

Studying the Adoption and Learning Processes of Online Interactivity

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ABSTRACT

Acknowledging the general difficulty of new e-learning pedagogical approaches to achieve wide acceptance and use, the study examined the adoption of a proposed online interactive learning environment by a class of MBA students. To this end, a web-based, case-based constructivist learning environment was developed for the purposes of the study embedding interactivity. The class students were given the choice to develop their group work using the proposed online environment, or develop it through more traditional group collaboration means. A wide array of possible factors influencing the student adoption decision was considered by the study (e.g. perceived attributes of the proposed environment, student characteristics, peer student actions and attitudes, change facilitator interventions). The obtained results led to the development of a model depicting the observed influencing factors along with their relative importance. A notable finding of the study is the high influence of change facilitator actions, making the whole adoption phenomenon observed more instrumentalist in nature.

The study also looked at methods through which an educator can practically and efficiently evaluate the learning processes involved in an online group discussion and assess individual student contribution. Towards this direction, the study found the model proposed by Gunawardena et al. to provide a very promising foundation.

The obtained student feedback regarding the overall experience was positive with most students finding the provided online interactive environment easy to use and effective. The majority of students reported also that a fair amount of group learning occurred in their teams. Other positive aspects reported include: the ability to overcome the barriers of time and place, the reduced need for physical meetings and the ability to learn something new involving technology. Some of the negative aspects reported include: the absence of

real-time feedback by teammates and the perceived not as rich interaction as face-to-face (including some difficulty to explain views online).

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GLOSSARY

Adopter categorization: Rogers' model distinguishes potential adopters into five groups according to their innovativeness: innovators, early adopters, early majority, late majority, laggards

Behaviourism: a learning theory stipulating that learning emanates from the conditioned responses to stimuli

Blog: a contraction of the term web log, is a website usually maintained by an individual with regular entries of commentary, descriptions of events, or other material

Case-based learning: a student-centred instructional strategy that provides rich, real-life context for problem presentation and facilitates experience-based knowledge sharing and construction

Change facilitator: an individual who makes easier the implementation of change through a taxonomy of appropriate interventions

Chat room: a real-time (synchronous) form of computer-mediated communication using instant messages

Cognitivism: a learning theory which, while being fundamentally objective based, recognizes the mental processing done during learning and enhances it via contiguity and repetition

Computer-Mediated Communication (CMC): any communicative transaction which occurs through the use of two or more networked computers

Concerns Based Adoption Model (CBAM): a widely applied theory and methodology for studying the process of implementing change in education

Constructivism: a learning theory asserting that learning is an active process via which learners construct or build new ideas or concepts on the basis of their prior experiences, mental structures and beliefs

Constructivist Learning Environment (CLE): a learning environment that engages learners in active manipulative, constructive, intentional, complex, authentic, cooperative (collaborative and conversational), and reflective learning activities

Course Management Systems (CMS): a software system providing a set of tools and a framework allowing the creation of course content, and the subsequent delivery and management of these courses, including the support of various interactions with participating students.

Google Docs: a free Web 2.0 based software that provides collaborative word-processing, spreadsheet, presentation and data storage services

Gunawardena model: a model proposed by Gunawardena et al. (1997) for group knowledge co-construction

ICT: Information Communications Technology

Ill-structured problems: problems characterised by uncertainties, multiple and/or conflicting perspectives among stakeholders, multiple solutions, and multiple criteria for solution evaluation

Innovation: An idea, practice, or object that is perceived as new by an individual or other unit of adoption

Innovativeness: the degree to which an individual is relatively earlier in adopting new ideas than other members of a system

Innovation attributes: as per the general innovation diffusion theory these are: relative advantage, compatibility, complexity, trialability and observability

Learning Management System (LMS): a software for delivering, tracking and managing training

Online interactivity: two-way online interactions among two or more learning participants (e.g. students, educators and learning materials) through which collaborative learning is achieved

Online learning environment: an Internet-based system designed to support learning in an educational setting by providing a collection of tools for collaboration (conferences, blogs, wikis, chat rooms etc.) and uploading / sharing of content

Rogers Model of Diffusion: a multi-stage innovation diffusion model introduced by E. Rogers in 1962.

Social constructivism: a philosophy that contends that categories of knowledge and reality are actively created by social relationships and interactions.

Social Web: please see Web 2.0

Web 2.0: the new architecture of World Wide Web based on social interconnectedness and collaboration

Wiki: a page or collection of web pages designed to enable anyone who accesses it to contribute or modify content using a simplified markup language.

EXECUTIVE SUMMARY

The recent advancements in information and computer technologies (ICT) have signalled a major transformation in learning processes (Duggan et. al., 2001). Indeed, educational institutions and corporations are increasingly adopting information and communication technologies (ICT) as tools for learning, collaboration, communication, course administration, and curriculum design, giving rise to the domain we generally refer to as e-learning. E-learning can be seen as consisting of two main blended dimensions (Elgort, 2005): e-learning technologies (e.g. learning management systems) and e-learning pedagogy (e.g. student centred, problem-based, collaborative learning). It is the e-learning pedagogy dimension that is considered by most scholars (Zemsky and Massy, 2004; Elgort, 2005) as the most powerful part and the one that has the potential to truly revolutionize learning. Studies have shown that, while the diffusion of e-learning technologies has progressed well in academic institutions, e-learning pedagogy is still stuck at the innovator stage, unable to achieve significant use by the large majority of students and faculty (Anderson et al., 1998; Zemsky and Massy, 2004).

The present study focuses upon the failure of e-learning (particularly its pedagogy dimension) to achieve widespread adoption and seeks to understand some of the reasons for this failure. Using a participation learning metaphor (Sfard, 1998), the study approaches learning as a collaborative process expressed in the sphere of e-learning by online interactivity (defined as two-way online interactions among two or more learning participants through which collaborative learning is achieved). The setting used in the study was a graduate MBA class at the University of Nicosia, delivered through a combination of face-to-face (the class lectures) and online (the class project) interaction. For the online part, a case-based learning scenario was employed in which students were called to collaboratively diagnose and solve authentic problems relevant to the class subject matter. To this end, an online constructivist learning environment was developed for the purposes of

the study, embedding online interactivity. The students were given the option to decide in favour of using the new learning environment (that is, adopt the new environment) or continue to collaborate through more traditional collaboration means such as face-to-face meetings or telephone calls (that is, not adopt the new environment). The entire adoption decision process followed by the students was studied in detail along with the main factors influencing their final decision.

E-learning (encompassing both its blended technologies and pedagogy dimensions) constitutes a technological innovation and its adoption is basically a problem of innovation diffusion and implementation among students and educators. Nevertheless, the conducted literature review has indicated that, to date, researchers have seldom approached the issue of e-learning adoption from the innovation diffusion angle, thus failing to utilize effectively the relevant adoption theories and models. Recognizing this gap, the study was informed by the dominant theories in both the general innovation diffusion perspective (emphasizing the decision to adopt or not a proposed innovation) and also the more specific educational change perspective (emphasizing the actual implementation of an innovation in educational settings). The subject of innovation adoption was thus approached comprehensively by considering a wide range of influencing factors (perceived innovation attributes, change facilitator actions, interpersonal communication networks, student concerns and student characteristics). The findings of the study led to the development of model reflecting the adoption process by students for the specific innovation considered (proposed online learning environment embedding interactivity) and incorporating the various influencing factors along with their relative importance. Knowledge of the influencing factors allows a change facilitator (e.g. educator or instructional designer) to address hindering mechanisms and reinforce driving forces towards improved adoption. A novel, and certainly welcome, result obtained in the study was the key role of the change facilitator both during the adoption process and also during the actual innovation implementation, signifying that the whole process can be

potentially steered towards the desired results through appropriate interventions.

Realizing the novelty of the field, the study also looked at methods through which an educator can practically and efficiently evaluate the learning processes involved in an online group discussion and assess appropriately individual student contribution. To this end, the study was informed by two of the most influential models for interaction analysis encountered in the literature: the interaction analysis model proposed by Henri (1992) and also the model proposed by Gunawardena et al. (1997) for knowledge co-construction. The model proposed by Gunawardena et al. was found to provide a very promising foundation for evaluating the learning processes associated with online interactions and assessing individual student contribution to online discussions.

The overall student feedback and satisfaction results were positive with most students finding the provided online collaborative environment easy to use and effective. Most students reported also that a fair amount of group learning occurred in their teams. The most frequently reported by students positive aspects of the provided online collaborative learning environment include: ability to overcome the barriers of time and place, reduced need for physical meetings, ability to learn something new involving technology, ability to receive prompt feedback by the lecturer and faster collaboration. The most frequently reported negative aspects include: absence of real-time feedback by teammates, not as rich interaction as face-to-face (including some difficulty to explain views online) and some rather minor technical issues.

Finally, recommendations are put forward for addressing the hindering mechanisms and reinforcing the driving forces unveiled in the study towards the wider use of online interactivity among students and educators at the University of Nicosia. To this end, an action plan is proposed for embedding online interactivity into additional university educational programs and courses.

CHAPTER 1: INTRODUCTION

1.1 Project Rationale and Context

The need for learning institutions to understand how to best integrate technology in their systems, pedagogical approaches and learning processes and how to diffuse the use of such technology among students and faculty has never been more important. Indeed, educational institutions and corporations are increasingly adopting information and communication technologies (ICT) as tools for learning, collaboration, communication, course administration, and curriculum design, giving rise to the domain we generally refer to as e-learning. E-learning is considered to be the most important educational innovation of the last decades and can be seen as consisting of two main blended dimensions (Elgort, 2005): e-learning technologies (e.g. learning management systems) and e-learning pedagogy (e.g. student centred, problem-based, collaborative learning). It is the e-learning pedagogy dimension that is considered by most scholars (Zemsky and Massy, 2004; Elgort, 2005) as the most powerful part and the one that has the potential to truly revolutionize learning as we know it today. Studies have shown that, while the diffusion of e-learning technologies has progressed well in academic institutions, e-learning pedagogy is still stuck at the innovator stage, unable to achieve significant use by the large majority of students and faculty (Anderson et al., 1998; Zemsky and Massy, 2004). In fact, it has been argued (Elgort 2005; Zemsky and Massy, 2004) that the ease of use of the new learning management systems combined with the reluctance of most faculty to actually change the way they teach, have resulted in many instructors adopting a surface approach to e-learning (e.g. simply upload their lecture notes online).

The present study focuses upon the failure of e-learning (particularly the pedagogy aspect) to achieve widespread adoption and seeks to understand some of the reasons for this failure with the final aim of addressing obstacles and making recommendations towards improved adoption. As shown in

Chapter 2 (section 2.3), e-learning (encompassing both its blended technologies and pedagogy dimensions) constitutes a technological innovation and its adoption is basically a problem of innovation diffusion and implementation among students and educators. Nevertheless, the conducted literature review has indicated that, to date, researchers have seldom approached the issue of e-learning adoption from the innovation diffusion angle, thus failing to utilize effectively the relevant adoption theories and models in order to understand better the underlying processes involved. This study considers the dominant theories in both the general innovation diffusion area and also the more specific educational change domain and examines the problem of e-learning adoption in a more holistic way, considering a variety of potential adoption factors along with their relative importance.

In order to gain a better understanding of the diffusion of e-learning pedagogy, which can encompass a number of actual instructional approaches and learning processes, it is necessary, for the purpose of the study, to select a specific key aspect of e-learning pedagogy and examine its adoption among a group of potential adopters. To this end, a participation learning metaphor (Sfard, 1998) is adopted in this study, which views learning as a collaborative process. The participation metaphor is grounded on social constructivism principles (Vygotsky, 1978) and its learning effectiveness has been demonstrated by a number of studies (Snow and Swanson, 1992). In the realm of e-learning, the participation metaphor is expressed by online interactivity which refers to two-way online interactions among two or more learning participants through which collaborative learning is achieved. The study thus performs an in-depth examination of the adoption of online interactivity by a group of students aiming at understanding the main factors that influence the underlying diffusion process.

It is also widely accepted in the relevant literature (Mason, 1991; Gunawardena et al., 1997) that the area of evaluating the learning processes

involved in online interactions is rather novel. Indeed, educators appear to currently lack effective and efficient tools that will reach beyond the mere quantitative characteristics of online group discussions (e.g. number of active participants, number of messages exchanged etc.) allowing them to quickly discern if indeed new collaborative knowledge is taking place in an online group discussion. The present study will also look into this area and examine whether some of the dominant interaction analysis models proposed in the industry could be of value in this effort.

The above discussion regarding the actual diffusion of e-learning today indicates that educational institutions globally are striving to integrate e-learning in their programs and promote its wider use. This e-learning diffusion effort may be also identified among Cypriot educational institutions with most of their educational initiatives falling under the Lifelong Learning Programme (LLP), a European funding programme which supports education and training across Europe. Other relevant research initiatives currently in progress in the area of education in Cyprus include the Centre for the Advancement of Research and Development in Educational Technology (CARDET) and the development of a Virtual University for Small States of the Commonwealth (VUSSC). The present study took place at the University of Nicosia, a leading private university in Cyprus, and constitutes part of its efforts to increase adoption of e-learning by students and faculty leading to an improved overall learning experience.

The researcher is a lecturer at the University of Nicosia and possesses significant technical expertise and multi-year experience in implementing direct channel innovation projects (like Internet banking and e-learning). Based on his experience, the researcher believes that change does not just happen automatically but instead significant and coordinated effort is necessary in order to achieve the desired results. Indeed, the widely followed rational approach to change articulated by Chin and Benne (1969), postulating that a *good* program or process provided to *good* people would find its way into their practice does not seem to be sufficient in the case of e-

learning. The researcher has led the successful implementation of several change programs in his work engagements as project manager and understands well the challenges involved in actually changing people attitudes and behaviours as required by the introduction of new programs and practices. He also holds a certificate in virtual tutoring by Henley Business School and has significant experience in delivering MBA classes for both the Henley Business School and the University of Nicosia. The researcher considers his own work experience, technical knowledge and research background as an indispensable part of this research, his added value to the whole effort. In addition, the researcher considers this work based action research as a very practical and effective method to improve his own pedagogical practices and contribute to the increased use of e-learning at the University of Nicosia.

1.2 Aims and Objectives

The purpose of this research is to gain a better understanding of the process of adoption of a selected aspect of e-learning (online interactivity) by students, evaluate the factors which influence this process and suggest actions towards overcoming obstacles and reinforcing driving forces leading to improved adoption.

The researcher considers the incorporation of e-learning facilities (both technologies and pedagogies) in educational programs as a major change which needs to be facilitated through focused actions or interventions by change agents or facilitators. To this end, the present research pays particular attention to the role of such change facilitators including the development of a taxonomy of potentially valuable interventions.

The study also seeks ways to evaluate the learning processes involved in online interactivity and measure the student satisfaction with the provided learning experience.

In order to achieve the above research aims, the following research objectives have been developed for the study:

RO 1: Examine the process of adoption (decision to use) of online interactivity by students and the factors affecting this decision

RO 2: Identify the consequences of different options followed by the change agent, that is, the tutor and to what extent these affect the adoption process

RO 3: Based on 1 and 2, suggest points to address hindering mechanisms and reinforce driving forces towards improved adoption

RO 4: Examine the learning processes involved in online interactivity and the degree of associated student satisfaction

1.3 Outcomes and Intended Impact

The present research aspires to contribute in a practical way to the increased use of the selected key aspect of e-learning (online interactivity) at the University of Nicosia, achieving greater adoption by students and a more fulfilling learning experience. To this end, in addition to the main project report, the following deliverables have been prepared as part of the project:

- An executive summary report summarizing the main findings of the project and proposing ways to achieve increased diffusion of online interactivity at the University of Nicosia. The recipient of this report will be the President of the Council of the University of Nicosia.
- An educator guide on how student adoption of online interactivity can be increased (practical steps to be followed by faculty) including recommendations for the design and implementation of online collaborative learning environments. A section on how to evaluate the learning processes involved in online interactions is also included. This guide will be given to the officer of the University of Nicosia responsible for teaching and learning practices.

Additionally, the researcher plans to submit for publication the main findings of the study, thus sharing with the wider learning community the main conclusions and recommendations. Even though the current research constitutes a case study conducted at the University of Nicosia, and is therefore subject to the generalisability issues inherent to case studies, the researcher believes that the results obtained could potentially have more general applicability since the problem of adoption of a selected aspect of e-learning (online interactivity) was approached from the *general* technological innovation diffusion perspective.

1.4 Structure of the Report

This first chapter introduces the project area, its importance and provides the rationale, aims and intended outcomes of the study.

The next chapter (Chapter 2) critically reviews the literature in the relevant areas of the study (general innovation diffusion theory, change implementation in education, promises and status of e-learning today, online interactivity and its value in collaborative learning, available models for evaluating online interactions and the associated learning processes). Any gaps identified in the existing literature are also identified and summarized.

Chapter 3 describes and justifies the research methodology adopted.

Chapter 4 describes the design and implementation of the online collaborative learning environment used in the study, the instructional design adopted and the researcher interventions used to facilitate the undertaken change.

Chapter 5 presents the findings of the study with a full discussion and interpretation including linking back to the literature review.

Chapter 6 presents the main conclusions of the project as these arise from the study's findings along with a list of recommendations.

Finally, chapter 7 includes a reflection on this research journey.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to present the main results of the conducted literature review spanning the areas of general innovation diffusion, change implementation in the educational environment, promises and status of e-learning today, online interactivity and its value in collaborative learning and a review of the available models for evaluating online interactions and associated learning processes.

2.2 E-Learning, its Promises and State of Diffusion

The recent advancements in information and computer technologies (ICT) have signalled a major transformation in learning processes (Duggan et. al., 2001). Educational institutions and corporations are increasingly adopting ICT as tools for learning, collaboration, communication, course administration, and curriculum design, giving rise to the domain we refer to as e-learning. Indeed, e-learning is considered to be the most important educational innovation of the last two decades and the only one that focuses on the actual learning content itself (Zemsky and Massy, 2004). E-learning has attracted significant investment partially due to its main promises that include:

- E-learning would bring a revolution in pedagogy itself (learning would become student-centred, personalised and problem-based with course instructors replaced by facilitators; students would learn through simulations and games increasing motivation; students would learn collaboratively through computer-mediated communication facilities and the emerging social software such as wikis and blogs etc.).

- Learning would be delivered any time and anywhere providing a distinctive competitive advantage to the institutions that succeed in integrating e-learning capabilities in their offerings and enabling them to capture the rising demand for distance education, lifelong learning and corporate education.
- Increased capabilities would be provided for the academic institutions to better control the quality of their offerings while enriching them with contributions from leading academic faculty and non-academic experts globally.
- Educational institutions would achieve cost savings due to the potentially lower cost base of technology mediated interaction and learning as compared to face-to-face learning.

Has e-learning lived up to its expectations and what is the actual state of e-learning diffusion today? To answer this question, it is useful to borrow Elgort's (2005) view of e-learning as consisting of two main blended dimensions: e-learning technologies (e.g. learning management systems) and e-learning pedagogy (e.g. student centred, problem-based, collaborative learning). It is exactly this second dimension (e-learning pedagogy) that is considered by most scholars (Zemsky and Massy, 2004; Elgort, 2005) as the most powerful and the one that has the potential to truly revolutionize learning as we know it today. It appears that, while the diffusion of e-learning technologies has progressed well in academic institutions today (considered to be in the early majority adoption stage), e-learning pedagogy is still stuck at the innovator stage (Elgort, 2005). In fact, Elgort (2005) has argued that the ease of use characterizing the new learning management systems allows instructors to adopt a *surface* approach to e-learning (e.g. simply upload their lecture notes online).

A similar conclusion is reached by Zemsky and Massy (2004) who identify the following four distinct and overlapping adoption cycles with regard to e-learning:

- Cycle 1: enhancements to traditional course / program configurations (e.g. e-mail, student access to information on Internet, use of multimedia and simple simulations, use of off-the-shelf software such as PowerPoint). This cycle was considered by the authors to be moving rapidly through the *early majority* stage.
- Cycle 2: course management systems (this cycle was considered to be moving into the *early majority* stage)
- Cycle 3: importation of learning objects (e.g. complex interactive simulations and other electronic learning objects). This cycle was considered to be at the *innovator* stage.
- Cycle 4: development of new course / program configurations (e.g. active learning; combination of face-to-face, virtual, synchronous and asynchronous interaction; new roles for professors and students). This cycle was considered to be at the *innovator* stage.

E-learning pedagogy can be associated with the latter two cycles (cycles 3 and 4) which are still at the innovator stage while e-learning technologies are associated with cycles 1 and 2 (early majority stage).

Other studies (e.g. Anderson et al., 1998; Mahony and Wozniac, 2005) have also confirmed the existence of a dividing chasm between the categories of early adopters and the early majority, preventing the wide adoption of e-learning pedagogy among students and faculty.

This study focuses upon the failure of e-learning pedagogy to achieve widespread adoption and seeks to understand some of the reasons for this failure with the final aim of making proposals towards addressing hindering mechanisms and reinforcing driving forces leading to improved adoption.

2.3 The Issue of e-Learning Diffusion

The present study approaches e-learning (encompassing both its blended technologies and pedagogy dimensions) as constituting a technological innovation, with its adoption thus becoming basically a problem of innovation

diffusion among students and educators. In order to justify this approach, it is worth examining the definition of an innovation as proposed by Rogers (2003). According to Rogers, *innovation* is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. Rogers proceeds further to state that most of the new ideas whose diffusion has been analysed are technological innovations with the words “innovation” and “technology” often used as synonyms. In Rogers’ view, a technological innovation usually has two components: (1) a *hardware* aspect, consisting of the tool that embodies the technology as a material or physical object, and (2) a *software* aspect, consisting of the information base for the tool. Clearly, e-learning satisfies Rogers’ definition for an innovation as it is generally perceived by educators and students as introducing drastically new tools and approaches for instructional design, course management and learning processes (Duggan et. al., 2001; Zemsky and Massy, 2004; Elgort, 2005). Additionally, e-learning constitutes also a technological innovation as it involves the use of new technologies (e.g. information and communication technologies). One can easily discern also the two technological innovation components mentioned by Rogers as follows:

- Hardware aspect: the physical information and communication devices used (e.g. computers, modems, routers etc.)
- Software aspect: the software applications used (e.g. Moodle or Google Docs), the adopted instructional design, the learning environment and processes used etc.

Innovations are generally divided into two types: continuous and discontinuous (Robertson, 1971; Moore, 2002; Moreau et al., 2001). Continuous innovations refer to normal upgrades of existing offerings or approaches, which do not require substantial change in user behaviour, while discontinuous innovations involve a greater degree of learning and change in behaviour. Technological innovations are predominantly discontinuous (Hirschmann, 1980). Evidently, e-learning constitutes a discontinuous innovation as it requires substantial learning and major

changes in both faculty and student behaviour. It can be argued further, that among the two blended dimensions of e-learning (technologies and pedagogy), e-learning pedagogy is more discontinuous in nature requiring a radically new approach to instructional design and learning processes (e.g. student-centred, problem-based, collaborative learning).

Diffusion theories can be divided into two broad categories (Surry and Farquhar, 1997): general diffusion theories applicable to a wide range of settings and instructional design diffusion theories specific to innovations in academic institutions. The dominant theories in each category are discussed in the next sections.

2.3.1 General Diffusion Theory

The general innovation diffusion literature has been largely based on the work of Rogers (2003, first published in 1962). Rogers carried out his seminal work over fifty years ago and it has since been reproduced and enriched through his own efforts and that of numerous other diffusion scholars. It has also been used to study a wide range of innovations and adopters. The heart of Rogers' work is his *innovation-decision process model* consisting of five stages:

- *Knowledge*: occurs when an individual is exposed to an innovation's existence.
- *Persuasion*: occurs when an individual forms a favourable or unfavourable attitude towards the innovation.
- *Decision*: occurs when an individual engages in activities that lead to a choice to adopt or reject the innovation.
- *Implementation*: occurs when an individual puts a new idea into use.
- *Confirmation*: occurs when an individual seeks reinforcement of an innovation decision already made.

The key principle of the general diffusion perspective is that a "new idea" is distributed inside a social system through the act of human communication

(Hall and Hord, 2006). The individuals in a social system do not all adopt an innovation at the same time. Rogers (2003) introduces an adopter categorization based on adopter *innovativeness* (defined as the degree to which an individual is relatively earlier in adopting new ideas than other members of a system). Hence, based on their time of adoption, the adopters are divided into five groups (*innovators, early adopters, early majority, late majority, laggards*). Like many other human traits, innovativeness is normally distributed as shown in Figure 2.1.

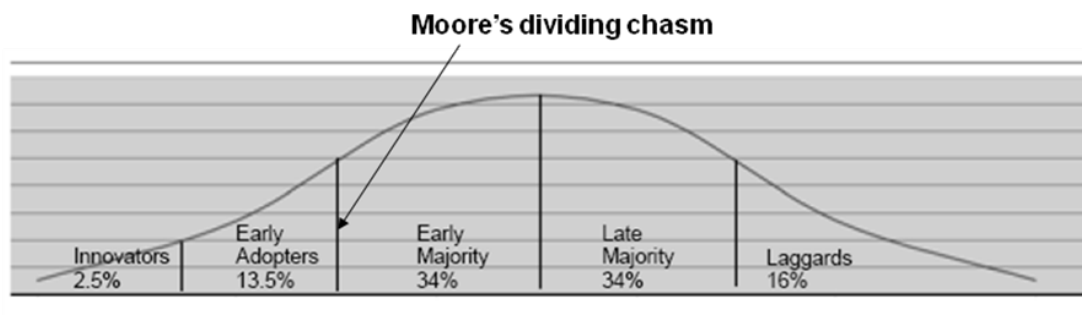


Figure 2.1: Distribution of New Adopters for Technological Innovations (Rogers, 2003: 281)

A voluminous research literature has accumulated about variables related to innovativeness. These can be classified into three categories: socioeconomic characteristics, personality variables and communication behaviour.

Moore (2002) builds upon the adopter categorization shown in Figure 2.1 and proposes the existence of what he calls *cracks* in the bell curve between the various adopter groups, necessitating different marketing strategies for each group. According to the author, the most severe of these cracks, a deep and dividing chasm, separates the early adopters from the early majority due to the fundamental differences in the characteristics of the two groups (early adopters are inclined to view innovations as an opportunity for a dramatic change in which they can get a competitive positioning while the early majority is more inclined to seek evolutionary improvements). Hence, the marketing strategies used must be such that they will make the innovation attractive to the early majority, otherwise the innovation runs the risk to stay forever on the fringes of the mainstream practice.

According to the general diffusion perspective, the rate of adoption of an innovation is determined by the following variables:

- **Perceived attributes of the innovation:** the five most important such attributes are:
 - *Relative advantage:* the degree to which an innovation is perceived superior to the product currently used or other competing products (the degree of relative advantage is often expressed as economic profitability, social prestige, or in other ways).
 - *Compatibility:* the extent to which the new product is consistent with existing values, the past experience of the adopter and adopter needs for the innovation.
 - *Complexity:* the degree to which the innovation is perceived difficult to understand or use.
 - *Trialability:* the ability to try out an innovation before finally adopting it.
 - *Observability:* the extent to which the results of using an innovation are visible and easily communicated to others.
- **Type of innovation-decision:** this can be optional (free individual decision), collective (decision taken by a group of individuals) or authority (decision imposed by a mandate).
- **Nature of communication channels:** There are various channels via which the messages about an innovation are communicated and which are categorized as: (a) *mass media* versus *interpersonal* and (b) *localite* (linking an individual with sources inside the social system) versus *cosmopolite* (linking an individual with sources outside the social system). According to the general diffusion perspective, mass media and cosmopolite channels are relatively more important at the knowledge stage while interpersonal and localite channels are more important at the persuasion stage. In interpersonal networks (also

called diffusion networks), the role of opinion leaders (individuals who influence others' opinions about innovations) is crucial towards influencing the mass population.

- **Nature of the social system in which the innovation is diffusing:** its norms, degree of network interconnectedness, socio-economic status, education level, opinion leadership etc.
- **Extent of change agents' promotion efforts:** A change agent is an individual who influences people innovation decisions in a direction deemed desirable by a change agency. Examples of change agents include consultants, teachers, salespeople etc.

The above five types of innovation adoption variables have not received equal attention from diffusion scholars. Among them, the perceived innovation attributes have been most extensively investigated and have been found to explain about half of the variance in rates of adoption (Rogers, 2003).

The process nature of Rogers' model (that is, the existence of stages in the innovation-decision process) has also not been studied in depth by scholars. Rogers himself (2003) identified the need for additional qualitative studies aiming at determining the sequence of diffusion events over time and understanding better adopter behaviour.

The conducted literature review unveiled that few empirical studies exist that actually made reference to specific innovation adoption models when examining e-learning diffusion. Several of these studies made use of the adopter categorization introduced by the general diffusion theory (e.g. Elgort, 2005; Zemsky and Massy, 2004) and some have confirmed the existence of Moore's (1991) dividing chasm between the categories of early adopters and the early majority (e.g. Anderson et al., 1998; Mahony and Wozniac, 2005). Some empirical support was also provided for the four factors identified by Geoghegan (1994) as contributing to the intensification of this chasm: (1) ignorance of the gap leading to the use of common adoption strategies for all

adopter groups, (2) the “technologist alliance” between Early Adopters (EAs), campus technical support personnel and instructional technology vendors alienating the Mainstream Faculty (MF), (3) further alienation of many faculty due to their non-involvement in decisions regarding the prioritization and level of investment given by the university to high technology projects (creating a feeling of resentment), (4) lack of compelling reasons to adopt (no value in pragmatic, mainstream terms is clearly demonstrated by the new instructional applications).

In addition, most past studies considered only a subset of potential adoption factors (e.g. perceived innovation attributes, adopter characteristics) while they also examined e-learning predominantly through the lenses of faculty adoption resulting in students’ views and attitudes being underrepresented. Examples of such case studies outlining faculty experiences include the diffusion of good practices in online teaching at the University of Sydney (Mahony and Wozniac, 2005), the adoption of new instructional technologies at the University of Alberta (Anderson et al., 1998), a longitudinal study regarding e-learning progress conducted by the Thomson Corporation in partnership with the University of Pennsylvania (Zemsky and Massy; 2004) and a review of six e-learning initiatives focusing on participant learning (Jackson and Schaverien, 2005).

The general diffusion perspective has a long and rich tradition of research and widespread application, viewing the adoption of an innovation and the resulting change as fundamentally a communication process. Despite the fact that the actual implementation and effective use of an innovation forms an integral part of Rogers’ adoption model, the main focus of the general diffusion perspective has been the decision to adopt (Hall and Hord, 2006). Adopting or deciding to use an innovation though, while being extremely important, is only half of the story. The remaining critical half is to actually put the innovation in effective practice by implementing successfully the required changes in technology, processes and people behaviours and attitudes. For this second half, one needs to look beyond the general diffusion perspective.

Other change perspectives, such as CBAM which is the topic of the next section, focus less on the adoption decision and emphasize the process of innovation implementation.

2.3.2 The CBAM Framework

The most influential instructional design diffusion theory is the Concerns Based Adoption Model (CBAM). It is a widely applied theory and methodology for studying the process of implementing change in education (Anderson, 1997). CBAM was originally developed at the University of Texas Research and Development Centre for Teacher Education between the early 1970s and mid-1980's and was later refined by a number of researchers world wide (e.g. van den Berg, 1993; Lethwood and Montgomery, 1980; Little, 1987; Fennel, 1992). Emphasizing the personal side of change, CBAM introduces the notion of *concerns* (feelings, perceptions and motivations) and proposes that during the implementation of an innovation an individual adopter progresses through a series of stages of concerns (Hall and Hord, 2006) as shown in Figure 2.2.

- | | | |
|-----------|---|--|
| Unrelated | { | <ul style="list-style-type: none"> • 0. Awareness: Little concern about or involvement with the innovation is indicated |
| Self | { | <ul style="list-style-type: none"> • 1. Informational: A general awareness of the innovation and interest in learning more is indicated • 2. Personal: Individual is uncertain about the demands of the innovation and his/her adequacy to meet them |
| Task | { | <ul style="list-style-type: none"> • 3. Management: Attention is focused on the processes and tasks of using the innovation |
| | { | <ul style="list-style-type: none"> • 4. Consequence: Attention focuses on the impact of the innovation on clients in his or her immediate sphere of influence |

Impact

- **5. Collaboration:** The focus is on coordination and cooperation with others regarding use of the innovation
- **6. Refocusing:** The focus is on the unveiling of more universal benefits from the innovation including the possibility of changes to it

Figure 2.2: CBAM Stages of Concern

That is, the progression is from concerns unrelated to the innovation, to self concerns (e.g. what the experience would be like for “me”, whether “I” can succeed) to task (e.g. “how-to” concerns) and finally to impact concerns (e.g. whether student outcomes will improve).

It is possible for a person to have concerns at more than one stage at the same time though, in general, there is a waveform movement of the intensity of such concerns from unrelated to impact as shown in Figure 2.3.

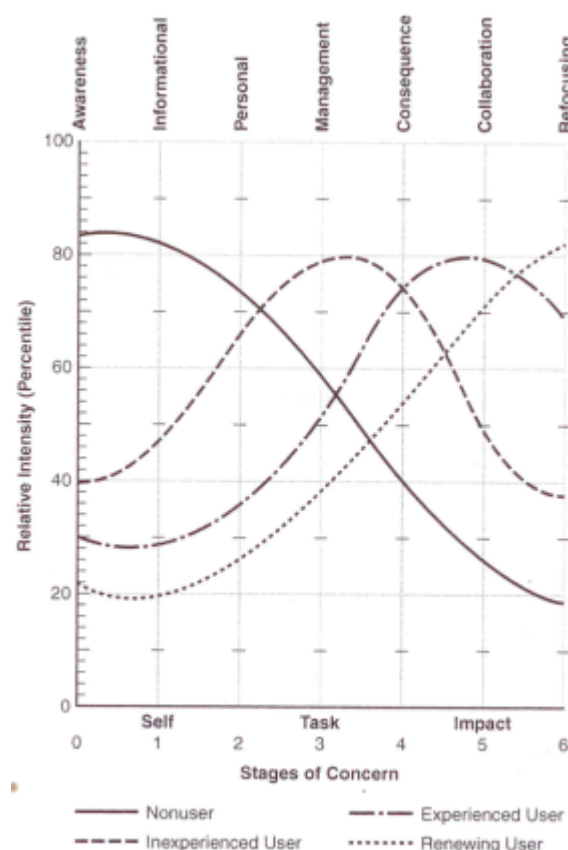


Figure 2.3: Ideal Wave Motion Development of Stages of Concern (Hall and Hord, 2006: 143)

The CBAM tools for measuring adopter concerns include a Stages of Concern Questionnaire (35 items), an Open Ended Concerns Statement and the One-Legged Interview (brief conversations between a change facilitator and the adopter providing encouragement and support).

CBAM puts a lot of emphasis on the role of change facilitator, proposing that change will not just happen automatically. An intervention is defined as any action or event that influences the individuals involved in the change process (Hall and Hord, 2006). The CBAM framework includes a taxonomy of possible interventions (Anderson, 1997) consisting of the following six functions: *developing and communicating a shared vision of change*, *planning and providing resources*, *investing in professional learning*, *checking on progress*, and *providing continuous assistance*. To achieve maximum effectiveness, such interventions need to be focused in order to address the specific concerns of an individual or group.

The vast majority of applications of the CBAM framework in empirical studies has been to study the concerns of teachers / faculty when new innovations were introduced in schools such as microcomputers in schools (Cicchelli and Baecher, 1989), social studies curriculum (Marsh 1987), distance education (Kember and Mezger, 1990) etc. Very few actual studies have looked at the concerns of students when new educational innovations are introduced (e.g. Marsh and Penn, 1988).

2.3.3 Gaps in Current e-Learning Diffusion Literature

Several gaps have been identified in the existing literature regarding e-learning diffusion as described in the preceding sections and summarized here.

It appears that the examination of e-learning adoption in a holistic way, considering a variety of potential adoption factors and their relative importance (e.g. perceived innovation attributes, adopter characteristics, peer actions and attitudes, change agent actions) has been an open

research topic. Past studies focused only on a subset of potential diffusion factors in a rather fragmented manner. In addition, most past studies examined e-learning adoption from the point of view of faculty resulting in an underrepresentation of student views and concerns.

Even when considering the older general diffusion perspective, counting already several decades of age, several of its aspects are still inadequately researched (this applies when considering the adoption of any discontinuous innovation, not just e-learning). For instance, only some of the theory's diffusion factors (the perceived innovation attributes and adopter characteristics) have been extensively investigated. Moreover, there is no adequate evidence regarding the relative importance of the various adoption factors while very little research has also been conducted regarding the process nature of Rogers' model (Rogers, 2003).

Finally, it must be noted that while both theories considered (general diffusion and CBAM) are process-based, viewing adoption as a progression of stages covering both the adoption decision and the consequent innovation implementation, they appear to differ significantly in their emphasis. Rogers' theory puts more emphasis on the adoption decision (positive or negative) of the prospective adopter and the factors affecting this decision. The CBAM theory, on the other hand, puts more emphasis on the actual implementation of the innovation and the actions of the change facilitator (in fact, the actual innovation decision point does not appear explicitly in the theory's stages of concerns). The researcher holds the view that both the adoption decision and the subsequent innovation implementation are vital for the successful implementation of e-learning technologies in pedagogical approaches and learning processes. As a result the two diffusion theories were used in a complementary mode throughout this study. In the researcher's knowledge, this is the first time such a combined approach has been employed in the study of e-learning adoption.

The present study aspires to contribute towards the filling of some of the literature gaps identified above.

2.4 Online Interactivity

The study seeks to gain a better understanding of the diffusion of e-learning and particularly its pedagogy dimension. Such pedagogy however can encompass a number of actual instructional approaches and learning processes. It is therefore necessary to select a specific key aspect of e-learning pedagogy and examine its diffusion among a group of potential adopters.

While e-learning can potentially be used with virtually any learning theory (e.g. behaviourism, cognitivism, constructivism etc.), it is in conjunction with a constructivist approach that it has the potential to truly revolutionize pedagogy enabling a more student-centred, personalized, problem-based and collaborative type of learning (Elgort, 2005; Zemsky and Massy, 2004). Such shift from the traditional teacher-centred methodology (objective based) to the more Socratic student-centred has also been recognized by many authors such as Revans (1980) and Kolb (1984). This shift appears also to be related with changes in the work environment, where the new order of turbulence and change requiring multi-skilling and continuous training, needs more active and flexible learning techniques (Williams, 2003). Sfard (1998), in his review of existing learning theories, identified two main learning metaphors: the acquisition metaphor (which predominantly occurs on an individual level) and the participation metaphor (which views learning as a more collaborative process). While both individual and collaborative learning are important, the participation metaphor has gained ground over the last decades and its learning effectiveness has been demonstrated by a number of studies (Snow and Swanson, 1992). The participation metaphor is also grounded on social constructivism principles (Vygotsky, 1978). Social constructivism maintains that learning is a shared / joint process in a responsive social context. Smith (1994) notes that in group meetings the thinking of each participant is inevitably influenced by the thinking of other individuals taking part in the discussion while there is a tension between the

conceptual structure held in common and the somewhat different version held by each individual (group-mediated cognition). An opinion expressed by a member of the group can influence the conceptual structures held by other participants and, if accepted by the group, become part of the common conceptual structure thus extending individual and common knowledge.

Following the above discussion, a participation learning metaphor (Sfard, 1998) is adopted in this study. In the realm of e-learning, the participation metaphor is expressed by online interactivity which will constitute the selected aspect of e-learning pedagogy on which further studying will focus. Online interactivity has been defined in several contexts for e-learning (Northrup, 2001; Moore, 1989; Wilson, 2004) and refers to two-way interactions among two or more learning participants through which collaborative learning is achieved. Moore (1989) classified interactivity as engagement in learning through three types of interactions: (1) interaction between participants and learning materials, (2) interaction between participants and tutors/experts, (3) interaction among participants. Bouhnik and Marcus (2006) proposed a fourth type of interaction (interaction with the system) emphasizing the importance of the underlying collaborative learning environment and, additionally, stressed the importance of designing interactivity intentionally into the e-learning offering. Northrup (2001) provided a framework of interaction attributes that can be used to select strategies and tactics in order to facilitate interaction on the web. Stacey (1999) found that learning collaboratively through group interaction was achieved by the development of a group consensus of knowledge, through communicating different perspectives, receiving feedback from other students and tutors, and discussing ideas, until a final negotiation of understanding was achieved. Online interactivity has been found by many researchers (e.g. Picciano, 2001; Brown, 2001; Swan, 2001) to be a critical factor in the success of online courses and the consequent achievement of student satisfaction. The significance of online interactivity has also been enhanced by the recent advancements in social computing facilities (Web

2.0, wikis, blogs etc.) which could potentially give a thrust to its wider diffusion.

2.5 Evaluating the Online Interactions and Learning Processes

In addition to examining the problem of online interactivity adoption and implementation, another aim of the present study is to examine the learning processes involved in online interactivity and seek methods to assess their quality.

Traditionally the term computer-mediated conferencing (CMC) has been used to refer to the exchange of messages among a group of participants through networked computers for the purpose of discussing a topic of mutual interest (Gunawardena et al., 1997). Henri (1992) highlights the increased richness and efficiency of CMC attributing them to factors such as group interaction not bounded by time and space restrictions and characterized by reflection, decision-making and problem solving. CMC interactions can be considered a goldmine of information (Henri, 1992; Jordan and Henderson, 1995), which once interpreted effectively by educators, could allow the latter to recognize the strengths and weaknesses of a particular group of learners and thus offer adequate pedagogical support.

Traditionally the quality of online interactions has been evaluated using quantitative participation analysis techniques and participants' own reports of satisfaction with the learning experience (Mason, 1991; Gunawardena et al., 1997). A number of interaction analysis models are available for assessing online interactions (e.g. Hiltz, 1990; Levin et al, 1990; Henri, 1992). Henri's model has been the most influential and attempts to provide a comprehensive framework for examining the learning processes revealed in the associated exchange of messages. The emphasis is not so much on what it is said on the subject but rather how it is said and the processes / strategies adopted by the learners to deal with the subject. Henri's model

consists of five dimensions: participative, social, interactive, cognitive and metacognitive. These dimensions are operationalized by a suitable set of indicators allowing their identification in the exchanged text. The participative dimension examines both the overall and also the active participation relevant to the subject of study. The social dimension looks at the social cohesion within the group as manifested by statements not related to the formal content of the subject of the study. The interactive dimension looks at the aspect of interactivity in the exchanged messages (e.g. responses, comments). The cognitive and metacognitive dimensions look at the revealed cognitive skills (e.g. understanding, reasoning, problem solving) and metacognitive skills (e.g. planning, regulation, self-awareness) supporting the learning process.

Regarding group cohesion, Rourke et al. (1999) proposed a model for examining the degree of social presence exhibited in online interactions. Social presence is defined as the ability of learners to project themselves socially and affectively into a community and is manifested by interactive, cohesive and affective expressions in the online interactions.

In an effort to move away from the traditional teacher-centred interaction analysis models, Gunawardena et al. (1997) proposed a new model for examining social construction of knowledge in a constructivist learning environment. The authors believe that Henri's (1992) examination of interactivity as a series of interlinked messages (message maps) is rather mechanistic and cannot capture the process of collaborative learning that takes place. Gunawardena et al. instead developed a model using grounded theory principles and according to which the active construction of knowledge progresses through five phases as follows:

- Phase 1: Sharing and comparing of information (e.g. statements of agreement or corroborating examples from other participants)
- Phase 2: Discovery and exploration of dissonance or inconsistency among the ideas, concepts or statements (e.g. identifying areas of

disagreement, clarifying the source and extent of disagreement, supporting arguments using a participant's experience, literature etc.)

- Phase 3: Negotiation of meaning / co-construction of knowledge (e.g. identification of areas of agreement among conflicting concepts, negotiation of new statements embodying compromise)
- Phase 4: Testing and modification of proposed synthesis or co-construction (e.g. testing the proposed synthesis against formal data collected, personal experience etc.)
- Phase 5: Agreement statement / application of newly constructed knowledge (e.g. summarization of agreement, application of new knowledge)

Given the preceding discussion and the constructivist nature of the online learning environment selected for the study, the researcher selected Henri's (1992) model (participative and interactive dimensions) for assessing participation in the online discussions and the model proposed by Gunawardena et al. (1997) for evaluating further the exhibited collaborative learning processes.

It must be noted that the area of evaluating the learning processes involved in online interactions is rather novel and the field lacks relevant empirical studies (Mason, 1991; Gunawardena et al., 1997). Indeed, the development of effective and efficient tools that will look beyond the mere quantitative characteristics of online group discussions (e.g. number of active participants, number of messages exchanged etc.) and which will allow educators to quickly discern if indeed new collaborative knowledge is taking place or not in an online group discussion is largely still an open research question.

2.6 Chapter Summary

The purpose of this chapter was to present a review of the conducted literature in the areas of e-learning adoption and implementation of change in academic institutions. By adopting Elgort's (2005) view of e-learning as consisting of two main blended dimensions, e-learning technologies and e-learning pedagogy, it appears that while the diffusion of e-learning technologies has progressed well in academic institutions today (considered to be in the early majority adoption stage), e-learning pedagogy is still stuck at the innovator stage. The problem of e-learning adoption by students and faculty is basically one of technological innovation diffusion. Both the more general diffusion perspective and the more specific to educational environments CBAM framework for innovation adoption and implementation were reviewed. Emphasis was placed on the various categories of potential adoption factors including the crucial role of change facilitators and the taxonomy of their interventions.

Online interactivity presents the selected key aspect of e-learning pedagogy whose adoption will be further examined by the study. A number of models were also presented for evaluating online interactions and the associated learning processes. The recorded online messages are considered a goldmine of information and their accurate and timely interpretation could enable educators to offer appropriate pedagogical support to a group of collaborating learners.

The next chapter (Chapter 3) justifies the choice of the research approach along with the data collection / analysis techniques used in the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this chapter is to describe and justify the research approach and data collection / analysis techniques adopted in the study. The complex dual worker researcher role is also considered outlining any concerns. The issue of research design validity and reliability along with more ethical concerns are also addressed.

3.2 Research Objectives

As unveiled during the literature review, e-learning, despite its hype and heightened expectations, has still not been able to achieve widespread adoption among faculty and students (Anderson et al., 1998; Zemsky and Massy, 2004). This is particularly true for its more powerful component (e-learning pedagogy) which is considered my most scholars (Zemsky and Massy, 2004; Elgort, 2005) as having the potential to revolutionize instructional design.

The purpose of this research is to gain a better understanding of the process of adoption of a selected aspect of e-learning pedagogy (online interactivity) and suggest actions towards overcoming obstacles and reinforcing driving forces leading to improved adoption at the University of Nicosia. While the study will examine the adoption of a specific aspect of e-learning, online interactivity, it is believed that the results could potentially have wider applicability to other aspects of e-learning as well since the problem is approached from the *general* technological innovation diffusion perspective. To this end, the study is informed by both the general innovation diffusion theory and also the more specific to academic environments CBAM adoption framework.

The study will also seek ways to evaluate the learning processes involved in online interactivity and measure the student satisfaction with the provided learning experience.

In order to achieve the above research aims, the following research objectives have been set for the study:

RO 1: Examine the process of adoption (decision to use) of online interactivity by students and the factors affecting this decision

RO 2: Identify the consequences of different options followed by the change agent, that is, the tutor and to what extent these affect the adoption process

RO 3: Based on 1 and 2, suggest points to address hindering mechanisms and reinforce driving forces towards improved adoption

RO 4: Examine the learning processes involved in online interactivity and the degree of associated student satisfaction

To address the above research questions a specific research methodology has been developed as described in the next sections of this chapter.

3.3 Philosophical Approaches to Research

The complexity of social reality has led to long standing debates among the research community about what are the most appropriate ways of studying it. These debates have led to the emergence of a number of paradigms in social research. Paradigms offer a way of categorizing a body of complex beliefs and worldviews (Blaxter et al., 2006) with the most widely used paradigms being *positivism* and *interpretivism*.

The positivist view looks to apply the methods of natural sciences to social research and attempts to develop explanations in the form of universal causal laws (Robson, 2002). It seeks the “facts or causes of social

phenomena with little regard to the subjective state of the individual” (Hussey and Hussey, 1997: 52). Positivism is closely associated with a deductive, hypothesis testing approach to research.

Interpretivism on the other hand is more interested in *understanding* (as opposed to explaining) the social world “primarily from the point of view of the actors directly involved in the social process” (Burrell and Morgan, 1979: 227). The interpretation of the social world is seen as culturally dependent and historically situated (Blaxter et al., 2006). Interpretivism was developed as a result of criticisms of the positivistic paradigm from social scientists who view social reality “as a meaningful construction and not as an objective reality” (Delanty, 2005: 41) rendering the tools of science inappropriate to study social phenomena. Interpretivism is usually associated with an inductive approach to research and includes a number of variants such as hermeneutics and phenomenology.

