University, which is expanding its use. (Mason & Bacsich, 1998) This was used to support both small and large group interaction and provide electronic resources to supplement the print resources already provided by the Faculty.

By 1996, the reduction in complexity and improvements in the operation of CMC software encouraged further expansion of the use of Asynchronous Learning Networks (ALN) in other Faculty of Business and Law distance learning programs. Academics also began to make the 'time and place' flexibility of an ALN available to students studying on campus to complement their face to face learning. Over the past two years this combined approach has been used for both tutorial programs and team based assignments in a variety of disciplines.

Computer mediated communication remains a key component of the Faculty of Business and Law's strategies for achieving its teaching and learning objectives. The CMC computer conference software is used in all Faculty teaching programs. Students studying in these programs have access to the online learning environment 24 hours a day, 365 days a year from the on campus computing facilities, or through their own private Internet connection, an Internet connection at their place of work or a community based Internet connection at a Library or Telecentre.

TEACHING PROJECT MANAGEMENT AT DEAKIN UNIVERSITY

The teaching of project management by the School of Management Information Systems at Deakin University is largely contained in the level three unit MSC303 Information Systems Project. This unit is seen as a capstone to the majors offered by the School and includes students from both the Management of Information Systems and the Electronic Commerce majors. Rather than proof of concept systems, the unit attempts to deliver working systems. Prior to 1998, the unit had used projects undertaken by small teams – two or three students. From 1998 the team of teams approach has been used.

To obtain projects, the School has established links with United Way in Geelong. United Way is an umbrella organisation for charitable organisations, which collects donations on their behalf and distributes them to constituent organisations according to requests for program funding from those organisations. United Way now asks for constituent organisations to submit proposals for information systems for their organisations. United Way (on needs) and the School (on appropriateness for the unit) jointly assess these submissions.

The students are allocated into four teams based on their academic record – both in terms of their success and the nature of the units they had taken. The aim of this selection is to obtain an even skill mix over the four teams. Each team has a nominated Project Manager, the remaining eight students are allocated to one of the team's two subteams, making a total of nine students per team. (see fig 1)
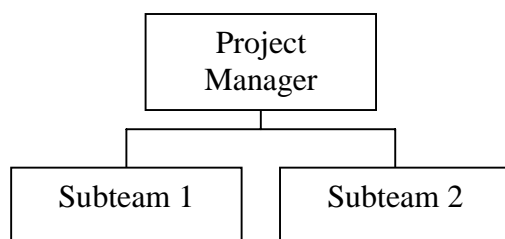

Figure 1 Project Team Structure

The Project Managers are each given the one sentence briefing on their project and the nominated contact details for their client. All students are given a schedule of milestones they are expected to achieve. Methodologies, task allocations and other details are to be negotiated

by the team with their clients, or through team discussions. All students receive a training session in FirstClass from the Faculty CMC Co-ordinator.

THE CMC ENVIRONMENT FOR INFORMATION SYSTEMS PROJECT

The main aim for incorporating CMC into the learning environment for Information Systems Project was to provide students with an alternative to face to face meetings so that the teams are able to communicate more effectively. Many students are now working to wholly or partially support themselves while studying at University and so may not be available for regular meetings. An additional difficulty is that students taking Information Systems Project may not all have the same class schedule because of the variety of elective subjects that may be studied within the final year of the undergraduate program. These two difficulties can be overcome by using asynchronous communication to both coordinate the team's work and report on progress.

An advantage of CMC is the visibility of each team member's contribution for the team participants and the academic staff. With asynchronous communication the extrovert personalities may leave many more messages than quieter members, however they cannot dominate completely as in a face to face situation. More reticent members still have the opportunity to contribute. Straus (1996) suggests that this equalisation effect is caused by the ability to participate simultaneously rather than having to compete to be heard at a face to face meeting. CMC also allows the academic staff to monitor both participation and the team's progress toward their project goals. Academic staff can provide more timely assistance without having to wait for the next class or arranging a meeting.

The use of groupware provides additional benefits to both students and staff. The asynchronous messaging results in the automated documentation of the students' work. As each student is required to document the work done by them on the project in the form of a diary, the messages within the team conference provide corroborating evidence without imposing additional work. The file repository function of the groupware facilitates collaboration by ensuring that each team member has access to the latest versions of files under development for the project.

The following are the major features of Deakin's CMC environment used by this unit:

- group (one to many) communication
- private (one to one) communication
- both asynchronous and synchronous (chat) communication
- access control for all functionality on an individual user basis
- file repository - built in upload and download functions
- access to Web based resources through hot linked URLs
- dynamic structure and access control to allow for changing needs during the project

The conference structure (see fig 2) is hierarchical, reflecting the team composition, with the top level containing a general forum, a resources folder, a send-only (for students) submissions folder, a social communication subconference and a 'help' conference for providing assistance with using the CMC software. This level is open to all participants in Information Systems Project. Each team also has their own conference embedded within the MSC303 conference. Access to the team conferences is controlled by use of the Permissions feature built into the CMC software. This allows each team to operate in a secure environment

as only the team members and the academic staff are able to enter this next level of the conference structure.

