Educational Design and Media Choice for Collaborative, Electronic Case-Based Learning (e-CBL)

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Merely to absorb facts is of only slight value in the present,
and usually of even less value in the future.
Learning how to learn is the element that is always of value,
now and in the future. *Carl Rogers (1983, p. 18)*

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List of Publications

The following publications emerged from this research:

Voigt, C. & Swatman, P. M. C. (2003). Learning to Learn: HCI-Methods for personalised eLearning. In J. Jacko & C. Stephanidis (Eds.), Human-Computer Interaction: Theory and Practice (Part I), Proceedings of Human Computer Interaction International 2003 (pp. 1081-1085). New Jersey: Lawrence Erlbaum.

Voigt, C. & Swatman, P. M. C. (2004). Contextual e-learning evaluation: A preliminary framework. Journal of Educational Media, 29(3), pp. 175-187.

Voigt, C. & Swatman, P. M. C. (2005). Instigating Interaction In Electronic Case-Based-Learning. Paper presented at the International Conference on the e-Society 2005, Malta.

Voigt, C. & Swatman, P. M. C. (2006a). Describing a design pattern: why is it not enough to identify patterns in educational design? Paper presented at the Australasian Society for Computers in Learning in Tertiary Education –ascilite 2006, Sydney, Australia.

Voigt, C. & Swatman, P. M. C. (2006b). From surface to meaningful collaboration: An activity theory perspective. Paper presented at the International Conference: e-Society 2006, Dublin, Ireland.

Voigt, C. & Swatman, P. M. C. (2006c). Learning through Interaction: improving practice with design-based research. International Journal of Interactive Technology and Smart Education, 3(3), pp. 207-224.

Voigt, C. & Swatman, P. M. C. (2006d). Online Case Discussions – Tensions in Activity Systems. Paper presented at the 6th IEEE International Conference on Advanced Learning Technologies (ICALT), July 5 - 7, Kerkrade, Netherlands.

Voigt, C. (accepted). The contextual analysis of electronic case-based learning: A Pattern in the making. In P. Goodyear & S. Retalis (Eds.), Technology-enhanced learning: Design Patterns and Pattern Languages: Sense Publishers, Rotterdam.

Abstract

Motivation for the Project: Virtual team work and decision-making in face of a flood of information is increasingly the lot of today's graduates. Moreover, learning is not limited to just one phase in life, but is increasingly considered to be a lifelong endeavour for all knowledge workers. These two sets of demands create an increasing need for flexible and versatile forms of education, such as e-learning. Consequently, an important objective of higher education, both off- and online, is the development of skills related to critical thinking, collaboration and team facilitation. From a pedagogical point of view, a suitable method for promoting these skills is the provision of case-based learning.

Objectives: When implementing case-based learning in an online environment it is important to enable both an interactive and a social learning experience, two qualities fundamental to learning but difficult to achieve in a virtual setting. This thesis explores the extent to which case-based learning can be implemented electronically and the associated efforts and benefits this might bring. The project also aims to formulate instructional guidelines that compensate students' efforts with an increasingly efficient and enjoyable learning process.

Overall, this thesis argues that an important part of electronic case-based learning is the encouragement of debate within, as well as between, the various individual student groups studying an online course. In fact, this research project is predicated on the belief that it is through critical discussions that students develop the skills this research is targeting. It therefore follows that the quality of a learning design can be evaluated in terms of its ability to support student interaction during the different stages of case-based learning.

Methodology: To analyse learning events in their natural settings, this research project combines design research principles with a process of data interpretation based on Ricoeur's 'hermeneutic arc'. The former gives the research its interventionist and iterative structure, while the latter attempts to present qualitative findings as objectively as possible.

The hermeneutic arc approach suggests that interpretation is based on a systematic three-stage process: (1) describing first impressions, (2) analysing the structural elements of a learning event; and (3) applying different angles of interpretation. At a data level, the three stages are supported by descriptive statistics, thematic schemes and learner comments respectively.