Positivism and interpretivism are often presented as competing alternatives, the two extremes of a continuum with alternative paradigms (called *realism*) in between (Morgan and Smircich, 1980; Saunders et al., 2009). In an effort to overcome the positivism vs. interpretivism debate, the *pragmatist’s* philosophy argues that the most important determinant of the epistemology, ontology and axiology adopted is the research question (Saunders et al. 2009). Pragmatism maintains further that, if the research question does not suggest unambiguously the adoption of either a positivist or an interpretivist philosophy, then variations or mixed approaches can be pursued. Pragmatism thus represents a practical approach that many research studies take by combining elements of the two extreme paradigms.

The criticisms of the positivistic paradigm also led to the emergence of post-positivism which can be viewed as a “less arrogant form of positivism” (Crotty, 1998:29). Post-positivists, rather than claiming a law like certainty for their findings, argue that social reality can only be known imperfectly and probabilistically (Blaxter et al., 2006). Post-positivism allows the adoption of

mixed-method research designs, aiming at “capturing as much of reality as possible” (Denzin and Lincoln, 2000: 9).

The study will seek to understand the process of adoption (decision to use) of online interactivity (a technological innovation) by students and the factors affecting this decision. It will also examine the learning processes involved in groups of students collaborating online. The actors involved (students and tutors) assign their own meaning to the events and situations they face and have their own intentions, feelings and motives which guide their actions. The actions observed are also influenced by the particular context of the study. The studied reality is thus subjective in nature and the outcome of the study can not be law like generalizations, leading to the adoption of a largely interpretivist approach. However, as some of the study’s research objectives can be partly addressed using positivist methods and limited quantitative analysis, it is the researcher’s belief that pragmatism presents the most appropriate paradigm for the undertaken study allowing for the use of mixed techniques.

3.4 Purpose of Research

The nature of the research questions in a study affects the research approach to be undertaken. Based on its purpose, Hussey and Hussey (1997) distinguish research into exploratory, descriptive or explanatory.

Exploratory studies are undertaken when there is little existing knowledge or theory about the topic under investigation. They are used to develop a better understanding of the phenomenon and are likely to use qualitative methods without specific research hypotheses.

Descriptive research attempts to portray an accurate profile of persons, events, or situations (Robson, 2002). Such an approach is used to describe a phenomenon or situation and the starting point for the investigation will usually be existing theory on the topic.

Explanatory research is also referred to as causal research and seeks to identify and explain the relationship between two or more variables that influence or affect a phenomenon. It is closely associated with hypotheses testing and the collection of associated data that support or refute them.

The three research purposes are not mutually exclusive and can be combined in a study even though one will typically dominate (Robson, 2002).

The study will seek to understand the process of adoption (decision to use) of online interactivity (a technological innovation) by students and the factors affecting this decision. It will also examine the learning processes involved in online interactivity. While some aspects of the general technological innovation adoption process have been widely studied, the process nature of adoption along with the factors that influence the diffusion of the specific innovation have been a largely open research topic. The learning processes involved in online interactivity, especially when viewed through the lenses of students, is also an underrepresented research area. It is clear that this study is not seeking to develop causal relationships between variables but rather to develop a better understanding and describe the phenomena involved. Consequently, it is the researcher's belief that the nature of the study is predominantly descriptive with some exploratory elements as well.

3.5 Research Design

Following the selection of the appropriate research paradigm for the study (pragmatism) and the specification of its nature (descriptive and explorative), the next step is to formulate the specific research design which will be adopted.

One of the first items to be addressed is the distinction between quantitative and qualitative research designs (Bryman and Bell, 2007; Creswell 2003). Qualitative research uses words to describe situations, individuals or circumstances surrounding a phenomenon while quantitative research uses numbers usually in the form of counts or measurements to give precision to a

set of observations (Remenyi et al., 1998). Quantitative research is closely associated with the positivistic paradigm, theory testing and structured methods such as surveys and experiments. Qualitative research is more associated with the interpretivist paradigm, theory-building and methods such as action research, ethnography, case studies and interviews. Similarly to the debate surrounding the appropriateness of research paradigms to study social reality, the qualitative/quantitative dichotomy has been the subject of much discussion as well. The positions taken by individual researchers vary considerably from those who see the two strategies as entirely separate and based on alternative views of the world, to those who are happy to mix these strategies within their research projects (Blaxter et al., 2006). Hartley (1994) proposes that research methodologies and data gathering techniques do not by themselves belong exclusively to any one paradigm but rather it is how they are used to collect and interpret data that determines their association with a specific paradigm.

Given the selected paradigm and nature of the study, predominantly qualitative methods were considered as more appropriate by the researcher, though some limited quantitative analysis was also used.

The next item to address is the selection of the specific research methods to be employed for the study. A number of methods seem to be particularly applicable given the objectives, context and nature of the study.

Action Research is an increasingly popular approach among researchers in the social sciences, particularly for those working in professional areas such as education, health and social care (Blaxter et al., 2006). It is well suited for work-based research and focuses on the improvement of the researcher's or his / her colleagues' practices. Saunders et al. (2009) suggest that action research is a strategy that differs from other forms of applied research as it focuses on action and change. The process involves taking action to address practical issues occurring in the everyday social world by attempting change and monitoring results. Improvement is achieved by the cyclic execution of the following steps as shown in Figure 3.1: identify and clarify the problem;

implement the change needed to improve the situation; test and assess the impact of the change on the original problem.



Figure 3.1: The Action Research Spiral (Saunders et al., 2009: 148)

Educational action research is considered the busiest area of action research publication (Dick, 2006). Farren (2008) provided substantial evidence regarding the significant value of action research in education. Educational practitioners are encouraged to reflect systematically on their pedagogical practice while implementing informed action to bring about improvement in that practice. Whitehead (1989) argues for the particular relevance of an action research approach to the education discipline. He describes education as a value-laden activity where *values* refer to those qualities that give meaning and purpose to our personal and professional lives, and he suggests that by asking questions about how their practices can be improved, practitioners can embody their own educational values. Further evidence about the value of action research in education is also provided by several other authors (Robinson and Lai, 2005; McNiff and Whitehead, 2005; Holly, Arhar and Kasten, 2005).

The researcher believes that the most appropriate method for this study is action research, given its wide applicability in the educational area and the fact that the project attempts to solve a real-life problem (that is, contribute in

a practical way to the increased use of online interactivity at the University of Nicosia, achieving greater adoption by students and a more fulfilling learning experience). The researcher is actually employed by the University of Nicosia which was selected as the setting for the study. The dual worker / researcher role presents several advantages as it provided the researcher with the ability and freedom to modify the instructional design of the selected class in order to include an online collaborative learning environment embedding interactivity. It also provided easy access to the subjects of the study (the class students). Another advantage of the dual worker / researcher role is also the access to other key university stakeholders who could facilitate the dissemination of the results of the study among other faculty members and university students.

Case Study is the method of choice when the phenomenon under study is not readily distinguishable from its context (Yin, 2003). The “case” under investigation could be an individual, an organization, a department, an event, in fact almost any “bounded system” being studied within its real-life context (Creswell, 1998). Case studies can be particularly useful for studying complex topics where the researcher seeks to understand the how and why of a particular phenomenon (Yin, 2003). A key characteristic of case studies is that they allow the use of multiple sources of evidence (such as interviews, documents and observation), and may in fact combine both quantitative and qualitative data (Yin, 2003). This characteristic allows the use of “triangulation” (that is, the collection of data using a variety of methods) augmenting the validity of the findings. A key issue with case studies pertains to their generalizability (the extent to which the findings apply to other similar situations). Mikkelsen (2005) suggests that generalizations from case studies should be handled with care as the findings concentrate on special cases. In an attempt to address the problem of generalization, Bassey (2001) introduced the concept of *fuzzy* generalization which arises from studies of singularities and typical claims that it is likely / unlikely that was found in the singularity will apply in similar situations elsewhere.

In addition to action research, the present study involves a case study approach as well since the setting is a graduate MBA class (MBA 670: Operations and Quality Management) at the University of Nicosia delivered over the period of one semester. Such study duration has been judged as adequate by Jackson and Schaverien (2005) and is in line with several other studies (Farren, 2008; Stacey, 1999).

Surveys involve the collection from a representative sample drawn by means of a structured data collection instrument (such as a questionnaire), of quantitative or quantifiable data which measure a number of concepts; the data is then analysed using statistical techniques to detect patterns and differences (Bryman and Bell, 2007). Respondents are typically asked a set of questions by means of self-complete questionnaires but other data collection instruments can also be used such as telephone survey, (structured) face-to-face interview, or even structured observation (Saunders et al., 2009). Question wording needs careful consideration and piloting before delivery while a main issue with surveys is ensuring that the sample selected is truly representative.

Surveys are also used by the study in order to capture student prior knowledge, expectations and familiarity with both e-learning technologies and collaborative learning and also post-class student views and satisfaction regarding the overall experience.

The specific research design employed in the study is summarized in Figure 3.2. The use of mixed techniques (that is, both qualitative and quantitative methods) is clearly seen in Figure 3.2.

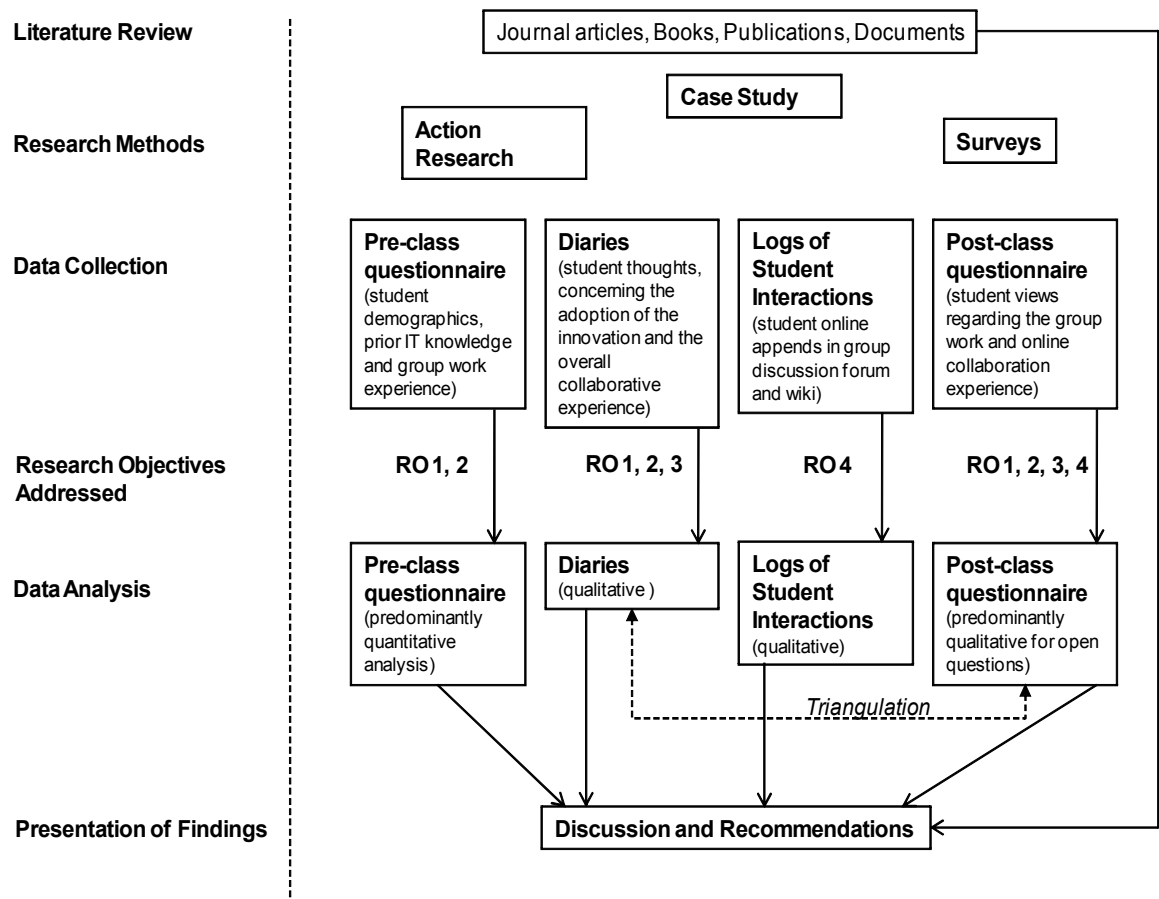


Figure 3.2: Research Design

3.6 Data Collection

The study employed the data collection techniques of diaries (reflection journals), self-complete questionnaires and logs of the actual student online interactions (wiki contributions and forum appends).

3.6.1 Questionnaires

Questionnaires are data collection tools and may be used to collect data about beliefs, opinions and perceptions of people (Saunders et al., 2009). They can include questions of seven basic question types: quantity or information, category, list or multiple choice, scale, ranking, complex grid or table and open ended (Blaxter et al., 2006). Open ended questions allow respondents to offer additional information using their own words. Questions

of the “scale” type utilize a set of responses that are ordered (e.g. a Likert scale). There a number of different ways in which questionnaires can be administered: sent by post to the intended respondents, administered over the telephone or face-to-face or sent over the Internet.

The study employed both a *pre-class* and a *post-class* questionnaire.

The aim of the pre-class questionnaire was to capture student prior knowledge and familiarity with information technology and Web 2.0 applications, student preferences and experience with group work along with an indication of the student’s attitude towards new technological innovations. The questionnaire was divided into four broad sections as follows:

- A. Demographics:** a set of 4 questions asking the respondents some general demographic information.
- B. Computer Literacy:** a set of 23 questions assessing the respondent’s knowledge of computers based on the European Computer Driving License (ECDL) core knowledge modules. Even though the actual question set is different, the approach followed is similar to that employed by Moreau et al. (2001) and Johar et al. (1997). An additional question in this section asked for the respondent’s overall perception regarding computer ease of use.
- C. Internet Access / Use:** a set of 4 questions assessing student access and prior experience with Internet and Web 2.0 applications.
- D. Group Work and Innovative Behaviour:** a set of 6 questions assessing the student preferences and prior experience with group work along with an indication of the student’s inclination towards early adoption of new technological innovations

The questionnaire included predominantly closed questions which are convenient and easy to analyse (Hussey and Hussey, 1997). A limited number of open questions were included in order for students to provide additional information where appropriate. The questionnaire utilized several

question types including scales where a five point Likert scale was employed. The researcher considered both the face-to-face (during the class) administration of the questionnaire and sending it over the Internet. In the end, the face-to-face administration was favoured in order to get a better response rate (Blaxter et al., 2006) and answer any potential queries the students may have. All 41 students completed the questionnaire. A copy of the pre-class questionnaire is included in Appendix 3.1.

The aim of the post-class questionnaire was to obtain the student views regarding the overall experience of developing their class project online using the provided online collaborative environment. The questionnaire was divided into two broad sections as follows:

- A. Group Work Experience:** a set of 4 questions requesting the student views regarding the overall experience of working in groups.
- B. Online Collaboration:** a set of 6 questions requesting the student views regarding the overall experience provided by the online collaborative environment used.

The design of the post-class questionnaire in broad lines was similar to the pre-class one. It employed, however, more open questions in an effort to get from the students as much feedback (positive or negative) regarding their experience. In addition, the post-class questionnaire was anonymous in order for the student feedback to be as objective as possible. Similarly to the pre-class questionnaire, the post-class questionnaire was administered face-to-face in class with 33 students completing it. A copy of the post-class questionnaire is included in Appendix 3.2.

3.6.2 Diaries (Reflection Journals)

The *diary* is a method of data collection where the researcher devises a structure for it (could be free-text as well) and then asks a sample of diarists to complete it in order to record what they do more or less contemporaneously with their activities (Bryman and Bell, 2007). Such

diaries are known as researcher-driven diaries (Elliott, 1997) in contrast with diaries as documents which are spontaneously written by diarists.

Researcher-driven diaries are further distinguished into structured and free-text and can be employed in both quantitative and qualitative research design as necessary (Corti, 1993).

Students were asked to maintain two diaries (called reflection journals). An *adoption journal* where students recorded their thoughts, feelings concerns related to their decision of using or not using the provided online collaborative environment and a *reflection journal* where they recorded their reflections regarding the online collaborative experience.

The adoption journal was used by the students during the first 6 weeks of the class (by that time they had to make a decision of doing their group project online using the provided online collaborative environment or in the traditional face-to-face mode). Students had to complete a minimum of 4 entries in the journal at different time instances depicting their attitude (positive, negative or neutral) towards the proposed online collaborative environment and the factors influencing this attitude (e.g. actions and attitudes of other students, actions and interventions of the lecturer / teaching assistant, specific attributes of the online collaborative environment etc.). Students were requested to record also the specific concerns they had at each specific instance in time. The journal format was structured but, through open questions, allowed students the freedom to record any concern or influencing factor they thought was important in their adoption decision process. Concluding their adoption journal, the students had to state their final decision of whether they finally opted to use the proposed online learning environment or not and the main reasons for their decision. Students could complete their adoption journals online (in Google Docs) or in hardcopy. A copy of the adoption journal is included in Appendix 3.3. Following the submission of the student adoption journals, the researcher studied them and wherever the records were not clear (this happened for 10

students) the following process was followed in order to ensure the true meaning of the student entries:

- The researcher wrote down an account of what he believed had happened based on the journal entries of the student and posed further clarifying questions to the student in writing.
- The student read the written account and commented as necessary in writing. Additionally the student answered the clarifying questions posed in writing.
- The resulting document (commented account and answers to questions) was discussed between the researcher and the student so that an accurate account of what happened was finally reached.

The above method resembled the combined diary-interview method used by Zimmerman and Wieder (1997).

Apart from the adoption journal, the students who opted to complete their project using the online collaborative environment had to maintain an online reflection journal where they recorded their reflections of their experience (feelings, thoughts, positive aspects, negative aspects, problems etc.). The journal was free-form and students were requested to complete at least 7 entries. Each entry had to be date stamped. A copy of the reflection journal is included in Appendix 3.4.

The researcher also maintained a reflection journal throughout the project where he recorded various observations, thoughts and reflections in a free-form structure.

3.6.3 Logs of Student Online Interactions

The students who opted for the online collaborative environment had a number of online facilities for their interactions as follows:

- A co-authoring facility (wiki) for developing their project implemented through the standard facilities of Google DOCS

- A discussion forum implemented via discussion tables in Google Docs to hold asynchronous discussions regarding the project
- An chat room like Gmail Chat or Windows Live Messenger to hold synchronous discussions regarding the project

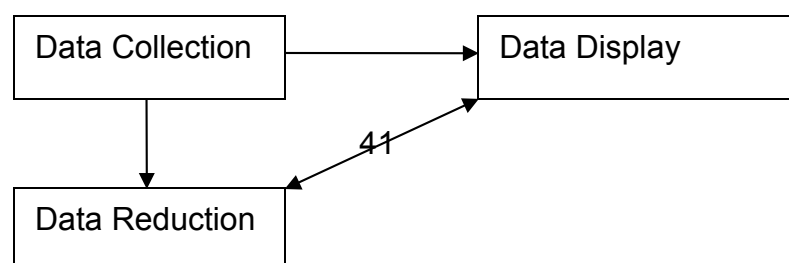
All student interactions using any of the above facilities were recorded and used for qualitative data analysis. Samples of such interactions are included in Appendix 3.5.

3.7 Data Analysis

Given the selected paradigm (pragmatist) and nature of the study, both qualitative (predominantly) and quantitative methods were used for analysing the collected data.

Some limited quantitative analysis was performed (e.g. descriptive statistics) in order to describe the characteristics of the sample used (e.g. in terms of their demographics, computer literacy, Internet access and prior use, group work preferences and innovative behaviour). Additional quantitative analysis was also performed regarding the rating of the overall student experience in relation to the online collaborative environment. To this end, the closed questions of both the pre-class and post-class questionnaires were coded in order to facilitate statistical analysis using the Statistical Package for the Social Science (SPSS) version 17.0.

The bulk of the collected data (reflection journals, logs of student online interactions, open questionnaire questions) was subjected to qualitative analysis. While there is no agreed best way to analyse qualitative data, the processes and techniques proposed by Miles and Huberman (1994) provide a good framework. These processes are depicted in Figure 3.3.



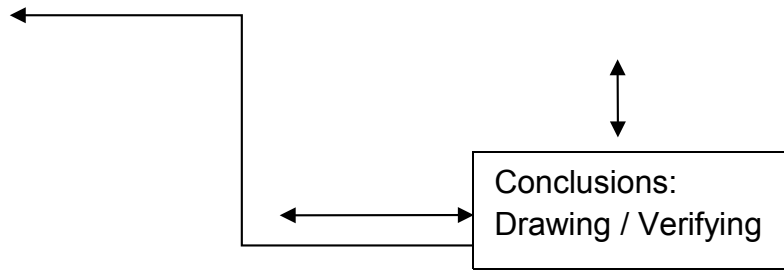


Figure 3.3: The Data Analysis Process (Miles and Huberman, 1994: 12)

Data reduction refers to the process of selecting and focusing the collected raw data through coding. A code is an abstract representation of an object or phenomenon (Strauss and Corbin, 1998), a selective filter to transform the collected data into meaningful concepts (Dey, 1993). Coding is a way of classifying and indexing text with codes, allowing a recontextualization of the data (Tesch, 1990). Given that the coding process could produce a large number of codes, a useful strategy is to cluster related concepts into larger categories (Strauss and Corbin, 1998). Codes can be a priori (or theoretically derived from the literature) or in vivo (derived directly from the data) (Bazeley, 2007).

Data display provides techniques for finding relationships between concepts (e.g. time sequence of events, causes and consequences). Such techniques fall into two main families: matrices (tables) and networks (Miles and Huberman, 1994). Matrices allow cross-case comparisons while networks can be used to show possible causal linkages between concepts / categories.

Drawing conclusions involves the use of a number of tactics in order to get meaning out of data such as noticing patterns, clustering into meaningful groups, counting, making contrasts / comparisons and noting relations between variables (Miles and Huberman, 1994).

In addition to in vivo codes (codes derived using grounded theory), the present study also employs a priori codes informed by the relevant diffusion theory (e.g. Rogers' and CBAM adoption models), social constructivism

principles, existing interaction analysis models used for electronic collaboration (e.g. Henri, 1992; Gunawardena et al., 1997) as well as codes / categories encountered in other similar studies (e.g. Stacey, 1999; Trendin, 2008). All collected data sources were analysed step by step, following rules dividing the material into content analytical units. Specifically for the analysis of student online interactions, the researcher pondered between the following two approaches in order to decide the most appropriate unit of analysis:

- The approach proposed by Henri (1992) emphasizing the need to use units of variable sizes, the so-called thematic units or meaning units. Under this approach, a message posted by students could be divided into several meaning units according to the number of ideas it contained
- The approach proposed by Gunawardena et al. (1997) favouring the use of whole student messages as units of analysis thus preserving the student contributions to the process of developing a group consensus of knowledge through sharing different perspectives, discussing areas of disagreement, until a negotiated agreement is finally reached.

Given the greater applicability of the approach proposed by Gunawardena et al. (1997) in a social constructivist learning environment, the researcher finally decided to use whole student messages as units of analysis. The study's codes / categories represent the processes or concepts under investigation for both the innovation adoption process and the collaborative learning process. A copy of the coding manual used in the study is included in Appendix A3.6.

Table 3.1 displays the unit of analysis and types of codes (a priori or in vivo) used by the researcher for each distinct data source.

| Data Source | Section in Data Source | Selected Unit of Analysis | Codes Used |
|-------------|------------------------|---------------------------|------------|
|-------------|------------------------|---------------------------|------------|

| | | | |
|------------------------------------|---|-----------------------|--|
| Student adoption journal (diary) | Current attitude towards proposed innovation | Entire entry | A priori (indifferent, negative, positive) |
| | Student concerns | Entire entry | - A priori main category and specific subcategories informed mostly by CBAM - In vivo for additional subcategories |
| | Peer actions and attitudes as influencing factors | Entire entry | - A priori main category informed by Rogers' model - In vivo subcategories |
| | Change facilitator actions and attitudes as influencing factors | Entire entry | - A priori main and specific subcategories informed by CBAM and Rogers' model - In vivo for additional subcategories |
| | Perceived innovation attributes as influencing factors | Entire entry | - A priori main and specific subcategories informed by Rogers' model - In vivo for additional subcategories (including sources of relative advantage) |
| | Any other influencing factor | Entire entry | - A priori informed by Rogers' model and CBAM - In vivo |
| | Final adoption decision | Entire entry | A priori (Yes or No) |
| | Adoption decision reasons | Entire entry | - A priori informed by Rogers' model and CBAM - In vivo |
| Student reflection journal (diary) | | Journal entry | - A priori main category (facilitators, inhibitors, suggestions for improvement) - In vivo subcategories |
| Logs of student interactions | | Whole student message | - A priori informed by Henri's and Gunawardena's interaction analysis models |
| Post-class questionnaires | Group work experience | Individual entry | - A priori main categories (positive aspects, negative aspects) - In vivo subcategories |
| | Online collaboration experience | | - A priori main categories (positive aspects, negative aspects) - In vivo subcategories |
| | Change facilitator actions | | - A priori main categories (most valuable, least valuable) - In vivo subcategories |

Table 3.1: Units of Analysis and Types of Codes Used

Given the large volume of the collected data, the researcher opted to use the computer software NVivo Version 8 to aid in the analysis of data. While the usefulness of such tool in facilitating the execution of the various analysis processes (e.g. data reduction and data display) is undisputable, the

researcher acknowledges that there have been also concerns regarding the impact of computerization on qualitative analysis. These concerns most commonly focus around four issues (Bazeley, 2007): that computers can distance researchers from their data, the dominance of code and retrieve methods to the exclusion of other analysis methods such as reflection and identifying connections in the data, the fear that the use of computer will mechanise analysis making it more “positivistic”, the misperception that computers support only grounded theory methodology. The researcher is well aware of the preceding criticisms and has taken precautions in order to avoid any negative impact on the quality of the conducted research by the decision to use computer software during the data analysis.

3.8 Sampling

Research studies can employ a variety of sampling strategies characterised by probability or non-probability sampling (Blaxter et al., 2006).

The target population of the present study included all 41 students that participated in the MBA 670 class (Operations and Quality Management) during the spring semester of 2010 at the University of Nicosia.

3.9 Reliability, Validity and Generalisability

This section focuses on the quality criteria (reliability, validity, generalisability) that the present research study needs to address. Reliability refers to the degree to which observations or measures are consistent or stable (Remenyi et al., 1998). Validity refers to the extent to which the findings of the study represent accurately what is happening in the situation studied (Hussey and Hussey, 1997). Generalisability is concerned with generalising from particular cases to populations (Silverman, 2000).

3.9.1 Reliability

In qualitative research a useful approach of addressing the problem of reliability is to ensure transparency of the data collection and analysis process (Easterby-Smith et al., 2002). To this end, the present study includes a comprehensive description of the adopted research methodology (overall research design, data collection and analysis techniques).

Intra-coder reliability was also achieved through the development of explicit coding instructions and adequate training. Moreover, a representative sample of the performed coding was double-checked by a senior faculty member of the University of Nicosia.

Regarding the reliability of the questionnaires (pre-class and post class), this was addressed using the method of “test - retest” (Bell, 2005). To this end, each test was given twice (at different time instances) to a group of pilot users and the responses were compared. In the pre-class questionnaire a scale consisting of 23 items (questions) was used for measuring the respondent’s “computer literacy”. The internal consistency of this measure was assessed using Cronbach’s alpha coefficient. This coefficient for the study’s sample yielded a value of 0.942, significantly above the acceptable minimum of 0.7 (DeVellis, 2003). The full SSDS internal consistency report is included in Appendix 3.7.

3.9.2 Validity

Maxwell (2005) referred to two broad types of threats to validity in relation to qualitative studies: *researcher bias* and *reflexivity*. Researcher bias refers to the selective use of data that fits the researcher’s existing theory or preconceptions along with data that “stands out” to the researcher. Reflexivity refers to the influence of the researcher on the setting or individuals studied (the fact that the researcher is part of the world under study). Regarding reflexivity, a point of comfort for the present study is the fact that much of the studied student interaction was electronic (through wikis, online reflection journals and forum discussions) which has been found

not to overtly affect the behaviour of the group studied (Stacey, 1999). Another validity threat is also the concept of “ideological hegemony” (Maxwell, 2005), that is, the tendency to see a phenomenon in ways that are prevalent in the literature. Ideological hegemony is expressed, for instance, by the dominant use of Rogers’ model in the innovation diffusion literature.

Miles and Huberman (1994) provide a number of suggestions for confirming qualitative research findings such as checking for representativeness (when the researcher moves from the particular to the general), weighting the evidence (some data may be “better” than others), looking for negative evidence and checking out rival explanations. Triangulation is also another technique that has attracted support by various authors (Maxwell, 2005; Bell, 2005; Huberman and Miles, 1994) and can be used to confirm the findings of a qualitative study. Triangulation stipulates the use of a variety of data sources and data collection approaches in order to obtain a more comprehensive view of the studied phenomenon while at the same time reducing the risk of chance associations and systematic biases due to a specific method (Maxwell, 2005).

The following strategies and tests were adopted in the present study in order to address the issue of validity:

- Triangulation (data was collected using a variety of techniques such as reflection journals, questionnaires and the logs of student online interactions (e.g. wiki contributions, forum appends).
- Respondent validation (e.g. systematically soliciting feedback about the data and conclusions from the people studied). This was done, for instance, during the verification process that followed the submission of the student adoption journals in order to clarify the true meaning of the associated student entries.
- Searching for discrepant evidence and negative cases (such cases were analysed carefully and objectively as they may have indicated a potential flaw in the conclusions)

- Comparison (the study's results were compared with other results in the literature from similar studies and the results were found to be similar. In fact, the researcher was able to find substantial evidence in support of the main theoretical models used in the study like Rogers' model (2003), Hall and Hord's CBAM model (2006) and Gunawardena's model (1997).
- In order to address the issue of ideological hegemony, the researcher reviewed and became familiar with some of the criticisms attracted by some of the major theoretical models encountered in the literature (such as Rogers' or CBAM innovation adoption model).

In order to enhance the validity of the questionnaires, the researcher discussed their contents with his adviser and consultant (the latter has substantial experience in e-learning studies). Both questionnaires were also piloted using a group of students before their final delivery to the audience. The pilot testing enabled the researcher to receive feedback regarding the instructions of the questionnaires, the clarity of the questions, the language used and the timeframe needed to complete them. The received feedback led to the revising of some of the questions in order to reduce their ambiguity and to combining / eliminating some questions in order to reduce the overall questionnaire length.

A final word on validity pertains to the dual worker researcher role. The value of experiential knowledge in research studies has received wide theoretical and philosophical support in the literature (Maxwell, 2005). The researcher possesses significant expertise and multi-year experience in the area of direct channel innovations (like e-learning) and inevitably has his own theories and beliefs regarding the area under study. Throughout the study the researcher was very conscious of the complexity of the worker researcher role and actively adopted the validity strategies outlined above in order to secure as much objectivity as possible.

3.9.3 Generalisability

Generalisability or external validity concerns the extent to which research findings are applicable to other settings (Saunders et al., 2009). In quantitative research this is achieved through statistical generalisation to the population from which the sample was drawn. For qualitative research (like case studies) such statistical generalisation is not available and the issue of generalisability must be approached with caution. Maxwell (2005) sees three ways in which the findings of qualitative studies can be generalisable: (a) qualitative studies often have “face generalisability” in the sense that there is no obvious reason *not* to believe that the results apply more generally, (b) the study can lead to development of theory that can be extended to other cases, (c) the existence of a number of features that lend plausibility to generalizations from case studies including the similarity of dynamics and constraints to other situations.

Even though the current research constitutes a case study conducted at the University of Nicosia, and therefore has the generalisability issues inherent to case studies, the researcher believes that the results obtained could have more general applicability since the problem of adoption of a selected aspect of e-learning (online interactivity) was approached from the *general* technological innovation diffusion perspective. To this end, the study was informed by the dominant models in both the general innovation diffusion theory and also the more specific to academic environments CBAM adoption framework (the two models were used in a complementary mode). In addition, the obtained results provide substantial support for both models and are aligned with the results of other relevant empirical studies. This potential generalisability of the adoption results applies both to other settings (e.g. other academic institutions) and other aspects of e-learning (beyond online interactivity).

The study also sought ways to evaluate the learning processes involved in online interactivity and found significant empirical support for the model

proposed by Gunawardena et al. (1997) regarding the social construction of knowledge in a collaborative environment. Again the results obtained were aligned with the results of other relevant studies such as the results obtained by Stacey (1999).

The researcher thus believes that the results of the study have “face generalisability” (Maxwell, 2005) as there is no obvious reason not to believe that they have more general applicability.

3.10 Ethical Considerations

Bryman (2001) breaks down the ethical issues involved in research into four main areas: whether there is *harm* to participants, whether there is a *lack of informed consent*, whether there is an *invasion of privacy* and whether *deception* is involved. All students that participated in the study provided their consent by signing a special “consent for participation in a research project” form. A copy of this form is included in Appendix 3.8. The form included the objectives of the study, a clear description of the student obligations in case they decided to participate, the potential risks (no real risks were identified beyond the need to preserve the confidentiality of the collected information), the expected benefits for the participants and a clear statement that participation was voluntary with a participant being able to withdraw from the study at any time.

The researcher devoted adequate time to explain to the students the contents of the form, answered any questions and then obtained their written consent

Data anonymity was preserved by using codes in the data collection and analysis software instead of the names of the participants (e.g. student S1, student S2 etc.). In addition, even though the class project was collaborative, students had access only to the items they needed to. For instance, the reflection journals kept online in Google Docs were protected by access control allowing access only to the specific student and the researcher.

Other ethical considerations include the objectivity and fairness of the individual student assessment avoiding any favouritism (or unfavouritism in an effort to appear impartial) to the students that showed increased enthusiasm and commitment to the research study and its objectives. The researcher was conscious of this issue and exercised great caution when assessing the student performance for the class. Precautions were also taken so that the quality of the delivered course and the associated learning was not impacted negatively by the concurrent running of the study, maintaining the proper balance between effective learning and research study. To this end, an effort was done to distribute evenly throughout the semester the extra student activities required by the study. The researcher remained also alert and open to relevant feedback by the students. Eventually, only one student raised some workload concerns regarding the extra activities included in the class because of the study.

3.11 Chapter Summary

The purpose of this chapter was to describe and justify the adopted research approach. Given the nature of the research questions, a pragmatist paradigm was selected for the study. Based on its purpose, the study is classified as predominantly descriptive with action research being the main research method adopted as the project attempts to solve a real-life problem. The main data collection techniques adopted include diaries, questionnaires and the logs of the actual online student interactions. Data analysis was primarily qualitative complemented by some limited quantitative analysis (descriptive statistics) as well. The issues of research validity, reliability and generalisability along with more ethical concerns were also discussed.

The next chapter (Chapter 4) presents some of the main activities involved in the study.

CHAPTER 4: PROJECT ACTIVITY

4.1 Introduction

The purpose of this chapter is to describe some of the main activities involved in the study. Emphasis is placed in the steps taken to design and implement the study's learning environment, the instructional design used and the interventions used to facilitate the undertaken change.

4.2 Designing the Project Learning Environment

The setting of the present study is a graduate MBA class (MBA670: Operations and Quality Management) delivered in Spring, 2010. The class was delivered through a combination of face-to-face (the class lectures) and online (the class project) interaction. The study's adoption of the participation learning metaphor (Sfard, 1998), viewing learning as a social collaborative process expressed in the e-learning world by online interactivity, necessitated the design and development of a suitable learning environment for the class project. Such an environment needs to be able to use real-world, case-based contexts for learning and facilitate collaborative construction of knowledge (Gunawardena et al., 1997). Jonassen et al. (1993) have proposed educational environments exhibiting these characteristics, which they called constructivist learning environments (CLE).

Having decided on pursuing a constructivist learning environment, the next step for the researcher was to decide what type of a constructivist approach: problem based (PBL), case-based (CBL) or project-based (Jonassen, 1999). After careful consideration of the relative advantages / disadvantages of each approach, the case-based (CBL) scenario was selected due to its simplicity, increased structure and the fact that it allows for increased tutor guidance and feedback (Savery, 2006).

Figure 4.1 displays the selected learning environment design for the online part of the class.

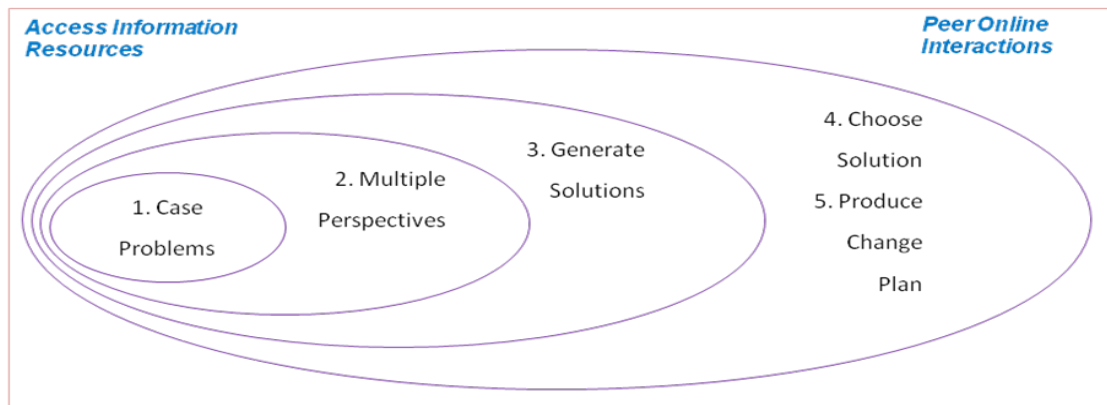


Figure 4.1: Class CLE Design

The design is based on Jonassen's CLE model (1997; 1999) and reflects also the following steps proposed by Choi and Lee (2006) for solving ill-structured problems in a web-based, case-based environment: (1) understanding situations and contexts where multiple problems may exist; (2) identifying problems among multiple perspectives held by different stakeholders; (3) generating possible solutions; (4) choosing appropriate solutions with a rationale; (5) implementing and evaluating the solutions. Facilities are also provided for students to access the required information resources and collaborate online with their group partners. To this end, the class project's design calls for the application of the class subject matter on actual real-life business settings. Students are required to select an actual business organization on which to base their project. They are also required to work in teams and collaboratively analyse the selected business operation, identify any problems / weaknesses, propose possible solutions and finally select the most appropriate solution and prepare an improvement change plan.

The final learning environment design thus enables students to attempt to collaboratively diagnose and solve authentic problems relevant to the class material. The approach selected can be further characterised as a BIG

(Beyond the Information Given) constructivist approach (Perkins, 1991) as it involves the integration of direct classroom instruction with opportunities to explore, experiment and solve problems during the semester's project (e-learning component).

The next step for the researcher was to decide the application platform which would implement the CLE design described above. The basic choice was between using some of the widely available (and mostly free) Web 2.0 collaborative facilities (such as blogs, wikis, electronic conferences, chat rooms etc.) and the more traditional course management systems (CMS) such as Moodle or WebCT available at the University of Nicosia. In order to examine more closely some of the available options, the researcher actually proceeded and built two prototypes of the desired environment; one using Moodle and another one using Web 2.0 facilities provided by Google (Google Docs as co-authoring wiki, Google Groups as electronic conference, Google Gmail for e-mail and Google Chat for real-time chatting). After careful consideration of the two options the researcher decided to give preference to the Google facilities and setup a pilot environment in order to solicit student feedback before taking the final decision for the environment to be used in the actual study. The researcher's initial inclination towards Google facilities rather than Moodle was formed using the innovation attributes of the diffusion perspective (Rogers, 2003) as follows:

- *Compatibility*: The Google facilities are already used by millions of users and many students have prior experience with at least some of these tools (like the very popular e-mail system Gmail). Most web tools share similar user interface principles making their use easier and more intuitive. Google Docs, the central tool in the developed framework, is impressively similar to Microsoft Word with which virtually all students are familiar. Moodle facilities, on the other hand, employ a less familiar interface and are more complex for those who have not used them before.

- *Complexity*: In general, Web 2.0 facilities innovate at a much faster pace than CMS (Alexander, 2008) as they aim at a much wider audience with diverse IT skills. They are thus typically easier and more intuitive to use than less mainstream tools like Moodle.
- *Trialability*: The Google facilities are already available on the web and it is extremely easy for anyone to obtain an account and experiment with them. No prior setup of any test environment is necessary.
- *Observability*: The wide accessibility of the web by virtually everyone, and from any place there is a connection, facilitates the demonstration of the Google facilities and the easier communication of the outcomes when using them.
- *Relative advantage*: A main perceived relative advantage of the Google facilities over Moodle is cost (the Google facilities are provided for free; there is no need for the use of local computer processing power or the engagement of local IT technical support personnel as is the case with Moodle). Additionally, a vital feature of the designed learning environment is its error-free operation and quick performance on a 24/7 basis. The students can easily be turned away by technical issues and, as many of them are also working professionals, their use of the environment could be late at night or during weekends. This is not an easy target for a local university IT team with limited technical support resources as it would be the case with Moodle. It is a much easier to achieve target, however, for organizations of the size of Google with vast IT resources.

The choice of platform (Web 2.0 facilities vs. traditional course management systems) has received attention in the literature (e.g. Alexander, 2008; Richardson, 2009) while the educational community observes a steadily growing use of widely available Web 2.0 facilities for learning purposes.

4.3 Piloting the Project Learning Environment

The developed environment using collaborative Google facilities was pilot-tested during the semester of Fall, 2009 (the semester preceding the conduction of the main study) using a group of four MBA students who volunteered for this purpose. The pilot students were requested to maintain online reflection journals where they recorded their feelings, thoughts, problems, positive aspects etc. regarding their experience. The researcher monitored closely the student journals for any issues and also the progress of the group project development and the associated collaboration. The researcher also held regular brief discussions before or after the class with the pilot users (along the lines of CBAMs' one-legged interviews) discussing any issues faced.

The general feedback of the students regarding the overall experience was very positive mentioning a number of advantages of the new online platform vs. the traditional group collaboration (face-to-face meetings, telephone conversations and e-mails). Some examples of these advantages as mentioned by the students themselves follow:

I would like to say that I was a bit insecure about my part... it is a great idea that other people can contribute, write their comments and discuss everybody's work at all times...

(Pilot Student[1])

Other pros of this cooperation is that I have communicated comments without personal meeting and write whatever I want to at 23:00!!!

(Pilot Student [2])

(Google Docs) makes the collaborative work more transparent with the possibility to see every team member's progress or any changes made in their part.

(Pilot student [3])

Some disadvantages were recorded as well like the complexity of using two tools for the main collaboration activities (Google Docs for co-authoring the project and Google Groups for holding electronic conferences). Following an actual suggestion by one of the pilot students, about half-way through the

semester the Google Groups tool was removed from the platform and was replaced by a discussion table within Google Docs itself. This change simplified the platform significantly and drew very positive feedback by all pilot students. Other problems encountered by the pilot students included some issues with drawing line graphics in Google Docs along with some limited Internet connectivity issues.

4.4 Designing for Interactivity

The primary data for the project was collected during the Spring, 2010 semester. As per the selected instructional design, the class consisted of two parts: the class lectures (delivered face-to-face) and the class group project (where students were given the choice to develop it online using the provided Google Docs collaborative environment or develop it through more traditional group collaboration such as face-to-face meetings, telephone conversations and e-mails).

The students in the class worked in teams of 3-4 students. The class project was divided in 10 parts with each part having a primary author among the group. Depending on the number of students in each team, primary authorship was divided evenly among the team members as much as possible. The primary author of each part wrote the first draft and then invited comments / feedback from his/her team members. This process was repeated until the team agreed that the part was finalized. Evidently, the selected project design included built-in interactivity as proposed by Bouhnik and Marcus (2006). Interactivity played also a major role in the assessment of the project as 30% of the grade was dependent on the contribution of the student to the improvement of the project parts he / she was not the primary author through online collaboration.

The students were given a period of 6 weeks during which they had to decide the approach they would use for developing their project, that is, whether they would use the new online collaborative environment or more

traditional face-to-face means. At the end of this period the students had to submit their completed adoption journals (where they recorded the progress of their decision process along with their final decision regarding the use of the provided online collaborative facilities or not). In order to motivate students to complete and submit timely their adoption journals, 5% of the overall class grade was allocated to this activity.

Of the 14 teams of the class, 13 of them actually opted to use the online facilities with one team deciding for the more traditional face-to-face mode. The students who selected the online mode had to maintain an online reflection journal where they recorded their reflections of their overall experience. The completion of this reflection journal was allocated 10% of the overall project grade.

4.5 Change Facilitator Interventions

As change (like the one introduced by the adoption of a new innovation) does not happen automatically (Hall and Hord, 2006) and students cannot be expected to take e-learning like ducks to water (Zemsky and Massy, 2004), it was crucial for the researcher to plan and implement a series of change facilitating interventions throughout the study. To this end, the researcher and the class technical assistant undertook the role of change facilitators (in CBAM terminology) or change agents (in the general diffusion perspective terminology). The interventions used in the study are presented below using the six types of interventions identified in the CBAM framework and shown in Figure 4.2.

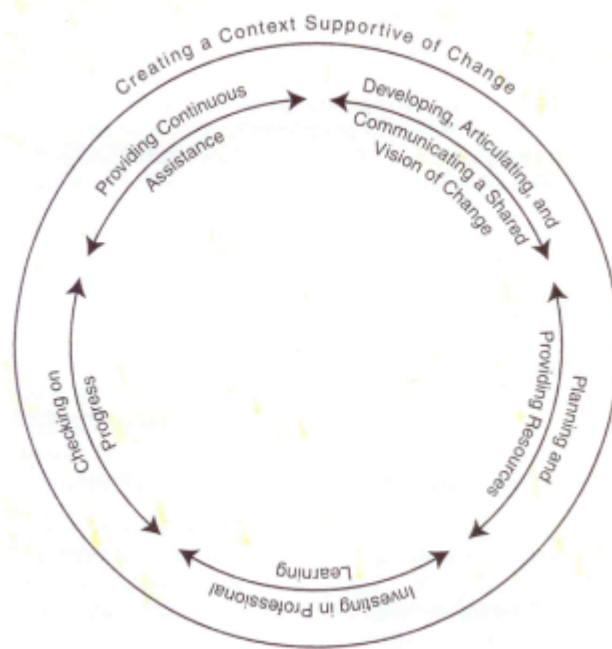


Figure 4.2: CBAM Types of Interventions (Hall and Hord, 2006: 189)

The specific interventions utilized are described in detail in the next sections.

4.5.1 Communicating a Shared Vision of Change

The researcher invested substantial time during the first lectures of the class to discuss with students the notion and value of collaborative learning using concepts drawn, among others, from the participation learning metaphor (Sfard, 1998) and social constructivism principles (Vygotsky, 1978). The crucial role that collaborative learning plays in the work environment was also outlined using concepts from experiential learning (Kolb, 1984).

Aiming at capturing the students' interest and arousing their enthusiasm, the researcher also presented to students the new architecture of the World Wide Web (Web 2.0) based on social interconnectedness and collaboration and stressed its importance and phenomenal growth. He presented also highlights of the new collaborative environment (based on Google Docs) and explained in detail its merits and the role it can play in effective student interaction when developing the class project.

As manifested by the discussions held in class, the majority of students showed considerable interest to learn more about the new environment.

4.5.2 Planning and Providing Resources

The researcher (aided by the technical support assistant) spent almost a year planning and producing the resources needed for the study. As explained in the preceding sections, the researcher considered very carefully the design and implementation of the online collaborative environment, weighted the available options and finally implemented an environment aiming at simplicity and ease of use. The researcher also spent a significant amount of time preparing additional resources for the students such as tutorials and step-by-step guides in order to facilitate their use of the new environment. A selection of this material is included in Appendix 4.1.

The provided online collaborative facilities (Google Docs for co-authoring / discussing the project and maintaining the reflection journal, Google Gmail for e-mail and Google Chat for real-time chatting) and associated student guides were conveniently collected together in the class project website as shown in Figure 4.3.

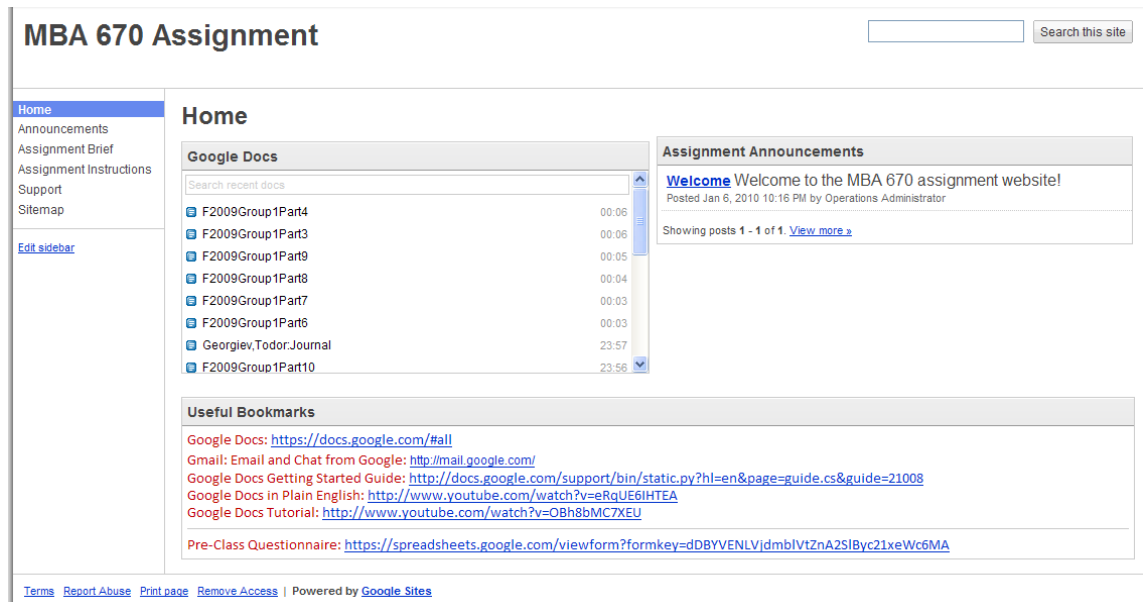


Figure 4.3: The Class Project Website

A specific section on the website allowed for easy access to the class technical support assistant through e-mail or online chatting. An “announcements” section was also included enabling easy communication of important items by the researcher to students.