Each team conference contains a general forum and further subconferences tailored to suit the needs of the team. This was generally two work areas for the subgroups working on components of the project, a file repository for progress reports and a subconference for the work diary.
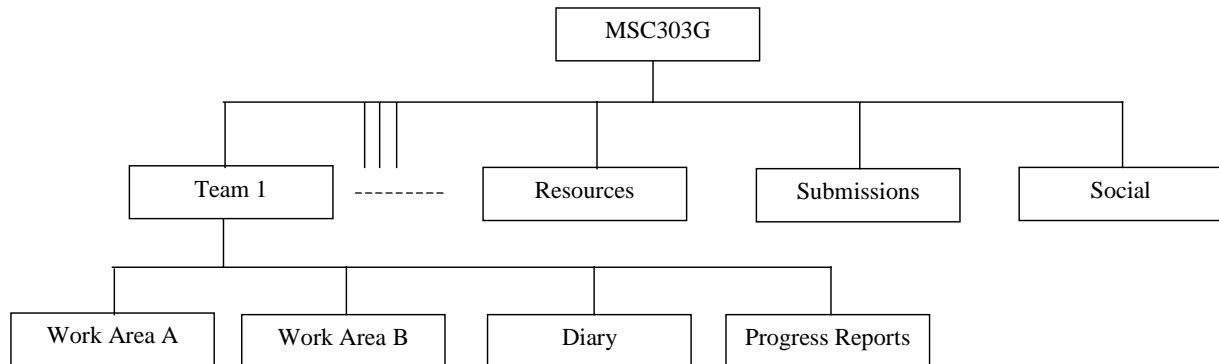

Figure 2 The hierarchical structure of the CMC environment for Information Systems Project.

DATA COLLECTION

As this was the first time that CMC had been used by Deakin in this way, an instrument was used to collect the students' opinions on this use of CMC. A mix of open and Likert scale questions were used. Statistics on the number and location of messages posted to CMC by the groups were also collected.

The last lecture in the unit was on post implementation reviews. Rather than stick solely to a traditional lecture, a post implementation review of the unit and the use of CMC was conducted by the lecturer, using brainstorming (Dwyer, 1999, p408).

OUTCOMES

There was very good acceptance of the use of CMC. Students found FirstClass easier to cope with than using generic internet tools. All students participated in its use and the vast majority used it more than once a week. The requirement to use CMC did impose a small burden on the students, but most considered the training received to be adequate, and any problems were quickly resolved. The stability of the Deakin University network did pose some problems. (see Tables 1, 2, and 3)

Technological aspects of FirstClass:	easy to use	somewhat easy to use	somewhat difficult to use	difficult to use
How easy did you find FirstClass?	20	5	0	0
How easy have you found using generic internet tools?	9	7	7	2

Table 1 FirstClass compared to generic Internet tools

How often did you participate in the computer conferencing?	
not at all	0
a few times all semester	1
about once a week	0
about a few days a week	13
about every day	11

Table 2 Extent of use of CMC

Did any of the following concerns become problems in the unit?	no problem	minor problem	moderate problem	major problem
The use of CMC took more time than it was worth	0	9	1	1
I didn't receive enough training in FirstClass	12	7	5	1
I couldn't get access to a computer when I needed it	9	12	3	0
There were too many technical problems with the computer or network	5	13	3	4
I had a difficult time getting help with FirstClass	13	9	2	1

Table 3 Concerns with CMC

These results were confirmed by the responses to the open ended questions. There were some comments about features which students believed that FirstClass didn't have (eg email, chat sessions on demand), when, in fact, they were available facilities, which would indicate that training could be improved. There were a number of comments about the network reliability, which was in fact the reason that a planned class demonstration of the live facilities of CMC did not go ahead. Training was restricted to a lecture on the system. In 1999 a computer lab session has been arranged to allow all students some hands on time in the first week of semester.

Eighty per cent of students mainly used the on-campus facilities to use CMC. Two things that were negatively commented upon were the automatic logout facility, and the short daily aggregate time limit – two hours. Students would work on their aspects of the project with CMC open as a background task. This is a very different method of using CMC to that of off-campus students. Off-campus students tend not to have CMC open for a long period as they connect through, and are paying, their Internet Service Provider, usually on a timed basis.

