Post-Implementation Evaluation of Collaborative Technology: a Case Study in Business Education

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Abstract: To be successful in their future careers students need to develop diverse skills and qualifications. Firstly, in addition to understanding the course content and the underlying theories, students need to explore the implications that emerge from their practical application and develop their critical thinking and analytical skills. Secondly, students need to gain experience and confidence in working effectively within multidisciplinary and multicultural groups that mirror the situation they are likely to face in their future work environment. Thirdly, they need to familiarise themselves with collaborative technologies (CTs) since these are increasingly used in the workplace to facilitate communication and collaboration between distant co-workers. To address these learning needs it is essential to incorporate CTs (such as videoconferencing systems) in the curriculum and provide well-organized opportunities for students to gain hands-on experience. Nevertheless, *what* technologies are used does not make the difference between motivated and unmotivated students; it is *how* these technologies are used that matters. Whilst innovative technologies can be fascinating, they must be properly evaluated and adjusted to specific educational, individual, and group needs in order to be successfully adopted by students. This evaluation entails taking into consideration the context within which the technology will be used (appropriateness evaluation) and the social-psychological motives for user acceptance (evaluation of user satisfaction). This paper reports the findings from an interpretive case study in postgraduate business education where students were using a state-of-the-art videoconferencing system as part of their workshops and group discussion sessions. This setting provided a suitable social milieu for post-implementation evaluation of this collaborative technology. Qualitative methods were employed including participant observation, focus groups, and analysis of videoconferencing sessions captured on video. The findings indicate that computer-supported collaborative learning (CSCL) helps students become confident with using CTs, learn best practices for communicating and collaborating effectively in technology-mediated settings, and appreciate the impact that technology has on everyday social endeavours. The videoconferencing exercises also engaged students to actively participate in the learning process. Given the duality of technology presence (in educational and business contexts alike) the findings can inform the design of new pedagogical models that maximize the learning potential of CTs.

Keywords: computer-supported collaborative learning (CSCL), videoconferencing; collaborative technology (CT), business education, post-implementation evaluation, video-ethnography, case study

1. Introduction

During the last decade a number of reasons have led to the escalating use of collaborative technologies (CTs) in education. Firstly, the increasing accessibility and enhanced functionalities of CTs open up new arenas for knowledge sharing and collaboration among students. CTs ranging from synchronous (such as video and audio-conferencing, shared online applications, etc) to asynchronous (including Web 2.0 tools such as blogs, forums, wikis, etc) provide innovative opportunities for collaborative learning thereby allowing students to develop both their interpersonal and technical skills. Another reason for promoting computer-supported collaborative learning (CSCL) activities is the increasing number of dispersed, multidisciplinary project teams in business organisations. In this respect CSCL can improve students' ability to act as part of a group, coordinate their efforts, and apply their collective knowledge in problem-solving situations (Kreijns & Kirschner, 2001; Lehtinen, 2003). To accommodate these aspects, and help students improve their career prospects, educational practices need to be constantly re-adjusted and re-evaluated. Alavi (1994, p.159) argues that: "Individuals need to learn at higher rates of effectiveness and efficiency than ever before because of rapidly growing bodies of relevant information and the escalation of knowledge and skill requirements for most jobs". This statement is more relevant today than it was fifteen years ago, and suggests the need for continuous development and evaluation of CSCL practices.

Despite their potential, CTs are not yet uniformly integrated in the curriculum in higher education and many challenges remain to be addressed (Dohn, 2009). Many educators use technology simply for dissemination of instructional material and fail to create responsive, collaborative, and active learning environments. In other situations universities may acquire state-of-the-art technologies but lecturers may not design appropriate learning tasks that motivate students to engage with the technology, with the subject matter, and with each other. However, the successful adoption of CTs in education does

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not simply depend on the available features and functionalities of the technology; it primarily depends on the pedagogical strategies and tasks employed (Lehtinen, 2003; Leidner & Jarvenpaa, 1995). Therefore, in addition to the technological aspects, the social and cognitive-psychological aspects of CSCL must be considered when designing, evaluating, and using educational technology (Garrison et al., 2000).