4.5.3 Investing in Professional Learning

A formal lab for using the new environment was planned for the second week of the class. The contents of the lab were selected in order to address the initial student concerns as per the CBAM perspective (self and task concerns). The lab guide used is included in Appendix 4.2. Both the researcher and the technical support assistant were available during the lab to offer assistance and discuss issues with students.

Student participation and interest in the lab activities was high enabling the students to get acquainted with the environment and have a first hands-on experience.

4.5.4 Checking on Progress

As change does not happen overnight (Hall and Hord, 2006), the entire process needed to be continuously assessed and monitored. To this end, the researcher monitored systematically the student reflection journals for the unveiling of any issues along with the student interactions for developing the project. The researcher intervened for providing encouragement and guidance and for resolving any problems through entries in the electronic discussions and brief “one-legged” interviews before or after the class with the students involved.

These interventions aimed not only at addressing any problems but also at creating a sense among the students that their efforts were valued and worthy of notice and support.

4.5.5 Providing Continuous Assistance

The importance of continuous and timely support when new technological innovations are introduced was highlighted by many researchers such as Mahony and Wozniak (2005) and Anderson et al. (1998).

The researcher planned for the availability of continuous assistance by either himself or the technical support assistant through various communications means such as electronic forum discussions, online chatting, e-mails and via the telephone. In all cases special emphasis was placed in prompt response and the quick resolution of the issues involved.

4.6 Chapter Summary

The purpose of this chapter was to describe some of the major activities involved in the study. Emphasis was placed in describing the characteristics of the learning environment designed and how it was implemented including feedback from its pilot operation. The main aspects of the instructional design used were also discussed demonstrating how interactivity was built in the overall design of the whole exercise. Emphasis was also placed in describing the extensive set of interventions undertaken by the change facilitating team (the researcher and the technical support assistant) during the study. The extent to which these interventions were successful will be discussed in the next chapter (Chapter 5) where the main findings of the project are presented and interpreted.

CHAPTER 5: PROJECT FINDINGS

5.1 Introduction

The purpose of this chapter is to present the main project findings with a full discussion and interpretation including linking back to the literature review. These findings are divided into four sections. The first section presents the findings regarding the process of adoption (decision to use or not) of the proposed online collaborative environment and the factors that appear to have played a role in this decision. The second section attempts to find any indication of potential relationships between the adoption results and student characteristics captured through the pre-class questionnaire (e.g. demographics, prior knowledge and familiarity with information technology and Web 2.0 applications, attitude towards new technological innovations). The third section deals with online interactivity and presents an evaluation of the interactions and learning processes observed during the study. The fourth section presents the student feedback and overall satisfaction results regarding the online collaborative experience.

5.2 Examination of the Process of Adoption of the New Online Collaborative Learning Environment

This section presents the findings of the study regarding the main factors that appear to have influenced the decision to adopt or not the new online collaborative environment for the class project. The students were asked to make their final adoption decision during the first 6 weeks of the class while they were also requested to record at least 4 entries in their adoption journals describing the progression of their decision process during the period. The results presented in this section reflect data collected primarily through the student adoption journals.

5.2.1 Categories of Factors Affecting the Adoption Process

The format of the adoption journals was partly structured and was informed by relevant literature (predominantly the diffusion perspective and the CBAM framework for effecting change in educational environments). As a result, the potential influencing factors were grouped into three categories: perceived innovation attributes, peer student actions and attitudes (interpersonal, localite networks) and change facilitator actions. The journal design also included open questions in order to provide students with the opportunity to record any other influencing factor or concern they thought it was important in their adoption decision process. Consequently, the qualitative analysis conducted used both *a priori* codes (informed by theory) while it also allowed for *in vivo* codes (derived directly from the data). During the coding process, the researcher coded appropriately each recorded influencing factor regardless of the actual section it appeared in the adoption journal (catering for potential student categorization errors).

Figure 5.1 presents a count of the times each factor category was denoted as important in the student journal entries.

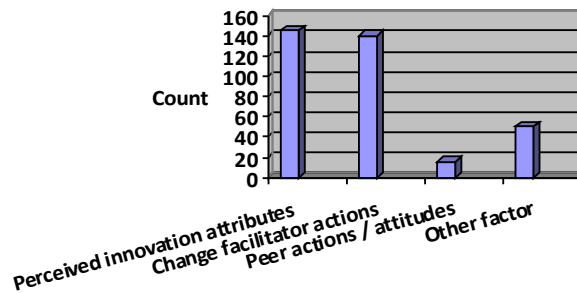


Figure 5.1: Recorded Adoption Factor Category Counts

The frequencies of the various factor categories are used in the study as a rough representation of their relative importance in influencing student adoption decisions. Figure 5.1 also includes a count of student entries in the “other factor” section of the adoption journals. In order to examine whether any of these entries indeed involved different adoption factor categories than

what stipulated by the general diffusion and CBAM theories, the researcher assessed each entry separately to determine if it could be categorised under the known diffusion theory categories (meaning that the original student categorization as “other factor” was incorrect). The researcher was actually able to re-classify in a straightforward manner the large majority of these “other” factors (35 out of 50) into one of the main diffusion factors. Table 5.1 presents some examples of such re-categorizations.

| “Other” Factor Recorded | Re-categorization |
|---|---|
| <i>The factor of awareness of web 2.0 applications by the fact that we used Google groups in a previous assignment in order to collaborate</i> (Student S5) | Perceived innovation attribute (compatibility) |
| <i>...I do believe that web 2.0 is the future, the next “big thing”...</i> (Student S2) | Perceived innovation attribute (relative advantage) |
| <i>Probably it will be useful in our workplace...</i> (Student S35) | Perceived innovation attribute (relative advantage) |
| <i>I think the availability of lecturer and teaching assistant play the important roles for this. They have to be ready at any time and explain over and over again...</i> (Student S9) | Change facilitator actions |
| <i>Yes, I tried how to use it and I think I can do it easily...</i> (Student S37) | Perceived innovation attribute (trialability) |

Table 5.1: Re-categorization of Other Factors Mentioned by Students

Of the remaining 15 not re-classified “other factors”, 10 are related to an overt statement by the relevant students that they needed to learn more about the innovation before forming a positive or negative attitude towards it. This indicates that most probably the particular students were still at an early stage in their innovation adoption decision process when they wrote their relevant journal entries (indeed, out of the 10 student cases, 6 were recorded at journal entry 1). The remaining 5 not re-classified entries are related with

student concerns regarding Internet access (2 entries), a suggestion for modifying the provided online collaborative environment (1 entry), difficulty to join a group (1 entry) and a concern that the new online environment was presented too early in the class (1 entry).

Hence, the results of the “other factor” re-categorization seem to provide strong evidence as to the completeness of the set of influencing factor categories stipulated by the general diffusion theory.

Figure 5.2 depicts the influencing factor categories following the “other factor” re-categorization and adjustment.

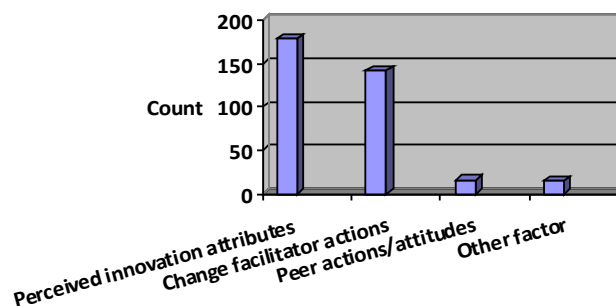


Figure 5.2: Recorded Adoption Factor Counts (Adjusted)

As seen in Figure 5.2, the decision adoption process for the study was influenced predominantly by the perceived innovation attributes of the proposed online collaborative learning environment and the change facilitator actions. Peer actions and attitudes were found to play a lesser role in the adoption decision process. While the influence of perceived innovation attributes was a rather expected result [previous studies have found that the perceived innovation attributes could explain about half of the variance in rates of adoption (Rogers, 2003)], the significant influence of the change facilitator actions is a rather novel result. It is also a welcome result signifying that the diffusion process can be potentially steered towards the desired results by appropriate actions on behalf of the change facilitator (tutor in this case).

The next sections take the analysis of adoption factor categories one step deeper examining the specific influencing factors referenced by students in each category.

5.2.2 Perceived Innovation Attributes

Figure 5.3 presents a breakdown of the frequencies of the perceived innovation attributes recorded by students as having an influence on their decision to adopt or not the proposed online collaborative environment.

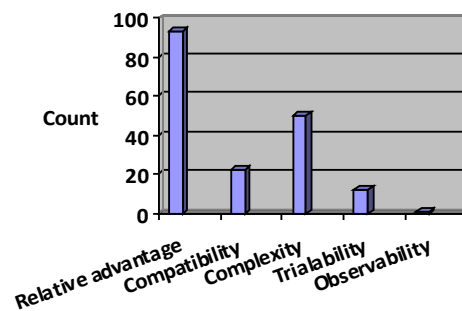


Figure 5.3: Recorded Perceived Innovation Attributes

As seen in Figure 5.3, the most frequently recorded influencing attribute is *relative advantage* followed by *complexity* and *compatibility*. These findings are in line with other studies which have found **relative advantage** (i.e. the degree to which an innovation is perceived better than the products it supersedes) to be one of the strongest predictors of an innovation's rate of adoption (Rogers, 2003).

The importance of **complexity** (i.e. the degree to which the innovation is perceived as relatively difficult to understand and use) for a technological innovation like the proposed online collaborative environment is also evident in the results. This signifies the importance of appropriate actions during innovation design and adoption facilitation so that the innovation appears as simple as possible to the prospective adopters.

Compatibility (i.e. the degree to which the innovation is compatible with the prospective adopter's values, past experiences and needs) and **trialability** (i.e. ability to experiment with the innovation before actual adoption) were also perceived as influencing factors by a number of students (though to a lesser extent than relative advantage and complexity).

Finally, **observability** (i.e. the degree to which the results of using an innovation are visible to others) was not perceived as an important influencing factor (only in one instance a student reported such influence).

Table 5.2 presents some examples of perceived innovation attributes recorded by students as influencing the adoption process.

| Adoption Journal Extract | Innovation Attribute Classification |
|--|--|
| <i>... it saves a lot of time and you can use it every where, at work, home, cafeteria. Anytime you want... (Student S11)</i> | Relative advantage |
| <i>... it saves time compared to face to face meetings... (Student S4)</i> | Relative advantage |
| <i>...increase(s) efficiency and promote(s) transparency towards member contribution... (Student S3)</i> | Relative advantage |
| <i>...It is very easy to use; it requires small effort to be learned... (Student S5)</i> | Complexity |
| <i>... it could be more user friendly with simpler appearance... (Student S4)</i> | Complexity |
| <i>... and has the same work environment like MS Windows and Office... (Student S1)</i> | Compatibility |
| <i>...ability to experiment is influencing on me. I am still learning and discovering the new way of learning... (Student S36)</i> | Trialability |

Table 5.2: Examples of Recorded Perceived Innovation Attributes

Given the importance of the relative advantage attribute, it is useful to progress the analysis one step further and examine the sources of relative

advantage referenced by students using *in vivo* coding. The results are shown Table 5.3 listing the main coded sources of relative advantage along with their respective frequencies. All but one (less sociable) of the listed relative advantage sources favour the new innovation (online collaborative learning environment) over the traditional face-to-face collaboration.

| Source of Relative Advantage | Impact | No of Times Referenced |
|---|---------------|-------------------------------|
| Work any time / any place | +ve | 20 |
| Faster collaboration / saves time | +ve | 21 |
| New cool product / use of technology | +ve | 11 |
| Generally convenient | +ve | 9 |
| Has useful tools / facilities | +ve | 7 |
| Less sociable (than physical contact) | -ve | 5 |
| Useful more generally (e.g. at work, use other similar tools) | +ve | 3 |

Table 5.3: Main Sources of Relative Advantage Recorded

The benefits / drawbacks mentioned listed in Table 5.3 can be particularly useful for designing appropriate change facilitator interventions in order to take advantage of the benefits and address the drawbacks. The “work any time / any place” benefit is one of the main general advantages of e-learning and has been referenced by several researchers (Henri, 1992; Deans, 2009). It is also worth noting the rather strong motivation provided to students by the “new cool product / use of technology” image of the proposed online learning environment. Regarding the recorded drawback of “less sociable”, while it is certainly an item requiring further investigation, it appears to stress the importance of the group cohesion dimension in online collaboration (Henri, 1992; Rourke et al., 1999).

5.2.3 Peer Actions and Attitudes

As seen in Figure 5.2, a number of students recorded peer actions and attitudes (interpersonal, localite communication networks) as factors influencing the adoption process. Table 5.4 presents some examples of such recorded peer actions and attitudes. The collected data indicates that student peer influence is stronger among prospective teammates though there are some records of wider influence as well.

| Adoption Journal Extract | Peer influence |
|---|----------------------------|
| <i>... my group mate [name] influences me towards to use the web 2.0... (Student S41)</i> | Influence by teammates |
| <i>Yes, one of my group members has very positive attitude toward it... (Student S29)</i> | Influence by teammates |
| <i>...realizing that more people use it, it will make me to try to use as well as them... (Student S6)</i> | Influence by peer students |
| <i>Well yes, if they have used it before and they have positive attitudes it can influence me in a good way. I spoke with my team member and he was very satisfied with the application so I believe it's a very useful and easy way for group work... (Student 19)</i> | Influence by teammates |

Table 5.4: Examples of Recorded Peer Actions and Attitudes

5.2.4 Change Facilitator Actions

The second most important influencing factor category in the study was that of change facilitator actions. The researcher coded the various change facilitator actions referenced by students as having an influence on their decision to adopt or not the proposed online learning environment, using the six types of interventions identified in the CBAM framework (Hall and Hord, 2006) as follows:

- **Communicating a shared vision of change** (e.g. explaining the need and the benefits of the change; arousing student enthusiasm,

interest and motivation; exhibiting enthusiasm and positive attitude as facilitator)

- **Planning and providing resources** (e.g. the quality of the provided online collaborative resources)
- **Investing in professional learning** (e.g. delivering formal training or other development sessions, providing information about the innovation, developing positive attitudes, demonstrating innovation use)
- **Checking on progress** (e.g. monitoring actual innovation use)
- **Providing continuous assistance** (e.g. solving problems, providing technical assistance, responding to questions, providing additional material and learning activities, providing encouragement)

Any change facilitator action referenced by students and not falling in any of the above types was coded as “Other”.

Figure 5.4 presents a breakdown of the frequencies of change facilitator actions recorded by students as having an influence on their decision to adopt or not the proposed online learning environment.

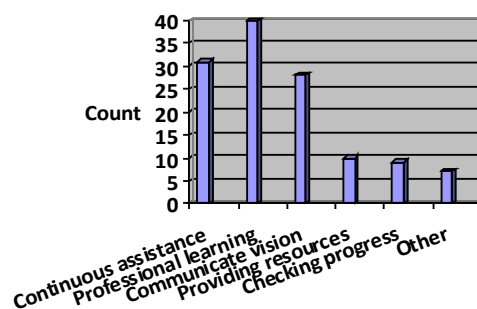


Figure 5.4: Recorded Change Facilitator Actions

As seen in Figure 5.4, the most frequently recorded type of influencing change facilitator actions is “investing in professional learning” followed by “providing continuous assistance” and “communicating a shared vision of

change”. The findings regarding professional learning can be judged as expected since the process of adopting an innovation is basically one of information uncertainty reduction (Rogers, 2003). The finding regarding continuous assistance is also in line with other studies which have signified the importance of continuous and timely support (Mahony and Wozniak, 2005; Anderson et al., 1998). The high frequency of the type of interventions related with communicating a shared vision of change was a rather unexpected result to the researcher, indicating how important it is for the change facilitator to explain thoroughly to the students the need and the benefits of the proposed change, arousing their enthusiasm and interest. The “Other” type of interventions refers to 7 recorded instances where the students mentioned the potential alignment with the lecturer preferences as influencing their decision (as the lecturer / researcher was promoting the use of the online environment).

Table 5.5 presents some examples of change facilitator actions recorded by students as influencing the adoption process.

| Adoption Journal Extract | Change facilitator type of actions |
|--|---|
| <i>... the way the lecturer described the whole process using the web 2.0 application it has influenced in a large extent my own attitude towards web 2.0 applications. By describing what is all about and the way we can all benefit from it... (Student S5)</i> | Communicating a shared vision of change |
| <i>... I feel more motivated to use the application and learn more so as to be able to use it in [the] future also in my other projects... (Student S12)</i> | Communicating a shared vision of change |
| <i>Lab helped to make the application more familiar... (Student S6)</i> | Investing in professional learning |
| <i>Everything has been made clear to us in the computer lab and the lecturer as well as the lecturer assistant checked constantly if we are learning how to use it... (Student S13)</i> | Investing in professional learning |
| <i>The most important is that the tutor</i> | Providing continuous assistance |

| | |
|--|---|
| <i>assured us that at any time there would be a support for each one of us...</i> (Student S5) | |
| <i>I know that I can deal any difficulty by asking the lecturer. Training and support are very important in these cases....</i> (Student S16) | Providing continuous assistance |
| <i>... It is wonderful that our lecturer can monitor our work and give advice at the same time...</i> (Student S11) | Checking on progress |
| <i>You want to be "aligned" with your lecturer/TA preferences...</i> (Student S2) | Other (alignment with lecturer preferences) |

Table 5.5: Examples of Recorded Change Facilitator Actions

5.2.5 Factors Referenced With Student Final Decision

The last section of the student adoption journals asked the students about their final adoption decision (decision to use or not the provided online collaborative environment) and included an open question requesting the main reasons contributing to this decision. Figure 5.5 shows the results of coding the student responses. The same categories of adoption influencing factors (perceived innovation attributes, peer actions and attitudes, change facilitator actions) were used.

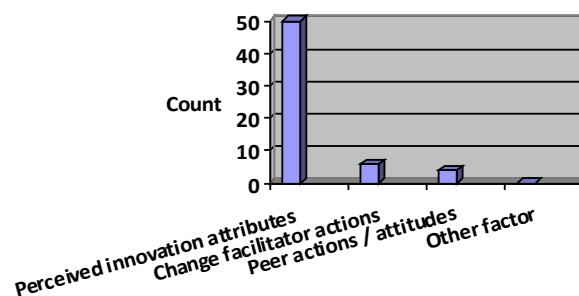


Figure 5.5: Student Final Decision Factors

There is a notable difference between Figure 5.5 and Figure 5.2 which records the frequency of adoption factor categories referenced during the

adoption process. The change facilitator and peer actions / attitudes are underrepresented in Figure 5.5 while the researcher was also able to map all mentioned factors in the student decision sections to the three main diffusion categories (i.e. the “other factor” count is zero indicating again the apparent completeness of the categories of factors stipulated by the general diffusion theory). This result tends to suggest that while change facilitator actions (predominantly) and peer actions / attitudes were important during the process of getting acquainted and learning how to use the innovation, the final adoption decision was taken principally on the merits of the innovation attributes. The result may also indicate that by this point in time (approximately 6th week of the class), the students, having become more familiar with the proposed online environment, started to develop a greater degree of confidence and autonomy in problem solving. In addition, among the innovation attributes referenced by students as contributing to their final decision, the vast majority (35 references) concerned the attribute of relative advantage (i.e. the degree to which an innovation is perceived better than the products it supersedes), 11 references concerned the attribute of complexity (i.e. the degree to which the innovation is perceived as relatively difficult to understand and use) and 4 references concerned the attribute of compatibility (i.e. the degree to which the innovation is compatible with the prospective adopter’s values, past experiences and needs). The attribute of trialability (i.e. ability to experiment with the innovation before actual adoption) was not referenced at all, probably because by that point in time the students were already acquainted with the innovation functionality.

The above results appear to provide support for a knowledge-based model for innovation adoption as that proposed by Moreau et al. (2001) and depicted in Figure 5.6.

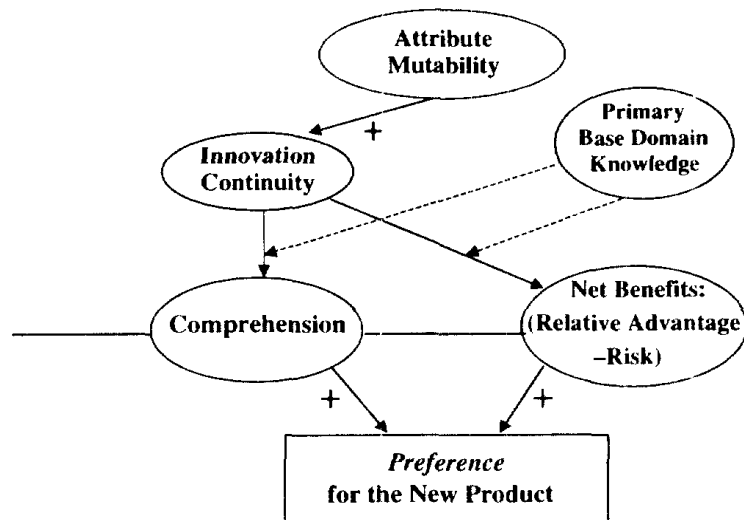


Figure 5.6: Knowledge-Based Adoption Model (Moreau et al., 2001: 15)

Innovations typically result from a change to the product attributes or features within a product category (Goldenberg et al., 1999). Depending on the mutability of the changed or eliminated attributes, the innovation is characterized as continuous (change is in highly mutable features, consumer ease in incorporating the new product into the existing product category) or discontinuous (change is in highly immutable features, increased consumer difficulty in incorporating the new product into the existing category structure). The likelihood of adoption increases with increasing potential adopter comprehension of the innovation, increasing relative advantage and decreasing risk. Moreover, the risk of using a new innovation for a potential adopter increases with innovation complexity and lack of compatibility.

5.2.6 Student Concerns

The study also examined the student concerns (feelings, perceptions, motivations) throughout the adoption decision period. Figure 5.7 shows the coded concerns recorded by students.

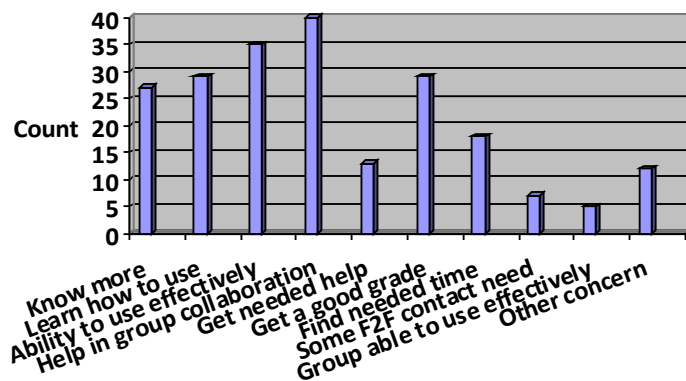


Figure 5.7: Recorded Student Concerns

As seen in Figure 5.7, the most frequent concerns reported are related with:

- getting more information about the innovation and learning how to use it
- concerns about meeting the demands of the innovation and using it effectively (including finding the necessary time and getting timely assistance)
- concerns regarding the actual impact of the innovation on group collaboration and student grades (including any need for face-to-face contact)
- other concerns such as specific problems with actual innovation use

Figure 5.8 displays the variation of the total number of concerns expressed across time (using the respective student journal entries). A decreasing trend is noted while at the same time the number of students not having a positive attitude regarding the innovation is also following a similar decreasing pattern. These variations across time appear to support the process nature of innovation adoption and the progression in adopter attitudes as he/she learns more about the innovation.

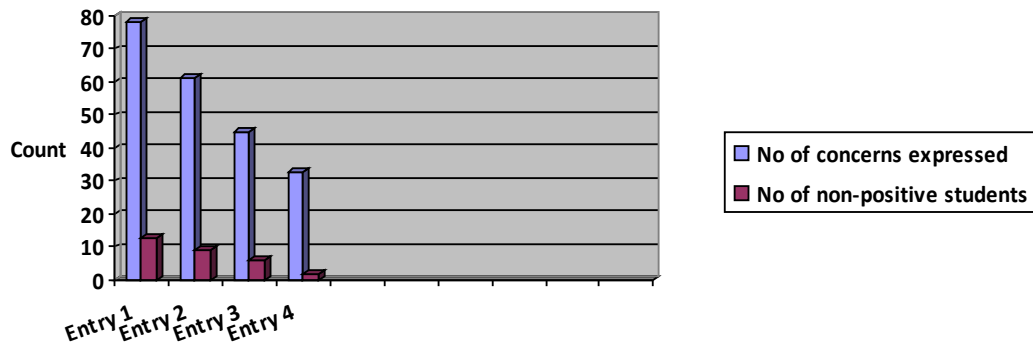


Figure 5.8: Variation of Concerns and Non-positive Attitudes Across Time

After examining the various student concerns recorded, the researcher proceeded to divide them into two broad categories: *adequacy* concerns and *outcome* concerns. Adequacy concerns are similar to the CBAM self concerns (Hall and Hord, 2006) and include learning more about the innovation and its demands and the associated student uncertainties about their adequacy to meet them. The following types of concerns were therefore classified as adequacy concerns: know more about the innovation, learn how to use it, ability to use it effectively, ability to get the needed help, find the needed time to devote etc. Outcome concerns, on the other hand, pertain to concerns regarding the actual impact of the innovation on group collaboration and the quality of the resulting project. Types of concerns classified as outcome concerns include: will the innovation help in group collaboration (including any needs for face-to-face discussions), will the innovation help in getting a good grade, how will the tutor monitor contribution etc. Figure 5.9 shows how the two categories of concerns vary across time (using the respective student journal entries).

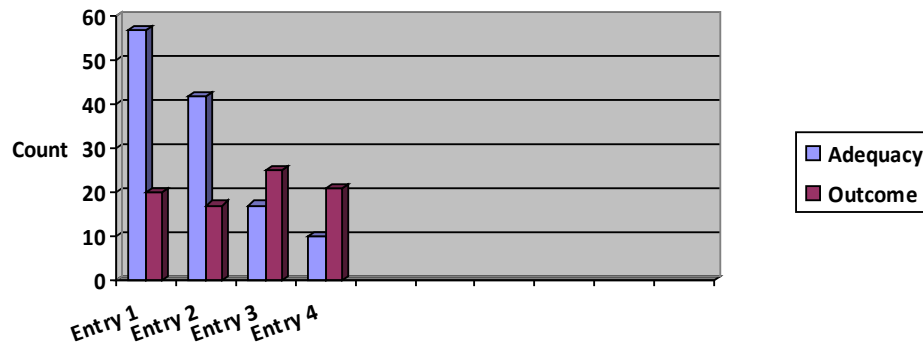


Figure 5.9: Variation of Concern Categories Across Time

As seen in Figure 5.9, adequacy concerns are high initially and decrease over time as students get more acquainted with the use of the innovation while outcome concerns remain relatively stable. This result indicates that change facilitators (educators) need to place a lot of emphasis initially in alleviating student adequacy concerns while also stressing throughout the change process the benefits of the innovation in meeting the desired results.

5.3 Potential Relationships Between Adoption Results and Student Characteristics

The researcher attempted to find any indication of potential relationships between the adoption results presented above and the study audience characteristics gathered through the pre-class questionnaires (demographic, computer literacy / internet use, innovative behaviour). Table 5.6 summarizes the student characteristics collected.

| Characteristic | | Freq. | Characteristic | | Freq. |
|------------------------------------|---------------------|-------|---------------------------------|---|----------------------|
| Gender | M | 20 | Willingness to work in Groups | 1=Not at all willing | - |
| | F | 21 | | 2 | - |
| Age | <= 25 | 18 | | 3 | 9 |
| | 26 – 35 | 20 | | 4 | 19 |
| | 36 – 45 | 3 | | 5=Extremely willing | 12 |
| Internet Use | At least once daily | 37 | | Willingness to seek new product information | 1=Not at all willing |
| | 3-4 times weekly | 4 | 2 | | - |
| Prior Use of Web 2.0 Applications | Chat room | 21 | 3 | | 9 |
| | Discussion forum | 9 | 4 | | 19 |
| | Wiki | 21 | 5=Extremely willing | 12 | |
| | Blog | 9 | Willingness to try new products | 1=Do not try them at all | - |
| | Media sharing | 29 | | 2=Wait until fully accepted | 3 |
| | Micro blogging | 7 | | 3=Wait until somewhat accepted | 12 |
| | Social Networking | 34 | | 4=Wait until someone else tries it | 11 |
| Prior Experience Working in Groups | Yes | 38 | | 5=Be among the first to try them | 15 |
| | No | 3 | | | |

Table 5.6: Summary of Student Characteristics

As seen in Table 5.6, the students that participated in the study were relatively young in age (< 36 years old), evenly distributed between the two genders, regular users of Internet, with prior experience in group work and rather willing to do so again. A minority of them had prior experience with discussion forums and about half with wikis and chat rooms. In addition, the majority of the students had prior experience with social networks such as facebook and portrayed themselves as willing to seek out new product information. A fair number of them also describe themselves as innovators, being willing to be among the first to try out new products.

A potentially important student characteristic in the adoption process of online interactivity is computer literacy. To this end, a suitable 23-item scale was devised (based on European Computer Driving License core knowledge) and included in the pre-class questionnaire. Figure 5.10 presents the distribution of this scale for the students that participated in the study

showing that the study audience includes participants of varying computer literacy.

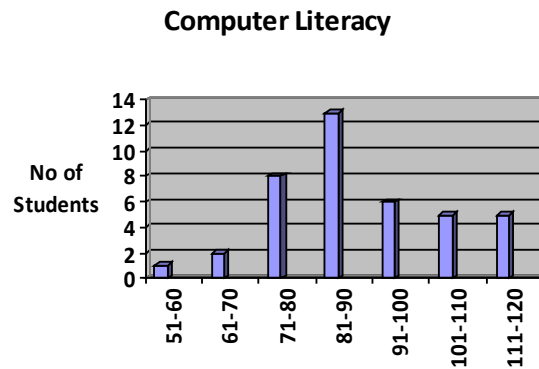


Figure 5.10: Student Computer Literacy

In order to seek any potential relationships between the adoption results presented earlier and the student characteristics, the researcher employed a specific feature of the qualitative analysis tool NVIVO, called matrix coding query, which produces a form of qualitative cross-tabulation with rows representing selected coding items (codes) and columns representing selected attributes of the participants.

Table 5.7 shows the output of a matrix coding query relating student computer literacy with: (from top to bottom) the various adoption factors (perceived innovation attributes, change facilitator actions, peer actions and attitudes), adequacy concerns, attitude towards the innovation.

| | 51-60 (1 student) | 61-70 (2 students) | 71-80 (8 students) | 81-90 (13 students) | 91-100 (6 students) | 101-110 (5 students) | 111-120 (5 students) |
|---|----------------------|-----------------------|-----------------------|------------------------|------------------------|-------------------------|-------------------------|
| 1 : Trialability | 0.0 | 0.5 | 0.4 | 0.2 | 0.0 | 0.4 | 0.0 |
| 2 : Relative advantage | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 | 0.8 |
| 3 : Complexity | 0.0 | 0.5 | 0.6 | 0.8 | 0.5 | 0.6 | 0.4 |
| 4 : Compatibility | 0.0 | 0.0 | 0.6 | 0.3 | 0.5 | 0.4 | 0.0 |
| 5 : Providing continuous assistance | 1.0 | 0.5 | 0.6 | 0.6 | 0.2 | 0.2 | 0.2 |
| 6 : Planning and providing resources | 1.0 | 0.5 | 0.1 | 0.1 | 0.3 | 0.0 | 0.0 |
| 7 : Other change facilitator action | 0.0 | 1.0 | 0.1 | 0.2 | 0.3 | 0.0 | 0.6 |
| 8 : Investing in professional learning | 1.0 | 0.5 | 0.5 | 0.5 | 0.3 | 0.4 | 0.4 |
| 9 : Communicating a shared vision for change | 0.0 | 0.5 | 0.4 | 0.5 | 0.7 | 0.4 | 0.2 |
| 10 : Checking on progress | 0.0 | 0.0 | 0.6 | 0.0 | 0.2 | 0.0 | 0.0 |
| 11 : Teammate actions or attitudes | 1.0 | 0.5 | 0.3 | 0.3 | 0.5 | 0.2 | 0.4 |
| 12 : Other student actions or attitudes | 0.0 | 0.5 | 0.5 | 0.6 | 0.3 | 0.0 | 0.0 |
| 13 : Will I have the necessary time to learn it | 0.0 | 0.5 | 0.5 | 0.4 | 0.2 | 0.0 | 0.2 |
| 14 : Will I be able to use it effectively | 0.0 | 1.0 | 0.6 | 0.6 | 0.7 | 0.8 | 0.0 |
| 15 : Will I be able to get the needed help | 0.0 | 0.0 | 0.3 | 0.3 | 0.7 | 0.0 | 0.0 |
| 16 : learn how ot use it | 1.0 | 1.0 | 0.5 | 0.5 | 0.7 | 0.4 | 0.4 |
| 17 : Know more about the innovation | 0.0 | 0.5 | 0.5 | 0.4 | 0.5 | 1.0 | 0.4 |
| 18 : Positive | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 | 1.0 | 0.6 |
| 19 : Negative | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.0 |
| 20 : Indifferent | 0.0 | 1.0 | 0.3 | 0.4 | 0.3 | 0.0 | 0.2 |

Table 5.7: Computer Literacy Vs. Adoption Factors and Concerns

Each column in the table provides the ratio of students within the specific computer literacy set of values that have been associated (coded) at least once with each of the factors / concerns / attitudes towards the innovation that appear in the respective rows. For instance, a ratio of 0.2 students having computer literacy scores between 101 and 110 (i.e. actually 1 out of the 5 students) referenced as important at least once the change facilitator action of providing continuous assistance.

Examining Table 5.7 for any patterns, yields as only indication of a potential relation the fact that students having higher computer literacy tended to value less the change facilitator intervention of continuous assistance (evidently they had less need for it). No indication of a correlation seems to exist between computer literacy and negative / indifferent attitude towards the innovation or perceived innovation complexity. This is a rather unexpected result as one could expect students with lower computer literacy to tend to perceive the innovation as being more complex and hold a less positive attitude towards it, at least initially. In fact, Moreau et al. (2001) found that supplementary base domain knowledge (that is, useful knowledge from domains other than the primary base domain of an innovation) plays an important role in its diffusion. In the case of e-learning, the primary base

domain knowledge is related to background and understanding of the basic learning subject matter and learning techniques whereas the supplementary base domain knowledge is related to a basic understanding of computers and the Internet. Possible explanations for this rather unexpected result of the study could be provided by the following factors:

- According to Table 5.6, all students were regular users of Internet and a fair number of them had prior experience with Web 2.0 Applications. Perhaps this more specific portion of IT knowledge, rather than more general computer literacy, constitutes the relevant and requisite supplementary base domain knowledge for this innovation.
- The selected online collaborative applications (based on Google Docs) are impressively similar to Microsoft Word with which virtually all students are familiar.
- The researcher (change facilitator) designed and delivered specific interventions so that the final online learning environment would be easy to use, students would receive adequate training and would have access to timely support through a variety of means when necessary.

Appendix A5.1 contains the results (similar to Table 5.7) of additional matrix coding queries attempting to relate other student characteristics with adoption factors / student concerns / attitudes towards the innovation. No clear indication of further relationships was unveiled.

5.4 Evaluation of the Online Interactions and Learning Processes

One of the objectives of the present study is the examination of the learning processes involved in online interactions. To this end, the study was informed by two of the most influential models for interaction analysis encountered in the literature: the interaction analysis model proposed by Henri (1992) and also the model proposed by Gunawardena et al. (1997) for

knowledge co-construction. This section presents the findings following the analysis of the data captured by the student online interactions in the Google Docs discussion tables (discussion forums).

5.4.1 Coding Online Interactions

The researcher's initial inclination was to utilize both the Henri's and Gunawardena's models in a complementary mode in order to analyse the large volume of collected data (690 distinct student messages). That is, use Henri's participative and interactive dimensions to evaluate student participation and types of interaction (e.g. responses, comments, independent statements) and Gunawardena's model to evaluate the exhibited collaborative learning processes. To this end, each student message was coded as follows (please refer to Appendix A3.6 for more information):

- **Henri's model:** Explicit interaction (direct response or commentary), implicit interaction (indirect response or commentary) or independent statement
- **Gunawardena's model:** Sharing / Comparing of Information (Phase I), Discovery / Exploration of Dissonance (Phase II), Negotiation / Co-construction of Knowledge (Phase III), Testing / Modification of Proposed Co-construction (Phase IV), Agreement Statement (Phase V)

Halfway through the coding process however, the researcher started appreciating some of the weaknesses of Henri's model (participative and interactive dimensions) as these have been actually identified and documented by Gunawardena et al. (1997) as follows:

- There appears to be no real point in actually distinguishing interactions between independent statements (monologic) or interactive since in an online discussion virtually all messages are

linked. In fact, out the 690 messages collected only a very small minority of them (21 messages) were coded as monologic.

- Henri’s categorisation of interactions into explicit or implicit appears mechanistic and does not provide much insight as to the actual collaborative learning processes. Furthermore, simply counting the total number of messages in an online discussion (whether these are related to the formal subject matter or not) may not be an accurate method to judge student active participation and contribution. In fact, a number of exchanged messages actually present very concise, superficial contributions with lack of adequate argumentation.

In view of the above, the researcher adopted the view that any evaluation of student participation must take into consideration the student contribution to the actual underlying learning processes. In this respect, Gunawardena’s model appeared to be a much more promising foundation for evaluating online interactions and thus became the main model used for the subsequent analysis.

5.4.2 Interaction Analysis Results

Table 5.8 presents an overview of the number of messages exchanged among the various groups of students.

| | No of Messages | Part 1 | Part 2 | Part 3 | Part 4 | Part 5 | Part 6 | Part 7 | Part 8 | Part 9 | Part 10 |
|----------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Group 01 | 79 | 10 ■ | 9 ■ | 8 ■ | 6 □ | 8 □ | 11 □ | 8 □ | 7 □ | 6 □ | 6 □ |
| Group 02 | 81 | 15 □ | 16 ■ | 12 □ | 7 □ | 7 □ | 6 □ | 5 □ | 2 | 5 □ | 6 □ |
| Group 03 | 105 | 20 ■ | 12 ■ | 14 ■ | 14 □ | 15 □ | 5 ■ | 8 □ | 5 □ | 10 □ | 2 |
| Group 04 | 47 | 11 ■ | 13 □ | 5 □ | 10 □ | 4 □ | 1 □ | 2 | 1 | - | - |
| Group 05 | 37 | 7 □ | 5 □ | 4 □ | 6 □ | | 5 □ | 2 | 3 □ | 1 | 4 □ |
| Group 06 | 31 | 5 □ | 4 □ | 1 | 6 □ | 1 | 4 □ | | 3 □ | 4 □ | 3 □ |
| Group 07 | 86 | 12 □ | 11 □ | 18 □ | 10 ■ | 9 ■ | 6 □ | 4 □ | 3 □ | 6 □ | 7 □ |
| Group 08 | 55 | 6 ■ | 7 ■ | 6 □ | 6 □ | 7 □ | 6 □ | 4 □ | 4 □ | 4 □ | 5 □ |
| Group 09 | 16 | 3 | 4 □ | 5 □ | 1 | - | 2 | - | - | 1 | - |
| Group 10 | 95 | 12 □ | 14 ■ | 18 ■ | 14 ■ | 9 □ | 5 □ | 5 □ | 7 □ | 9 □ | 2 |
| Group 11 | 8 | 1 | - | 5 □ | - | - | 1 | - | - | 1 | - |
| Group 12 | 24 | 5 □ | 3 □ | 3 □ | 3 □ | 4 □ | 2 | 1 | 3 □ | - | - |
| Group 13 | 26 | 3 □ | 5 □ | 2 | 2 | 2 | 4 □ | 3 □ | 1 | 3 □ | 1 |
| | | | | | | | | | | | |
| | 690 | 110 | 103 | 101 | 85 | 66 | 58 | 42 | 39 | 50 | 36 |

Table 5.8: Group Discussions and Learning Processes Observed

The study involved 13 groups working on class projects consisting of 10 parts. For each project part, there was a primary author in each group with the remaining group members providing information, comments and feedback until the project part was deemed finalized by the team. That is, each group was to hold basically 10 group discussions, one for each part. Each entry in Table 5.8 basically corresponds to a group discussion containing the number of messages exchanged among the specific group for that discussion. Next to the number of messages exchanged, one of two symbols can appear as follows:

- **Lower level learning processes:** means that the group discussion stayed at what Gunawardena's model refers to as Phase I or "lower mental functions" with participants sharing and comparing information and accepting each others' statements or examples as consistent with what the group members already know or believe. Negotiation in this case tends to be mostly unspoken and the discussion typically does not advance beyond Phase I (Sharing / Comparing).
- **Higher level learning processes:** means that the group discussion unveiled inconsistencies or disagreements among the group members and the discussion advanced beyond Phase I into Phase II (Dissonance), Phase III (Negotiation / Co-construction) and finally to Phase V (Agreement Statement). The model refers to Phases beyond Phase II as characterised by "higher mental functions". The researcher was not able to discern instances of Phase IV (Testing Tentative Constructions) which calls for testing the proposed synthesis or co-construction against formal data, personal experience etc. Evidently, to the extent that this was actually done by the students, it was unspoken for the specific discussions examined.

As seen in Table 5.8, the researcher was able to identify several group discussions which exhibited the above learning processes, though most of

them remained at the lower mental functions level. Some group discussions, however, managed to advance further into the higher mental functions level.

Tables 5.9 and 5.10 below include sample group discussions at both levels of social construction of knowledge.

| Student | Message | Gunawardena Phase |
|----------------|---|--------------------------|
| S31 | May be would be better to add gap customer expectations and perceptions graph. | Phase I |
| S32 | You know, I pasted it at the beginning, but thought it's not necessary and erased. I already put it back if you also think it should be there. | Phase I |
| S30 | What about 6 Sigma? can you dwell on the measures of quality? | Phase I |
| S31 | Watch maybe it will be useful http://www.watchtalkforums.info/forums/general-discussion-forum/29727-horology-101-waterproofing.html#post273888 | Phase I |
| S32 | Thanks, very useful!!! | Phase I |
| S30 | Can you explain what quality characteristics are and what each of them means? Maybe you have some data that proves that the company is not a 6 sigma one? Maybe statistical data as for defects? | Phase I |
| S32 | Sure, I added the information and this table about the [six] Sigma!! | Phase I |

Table 5.9: Sample Conversation Exhibiting Lower Level Learning Processes

| Student | Message | Phase |
|---------|---|-------|
| S1 | <p>Wow, what a comprehensive work of yours, [S2], thanks :) It seems that they emphasized and have invested in various technologies to ensure their Dependability over the contract, Quality specified by the customer, and Speed from mine-to-market. I agree with all of them. Although these technologies will certainly cost them a fortune, they're willing to pay it, maybe because they focus more on above 3 objective rather than Cost objective. Should we lower KPC's objective / current performance on Cost objective a little bit then, just to accentuate that? I know It's a minor, but that's the only input I have now :p Maybe [S3] have something to say? Thank you & good night! Have a good rest, guys :)</p> | I |
| S2 | <p>@[S1]: Thanks for the comment. However, I must disagree with you that although company invested in technology that cost them a fortune, but in the end of the day, it's about cost per unit or, in coal business, they call it "cost per ton". The investment was made to increase the production and reduce cost. But, I see your point that you can't have it all in polar diagram specially cost and speed. Maybe [S3] should step up as our angel to give her insight on this...</p> | II |
| S3 | <p>Your wish comes true guys... 1. Cost - we should discuss more in terms of the <i>selling price</i> of the coal compared to the market prices. E.g. are they pursuing <i>cost leadership</i>? If yes, this will be automatically reflected in their operational costs (low production cost) 2. Flexibility – Don't you guys think that we should put the flexibility (objective & actual) higher because in terms of coal market, it able to <i>customize its product</i> (e.g. blending the coal as per requested) where not every coal company willing to do that and just stick with their end products... 3. Dependability - if they always <i>keep they promises</i> e.g. fulfil the contract, on-time delivery date, receive no significant customers' complains, why do they still not achieve the objective? The same point applies for other 4 objectives such as Speed (<i>the pace of production work</i>), Quality of the end product, cost and flexibility.</p> | III |
| S2 | <p>Thank god [S3] has spoken ;) I believe KPC has lower actual performance compared to the objective because they believe "there is always a better way of doing things" as I bolded in the first paragraph. But I might add a couple sentences at the bottom to talk about it that would make it clearer. (<i>added below the figure</i>) 1. In my opinion, there is no coal producer would like to be a cost leadership because most of the price formulations are based on the coal index price. Although KPC never claimed to be the "lowest price coal producer" in the world but KPC is always being the example of best practice in the industry. Unlike KPC's competitor, adaro, claimed as the lowest price coal producer in the world, it's because their coal contour/topology is easy to mine, as for KPC, the contour is like zig-zag thus require more efforts/processes. I'm not sure whether my further explanation gives more insight or not, but I believe that all of the investment & process improvement project has been done to reduce cost... 2. I'm not saying KPC is the only one who able to blend coal in their processing plant, as most of other big coal producers... are able to do it. But KPC's strength having the expert personnel who are able to blend it correctly. Just FYI, they have a software called MineTrack... like "executive</p> | III |

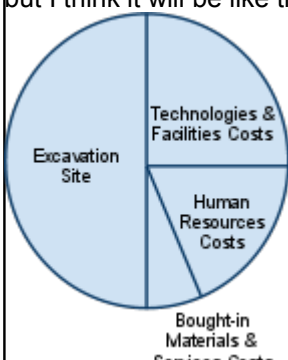
| | | |
|----|--|-----|
| | information system" that [is] able to give "end-to-end" supply information (amount and coal specification) in real-time from the coal still inside the earth, being mined in the pit, in the processing plant and port stock pile... 3. I think I have answered this from point no 1. Because they believe there is always room for improvement :) | |
| S1 | <p>Hi Guys...</p> <p>...I think KPC tends to be Differentiation Focus with emphasis on Quality and Dependability. I think it is more "Differentiation" rather than "Cost" as KPC seems more excel on their coal quality and focus in keeping their promises to the customers. Moreover, it is more "Focus" rather than "Leadership" as KPC competes in narrow range of competition (on coal only and not other business). What do you guys think about this?</p> <p>Secondly, is it useful to breakdown KPC's cost structure? As it might reveal other cost-related analysis, not only for this Cost objective, but also for the selection of location that you will discuss on Part 3? I'm not sure about this, but I think it will be like this:</p>  <p>We can see from above diagram that KPC will spend the highest costs (FC) on excavation site and technologies and facilities to support it, thus make them the most important decisions on the beginning of the whole coal excavation and production. Not only deals with the potency (benefits) of the land, but maybe with the costs of the land itself (compared to its acquisition and excavating costs [overland and overseas fleets, conveyor belts, etc.] due to its accessibility [distance, contour, etc.]). It's just an idea though, please feel free to criticize :-)</p> <p>Thanks and good night!</p> | III |
| S3 | <p>Hi all, how are you? Firstly, I would like to thanks [S2] for the explanation and personal advice =p</p> <p>I would agree with [S1] that the company is differentiation focus who tries to excel in dependability and quality aspects. Is that so [S2]?</p> <p>It is a brilliant thought of the cost breakdown, [S1] but in my opinion we do not need it at this stage. Cheers!</p> | III |
| S2 | <p>Hi All, after rethinking it again, I agree with you guys that KPC is trying to differentiate on dependability and quality objectives. I have added couple sentences after the figure to highlight it. Also, I have lowered the figure on cost and speed.</p> <p>I believe I can wait for final comment on this, otherwise I can set this part as final. Thank you guys</p> | V |
| S1 | Thank you {S2}. We can finalize this part then! | V |
| S3 | Yeap, well done [S2]! Let's move on! =) | V |

Table 5.10: Sample Conversation Exhibiting Higher Level Learning Processes

Examining again Table 5.8 reveals that the number of messages exchanged in group discussions actually decreased for the last parts of the project along with the number and quality of actual learning processes observed. This observation may be related with some of the comments recorded in student online journals (presented in section 5.5.2) stating that, closer to the due date, some students considered traditional face-to-face collaboration as potentially more effective in order to finalize pending work.