Findings and Contributions: While synchronous events are not yet common features of all online courses, with few exceptions students had no difficulty committing to synchronous collaboration – although questions did emerge at a later stage, when

meetings needed to be prepared and facilitated and meeting outcomes integrated into the group's report. The general concept, already provided in the form of the Harvard case method, was clearly insufficient to support online learning in and of itself: what was needed was a design that supported the decisions and activities of e-CBL teams more closely.

Based on a pilot study and three research iterations, involving more than 180 students, the e-CBL design was continuously refined and extended. Findings comprise:

- an e-CBL development matrix structuring learners' progress in terms of method and media competencies,
- a collaboration process using application sharing and Voice over IP which is recommended to get groups started,
- an e-CBL meeting model explaining the differences between groups usage of online meetings;
- a set of design patterns for those areas where the instructional design needed to balance competing educational effects.

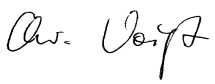
At a theoretical level the research identifies a conceptual framework for the design of fruitful case discussions in an online environment and at a practical level, the conceptual framework has been used to implement and evaluate several versions of a case-based online course.

Declaration

I declare that:

this thesis presents work carried out by myself and does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university;

to the best of my knowledge it does not contain any materials previously published or written by another person except where due reference is made in the text; and all substantive contributions by others to the work presented, including jointly authored publications, is clearly acknowledged.



Christian Voigt
July 2008

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Working on this thesis was often an experience as exciting as it was challenging. The excitement came with every idea that would help to tackle a problem from a new perspective until a solution began to emerge. However, integrating the parts of the solution into a coherent whole could be a tough task at times.

I would not have mastered the obstacles along the way without the support of many. Foremost, I would like to thank my doctoral mentor, Professor Paula Swatman for her outstanding assistance during the ups and downs of my research. How many PhD supervisors check draft chapters Sunday late evening, invite their students to a BBQ and help out whenever they can? Her guidance and insights taught me a lot and in fact, I would not have been able to come to Adelaide and continue my PhD at the University of South Australia without her.

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Very importantly, thanks to all students who participated in this research; without their willing cooperation this thesis would not have been possible.

Every research profits from the opportunity to discuss and bounce off ideas with colleagues and friends. Their attention, empathy and feedback is gratefully appreciated and acknowledged. I thank: Adam Jenkins, Christopher Stewart, David Banks, Assoc. Prof. David Kearney, Donald Falconer, Dr. Freya Higgins Desbiolles, Assoc. Prof. Ian Reid, Steven Clark, Steven Hodge, Stuart Ainsworth and Dr. Wendy Bastalich.

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1 INTRODUCTION

In today's society, learning is one of the most indispensable activities to succeed in an environment characterised by continuous change. Globalisation, increased competition and the revolutionising development of information technology are only a few signs of rapidly changing social and economic conditions creating a need for continuous learning (Zhang & Nunamaker 2003).

The speed with which knowledge goes out of date in many areas of life requires an ongoing commitment to learning which, in order to be compatible with a learner's professional or personal goals, needs to be flexible. There is a danger in using the term "flexible learning", however, because it is often taken to be synonymous with distance learning, indicating that the major obstacle to be overcome is being at a distance from where education is provided (Collis & Moonen 2001). However, recent conceptualisations of flexible learning include choices not only about time and place but also about content, tasks and technologies used (ibid). To provide for these latter meanings, understanding of the true meaning of flexible learning poses a challenge for educators, who need to decide on the level of the technological and instructional support for their learners. The purpose of this Thesis is to design, implement and evaluate online case-based learning as a pedagogical strategy that has already proven to be a flexible, yet productive, form of learning in the off-line world (Hackney, McMaster & Harris 2003; Williams 1992).

The objective of this Chapter is to position this Thesis within the current educational and technological landscape. Figure 1-1 shows the flow of the presented argument .