The aim of this paper is to investigate how postgraduate business students appropriate a videoconferencing system and how they engage with each other and with technology as part of their learning. This investigation aims to address the following questions:

- Is the system appropriate taking into account the educational context within which it is used? (appropriateness evaluation)
- What are the perceived benefits and limitations of using the system and how do these affect student satisfaction and engagement? (evaluation of user satisfaction)

The paper initially lays out the theoretical framework in section 2, followed by an overview of the research context in section 3. The research methodology is then outlined in section 4 followed by the major findings and conclusions from the study in sections 5 and 6 respectively.

2. Theoretical insights

A definition of 'collaborative learning' was provided by Dillenbourg (1999) and has been expanded here to accommodate the use of computer support resulting in the following definition: 'computer-supported collaborative learning (CSCL) is the situation in which two or more people learn something together using technology'. As an offspring of socio-constructivism, the major goal of collaborative learning is the construction of knowledge through teamwork and interaction with others. The key pedagogical assumption of collaborative learning is that knowledge is created as it is shared. Therefore, the more information students share the more they learn; participation and active contribution are considered critical for learning. It is also assumed that learners have prior knowledge they can contribute to the conversation and that they will participate if given optimal conditions and incentives (Leidner and Jarvenpaa, 1995).

CTs can enhance the learning environment, support new modes of learning and instruction, and ultimately, encourage learners to actively participate in the learning process. Their increasing use has shifted the teachers' role from being in the centre of instruction to becoming moderators or facilitators in the learning process. Their use also empowers students to become active participants rather than passive observers (de Freitas & Neumann, 2009; Dohn, 2009). Recent research is considering the possibilities of CTs to enable social interaction amongst students, between teachers and students, and within a wider community of learners (Chou & Min, 2009; Kreijns & Kirschner, 2001).

3. Research context

3.1 The videoconferencing system

The case study involves evaluation of the high-tech Collaborative Learning Laboratory (ColLab) which features an advanced videoconferencing system with technology-enhanced learning facilities (iCOM, 2008). The system (Figure 1), which was launched in November 2007, is available to both students and academic staff and it is used primarily for learning and research purposes. Since its launch, postgraduate business students registered in MSc in Business Information Systems at Royal Holloway University of London have been using ColLab to gain hands-on experience with the available tools and technologies built into the system.

The system includes video cameras, high resolution plasma displays (used for videoconferencing and for sharing documents such as presentation slides with the remote sites), and a SmartBoard which allows remote participants to work on the same document simultaneously. The system is controlled by a touch-screen panel and students can log into the system using their usernames and passwords. ColLab can support videoconferencing with up to three remote locations. In addition to connecting with external sites there are facilities for connecting via videoconferencing with other rooms within the university campus hence allowing students to experiment and 'play' with the technology. ColLab also offers recording capabilities (for recording the videoconference discussions) and archiving capabilities (for saving the documents created using the SmartBoard for future reference).

Figure 1: The videoconferencing system (ColLab)

3.2 The pedagogical context within which ColLab is used

The evaluation described in this paper draws from the 2008-09 delivery of the 'People and Technology' course which is one of the core courses for students registered in MSc in Business Information Systems. The distinguishing aspect of this intensive Masters degree is that it brings together students from diverse academic and professional backgrounds including management, marketing and finance, computer science, and engineering amongst others. The aim of the 'People and Technology' course as outlined on the Virtual Learning Environment (Moodle) is "to increase students' understanding of the principles of ICT design and implementation, with specific reference to advanced interactive systems, and to integrate the understanding with practical experience".

To accommodate the diversity of students' needs and interests a blended learning approach was employed. The course design incorporated classroom-based lectures, workshops, and presentations from invited speakers from the industry. During the workshops students were organised in groups and two of the groups had to engage (in turn) into collaborative tasks through videoconferencing. The aim was to facilitate their theoretical understanding of the role of technologies in human communication by sharing their views on how this communication can be enhanced, while at the same time gaining practical experience with technological tools. The two groups participating in each collaborative activity were located in two different rooms but within the same building for practical reasons.