The researcher also believes that Gunawardena's model could provide a promising basis for evaluating student participation in the learning processes involved in online interactions. To this end, the evaluator could consider, for instance, only the student messages which qualify either as lower level learning process contribution (e.g. Phase I of the model) or higher level learning process contribution (Phases II – V). Superficial messages exchanged among the participants would thus be discarded. The evaluator could also consider assigning a different weight for the two learning process levels with contributions at the higher level counting more.

5.5 Overall Student Feedback and Satisfaction Results

This section presents student feedback and overall satisfaction results regarding the whole the collaborative experience. The results presented in this section reflect data collected through the post-class questionnaires that were administered at the end of the class and also the student journals. Regarding the post-class questionnaires, the student feedback was solicited both for the general experience of working in groups (not necessarily involving online collaboration) and also for the more specific experience of using the provided online collaborative learning environment.

The use of multiple sources (questionnaires and journals) provided the researcher with a more comprehensive view regarding the positive and negative aspects of the actual student experience through data triangulation.

5.5.1 Group Work Experience

The feedback received by the students regarding their overall satisfaction with the general experience of working in groups (closed questions of the post-class questionnaire) is summarized in Table 5.11.

| Aspect | | Frequency |
|---------------------------|------------------------|-----------|
| Group work effectiveness | 1=Not at all effective | - |
| | 2 | 2 |
| | 3 | 6 |
| | 4 | 17 |
| | 5=Extremely effective | 7 |
| Fairness of work division | 1=Not at all fairly | - |
| | 2 | - |
| | 3 | 5 |
| | 4 | 14 |
| | 5=Extremely fairly | 13 |
| Group work enjoyment | 1=Not at all | - |
| | 2 | 3 |
| | 3 | 8 |
| | 4 | 15 |
| | 5=Extremely so | 6 |

Table 5.11: Summary of Overall Satisfaction With Group Work Experience

As seen in Table 5.11, the students were asked how effectively they worked together as a group (effective group work referred to whether the team managed to create the necessary bonding, whether the various project parts were developed and shared timely, whether adequate interaction and discussion of each part by the team took place leading to a better outcome etc.). The majority of students found their team working rather effective (7 students gave a score of 5, 17 students gave a score of 4 and 8 student a score of 3 or 2).

Regarding the student perceptions on how fairly (e.g. each student undertaking roughly equal share of the load) the project work was divided among the group members, most students thought the work was shared quite fairly (13 students gave a score of 5, 14 students gave a score of 4 and

5 students a score of 3). This is an interesting result as working online could potentially help make the contribution of each team member more transparent.

As seen also in Table 5.11, the majority of students enjoyed working in groups (6 students gave a score of 5, 15 students gave a score of 4, 8 students a score of 3 and three students a score of 2).

In the open questions of the post-class questionnaires the students were also asked to list some of the most positive and some of the most negative aspects of their group work experience. The recorded entries were coded *in vivo* for the various subcategories of positive and negative aspects referenced by students.

Positive Aspects of Group Work Experience

The most frequently listed positive aspect (8 references) was the **ability to share information and express multiple views on a topic**. Examples of student references include: “we have shared our different views and opinions”, “we got more perspectives on the team working”, “we can share our thoughts and make our work better”. One student saw also collaboration with students from other cultures as enriching the process (“working with foreigners enlarges knowledge points of view”). The next most frequently listed positive aspect (also 8 references) was the **ability of the group to achieve some form of bonding** (social cohesion). Examples of relevant student references include: “friendly group... helpful team”, “our team cooperated well, each member supported every one who needed support”, “makes the bond between us becomes stronger”, “the team members were very positive and understood the difficulties we faced”. The next most frequently listed (7 references) positive aspect was the **ability of students to learn from each other**. Example references include: “we have shared our different views and opinions and learned from each other”, “we learn and complement the work of each other”, “it enables you to learn a lot more than when you work alone”, “learn new things from other group members”. Other

positive aspects of the group work experience referenced by students include: **ability to share the workload, a more effective and interesting mode of work, less demand on time, opportunity to put theory to practice**. Two students also thought that group work could lead to a **better outcome** regarding their project.

The above results seem to be in agreement with similar benefits reported in other studies such as the ability to share resources and have many problem-solving view points (Stacey, 1999; Henri, 1992; Briscoe, 2008) and the reduction of workload for each individual participant (Briscoe, 2008).

Negative Aspects of Group Work Experience

The most frequently listed negative aspect of group work experience was related to **inadequate interaction and commitment by other team members** and the fact that the **final outcome also depended on others** (“there was difficulty in communication, more interaction is needed by all team members”, “slow process, the final project does not depend only on me”, “disrespect among [team] members, members not doing their parts on time”, “there are some problems since not all [team] members keep the same pace”, “result depends on everybody, not only on you”, “sometimes teammates are not helpful but rather disappointing”). **Team cohesion / cooperation issues** also emerged (“group member trying to control the others believing that he/she knows it all”, “misunderstandings, conflict”, “different characters make the whole communication process more difficult”). Some **difficulties to reach easily an agreement and common conclusions** were also mentioned (“more difficult to come to conclusion, different opinions”, “sometimes it is difficult to agree on something”). **Lack of time** (and its proper management) was also referenced by some students as impacting the group work experience (“do not have so much time as others”, “time not well managed”). Evidently, some students tried to complement online collaboration with some face-to-face meetings and faced the **problem of synchronizing calendars and finding suitable meeting time / place** (“due to the heavy schedule everyone has, it is difficult to have face-to-face

meetings and discussions”, “a bit difficult to gather with all members of a group”, “not easy to find a common meeting point”, “different programs, so it is hard to arrange meetings”).

Similar negative aspects have been reported in other studies such as inadequate participation by some team members (Clark, 2003), disagreement on problem goals, highly complex decision making, lack of independent direction (Briscoe, 2008).

5.5.2 Online Collaboration

The feedback received by the students regarding their overall satisfaction with the provided online collaborative environment and its various associated Web 2.0 applications (closed questions of the post-class questionnaire) is summarized in Table 5.12.

| Aspect | | Freq. | Aspect | | Freq. |
|--|------------------------|-------|--|-------------------|----------------|
| Google Docs wiki effectiveness | 1=Not at all effective | - | Google Docs wiki ease of use | 1=Not at all easy | - |
| | 2 | 1 | | 2 | 1 |
| | 3 | 4 | | 3 | 4 |
| | 4 | 13 | | 4 | 17 |
| | 5=Extremely effective | 13 | | 5=Extremely easy | 10 |
| Google Docs discussion table effectiveness | 1=Not at all effective | 1 | Google Docs discussion table ease of use | 1=Not at all easy | 1 |
| | 2 | - | | 2 | - |
| | 3 | 4 | | 3 | 5 |
| | 4 | 12 | | 4 | 9 |
| | 5=Extremely effective | 14 | | 5=Extremely easy | 16 |
| Online reflection journal effectiveness | 1=Not at all effective | - | Online reflection journal ease of use | 1=Not at all easy | 1 |
| | 2 | 4 | | 2 | - |
| | 3 | 5 | | 3 | 8 |
| | 4 | 16 | | 4 | 8 |
| | 5=Extremely effective | 6 | | 5=Extremely easy | 14 |
| % of group collaboration performed online | < 25% | - | Extent of learning from each other | 1=Not at all | - |
| | 25% - 50% | 1 | | 2 | 2 |
| | 51% - 75% | 16 | | 3 | 4 |
| | > 75% | 13 | | 4 | 20 |
| | | | | | 5=Extremely so |

Table 5.12: Summary of Overall Satisfaction With the Online Collaborative Experience

As seen in Table 5.12, the students were asked how **effective** (i.e. facilitating well what they had to do) they found the various tools they used. The majority of students found all 3 tools they used (Google Docs wiki, Google Docs discussion table and online reflection journal) rather effective (the large majority of students gave a score of 5 or 4 with a scale of 1=not at all effective and 5=extremely effective).

Table 5.12 shows the student responses regarding the **ease of use** of the provided online collaborative tools. As seen in Figure 5.24, most students found the online tools easy to use (the large majority of students gave a score of 5 or 4 with a scale of 1=not at all easy and 5=extremely easy).

The students were also asked of their perception regarding **how much of the group collaboration was finally done online** (recognizing that most groups had complementary face-to-face interactions as well). All students except for one responded that online interaction was more than 50% with slightly less than half of the respondents (13 students out of 30) stating that online interaction exceeded 75% of the total group interaction.

Table 5.12 also shows the student responses regarding the extent that they thought as a group **learned from each other** (e.g. by sharing different views, discussing and finally agreeing on a new perspective of looking at things). Most students thought that a fair amount of group learning occurred (the large majority of students gave a score of 4 or 5 with a scale of 1=not at all and 5=extremely so). This result appears to be consistent with Table 5.8 depicting that most group discussions were able to exhibit either low or high level learning processes (presenting another example of data triangulation).

In the open questions of the post-class questionnaires, the students were also asked to list some of the most positive and some of the most negative aspects of their experience with the online collaborative learning

environment. The recorded entries were again coded *in vivo* for the various subcategories of positive and negative aspects referenced by students.

Positive Aspects of Online Collaborative Experience

The most frequently listed positive aspect (8 references) was the **ability to overcome the barriers of time and place**. Examples of student references include: (“Work at any time you want. No need for useless meetings”, “can use every day, anytime, everywhere. Good opportunity to communicate with others sitting at home”, “We have a distance problem with the other member of my group so Web 2.0 helped a lot”, “No need for group meetings all the time. Each group member can develop and share its parts at any time and the other members can see them and make comments anytime”). A number of students made particular note of the **reduced need for physical meetings** (6 references). Another positive aspect mentioned frequently (8 references) was the **opportunity to learn something new that involved technology** (“learned a new tool”, “It’s something new for me and for all the students and I think it’s interesting too”, “use of technology”). Other positive aspects referenced in decreasing frequency were the **ability to receive prompt feedback by the lecturer** (“Teacher sees all mistakes and can help immediately”, “lecturer’s online comments can help group members to do a better work”), **faster collaboration** (“less time to share information, fast discussion”, “everybody can communicate quickly, save time over meeting with group”, “less time consuming mode of team working”), **easy to use for collaboration** (“it’s easy to collaborate with my group members”, “very easy to use, each partner from group can see [the project]”) and **providing for a fairer mode of group work** (“Make everything fair, somehow *forces* us to comment, think again and not just leave it to others”).

The above listed positive aspects of the online collaborative experience (obtained through the questionnaires) were contrasted with the positive aspects (facilitators) mentioned by students in their online journals. As mentioned in Chapter 3, the online reflection journals were coded for 3 main categories (facilitators, inhibitors, suggestions for improvement) with *in vivo*

subcategories. Again the **ability to overcome the barriers of time and place** was the most frequent benefit referenced by students in their journals (“... during Easter holidays, [name of student] went back home, and during that period, we were still able to continue our work by using the on line web 2.0 applications although she was not physically present in Cyprus...” [Student S35]; “... I really started enjoying the benefits of using web 2.0 applications to complete my assignments! I was sitting in front of my PC, at my place and in a relax outfit!!” [Student S5]; “... During the Easter period we were working from our place without the need of arranging any meetings... that was perfect!!! we enjoyed our holidays in full!” [Student S5]; “What a busy week. I can’t find enough time to work on this assignment. Thanks to web 2.0 that gives me time flexibility, I can still work even it's already 2 or 3 am!” [Student S3]; “In cases that face-to-face communication is not possible due to workload, especially for part time students...” [Student S8]). Again, some students made particular note to the **decreased need to hold physical meetings** (“There wasn't any need to arrange meetings and spend time and money” [Student S5]; “Before you had to find suitable time to get with your group-mates, go to silent place, it is inconvenient, takes a lot of time and it is difficult to find suitable time for everyone” [Student S22]). Other benefits mentioned by students in their journals include: the **ability to collaborate productively** (“Yesterday one of our team members dropped the course [while] we were expecting her to deliver part of the project 3 weeks ago. So we had to work intensively 2 members to do the delayed part. This was done in a few hours with the help of Google docs. It was amazing!! My team mate was working on top and me on the bottom section and you could easily see instant changes and the project getting life!!” [Student S5]; “group members can backtrack and re-read a message and try to understand the meaning of the discussion. We have more freedom to express our opinion and comment on others' opinion.” [Student S9]), the **saving of time** (“Web 2.0 is helping us to save some time” [Student S36]; “the online environment’s main advantage is the non waste of time required for meetings” [Student S6]), **ease of use** (“We are reaching the end of the

project and [the online environment] was easy and straight-forward” [student S18]; “In general, I can say that Google docs is convenient for me, everything here is straightforward and easy to use, so I don't find any problems.” [Student S24]), **lecturer’s support and feedback** (“I had difficulty on inserting the network supply diagram, therefore I had to ask for help from the lecturer. Thankfully I had a very quick response and I was very much assisted” [Student S16]; “I found very interesting and helpful is that the tutor participates on the discussion and provides feedback to us in order to complete our assignment” [Student S5]) and the **absence of technical problems** (“We are in the middle of the project, so far I did not face any technical issues” [Student S18]; “no technical problems. it was nice experience” [Student S17]).

Table 5.13 summarizes the main positive aspects of the online collaborative experience as reported by students using actually three data sources utilized in the study (the three data sources were coded independently using in vivo codes): the answers to the post-class questionnaire and the student online journals presented in this section along with the sources of relative advantage referenced by students in the adoption journals (presented in section 5.2.2).

| Post-class Questionnaire | Student Online Journal | Student Adoption Journal (sources of relative advantage) |
|---|--|---|
| <ul style="list-style-type: none"> - Overcome barriers of time and place - Reduced need for physical meetings - Learn something new involving technology - Ability to receive prompt feedback by the lecturer - Faster collaboration - Easy to use for collaboration - Providing a fairer mode of group work | <ul style="list-style-type: none"> - Overcome the barriers of time and place - Reduced need for physical meetings - Ability to collaborate productively - Saving of time - Ease of use - Lecturer support and feedback - Limited technical issues faced | <ul style="list-style-type: none"> - Work any time / any place - Faster collaboration / save time - New cool product / use of technology - Generally convenient - Has useful tools - Useful more generally (e.g. at work) |

Table 5.13: Positive Aspects of the Online Collaborative Experience

As seen in Table 5.13, the agreement among the results originating from the three data sources is remarkable presenting an excellent example of triangulation, increasing validity. This agreement among the results could even increase further if one considers that one benefit not included in the adoption journals but included in the other two sources is the ability to receive prompt feedback by the tutor (something the students could have appreciated only by the end of the class and not by the time they submitted their adoption journals during the initial weeks of the class). The agreement of these results with other studies has already been discussed in section 5.2.2.

Negative Aspects of Online Collaborative Experience

The negative aspects of the provided online environment referenced by students in their post-class questionnaires include: **absence of real-time feedback** (“you do not have feedback from your group member at the time you want”, “there is a delay between our posted answer and comments from others”, “it is frustrating to wait for a response”), **not as rich interaction as face-to-face** (“sometimes you cannot explain online to other members of your team, your point of view”, “we are not sure if the other [team] member [actually] likes [our contribution]”, “sometimes we need to meet physically to [properly] analyze...”). The **lack of face-to-face contact** was also referenced as a negative aspect on three occasions. A number of students listed some **technical issues** they faced when using Google Docs (e.g. problems with accessing the Internet, problems with graphics, missing functionality). Finally, two students mentioned that they needed more time to practice and learn the tool while one student mentioned that the various positive aspects of the provided online environment led to group complacency.

The above listed negative aspects (obtained through the questionnaires) were also contrasted with the negative aspects mentioned by students in their online journals. Again the **absence of real-time feedback** was referenced by students as one of the most frequent negative aspects (“Today as I was reviewing what my classmates did regarding the assignment I observed significant mistakes and misunderstandings and I wanted to tackle this on the spot! I couldn't do it since the document was edited 3 hours ago and no one was online to express this. So I had to wait until my classmates go online and start working over it again” [Student S5]; “It would be nice if we can be online in the same time so we can do a real-time chat or conversation. Skype might help but I don't know if our schedule can match with each other” [Student S2]). Other negative aspects recorded by students include: **not responsive team members** (“I start to worry about the success of the whole collaboration, because previous parts are not ready yet and it is

more difficult to proceed with my own one” [Student S21]; “As an individual you have to keep persuading the [other] group members, especially to go through and comment on you part so as to make changes” [Student S12]; “it is very difficult to get a quick response for our post in the web, we have to wait and finally we must use traditional method like phone call just to ask our member to log in and answer my question” [Student S9]), **difficulty to explain views online and achieve consensus** (“Why it’s so hard to communicate what I mean in my feedback to [teammate]? Is it because of the language barrier or technology barrier? ... Finally, I just arrange a face-to-face meeting with [teammate] to clear up all things” [Student S1]; “The Web 2.0 tool is very useful and interesting but in our case we have a problem. We are 3 different people, we didn’t know each other, with different state of mind and sometimes it is difficult to explain your view on line” [Student S23]; “We found that even [though] the program provides [for] effective online collaborative work, we find that the traditional approach has some superiority in terms of communicating the ideas, arguing etc.” [Student S3]) along with **technical issues** (“I had a lot of problems with inserting images or drawing. Some windows were popping up that I don’t have permission on doing something, to try again later” [Student S36]; “The technical problems I encountered is that many times their is a problem with my internet connection so I didn’t have access to the web 2.0” [Student S26]; “when I was doing my work and faced a technical problem, it was difficult to solve it immediately as there was nobody around me for help and student’s support was not on line at the same time, and I felt a bit frustrated” [Student S35]).

As done with the positive aspects, Table 5.14 summarizes the main negative aspects of the online collaborative experience as reported by students using the same three data sources.

| Post-class Questionnaire | Student Online Journal | Student Adoption Journal (sources of relative advantage, perceived complexity / |
|--------------------------|------------------------|---|
|--------------------------|------------------------|---|

| | | compatibility) |
|--|---|--|
| <ul style="list-style-type: none"> - Absence of real time feedback by teammates - Not as rich interaction as face-to-face (includes difficulty to explain views online) - Lack of face-to-face contact - Some technical issues (e.g. support for graphics) | <ul style="list-style-type: none"> - Absence of real time feedback by teammates - Not responsive team members - Difficult to explain views online and achieve consensus - Some technical issues (e.g. support for graphics) | <ul style="list-style-type: none"> - Less “sociable” - Innovation complexity and to a lesser extent compatibility were perceived as important adoption factors by students |

Table 5.14: Negative Aspects of the Online Collaborative Experience

Again we see in table 5.14 a close agreement between the results obtained using the post-class questionnaires and the student online journals.

Regarding the student adoption journals, these were submitted early in the class before the students had the chance to actually use the online environment. Still, the issue of “sociability” mentioned in the adoption journals, may be related with the negative aspects of “not as rich interaction as face-to-face” and “lack of face-to-face contact” reported in the other data sources. Additionally, the importance placed by students in their adoption journals on perceived innovation complexity and compatibility seems related with the technical issues mentioned by students in the other sources.

A significant finding which came out of the analysis of the student journals is that several teams complemented their online collaboration with more traditional communication means such as face-to-face meetings and telephone calls (“Also when really things tight up I establish real face to face cooperation with [teammate]” [Student S27]; “When its coming closer to the due date, I think at this stage traditional face-to-face collaboration is more effective, because more can be said and done and noted, when you are

concentrated and forced in a way by the whole team” [Student S30]; “Final agreements were achieved on face-to-face collaboration mostly. Because I like to discuss, to argue sometimes, I can’t put all my thoughts on the paper” [Student S36]; “Finally, we decided to have a face-to-face meeting to discuss and consolidate our thoughts among team members. It was a productive one and we did a lot of things. Online and offline collaboration have their own pros and cons but it seems a combination of them would be the best” [Student S2]; “I thought that making the assignment on line would be easier and faster. Beside the on line comments, it takes a lot of phone calls and messages” [Student 23]; “After combination of direct meetings and online collaboration, we take more advantage of team working” [Student S7]; “The collaboration is continuing in two ways. The first is on-line (table below the text) and the second is by phone since a lot of things cannot be clarified by writing on –line” [Student S39]).

Hence, evidence from the student journal entries indicates that a number of students found complementing online collaboration with face-to-face interaction an effective approach towards finalizing work, discussing areas of disagreement and accelerating progress. Some students also took the position that best results can be achieved by combining the benefits of both online and face-to-face collaboration.

The above findings regarding the negative aspects of the online collaborative experience seem to be in agreement with similar findings in other studies such as difficulty in consensus building (Warschauer, 1997), few responses from some students increasing participatory burden on other students, discussion can be superficial or forced due to requirements for comment and response (Clark, 2003).

5.5.3 Change Facilitator Actions

The post-class questionnaire included a section on the perceived usefulness of the change facilitator interventions in actually enabling the students to use

effectively the online collaborative environment. The results are shown in Figure 5.11 depicting that the large majority of students found these interventions quite useful (16 students gave a score of 5, 13 students gave a score of 4 and one student a score of 3 with a scale of 1=not at all useful and 5=extremely useful).

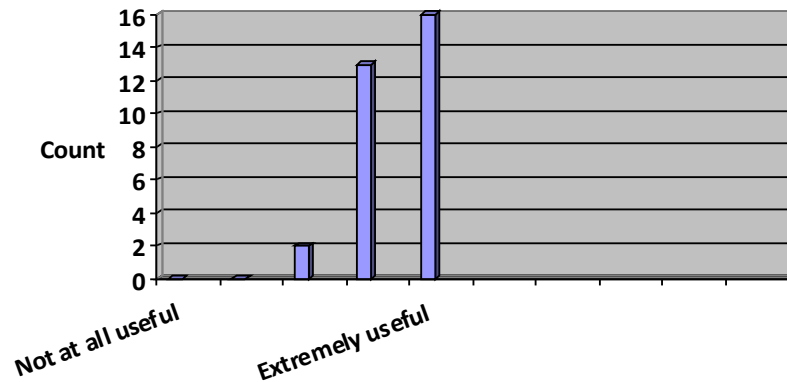


Figure 5.11: Usefulness of Lecturer Interventions

The post-class questionnaire also requested the students to list some of the most and least valuable change facilitator interventions.

Figure 5.12 shows the most valuable change facilitator actions reported by students (coded and categorized according to the six types of interventions identified in the CBAM framework).

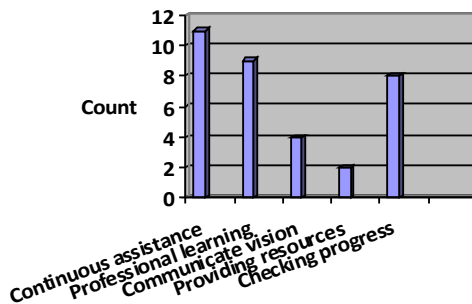


Figure 5.12: Most Valuable Change Facilitator Actions

As seen in Figure 5.12, the most valuable change facilitator action reported by students was **providing continuous assistance**. Examples of relevant

student comments in the post-class questionnaires include: “[the lecturer] solving queries about the use of Google Docs”, “explanations before or after the lecture”, “[the lecturer] being available for assistance if we have some difficulties”, “support and availability”, “[the lecturer provides] encouragement”, “support / feedback”, “online support”.

The next most valuable change facilitator action reported was **investing in professional learning**. Examples of relevant student comments include: “[the lecturer] holding a special class directed to the use of Google docs”, “explanation of the online Web 2.0 applications in the lab (practical explanation)”, “organise the training”, “computer lab presentation”, “showing how to use the tools in class”, “we had at least 2 presentations about the online collaborative environment. We had one lab about technical information about the Web 2.0”, “workshop activity”, “in-class discussions”. As noted, the professional learning interventions mentioned include both the formal workshop held but also the class discussions / demonstrations.

The third most valuable intervention mentioned was **checking on progress** and examples of relevant comments include: “lecturer participated a lot in our assignment”, “reminding us, keep telling. Strict timetable”, “comments on group performance”, “feedback for the [assignment] part”, “reminding every time about the assignment”.

Examples of the remaining valuable interventions mentioned (**communicating a shared vision of change / planning and providing resources**) include: “explaining the benefits”, “Great comments that inspire me”, “lecturer's enthusiasm about using Web 2.0”, “[the lecturer] explaining us how useful it can be”, “[quality of] instruction notes given in first class”, “good preparation”.

Some students provided comments also for **least valuable** lecturer interventions. One student complained about the lecturer's monitoring of progress (“reminding too often online about the time of completion”) while two more students offered suggestions of a more technical nature (“[login

credentials] email [to] provide direct link to the assignment site”, “need to pay [more] attention on drawing[s], [more] emphasis on diagrams”). One student also complained about the extra work required by the study (“[lecturer] giving so many journals to fill, pre and post as well”).

For the purpose of triangulation, it is worth cross-checking the findings of Figure 5.4 (derived from data in the student adoption journals) with those of Figure 5.12 (derived from data in the post-class student questionnaires). One difference between the two figures is that, by the end of the class, students seem to have appreciated more the tutor “checking on progress” interventions that provided them with systematic feedback during innovation implementation throughout the class (the students were barely exposed to such interventions when they were completing their adoption journals early in the class). It is also reasonable that the “communicating a shared vision of change” category of interventions was considered more valuable at the early stages of the whole process. We can thus conclude that the findings emanating from the two distinct sources of data are broadly in agreement.

5.6 Chapter Summary

The purpose of this chapter was to present the main findings of the study in four sections: innovation adoption process and influencing factors, potential influences of student characteristics on the adoption process, evaluation of online interactions and associated learning processes, and overall student feedback and satisfaction. Data were gathered and analysed from a variety of data sources (student adoption journals, student online journals, pre-class and post-class questionnaires, electronic forum and wiki interactions) enabling triangulation and finding reinforcement. The subject of innovation adoption was approached comprehensively by considering a wide range of influencing factors (perceived innovation attributes, change facilitator actions, inter-personal communication networks, student concerns and student characteristics). A rough measure of each factor’s relative importance was obtained using the frequency it was mentioned by students as influencing their decision in their adoption journals. It was found that the decision

adoption process was influenced predominantly by the perceived innovation attributes and the change facilitator actions. Additionally, some evidence supporting the process nature of the adoption process was obtained using the progression of student concerns and positive attitudes.

The model proposed by Gunawardena et al. (1997) for knowledge co-construction was found to provide a very promising foundation for evaluating the learning processes associated with online interactions. It can also provide a more appropriate basis (rather than simply counting the number of messages submitted by each student) for educators to assess meaningful student contribution in online discussions.

The overall student satisfaction results were positive with most students finding the functioning of their teams rather effective and the provided online collaborative environment easy to use and effective. Most students reported also that a fair amount of group learning occurred in their teams. The most frequently reported by students positive aspects of the provided online collaborative learning environment include: ability to overcome the barriers of time and place, reduced need for physical meetings, ability to learn something new involving technology, ability to receive prompt feedback by the lecturer and faster collaboration. The most frequently reported negative aspects include: absence of real-time feedback by teammates, not as rich interaction as face-to-face (including some difficulty to explain views online) and some technical issues (mostly in the area of graphics).

CHAPTER 6: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The purpose of this chapter is to discuss and present the main conclusions of the study summarizing its main findings and examining how these findings can provide answers to the study's research objectives. In addition, recommendations are provided regarding how the actual adoption and use of online interactivity can be increased at the University of Nicosia, leading to a more fulfilling learning experience for both students and faculty. The main project outcomes are also presented along with some evidence as to their potential impact. Finally, this chapter includes a plan for sharing the results of the study with the wider learning community.

6.2 Discussion and Main Conclusions

As described in the preceding chapters, the present study focuses upon the failure of e-learning (especially the pedagogy aspect) to achieve widespread adoption. In an effort to understand better some of the reasons for this failure, the study examined in detail the process of adoption by students of a selected key aspect of e-learning (online interactivity) and the factors influencing this process.

Realizing the novelty of the field, the study also looked at the problem of how an educator can practically and efficiently evaluate the learning processes involved in an online group discussion and assess individual student contribution.

This section summarizes the relevant study findings and examines how they provide answers to research objectives RO 1, RO 2 and RO 4. RO 3 will be dealt with in section 6.3 (Recommendations). The four research objectives of the study are repeated below for easy reference.

RO 1: Examine the process of adoption (decision to use) of online interactivity by students and the factors affecting this decision

RO 2: Identify the consequences of different options followed by the change agent, that is, the tutor and to what extent these affect the adoption process

RO 3: Based on 1 and 2, suggest points to address hindering mechanisms and reinforce driving forces towards improved adoption

RO 4: Examine the learning processes involved in online interactivity and the degree of associated student satisfaction

6.2.1 Process of Adoption and Influencing Factors

Regarding research objective RO1, the study examined in depth how a class of students adopted (decided to use) or not the proposed online collaborative environment developed for the study (embedding online interactivity).

The relevant literature review has indicated that researchers have seldom approached the issue of e-learning adoption from the dimension of being fundamentally a problem of technological innovation diffusion, thus failing to utilize effectively the relevant diffusion theories and models in order to understand better the processes involved. Aiming at addressing this gap, and taking the view that both the adoption decision and subsequent innovation implementation are vital for the successful integration of e-learning in educational programs, the study was informed by both the general diffusion theory (emphasizing the adoption decision) and also the more specific to educational environments CBAM theory (emphasizing the actual implementation of the innovation).

The subject of innovation adoption was also approached comprehensively by considering a wide range of influencing factors (perceived attributes of the new online learning environment, change facilitator actions, peer student actions and attitudes, student concerns and student characteristics). A rough measure of each factor's relative importance was obtained using the

frequency it was mentioned by students as influencing their decision in their adoption journals.

The main findings of the study regarding the factors influencing the adoption process for the provided online collaborative environment, along with the relative importance of these factors, have been depicted in several figures (Figures 5.2, 5.3, 5.4). Figure 6.1 summarizes these findings by presenting a model reflecting the study's observed adoption process. The relative importance of each influencing factor or attribute is signified with the number of (+) adjacent to it with (+++) denoting high influence and (+) low influence.

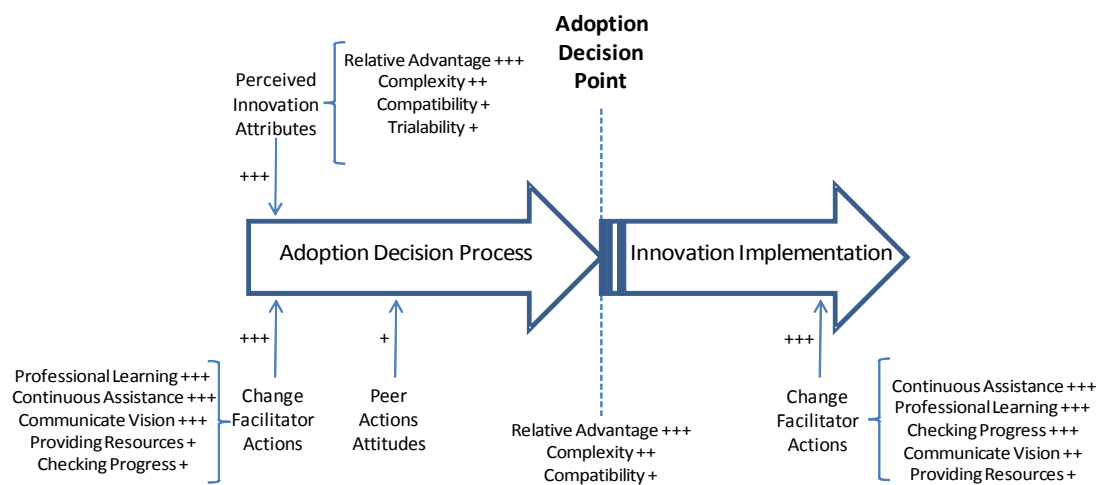


Figure 6.1: Adoption Model Summarizing the Findings of the Study

The *Adoption Decision Point* shown in the developed model reflects the point in time in the course by which the students had to take their final decision regarding using or not the proposed online collaborative environment for their project. *Innovation implementation* refers to the actual use of the new online environment by the students to develop their project. As seen in Figure 6.1, the adoption decision part of the study was mainly influenced by two categories of variables: perceived attributes of the new online environment and change facilitator (tutor) actions. Peer (other student) actions and attitudes were found to play a lesser role in the adoption decision process. While the high influence of perceived innovation attributes was a rather expected result (previous studies have found that the perceived innovation

attributes could explain about half of the variance in rates of adoption (Rogers, 2003)), the significant influence of the change facilitator actions is a rather novel result. The study also found, basically no indication of a potential relationship between the adoption results and the student characteristics such as demographics, general computer literacy or innovative behaviour. This rather unexpected result (especially regarding the student computer literacy aspect) can be explained by the fact that all students that participated in the study were already regular users of Internet and a fair number of them had prior experience with Web 2.0 Applications. Consequently, the student characteristics do not appear in the above model.

Regarding the relative importance of the various distinct perceived innovation attributes, relative advantage (the degree to which the new online environment was perceived superior to existing traditional collaboration means) was found as having the highest influence followed by complexity (the degree to which the new environment was perceived difficult to understand or use), compatibility (the extent to which the new environment was perceived consistent with existing values, past experience and student needs) and trialability (the ability to experiment with the new online environment before actual adoption).

The study also examined the concerns (feelings, perceptions, motivations) expressed by students during their adoption decision process. A very significant finding of the study is that the number of student concerns observed during the adoption decision period actually decreased over time (as presented in Figure 5.8). The same effect was observed also for the number of students having a non positive attitude towards the innovation (Figure 5.8). This progression in adopter concerns and attitudes tends to provide support towards the process nature of innovation adoption (a notable under researched topic in the general diffusion theory).

Another worthwhile finding of the study is the proposed novel categorization of student concerns into the two broad categories of *adequacy* concerns and *outcome* concerns (instead of the more complex and elaborate CBAM

categories). The significance of this categorization lies in the fact that the adequacy concerns were found in the study to diminish over time while the outcome concerns persisted throughout the adoption decision process (Figure 5.16), indicating that change facilitators need to direct their emphasis in addressing both categories of concerns in an analogous manner.

Figure 6.1 also summarizes the factors referenced by students as contributing to their final decision of using or not the proposed online collaborative environment at actual adoption decision point (Figure 5.5). The results of the study tend to indicate that, while change facilitator actions (predominantly) and peer actions / attitudes (to a lesser extent) were important during the process of getting acquainted and learning how to use the new online collaborative environment, the final student adoption decision was taken principally on the merits of the perceived attributes of the new environment (principally relative advantage and to a lesser extent complexity and compatibility). The ability to try out the new online collaborative environment prior to adoption (trialability), perceived as moderately important during the early stages of the process, did not seem to play a role at the point of final adoption decision (evidently, by that point in time the students were already acquainted with the functionality of the new environment).

The preceding discussion indicates that the study actually attempted to contribute towards the filling of some of the e-learning diffusion literature gaps unveiled in section 2.3.

6.2.2 Change Facilitator Actions

Regarding change facilitator actions and research objective RO2 (**Identify the consequences of different options followed by the change agent, that is, the tutor and to what extent these affect the adoption process**), Figure 6.1 shows that these actions were found to be very important both during the adoption decision period and also during the actual implementation of the proposed innovation. During adoption decision, the

most influential categories of change facilitator actions were found to be “investing in professional learning” followed by “providing continuous assistance” and “communicating a shared vision of change”. At the end of the class, the most influential categories of change facilitator actions recorded by students in their post-class questionnaires (covering the whole experience) were “providing continuous assistance” followed by “investing in professional learning” and “checking on progress”. That is, it appears that during the actual use of the new online collaborative environment (innovation implementation), the students developed a higher appreciation for the tutor “checking on progress” interventions that provided them with systematic feedback (the students were barely exposed to such interventions when they were completing their adoption journals early in the class). It is also a reasonable finding that the “communicating a shared vision of change” category of interventions was considered by students more valuable at the early stages of the process.

6.2.3 Online Interactivity and Learning Processes

This section summarizes the study findings which attempt to provide answers to the first part of research objective RO4 (**Examine the learning processes involved in online interactivity**). As described in Chapter 5, the study considered two of the most influential models for interaction analysis encountered in the literature: the interaction analysis model proposed by Henri (1992) and the model proposed by Gunawardena et al. (1997) for knowledge co-construction.

The study findings provide substantial support for the practical applicability of Gunawardena’s model as a tool for evaluating the extent of collaborative learning processes prevalent in online group discussions. Such an evaluation tool needs to allow educators to quickly discern whether knowledge co-construction among a group of learners indeed takes place or not and thus provide appropriate pedagogical support to them. During data analysis and through using Gunawardena’s model, the researcher was able in a

straightforward manner and efficiently to classify distinct student interactions into: interactions exhibiting lower level learning processes, interactions exhibiting higher level learning processes and superficial contributions (Table 5.8). In a similar way, an educator monitoring student interactions can perform such classification and provide timely guidance to groups of students whose online discussions do not exhibit the required level of collaborative learning.

Gunawardena’s model appears also to provide a good basis for assessing individual student contribution to online group discussions. To this end, an educator could simply count the number of interactions of a particular student which exhibit either lower or higher learning processes (discarding superficial contributions). The assessor could also consider assigning a different weight for the two learning process levels with contributions at the higher level counting more towards the student collaboration grade.

6.2.4 Overall Student Feedback

Regarding the second part of research objective RO4 (**examine the degree of associated student satisfaction**), the students’ own reports of overall satisfaction indicated generally positive results for both the general experience of working in groups and also the use of the provided online learning environment (Table 5.11).

Regarding the general experience of working in groups, most students found the functioning of their teams rather effective, the sharing of the workload rather fair and generally enjoyed the experience. Table 6.1 includes a summary of the most frequent positive and negative aspects referenced by students regarding their general group work experience.

| Positive Aspects | Negative Aspects |
|------------------|------------------|
|------------------|------------------|

| | |
|--|--|
| <ul style="list-style-type: none"> • Sharing information and expressing multiple views on a topic • Achieve a form of bonding among the members of the group • Learning from each other • Sharing the workload | <ul style="list-style-type: none"> • Inadequate interaction and commitment by other group members • Group cohesion / cooperation issues • Lack and proper management of time • Difficulty in arranging physical meetings (most groups held complementary F2F meetings) |
|--|--|

Table 6.1: Positive and Negative Aspects of General Group Work Experience

Regarding the feedback received by the students pertaining to the use of the provided online collaborative environment, most students found the various online tools provided rather effective (i.e. facilitating well what they had to do) and easy to use (Table 5.12). While most groups had complementary face-to-face interactions as well, almost all students believed that the online part of the interaction exceeded 50% of the total group interaction. Most students also believed that their team was able to achieve a fair amount of group learning (learning from each other). Table 6.2 includes a summary of the most frequent positive and negative aspects referenced by students regarding their online collaborative experience (summarizing Tables 5.13 and 5.14).

| | |
|-------------------------|-------------------------|
| Positive Aspects | Negative Aspects |
|-------------------------|-------------------------|

| | |
|--|--|
| <ul style="list-style-type: none"> • Overcome the barriers of time and place • Reduced need for physical meetings • Learn something new involving technology • Ability to receive prompt feedback by the lecturer • Faster collaboration, save time • Easy to use • Limited technical issues faced • Providing a fairer mode of group work | <ul style="list-style-type: none"> • Absence of real time feedback by teammates • Not as rich interaction as face-to-face (includes difficulty to explain views online and achieve consensus) • Lack of face-to-face contact • Some technical issues (e.g. support for graphics) |
|--|--|

Table 6.2: Positive and Negative Aspects of Online Collaborative Experience

The positive and negative aspects included in Tables 6.1 and 6.2 need to be considered and translated into appropriate interventions by educators and change facilitators in order to reinforce the positive aspects and address the negative aspects. Section 6.3 (Recommendations) includes possible interventions to address some of the issues raised.

6.3 Recommendations

Regarding research objective RO3 (**Suggest points to address hindering mechanisms and reinforce driving forces towards improved adoption**), Figure 6.1 along with Tables 6.1 and 6.2 present a good framework for discussion. Indeed, successful, wider adoption of online interactivity would require maximization of the positive influencing factors depicted in Figure 6.1 and minimization of the respective negative influencing factors with more

emphasis placed on factors whose impact is larger (denoted with an adjacent +++). It would also require reinforcement of the positive aspects depicted in Tables 6.1 and 6.2 and addressing of the respective negative aspects. Table 6.3 presents an action plan encapsulating all recommendations which stem out of the study's findings (positive and negative influencing factors, positive and negative reported aspects).

| Factor or Aspect | Actions |
|--|---|
| <p>Relative advantage (+++)</p> <ul style="list-style-type: none"> - Overcome the barriers of time and place (+ve) - Reduced need for physical meetings (+ve) - Faster collaboration, save time (+ve) - Absence of real-time feedback by teammates (-ve) - Not as rich interaction as face-to-face (includes difficulty to explain views online and achieve consensus) (-ve) | <ul style="list-style-type: none"> - As the most important benefit identified by students is work anytime / anyplace, ensure that the application is available everywhere there is an Internet browser and on a 24 / 7 basis. Given the proliferation of smart phones, consider solutions that allow access through mobile phones as well - Ensure error-free operation and quick performance - Provide, additionally to wiki and discussion forum, an integrated chat room with video conferencing facilities allowing for enhanced real-time communication and more enriched interaction when needed |
| <p>Complexity (++)</p> <ul style="list-style-type: none"> - Easy to use (+ve) - Technical issues (-ve) | <ul style="list-style-type: none"> - Consider available alternatives and select the most intuitive, easy to use online collaborative platform - Select a mainstream online platform (e.g. Google Docs or Windows Office Live) which is supported by a large IT team on a 24 / 7 basis (as opposed to a University supported environment) |
| <p>Compatibility (++)</p> | <ul style="list-style-type: none"> - Select a mainstream online collaborative platform (such as Google Docs or Windows Office Live) used by millions of users (instead of a proprietary one) and to which it is more probable that students had prior exposure - Select a familiar user interface for students (e.g. as similar to Microsoft Office as possible) |
| <p>Trialability (+)</p> | <ul style="list-style-type: none"> - Provide a test environment with test accounts from Day 1 of the class for students to experiment (this test environment should be accessible from everywhere) |
| <p>Communicating a shared vision of change (+++)</p> <ul style="list-style-type: none"> - Learn something new involving technology (+ve) | <ul style="list-style-type: none"> - Champion the value of collaborative learning and its wider applicability (e.g. in the workplace) - Demonstrate systematically the merits of the online platform, explaining how it can be used to facilitate the achievement of the project's objectives (including its 24/7 flexibility and how it |

| | |
|---|--|
| | <p>can save precious time).</p> <ul style="list-style-type: none"> - Be enthusiastic, trying to arouse student interest and motivation - Put emphasis and portray the image of a new cool technological offering |
| <p>Investing in professional learning (++) + - Absence of real-time feedback by teammates (-ve)</p> | <ul style="list-style-type: none"> - Prepare and deliver a mandatory lab session in the beginning of the class and an additional optional session towards the middle of the class (to resolve any issues). Include in the lab session an exercise exhibiting real-time chatting and also discussion through video-conference facilities - Demonstrate key functionality and how to overcome certain problems during face-to-face lectures to all students - Demonstrate collaborative learning through sharing / comparing of information, exploration of dissonance and negotiation / co-construction of knowledge |
| <p>Providing continuous assistance (++) + - Technical issues (-ve)</p> | <ul style="list-style-type: none"> - Arrange for available competent technical support using a variety of means (e-mails, online chatting or telephone) and for a prolonged period of time during the day - Monitor average response times to address student technical problems and ensure that there are no delays - Provide encouragement and guidance to students as necessary |
| <p>Planning and providing resources (+) - Inappropriate management of time (-ve) - Sharing the workload (+ve) - Providing a fairer mode of group work (+ve)</p> | <ul style="list-style-type: none"> - Design and implement the new online collaborative platform exhibiting the characteristics required by the attributes of relative advantage, complexity, compatibility and trialability as presented in the first four rows of this table - Design a constructivist learning environment embedding online interactivity for the class project as described in Chapter 4 - Design for a transparent and fair sharing of the workload among the group members - Provide an intermediate deadline for completing the first parts of the project |
| <p>Checking on progress (+) - Ability to receive prompt feedback by the lecturer (+ve) - Group cohesion / cooperation issues (-ve) - Inadequate interaction and commitment by other group members (-ve) - Learning from each other (+ve)</p> | <ul style="list-style-type: none"> - Monitor systematically the student interactions and progress for the unveiling of any issues (e.g. team cohesion or non-responsiveness) and take appropriate action to resolve the problem through entries in the electronic discussions or brief one-legged interviews before or after the class with the students involved - Monitor the student online group discussions providing feedback as necessary so that higher level learning processes are achieved as much as possible |

| | |
|--|--|
| | <ul style="list-style-type: none"> - Provide timely and direct feedback to students who do not exhibit adequate interaction and contribution - Assess individual student contribution as per Gunawardena's model |
|--|--|

Table 6.3: Action Plan for Increased Online Interactivity Diffusion

The recommendations presented in Table 6.3 can be divided into two sections: the desired characteristics of the online collaborative environment represented by the first four rows (relative advantage, complexity, compatibility and trialability) and the desired interventions which need to be undertaken by the change facilitator presented using the CBAM taxonomy (remaining rows of the table). The recommendations provided attempt to address all issues and hindering mechanisms unveiled during the study. For instance, to address the issue of learning environment complexity and compatibility, it is proposed to select a suitable mainstream collaborative platform (e.g. Google Docs or Windows Office Live) which is supported by a large IT team on a 24 / 7 basis and to which it is more probable that students would have had prior exposure. In order to address the issues of “not so rich interaction as face-to-face” and the “absence of real-time feedback by teammates” reported by some students, it is proposed to add in the learning environment an integrated real-time chat room with video conferencing facilities to be used by students when real-time communication is deemed more appropriate. As another example, to address the issue of “inadequate interaction and commitment by other group members”, it is proposed for the educator to monitor systematically the online group discussions and provide timely and direct feedback to students who do not exhibit adequate interaction and contribution as a first measure. In order to reinforce group learning, it is suggested for the educator to demonstrate collaborative learning through sharing / comparing of information, exploration of dissonance and negotiation / co-construction of knowledge in class and during the lab sessions, and also to again monitor systematically the online group discussions providing feedback as necessary to students so that higher level learning processes are achieved as much as possible

The change facilitator interventions included in Table 6.3, start with designing and developing the online collaborative learning environment (including the instructional design) and span through facilitating the actual adoption and effective use of the environment by the students until the end of the class. While most of these interventions would normally be undertaken by the educator, the ones that are of more technical nature (such as designing and developing the online collaborative environment or providing technical support to students) can be facilitated by more technically oriented teaching assistants or other university support personnel. It must also be noted that the work required by the educator for properly setting-up the learning environment, and especially for monitoring the online group discussions and providing continuous guidance and support to students, is substantial and needs to be assessed objectively, allowing for the needed time.

The researcher will pursue the above recommendations in order to improve his own practice and achieve a higher adoption and a more effective use of online interactivity by the researcher's students. The wider diffusion of online interactivity in additional educational programs and courses in the University of Nicosia, however, would require the adoption of a broader change program characterised by the following stages:

- i. Educate additional interested university faculty using the developed study outcomes (executive summary report and educator guide). Promote the value of collaborative learning and the benefits of online interactivity among faculty.
- ii. Define 1-2 additional pilot course offerings for which the researcher will help the relevant faculty in designing and developing the case-based, online collaborative learning environment and the required change facilitator interventions. The researcher will also provide assistance throughout the duration of the pilot course offerings through bi-weekly progress meetings. It is expected that by the end of stage (ii), a core team of educators (the researcher and the pilot

faculty) will be formed having the requisite skills to facilitate further implementations.

- iii. Incorporate additional recommendations and alter the learning environment / instructional design as per the feedback obtained in stage (ii).
- iv. Expand the use of online interactivity in additional program offerings as needed.

6.4 Project Outcomes and Impact

As mentioned in the Introduction (section 1.3), the present research aspires to contribute in a practical way to the increased use of online interactivity (embedded in collaborative learning environments) at the University of Nicosia. To this end, in addition to the main project report, the following deliverables have been prepared as part of the project:

- An executive summary report (included in Appendix A6.1) summarizing the main benefits of online interactivity for the University of Nicosia and proposing ways to achieve its increased diffusion among faculty and students, based on the findings of the study. The produced report includes also some insights as to the potential wider applicability of the study's developed models and recommendations in facilitating the diffusion of other aspects of e-learning (beyond online interactivity).
- An educator guide (included in Appendix A6.2) outlining the benefits of online interactivity and how it could be embedded in educational programs and course offerings. To this end, the guide includes guidelines and recommendations for the design and implementation of case-based, online collaborative learning environments. A description of the process and underlying factors which influence the student decision towards adopting (using effectively) or not such a proposed

online environment is also included. The critical role of the educator / change facilitator, during both the student adoption decision period and also during the actual implementation and use of the proposed online environment, is highlighted and a set of possible valuable interventions at each stage of the process is provided. The guide proposes also practical methods for evaluating the learning processes involved in online group discussions and assessing individual student contributions.