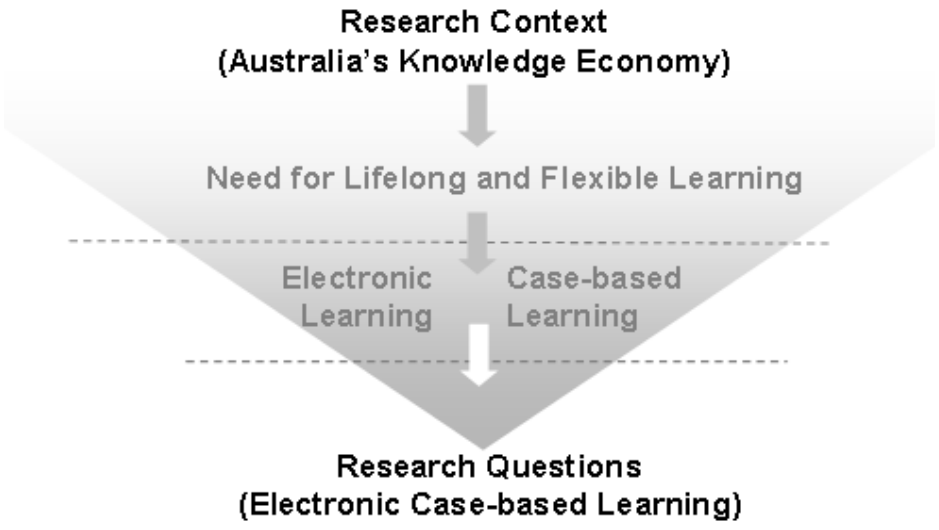

Figure 1-1: From research context to research questions

Chapter outline: The Chapter begins by defining the social context of this study in terms of educational needs experienced by knowledge-based economies in general – and Australia in particular (Section 1.1). Great expectation is associated with more flexible forms of education, such as e-learning, which enhance access to further education. However, employers and governments are not only concerned with the breadth and variety of education alternatives, but also with the depth of the learning which these provide. A critical reflection on the 'hopes and hypes' of e-learning argues for the need to avoid deterministic e-learning research that regards either technology or learners as passive elements that can be controlled experimentally (Section 1.2).

A brief introduction to case-based learning and its merits shows why an attempt to offer this teaching and learning method in an online environment is a worthwhile endeavour (Section 1.3). The chapter continues by outlining the overarching research question and specifies subsidiary research questions that will guide further investigation (Section 1.4). To contextualise the research, the field of study is described in terms of course characteristics and the technological infrastructure available (Section 1.5). Significance and expected contributions of this research project, as well as an outline of this Thesis, conclude the Chapter (Sections 1.6 and 1.7).

1.1 Background: Lifelong Learning and Australia's Shortage of Skills

Lifelong or continuous learning arrangements are considered to be a condition *'sine qua non*' for the development of modern societies (Longworth 2003). The need for lifelong learning is based on the importance of skilled workers in knowledge-based economies of the 21st century. A key argument for lifelong learning is the relationship between economic growth and the development and application of new technologies, particularly information and communication technologies (Fitzgerald 2001). Importantly, in addition to the economic rationale for lifelong learning, a seminal UNESCO report by Delors (1996) made a strong plea for learning as a condition to promote social cohesion, democratic participation and global understanding.

In Australia, the need for 'knowledge-workers' can be discerned from a general concern about the shortage of skilled labour and an increased business use of information and communication technologies (ICT):

- For example, the 'Availability of Suitably Qualified Employees' was the number one concern for Australian businesses in the last two investor confidence reports issued by the Australian Chamber of Commerce and Industry (ACCI 2006, 2007).
- According to the Australian Bureau of Statistics, the uptake of ICT by Australian businesses is steadily increasing; 77% of businesses used the Internet in some

form, 27% had a web presence and 33% placed orders via the Internet (ABS 2006).

Australia's higher education sector plays an important role in satisfying the country's need for qualified workers, as well as supporting cultural growth. This was emphasised in a Ministerial Discussion Paper of 2002 which stated that the purpose of higher education is to prepare individuals for the workforce; and to contribute: "to the fulfilment of human and societal potential, the advancement of knowledge and social and economic progress" (DEST 2002, p.7).