Area	No of Messages
General	66
Resources	23
Submissions	10
Social	34

	Team 1	Team 2	Team 3	Team 4
General	219	81	347	201
Work Area A	57	58	20	49
Work Area B	32	34	32	43
Diary	40	50	21	13
Progress Reports	0	11	10	2

Table 4 Number and location of messages posted to CMC

The statistics on the number of messages posted to CMC appear in Table 4. It is interesting to note the preponderance of messages in the specific team areas, compared to the general MSC303 area at the top of the table. Students were asked to rank the nature of their use of CMC from one to four against the categories shown in Table 5. The averages of these ranking are shown in Table 5. As can be seen the main use was interacting with other students about the course work. This is confirmed by the relatively minor use of the Social folder on CMC.

How did you use computer conferencing?	
for social interactions with other students	2.0
for social interactions with the teaching staff	3.6
for instructional interactions with other students	1.5
for instructional interactions with the teaching staff	2.9

Table 5 Nature of messages posted to CMC

The effects of using CMC can be seen from Table 6 as being generally positive. One unusual result is that the majority of students felt that CMC had either no effect on or required more face to face meetings. One student suggested that this was not so much because of deficiencies with CMC, but because the CMC sessions lead to the suggestion of new ideas which required development and evaluation, and that these were usually done face to face. The responses to the open ended questions in this area commented on the positive effects in the areas of communications, team building and general team interaction. Students also commented on the uniform interface and single storage place for team materials. They liked being able to place drafts for team comments and the asynchronous communications possibilities, but felt it added to, rather than replaced, personal contact.

How did the use of CMC in this unit affect:	increased	somewhat increased	no effect	somewhat decreased	decreased
the amount of your interaction with other students?	15	7	3	0	0
the quality of your interaction with other students?	14	9	1	0	0
the degree to which your group became a team?	14	8	3	0	0
the need for face to face meetings by your team?	4	6	7	7	1
the ease of tracking the completion of your team's project tasks?	9	14	2	0	0
the amount of your interaction with the teaching staff?	4	11	10	0	0
the quality of your interaction with the teaching staff?	5	9	11	0	0
the amount of your learning?	6	17	2	0	0
the amount of your motivation to learn?	5	13	7	0	0
your familiarity with computers?	8	4	13	0	0

Table 6 Effects of CMC on unit learning

The feeling of most students was that the experience had been a positive one, and all students indicated that they would be willing to study another unit which required the use of CMC. (See tables 7 and 8)

How would you rate your overall experience of CMC?	
excellent	7
very good	10
good	7
fair	1
poor	0

Table 7 The value of CMC

Would you study another unit using CMC?	
definitely yes	14
probably yes	11
probably no	0
definitely no	0

Table 8 Willingness to use CMC again

UNIT EVALUATION AND POST IMPLEMENTATION REVIEW

The unit evaluation was extremely positive, with high scores against all of the evaluation criteria. Students used the opportunity to comment favourably on the unit and the lecturer. Some of the comments included:

- Overall good learning value – one of the best units I have done

- Good learning value – practical

- FirstClass was a big help

- Great working with real clients instead of straight theory out of texts for [the] whole semester

- Clients are difficult to handle sometimes

These themes and other project management challenges also emerged in the post implementation review:

- difficulty of developing roles within teams

- project got easier when the teams gelled

- leadership means listening

- levelling – people took positions seriously

- client didn't know what they wanted

- difficulty of obtaining requirements from the client

- client had changing requirements

- projects slip one day at a time

- the lecturer should be used as an expert mentor

The clients were very pleased with the results of their projects. One client presented the School with a plaque in appreciation, and students with certificates of appreciation. Another of the projects now forms part of the School resources for teaching internet commerce.

CONCLUSIONS

The team of teams approach to project management has been successfully undertaken at Deakin University – successfully scaling up to a much larger institution than the University of Tasmania where it was originally devised. It has proven to be a very useful structure through which students have learned a great deal about teamwork, practical project management, and sharing information, as well as completing the technical requirements of the project. Full details of the team of teams approach can be found in Keen et al (1998). The opportunity to use the CMC tool has enabled students to focus on the project rather than becoming proficient in a mix of generic and internet tools.

The students rapidly appreciate that apparently simple tasks can become very complex. The initial optimism is tempered by the reality of the tasks they must complete. However, commitment to high quality output has been evident in all project teams. The quality of the project outcomes has impressed clients as well as academic staff and has lead to the development of an ongoing relationship with United Way. The relationship is positive in both directions – Deakin University has access to a pool of differing and challenging projects, and through this its teaching and standing as a corporate citizen is enhanced; United Way is able to assist its constituent organisations in a new area; and their constituent organisations are able to implement information systems beyond their financial means.

It has been evident from the comments received and output achieved in these projects that, in addition to developing systems valued by their clients, students have gained a very real appreciation of each of the major human-oriented aspects of software development projects. We would like to conclude with one student's main feeling on their project – "the sense of accomplishment when finished".

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