The project outcomes were submitted to the President of the Council of the University of Nicosia and have been accepted as a substantial contribution to the University's e-learning initiatives (please refer to Appendix A6.3 for the respective evidence).

6.5 Communication of Findings

The researcher plans to submit for publication the main findings of the study, thus sharing with the wider learning community its main conclusions and recommendations. Three planned papers have been identified with the following working titles:

- “A model for student adoption of online interactivity”
- “The role of educator / change facilitator in implementing online interactivity in educational programs”
- “Evaluating the extent of collaborative learning in online group discussions”

The above papers will be submitted for publication to relevant journals such as: *Innovate: Journal of Online Education*, *International Journal on E-Learning (IJEL)* and *Journal of Educational Technology Systems*.

The planned papers will also be submitted for presentation at regional conferences such as the ECIS (European Conference on Information Systems), the MCIS (Mediterranean Conference on Information Systems) and the IADIS (International Association for Development of the Information Society) Conference on E-learning.

6.6 Chapter Summary

This chapter presented and discussed the main conclusions of the study, demonstrating how they can provide answers to the research objectives set. Regarding the adoption process, a model was developed summarizing the factors which were found to influence the student decision of using or not the proposed online collaborative environment. The critical role of the change facilitator (e.g. educator), both during the adoption decision period and also during the actual implementation and use of the proposed online environment by students, was outlined paying particular attention to those interventions which were perceived as being valuable at each stage of the process. A method was also proposed for evaluating the degree of collaborative learning in online group discussions and assessing individual student contribution.

Recommendations for achieving a greater diffusion of online interactivity among faculty and students, based on the findings of the study, were also presented. The main deliverables of the project, in addition to the main project report, were described and some evidence as to their potential impact was provided. Finally, a communication plan was included outlining how the main conclusions and recommendations of the study will be shared with the wider learning community.

CHAPTER 6: REFLECTION

This chapter includes my own reflections regarding the experience of being a worker researcher during this very challenging journey. I feel that I have to start from the dual role of worker researcher and the research method of action research. I must admit that initially I approached the subject with some concerns. Is work based research as authentic and accurate as non-work based research? Does the worker researcher's prior experiential knowledge introduce such unsurpassable "bias" that renders such research of limited value? On the other hand, we often hear of the chasm which frequently exists between academic research and solving actual, tangible problems in real-life business settings. I can now say, after three years of working on this study, that I find action research a superb method for addressing complex problems in the work environment while at the same time generating tangible benefits and value for the organisation involved. Action research adds both the scientific rigor which is missing from many problem solving approaches prevalent in businesses today and also the real-life relevance and applicability which may be missing from a number of academic research studies.

The dual worker / researcher role presented several advantages for me. First, it allowed me to work in an area that I have very high personal motivation. As a person, I have always been fascinated (given my information technology background) by technological innovations and the factors that make them succeed or fail. Being an educator, I have also had a very acute interest in understanding the reasons why the most important educational innovation of the last decades, e-learning, is still at such a low level of adoption by students and faculty. Indeed, investigating how to best integrate new technology into my own teaching practices so as to achieve an enhanced learning experience for my students, was an extremely appealing endeavour for me. Being also a lecturer at the university provided me with easy access to the study setting and enabled me to modify the instructional

design of the selected class as per the requirements of the study. The down side of the dual worker / researcher role are the threats to the validity of the results, mostly researcher bias and reflexivity. Throughout the study, I was very conscious of the complexity of the worker researcher role and I actively adopted a number of validity strategies (described in Chapter 3) in order to secure as much objectivity as possible.

During the study, I also had the opportunity to work for the first time with qualitative research and appreciate its strength when trying to understand social phenomena and human attitudes and behaviours. While the study utilized both a priori codes (theoretically derived from the literature) and in vivo codes (derived directly from the data), it was in vivo coding which I found more fulfilling, as it gave me the feeling that I was really exploring new ground. I have also developed an appreciation for the immense power of data and the value of using multiple sources in order to improve the validity of the findings. Given also the large volume data collected in the study, I firmly believe that the analysis could not have been so comprehensive and elaborate, if it wasn't for the use of the computer software NVivo. Indeed, the use of NVivo allowed for the efficient coding and recoding of data and facilitated enormously the use of several techniques in order to get meaning out of data such as clustering codes into meaningful categories, counting, making comparisons and noting relations between variables.

Another item that impressed during the study is the value and power of social software and collaboration facilities (electronic conferences, wikis, blogs, chat rooms etc.) which are freely available on the Internet today. We are definitely living in the era of social collaboration and co-creation at a global scale. It remains with us, the educators, to find ways to incorporate the tremendous opportunities provided by these facilities in our educational offerings. The study dealt with collaboration and co-creation of knowledge among the students attending a class. Such collaboration, however, could extend among students and tutors in multiple universities and even industry experts and business professionals.

I have also found that pursuing e-learning initiatives in academic institutions is about effecting change in infrastructure, processes and, above all, the attitudes and behaviours of people (e.g. faculty and students). I was rather impressed seeing how my developed change management skills and extensive experience in delivering projects in various industries could actually be of significant assistance in the successful introduction of such programs.

Above all, I believe that the whole experience enable me to become a more competent educator, much more confident to promote group learning among my students. I have also become much more familiar with the various research methods, and the various data collection and data analysis techniques available and I am now in a better position to select the best approach given a specific research problem. I have also improved significantly my critical analysis skills as I had to review numerous articles and books and identify congruence and gaps in the various views and claims expressed. I also had to synthesize complex and occasionally conflicting information from multiple sources in order to find patterns, derive relations and draw conclusions. During the study, I have also developed a much higher appreciation for validity techniques (such as data triangulation) and also the various ethical considerations involved in research projects (such as obtaining informed consent, data anonymity etc.)

Overall, it was a trip worth every minute of it!

[Word Count: 36,187]

REFERENCES

- Alexander, B. (2008), "Deepening the Chasm: Web 2.0, Gaming and Course Management Systems", *MERLOT Journal of Online Learning and Teaching*, Vol. 4, No. 2, June 2008.
- Anderson, S. E. (1997), "Understanding Teacher Change: Revisiting the Concerns Based Adoption Model", *Curriculum Inquiry*, 27(3), 331-367.
- Anderson, T. (2003), "Getting the Mix right Again: An Updated and Theoretical Rationale for Interaction", *International Review of Research in Open and Distance Learning*, 4(2).
- Anderson, T., Varnhagen, S., Campbell, K. (1998), "Faculty adoption of teaching and learning technologies: Contrasting Earlier Adopters and Mainstream Faculty", *The Canadian Journal of Higher Education*, 28 (2,3), 1998, 71-98.
- Bassey, M. (2001) "A Solution to the Problem of Generalisation in Educational Research: Fuzzy Prediction", *Onford Review of Education*, 27(1): 5-22.
- Bailey, D.B., Jr., Palsha, S.A. (1992), "Qualities of the Stages of Concern Questionnaire and Implications for Educational innovations", *Journal of Educational Research*, 85, 226-232.
- Bazeley, P. (2007), *Qualitative Data Analysis with NVivo*, London: Sage.
- Bell, J. (2005), *Doing your Research Project*, UK: Open University Press
- Blom J. (2000), "Personalization – A Taxonomy", *ACM 2000*. ISBN:1-58113-248-4.
- Bouhnik, D., Marcus, T. (2006), "Interaction in Distance-Learning Courses", *Journal of the American Society for Information Science and Technology*, 57(3):299-305.

- Briscoe, M. G. (2008), "Collaboration in the Ocean Sciences: Best Practices and Common Pitfalls", *Oceanography*, 21 (3), 58-65.
- Brown, R.E. (2001), "The Process of Community-Building in Distance Learning Classes", *Journal of Asynchronous Learning Networks*, 5(2).
- Bryman, A. (2001), *Social Research Methods*, Oxford: Oxford University Press.
- Bryman, A., Bell, E. (2007), *Business Research Methods*, Oxford: Oxford University Press.
- Burrell, G., Morgan, G. (1979), *Sociological Paradigms and Organisational Analysis*, Aldershot: Ashgate Publishing.
- Chin, R., & Benne, K. D. (1969), "General Strategies for Effecting Changes in Human Systems", In W. G. Bennis, K. D. Benne, & R. Chin (Eds.), *The Planning of Change* (2nd ed., pp. 32-59). New York: Holt, Rinehart and Winston.
- Choi, I. & Lee, K. (2006), "A Case-Based E-Learning Environment for Facilitating Ill-Structured Problem Solving Skills: Classroom Management", In T. Reeves & S. Yamashita (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2006* (pp. 1894-1901). Chesapeake, VA: AACE.
- Clark, T. (2003), "Disadvantages of Collaborative Online Discussion and the Advantages of Sociability, Fun and Cliques for Online Learning", *Proceedings of the 3.1 and 3.3 Working Groups Conference on International Federation for Information Processing: ICT and the Teacher of the Future* (pp. 23-25), Melbourne, Australia: ACM.
- Coppola, N., Hiltz, S., Rotter, N. (2002), "Becoming a Virtual Professor: Pedagogical Roles and Asynchronous Learning Networks", *Journal of management of Information Systems*, 18, 4, 169-189.
- Corti, L. (1993), "Using Diaries in Social Research", *Social research Update*, 2.

- Creswell, J.W. (1998) *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*, CA: Sage.
- Creswell, J.W. (2003) *Research Design*, CA: Sage.
- Creswell, J.W. (2007) *Qualitative Inquiry and Research Design*, CA: Sage.
- Crotty, M. (1998), *The Foundations of Social Research*, London: Sage.
- Deans, P. C. (2009), *Social Software and Web 2.0 Technology Trends*, New York: Information Science Reference.
- Delanty, D. (2005), *Social Science*, Maidenhead: Open University Press
- Denzin, N.A., Lincoln, Y.S. (2000) "Introduction: The Discipline and Practice of Qualitative Research", in N.A. Denzin and Y.S. Lincoln (Eds.), *Handbook of Qualitative Research*, CA: Sage.
- DeVellis, R.F. (2003), *Scale Development: Theory and Applications*, CA:Sage.
- Dey, I. (1993), *Qualitative Data Analysis*, London: Routledge.
- Dick, B. (2004) "Action Research Literature: Themes and Trends", *Action Research*, 2(4), 425-444.
- Duggan, A., Hess, B., Morgan, D., Kim, S., Wilson, K. (2001), "Measuring Student Attitude Toward Educational Use of the Internet", *Journal of Educational Computing Research*, 25(3), 267-281.
- Easterby-Smith, M., Thorpe, R., Lowe, A. (2002), *Management Research: An Introduction*, London: Sage.
- Elgort, I. (2005), "E-learning Adoption: Bridging the Chasm", *Proceedings of the 22nd annual conference of the Australasian Society for Computers in Learning in Tertiary Education* Brisbane: ascilite.
- Elliott, H. (1997), "The Use of Diaries in Sociological Research on Health Experience", *Sociological Research Online*, 2. Available from:

<http://www.socresonline.org.uk/2/2/7.html> [Accessed 18 September 2010].

- Ertmer, P.A., Newby, T.J. (1993), "Behaviorism, Cognitivism, Constructivism: Comparing Critical Features From an Instructional Design Perspective", *Performance Improvement Quarterly*, 6(4), 50-70.
- Farren, M. (2008), "E-Learning and Action Research as a Transformative Practice", *Innovate* 5 (1). Available from: <http://www.innovateonline.info/index.php?view=article&id=543> [accessed 9 October 2008]
- Garrison, D.R. (1993), "A Cognitive constructivist View of Distance Education: An Analysis of Teaching-Learning Assumptions", *Distance Education*, 14(2), 199-211
- Germanakos, P., Tsianos, N., Mourlas, C., Samaras, G. (2005), "New Fundamental Profiling Characteristics for Designing Adaptive Web-based Educational Systems", *Proceedings of the IADIS International Conference on Cognition and Exploratory Learning in Digital Age(CELDA2005)*, Porto, December 14-16, pp. 10-17.
- Goldenberg, J., Mazursky, D., Solomon, S. (1999), "Toward Identifying the Inventive Templates of New Products: A Channelled Ideation Approach", *Journal of Marketing Research*, 36 (May), 200-210.
- Gorard, S., Selwyn, N., Madden, L. (2003), "Logged on to Learning? Assessing the Impact of Technology on Participation in Lifelong Learning", *International Journal of Lifelong Education*, 22, 3, 281-296.
- Gunawardena, C.N., Lowe, C.A., Anderson, T.A. (1997), "Analysis of a Global Online Debate and the Development of an Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing", *Journal of Educational Computing Research*, 17(4), 397-431.

- Hall, G.E., Loucks, S. (1978), "Teacher Concerns as a Basis for Facilitating and Personalizing Staff Development", *Teachers College Record*, 80, 36-53.
- Hall, G.E., Hord, S.M. (2006), *Implementing Change: Patterns, Principles and Potholes*, Boston: Pearson.
- Harasim, L.M. (1990), *Online Education: Perspectives on a New Environment*, New York: Praeger
- Hartley, J.F. (1994) "Case Studies in Organisational Research" in C. Cassel and G. Symon (Eds) *Qualitative Methods in Organizational research: A Practical Guide*, London: Sage.
- Henri, F. (1992), "Computer Conferencing and Content Analysis", In *Collaborative learning Through Computer Conferencing* (ed. A. R. Kaye), pp. 117-136, Berlin and Heidelberg:Springer.
- Hiltz, S. (1990), "Evaluating the Virtual Classroom", *Online Education*, In L. Harasim (Ed.), *Online Education*, 133-184, New York: Praeger.
- Hirschman E., 1980, "Innovativeness, Novelty Seeking, and Computer Creativity", *Journal of Consumer Research*, 7 (December), 289-295.
- Holly, M.L., Arhar, J., Kasten, W.C. (2005), *Action Research for Teachers: Travelling the Yellow Brick Road*, NJ: Prentice-Hall.
- Hussey, R., Hussey, J. (1997), *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*, New York: Palgrave.
- Jackson, K. & Schaverien, L. (2005), "Developing Research Designs and Methodologies for Investigating Learning in Postgraduate e-Learning Contexts", In P. Jeffery (Ed.), *AARE 2005 Conference Papers*, University of Western Sydney, Parramatta: Australian Association for Research in Education. Available from: <http://www.aare.edu.au/05pap/jac05488.pdf> [Accessed 27 November 2006].
- Johar, G.V, Jedidi, K., Jacoby, J. (1997), "A varying Parameter Averaging Model of On-line Brand Evaluations", *Journal of Consumer Research*, 24 (September), 232-248.

- Jonassen, D., Mayes, T., McAleese, R. (1993), "A Manifesto for a Constructivist Approach to Technology in Higher Education", In T. Duffy, J. Lowyck, and D. Jonassen (eds.), Berlin: Springer-Verlag.
- Jonassen, D. (1997), "Instructional Design Models for Well-structured and Ill-structured Problem-solving Learning Outcomes", *Educational technology research and Development*, 45(1), 65-94.
- Jonassen, D. (1999), "Constructivist Learning Environments on the Web: Engaging Students in Meaningful Learning", *EdTech99: Educational Technology Conference and Exhibition*, Singapore.
- Jordan, B., Henderson, A. (1995), "Interaction Analysis: Foundations and Practice", *Journal of the Learning Sciences*, 4(1), 39-103.
- Kanuka, H., Anderson, T. (1998), "Online Social Interchange, Discord, and Knowledge Construction", *Canadian Journal of Distance Education*, 13(1), 57-74.
- Kolb, D. (1984), *Experiential Learning: Experience as the Source of Learning and Development*, Englewood Cliffs NJ, Prentice Hall.
- Levin, J., Kim, H., Riel, M. (1990), "Analyzing Instructional Interactions on Electronic Message Networks", In L. Harasim (Ed.), *Online Education*, 185-213, New York: Praeger.
- Mackenzie K. (1996), "Structured Centrality in Communication Networks", *Psychometrica* **31**, 17-26.
- Magoulas, G., Papanikolaou, K., Grigoriadou, M. (2003), "Adaptive Web-based Learning: Accomodating Individual Differences Through System's Adaptation", *British Journal of Educational Technology*, Vol. 34, No. 4, pp. 511-527.
- Mahony, M., Wozniak, H. (2005), "Diffussion of Innovation and Professional Development in eLearning: The CHS eLearning Resource Case Study", Selected papers of the 2006 ODLAA conference, Bathurst, Australia: ODLAA.
- Markides C., Geroski, P. (2005), *Fast Second: How Smart Companies Bypass Radical Innovation to Enter and Dominate New Markets*, John Wiley & Sons, Inc.

- Mason, R. (1991), "Methodologies for Evaluating Applications of Computer Conferencing", In A. R. Kaye (Ed.), *Collaborative Learning through Computer Conferencing*, Heidelberg: Springer-Verlag.
- Maxwell, J. (2005), *Qualitative Research Design: An Interactive Approach*, London: Sage.
- Mayring, P. (2000), "Qualitative Content Analysis", *Forum: Qualitative Social Research*, 1(2), Art. 20.
- McNiff, J., Whitehead, J. (2005), *Action Research for Teachers: A Practical Guide*, London: David Fulton.
- Mergel, B. (1998), "Instruction Design & Learning Theory", *Educational Communications and Technology*, University of Saskatchewan.
- Mikkelsen, B. (2005), *Methods for Development Work and Research: A New Guide for Practitioners*, New Delhi: Sage.
- Miles, M.B., Huberman, A.M. (1994) *Qualitative data Analysis*, CA: Sage.
- Moon, S., Birchall, D., Vrasidas, D., Williams, S. (2003), "Learning How to Become a More Effective SME Manager – Design Principles for a Work-Based e-Learning Course", *Work Based Learning Conference Paper*.
- Moore, G. (2002), *Crossing the Chasm: Marketing and Selling High-tech Products to Mainstream Customers*, New York, HarperBusiness.
- Moore, M.G. (1980), "Independent Study", In R. Boyd & J. Apps (eds.) *Redefining the Discipline of Adult Education*, San Francisco: Jossey-Bass, pp.16-31.
- Moore, M.G. (1989), "Three Types of Interaction", *The American Journal of Distance Education*, 3(2), 1-6.
- Moreau, P.C., Lehmann, D.R., Markman, A.B. (2001), "Entrenched Knowledge Structures and Consumer Response to New Products", *Journal of Marketing Research*, XXXVIII, 14-29.
- Morgan, G., Smircich, L. (1980), "The Case of Qualitative Research", *Academy of Management Review*, 5, pp. 491-500.

- Ng, K.C., Murphy, D. (2005), "Evaluating Interactivity and Learning in Computer Conferencing Using Content Analysis Techniques", *Distance Education*, vol. 26, No 1, pp. 89-109.
- Northrup, P. (2001), "A Framework for Designing Interactivity into Web-Based Instruction", *Educational Technology*, March/April.
- Neuendorf, Kimberly A. (2002), *The Content Analysis Guidebook*, London:Sage.
- O'Donohue, J. (2003), *The Invisible Embrace*, London: Transworld Publishers
- Perkins, D.N. (1991), "Technology Meets Constructivism: Do they Make a Marriage?", *Educational Technology* 31(5), 18-23.
- Picciano, A.G. (2002), "Beyond Student Perceptions: Issues of Interaction, Presence and Performance in an Online Course", *Journal of Asynchronous Learning Networks* 6, 21-40.
- Porter, M. E. (2001), "Strategy and the Internet", Harvard Business Review.
- Remenyi, D., Williams, B., Money, A., Swartz, E. (1998), *Doing Research in Business and Management: An Introduction to Process and Method*, London: Sage.
- Revans, R. (1980), *Action Learning: New Techniques for Management*, London: Blond & Briggs.
- Richardson W. (2009), *Blogs, Wikis, Podcasts, and Other Powerful Web Tools for Classrooms*, London:Sage.
- Robertson, T. S. (1971), *Innovation Behaviour and Communication*, New York: Holt, Rinehart, and Winston.
- Robinson, V., Lai, M.K. (2005), *Practitioner Research for Educators: A Guide to Improving Classrooms and Schools*, CA: Corwin.
- Robson, C (2002), *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*, MA: Blackwell Publishers.
- Rogers, E. M. (2003), *Diffusion of Innovations*, New York: The Free Press.

- Rourke, L., Anderson, T., Garrison, D. R., Archer, W. (2001), "Assessing Social Presence in Asynchronous Text-Based Computer Conferencing", *Journal of Distance Education*, 14(2).
- Salmon, G., (2000) *E-Moderating – the Key to Teaching and Learning Online*, London: Kogan Page.
- Savery, J. (2006), "Overview of Problem-based Learning", *The Interdisciplinary Journal of Problem-based Learning*, Vol. 1, No. 1, Spring 2006, pp. 9-20.
- Saunders, M., Lewis, P., Thornhill, A. (2009), *Research Methods for Business Students*, London: Pearson Education.
- Sfard, A. (1998), "On Two Metaphors for Learning and the Dangers of Choosing Just One", *Educational Researcher*, 27(2), 4-13.
- Silverman, D. (2000), *Doing Qualitative Research: A practical Handbook*, London: Sage.
- Smith, J.B. (1994), *Collective Intelligence in Computer-Based Collaboration*, New Jersey: Lawrence Erlbaum Associates.
- Snow, R.E., Swanson, J. (1992), "Instructional Psychology – Aptitude, Adaptation, and Assessment ", *Annual Review of Psychology*, 43, 583-626.
- Stacey, E. (1999), "Collaborative Learning in an Online Environment", *Journal of Distance Education*, Vol. 14, No 2, 14-33
- Stemler, S. (2001), "An Overview of Content Analysis", *Practical Assessment, Research & Evaluation*, 7 (17).
- Strauss, A., Corbin, J. (1998), *Basics of Qualitative Research*, CA: Sage.
- Strijbos, J.W., Martens, R.L., Prins, F.J., Jochems, W.M.G. (2006), "Content Analysis: What Are They Talking About?", *Computers & Education*, 46, 29-48.
- Swan, K. (2001), "Virtual Interaction: Design Factors Affecting Student Satisfaction and Perceived Learning in Asynchronous Online Courses", *Distance Education*, 22(2), 306-331.

- Surry, D.W., Farquhar, J.D. (1997), "Diffusion Theory and Instructional Design", *Journal of Instructional Science and Technology*, 2 (1).
- Tesch, R. (1990), *Qualitative Research: Analysis Types and Software Tools*, London: Falmer.
- Tight, M. (2004), "Research Into Higher Education: an A-Theoretical Community of Practice?", *Higher Education Research & Development*, Vol. 23, No. 4.
- Trendin, G. (2008), "Using a Wiki to Evaluate Individual Contribution to a Collaborative Learning Project", *Journal of Computer Assisted Learning*, 25, 43-55.
- Vygotsky, L.S. (1978), *Mind in society: The development of higher psychological processes*. (M.M.Lopez-Morillas Cole, A.R. Luria & J. Wertsch, J. Trans.). Cambridge, MA: Harvard University Press.
- Warschauer, M. (1997), "Computer-Mediated Collaborative Learning: Theory and Practice", *The Modern Language Journal* , 81 (4), 470-481.
- Whitehead, J. (1989), "Creating a Living Educational Theory from Questions of the Kind, How Do I Improve my Practice?", *British Educational Research Journal*, 15:3-17.
- Williams, S. (2003), "The Learning Manager: Knowledge, Action and Social Practice", *HMC White Paper*.
- Wilson, G., Stacey, E. (2004), "Online Interaction Impacts on Learning: Teaching the Teachers to Teach Online", *Australasian Journal of Education Technology*, 20(1), 33-48.
- Yin, R.K. (2003), *Case Study Research: Design and Methods*, CA: Sage.
- Zemsky, R., Massy, W.F. (2004), *Thwarted Innovation. What Happened to e-learning and Why*, The University of Pennsylvania, PN: The Learning Alliance.
- Zimmerman, D.H., Wieder, D.L. (1977), "The Diary-Interview Method", *Urban Life*, 5(4):479-499.

APPENDIX A3.1

Study on the Adoption and Learning Processes of Online Interactivity

Pre-Class Questionnaire

All answers will be treated in absolute confidence

The aim of the questionnaire is to assess the computer literacy and the prior experience of students with Internet and Web 2.0 applications. The innovative behaviour of students along with their preferences towards group work is also recorded.

The questionnaire is divided in 4 parts:

- A. Demographics:** The collected data will be used in order to examine any relations with the student decision to adopt or not the Web 2.0 applications for the course
- B. Computer Literacy:** An assessment of the student's general computer knowledge
- C. Internet Access / Use:** An assessment of student access and prior experience with Internet and Web 2.0 applications
- D. Group Work and Innovative Behaviour:** The student preference and prior experience with group work along with an indication of the student's inclination towards early adoption of new innovations.

The completion of the questionnaire requires about 10 minutes.

I thank you deeply for your time,

Neophytos Karamanos

| | |
|-------------------------|-------------|
| | Please fill |
| Student's Name | |
| Student's Number | |

A. Demographics

1. Age

| | Please tic (√) |
|---------------------|-------------------|
| 25 years or younger | |
| 26 - 35 years old | |
| 36 - 45 years old | |
| 46 years or older | |

2. Gender

| | Please tic (√) |
|--------|-------------------|
| Male | |
| Female | |

3. Education

a. Highest completed level of education

| | Please tic (√) |
|-------------------------------------|-------------------|
| College graduate (HND) | |
| University graduate (bachelor) | |
| Post – graduate (master, doctorate) | |
| Other (please specify) | |

b. Field(s) of study

| | Please fill |
|---|-------------|
| Field(s) of study (e.g. Computer Science, Business, Economics, Law, Architecture etc.) | |

4. Profession

| | Please fill |
|--------------|-------------|
| Organization | |
| Department | |

| Position in Organization | Please tic (√) |
|--------------------------|-------------------|
| Senior management | |
| Middle management | |
| First-level management | |
| Non-managerial | |

B. Computer Literacy

| | | Please tic (√) | | | | |
|---|--|----------------|---|---|---|-----------------------|
| | | Not at all | | | | Extre mely well |
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | How well do you understand the terms hardware, software, Information Technology (IT)? | | | | | |
| 2 | How well do you understand and distinguish between central computer, personal computer, laptop, netbook and smartphone in terms of capacity, speed, cost, and typical uses? | | | | | |
| 3 | How well do you understand the main parts of a personal computer such as: central processing unit (CPU), memory (RAM), hard disk, motherboard, video / sound card, data ports (serial, parallel, USB)? | | | | | |
| 4 | How well can you identify some of the main peripheral devices used with computers such as: mouse, keyboard, monitor, printer, scanner, webcam, modem, USB memory stick, memory card, DVD drive? | | | | | |
| 5 | How well can you distinguish between operating systems software and applications software? | | | | | |
| 6 | How well can you list some common applications (such as word processing, spreadsheet, database, Web browsing, desktop publishing), together with their uses? | | | | | |
| 7 | How well do you understand how computer-based systems are developed (know about the process of analysis, design, programming and testing used in developing computer-based systems)? | | | | | |
| 8 | How well do you understand the terms: local area network (LAN), wide area network (WAN) and client/server? | | | | | |

| | | | | | | |
|----|---|--|--|--|--|--|
| 9 | How well do you understand what the Internet is and know some of its main uses? | | | | | |
| 10 | How well do you understand what the World Wide Web (WWW) is and distinguish it from the Internet? | | | | | |
| 11 | How well do you understand the distinction between the Internet, an intranet and an extranet? | | | | | |
| 12 | How well do you understand the term e-Commerce and the concept of purchasing goods and services online, including giving personal details before a transaction can be carried out? | | | | | |
| 13 | How well do you understand security issues associated with computers (such as user IDs and passwords, access rights, the importance of an information security policy with respect to handling sensitive data)? | | | | | |
| 14 | How well do you know about anti-virus measures and what to do when a virus infects a computer (be aware of the limitations of anti-virus software and understand what 'disinfecting' files means)? | | | | | |
| 15 | How well can you manage desktop icons (e.g. selecting and moving them, recognizing basic desktop icons, creating a desktop shortcut icon)? | | | | | |
| 16 | How well can you manage desktop windows (e.g. re-size, minimize, move, close)? | | | | | |
| 17 | How well do you understand the basic directory and folder structure on the computer (including how to create a directory/folder and how to search for documents in a folder by name or date of creation)? | | | | | |
| 18 | How well can you manage and organise files in Microsoft Windows by copying, moving and deleting them across directories / folders? | | | | | |

| | | | | | | |
|----|--|--|--|--|--|--|
| 19 | How well can you use the printing facilities of Microsoft Windows (print, set default printer, view a print job's progress)? | | | | | |
| 20 | How well can you create, format and print a document using a word processor like Microsoft Word (including changing font or color, using bulleted lists, changing indentation or line spacing, adding headers or footers, using spell-checking)? | | | | | |
| 21 | How well can you use tables, images and graphics in your word processing documents? | | | | | |
| 22 | How well can you perform web search tasks using a Web browser and available search engine tools (including bookmarking search results and printing web pages)? | | | | | |
| 23 | How well can you use electronic mail software (e.g. to send and receive messages, attach documents or other files to a message, organize and manage message folders)? | | | | | |

| | | Not at all | | | | Extre mely easy |
|----|---|---------------|---|---|---|-----------------------|
| | | 1 | 2 | 3 | 4 | 5 |
| 24 | Overall, do you find computers easy to use? | | | | | |

C. Internet Access / Use

1. How often do you use the Internet for any purpose?

Please tic (√)

| | | | | |
|--|-------------------|------------------|------------------|---------------------|
| Not at all or less than once per month | 1-2 times monthly | 1-2 times weekly | 3-4 times weekly | At least once daily |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

2. For which purpose do you use the Internet? (multiple options could apply)

Please tic (√)

| | |
|--|----------------|
| | Please tic (√) |
| I do not use it | |
| Send e-mails | |
| Access my course material / grade | |
| Search for information | |
| Stay in touch with friends | |
| Purchase goods / services online | |
| Execute business transactions (as part of my work) | |
| Other (please specify) | |

3. In which of the following places, do you have easy and timely access to the Internet? (multiple options could apply)

Please tic (√)

| | |
|-------------------|----------------|
| | Please tic (√) |
| at the University | |
| at home | |
| at work | |

4. Which of the following Web 2.0 (Social Web) applications have you used before? (multiple options could apply)

Please tic

| | |
|--|------------|
| | Please tic |
| Social networking such as Facebook or LinkedIn | |
| Micro-blogging tools such as Twitter | |
| Media / file sharing tools such as Youtube or Flickr | |
| Blog | |
| Wiki | |
| Discussion forum | |
| Chat room | |
| Other (please specify) | |

D. Group Work and Innovative Behaviour

1. Have you worked on a group assignment before?

Please tic (✓)

| | |
|-----|----|
| Yes | No |
| | |

2. In general, how willing are you to work in a group (rather than working alone)?

Please tic (✓)

| | | | | |
|--------------------|---|---|---|-------------------|
| Not at all willing | | | | Extremely willing |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

3. In general, how willing are you to seek out information regarding new products and services?

Please tic (✓)

| | | | | |
|--------------------|---|---|---|-------------------|
| Not at all willing | | | | Extremely willing |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

4. In general, how willing are you to try new products and services which exploit the latest technology?

Please tic (✓)

| | | | | |
|--------------------------|--|---|--|--|
| I do not try them at all | I usually wait until they are fully accepted in the market | I usually wait until they are somewhat accepted in the market | I usually wait until someone else tries them first | I prefer to be among the first to try them |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

5. Regarding the adoption of new technological products, do you usually request the opinion of others or do you provide your own opinion to others?

Please tic (√)

| | | | | |
|--|---|---|--|---------------------------------------|
| I always request the opinion of others | Most of the times I request the opinion of others | About half of the times I request the opinion of others and the other half I provide my opinion to others | Most of the times I provide my opinion to others | I always provide my opinion to others |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

6. Regarding new technological products, what sources do you usually use in order to obtain more information regarding the products?
(multiple sources could apply)

| | |
|--|----------------|
| | Please tic (√) |
| Newspapers or magazines | |
| Books or articles | |
| Consult other people | |
| Internet | |
| Professional networks, associations or special interest groups | |
| Other (please specify) | |

Thank you very much for your time and cooperation

APPENDIX A3.2

Study on the Adoption and Learning Processes of Online Interactivity

Post-Class Questionnaire

All answers will be anonymous and will be treated in absolute confidence

The aim of the questionnaire is to obtain the student views regarding the overall experience of developing their class assignment online using the provided collaborative Web 2.0 applications.

The questionnaire is divided in 2 parts:

- A. Group Work Experience:** Student views regarding the overall experience of working in groups
- B. Online Collaboration:** Student views regarding the use of the provided online collaborative Web 2.0 applications

The completion of the questionnaire requires about 10 minutes.

I thank you deeply for your time,

Neophytos Karamanos

A. Group Work Experience

1. Regarding the preparation of your class assignment, how effectively did you work together as a group? (Effective group work refers to whether the team manage to create the necessary bonding, whether the various assignment parts were developed and shared timely, whether adequate interaction and discussion of each part by the team took place leading to a better outcome etc.)

Please tic (√)

| | | | | |
|---------------------------|---|---|---|-------------------------------|
| Not at all effectively | | | | Extremely effectively 5 |
| 1 | 2 | 3 | 4 | |
| | | | | |

2. How fairly (e.g. each student undertaking roughly equal share of the load) was the assignment work divided among the members of your group?

Please tic (√)

| | | | | |
|----------------------|---|---|---|---------------------|
| Not at all fairly | | | | Extremely fairly |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

3. How much did you enjoy working in a group for the assignment?

Please tic (√)

| | | | | |
|---------------|---|---|---|-----------------|
| Not at all | | | | Extremely so |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

4. List some of the most positive and some of the most negative aspects of your group work experience:

| Positive aspects | Negative aspects |
|-------------------------|-------------------------|
| | |
| | |
| | |

B. Online Collaboration

1. How effective (facilitating well what you had to do) did you find the Web 2.0 Applications you used for developing the group assignment?

| | Not at all effective 1 | 2 | 3 | 4 | Extremely effective 5 |
|--|---------------------------|---|---|---|--------------------------|
| Google DOCS (for developing and sharing the various assignment parts) | | | | | |
| Google DOCS Discussion Table (for discussing the various assignment parts) | | | | | |
| Google DOCS Online Reflection Journal (for recording your thoughts, experiences, reflections) | | | | | |
| Chat Room like Gmail chat or Windows Live Messenger (for discussing the various assignment parts) (complete only if used) | | | | | |

2. How easy to use did you find the Web 2.0 Applications you used for developing the group assignment?

| | Not at all easy 1 | 2 | 3 | 4 | Extremely easy 5 |
|--|----------------------|---|---|---|---------------------|
| Google DOCS (for developing and sharing the various assignment parts) | | | | | |
| Google DOCS Discussion Table (for discussing the various assignment parts) | | | | | |
| Google DOCS Online Reflection Journal (for recording your thoughts, experiences, reflections) | | | | | |
| Chat Room like Gmail chat or Windows Live Messenger (for discussing the various assignment parts) (complete only if used) | | | | | |

3. Overall, how much of the group collaboration for developing the assignment was finally done online using the provided Web 2.0 Applications (as opposed to more traditional means such as face-to-face, telephone, e-mails, etc.)?

| | Please tic (√) |
|-----------|----------------|
| < 25% | |
| 25% - 50% | |
| 51% - 75% | |
| > 75% | |

4. Your lecturer / teaching assistant took a number of actions and interventions in support of the online collaborative environment (e.g. explaining the benefits of the online collaborative environment, quality and ease of use of provided online resources, training, support, discussions, monitoring of progress, enthusiasm etc.)

- a. How useful were your lecturer / teaching assistant actions and interventions in enabling you to use effectively the online collaborative environment?

Please tic (√)

| Not at all useful | | | | Extremely useful |
|----------------------|---|---|---|---------------------|
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

- b. List some of the most valuable and some of the least valuable lecturer / teaching assistant actions and interventions in enabling you to use effectively the online collaborative environment:

| Most Valuable Actions / Interventions | Least Valuable Actions / Interventions |
|--|---|
| | |
| | |
| | |
| | |

5. To what extent do you believe were you able as a group to learn from each other (e.g. via sharing of different views, discussion and final agreement on a new perspective of looking at things) through online collaboration?

Please tic (✓)

| | | | | |
|------------|---|---|---|-----------------|
| Not at all | | | | Extremely so |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |

6. List some of the most positive and some of the most negative aspects of your experience with the provided Web 2.0 Applications:

| Positive aspects | Negative aspects |
|------------------|------------------|
| | |
| | |
| | |
| | |
| | |

Thank you very much for your time and cooperation

APPENDIX A3.3

Student Adoption Journal

Student Name:

Student No:

Please complete a minimum of 4 entries and answer the final decision question at the end, regarding your final decision. The following are provided as a guidance regarding possible content. However, you are encouraged to record anything (e.g. thoughts, feelings, concerns) that relate to your decision process of finally deciding to use or not use the provided Web 2.0 applications.

| | |
|--|--------------|
| Entry 1 | Date: |
| Attitude towards Web 2.0 applications at this point: indifferent, negative, positive | |
| | |
| What are the major concerns you have at this point a) know more about the Web 2.0 applications b) learn how to use them, c) will I be able to use them effectively, d) will I be able to get the needed help, e) will I have the necessary time to devote to learn it, f) will it help in group collaboration, g) will it help to achieve a good assignment grade, h) any other concern? | |
| | |
| Do you feel that the actions and attitudes of other students (or prospective group members) are influencing your own attitude towards Web 2.0 applications? If yes, how? | |
| | |
| Do you feel that the actions and interventions of your lecturer / teaching assistant (e.g. explaining the need for the Web 2.0 applications and their benefits, quality of provided online resources, training, support, discussions, monitoring of progress, enthusiasm etc.) are influencing your own attitude towards Web 2.0 applications? If yes, how? | |
| | |
| Do you feel that specific attributes of Web 2.0 applications (e.g. potential advantages relative to face-to-face collaboration, complexity or ease of use, learning effort required, ability to experiment) are influencing your attitude towards Web 2.0 applications? If yes, please explain. | |
| | |
| Is there any other factor that appears to be influencing your current attitude towards Web 2.0 applications? If yes, please explain. | |
| | |

| |
|--|
| |
| Entry 2 Date: |
| Attitude towards Web 2.0 applications at this point: indifferent, negative, positive |
| |
| What are the major concerns you have at this point a) know more about the Web 2.0 applications b) learn how to use them, c) will I be able to use them effectively, d) will I be able to get the needed help, e) will I have the necessary time to devote to learn it, f) will it help in group collaboration, g) will it help to achieve a good assignment grade, h) any other concern? |
| |
| Do you feel that the actions and attitudes of other students (or prospective group members) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that the actions and interventions of your lecturer / teaching assistant (e.g. explaining the need for the Web 2.0 applications and their benefits, quality of provided online resources, training, support, discussions, monitoring of progress, enthusiasm etc.) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that specific attributes of Web 2.0 applications (e.g. potential advantages relative to face-to-face collaboration, complexity or ease of use, learning effort required, ability to experiment) are influencing your attitude towards Web 2.0 applications? If yes, please explain. |
| |
| Is there any other factor that appears to be influencing your current attitude towards Web 2.0 applications? If yes, please explain. |
| |

| |
|--|
| Entry 3 Date: |
| Attitude towards Web 2.0 applications at this point: indifferent, negative, positive |
| |
| What are the major concerns you have at this point a) know more about the Web 2.0 applications b) learn how to use them, c) will I be able to use them effectively, d) will I be able to get the needed help, e) will I have the necessary time to devote to learn it, f) will it help in group collaboration, g) will it help to achieve a good assignment grade, h) any other concern? |
| |
| Do you feel that the actions and attitudes of other students (or prospective group members) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that the actions and interventions of your lecturer / teaching assistant (e.g. explaining the need for the Web 2.0 applications and their benefits, quality of provided online resources, training, support, discussions, monitoring of progress, enthusiasm etc.) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that specific attributes of Web 2.0 applications (e.g. potential advantages relative to face-to-face collaboration, complexity or ease of use, learning effort required, ability to experiment) are influencing your attitude towards Web 2.0 applications? If yes, please explain. |
| |
| Is there any other factor that appears to be influencing your current attitude towards Web 2.0 applications? If yes, please explain. |
| |

| |
|--|
| Entry 4 Date: |
| Attitude towards Web 2.0 applications at this point: indifferent, negative, positive |
| |
| What are the major concerns you have at this point a) know more about the Web 2.0 applications b) learn how to use them, c) will I be able to use them effectively, d) will I be able to get the needed help, e) will I have the necessary time to devote to learn it, f) will it help in group collaboration, g) will it help to achieve a good assignment grade, h) any other concern? |
| |
| Do you feel that the actions and attitudes of other students (or prospective group members) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that the actions and interventions of your lecturer / teaching assistant (e.g. explaining the need for the Web 2.0 applications and their benefits, quality of provided online resources, training, support, discussions, monitoring of progress, enthusiasm etc.) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that specific attributes of Web 2.0 applications (e.g. potential advantages relative to face-to-face collaboration, complexity or ease of use, learning effort required, ability to experiment) are influencing your attitude towards Web 2.0 applications? If yes, please explain. |
| |
| Is there any other factor that appears to be influencing your current attitude towards Web 2.0 applications? If yes, please explain. |
| |

| |
|--|
| Entry 5 Date: |
| Attitude towards Web 2.0 applications at this point: indifferent, negative, positive |
| |
| What are the major concerns you have at this point a) know more about the Web 2.0 applications b) learn how to use them, c) will I be able to use them effectively, d) will I be able to get the needed help, e) will I have the necessary time to devote to learn it, f) will it help in group collaboration, g) will it help to achieve a good assignment grade, h) any other concern? |
| |
| Do you feel that the actions and attitudes of other students (or prospective group members) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that the actions and interventions of your lecturer / teaching assistant (e.g. explaining the need for the Web 2.0 applications and their benefits, quality of provided online resources, training, support, discussions, monitoring of progress, enthusiasm etc.) are influencing your own attitude towards Web 2.0 applications? If yes, how? |
| |
| Do you feel that specific attributes of Web 2.0 applications (e.g. potential advantages relative to face-to-face collaboration, complexity or ease of use, learning effort required, ability to experiment) are influencing your attitude towards Web 2.0 applications? If yes, please explain. |
| |
| Is there any other factor that appears to be influencing your current attitude towards Web 2.0 applications? If yes, please explain. |
| |

| |
|--|
| Final Decision: Have you decided to use or not use Web 2.0 applications for the assignment? |
| Yes/No: |
| Main Reasons Contributing to Decision: |

APPENDIX A3.4

Sample Student Reflection Journal

| Entry No. | Date | Entry |
|-----------|------------|---|
| 1 | 10/03/2010 | I thought that making the assignment on line would be easier and faster. Beside the on line comments, it takes a lot of phone calls and messages. Part 1 is finished but I think that we haven't found yet the way [to] communicate fast and effective. |
| 2 | 31/03/2010 | I'm disappointed because not all members of my team share the same enthusiasm and devotion. You can see it from the comments. We were waiting long enough for one member of our team, to make only ONE comment. We have an interaction problem... |
| 3 | 15/4/2010 | Part 3 is taking too much time. I've made my comments and suggestions and I hope I've helped a little. Nevertheless, I think that this part's structure and composition is very informal and extempore. The Web 2.0 tools are very useful and interesting but in our case...we have a problem. We are 3 different people, we didn't know each other, with different state of mind and sometimes it is difficult to explain your view on line. |
| 4 | 01/05/2010 | At this part we had a huge disagreement about technology and needed improvements. I strongly believe that the author's suggestions were not appropriate for a retail shop. I think that if we had chosen Zara manufacture it might be more clear as an assignment... |
| 5 | 12/5/2010 | Unfortunately our request for information to the manager of Zara Cyprus was not answered. The main source of our information was internet, and that's why sometimes in the assignment we wrote about Zara international. I think that all this are applied at Zara Cyprus too. |
| 6 | 18/5/2010 | We decided that it is not fair for [name of student] to make four parts instead of three, and that why we are going to share part 10 and each one to answer two questions. |
| 7 | 21/5/2010 | The assignment is finished! I think that Web 2.0 tools are very useful and the weekly feedback from the lecturer is very helpful. I enjoyed working with this application, it was very interesting. I had some problems to insert the drawings, but copy-paste is always an effective alternative. I'm not satisfied from the teamwork, because we disagreed [on] to many basic issues, but once again i've learned that patience is very important especially in teamwork |

APPENDIX A3.5

Sample Group Discussion Excerpt

Group01Part1 Discussion:

| Date | Time | User | Comment |
|----------|-------|---------------|--|
| 7/3/2010 | 5:31 | Student S1 | <p>Excellent, [name of student S2], thanks for your work :-). I just want to comment several minor points:</p> <ol style="list-style-type: none"> 1. Should we add Conveyor Belt, Ship, and Crane as other Input Transforming Resources, as they also use them for transporting coal from site to the factory? 2. Should we specify the output goods to more detailed specifications and not just "coal from Indonesia"? I don't know about this & maybe you know it better, but shouldn't output goods in energy sector be detailed unto several specifications, such as purity, chemical level, etc? 3. For the Four Vs, I agree with the Volume, Variety and Visibility, but about Variation... Isn't the reason for low Variation in Demand suppose to come from more customer-oriented perspective? I mean that it's not just because they can produce all year long & stock them, but how about the real-demand that comes from the customer? Is it vary throughout the year or not? <p>Thank you for listening to my comments, looking forward for your response! Have a nice Sunday :-)</p> |
| 7/3/2010 | 19:01 | Student S2 | <p>@[name of student S1]:</p> <ol style="list-style-type: none"> 1. Good point. But, I think they are "Input Transformed Resources" and I was thinking to scope our process only in "mining operation" but if we want to review "end-to-end" process, that would be OK with me. 2. I believe the final product is still generally coal with different specifications (associated with their brand) and according to customer's need like Power Plant and Steel Manufactures that need different specification of coal (calorie, moisture, ash, etc) and I don't want to be too detail on this. 3. In coal business, most of the contract is long-term (3-5 years) because power-plant needs coal throughout the year. Although, sometime KPC sells their coal in short-term contract (less than 1 year) to benefit from favorable price in spot-market. <p>Thank you for your kind feedback and looking forward for further comments :)</p> |
| 7/3/2010 | 22:25 | Febrina Mulia | <p>Hello guys... it's my turn to drop comments :P Firstly, Thanks [name of student S2] for the thorough discussion! Here are mine:</p> <ol style="list-style-type: none"> 1. I agree with [name of student S2] that we should limit the process to "on-site" mining operation. However, there are misplacements on the transformation diagram; the transforming resources should be the <i>ones who perform the operation process</i> (e.g. operators, engineers, truck, etc.) As opposed, the transformed resources should be the <i>raw materials in which they will be transformed into</i> coal (e.g. top soil, overburden coal, etc.) 2. How about mentioning the output goods based on the product brands (e.g. Prima, Pinang, and Melawan) that Alex mentioned above? For instance, coca cola --> outputs: sprite, fanta, coke. 3. In this issue, i would agree with [name of student S1]. The term "Variation" here is " Variation of Demand" -- how varies of the demand? are they stable overtime? Thus, it should <i>not</i> depend on how long the sales contracts are made, but how often and stable are they over the certain period? E.g. whether the demand is always high or low (stable) ---><i>low variation OR</i> whether the demand is sometimes high and sometimes low --> <i>high variation OR moderate ??</i>. <p>In the above 4V's, i notice that Alex use the supply's point of view rather than demand's.</p> <p>Well, that's all from me now. Hope they give us some useful insight for consideration!</p> <p>Cheers!</p> |

APPENDIX 3.6: CODING MANUAL

A. Adoption Journal Coding Instructions

1. Make the journal document Read/Write and insert a divider row between each adoption journal entry (using Control-Insert from the row that follows). This will separate the sections and count more accurately the code (node) references included.
2. Select and code the whole adoption journal document to the **case (student)** involved,
3. **Select each adoption entry section** and code it as appropriate using the possible codes:

| Name | Nickname | Created | Modified |
|--------------------------------|----------|------------------|------------------|
| Other Adoption Factor | | 20/08/2010 07:51 | 21/08/2010 08:41 |
| Innovation Attributes | | 01/08/2010 11:22 | 21/08/2010 08:41 |
| Communication Activity | | 20/08/2010 07:51 | 20/08/2010 18:23 |
| AdoptionTutor actions or attit | | 01/08/2010 12:31 | 21/08/2010 08:41 |
| Adoption Process Outcome | | 01/08/2010 12:38 | 01/08/2010 12:38 |
| Adoption Peer actions or attit | | 01/08/2010 12:31 | 20/08/2010 18:41 |
| Adoption Journal Entries | | 01/08/2010 12:46 | 01/08/2010 12:46 |
| Adoption Facilitators or Barri | | 01/08/2010 12:17 | 01/08/2010 12:17 |
| Adoption Decision Reasons | | 20/08/2010 12:16 | 20/08/2010 18:41 |
| Adopter Concerns | | 01/08/2010 11:40 | 21/08/2010 08:41 |
| Adopter Characteristics | | 20/08/2010 11:08 | 20/08/2010 18:29 |
| Adopter Attitude | | 01/08/2010 12:14 | 20/08/2010 09:10 |

- a. **Other adoption factor** (if text mentioned in column can be classified as another code e.g. innovation attribute, concern) use double coding.
- b. Code the mentioned **innovation attributes** both at the general category (innovation attributes) and also the specific attribute (e.g. relative advantage). If the specific attribute is **relative advantage** then code further the sources of relative advantage (or disadvantage) mentioned.
- c. Code **communication activity** if you see such explicitly.
- d. Code **Adoption Tutor Actions or attitudes**, if such intervention / attitudes are mentioned (code it even if the only thing mentioned is “Yes”). Categorize further the intervention into one of the six **CBAM types**: communicating a shared vision of change, planning and providing resources, investing in professional learning, checking on progress, providing continuous assistance (see more on this below).
- e. Code the mentioned **peer actions or attitudes** both at the general level (Adoption peer actions or attitudes) and the more detailed level (e.g. “Teammate actions or attitudes” or “Other student actions or attitudes” or “recognition that all teammates must agree to go for online mode” or “Team cooperating issues regarding work”). If only “Yes” appears in the relevant column then code only at

the general level. [Note that the codes “recognition that all teammates must agree to go for online mode” and “Team cooperating issues regarding work” do not refer to adoption influences and should be excluded from queries as appropriate].