The learning tasks students had to participate in usually involved role play between the two groups and students were given a case script to frame the topic of their discussions. For instance, in one activity the first group took the role of a parent company and the second group was a newly-acquired child company and the two groups had to discuss and negotiate the new policies following the merger. In another example the first group represented the team that designed a system (e.g. a website) and the second group were their clients. In this example the two groups had to negotiate changes in the system functionality and resolve conflicts regarding the final system. These learning tasks intended to give students the opportunity to learn at multiple levels simultaneously: students could gain practical experience with the system, participate in, and manage, both intra-group and inter-group discussions, and at the same time apply the theories taught during the lecture in practical business problems. All students attended a videoconferencing training session at the beginning of the term and a user manual for ColLab was also created and uploaded on Moodle. The subsequent sections of this paper discuss the post-implementation, interpretive evaluation of this collaborative technology. In the following discussion the terms 'user' and 'student' are used interchangeably.

3.3 Participants

In total, 43 students (of which 17 were female and 26 were male) were enrolled in the course. The students in this cohort had diverse professional and academic backgrounds, different age groups (ranging from 20 to 45 with an average age of 24.3 years) and cultures (there were students from 16 different countries). The majority of students had prior work experience (68%). Many students were familiar with one-to-one desktop videoconferencing systems (e.g. Skype) but most students had no experience with advanced CTs such as the one used in this course which involved many-to-many videoconferencing. The novelty factor was taken into consideration in the study as it inevitably affects student satisfaction and can have implications for the appropriateness of the technology.

4. Research methodology

4.1 The challenge of evaluating Collaborative Technologies (CTs)

The aspects that need to be considered when evaluating collaborative systems are more complex and varied than those needed when evaluating single-user systems. Group dynamics and collaborative factors need to be explored in addition to individual cognitive factors, usability (ease of use, effectiveness, efficiency, satisfaction), and contextual issues (Neale et al., 2004; Arrow et al., 2000; McGrath, 1984). Furthermore, collaborative systems evaluation does not only focus on human-computer interaction; it also deals with human-human interaction as well as with the workflow changes that accompany the use of collaborative tools (Damianos et al., 1999). The variability in group composition and the wider social issues also impact system acceptance and inevitably add to the complexity of evaluating the system. Therefore, choosing a sound methodological framework is critical for capturing these multifaceted aspects.

While experimental studies are widely employed and are straightforward for single-user applications, it is difficult to create a group in the laboratory that will reflect the social, motivational, economic, and political factors that are central to group performance. Interpretive field studies, on the other hand, can better capture the social and cognitive-psychological effects of CTs on everyday practices (Grudin, 1988). Nevertheless, quantitative, positivist studies still remain the dominant methodological paradigm in group research and exceed the number of interpretive field studies for various reasons (Arrow et al., 2000). On one hand, field studies often require longitudinal observation and therefore are more time-consuming and costly than laboratory-based or quantitative evaluations. On the other hand, in order to conduct a field study the system to be evaluated needs to have robust, working functionalities to allow researchers to observe how people use it in their everyday activities. However, this is not always possible but, even if there is such a possibility, the designers may be reluctant to release a version of the system which is under evaluation to be used by the intended end-users. Hence, the real-life environment within which evaluation will take place needs to be able to accommodate a technology which is still in an experimental, evaluation stage. Due to these factors researchers often use laboratory methods or exclusively quantitative metrics for technology evaluation (Arrow et al., 2000; Damianos et al., 1999; Cugini, et al., 1997).