To provide an idea of the size of the higher education sector, the following facts may help. Since 2001 student enrolments have been stable, with around 19% of the student population aged 17-24 (OECD 2007, p.x), which meant that in 2005 almost one million students were enrolled in higher education institutions (ABS 2007, p.307).

Particularly interesting for this research are the numbers of students who choose to study either entirely or partially in external mode (i.e. off-campus), since they are the most likely beneficiaries of the advancements in online education. In 2005, 13% of all Australian students enrolled externally and a further 6% chose multi-modal tuition, which refers to a blend of courses in face-to-face and external mode (ABS 2007, p.308).

Adding to the demand for high quality external studies is Australia's population density and the increasing tendency to work and study simultaneously:

- With 2.5 people per square kilometre, Australia is the third least populated OECD country, generating particular issues in offering higher education to regional, rural and isolated communities (OECD 2007). Despite its obvious suitability to resolve this problem, however, external study mode is not always the preferred alternative for aspiring students in rural areas, due to the lack of a social network and limited teacher interaction (DEST 1999, p.67). This situation could change through the use of richer communication media and more interactive learning scenarios.
- Another likely reason to choose an external study mode is the increasing number of full-time students who work part-time and thus spend less time on campus (James 2001).
- Finally, Australia has a tradition of mature age students, with 25% being thirty and over (ABS 2007. p.309), people who are likely to work and study simultaneously.

In general, it can be said that students increasingly seek choice in their learning and this is increasingly supported by technology and new forms of learning (Frand 2000; Hilton 2006). Ever more students in higher education require flexible forms of learning, independent of time and place or of their respective phases of life (Longworth 2003).

Learning is no longer seen as a ‘one-off’ preparation for future employment (Aspin & Chapman 2000).

In addition to the need for flexible and ongoing learning at a national and individual level, an important factor to consider when discussing flexible learning, is employers' expectations in regard to the skills graduates bring into their business. Although technical and applied capabilities are still important, the Business Council of Australia has reported an increasing demand for communication, teamwork and other 'soft' skills, which are seen as crucial to innovative businesses (BCA 2006, p.15).

Similar results have been reported in a study conducted by ACNielsen, which showed that employers ranked creativity and flair, enthusiasm; and the capacity for independent and critical thinking in graduates highly (ACNielsen Research Services 2000, p.16).

1.2 Research Motivation: Hopes and Hypes of e-Learning

This section provides a brief overview of existing research on e-learning, with the goal of highlighting changes in general understanding of what e-learning involves. Whereas early research focused almost exclusively on the role and effects of technology, researchers soon realised the need to re-centre their analysis on learners and their activities (Dillenbourg *et al.* 1996). Hopes and hypes of e-learning have been direct consequences of this changed understanding. Though new technology justifies the hope for better learning environments, a belief that there is a “technological fix” (Whitworth 2006) to an essentially socio-technical problem can quickly turn hope into hype. With the increase of online interactivity, e-learning becomes more social and requires multi-disciplinary approaches to better understand the relationship between learning and technology (Vrasidas & Zembylas 2003). Moreover, as the following discussion of e-learning definitions will show, at the centre of each definition is the activities of learners rather than the potential capabilities of the applied technology.

A 'broad tent' definition of e-learning offered by Laurillard (2006) states: "A student who is learning in a way that uses information and communication technologies (ICTs) is using e-learning" (p.71). Alternative terms used to describe learning involving technology include: web-based learning, online learning or networked learning (Goodyear *et al.* 2004; Khosrowpour 2002). These terms emphasise the role of the Internet, web-applications or computers as a medium which connects learners with instructors, digitised materials and peers (McConnell 2006b).

Recent discussions about an appropriate definition for e-learning, however, suggest providing a broader meaning to the 'e' in e-learning, emphasising the transformational

force of technologies which can enable learning beyond the mere replication of known classroom practices. Rosenberg (2001, p. 37) offers the following interpretations:

- 'e' for experiential learning, as it is influenced by technological as well as social factors;
- 'e' for extending learning beyond classroom or training activities;
- 'e' for expanded learning that gives choice in terms of topics, materials and learning pathways.