- f. Code the [Adoption Journal Entries](#) at the detailed level only (e.g. Adoption journal entry 1 through Adoption journal entry 5).
 - g. Code the [adopter concerns](#) at both the general and the more specific levels.
 - h. Code [adopter attitude](#) (detail level only e.g. positive / negative / indifferent) as suitable.
 - i. Code [adopter characteristics](#) if you see any mention of such characteristic in the journal.
4. Regarding the **Final decision section**, code only the [adoption process output](#) (detail only e.g. “Innovation Adopted” or “Innovation NOT Adopted”).
 5. Regarding the **Adoption Decision Reasons** section, code [adoption decision reasons](#), code the factors mentioned that played a role in the decision (e.g. [innovation attributes](#), [Adoption tutor Actions or attitudes](#), [peer actions or attitudes](#)) and [adoptions facilitators / barriers](#) (detail level) as appropriate (could be both). Again code [adopter characteristics](#) if you see any mention of such characteristic in the decision reasons given.

B. Coding Change Facilitator Actions (CBAM Types)

1. Code [Communicating a shared vision of change](#) if any of the following are mentioned in the text:
 - a. Change facilitator actions explaining the need and the benefits of the change and arousing student enthusiasm, interest and motivation
 - b. Change facilitator’s enthusiasm and positive attitude

The vision must be continuously communicated to the students.
2. Code [Planning and providing resources](#) if the quality of provided online resources is mentioned in the text.
3. Code [Investing in professional learning](#) if formal training or other development sessions are held (e.g. the conducted lab, providing information about the innovation, developing positive attitudes, demonstrating innovation use). This type of interventions involves [large group instruction](#) (not professional learning interventions at the individual or small – group level which belong in “Providing continuous assistance”).
4. Code [Checking on Progress](#) if change facilitator monitoring of progress is mentioned in the text

5. Code **Providing continuous assistance** when the following are mentioned: problem resolution, provision of technical assistance, responding to individual questions, supplying of additional material, provision of additional formal or informal learning activities, providing encouragement. The focus of these interventions is at the **individual or very small group level**.
6. Code **Other change facilitator action** if the action mentioned does not fall into any of the above categories or if the student just mentioned that he/she was influenced by the change facilitator without being more specific.

C. Coding the Open Questions of the Post-Class Questionnaire

1. Code the **most valuable change facilitator interventions** mentioned by students using the CBAM types listed above.
2. Code the **most positive aspects of group work experience** mentioned by students.
3. Code the **most positive aspects of online collaboration** mentioned by students.
4. There is no need to code the negative aspects mentioned as these are only a few and can be handled without coding.

D. Coding Student Journals

1. For each journal entry, code the mentioned online collaboration **facilitators**, **inhibitors** and **suggestions for improvement**.

E. Coding Discussion Tables

1. Code the entire file (all 10 discussion tables) with the **name of the group**
2. For each table entry (message), code (**Henri model**):
 - a. **Explicit Interaction**: if the message refers explicitly to another message or person, or group (as a response or commentary)
 - b. **Implicit Interaction**: if the message refers implicitly to another message or person, or group (as a response or commentary)
 - c. **Independent Statement**: Any statement relating to the subject under discussion, but which is neither an answer nor a commentary and which does not lead to any further statements
 - d. **Social**: if the statement or part of statement is not related to formal content of subject matter (e.g. containing social cues such as self-introduction, verbal

support, expression of feeling such as “I am feeling great...”, greetings such as “hi everyone...”, symbolic icons such as ☺)

3. For each table entry (message) code (**Gunawardena model**):
 - a. **Sharing / Comparing of Information (Sharing / Comparing)**: if there is:
 - i. A statement of observation or opinion
 - ii. a statement of agreement from one or more of the other participants
 - iii. corroborating (strengthening) evidence provided by one or more participants
 - iv. asking and answering questions to clarify details of statements
 - v. definition, description or identification of a problem
 - b. **Discovery and Exploration of Dissonance or Inconsistency Among Ideas, Concepts or Statements (Dissonance)**: if there is dissonance or disagreement between ideas, concepts or statements such as:
 - i. Identifying and stating areas of disagreement
 - ii. Asking and answering questions to clarify the source and extent of disagreement
 - iii. Restating the participant’s position, and possibly advancing arguments or considerations in its support by references to the participant’s experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view
 - c. **Negotiation of Meaning / Co-construction of Knowledge (Negotiation/Co-construction)**: if there is:
 - i. negotiation or clarification of the meaning of terms
 - ii. negotiation of the relative weight to be assigned to types of argument
 - iii. identification of areas of agreement or overlap among conflicting concepts
 - iv. proposal and negotiation of new statements embodying compromise, co-construction
 - d. **Testing and Modification of Proposed Synthesis or Co-Construction (Testing Tentative Constructions)**:
 - i. Testing the proposed synthesis against “received fact” as shared by the participants and / or their culture
 - ii. Testing against existing cognitive schema
 - iii. Testing against personal experience

- iv. Testing against formal data collected
- v. Testing against contradictory testimony in the literature
- e. Agreement Statement / Application of Newly - Constructed Knowledge
 - i. Summarization of agreement(s)
 - ii. Applications of new knowledge
 - iii. Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction

APPENDIX A3.7

Computer Literacy Internal Consistency Report

Case Processing Summary

| | | N | % |
|-------|-----------------------|----|-------|
| Cases | Valid | 40 | 100.0 |
| | Excluded ^a | 0 | .0 |
| | Total | 40 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

➔ Scale: IT Literacy

Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|--|------------|
| .942 | .944 | 23 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|------------------------------|----------------------------------|
| Q1 | 85.55 | 211.177 | .591 | . | .940 |
| Q2 | 85.28 | 213.179 | .632 | . | .939 |
| Q3 | 85.80 | 202.882 | .722 | . | .938 |
| Q4 | 84.88 | 213.856 | .618 | . | .940 |
| Q5 | 86.18 | 203.892 | .690 | . | .939 |
| Q6 | 85.75 | 208.962 | .663 | . | .939 |
| Q7 | 86.95 | 207.741 | .648 | . | .939 |
| Q8 | 86.30 | 197.446 | .803 | . | .937 |
| Q9 | 85.10 | 213.682 | .668 | . | .939 |
| Q10 | 85.80 | 203.856 | .734 | . | .938 |
| Q11 | 86.15 | 203.054 | .698 | . | .938 |
| Q12 | 85.48 | 210.204 | .622 | . | .939 |
| Q13 | 85.70 | 209.959 | .616 | . | .940 |
| Q14 | 85.78 | 206.743 | .778 | . | .937 |
| Q15 | 84.85 | 215.464 | .574 | . | .940 |
| Q16 | 84.60 | 222.195 | .470 | . | .942 |
| Q17 | 84.93 | 215.404 | .634 | . | .940 |
| Q18 | 84.75 | 218.603 | .567 | . | .940 |
| Q19 | 84.78 | 220.281 | .550 | . | .941 |
| Q20 | 84.75 | 220.295 | .453 | . | .942 |
| Q21 | 85.15 | 215.208 | .498 | . | .941 |
| Q22 | 85.33 | 209.969 | .636 | . | .939 |
| Q23 | 84.80 | 217.600 | .583 | . | .940 |

APPENDIX A3.8

CONSENT FOR PARTICIPATION IN A RESEARCH PROJECT UNIVERSITY OF NICOSIA

Study Title: *Studying the Adoption and Learning Processes of Online Interactivity*

Principal Investigator: *Neophytos Karamanos*

Invitation to Participate and Description of Project

You are invited to participate in a research study designed to look at the factors impacting the adoption and use of Web 2.0 applications (such as blogs, wikis, discussion forums etc.) by students in order to prepare their group assignment for the course. The study will also examine the learning processes involved in such an online collaborative environment.

In order to decide whether or not you wish to be a part of this research study you should know enough about it to make an informed judgment. This consent form gives you detailed information about the research study, which a member of the research team will discuss with you. This discussion should go over all aspects of this research: its purpose, the procedures that will be performed, any potential risks and possible benefits. Once you understand the study, you will be asked if you wish to participate; if so, you will be asked to sign this form.

Description of Procedures

If you agree to participate in this study, you will be asked to:

- *Complete a pre-class questionnaire containing some demographic information along with questions regarding your previous use of Web 2.0 applications and your inclination to adopt new technological products.*
- *Maintain a reflection journal recording your thoughts, feelings and concerns during the adoption-decision period (students will have to decide during the first 4 weeks of the course whether they will use the*

Web 2.0 applications and tools in order to do their assignment or rather do it using traditional face-to-face methods).

- *Potentially participate in an interview regarding your overall experience and the reasons that led to your final decision to use or not use the Web 2.0 applications for your group assignment.*
- *Complete a post-class questionnaire regarding your overall experience.*

- *You retain the right to refuse to answer any question (in a questionnaire or interview) without any adverse consequences whatsoever.*
- *You retain the right to interrupt sound recording during an interview without any adverse consequences whatsoever.*

Potential Risks

- *There are no known risks associated with this study other than those associated with preserving the confidentiality of the collected information (mentioned below).*

Benefits

- *The study aims to provide a new online collaborative environment for students to conduct their group work overcoming the constraints of time and location (the students will be able to work when and where is convenient for them).*
- *The study will attempt to identify the obstacles hindering the adoption of Web 2.0 application by students and suggest ways to overcome them.*
- *The study will introduce a presumably more equitable method of assessing group work taking into consideration individual contribution*

Confidentiality

- *The study involves the collection and analysis of a multitude of information using questionnaires, interviews, reflection journals and the actual student online postings in the class wikis, chat rooms and discussion forums. All collected information will be stored in a secure place, held confidential and used only for the purpose of the study.*
- *The collected data will be kept for a period of three years before being destroyed.*
- *You retain the right to review any of the collected information that pertains to your participation in the study.*

Voluntary Participation and Withdrawal

You are free to choose not to participate and if you do become a subject you are free to withdraw from this study at any time during its course. If you choose not to participate or if you withdraw, this by itself will not harm your performance and evaluation in the class in any way whatsoever.

Questions

We have used some technical terms in this form. Please feel free to ask about anything you don't understand and to consider this research and the consent form carefully – as long as you feel is necessary – before you make a decision.

Authorization

I have read (or someone has read to me) this form and have decided to participate in the project described above. Its general purposes, the particulars of involvement and potential risks have been explained to my satisfaction. My signature also indicates that I have received a copy of this consent form.

Student Name: _____

Student Number: _____

Signature: _____

Date: _____

Signature of Principal Investigator

Date

If you have further questions about this project or if you have a research-related problem, you may contact the Principal Investigator.

APPENDIX A4.1

Student Guides and Tutorials

MBA 670 Collaborative Assignment – Online Mode

Instructions to Students

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1. Class Assignment Website

The various resources and collaborative Web 2.0 tools used for the assignment have been conveniently grouped in a website (<https://sites.google.com/site/mba670assignment>) as shown in Figure 1.1.

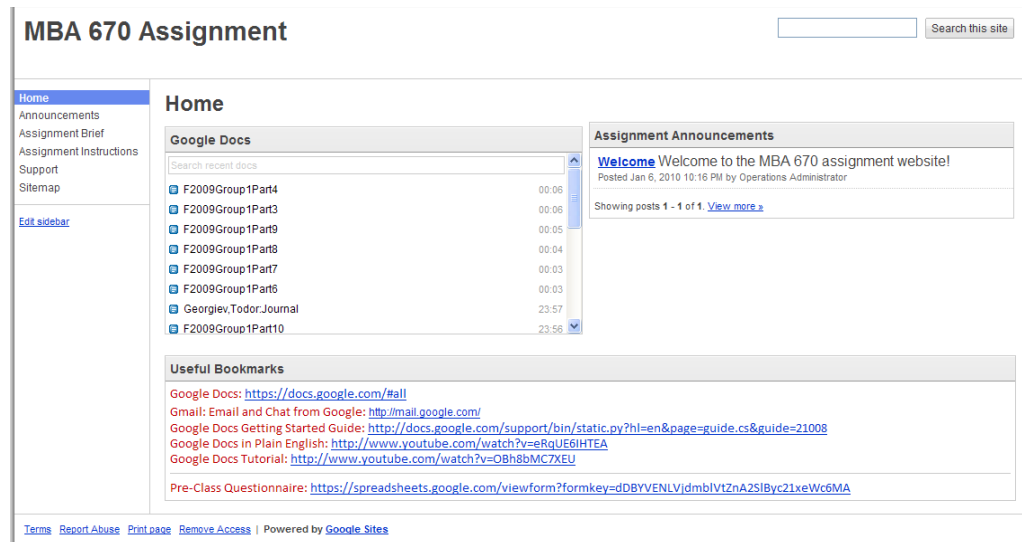


Figure 1.1: The Class Assignment Website

The assignment website includes a number of resources and tools as follows:

- **Left sidebar:** it includes links to various web pages containing information regarding the assignment. For instance, the link [Assignment Brief](#) includes the assignment questions while the link [Assignment Instructions](#) includes instructions for the students relevant to the assignment. The link [Support](#) provides the ability for students to chat online with the teaching assistant (provided he is online) and/or access other support resources. Note that the link [Home](#) of the left sidebar always returns the user to the main website page (home page) as shown in Figure 1.1.
- **Google Docs Window:** it provides a view of the various assignment parts (files) as these are being co-authored by the students in the relevant team. Co-authoring of the various parts is achieved using the [Google Docs](#) Web 2.0 application which is the main collaboration tool used for the assignment. Please note that this window initially may appear empty as it lists the Google Docs files you have already opened.

- **Assignment Announcements Window:** it provides access to the class announcements relevant to the assignment.
- **Useful Bookmarks:** it contains several useful links like:
 - direct links to Google Docs and Gmail (Google’s e-mail)
 - a number of guides and tutorials on how to use Google Docs
 - access to the class questionnaires (pre-class and post-class)

2. Accessing the Class Assignment Website

As mentioned above the assignment website is located at <https://sites.google.com/site/mba670assignment> (it is a good idea to bookmark / add this page to your favourites for quick and easy access). In order to access the website you will need to use a Google account (a userid / e-mail and a password) as shown in Figure 2.1. According to your assigned group for the assignment, you will be provided with a userid (Google e-mail) like s2010g01s1 (meaning spring 2010, group 01, student 1) and a respective password. As soon as you enter your login details in the rightmost part of Figure 2.1 and press **Sign in** you will be taken to the class assignment website

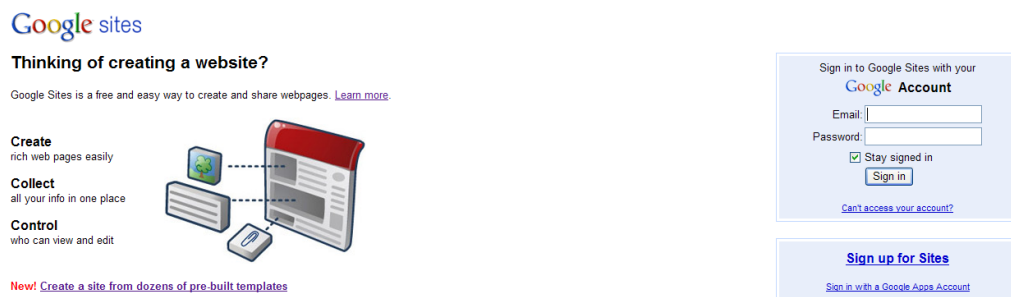


Figure 2.1: Accessing the Assignment Website

Occasionally, after signing in, Google may take you to the web page shown in Figure 2.2. In such, simply click on the **MBA 670 Assignment** link and you will be taken to the class assignment website.

Google sites Create new site

Create new site

My sites

[MBA 670 Assignment](#) Shared with 6 people

Figure 2.2: Accessing the Assignment Website – Intermediate Page

3. The Google Docs Window and The Assignment Parts

Looking at the Google Docs window of the website you will normally see the Google Docs files you have already opened in the process of developing your assignment. Occasionally you may see an invitation to sign in as shown in Figure 3.1. In such case click on the [Sign in](#) link and, if requested, enter the same userid / e-mail and password you have been provided.

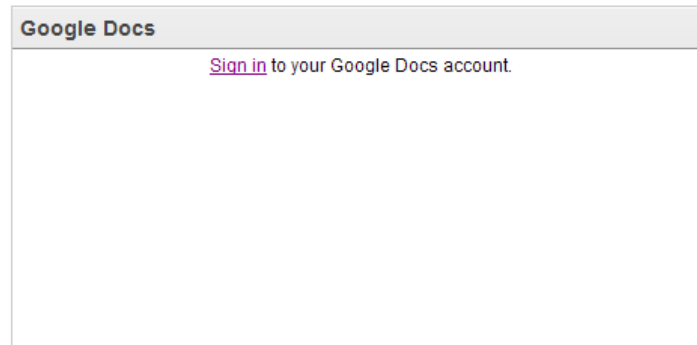


Figure 3.1: Google Docs Window with a Request to Sign In

The normal display of the Google Docs window (a list of the assignment files you have already opened) is shown in Figure 3.2.

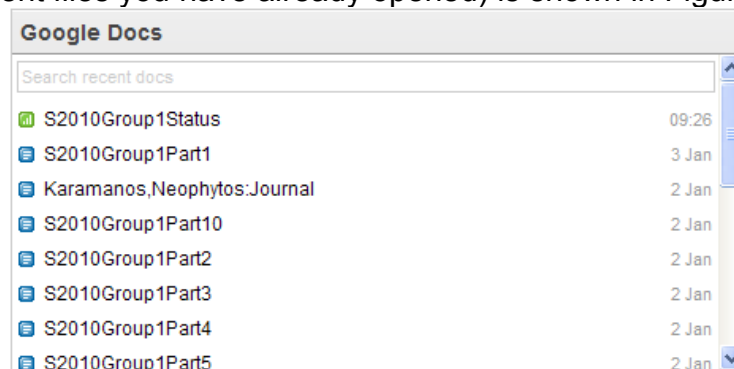


Figure 3.2: Normal View of Google Docs Window

Please note initially the above list may be empty (you have not opened any assignment part files yet). As you continue with your assignment the opened files will appear in this window providing a fast way to access them.

The full list of assignment files (regardless of whether you have already opened them or not) can be seen by pressing [All docs](#) at the bottom right of the window (you may need to use the scroll bar at the right of the window), at which point the Google Docs application starts (the application may start in a new browser window depending on the browser type and version you are using) as shown in Figure 3.3. Please note that, alternatively, you can start the Google Docs

application using the first link ([Google Docs](#)) in the **Useful Bookmarks** window.

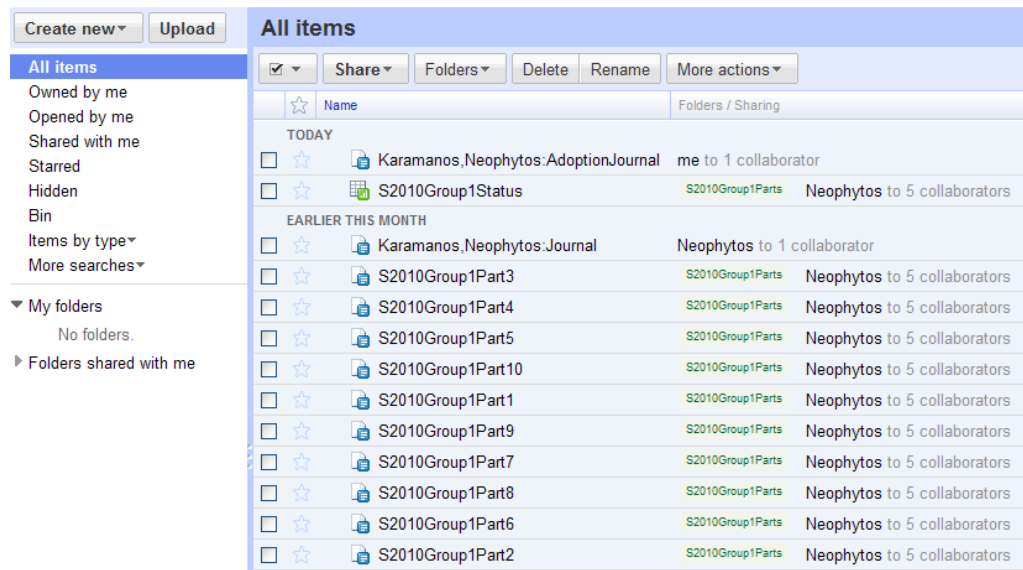
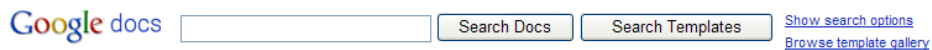


Figure 3.3: Assignment Files in Google Docs

The following files are seen: [S2010GroupnPart1](#) - [S2010GroupnPart10](#) with “n” being your Group number and part 1-part 10 the 10 parts of the assignment. There is also a status file ([S2010GroupnStatus](#)) where the current status of each assignment part (“Not Started”, “Work in Progress”, “Submit for Feedback”, “Submit Final Comments” and “Finalized”) is recorded by the part’s primary author.

In addition, there are two files with your userid followed by the suffix “Journal” (e.g. [S2010g01s1Journal](#)) and “AdoptionJournal” (e.g. [S2010g01s1AdoptionJournal](#)) where you need to enter your thoughts and reflections as follows:

- **Adoption Journal:** This journal applies only for the first weeks of the class (until the student makes his/her final decision regarding the assignment mode – online or Face-to-Face – to be used) and can be submitted by the students also in hardcopy (an electronic version is included here for the students who prefer it). The aim is to record your thoughts, feelings, concerns that relate to your decision of finally using or not using the provided Web 2.0 applications (Google Docs) for writing the assignment.
- **Journal:** This is the normal journal where you will enter your reflections regarding the collaborative experience (feelings, thoughts, positive aspects, negative aspects, problems etc.) as

the assignment is being developed. Of course it applies to the students who select the online assignment mode.

Please note that both journal files contain inside them instructions on how to use them.

Also note that all assignment parts are shared among the members of your group except your personal journals (*useridJournal* and *useridAdoptionJournal*) which are only shared between yourself and your lecturer.

4. Developing the Assignment Parts

Each assignment part needs to be appointed to a specific group member as primary author (you will need to discuss as a group regarding who undertakes which part). This appointment is recorded in the assignment status file *S2010GroupnStatus* as shown in Figure 4.1.

| Part | Description | Primary Author (Google ID / Name) | Start Date | Completion Date | Status | |
|------|--|-----------------------------------|-------------------|-----------------|------------|-----------------------|
| 1 | Introduction | s2010g01s1 | George Nicolaidis | 01/12/2009 | 31/12/2009 | Finalised |
| 2 | Operation strategy | s2010g01s1 | George Nicolaidis | 14/12/2009 | | Submit Final Comments |
| 3 | Process and supply network design | s2010g01s1 | George Nicolaidis | 02/01/2010 | | Submit Feedback |
| 4 | Operation layout, technology and job design | | | | | Work in Progress |
| 5 | Capacity management and scheduling | | | | | Work in Progress |
| 6 | Inventory management and supply chain relationships | | | | | Not Started |
| 7 | MRP, JIT and lean philosophy | | | | | Not Started |
| 8 | Quality management | | | | | Not Started |
| 9 | Assessing operation performance and finding areas of improvement | | | | | Not Started |
| 10 | Implementing an improvement project | | | | | Not Started |

| | | |
|---------|-----------------------|---|
| Status: | Not Started | Part not started |
| | Work in Progress | Primary author currently works on part |
| | Submit Feedback | Waiting for feedback using the discussion table |
| | Submit Final Comments | Waiting for final in line comments |
| | Finalised | Part completed |

Figure 4.1: The Assignment Status File

The primary author will also record in the status file the date he/she started working on the specific assignment part while the initial status of the part will be “Not Started”.

The primary author will then write a first draft of the assignment part in the respective *S2010GroupnPartx* file (please refer to the Google Docs Getting Started Guide and the other tutorials included in the **Useful Bookmarks** window of the website for information on how to write documents using Google Docs). Note that Google Docs includes all common features (such as fonts, colours, bulleted lists, images, line graphics, tables etc.) that you typically find in a word processor like Microsoft Word.

Each assignment part file originally includes at its bottom an empty discussion table as shown in Figure 4.2.

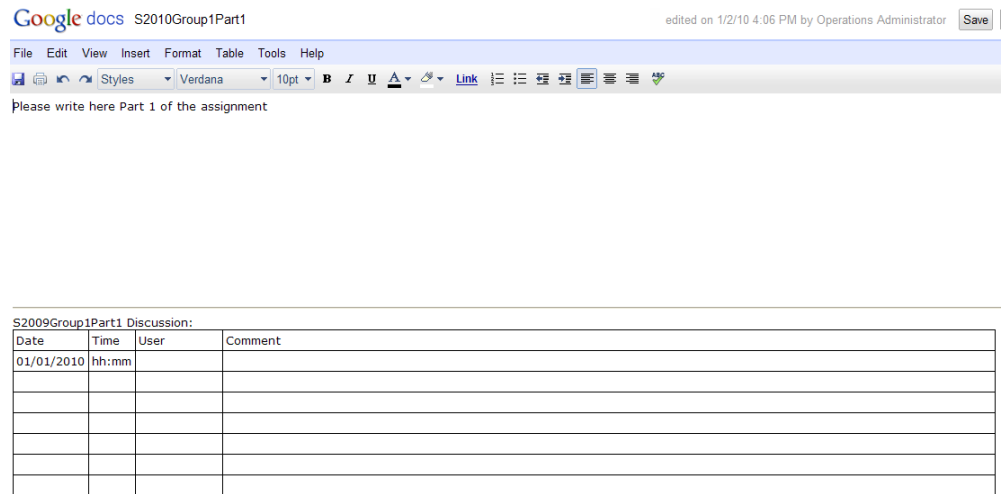


Figure 4.2: Original Contents of an Assignment Part File

When the first draft of each assignment part is written it must be put for discussion by the group. The part primary author indicates this by changing the status of the part in the status file *S2010GroupnStatus* to **“Submit Feedback”** (this is achieved by typing “Submit Feedback” in the respective table cell). All group members then enter comments in the discussion table at the bottom of the assignment part file as shown in Figure 4.3 (the discussion table acts in effect as a **discussion forum**).

| F2009Group1Part4 Discussion: | | | |
|------------------------------|-------|--------|--|
| Date | Time | User | Comment |
| 28/11/2009 | 10:20 | John | Maria, your part is very good!! I do not have any corrective comments for it. The only thing which needed to be added is: in the part describing the team members, there must be the operational manager added above all of them. That is all. Definitely, the best part so far :) |
| 28/11/2009 | 16:10 | George | Very good part Maria, I like it very much, very good idea with using the operation's logo in pictures and diagrams. Just some ideas of mine: You mentioned correctly that the operation is for sure not a mass service (because of customer-staff interaction). However I think that the idea of introducing line layout into this type of operation was to cause or better said to indicate a shift from a service shop to mass service that enables to cope with high variety and high volume at the same time. |
| 29/11/2009 | | Maria | John and George, thank you very much for your comments. I still think that the process type for the operation is service shop due to the finite number of customers it can serve (medium volume). |

Figure 4.3: Entering Comments in the Discussion Table

When enough discussion has occurred in the discussion table, the primary author of the respective assignment part reviews his/her work in Google Docs as per the group’s discussion. When a newer draft is prepared, further collaboration will be invited using the **Comment** function of Google Docs. To this end, the assignment part status in the status file is set by the primary author to **“Submit Final Comments”**. The other Group members will then enter in line

comments (if such exist) using the **Comment** function (as shown in Figure 4.4).

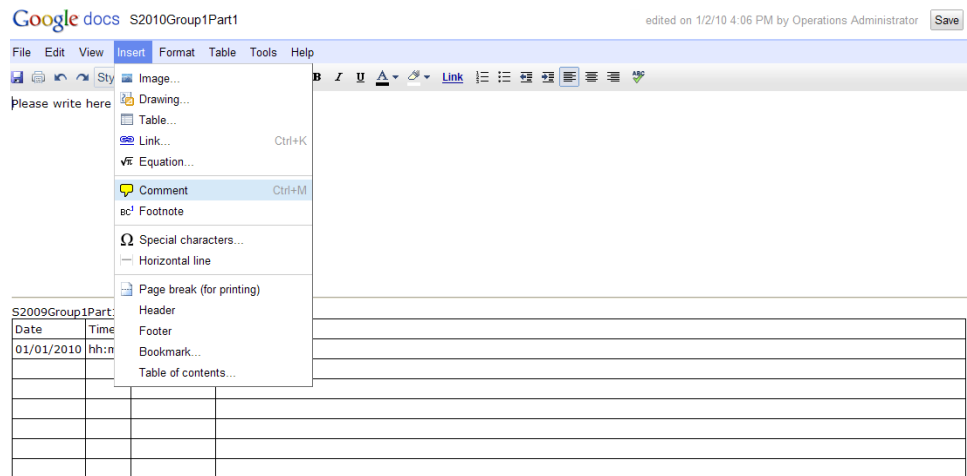


Figure 4.4: Using the Comment Function of Google Docs

The entered comments appear with a different colour in the document (see Figure 4.5). Please make sure that you do not accidentally delete your user name (automatically inserted by Google Docs) as this will be used as part of your collaboration participation assessment.

The input resources **type here -Operations Administrator 06/01/2010 12:13** used by the operation can be distinguished into input transforming and input transformed resources. The input transforming resources include the operation's staff, machinery and premises while the input transformed resources include

Figure 4.5: Inserting In Line Comments

When the group has completed entering their in line comments, the primary author either accepts a comment and inserts it into the text or rejects it by deleting it (please see Figure 4.6). Of course the primary author can also modify an inserted comment.

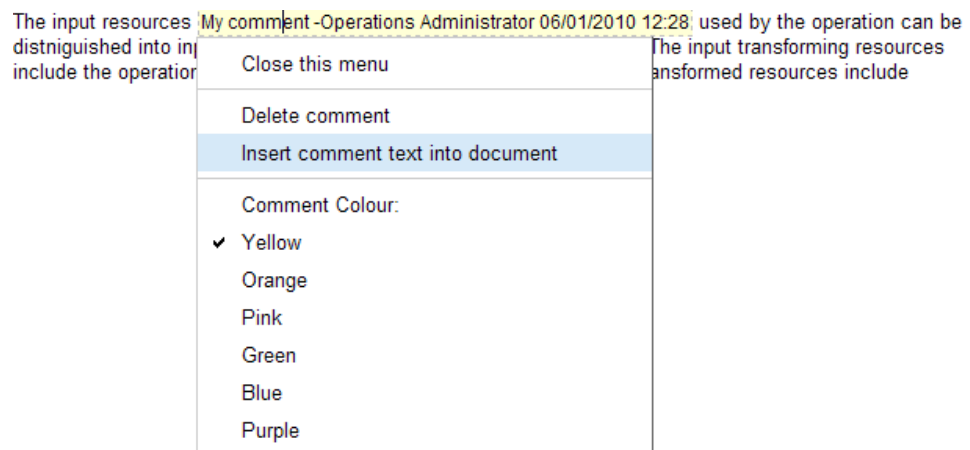


Figure 4.6: Accepting or Deleting In Line Comments

After considering all in line comments the primary author finalizes the assignment part and updates its status in the status file **S2010GroupnStatus** to **“Finalized”** (filling also the completion date). The team is now ready to move on to the next assignment part!

5. Further Collaboration Using E-mail (e.g. Gmail) and Google Chat

While Google Docs is the principal online collaboration tool to be used for developing the assignment, students can also optionally exchange e-mails using the provided **Gmail** ids or chat online using **Gmail Chat** as explained below. Students can access their Gmail (e-mail in Google) using the second link (**Gmail: email and chat from Google**) in the Useful Bookmarks window of the website as shown in Figure 5.1.

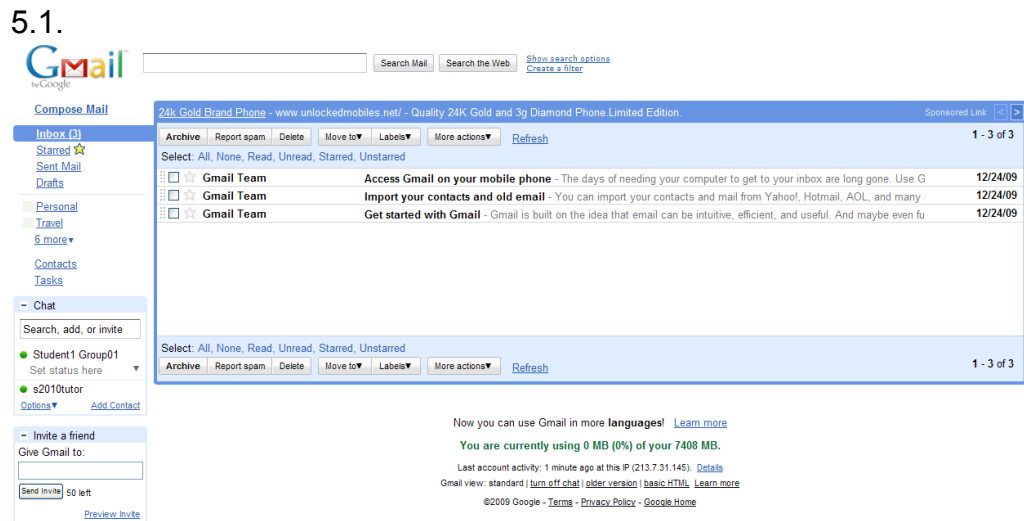


Figure 5.1: Accessing Gmail

Students can also have online chats by using the **Chat** function of Gmail (Chat window at the left – bottom column of Figure 8) as shown in Figure 5.2.

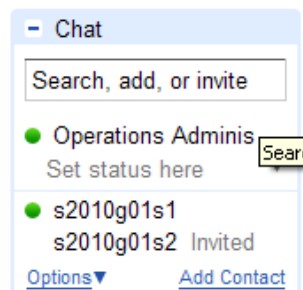


Figure 5.2: The Chat Function of Gmail

Students can invite for the first time their teammates (if these are not already shown in the chat window) for a chat using the [Add Contact](#) link at the bottom right of Figure 5.2 at which point Figure 5.3 appears.

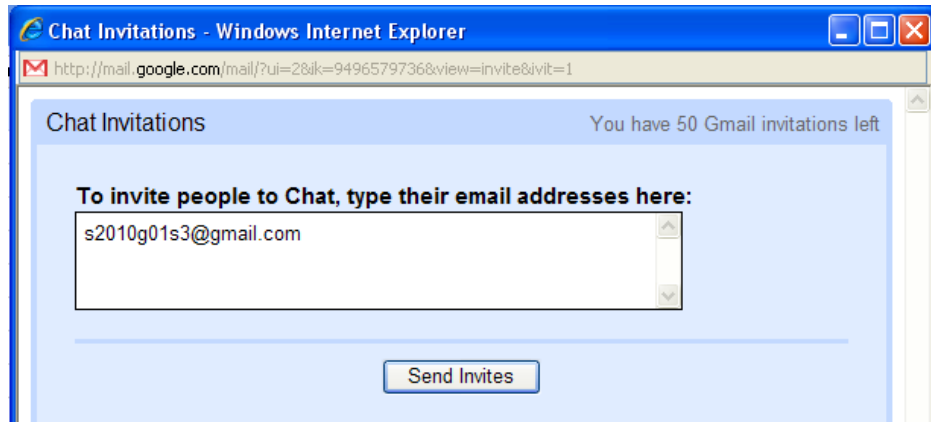


Figure 5.3: The Chat Function of Gmail

When their teammates accept the invitation they will appear in the Chat window (Figure 5.2) with a status solid circle to their left. When the specific teammate is online (and therefore available to chat) the solid circle is green (e.g. student s2010g01s1 in Figure 5.2). Please note that in order for the invited teammates to appear in the Chat window, this window must be expanded and not collapsed as shown in Figure 5.3.

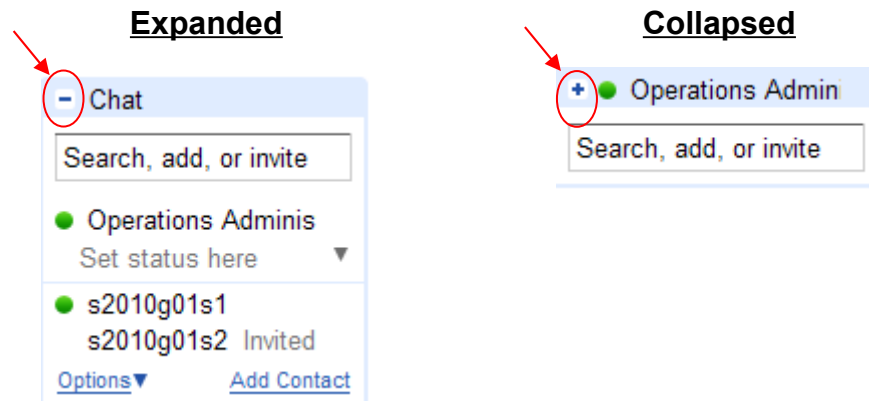


Figure 5.3: Expanding the Chat Window

Students can select their teammates who are online (as mentioned already, this is indicated by a green solid circle to the left of their names) by clicking on their names in the chat window. A chat box opens as shown in Figure 5.4 in order to chat with the selected person.

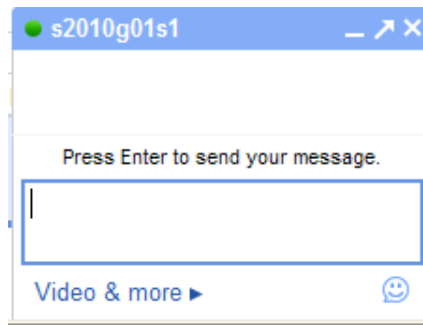


Figure 5.4: Gmail Chat Box

More persons can join the chat by selecting **Video & More** at the bottom left and selecting **Group chat** as shown in Figure 5.5.

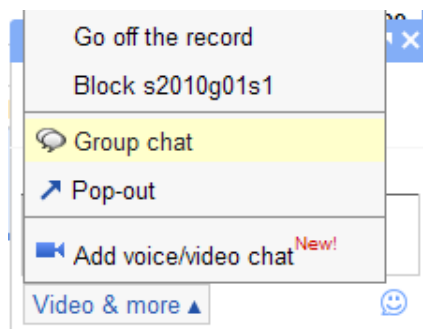


Figure 5.5: Adding More Persons in the Online Chat (Group Chat)

Please note that in case you hold an online chat with your teammates for discussing the assignment and you want this chat to count towards your team collaboration then you should send a copy of this chat to s2010tutor@gmail.com. For Gmail chat this is achieved by selecting **Chats** in the leftmost column of Gmail in order to display all saved chat conversations as shown in Figure 5.6 (in Gmail all chat conversations are saved automatically). You can use the Gmail account of any teammate participating in the chat for accessing the saved chat conversation.

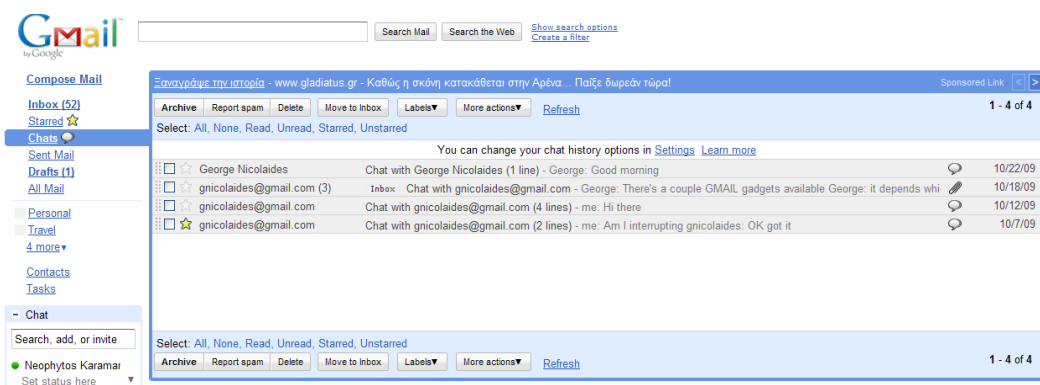


Figure 5.6: Displaying the Saved Chat Conversations in Gmail

Open the specific chat conversation you want by clicking on it (see Figure 5.7)

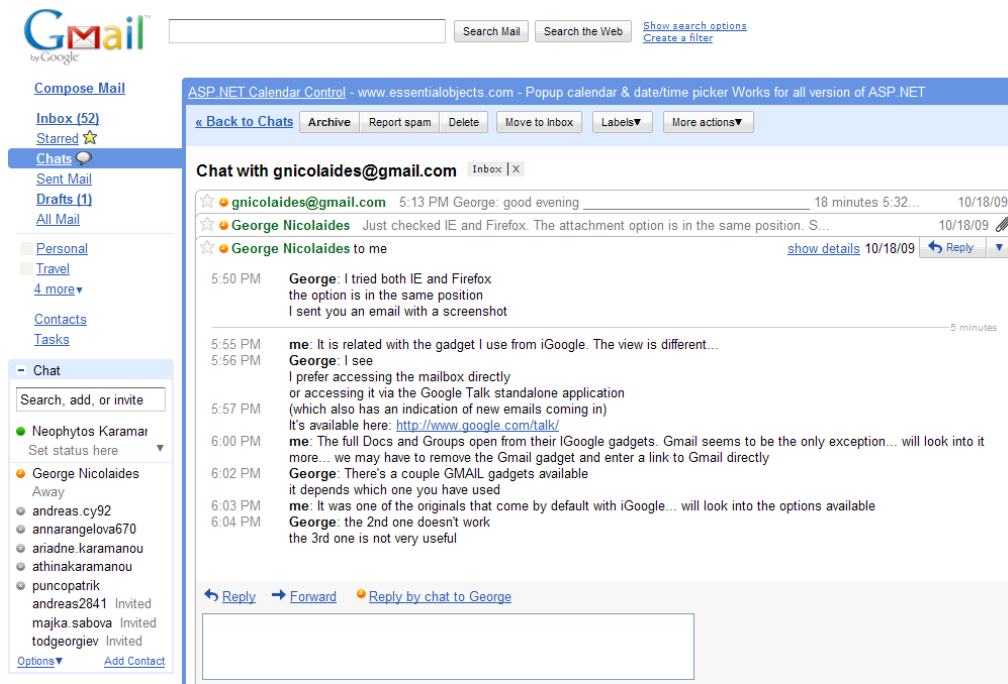


Figure 5.7: Opening the Saved Chat Conversations in Gmail

The last step is to press **Forward** at the bottom-left of Figure 5.7 and send it to s2010tutor@gmail.com.

In case you and your teammates prefer to have the Chat using **Windows Live Messenger**, you can highlight and copy the discussion as shown in Figure 5.8 and then paste it in an e-mail to be sent to s2010tutor@gmail.com.

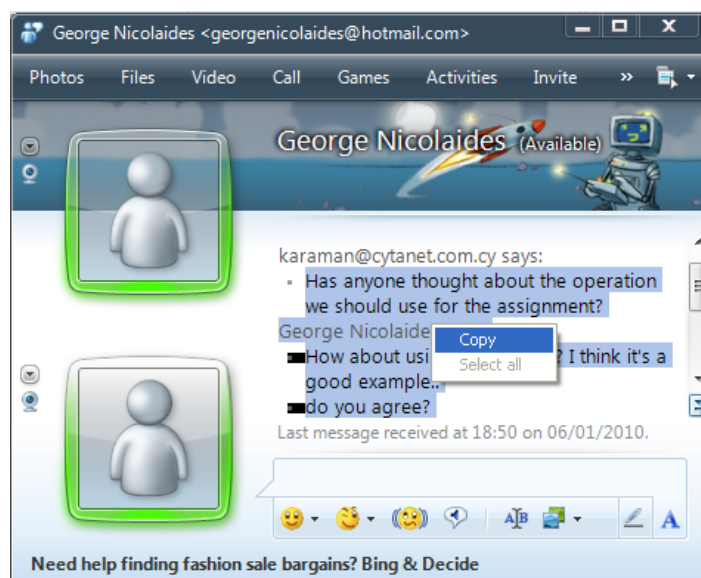


Figure 5.8: Chatting Using the Windows Live Messenger

6. Sending e-mails to Your Teammates

You can easily send an email to your teammates using Gmail as described above. Alternatively, you can also send an e-mail from Google Docs to your teammates (for example to invite them to enter their feedback in the discussion table) using the “Share” function as shown in Figure 6.1.



Figure 6.1: Using the Share Function to Send E-mails I

Select “Invite people” and then in the next window displayed select the tab “People with access” as shown in Figure 6.2.

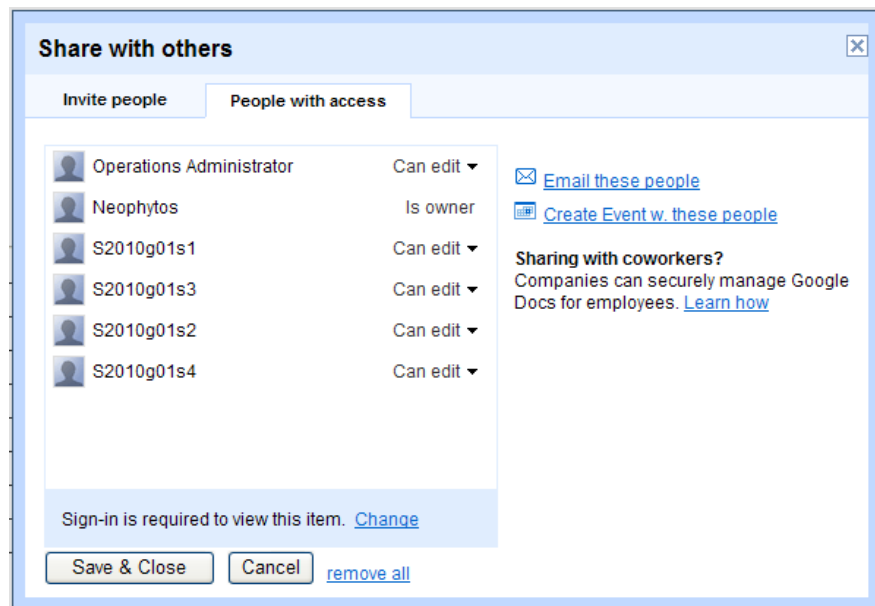


Figure 6.2: Using the Share Function to Send E-mails II

Then select “Email these people” at which point Figure 6.3 is displayed.

Send message

To:
karaman500@gmail.com,
s2010g01s1@gmail.com,
s2010g01s3@gmail.com,
s2010g01s2@gmail.com,
s2010g01s4@gmail.com

Subject:
S2010Group1Part1

Message:
Dear teammates,
Part 1 of the assignment is now ready for your feedback. Please provide your comments in the discussion table.

Send a copy to myself

Send **Cancel**

Figure 6.3: Using the Share Function to Send E-mails III

Fill in your desired message and then press the “Send” button in order to send the desired e-mail to your teammates.

7. Obtaining Support

Students can obtain support by sending an e-mail to s2010tutor@gmail.com or contacting:

- George Nicolaidis (Teaching Assistant) at tel. nnnnnnnn
- Neophytos Karamanos (Lecturer) at tel. nnnnnnnn

Students can also seek support by pressing the link **Support** (included in the left sidebar of the website) at which point Figure 7.1 is displayed.

The screenshot shows a web page titled "MBA 670 Assignment" with a search bar in the top right. On the left is a sidebar with navigation links: Home, Announcements, Assignment Brief, Assignment Instructions, Support (highlighted), Sitemap, and Edit sidebar. The main content area is titled "Support" and features a green speech bubble icon next to the link "Online Support". Below this, a paragraph explains that a green bullet indicates the teaching assistant or lecturer is available online for real-time support. Further down, there is a section for "Attachments (1)" listing a GoogleDocs file "Getting Started Guide.pdf" with "View" and "Download" links. At the bottom, there is an "Attach a file" section with a "Browse..." button and a "Comments (0)" section.