Experimental studies are conducted in controlled environments with time restrictions and many variables kept constant. Therefore, they less accurately identify dynamic issues embedded into natural environments such as cultural issues and learning curves and hence they fail to capture the wider context within which the system will be used (Cugini, et al., 1997). It can be argued that excluding people from their normal working environment can completely alter their working patterns and practices. Unlike an experimental study, an interpretive field study can provide deeper understanding of how well the system supports the various kinds of collaborative tasks. Interpretivist research studies explore a naturalistic setting in depth in an attempt to generate rich insights and make sense of the contextual aspects that affect the acceptance of collaborative technologies in the workplace (Orlikowski et al., 1995). These aspects cannot be replicated in an experimental or laboratory environment (Rosenberg, 2000).

Furthermore, problems with technology often appear after the system is installed and embedded with the users' everyday work activities; hence, there is a need for continuous re-evaluation. Within educational literature the number of post-implementation evaluations of CTs is limited. The post-implementation evaluation described in this paper is based on an observational field study which allows capturing the users' experiences and perceptions in a naturalistic setting. A field study was deemed suitable for evaluating ColLab since it offers a complete set of functioning tools and it is already being used by students. Post-implementation evaluation is important for designers, researchers, and users in order to identify any external factors that may affect user-satisfaction and acceptance. It also helps to gain knowledge on which pitfalls to avoid in future applications of similar technologies.

4.2 Methods

In the course of the research a combination of qualitative data collection methods were employed. The primary method used was participant observation. Students were observed while using the system as part of their workshops. Some workshops were also video-recorded. Video-recording has the advantage that we can capture how the participants behave, how they use space, and most

importantly how they interact with the system and with each other. These insights are particularly important when it comes to studying interactive, collaborative technologies used by groups of people. Another advantage of video-recording is micro analysis: we can replay the video many times and capture details that might have not been evident during direct observation. However, video-ethnography has many ethical implications which had to be considered throughout the research. For this reason participants (both students and the teaching team) were asked to sign an informed consent form and give full, partial, or no consent for their images or videos to be used for research purposes.

In addition to direct observation and video-recording a total of nine focus groups were conducted with students at the end of the course. During the focus groups students were given the opportunity to elaborate on their perceptions and behaviours and talk about the issues which had strongly affected their attitude towards using ColLab. Students were asked to re-live their experience, talk about how they felt when using the system, and comment on their experiences and on certain behaviours which were observed during their interaction with the system. The focus groups were useful for eliciting details on how the users' themselves viewed their experience with the system.

The researcher also participated in group discussions and engaged in informal conversations with individual students in an attempt to grasp their perceptions and attitudes towards the system. Furthermore, to gain a holistic view, the researcher attended all the lectures and workshops in order to understand the students' perspectives and identify with the metaphors they were using and with the references they were making to incidents and examples that took place throughout the course. The combination of observational and query data collection techniques facilitated the clarification of details and helped to understand why students were acting (or interacting) in a certain way and what affected their engagement with the system. Finally, as "the best way to evaluate a system is to use it" (Cugini et al., 1997, p. 15) the researcher used the system personally as part of the evaluation process.

4.3 Data analysis

The focus group discussions were recorded, fully transcribed, analysed, and coded in NVivo® according to prominent themes. In particular, content analysis was initially used to filter the data and identify the most salient data that would form the basis for an in-depth analysis. The next stage involved thematic analysis to identify the prominent themes. These were coded and classified into thematic categories which included the students' motivation and engagement with the system, collaborative learning patterns, individual learning preferences, and the lecturer's role in engaging students to use the system (both in terms of educational approach, feedback, and design of learning tasks). The final stage involved systematically looking for code co-occurrence and relationships between the prominent thematic categories (Miles & Huberman, 1994). The data analysis also draws extensively on the informal discussions with students, from the observations that took place during the learning process as well as from the video recordings. The next section presents the main findings and illustrates how they relate to each dimension of evaluation.

5. Findings

The following sub-sections present the interpretation of the findings with the view to evaluate user satisfaction and the appropriateness of the videoconferencing system for the particular educational context within which it is used.