Rosenberg's enhanced definition of e-learning and the demands of learners and employers as expressed in section 1.1 are only some of the reasons why e-learning needs to be engaging, flexible and highly interactive. Merrill's (2006) statement "Information is not instruction" (p.272) is a case in point. Few would deny that e-learning needs to advance beyond electronic page turners of lecture notes or other learning materials if learning objectives include technical *and* soft skills. This renewed focus on quality in online education is the background for current research that strives to exploit the potential capabilities of new technologies based on effective educational designs (Laurillard 2002).

The hope

The demand for skilled professionals and the need for these staff members to continuously update their skills and knowledge has led to an ongoing interest in efficient and cost-effective forms of learning. In this context ICT is seen as a crucial factor to support flexible learning.

An indicator of the importance of e-learning is the continuing growth of e-learning programs and e-learning related investments:

- Since the 1950s Australia has been an early adopter of new technologies in distance learning, starting with radio broadcasts ('School of the air') and educational television programs (Mason 2003). In order to boost research and development the 'Backing Australia's Ability – Building our Future through Science and Innovation' plan commits AUD $5.3 billion over seven years (2004 – 2011) to science and innovation (Australian Government 2004). Though the latter does not specifically target e-learning, it improves infrastructure and provides funds for the development of technologically enhanced learning (Mason 2003).
- In a survey undertaken by the Sloan Center for OnLine Education, over half of the American public, private or for-profit institutions (52.6%) agreed or strongly agreed that online education is critical to their long term success (Allen & Seaman 2004, p.12).

- In Europe, a study of 200 universities showed that 85% integrated ICT into their teaching (PLS Ramboll Management 2004). Considerable variations, however, existed regarding the use of ICT as a tool to redesign educational programmes and develop novel pedagogical frameworks (ibid).

Is it all hype?

Impact studies of "new" media on distance education already have a substantial history. Every new medium (radio, television, Internet) has claimed to improve learning but comparative studies concerning the influence of media on learning[1] have not been able to show unequivocal results (IDECC 2007).

E-learning evaluation studies seem to repeat Cuban's (2001) analysis of the hype and hope around the introduction of computers in schools and higher education in the mid 80's. At the time US school administration assumed that increasing the availability of new technologies in schools would lead to better education (2001, p.180). Subsequent evaluations were disappointing, however, showing unexpectedly little use of the available technology (2001, p.133). Cuban concluded that the problem lay in the premise that technology would shape education automatically and noted that little research had been undertaken to understand the impact of computers on the ecological system of schooling, e.g. teachers needing specialised preparation, curricula including time to teach the new technologies, and software allowing for different modes of instruction (ibid. p. 181-183).

Today, meta-analysis of large numbers of evaluation studies (Abrami *et al.* 2006; Bernard *et al.* 2004; Machtmes & Asher 2000) 'still' cannot find significant correlations between the use of specific technologies and learning outcomes. Hence, not many firm and undebated recommendations are available for educators who just want to apply the findings of e-learning research when planning their next online course.

The need for more comprehensive theories that link learning technologies with their educational settings is widely cited and long known (Banathy & Jenlink 2003; Romiszowski 1970). Nonetheless, studies embracing a broader view of e-learning as socio-technical systems are still rare and many studies pursue isolated media characteristics (Fletcher, Tobias & Wisher 2007).

A change in research practices can be seen with computer supported collaborative learning (CSCL) studies which show an increasingly interdisciplinary theoretical basis,

[1] The "No Significant Difference Phenomenon" website gives an overview of evaluative research about the effects of technology in education since 1923. The web site continues to report mixed results about whether technology makes a significant difference or not.

incorporating knowledge from areas as diverse as computer science, psychology, sociology, anthropology and information sciences (Hoadley 2005).

Implications for this research

In light of the limited value of comparative research and the recognition that practicable e-learning models are still lacking, more interpretative studies[2] of innovative ICT applications in education have been demanded (Blass & Davis 2003; Jonassen, Campbell & Davidson 1994; Kozma 1994).