Figure 7.1: Using the Support Link

If the bullet to the left of the link **Online Support** at the top of figure 7.1 is green then either the teaching assistant or the lecturer is available online and the student can get support by chatting online with them (by clicking on the link **Online Support**). Note that the support page may include also other support resources such as guides and tutorials as attachments.

Important Note:

- **Remember always that you are using a browser environment. You may have to press the browser refresh page button on such occasions in order to see the results of your actions or to resolve temporary hang-ups.**

APPENDIX A4.2

Lab Guide

MBA 670 Collaborative Assignment – Lab Exercise

1. Introduction

Google Docs makes creating, editing and sharing documents, spreadsheets and presentations simple and free. Your documents are stored safely online, so you can access them any time, from any computer with an Internet connection. You only need an Internet browser, such as Internet Explorer / Mozilla Firefox / Chrome, etc.




Figure 1.1: Document Collaboration

Google Docs provides a familiar interface that resembles Microsoft Office. It certainly does not have the hundreds of features that Office possesses. For example, you won't have a huge library of fonts or complex formatting options, but it has enough features to satisfy basic word processing needs required for this course. Google Docs will allow you to create tables, insert images, make bulleted lists, and spell-check.

2. Edit a Document

To get started, go to <https://sites.google.com/site/mba670assignment> (assignment website) and sign in using the test Google account (Username:

s2010test, Password: operations2010). Then click on the **Google Docs** bookmark.



A Gmail account will get you access both to Gmail and Google Docs as well as the other free programs offered through Google.
Google Docs can also be accessed directly via <http://docs.google.com>

Once you have successfully logged in, you should be able to see all the documents available for editing, as shown in figure 2.1 below.

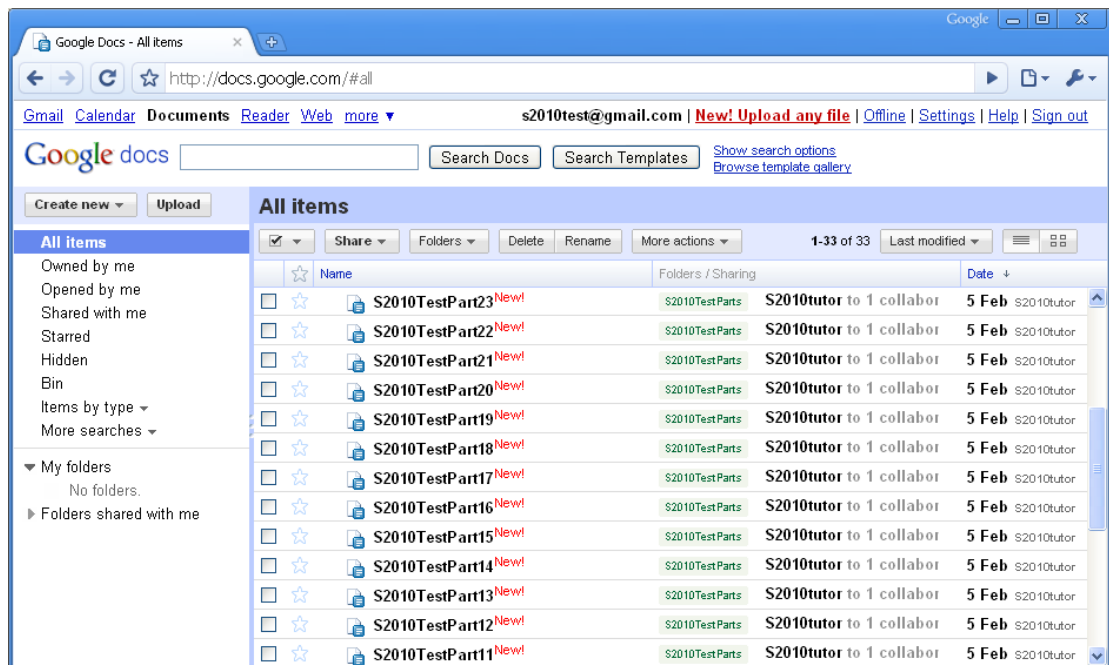


Figure 2.1: Assignment Parts

Click on the test assignment part allocated to you, to check out the features available by Google Docs.

3. Toolbar

The toolbar allows you to Save the document, Print it, Change the formatting and alignment, Insert Images, etc.

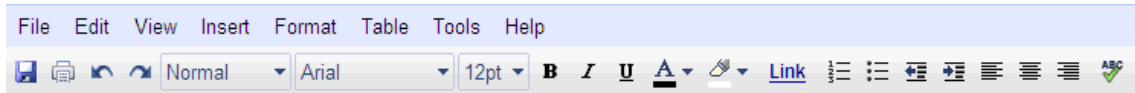


Figure 3.1: Google Docs Menu and Toolbar

Point (and hover) your cursor to the buttons of the toolbar, to learn more about each option. An explanation of the toolbar icons is shown in figure 3.2.

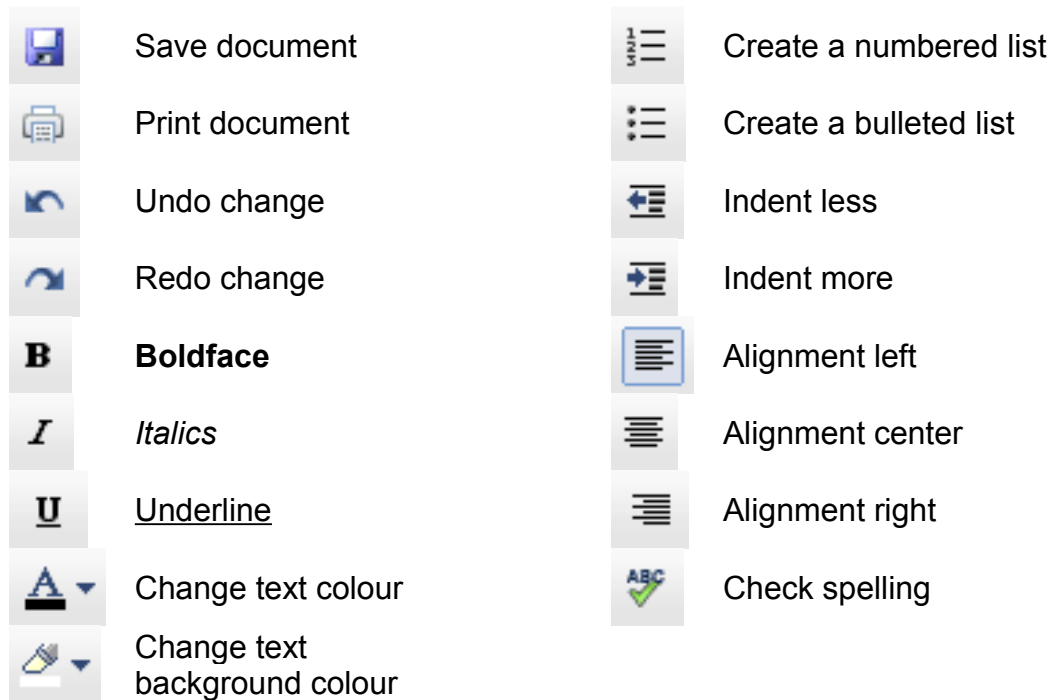


Figure 3.2: Toolbar Icons

4. Writing Text

Try out the different options available on the toolbar, in your document, by recreating this text extract:

Operations Management

Operations management is an area of business concerned with the production of goods and services, and involves the responsibility of ensuring that business operations are *efficient* in terms of using as little resource as

needed, and *effective* in terms of meeting customer requirements. It is concerned with managing the **process** that converts inputs (in the forms of materials, labour and energy) into outputs (in the form of goods and services). (Wikipedia, 2009)

Check your document for spelling mistakes, after you have finished, using **Tools > Check Spelling**.

5. Creating Drawings

To start creating drawings in GoogleDocs, click **Insert > Drawing**. Then, select the type of object you would like to insert from the toolbar. Once you have created your drawing, click **Save & Close** at the top right of the canvas to close the window and insert the drawing into your doc. Try to recreate the drawings shown in figure 5.1:

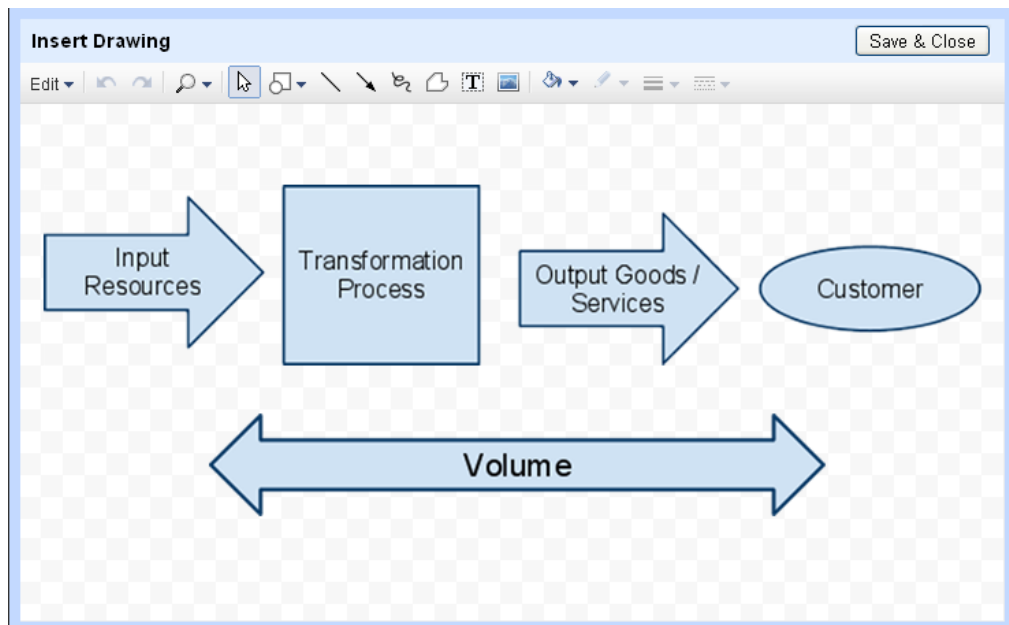


Figure 5.1: Drawing Editor



To duplicate a shape, just hold the Ctrl key while dragging the shape.

Saving images from Lecture Slides

Images contained in the lecture PowerPoint slides can also be included in Google Docs. The Lecture 1 slides can be found in the assignment website <https://sites.google.com/site/mba670assignment> by clicking on the Support link (in the left Navigation Bar). The file (**Lecture 1.ppt**) is located in

the Attachments section, as shown in figure 5.2, and can be saved / opened on your PC by clicking on the download link.

Attachments (3)




-  GoogleDocs Getting Started Guide.pdf - on Jan 31, 2010 5:33 PM by Operations Administrator (version 1)
1251k [View](#) [Download](#)
-  Lecture 1.ppt - on Feb 7, 2010 11:49 AM by Operations Administrator (version 1)
2465k [View](#) [Download](#)
-  StudentInstructionsV6.pdf - on Jan 31, 2010 6:52 PM by Operations Administrator (version 1)
1009k [View](#) [Download](#)

Figure 5.2: Download Lecture Notes

After you **download** and **open** the Lecture slides in PowerPoint, edit the objects you would like to use (e.g. change the text). Then highlight them by clicking and dragging the mouse across them, as shown in figure 5.3. Once your selection is highlighted, right click on any of the object outlines and click on **Save as Picture**.

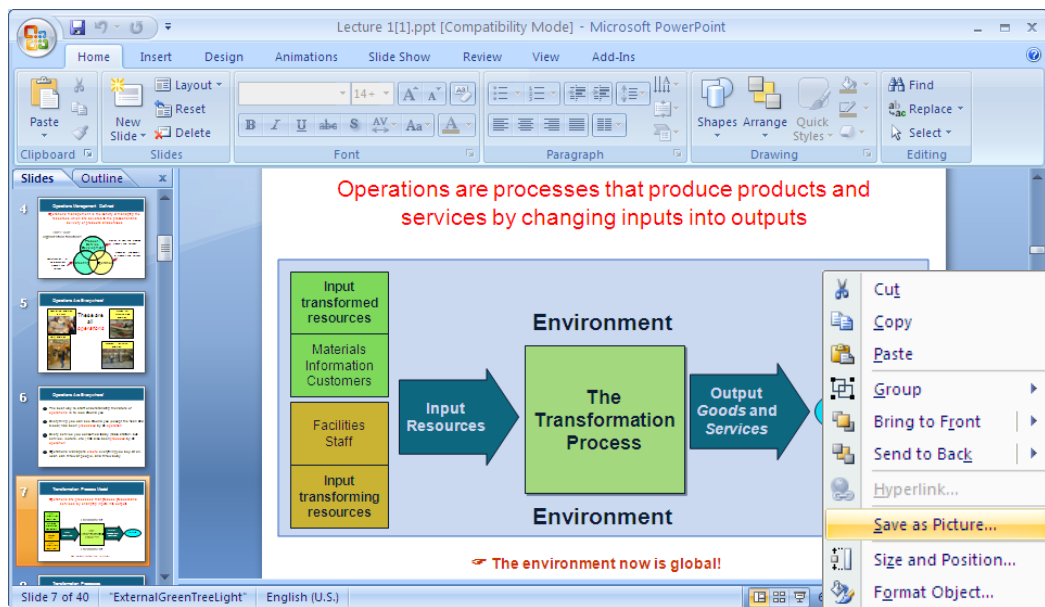


Figure 5.3: Editing / Saving Images in PowerPoint

Save the picture on the **Desktop**, with the file name **Picture1.jpg**, as shown in figure 5.4, and continue with the instructions to add it in your document.

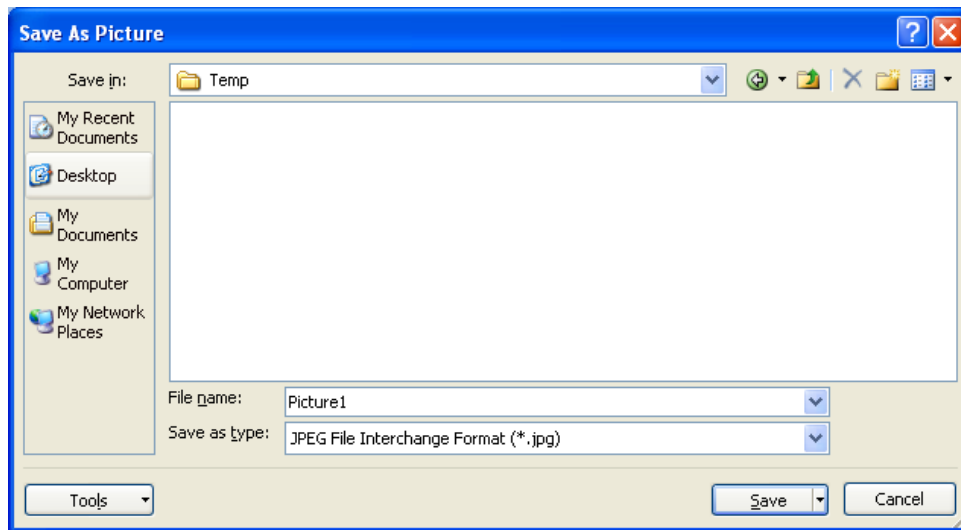


Figure 5.4: Saving a Picture in PowerPoint

Adding images to your document

To insert an image into your document, follow these steps:

1. Click **Insert > Image**
2. In the window that appears, click **Browse**.
3. Select the image you would like to insert (in this case click on **Desktop** and select **Picture1.jpg**)
4. Click **OK**.

You can resize the image by dragging one of the resize (white) handles, and the image will expand and contract with your cursor's movement. Images can be resized to scale by holding the Shift key while dragging a corner resize handle. To flip an image, click **Edit > Rotate**, and select **Flip horizontally** or **Flip vertically**.

6. Creating Tables in your Document

To insert a table in your document, follow these steps:

1. Click **Table > Insert table**
2. Select the number of Rows and Columns of the table

3. Set the column width of the table
4. Click **insert**

Try to recreate the table shown below:

| Column 1 | Column 2 | Column 3 |
|----------|----------|----------|
| Row 2 | | |
| Row 2 | | |



Use 3 Rows x 3 Columns and set the width to 'adjust to content'.

7. Adding comments

Comments are a handy way of adding notes to your regular document text and are visible to your group collaborators. These can be invaluable for communicating with your group about specific parts of the document, as well as making notes about changes you've made or would like to make.

To add a comment to your document, follow these instructions:

1. Place your cursor where you'd like your comment to appear.
2. Click the **Insert** drop-down menu.
3. Select the **Comment** icon.

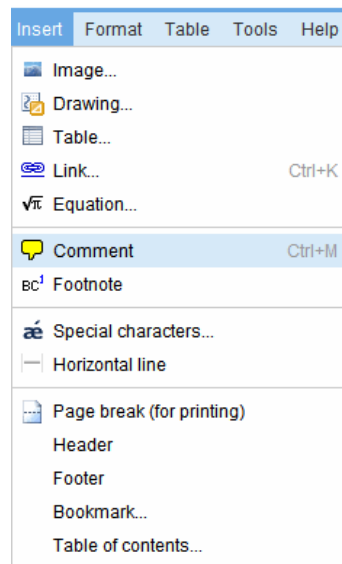


Figure 7.1: Insert Comment

4. Type your comment in the comment field. Each comment is automatically stamped with your username and the date.
5. To print your comments, go to **File > Print settings** and you will see a box called **Include comments**. This box will be checked by default.

A useful tip: If you'd like a shortcut, you can also use the keyboard shortcut, Ctrl + M (Cmd + M for Mac), to insert a comment.

To delete a comment, simply click on it and choose **Delete comment** from the menu.

8. Revision history

While you and your collaborators are editing a document, you can keep track of changes (and of the person who made them), and even revert to an older version by using 'Revision history.' From your document, click **File > See revision history**.

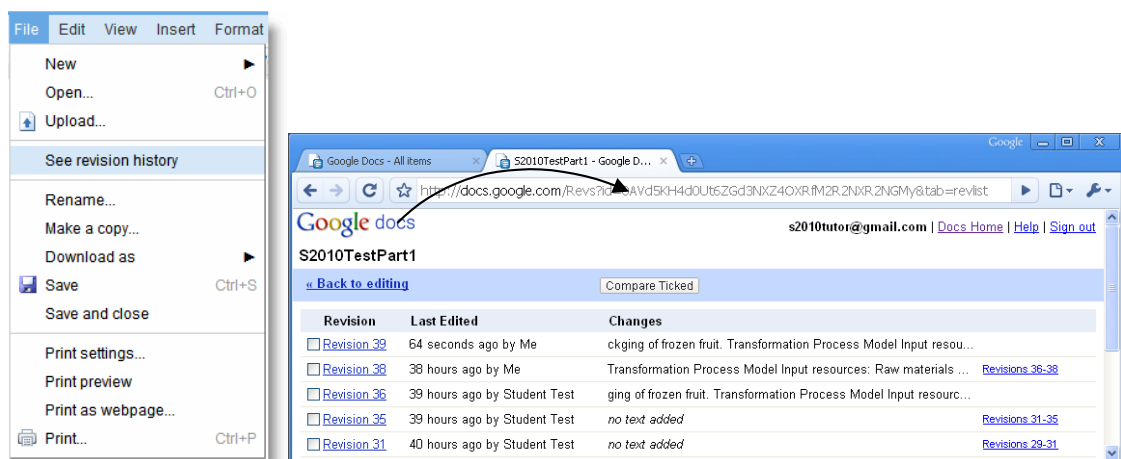


Figure 8.1: File Revision History

On the next page, you'll see a list of the revisions, the date and time each was last edited, and the changes made. You can also compare two revisions at a time.

If you change your mind about the most recent edits you or your collaborators made to the document, simply revert to an older version. Here's how:

1. Click any revision from the list you see. If you select the wrong one, you can click **Older** or **Newer** until you find the version you want.
2. Click **Revert to this one** on the right side of the page.

Your document is reset to the version you selected. When your collaborators view this file, they will see the version you selected. To return back to your document, click on **Back to editing**.

9. Discuss a Section of your Document

Use the Discussion table at the bottom of the page, to post a comment about your document. Your group can use this space to post comments and provide feedback, without modifying the original document, as per the example in figure 9.1.

S2010TestPart1 Discussion:

| Date | Time | User | Comment |
|------------|-------|--------|--|
| 02/02/2010 | 20:51 | Maria | I believe that the emphasis of the taxi service is on speed rather than cost. Do you agree? |
| 02/02/2010 | 21:05 | George | I completely agree! The taxi can take you from point A to point B faster than a bus, since it doesn't make any stops in between, but costs more. |

Figure 9.1: Document Discussion

10. Saving and Closing

Once you have completed your tasks, click on **Save & Close** button, to save your work and close the document.

Now try to open any other Part available, e.g. the Part of the person sitting next to you, and leave a comment in it (as per the instructions in Section 7). Check if any comments have been added in your own document.

11. Document Status

Once you have saved your document, open the assignment status file S2010TestStatus, as shown in Figure 11.1. Find the entry for your allocated part and change its status to any of the following:

- Not Started
- Work in Progress
- Submit Feedback
- Finalised

If you complete this step successfully, the colour of the status cell should change accordingly, as shown in Figure 11.1.

| Part | Description | Primary Author (Google ID / Name) | Start Date | Completion Date | Status |
|------|--|-----------------------------------|------------|-----------------|-----------------------|
| 1 | Introduction | s2010g01s1 George Nicolaidis | 01/12/2009 | 31/12/2009 | Finalised |
| 2 | Operation strategy | s2010g01s1 George Nicolaidis | 14/12/2009 | | Submit Final Comments |
| 3 | Process and supply network design | s2010g01s1 George Nicolaidis | 02/01/2010 | | Submit Feedback |
| 4 | Operation layout, technology and job design | | | | Work in Progress |
| 5 | Capacity management and scheduling | | | | Work in Progress |
| 6 | Inventory management and supply chain relationships | | | | Not Started |
| 7 | MRP, JIT and lean philosophy | | | | Not Started |
| 8 | Quality management | | | | Not Started |
| 9 | Assessing operation performance and finding areas of improvement | | | | Not Started |
| 10 | Implementing an improvement project | | | | Not Started |

| | | |
|---------|-----------------------|---|
| Status: | Not Started | Part not started |
| | Work in Progress | Primary author currently works on part |
| | Submit Feedback | Waiting for feedback using the discussion table |
| | Submit Final Comments | Waiting for final in line comments |
| | Finalised | Part completed |

Figure 11.1: The Assignment Status File

The Assignment Status File is an easy way to keep track of the assignment progress. You should check it regularly, to see if any of your group members are requesting feedback for their part and update them with the status of your parts.

12. Use Keyboard Shortcuts

Following are some of the many shortcuts you can use to make creating and collaborating on Docs more efficient.

| | | Documents | Spreadsheets | Presentations |
|----------------------|------------------|-----------|--------------|---------------|
| Undo | Ctrl + Z | ✓ | ✓ | ✓ |
| Redo | Ctrl + Y | ✓ | ✓ | ✓ |
| Cut | Ctrl + X | ✓ | ✓ | ✓ |
| Copy | Ctrl + C | ✓ | ✓ | ✓ |
| Paste | Ctrl + V | ✓ | ✓ | ✓ |
| Print | Ctrl + P | ✓ | ✓ | ✓ |
| Find and replace | Ctrl + ... | Ctrl + H | Ctrl + F | |
| Bulleted list | Ctrl + Shift + L | ✓ | | |
| Insert comment | Ctrl + M | ✓ | | |
| Insert slide | Ctrl + M | | | ✓ |
| Remove formatting | Ctrl + Spacebar | ✓ | | |
| Select entire column | Ctrl + Spacebar | | ✓ | |
| Select entire row | Shift + Spacebar | | ✓ | |
| View slideshow | F5 | | | ✓ |

Visit <http://docs.google.com/support> and search on 'keyboard shortcuts' for a complete list of shortcuts.

13. Access Docs from Anywhere

Because your docs are stored securely online, you can access them from anywhere, from any computer with an Internet connection and a standard browser. It is easy to export or download your docs in a variety of formats, including Word (DOC), PDF and others – just select **File > Download file as**.

APPENDIX A5.1

Cross-Tabulations Relating Adoption results vs. Student Characteristics

1. Age Vs. Adoption Factors and Concerns

| | Age = 25 years or younger (18 students) | Age = 26-35 years old (20 students) | Age = 36-45 years old (3 students) |
|---|--|--|---------------------------------------|
| 1 : Trialability | 0.2 | 0.2 | 0.3 |
| 2 : Relative advantage | 0.9 | 1.0 | 1.0 |
| 3 : Complexity | 0.6 | 0.7 | 0.3 |
| 4 : Compatibility | 0.2 | 0.4 | 0.7 |
| 5 : Providing continuous assistance | 0.3 | 0.6 | 0.7 |
| 6 : Planning and providing resources | 0.2 | 0.1 | 0.3 |
| 7 : Other change facilitator action | 0.3 | 0.3 | 0.0 |
| 8 : Investing in professional learning | 0.4 | 0.6 | 0.7 |
| 9 : Communicating a shared vision for change | 0.6 | 0.3 | 0.0 |
| 10 : Checking on progress | 0.1 | 0.3 | 0.0 |
| 11 : Teammate actions or attitudes | 0.4 | 0.3 | 0.7 |
| 12 : Other student actions or attitudes | 0.3 | 0.5 | 0.0 |
| 13 : Will I have the necessary time to devote to learn it | 0.3 | 0.3 | 0.3 |
| 14 : Will I be able to use it effectively | 0.5 | 0.7 | 0.3 |
| 15 : Will I be able to get the needed help | 0.4 | 0.1 | 0.3 |
| 16 : learn how of use it | 0.6 | 0.5 | 0.7 |
| 17 : Know more about the innovation | 0.6 | 0.5 | 0.3 |
| 18 : Positive | 0.9 | 0.9 | 1.0 |
| 19 : Negative | 0.1 | 0.2 | 0.3 |
| 20 : Indifferent | 0.3 | 0.3 | 0.3 |

2. Gender Vs. Adoption Factors and Concerns

| | Gender = Male (20 students) | Gender = Female (21 students) |
|---|--------------------------------|----------------------------------|
| 1 : Trialability | 0.2 | 0.2 |
| 2 : Relative advantage | 1.0 | 1.0 |
| 3 : Complexity | 0.6 | 0.7 |
| 4 : Compatibility | 0.5 | 0.2 |
| 5 : Providing continuous assistance | 0.5 | 0.4 |
| 6 : Planning and providing resources | 0.1 | 0.2 |
| 7 : Other change facilitator action | 0.4 | 0.2 |
| 8 : Investing in professional learning | 0.6 | 0.4 |
| 9 : Communicating a shared vision for change | 0.4 | 0.4 |
| 10 : Checking on progress | 0.2 | 0.2 |
| 11 : Teammate actions or attitudes | 0.4 | 0.4 |
| 12 : Other student actions or attitudes | 0.3 | 0.5 |
| 13 : Will I have the necessary time to devote to learn it | 0.3 | 0.3 |
| 14 : Will I be able to use it effectively | 0.6 | 0.6 |
| 15 : Will I be able to get the needed help | 0.2 | 0.3 |
| 16 : learn how ot use it | 0.5 | 0.5 |
| 17 : Know more about the innovation | 0.5 | 0.5 |
| 18 : Positive | 0.9 | 1.0 |
| 19 : Negative | 0.2 | 0.1 |
| 20 : Indifferent | 0.3 | 0.3 |

3. Willingness to Try New Products Vs. Adoption Factors and Concerns

| | I usually wait until they are fully accepted in the market (3 students) | I usually wait until they are somewhat accepted in the market (12 students) | I usually wait until someone else tries them first (11 students) | I prefer to be among the first to try them (15 students) |
|---|---|---|--|--|
| 1 : Trialability | 0.3 | 0.1 | 0.5 | 0.1 |
| 2 : Relative advantage | 1.0 | 1.0 | 0.8 | 1.0 |
| 3 : Complexity | 0.7 | 0.6 | 0.7 | 0.5 |
| 4 : Compatibility | 0.0 | 0.3 | 0.5 | 0.4 |
| 5 : Providing continuous assistance | 0.3 | 0.6 | 0.5 | 0.3 |
| 6 : Planning and providing resources | 0.3 | 0.3 | 0.1 | 0.1 |
| 7 : Other change facilitator action | 0.7 | 0.4 | 0.1 | 0.2 |
| 8 : Investing in professional learning | 0.3 | 0.7 | 0.5 | 0.3 |
| 9 : Communicating a shared vision for change | 0.3 | 0.5 | 0.4 | 0.4 |
| 10 : Checking on progress | 0.0 | 0.2 | 0.4 | 0.1 |
| 11 : Teammate actions or attitudes | 0.3 | 0.2 | 0.6 | 0.3 |
| 12 : Other student actions or attitudes | 0.3 | 0.4 | 0.4 | 0.4 |
| 13 : Will I have the necessary time to devote to learn it | 0.7 | 0.3 | 0.2 | 0.3 |
| 14 : Will I be able to use it effectively | 0.7 | 0.5 | 0.5 | 0.7 |
| 15 : Will I be able to get the needed help | 0.0 | 0.2 | 0.2 | 0.4 |
| 16 : learn how to use it | 0.7 | 0.6 | 0.4 | 0.5 |
| 17 : Know more about the innovation | 0.3 | 0.5 | 0.5 | 0.5 |
| 18 : Positive | 0.7 | 0.9 | 0.9 | 1.0 |
| 19 : Negative | 0.0 | 0.2 | 0.2 | 0.1 |
| 20 : Indifferent | 0.3 | 0.3 | 0.4 | 0.2 |

APPENDIX A6.1

Studying the Adoption and Learning Processes of Online Interactivity

EXECUTIVE SUMMARY REPORT

This executive summary report has been produced as part of the author's project titled "Studying the Adoption and Learning Processes of Online Interactivity", undertaken towards satisfying the requirements for the degree of Doctor in Professional Studies at Middlesex University. The setting for this action research project was a graduate MBA class (MBA 670: Operations and Quality Management) delivered at the University of Nicosia during the Spring, 2010 semester. Undertaken as part of the university's numerous e-learning initiatives, the present research aspires to contribute in a practical way to the increased use of a selected aspect of e-learning (online interactivity) at the University of Nicosia.

The Problem of e-Learning Diffusion

We live in an era of frantic change caused predominantly by the dramatic advances in technology. The need for learning institutions to understand how to best integrate technology in their systems, pedagogical approaches and learning processes and how to diffuse the use of such technology among students and faculty has never been more important. Indeed, educational institutions and corporations are increasingly adopting information and communication technologies (ICT) as tools for learning, collaboration, communication, course administration, and curriculum design, giving rise to the domain we refer to as e-learning. E-learning is considered to be the most important educational innovation of the last decades and can be seen as consisting of two main blended dimensions (Elgort, 2005): e-learning technologies (e.g. learning management systems) and e-learning pedagogy (e.g. student centred, problem-based, collaborative learning). It is the e-learning pedagogy dimension that is considered by most scholars (Zemsky and Massy, 2004; Elgort, 2005) as the most powerful part and the one that has the potential to truly revolutionize learning. Studies have shown that, while the diffusion of e-learning technologies has progressed well in academic institutions, e-learning pedagogy is still stuck at the innovator stage, unable to achieve any significant use by the large majority of students and faculty.

Online Interactivity and Learning Environment

In an attempt to understand better some of reasons for the failure of e-learning (especially the pedagogy aspect) to achieve widespread adoption, the present study focuses upon a selected key aspect of e-learning, online interactivity, which is defined as two-way online interactions among two or more learning participants (e.g. students, educators and learning materials) through which collaborative learning is achieved. In simple terms, online interactivity means providing to students appropriate Internet-based facilities (such as electronic conferences, wikis, blogs, chat rooms etc.) to access relevant learning material, discuss and exchange views on raised issues, co-author their group work and receive guidance and feedback by tutors. In such an environment, learning is approached as a collaborative process based on the participation learning metaphor (Sfard, 1998) and social constructivism principles (Vygotsky, 1978). Students advance their learning through group interaction, by communicating different perspectives, receiving feedback from other students and tutors, and discussing ideas, until a final negotiation of new understanding is achieved.

The setting selected for the study was a graduate MBA class delivered through a combination of face-to-face (the class lectures) and online (the class project) interaction. For the online part, a case-based learning scenario was adopted in which students were called to collaboratively diagnose and solve authentic problems relevant to the class subject matter. To this end, the students were required to select an actual business organization on which to base their project. They were also required to work in teams and collaboratively analyse the selected business operation, identify any problems / weaknesses, propose possible solutions and finally select the most appropriate solution and prepare an improvement change plan. An online constructivist learning environment was developed for the purposes of the study, embedding online interactivity, and providing facilities for the students to access the required information resources and collaborate online with their group partners.

One of the key decisions the author had to take during the study was the selection of the actual application platform on which to implement the online learning environment. The choices considered included on one hand some of the widely available (and free) Web 2.0 collaborative facilities provided, for example, by Google or Microsoft, and on the other hand some of the more traditional course management systems (CMS) such as Moodle or WebCT

available at the University of Nicosia. As explained in the study, the choice was rather straightforward, strongly favouring the free Web 2.0 facilities which were found to be more familiar to students, exhibiting higher ease of use and robust 24 /7 availability, providing extremely powerful co-working functionality while at the same time being easier to implement and support.

Main University Benefits from the Increased Use of Online Interactivity

Increased use of online interactivity in academic programs can potentially provide the University of Nicosia with several advantages as follows:

- The current positioning of the university towards the establishment of increased links with the industry and the provision of more applied educational programs is facilitated by the provision of collaborative learning environments as outlined above which focus on the resolution of problems in real life business settings. Purposeful collaboration also allows students to share their relevant experiences and viewpoints, achieving a more comprehensive and practical understanding of the situation examined and the options available. The whole collaborative experience allows students to develop valuable problem-solving skills which are particularly useful in the work environment.
- Online collaboration allows students to overcome the barriers of time and place. This can benefit many of the university's students, especially busy professionals and overseas students. Busy professionals, admittedly, do not have the time required to hold regular face-to-face meetings in order to discuss and exchange views on group work. Collaborating online provides more flexibility and releases some of the strain of physical meetings. Overseas students can also benefit from the provision of online collaborative environments. They could, for instance, work on group projects while not physically present at the university (e.g. when visiting their home countries or when attending preparatory classes prior to their initial arrival to Cyprus).
- Embedding online collaborative facilities in educational programs can aid in building a progressive, technologically advanced image for the university which can be used to attract new students. Actually the ability to learn something new involving latest technology was perceived as a major advantage by the students that participated in the study.

- Another major benefit for the university is that the provision of online environments which utilize the widely and freely available Web 2.0 facilities (like the one developed for the study) does not entail any substantial investment cost for the university. As the various facilities are available for free, the only cost is related to the educator time to set-up the final environment and monitor the student interactions during the actual course delivery.

Adoption Model for Online Interactivity

Given the already discussed current failure of e-learning (especially the pedagogy aspect) to achieve widespread adoption, how can then one achieve wider use of e-learning components, such as online interactivity, among students and educators? The conducted literature review has indicated that, to date, researchers have seldom approached the issue of e-learning adoption from the dimension of being fundamentally a problem of technological innovation diffusion among students and educators, thus failing to utilize effectively the relevant theories and models. Recognizing this gap, the study was informed by the dominant theories in both the general innovation diffusion perspective (emphasizing the decision to adopt or not a proposed innovation) and also the more specific educational change perspective (emphasizing the actual implementation of the innovation in educational settings). The subject of innovation adoption was thus approached comprehensively by considering a wide range of influencing factors (perceived attributes of the new online environment such as relative advantage and complexity, educator actions, peer student actions and attitudes, student concerns and student characteristics). The findings of the study led to the development of model reflecting the observed adoption process by students for the specific innovation considered (online collaborative learning environment embedding interactivity). The developed model incorporates the various factors which were found to influence the student decision to use or not the proposed environment along with the relative importance of these factors. Knowledge of the important influencing factors allows a change facilitator (e.g. educator or instructional designer) to properly design and support the online collaborative environment, addressing hindering mechanisms and reinforcing driving forces towards improved adoption by students.

The author holds the view that, even though the adoption model developed reflects the behaviour of a specific class of students towards adopting or not a specific aspect of e-learning (online interactivity), it could potentially have

wider applicability to the diffusion of other e-learning components at the university given the general technological innovation diffusion approach followed in the study.

Evaluating the Learning Processes and Individual Student Contribution

Given the novelty of the field, the study also looked at methods through which an educator can practically and efficiently discern whether knowledge co-construction among a group of learners indeed takes place or not and provide accordingly appropriate pedagogical support to them. To this end, the study was informed by two of the most influential models for interaction analysis encountered in the literature: the interaction analysis model proposed by Henri (1992) and also the model proposed by Gunawardena et al. (1997) for knowledge co-construction.

The model proposed by Gunawardena et al. was found to provide a very promising foundation for evaluating the learning processes involved, allowing efficient classification of distinct student interactions into: interactions exhibiting lower level learning processes, interactions exhibiting higher level learning processes and superficial contributions. Gunawardena's model was also found to provide a good basis for assessing individual student contribution to online group discussions. To this end, an educator could simply count the number of interactions of a particular student which exhibit either lower or higher learning processes (discarding superficial contributions). The assessor could also consider assigning a different weight for the two learning process levels with contributions at the higher level counting more towards the student collaboration grade.

Overall Student Feedback and Satisfaction

The overall student feedback and satisfaction results obtained in the study were positive with most students finding the provided online collaborative environment easy to use and effective. Most students reported also that a fair amount of group learning occurred in their teams. The most frequently reported by students positive aspects of the provided online collaborative learning environment include: ability to overcome the barriers of time and place, reduced need for physical meetings, ability to learn something new involving technology, ability to receive prompt feedback by the lecturer and faster collaboration. The most frequently reported negative aspects include: absence of real-time feedback by teammates, not as rich interaction as face-

to-face (including some difficulty to explain views online) and some rather minor technical issues.

Action Plan for Wider Use of Online Interactivity at the University of Nicosia

The *educator guide* developed as part of the study includes detailed guidelines and recommendations for the design and implementation of case-based, online collaborative learning environments. The guide includes also numerous recommendations addressing the various issues and hindering mechanisms unveiled during the study. The critical role of the educator / change facilitator, during both the student adoption decision period and also during the actual implementation and use of the proposed online environment, is highlighted and a set of possible valuable interventions at each stage of the process is provided.

While the author will pursue the above recommendations in order to improve his own practice and achieve a more effective use of online interactivity by his own students, the wider diffusion of online interactivity in additional educational programs and courses provided by the University of Nicosia would require the adoption of a broader change program characterised by the following stages:

- v. Educate additional interested university faculty using the developed study outcomes (executive summary report and educator guide). Promote the value of collaborative learning and the benefits of online interactivity among faculty.
- vi. Define 1-2 additional pilot course offerings for which the author will assist the relevant faculty in designing and developing suitable case-based, online collaborative learning environments and the required change facilitator interventions. The author will also provide assistance throughout the duration of the pilot course offerings through bi-weekly progress meetings. It is expected that by the end of stage (ii), a core team of educators (the author and the pilot faculty) will be formed having the requisite skills to facilitate further implementations.
- vii. Incorporate additional recommendations and alter the learning environment / instructional design as per the feedback obtained in stage (ii).

- viii. Expand the use of online interactivity in additional program offerings as needed.

As outlined in the above change plan, the author remains committed and available to assist, based on the results of the undertaken study, in the wider diffusion of online interactivity in the university's program offerings.

References

- Elgort, I. (2005), "E-learning Adoption: Bridging the Chasm", *Proceedings of the 22nd annual conference of the Australasian Society for Computers in Learning in Tertiary Education* Brisbane: ascilite.
- Gunawardena, C.N., Lowe, C.A., Anderson, T.A. (1997), "Analysis of a Global Online Debate and the Development of an Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing", *Journal of Educational Computing Research*, 17(4), 397-431.
- Henri, F. (1992), "Computer Conferencing and Content Analysis", In *Collaborative learning Through Computer Conferencing* (ed. A. R. Kaye), pp. 117-136, Berlin and Heidelberg:Springer.
- Sfard, A. (1998), "On Two Metaphors for Learning and the Dangers of Choosing Just One", *Educational Researcher*, 27(2), 4-13.
- Vygotsky, L.S. (1978), *Mind in society: The development of higher psychological processes*. (M.M.Lopez-Morillas Cole, A.R. Luria & J. Wertsch, J. Trans.). Cambridge, MA: Harvard University Press.
- Zemsky, R., Massy, W.F. (2004), *Thwarted Innovation. What Happened to e-learning and Why*, The University of Pennsylvania, PN: The Learning Alliance.

APPENDIX A6.2

Increasing the Adoption Online Interactivity and Assessing the Learning Processes Involved

EDUCATOR GUIDE

1. Introduction

This guide has been produced as part of the author's study titled "Studying the Adoption and Learning Processes of Online Interactivity", undertaken towards satisfying the requirements for the degree of Doctor in Professional Studies at Middlesex University. The setting for this action research project was a graduate MBA class (MBA 670: Operations and Quality Management) delivered at the University of Nicosia during the Spring, 2010 semester. Undertaken as part of the university's numerous e-learning initiatives, the study had as one of its main objectives to contribute in a practical way to the increased use of a selected aspect of e-learning (online interactivity) by students and educators at the University of Nicosia. To this end, this guide includes detailed guidelines and recommendations for the design and implementation of case-based, online collaborative learning environments. It also includes a collection of appropriate interventions which can be used selectively by educators in their efforts to induce more students to make use of the proposed online environment and also to support them effectively during their entire learning experience.

1.1 Online Interactivity and Learning Environment

Online interactivity is defined as two-way online interactions among two or more learning participants (e.g. students, educators and learning materials) through which collaborative learning is achieved (Moore, 1989). In simple terms, online interactivity means providing to students appropriate Internet-based facilities (such as electronic conferences, wikis, blogs, chat rooms etc.) to access relevant learning material, discuss and exchange views on raised issues, co-author their group work and receive guidance and feedback by tutors. In such an environment, learning is approached as a collaborative process based on the participation learning metaphor (Sfard, 1998) and social constructivism principles (Vygotsky, 1978). Students advance their learning through group interaction, by communicating different perspectives,

receiving feedback from other students and tutors, and discussing ideas, until a final negotiation of new understanding is achieved.

The setting selected for the study was a graduate MBA class delivered through a combination of face-to-face (the class lectures) and online (the class project) interaction. For the online part, a case-based learning scenario was adopted in which students were called to collaboratively diagnose and solve authentic problems relevant to the class subject matter. To this end, the students were required to select an actual business organization on which to base their project. They were also required to work in teams and collaboratively analyse the selected business operation, identify any problems / weaknesses, propose possible solutions and finally select the most appropriate solution and prepare an improvement change plan. An online constructivist learning environment was thus developed for the purposes of the study, embedding online interactivity, and providing facilities for the students to access the required information resources and collaborate online with their group partners.

One of the key decisions the author had to take during the study was the selection of the actual application platform on which to implement the online learning environment. The choices considered included on one hand some of the widely available (and typically free) Web 2.0 collaborative facilities provided, for example, by Google or Microsoft, and on the other hand some of the more traditional course management systems (CMS) such as Moodle or WebCT available at the University of Nicosia. As explained in section 3 of this guide, the choice was rather straightforward, strongly favouring the free Web 2.0 facilities which were found to be more familiar to students, exhibiting higher ease of use and robust 24 / 7 availability and providing extremely powerful co-working functionality while at the same time being easier to implement and support.

1.2 The Problem of e-Learning Diffusion

We live in an era of frantic change caused predominantly by the dramatic advances in technology. The need for learning institutions to understand how to best integrate technology in their systems, pedagogical approaches and learning processes and how to diffuse the use of such technology among students and faculty has never been more important. Indeed, educational institutions and corporations are increasingly adopting information and communication technologies (ICT) as tools for learning, collaboration, communication, course administration, and curriculum design, giving rise to the domain we generally refer to as e-learning. E-learning is considered to be

the most important educational innovation of the last decades and can be seen as consisting of two main blended dimensions (Elgort, 2005): e-learning technologies (e.g. learning management systems) and e-learning pedagogy (e.g. student centred, problem-based, collaborative learning). It is the e-learning pedagogy dimension that is considered by most scholars (Zemsky and Massy, 2004; Elgort, 2005) as the most powerful part and the one that has the potential to truly revolutionize learning. Studies have shown that, while the diffusion of e-learning technologies has progressed well in academic institutions, e-learning pedagogy is still stuck at the innovator stage, unable to achieve any significant use by the large majority of students and faculty.

In an attempt to understand better some of reasons for the failure of e-learning (especially the pedagogy aspect) to achieve widespread adoption, the undertaken study focused upon a selected key aspect of e-learning, online interactivity, and examined in detail its adoption by the students that participated in the study. To this end, the online collaborative learning environment developed for the purposes of the study was proposed to the students to be used as the primary means for group collaboration. The students were given the option to decide in favour of using the new learning environment (that is, adopt the new environment) or continue to collaborate through more traditional collaboration means such as face-to-face meetings or telephone calls (that is, not adopt the new environment). The entire adoption decision process followed by students was studied in detail along with the main factors influencing the final student decision. Potential educator interventions which can be used to increase actual student adoption were also considered. In addition to the student adoption decision, the study examined also potential hindering mechanisms and driving forces unveiled during the actual use of the new online environment by students for their project, and considered again suitable educator interventions towards a more effective use of the new environment and enhanced student collaborative learning.

1.3 Main University Benefits from the Increased Use of Online Interactivity

Increased use of online interactivity in academic programs can potentially provide the University of Nicosia with several advantages as follows:

- The current positioning of the university towards the establishment of increased links with the industry and the provision of more applied educational programs is facilitated by the provision of collaborative

learning environments as outlined above which focus on the resolution of problems in real life business settings. Purposeful collaboration also allows students to share their relevant experiences and viewpoints, achieving a more comprehensive and practical understanding of the situation examined and the options available. The whole collaborative experience allows students to develop valuable problem-solving skills which are particularly useful in the work environment.

- Online collaboration allows students to overcome the barriers of time and place. This can benefit many of the university's students, especially busy professionals and overseas students. Busy professionals, admittedly, do not have the time required to hold regular face-to-face meetings in order to discuss and exchange views on group work. Collaborating online provides more flexibility and releases some of the strain of physical meetings. Overseas students can also benefit from the provision of online collaborative environments. They could, for instance, work on group projects while not physically present at the university (e.g. when visiting their home countries or when attending preparatory classes prior to their initial arrival to Cyprus).
- Embedding online collaborative facilities in educational programs can aid in building a progressive, technologically advanced image for the university which can be used to attract new students. Actually the ability to learn something new involving latest technology was perceived as a major advantage by the students that participated in the study.
- Another major benefit for the university is that the provision of online environments which utilize the widely and freely available Web 2.0 facilities (like the one developed for the study) does not entail any substantial investment cost for the university. As the various facilities are available for free, the only cost is related to the educator time to set-up the final environment and monitor the student interactions during the actual course delivery.

2. Adopting Online Interactivity

Given the already discussed current failure of e-learning (especially the pedagogy aspect) to achieve widespread adoption, how can then one achieve wider use of e-learning components, such as online interactivity, among students and educators? The conducted literature review has indicated that, to date, researchers have seldom approached the issue of e-learning adoption from the dimension of being fundamentally a problem of technological innovation diffusion among students and educators, thus failing to utilize effectively the relevant adoption theories and models. Recognizing this gap, the study was informed by the dominant theories in both the general innovation diffusion perspective (emphasizing the decision to adopt or not a proposed innovation) and also the more specific educational change perspective (emphasizing the actual implementation of the innovation in educational settings).

2.1 General Diffusion Theory

The general innovation diffusion literature has been largely based on the work of Rogers (2003, first published in 1962). Rogers carried out his seminal work over fifty years ago and it has since been reproduced and enriched through his own efforts and that of numerous other diffusion scholars. It has also been used to study a wide range of innovations and adopters. The heart of Rogers' work is his *innovation-decision process model* consisting of five stages:

- *Knowledge*: occurs when an individual is exposed to an innovation's existence.
- *Persuasion*: occurs when an individual forms a favourable or unfavourable attitude towards the innovation.
- *Decision*: occurs when an individual engages in activities that lead to a choice to adopt or reject the innovation.
- *Implementation*: occurs when an individual puts a new idea into use.
- *Confirmation*: occurs when an individual seeks reinforcement of an innovation decision already made.

The key principle of the general diffusion perspective is that a "new idea" is distributed inside a social system through the act of human communication (Hall and Hord, 2006). The individuals in a social system do not all adopt an innovation at the same time. Rogers (2003) introduces an adopter categorization based on adopter *innovativeness* (defined as the degree to which an individual is relatively earlier in adopting new ideas than other members of a system). Hence, based on their time of adoption, the adopters are divided into five groups (innovators, early adopters, early majority, late majority, laggards). Like many other human traits, innovativeness is normally distributed as shown in Figure 2.1.