5.1 Appropriateness evaluation

Since the videoconferencing system is used within an educational context the aim of appropriateness evaluation was to assess whether the system contributes to learning and whether it is aligned with the course aims and objectives and the expected learning outcomes. Specifically, the focus was on exploring whether the system is robust, flexible, and accessible enough to accommodate the underlying educational goals (i.e. experiential learning with CTs and learning through collaboration).

To assess the appropriateness of ColLab in the specific context we observed students 'in action' focusing on how they engaged with the system throughout the academic term and later asked them to talk about what they learned by using videoconferencing as part of the course and how it has affected their learning experience in general. As outlined earlier, the pedagogical approach adopted in the particular postgraduate course reflected the view that to understand the principles of technology design and the impact that technology has in everyday work practices, it is important to get hands-on

experience in addition to a theoretical understanding. Therefore, by collaborating through videoconferencing students had the opportunity to see things from the perspective of the 'user' rather than considering the technology theories solely from the 'designer' point of view. In this respect ColLab facilitated students' learning by giving them a realistic, practical point of view and bringing to the forefront deeper issues that guided students to explore things further. The students reported that seeing things 'in perspective' helped them to identify the practical relevance of what they learn during the lecture and what they read in the literature. This, in turn, helped them to develop their critical and analytical skills by reflecting on what they learn.

Unavoidably, adjusting to the videoconferencing setting was not straightforward for every student. Participating in conversations and negotiations with non-collocated participants over a video link made students feel conscious of what they say and how they behave. The fact they had to ensure their messages were clearly transmitted and heard at the remote site deducted from the naturalness of the situation. During observations at the beginning of the year it was obvious that a few students were feeling uncomfortable or shy to talk over videoconferencing resulting in one or two students dominating the discussions. This feeling of uneasiness emerged partly due to the novelty of the situation (both in terms of many-to-many or between-group collaboration and in terms of technology-mediation) and partly due to the fact that when two of the groups were participating the rest of the students were sitting in the classroom observing the interaction. Despite this initial nervousness, however, by the end of the course students appeared more confident to participate. This reinforces the value of experiential learning that is, students learn better 'by doing' rather than by submissively acquiring a theoretical understanding as can be seen in the dialogue below:

> *Student: We always knew the theories of how to work in a videoconferencing but actually sitting in front of a camera and speaking as a group is really hard […] It's like being on the stage in front of a hundred people, especially if there is an audience sitting behind and watching both groups, it makes it more harder. But it was really good.*
>
> *Interviewer: Do you think that if you use it more times it would be even better?*
>
> *Student: Yeah. The thing is we got an idea already on how to use it and now the next day we are going to be prepared. So, we know what's going to happen. It's going to be a lot easier.*

This excerpt shows that even though students were experiencing feelings of anxiety while using the technology (which is often documented in the literature) they could see the benefits in the long term. Furthermore, students seemed to be aware that during the videoconference they had to focus on many things at the same time such as making sure the remote audience can hear them and see them while also focusing on completing the actual task (e.g. negotiate the policies following a merger or agreeing on changes on the website design). By doing so, students started to appreciate the role of best practices (such as speaking slowly, pausing during the discussion, etc) in situations where two remote groups of people need to communicate and collaborate via videoconferencing:

> *Student: With some of the techniques we discussed about doing these things, we understand how to make it easier to get these interactions going, like pausing during the discussion and things like that.*

This learning experience allowed students to 'learn how to manage themselves' in computer-supported collaborative settings. Most importantly they learned this in a safe environment before they move in a more demanding setting, the real business world. Further, as mentioned above, when two groups were using ColLab, their classmates were observing their interactions which allowed them to learn by watching how other students behave in the same situation. There was one incident in particular which was mentioned a number of times by students in the focus groups. When the audio was lost during one of the videoconferences, one of the remote participants wrote a message on a piece of paper saying "We can't hear you" and showed it to the others through the camera. Although this may be considered common practice (at least for those who widely use desktop videoconferencing), there were students who thought this was an innovative idea. Subsequently, during the focus groups when students were asked what they would do in case they could not hear the remote audience many of them referred to this incident. This example illustrates the emergent learning opportunities created by computer-supported collaborative learning practices.