Believing that using a variety of media and offering choices to online learners improves learning and learner motivation - if combined with suitable learning designs - (Williams, Nicholas & Gunter 2005) this research aims to contribute to the field of e-learning, specifically in the areas of design and implementation.

Finally, avoiding overgeneralisations, the study concentrates on exploring e-learning in a given course context where consequences of design changes can be observed and analysed in-depth by the researcher.

The following section provides a rationale for the choice of e-CBL as a guiding learning strategy, based on the benefits of the method which seem to respond directly to the demands for more engaging e-learning as stated at the outset of this section.

1.3 A Rationale for Case-Based Learning

Historically, learning with case studies in higher education was first developed in 1870 in the Harvard Law School (Merseth 1991). Later, the method was gradually introduced in additional teaching areas such as economics, accounting, computer science and information systems (Golich *et al.* 2000). Other disciplines where case based learning is widely practiced include health sciences and medical education (Eshach & Bitterman 2003; Williams 1992).

Most authors describe case-based learning (CBL) as an active, self-directed inquiry into situations containing number of domain-related issues (Andrews 2002).

Matejka and Cosse (1981) define CBL as "*an instructional technique that, rather than presenting general concepts and theories, provides situations to analyse and data from which decisions must be made*" (p.2).

[2] A case in point is the Second International Technology in Education Study, which analysed 174 case studies from 28 participating countries with the aim of generating model cases to inform and inspire the use of learning technologies in similar settings (Kozma 2003; Kozma & Anderson 2002).

Depending on learning objectives and information given in the teaching case, students need to identify problematic issues, suggest solutions, or evaluate decisions made by the stakeholders in the case study (Barrows 1986).

Advocates of case-based learning argue that students are better prepared for what they will encounter in their future professions (Andrews 2002; Williams 1992). Teaching cases aim to shift the focus from rote learning to meaning, because real world problems are mostly ill-structured and do not present themselves in the form of clearly defined questions, as they often appear in a school context (Jonassen 1997).

Another reason to use CBL is the similarity between case studies and stories. Jonassen & Hernandez-Serrano (2002) point to the importance of story telling for preserving and developing knowledge over time. Stories present knowledge in a way that enables an audience to personally revive the genesis of knowledge (Lave & Wenger 1991). The primary objective of story telling is not to provide a logical proof of knowledge, but to get to the meaning of a story and solve problems based on solutions that worked in similar cases (Polkinghorne 1988; Schön 1995).

Other benefits of CBL have been reported in other areas:

- Kleinfeld (1991) found that students taught with the case method were better able to spot critical issues and analyse them in more sophisticated ways than students taught through the discussion of readings.
- Reported benefits of case-based learning in information systems (IS) education frequently indicate improved higher-order reasoning skills, a high ratio of student / instructor activities (Stewart & Winn 1996) and considerable motivational gain through realistic problems derived from real world examples (Hackney, McMaster & Harris 2003).
- Desiraju and Gopinath (2001) point to the increased integration of many learners who would otherwise remain passive.

The last benefit to be mentioned in this introduction is the collaborative nature of CBL (Wassermann 1994). In discussing different view-points, students need to demonstrate elaborated argumentation skills as well as extensive coordination and negotiation skills to manage the collaborative aspects of working in a group (McConnell 2000, p.26). The value of collaboration has been shown by Gokhale (1995) and Moshman and Geil (1998), who found that peer interaction in small learning groups substantially increased critical thinking skills.

In summary, it can be said that case-based learning is a promising method in terms of engaging students, promoting critical thinking and developing interpersonal and

communication skills. Hoping to transfer these benefits into an online environment, this research aims at specifying an educational design using multiple electronic communication media. The next section will present the central research questions as well as derived subsidiary research questions.

1.4 Research Questions

In this Thesis, the design and usefulness of the case-based learning method as an instructional e-learning strategy is examined. However, as previous research in e-learning has shown (Section 1.2), neither technology nor instructional methods alone are sufficient to specify successful e-learning solutions.