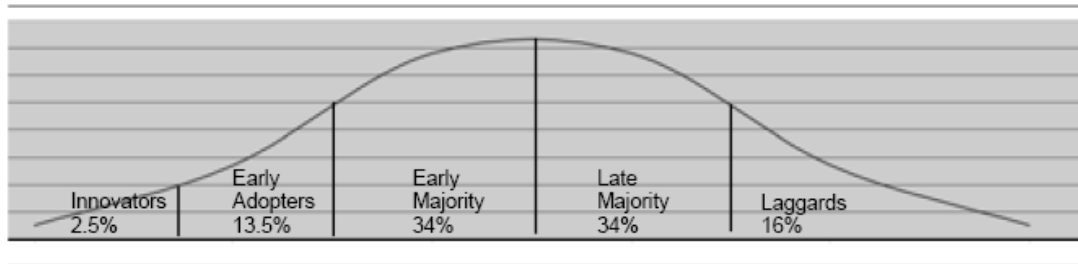


Figure 2.1: Distribution of New Adopters for Technological Innovations

According to the general diffusion perspective, the rate of adoption of an innovation is determined by the following variables:

- **Perceived attributes of the innovation:** the five most important such attributes are:
 - *Relative advantage:* the degree to which an innovation (in our case, the proposed online collaborative environment) is perceived superior to the product currently used or other competing products.
 - *Compatibility:* the extent to which the innovation is consistent with existing values, the past experience of the adopter and adopter needs for the innovation.
 - *Complexity:* the degree to which the innovation is perceived difficult to understand or use.
 - *Trialability:* the ability to try out an innovation before finally adopting it.
 - *Observability:* the extent to which the results of using an innovation are visible and easily communicated to others.
- **Type of innovation-decision:** this can be optional (free individual decision), collective (decision taken by a group of individuals) or authority (decision imposed by a mandate).
- **Nature of communication channels:** There are various channels via which the messages about an innovation are communicated and which are categorized as: (a) *mass media* versus *interpersonal* and (b) *localite* (linking an individual with sources inside the social system) versus *cosmopolite* (linking an individual with sources outside the social system).
- **Nature of the social system in which the innovation is diffusing:** its norms, degree of network interconnectedness, socio-economic status, education level, opinion leadership etc.

- **Extent of change agents' promotion efforts:** A change agent is an individual who influences people decisions towards adoption of the innovation.

The general diffusion perspective has a long and rich tradition of research and widespread application (Hall and Hord, 2006). It views adoption of an innovation and the resulting change as fundamentally a communication process while it focuses on the decision to adopt. Other change perspectives, such as CBAM which will be discussed next, focus less on the adoption decision and emphasize the process of implementation.

2.2 The CBAM Framework

The most influential instructional design diffusion theory is the Concerns Based Adoption Model (CBAM). It is a widely applied theory and methodology for studying the process of implementing change in education (Anderson, 1997). Emphasizing the personal side of change, CBAM introduces the notion of *concerns* (feelings, perceptions and motivations) and proposes that during the implementation of an innovation an individual adopter progresses through a series of stages of concerns (Hall and Hord, 2006) as shown in Figure 2.2.

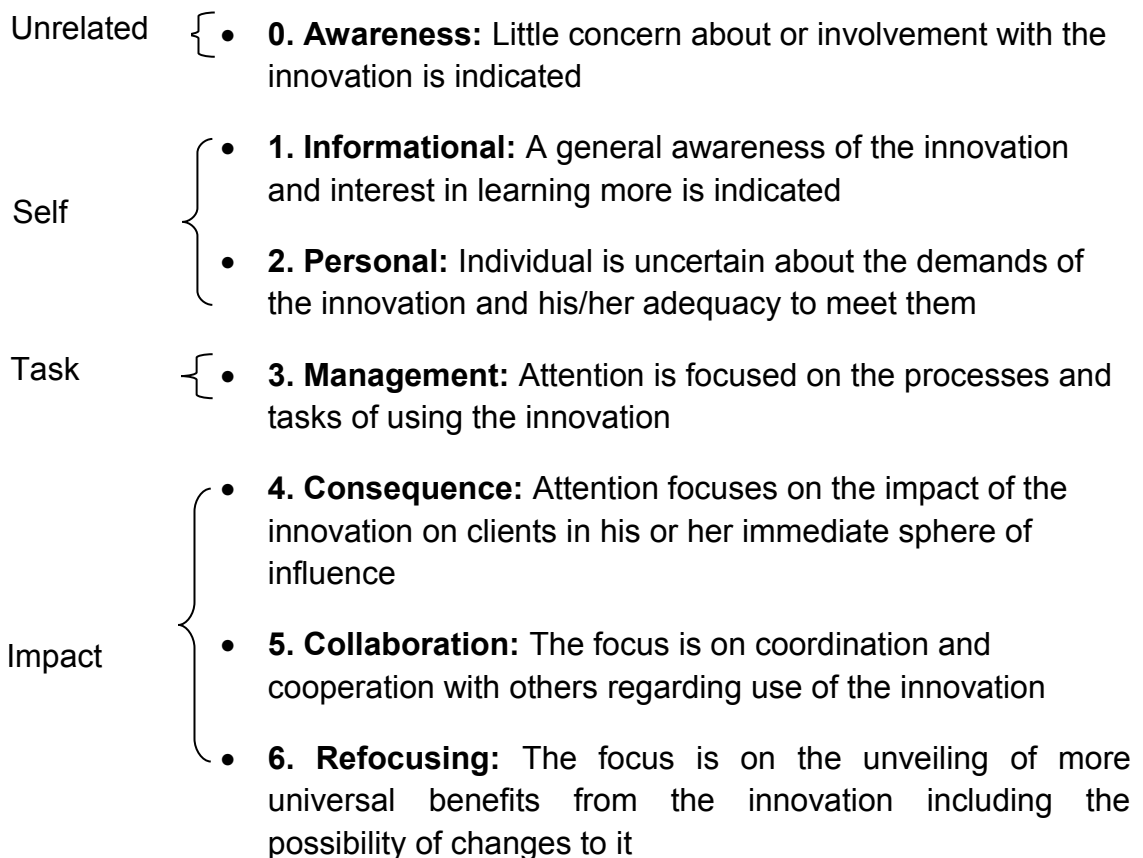


Figure: 2.2: CBAM Stages of Concern

That is, the progression is from concerns unrelated to the innovation, to self concerns (e.g. what the experience would be like for “me”, whether “I” can succeed) to task (e.g. “how-to” concerns) and finally to impact concerns (e.g. whether student outcomes will improve). The CBAM tools for measuring adopter concerns include a Stages of Concern Questionnaire (35 items), an Open Ended Concerns Statement and the One-Legged Interview (brief conversations between a change facilitator and the adopter providing encouragement and support).

CBAM puts a lot of emphasis on the role of change facilitator, proposing that change will not just happen automatically. This role is similar to the change agent role encountered in the general diffusion theory. In our case, it reflects the actions of the educator, instructional designer, and potentially other support personnel, to properly design and support the online learning environment, with the objective of achieving improved use and collaboration by students. An intervention is defined as any action or event that influences the individuals involved in the change process (Hall and Hord, 2006). The CBAM framework includes a taxonomy of possible interventions (Anderson, 1997) consisting of the following six functions: *developing and communicating a shared vision of change, planning and providing resources, investing in professional learning, checking on progress, and providing continuous assistance*. To achieve maximum effectiveness, such interventions need to be focused in order to address the specific concerns of an individual or group.

2.3 Developed Adoption Model

The subject of innovation adoption (that is, the students deciding to use or not the proposed online environment) was thus approached comprehensively during the undertaken study by considering a wide range of influencing factors (perceived attributes of the new online environment, educator actions, peer student actions and attitudes, student concerns and student characteristics). The main findings of the study led to the development of a model (shown in Figure 2.3) reflecting the observed adoption process by students for the specific innovation considered (online collaborative learning environment embedding interactivity).

The relative importance of each influencing factor or attribute is signified with the number of (+) adjacent to it with (+++) denoting high influence and (+) low influence.

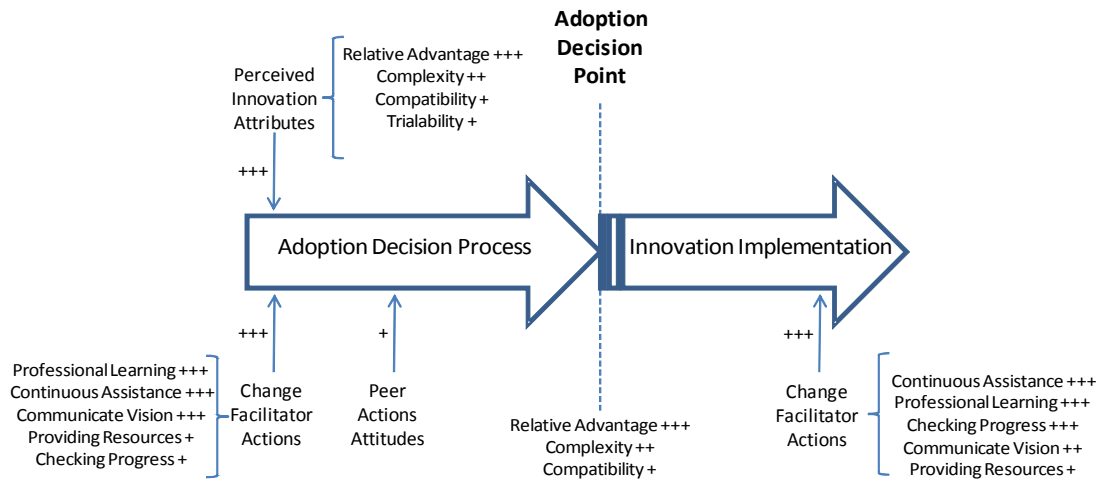


Figure 2.3: Developed Adoption Model

The *Adoption Decision Point* shown in the developed model reflects the point in time in the course by which the students had to take their final decision regarding using or not the proposed online environment for their project. *Innovation implementation* refers to the actual use of the new online collaborative environment by the students to develop their project. As seen in Figure 2.3, the adoption decision part of the study was mainly influenced by two categories of variables: perceived attributes of the new online environment and change facilitator (educator) actions. Peer (other student) actions and attitudes were found to play a lesser role in the adoption decision process. While the high influence of perceived innovation attributes was a rather expected result (previous studies have found that the perceived innovation attributes could explain about half of the variance in rates of adoption (Rogers, 2003)), the significant influence of the change facilitator actions is a rather novel result. The study also found, basically no indication of a potential relationship between the adoption results and the student characteristics such as demographics, general computer literacy or innovative behaviour. This rather unexpected result (especially regarding the student computer literacy aspect) can be explained by the fact that all students that participated in the study were already regular users of Internet and a fair number of them had prior experience with Web 2.0 Applications. Consequently, the student characteristics do not appear in the above model.

Regarding the relative importance of the various distinct perceived innovation attributes, relative advantage (the degree to which the new online environment was perceived superior to existing traditional collaboration means) was found as having the highest influence followed by complexity (the degree to which the new environment was perceived difficult to understand or use), compatibility (the extent to which the new environment

was perceived consistent with existing values, past experience and student needs) and trialability (the ability to experiment with the new online environment before actual adoption).

The various change facilitator actions were found to be very important both during the adoption decision period and also during the actual implementation of the proposed innovation. During adoption decision, the most influential categories of change facilitator actions were found to be “investing in professional learning” followed by “providing continuous assistance” and “communicating a shared vision of change”. At the end of the class, the most influential categories of change facilitator actions recorded by students in their post-class questionnaires (covering the whole experience) were “providing continuous assistance” followed by “investing in professional learning” and “checking on progress”. That is, it appears that during innovation implementation, the students developed a higher appreciation for the educator “checking on progress” interventions that provided them with systematic feedback. It is also a reasonable finding that the “communicating a shared vision of change” category of interventions was considered by students more valuable at the early stages of the process.

The study also examined the concerns (feelings, perceptions, motivations) expressed by students during their adoption decision process. These concerns were categorized into the two broad categories: *adequacy* concerns and *outcome* concerns. Adequacy concerns are similar to the CBAM self concerns (Hall and Hord, 2006) and include learning more about the innovation and its demands and the associated student uncertainties about their adequacy to meet them. Outcome concerns, on the other hand, pertain to concerns regarding the actual impact of the innovation on group collaboration and the quality of the resulting project. The significance of this categorization lies in the fact that the adequacy concerns were found in the study to diminish over time while the outcome concerns persisted throughout the study, indicating that change facilitators need to direct their emphasis in addressing both categories of concerns in an analogous manner.

A final word regarding the developed adoption model pertains to its potential more general use. The author holds the view that, even though the adoption model developed reflects the behaviour of a specific class of students towards adopting or not a specific aspect of e-learning (online interactivity), it could potentially have wider applicability to the diffusion of other e-learning components at the university given the general technological innovation diffusion approach employed in the study.

3. Designing the Online Learning Environment

The setting of the study was a graduate MBA class (MBA670: Operations and Quality Management) delivered in Spring, 2010. The class was delivered through a combination of face-to-face (the class lectures) and online (the class project) interaction. The study's adoption of the participation learning metaphor (Sfard, 1998), viewing learning as a social collaborative process, necessitated the design and development of a suitable learning environment for the class project. Such an environment needed to be able to use real-world, case-based contexts for learning and facilitate collaborative construction of knowledge. Jonassen et al. (1993) have proposed educational environments exhibiting these characteristics, which they named constructivist learning environments (CLE). The next step in the design of the learning environment was to decide what type of a constructivist approach: problem based (PBL), case-based (CBL) or project-based (Jonassen, 1999). After careful consideration of the relative advantages / disadvantages of each approach, the case-based (CBL) scenario was selected due to its simplicity, increased structure and the fact that it allows for increased tutor guidance and feedback (Savery, 2006).

Figure 3.1 displays the selected learning environment design for the online part of the class.

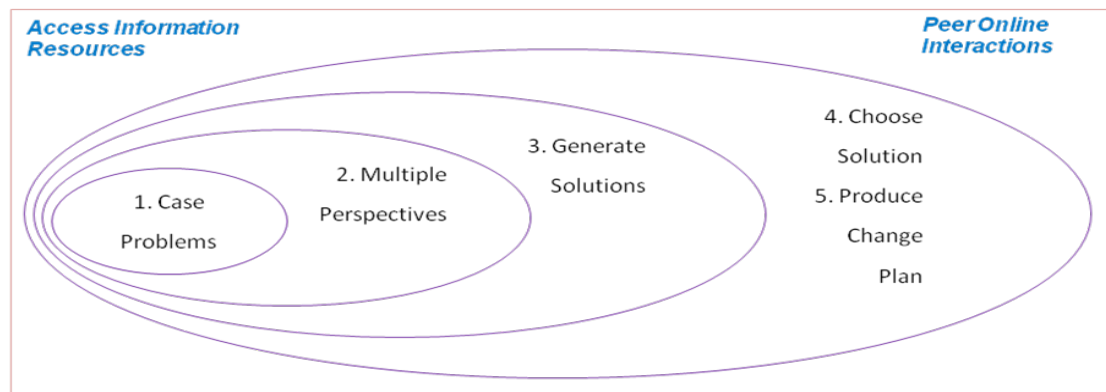


Figure 3.1: Online Learning Environment Design

The adopted design is thus based on Jonassen's CLE model (1997; 1999) and reflects also the following steps proposed by Choi and Lee (2006) for solving ill-structured problems in a web-based, case-based environment: (1) understanding situations and contexts where multiple problems may exist; (2) identifying problems among multiple perspectives held by different stakeholders; (3) generating possible solutions; (4) choosing appropriate solutions with a rationale; (5) implementing and evaluating the solutions. Facilities were also provided for students to access the required information resources and collaborate online with their group partners. The class project's design called for the application of the class subject matter on actual real-life business settings. Students were required to select an actual

business organization on which to base their project. They were also required to work in teams and collaboratively analyse the selected business operation, identify any problems / weaknesses, propose possible solutions and finally select the most appropriate solution and prepare an improvement change plan.

The final learning environment design thus enabled students to attempt to collaboratively diagnose and solve authentic problems relevant to the class material. The approach selected can be further characterised as a BIG (Beyond the Information Given) constructivist approach (Perkins, 1991) as it involves the integration of direct classroom instruction with opportunities to explore, experiment and solve problems during the semester's project (e-learning component).

The next step for the author was to decide the application platform which would implement the CLE design described above. The basic choice was between using some of the widely available (and mostly free) Web 2.0 collaborative facilities (such as blogs, wikis, electronic conferences etc.) or the more traditional course management systems (CMS) such as Moodle or WebCT available at the University of Nicosia. In order to examine more closely some of the available options, the author actually proceeded and built two prototypes of the desired environment; one using Moodle and another one using Web 2.0 facilities provided by Google (Google Docs as co-authoring wiki and discussion forum, Google Gmail for e-mail and Google Chat for real-time chatting). After careful consideration of the two options the author decided to give preference to the Google facilities and setup a pilot environment in order to solicit student feedback before taking the final decision for the environment to be used in the actual study. The author's initial inclination towards Google facilities rather than Moodle was formed using the innovation attributes of the diffusion perspective (Rogers, 2003) as follows:

- *Compatibility*: The Google facilities are already used by millions of users and many students have prior experience with at least some of these tools (like the very popular e-mail system Gmail). Most web tools share similar user interface principles making their use easier and more intuitive. Google Docs, the central tool in the developed framework, is impressively similar to Microsoft Word with which virtually all students are familiar. Moodle facilities, on the other hand, employ a less familiar interface and are more complex for those who have not used them before.
- *Complexity*: In general, Web 2.0 facilities innovate at a much faster pace than CMS (Alexander, 2008) aiming at a much wider audience with diverse IT skills. They are thus typically easier and more intuitive to use than less mainstream tools like Moodle.
- *Trialability*: The Google facilities are already available on the web and it is extremely easy for anyone to obtain an account and experiment with them. No prior setup of any test environment is necessary.

- *Observability*: The wide accessibility of the web by virtually everyone and from any place there is a connection facilitates the demonstration of the Google facilities and the easier communication of the outcomes when using them.
- *Relative advantage*: The perceived relative advantage of the Google facilities vs. Moodle includes cost (the Google facilities are provided for free; there is no need for the use of local computer processing power or the engagement of local IT technical support personnel as is the case with Moodle). Additionally, a vital feature of the designed learning environment is its error-free operation and quick performance on a 24/7 basis. The students can easily be turned away by technical issues and, as many of them are also working professionals, their use of the environment could be late at night or during weekends. This is not an easy target for a local university IT team with limited technical support resources as it would be the case with Moodle. It is a much easier to achieve target, however, for organizations of the size of Google with vast IT resources.

The developed online environment using collaborative Google facilities was pilot-tested during the semester of Fall, 2009 (the semester preceding the conduction of the main study) using a group of MBA students with very positive results, thus confirming the appropriateness of the selected platform.

3.1 Embedding Interactivity

As per the study's instructional design, the class consisted of two parts: the class lectures (delivered face-to-face) and the class group project (where students were given the choice to develop it online using the provided Google Docs collaborative environment or develop it through more traditional group collaboration such as face-to-face meetings, telephone conversations and e-mails).

The students in the class worked in teams of 3-4 students. The class project was divided in 10 parts with each part having a primary author among the group. Depending on the number of students in each team, primary authorship was divided evenly among the team members as much as possible. The primary author of each part wrote the first draft and then invited comments / feedback from his/her team members. This process was repeated until the team agreed that the part was finalized. Evidently, the selected project design included built-in interactivity as proposed by Bouhnik and Marcus (2006). Interactivity played also a major role in the assessment of the project as 30% of the grade was dependent on the contribution of the student to the improvement of the project parts he / she was not the primary author through online collaboration.

The students were given a period of 6 weeks during which they had to decide the approach they would use for developing their project, that is, whether they would use the new online collaborative environment or more traditional collaboration means such as face-to-face meetings or telephone calls. Out of the 14 teams of the class, 13 actually opted to use the online facilities with one team deciding for the more traditional face-to-face mode. The students who selected the online mode had to maintain an online reflection journal where they recorded their reflections of their overall experience. The completion of this reflection journal was allocated 10% of the overall project grade.

3.2 Change Facilitator Interventions

The importance of change facilitator interventions in actually persuading students to use the new online environment and do so effectively has already been discussed in section 2.3. As change (like the one introduced by the adoption of a new innovation) does not happen automatically (Hall and Hord, 2006), it was crucial for the author to plan and implement a series of change facilitating interventions throughout the study. To this end, the author and the class technical assistant undertook the role of change facilitators (in CBAM terminology) or change agents (in the general diffusion perspective terminology). The interventions used in the study are presented in Figure 3.2 using the six types of interventions identified in the CBAM framework.

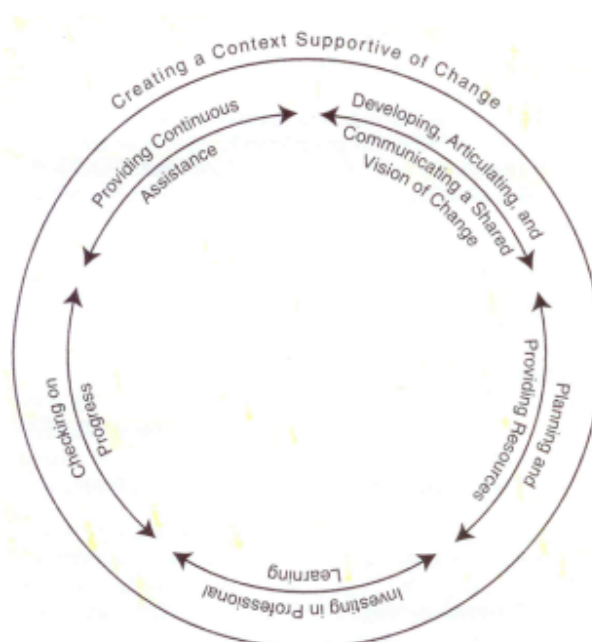


Figure 3.2: CBAM Types of Interventions (Hall and Hord, 2006: 189)

The specific interventions utilized are described in detail in the next sections.

Communicating a Shared Vision of Change

The author invested substantial time during the first lectures of the class to discuss with students the notion and value of collaborative learning using concepts drawn, among others, from the participation learning metaphor (Sfard, 1998) and social constructivism principles (Vygotsky, 1978). The crucial role that collaborative learning plays in the work environment was also outlined using concepts from experiential learning (Kolb, 1984).

Aiming at capturing the students' interest and arousing their enthusiasm, the author also presented to students the new architecture of the World Wide Web (Web 2.0) based on social interconnectedness and collaboration and stressed its importance and phenomenal growth. He presented also highlights of the new collaborative environment (based on Google Docs) and explained in detail its merits and the role it can play in effective student interaction when developing the class project.

As manifested by the discussions held in class, the majority of students showed considerable interest to learn more about the new environment.

Planning and Providing Resources

The author spent almost a year planning and producing the resources needed for the study. As explained in the preceding sections, the author considered very carefully the design and implementation of the online collaborative environment, weighted the available options and finally implemented an environment aiming at simplicity and ease of use. The author and technical assistant also spent a significant amount of time preparing additional resources for the students such as tutorials and step-by-step guides in order to facilitate their use of the new environment. A selection of this material is included in Appendix 1.

The provided online collaborative facilities (Google Docs for co-authoring / discussing the project and maintaining the reflection journal, Google Gmail for e-mail and Google Chat for real-time chatting) and associated student guides were conveniently collected together in the class project website as shown in Figure 3.3.

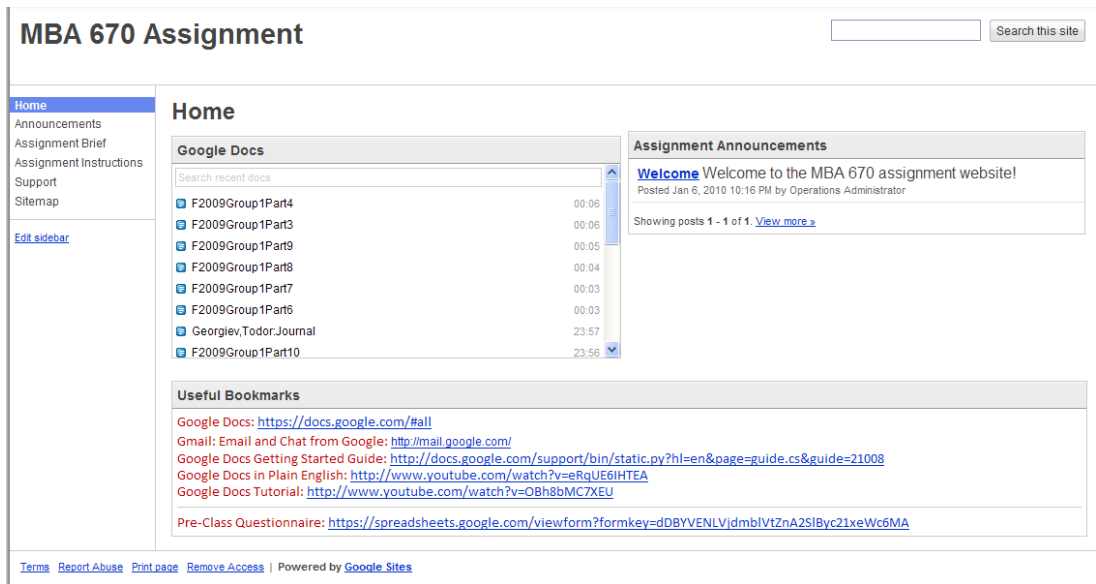


Figure 3.3: The Class Project Website

A specific section on the website allowed for easy access to the class technical support assistant through e-mail or online chatting. An “announcements” section was also included enabling easy communication of important items by the author to students.

For each of the 10 project parts, the respective primary author had to produce a first draft and then invite feedback by his teammates. To this end, each project part included at its end a discussion table as shown in Figure 3.4.

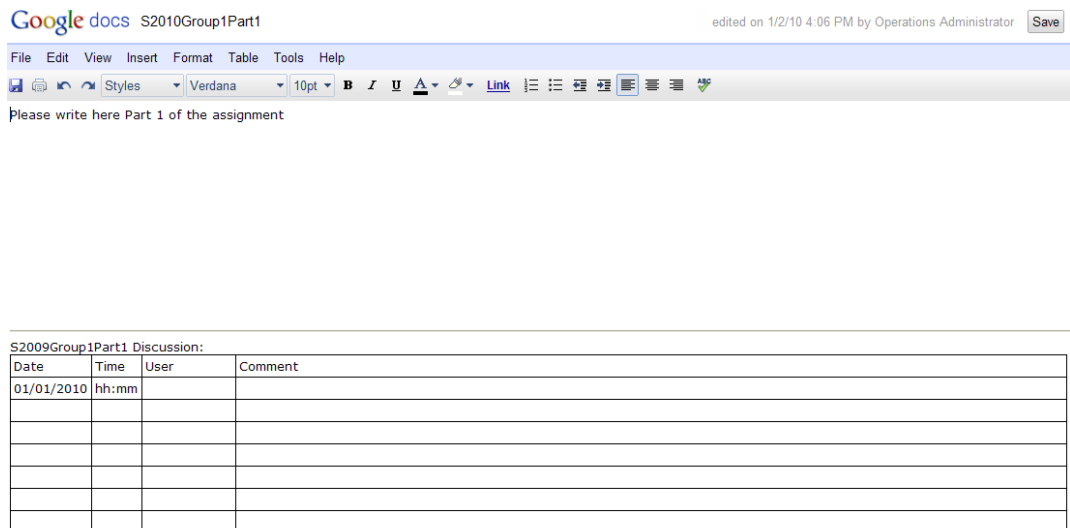


Figure 3.4: Empty Project Part File

Investing in Professional Learning

A formal lab for using the new environment was delivered during the second week of the class. The contents of the lab were selected in order to address the initial student concerns as per the CBAM perspective (self and task concerns). The lab guide used is included in Appendix 2. Both the author and the technical support assistant were available during the lab to offer assistance and discuss issues with students.

High student participation and interest was exhibited during the lab session, enabling the students to get acquainted with the environment and have a first hands-on experience.

Checking on Progress

As change does not happen overnight, the entire process needs to be continuously assessed and monitored (Hall and Hord, 2006). To this end, the author monitored systematically the student reflection journals for the unveiling of any issues along with the student interactions for completing the course project. The author intervened in order to provide encouragement and guidance and also to resolve any problems through entries in the electronic discussions and brief “one-legged” interviews before or after the class with the students involved.

These interventions aimed not only at addressing any problems but also at creating a sense among the students that their efforts were valued and worthy of notice and support.

Providing Continuous Assistance

The importance of continuous and timely support when new technological innovations are introduced was highlighted by many researchers such as Mahony and Wozniak (2005) and Anderson et al. (1998).

The author planned for the availability of continuous assistance by either himself or the technical support assistant through various communications means such as electronic forum discussions, online chatting, e-mails and via the telephone. In all cases special emphasis was placed in prompt response and the quick resolution of the issues involved.

4. Evaluating the Learning Processes and Individual Student Contribution

Given the novelty of the field, the study also looked at methods through which an educator can practically and efficiently discern whether knowledge co-construction among a group of learners indeed takes place or not and provide accordingly appropriate pedagogical support to them. To this end, the study was informed by two of the most influential models for interaction analysis encountered in the literature: the interaction analysis model proposed by Henri (1992) and also the model proposed by Gunawardena et al. (1997) for knowledge co-construction.

The model proposed by Gunawardena et al. was found to provide a very promising foundation for evaluating the learning processes involved, allowing the efficient classification of distinct online student interactions into: interactions exhibiting lower level learning processes, interactions exhibiting higher level learning processes and superficial contributions.

Table 4.1 presents an overview of the number of messages exchanged among the 13 groups of students that participated in the study.

| | No of Messages | Part 1 | Part 2 | Part 3 | Part 4 | Part 5 | Part 6 | Part 7 | Part 8 | Part 9 | Part 10 |
|----------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Group 01 | 79 | 10 ■ | 9 ■ | 8 ■ | 6 □ | 8 □ | 11 □ | 8 □ | 7 □ | 6 □ | 6 □ |
| Group 02 | 81 | 15 □ | 16 ■ | 12 □ | 7 □ | 7 □ | 6 □ | 5 □ | 2 | 5 □ | 6 □ |
| Group 03 | 105 | 20 ■ | 12 ■ | 14 ■ | 14 □ | 15 □ | 5 ■ | 8 □ | 5 □ | 10 □ | 2 |
| Group 04 | 47 | 11 ■ | 13 □ | 5 □ | 10 □ | 4 □ | 1 □ | 2 | 1 | - | - |
| Group 05 | 37 | 7 □ | 5 □ | 4 □ | 6 □ | | 5 □ | 2 | 3 □ | 1 | 4 □ |
| Group 06 | 31 | 5 □ | 4 □ | 1 | 6 □ | 1 | 4 □ | | 3 □ | 4 □ | 3 □ |
| Group 07 | 86 | 12 □ | 11 □ | 18 □ | 10 ■ | 9 ■ | 6 □ | 4 □ | 3 □ | 6 □ | 7 □ |
| Group 08 | 55 | 6 ■ | 7 ■ | 6 □ | 6 □ | 7 □ | 6 □ | 4 □ | 4 □ | 4 □ | 5 □ |
| Group 09 | 16 | 3 | 4 □ | 5 □ | 1 | - | 2 | - | - | 1 | - |
| Group 10 | 95 | 12 □ | 14 ■ | 18 ■ | 14 ■ | 9 □ | 5 □ | 5 □ | 7 □ | 9 □ | 2 |
| Group 11 | 8 | 1 | - | 5 □ | - | - | 1 | - | - | 1 | - |
| Group 12 | 24 | 5 □ | 3 □ | 3 □ | 3 □ | 4 □ | 2 | 1 | 3 □ | - | - |
| Group 13 | 26 | 3 □ | 5 □ | 2 | 2 | 2 | 4 □ | 3 □ | 1 | 3 □ | 1 |
| | 690 | 110 | 103 | 101 | 85 | 66 | 58 | 42 | 39 | 50 | 36 |

Table 4.1: Group Discussions and Learning Processes Observed

The study involved 13 groups working on class projects consisting of 10 parts. For each project part, there was a primary author in each group with the remaining group members providing information, comments and feedback until the project part was deemed finalized by the team. That is, each group was to hold basically 10 group discussions, one for each part. Each entry in Table 4.1 basically corresponds to a group discussion, containing the number of messages exchanged among the specific group for

that discussion. Next to the number of messages exchanged, one of two symbols can appear as follows:

- **Lower level learning processes:** means that the group discussion stayed at what Gunawardena's model refers to as Phase I or "lower mental functions" with participants sharing and comparing information and accepting each others' statements or examples as consistent with what the group members already know or believe. Negotiation in this case tends to be mostly unspoken and the discussion typically does not advance beyond Phase I (Sharing / Comparing).
- **Higher level learning processes:** means that the group discussion unveiled inconsistencies or disagreements among the group members and the discussion advanced beyond Phase I into Phase II (Dissonance), Phase III (Negotiation / Co-construction) and finally to Phase V (Agreement Statement). The model refers to Phases beyond Phase II as characterised by "higher mental functions". The author was not able to discern instances of Phase IV (Testing Tentative Constructions) which calls for testing the proposed synthesis or co-construction against formal data, personal experience etc. Evidently, to the extent that this was actually done by the students, it was unspoken for the specific discussions examined.

As seen in Table 4.1, the author was able to identify several group discussions which exhibited the above learning processes, though most of them remained at the lower mental functions level. Some group discussions, however, managed to advance further into the higher mental functions level.

Gunawardena's model was also found to provide a good basis for assessing individual student contribution to online group discussions. To this end, an educator could simply count the number of interactions of a particular student which exhibit either lower or higher learning processes (discarding superficial contributions). The assessor could also consider assigning a different weight for the two learning process levels with contributions at the higher level counting more towards the final student collaboration grade.

5. Overall Student Feedback and Recommendations

This section presents overall feedback and satisfaction results regarding the online collaborative experience as reported by the students that participated in the study. These results reflect data collected through the post-class questionnaires that were administered at the end of the class and also the student reflection journals. Overall, the students reported positive results for both the general experience of working in groups and also the use of the provided online learning environment.

Regarding the general experience of working in groups, most students found the functioning of their teams rather effective, the sharing of the workload rather fair and generally enjoyed the experience. Table 5.1 includes a summary of the most frequent positive and negative aspects referenced by students regarding their general group work experience.

| Positive Aspects | Negative Aspects |
|--|--|
| <ul style="list-style-type: none"> • Sharing information and expressing multiple views on a topic • Achieve a form of bonding among the members of the group • Learning from each other • Sharing the workload | <ul style="list-style-type: none"> • Inadequate interaction and commitment by other group members • Group cohesion / cooperation issues • Lack and proper management of time • Difficulty in arranging physical meetings (most groups held complementary F2F meetings) |

Table 5.1: Positive and Negative Aspects of General Group Work Experience

Regarding the feedback received by the students pertaining to the use of the provided online collaborative environment, most students found the various online tools provided rather effective (i.e. facilitating well what they had to do) and easy to use. While most groups had complementary face-to-face interactions as well, almost all students believed that the online part of the interaction exceeded 50% of the total group interaction. Most students also believed that their team was able to achieve a fair amount of group learning (learning from each other). Table 5.2 includes a summary of the most

frequent positive and negative aspects referenced by students regarding their online collaborative experience.

| Positive Aspects | Negative Aspects |
|--|--|
| <ul style="list-style-type: none"> • Overcome the barriers of time and place • Reduced need for physical meetings • Learn something new involving technology • Ability to receive prompt feedback by the lecturer • Faster collaboration, save time • Easy to use • Limited technical issues faced • Providing a fairer mode of group work | <ul style="list-style-type: none"> • Absence of real time feedback by teammates • Not as rich interaction as face-to-face (includes difficulty to explain views online and achieve consensus) • Lack of face-to-face contact • Some technical issues (e.g. support for graphics) |

Table 5.2: Positive and Negative Aspects of Online Collaborative Experience

The positive and negative aspects included in Tables 5.1 and 5.2 need to be considered and translated into appropriate interventions by educators and change facilitators in order to reinforce the positive aspects and address the negative aspects. The next section includes possible interventions to address some of the issues raised.

6. Recommendations for Wider Use of Online Interactivity and Action Plan for the University of Nicosia

One of the main objectives of the undertaken study was to address hindering mechanisms and reinforce driving forces towards wider use of online interactivity by students and faculty. Figure 2.3 (developed adoption model) along with Tables 5.1 and 5.2 present a good framework for discussion. Indeed, successful, wider use of online interactivity would require maximization of the positive influencing factors depicted in Figure 2.3 and minimization of the respective negative influencing factors with more emphasis placed on factors whose impact is larger (denoted with an adjacent +++). It would also require reinforcement of the positive aspects depicted in Tables 5.1 and 5.2 and addressing of the respective negative aspects. Table 6.1 encapsulates all recommendations which stem out of the study's findings (positive and negative influencing factors, positive and negative reported aspects).

| Factor or Aspect | Recommendations |
|--|---|
| <p>Relative advantage (+++)</p> <ul style="list-style-type: none"> - Overcome the barriers of time and place (+ve) - Reduced need for physical meetings (+ve) - Faster collaboration, save time (+ve) - Absence of real-time feedback by teammates (-ve) - Not as rich interaction as face-to-face (includes difficulty to explain views online and achieve consensus) (-ve) | <ul style="list-style-type: none"> - As the most important benefit identified by students is work anytime / anyplace, ensure that the application is available everywhere there is an Internet browser and on a 24 / 7 basis. Given the proliferation of smart phones, consider solutions that allow access through mobile phones as well - Ensure error-free operation and quick performance - Provide, additionally to wiki and discussion forum, an integrated chat room with video conferencing facilities allowing for enhanced real-time communication and more enriched interaction when needed |
| <p>Complexity (++)</p> <ul style="list-style-type: none"> - Easy to use (+ve) - Technical issues (-ve) | <ul style="list-style-type: none"> - Consider available alternatives and select the most intuitive, easy to use online collaborative platform - Select a mainstream online platform (e.g. Google Docs or Windows Office Live) which is supported by a large IT team on a 24 / 7 basis (as opposed to a University supported environment) |
| <p>Compatibility (++)</p> | <ul style="list-style-type: none"> - Select a mainstream online collaborative platform (such as Google Docs or Windows Office Live) used by millions of users (instead of a proprietary one) and to which it is more probable that students had prior exposure - Select a familiar user interface for students (e.g. as similar to Microsoft Office as possible) |

| | |
|--|--|
| Trialability (+) | <ul style="list-style-type: none"> - Provide a test environment with test accounts from Day 1 of the class for students to experiment (this test environment should be accessible from everywhere) |
| Communicating a shared vision of change (+++) <ul style="list-style-type: none"> - Learn something new involving technology (+ve) | <ul style="list-style-type: none"> - Champion the value of collaborative learning and its wider applicability (e.g. in the workplace) - Demonstrate systematically the merits of the online platform, explaining how it can be used to facilitate the achievement of the project's objectives (including its 24/7 flexibility and how it can save precious time). - Be enthusiastic, trying to arouse student interest and motivation - Put emphasis and portray the image of a new cool technological offering |
| Investing in professional learning (+ ++) <ul style="list-style-type: none"> - Absence of real-time feedback by teammates (-ve) | <ul style="list-style-type: none"> - Prepare and deliver a mandatory lab session in the beginning of the class and an additional optional session towards the middle of the class (to resolve any issues). Include in the lab session an exercise exhibiting real-time chatting and also discussion through video-conference facilities - Demonstrate key functionality and how to overcome certain problems during face-to-face lectures to all students - Demonstrate collaborative learning through sharing / comparing of information, exploration of dissonance and negotiation / co-construction of knowledge |
| Providing continuous assistance (++ +) <ul style="list-style-type: none"> - Technical issues (-ve) | <ul style="list-style-type: none"> - Arrange for available competent technical support using a variety of means (e-mails, online chatting or telephone) and for a prolonged period of time during the day - Monitor average response times to address student technical problems and ensure that there are no delays - Provide encouragement and guidance to students as necessary |
| Planning and providing resources (+) <ul style="list-style-type: none"> - Inappropriate management of time (-ve) - Sharing the workload (+ve) - Providing a fairer mode of group work (+ve) | <ul style="list-style-type: none"> - Design and implement the new online collaborative platform exhibiting the characteristics required by the attributes of relative advantage, complexity, compatibility and trialability as presented in the first four rows of this table - Design a constructivist learning environment embedding online interactivity for the class project as described in section 3 - Design for a transparent and fair sharing of the workload among the group members - Provide an intermediate deadline for completing the first parts of the project |
| Checking on progress (+) <ul style="list-style-type: none"> - Ability to receive prompt feedback by | <ul style="list-style-type: none"> - Monitor systematically the student interactions and progress for the unveiling of any issues (e.g. |

| | |
|---|--|
| <p>the lecturer (+ve)</p> <ul style="list-style-type: none"> - Group cohesion / cooperation issues (-ve) - Inadequate interaction and commitment by other group members (-ve) - Learning from each other (+ve) | <p>team cohesion or non-responsiveness) and take appropriate action to resolve the problem through entries in the electronic discussions or brief one-legged interviews before or after the class with the students involved</p> <ul style="list-style-type: none"> - Monitor the student online group discussions providing feedback as necessary so that higher level learning processes are achieved as much as possible - Provide timely and direct feedback to students who do not exhibit adequate interaction and contribution - Assess individual student contribution as per Gunawardena's model |
|---|--|

Table 6.1: Recommendations for Increased Online Interactivity Diffusion

The recommendations presented in Table 6.1 can be divided into two sections: the desired characteristics of the online collaborative environment represented by the first four rows (relative advantage, complexity, compatibility and trialability) and the desired interventions which need to be undertaken by the change facilitator presented using the CBAM taxonomy (remaining rows of the table). The recommendations provided attempt to address all issues and hindering mechanisms unveiled during the study. For instance, to address the issue of learning environment complexity and compatibility, it is proposed to select a suitable mainstream collaborative platform (e.g. Google Docs or Windows Office Live) which is supported by a large IT team on a 24 / 7 basis and to which it is more probable that students would have had prior exposure. In order to address the issues of “not so rich interaction as face-to-face” and the “absence of real-time feedback by teammates” reported by some students, it is proposed to add in the learning environment an integrated real-time chat room with video conferencing facilities to be used by students when real-time communication is deemed more appropriate. As another example, to address the issue of “inadequate interaction and commitment by other group members”, it is proposed for the educator to monitor systematically the online group discussions and provide timely and direct feedback to students who do not exhibit adequate interaction and contribution as a first measure. In order to reinforce group learning, it is suggested for the educator to demonstrate collaborative learning through sharing / comparing of information, exploration of dissonance and negotiation / co-construction of knowledge in class and during the lab sessions, and also to again monitor systematically the online group discussions providing feedback as necessary to students so that higher level learning processes are achieved as much as possible

The change facilitator interventions included in Table 6.1, start with designing and developing the online collaborative learning environment (including the instructional design) and span through facilitating the actual adoption and effective use of the environment by the students until the end of the class. While most of these interventions would normally be undertaken by the educator, the ones that are of more technical nature (such as designing and developing the online collaborative environment or providing technical support to students) can be facilitated by more technically oriented teaching assistants or other university support personnel. It must also be noted that the work required by the educator for properly setting-up the learning environment, and especially for monitoring the online group discussions and providing continuous guidance and support to students, is substantial and needs to be assessed objectively, allowing for the needed time.

Action Plan for the Wider Use of Online Interactivity at the University of Nicosia

While the author will pursue the above recommendations in order to improve his own practice and achieve a more effective use of online interactivity by his own students, the wider diffusion of online interactivity in additional educational programs and courses provided by the University of Nicosia would require the adoption of a broader change program characterised by the following stages:

- ix. Educate additional interested university faculty using the developed study outcomes (executive summary report and educator guide). Promote the value of collaborative learning and the benefits of online interactivity among faculty.
- x. Define 1-2 additional pilot course offerings for which the author will assist the relevant faculty in designing and developing suitable case-based, online collaborative learning environments and the required change facilitator interventions. The author will also provide assistance throughout the duration of the pilot course offerings through bi-weekly progress meetings. It is expected that by the end of stage (ii), a core team of educators (the author and the pilot faculty) will be formed having the requisite skills to facilitate further implementations.
- xi. Incorporate additional recommendations and alter the learning environment / instructional design as per the feedback obtained in stage (ii).

- xii. Expand the use of online interactivity in additional program offerings as needed.

References

- Alexander, B. (2008), "Deepening the Chasm: Web 2.0, Gaming and Course Management Systems", *MERLOT Journal of Online Learning and Teaching*, Vol. 4, No. 2, June 2008.
- Anderson, S. E. (1997), "Understanding Teacher Change: Revisiting the Concerns Based Adoption Model", *Curriculum Inquiry*, 27(3), 331-367.
- Anderson, T., Varnhagen, S., Campbell, K. (1998), "Faculty adoption of teaching and learning technologies: Contrasting Earlier Adopters and Mainstream Faculty", *The Canadian Journal of Higher Education*, 28 (2,3), 1998, 71-98.
- Bouhnik, D., Marcus, T. (2006), "Interaction in Distance-Learning Courses", *Journal of the American Society for Information Science and Technology*, 57(3):299-305.
- Choi, I. & Lee, K. (2006), "A Case-Based E-Learning Environment for Facilitating Ill-Structured Problem Solving Skills: Classroom Management", In T. Reeves & S. Yamashita (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2006* (pp. 1894-1901). Chesapeake, VA: AACE.
- Elgort, I. (2005), "E-learning Adoption: Bridging the Chasm", *Proceedings of the 22nd annual conference of the Australasian Society for Computers in Learning in Tertiary Education* Brisbane: ascilite.
- Gunawardena, C.N., Lowe, C.A., Anderson, T.A. (1997), "Analysis of a Global Online Debate and the Development of an Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing", *Journal of Educational Computing Research*, 17(4), 397-431.
- Hall, G.E., Hord, S.M. (2006), *Implementing Change: Patterns, Principles and Potholes*, Boston: Pearson.
- Henri, F. (1992), "Computer Conferencing and Content Analysis", In *Collaborative learning Through Computer Conferencing* (ed. A. R. Kaye), pp. 117-136, Berlin and Heidelberg:Springer.
- Jonassen, D., Mayes, T., McAleese, R. (1993), "A Manifesto for a Constructivist Approach to Technology in Higher Education", In T. Duffy, J. Lowyck, and D. Jonassen (eds.), Berlin: Springer-Verlag.
- Jonassen, D. (1997), "Instructional Design Models for Well-structured and Ill-structured Problem-solving Learning Outcomes", *Educational technology research and Development*, 45(1), 65-94.
- Jonassen, D. (1999), "Constructivist Learning Environments on the Web: Engaging Students in Meaningful Learning", *EdTech99: Educational Technology Conference and Exhibition*, Singapore.
- Kolb, D. (1984), *Experiential Learning: Experience as the Source of Learning and Development*, Englewood Cliffs NJ, Prentice Hall.

- Mahony, M., Wozniak, H. (2005), "Diffusion of Innovation and Professional Development in eLearning: The CHS eLearning Resource Case Study", Selected papers of the 2006 ODLAA conference, Bathurst, Australia: ODLAA.
- Moore, M.G. (1989), "Three Types of Interaction", *The American Journal of Distance Education*, 3(2), 1-6.
- Perkins, D.N. (1991), "Technology Meets Constructivism: Do they Make a Marriage?", *Educational Technology* 31(5), 18-23.
- Rogers, E. M. (2003), *Diffusion of Innovations*, New York: The Free Press.
- Savery, J. (2006), "Overview or Problem-based Learning", *The Interdisciplinary Journal of Problem-based Learning*, Vol. 1, No. 1, Spring 2006, pp. 9-20.
- Sfard, A. (1998), "On Two Metaphors for Learning and the Dangers of Choosing Just One", *Educational Researcher*, 27(2), 4-13.
- Vygotsky, L.S. (1978), *Mind in society: The development of higher psychological processes*. (M.M.Lopez-Morillas Cole, A.R. Luria & J. Wertsch, J. Trans.). Cambridge, MA: Harvard University Press.
- Zemsky, R., Massy, W.F. (2004), *Thwarted Innovation. What Happened to e-learning and Why*, The University of Pennsylvania, PN: The Learning Alliance.

Appendix 1: Student Guides and Tutorials

[The contents of this appendix is the same as Appendix A4.1 of the main dissertation]

Appendix 2: Lab Guide

[The contents of this appendix is the same as Appendix A4.2 of the main dissertation]

APPENDIX A6.3

Acceptance of the Study's Outcomes

UNIVERSITY OF NICOSIA



Committed to Excellence

Office of the President of the Council

TO WHOM IT MAY CONCERN

Mr. Neophytos Karamanos has submitted to the University two reports (an executive summary report and an educator guide), which he has produced as part of his project titled "Studying the Adoption and Learning Processes of Online Interactivity", undertaken towards satisfying the requirements for the degree of Doctor in Professional Studies, at Middlesex University.

The two reports have been accepted as a substantial contribution to the University's e-learning initiatives. The recommendations and action plan included in the executive summary report will be incorporated into the University's e-learning strategy. The educator guide will form part of the University's teaching and learning strategy and will be made available to all faculty.

A handwritten signature in blue ink, appearing to read 'Nicos Peristianis'.

Dr. Nicos Peristianis

President of the Council

Nicosia 22 June, 2011