Overall, ColLab is considered robust for the educational purposes for which it was used and can accommodate the underlying learning goals. In some cases there were some technical problems with connectivity or being unable to hear the remote side but it was through these problems that students

actually learned how people manage to communicate despite the constraints posed by technology. The system was also flexible in the sense that it allowed students to experiment with it not only for the purposes of the course but also for pursuing personal interests or using it for their dissertations. Finally, ColLab was readily available outside the classroom hours and students could just book the room and use it either in groups or individually if they wanted to get more experience with it.

5.2 Evaluation of user satisfaction

The aim of evaluation of user satisfaction was to assess how students feel when they use ColLab, what their perceived benefits and limitations of using the system are, and how these affect their attitude and future use of the system. The evaluation draws from participant observation, the focus group discussions, as well as from informal encounters with students in an attempt to gain deeper insights into the extend to which they are satisfied with its use in their learning journey. The combination of research methods was invaluable because it made it possible to compare students' actions (the observed behaviour) with what students said about their learning experiences and motivations.

In verbalising their feelings and attitudes towards the system students focused more on the individual, personal benefits they got from participating in the CSCL tasks rather than what they could contribute in this collective effort. In particular, students reported that their overall experience was positive and they seemed to be very aware of both the short-term (i.e. facilitating their coursework and putting theories in practice) and the long-term benefits (i.e. developing new skills and preparing for their future careers) although more emphasis was placed on the latter. Additionally, students felt that CSCL tasks gave them the opportunity to experiment and gain familiarity with a state-of-the-art technology which they considered as beneficial in its own right. Given that some students had no prior experience with either group work or advanced videoconferencing systems, using ColLab as part of the course gave them the confidence to work effectively in groups and use similar systems in the future, as illustrated in the following excerpts:

> *Student A: The workshops give you the chance of actually work in groups, interact and it's an important experience to the real world. You will be never working alone, you will be interacting with people. That's the importance of this kind of experience working together, achieving a common goal.*
>
> *Student B: There are so many companies that use videoconferencing so I think it's going to be really useful in our future job […] We must know how to present our ideas and communicate with other workers.*

The focus groups also led us to some insights regarding the motivations and mixed factors that affected the students' attitude towards using the system. Students seemed very enthusiastic and involved during the workshops and it was expected that they might want to extend the benefits by using the system in their own time. What we found instead was that although students found the videoconferencing exercises helpful in many ways none of them used it outside the workshops. When we investigated this further we found that the limited adoption of the system was related to the fact that the use of ColLab was not part of the assessment criteria. Students mentioned that if their participation was assessed they would get more involved. Although students go to the university to learn this does not necessarily mean that their primary motivating factor for engaging with the learning tasks is learning as such. Students may engage for getting higher marks or for gaining a competitive advantage. Thus, to enable students to actively engage in self-directed learning additional incentives need to be promoted such as making the links to other (assessed) learning tasks more obvious, praising or rewarding those who make an effort, emphasizing the practical skills they can develop by working with others and elucidating how these skills can help them in their future careers.

Despite the fact that the wider adoption of the system was nonexistent students were very active during the in-class workshops although they were neither assessed nor mandatory. Students mentioned that they really benefited from the group discussions and that their experiences with ColLab during the workshops were very enjoyable. The question hence was, why did students attend the workshops but did not attempt to use ColLab as part of their self-study? This issue led us to investigate what motivated students to attend the workshops in the first place. We found out that during the workshops students knew they will have a specific task to complete and a given, predetermined case study to discuss which guided their interactions during the videoconference. Students explained that it is difficult to organise such tasks on their own. Another reason was the fact

that they knew the tasks would be useful for facilitating their understanding of the theories and therefore would help them complete their individual assignment. Finally, many students explained that the feedback and guidance provided from the lecturer during the workshops was invaluable for their learning. This illustrates that student engagement with CTs is decidedly affected by the educational approach used. It also shows that well-organised, guided learning tasks make students more eager to participate.