Jonassen *et al.* (1994) caution that people learn from thinking and not from technology. Technology has no causal impact on learning, in the sense that the 'right' technology could make someone learn. Objective answers to questions such as "What is the added value of technology?" or "Is learning with technology better than without technology?" cannot be given without unduly oversimplifying the complex nature of learning (Bell, Hoadley & Linn 2004, p.79). An alternative design question, however, could be "How does technology add value to the learning of X under the conditions of Y?". The crucial element is how technology and instructional method facilitate learning activities, because it is activities that engage students and change their understanding and not technology itself (Schank, Berman & Macpherson 1999).

The present research is mainly evaluative, in that different course designs incorporating different sets of technologies are explored and compared in terms of costs and benefits. However, the arguments which follow will use the word 'efforts' instead of 'costs' to avoid the impression that the analysis will aim at the financial or organisational side of the investment in e-learning.

Focusing on a learners' perspective on e-CBL the overall research question is:

Can electronic case-based learning be designed in such a way that learners' additional efforts are balanced by an equally significant benefit in terms of skills development, motivation and learning efficiency?

In order to determine whether one e-CBL design is not only functional but also better than another e-CBL design, efforts and benefits which come with different designs will be compared. Put simply, if acquiring the skills to master a technology takes twice as much time as doing the task without technological support then one might doubt the value of using the technology. If, however, once the technology is mastered the task output

improves or, in the case of e-CBL, participation in online tasks increases considerably, then one would probably encourage the usage of the tool despite the time needed to learn how to master the technology.

Due to the complexity of the overall research question, the following subsidiary research questions (SRQs) are established:

	Subsidiary Research Question
SRQ 1:	What are the various dimensions to be considered when developing e-CBL in an online learning environment?
SRQ 2:	On what basis can the efforts and benefits in e-CBL be evaluated ?
SRQ 3:	What are the efforts and benefits of e-CBL from a student perspective?
SRQ 4:	How can e-CBL design knowledge be formulated to support its reusability?
SRQ 5:	What design patterns can increase the practicability of the e-CBL framework?

The subsidiary research questions 1-5 reflect the developmental nature of this research: conceptualisation, implementation and specification, evaluation and preparation for future reusability. These phases are typical for educational technology research when a design is performed and studied at the same time (Richey, Klein & Nelson 2003).

The following paragraphs discusses each research question in more detail.

SRQ 1 – Conceptual model

Based on an initial understanding derived from the literature and a first implementation of e-CBL, SRQ 1 provides a conceptual model that combines the various learning objectives and activities which constitute e-CBL.

SRQ 2 – Evaluation framework

Having gained a qualitative understanding of efforts and benefits, SQR 2 seeks to provide a framework that enables researchers and educators to understand e-CBL on a more fine-grained level. Understanding the potential value of different types of activities is an indispensable pre-condition for evaluating the way the conceptual model is implemented.

SRQ 3 – Enriched conceptual model

Together with SRQ2, SRQ 3 asks for an identification of the efforts and benefits that come with the implementation of the conceptual model. Whereas SRQ 2 concentrates on a

theory based analysis of e-CBL, this question aims to clarify the learning experience based on the learner's perspective.

SRQ 4 – Reusable design knowledge

SQR 4 investigates the possibilities of describing the e-CBL design knowledge gained after two empirical studies in such a way that it can be reused beyond the research project.

SRQ 5 – Extensions to the e-CBL design

It is important to point out that this research does not claim to provide a complete e-CBL design which would prove successful under all circumstances. The objective is rather to formulate 'fine-grained' design elements that can inform future e-CBL implementations. 'Design elements' in this study are conceptualised as design patterns (Alexander 1979, 1999). Design patterns are defined as rules describing a solution for a problem linked to a context.

1.5 Research Scope and Environment

This Section gives a brief overview of the research scope in terms of graduate qualities such as educational objectives and course enrolments, as well as the research environment's main characteristics in terms of course design and available ICT infrastructure. However, most of what is described here will be developed in more detail in Chapters 5 to 7.