Further, when students were asked about their perceptions regarding the difference between face-to-face communication and communication through videoconferencing the majority explained that the latter takes longer time, more effort, and requires more preparation. Some students also referred to the learning outcomes and stated that after having practical experience with ColLab they could appreciate how important it is to design systems that accommodate diverse user needs. Finally some mature students (who had prior work experience) mentioned that the experience they had during the workshops mirrors what happens in real-life situations and this created a feeling of fulfilment; this shows the value-added features of this CT. Overall, the findings show that student satisfaction and engagement depend on a combination of aspects and these have to be considered collectively when evaluating the effects of using CTs in education.

5.3 Limitations of the study

In interpretive studies, the researcher's bias inevitably impacts the interpretation of the findings. This could be alleviated if more than one researchers collected information independently and then compared their interpretations. Another way to mitigate bias and increase the reliability of the findings is by using mixed methods and this should be addressed in future research. Also, although students became familiar with the researcher and provided their consent to be observed and video-recorded, their behaviours were likely to be influenced by the researcher's presence. Quantitative methods could be employed in addition to the various qualitative methods to allow validation and triangulation of the findings. Another limitation was the solitary focus on students' perspectives. Future research should systematically address the perspectives of teaching staff on the use of CTs in education since, as findings show, educators play a key role in the successful adoption of the system.

6. Discussion

Engaging students and preparing them for the ever-changing, complex world of work requires continuous re-adjustment and re-evaluation of educational technologies and educational practices alike. The paper evaluates the suitability of a videoconferencing system in postgraduate business education (appropriateness evaluation) and the students' perceived motives towards using the system (evaluation of student satisfaction). The evaluation is based on an interpretive, real-life case study for capturing the users' experiences and perceptions in a naturalistic setting.

The end-goal of performing any type of evaluation is to identify potential areas of improvement. Arguably, the findings from this case study can inform the application of videoconferencing applications in educational contexts, particularly for subjects such as Business and IT. In particular, the findings suggest that using videoconferencing as part of a postgraduate course helped students to gain confidence with computer-mediated communication, learn best practices of how to collaborate in technology-mediated settings, and appreciate the impact of technology on everyday life. The videoconferencing exercises also acted as a means for engaging students to participate actively in the learning process by providing them appealing opportunities to put the subject-related theories in practice in addition to reading and attending lectures.

The findings also show that student engagement and motivation to participate in CSCL tasks do not primarily depend on how attractive the technology is; rather they depend on a combination of individual, personal factors such as the benefits that students perceive they get from using the technology, and situational factors such as the type of the learning tasks and the quality of feedback and guidance from the lecturer. Using a system which is not robust enough can actually challenge students more and hence enhance the learning process; however, if educators do not design appropriate CSCL tasks that incorporate the system or if they do not provide sound incentives to encourage students to use it, then the system is less likely to be adopted. Technology alone is seldom enough for successful CSCL practices. We need appropriate learning tasks to be designed in order to engage students to participate and use the technology. Most importantly there is a need for new pedagogical models that make the most of the technology available today.

This study reinforces the view that bringing new technologies in a social educational setting is not the solitary ingredient for engaging students and contributing towards the learning outcomes. A more holistic approach needs to be pursued considering the individual, social, and contextual aspects intertwined in such complex situations. At a broader educational context this could mean that combining both formal and informal learning practices can possibly lead to an enhanced learning experience. For lecturers, the findings suggest that successful CSCL tasks require good organisation and regular feedback and guidance to students (even postgraduate students). For those responsible for educational policies, an issue that needs further investigation is the adjustment of current assessment strategies in order to reflect the value of CTs in learning. Further research is needed to continue exploring the potential uses of CTs in enhancing collaborative learning and to illuminate better understandings of the interplay and mutual influences between technology use and learning practices in educational contexts and beyond. Such enquiries alongside continuous re-evaluation of technology in naturalistic contexts may lead to enhanced CSCL experiences.

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