Research scope

All e-CBL designs evaluated in this thesis were applied in an undergraduate course "Introduction to e-Business" at the University of South Australia (UniSA) where the researcher was both investigator and Course Coordinator. Although this provided the necessary flexibility to implement design changes as they became necessary, it also meant that additional care was required when collecting feedback in a non-anonymous way (e.g. interviews and focus groups). To adapt this project to the time and resources available, the scope of the project was limited to a single course and a single technological learning infrastructure as offered at UniSA. Future research might apply the e-CBL design in a graduate course or a different university to see whether different courses and technologies would substantially alter the research outcome.

The course "Introduction to e-Business" is offered three times a year. The present Thesis comprises data selected from a total of four study periods. The course is conducted over thirteen weeks, except over the summer break when the course is offered in intensive study mode over eleven weeks. Course offerings over the summer break have

considerably higher online enrolment numbers, with an average of 56 online students over the past three years, compared to an average of 20 online students during other study periods. The course is part of the University's 'Broadening Undergraduate Education' (BUGE) program and thus no specific entry requirements exist.

Furthermore, this research is limited by the University's educational goals as part of its teaching and learning framework (UniSA - Flexible Learning Centre 1999). This is a necessary restriction to establish a first orientation against which educational success can be measured.

UniSA has committed to seven graduate qualities that have been identified as educationally, socially and professionally desirable (see Figure 1-2).

A graduate of the University of South Australia…

1. operates effectively with and upon a body of knowledge of sufficient depth to begin professional practice
2. is prepared for lifelong learning in pursuit of personal development and excellence in professional practice
3. is an effective problem solver, capable of applying logical, critical and creative thinking to a range of problems
4. can work both autonomously and collaboratively as a professional
5. is committed to ethical action and social responsibility as a professional and citizen
6. communicates effectively in professional practice and as a member of the community
7. demonstrates international perspectives as a professional and as a citizen.

Figure 1-2: Graduate qualities at the University of South Australia

As outlined in the University's strategic intent, these generic qualities need to be reflected in concrete course designs and assessment tasks (UniSA 2006). Fostering the above qualities cannot be separated from creating conditions which are conducive to their achievement (Reid 2007, p.36). External students, however, often find it difficult to engage with their instructors and peers in a similar way to on-campus students, because of the differences in their learning environment. With one of its main objectives being to promote collaboration and critical thinking skills as part of case-based learning, therefore, this research contributes to the realisation of UniSA's graduate qualities.

Research environment

The course introduces e-Business from three perspectives: business foundations, technologies and societal phenomena (Laudon & Traver 2007). Structuring the course around case studies provided an excellent opportunity to promote in-depth discussions of diverse topics such as online business models, e-marketing or secure payment solutions for small e-businesses. Addressing those topics in a number of case studies, students realised that these were not completely separate issues but problems most companies had to face if they decided to do business online.

To work on the case studies collaboratively, all students were assigned to groups of four to six learners. Group structures were heterogeneous in terms of age, nationality, work experience, field of study; and geographic location (a more detailed discussion of demographic information is provided with each empirical study in Chapters 5 to 7). The majority of students enrolling in this course were in their second and third study year, by which time basic skills in academic writing, referencing and using the University's online tools could be expected.

Learning groups were formed to prepare a case, meet online to discuss issues and solutions to the case, and to write a case report based on the group's discussions. Group processes were supported through suggesting a step by step approach to working through learning cases (Mauffette-Leenders, Erskine & Leenders 1999).

To work collaboratively on the case studies, groups had access to both asynchronous (discussion boards, emails) and synchronous (chat, virtual meeting rooms) communication channels (Learning-Connection 2007). These communication channels are all part of the University's online learning environment, where courses can be designed either based on pre-defined templates or arranging learning objects as needed (Reid 2007). Discussion groups (Figure 1-3) and chat rooms (Figure 1-4) are two of the learning objects teachers can integrate into their course homepages.

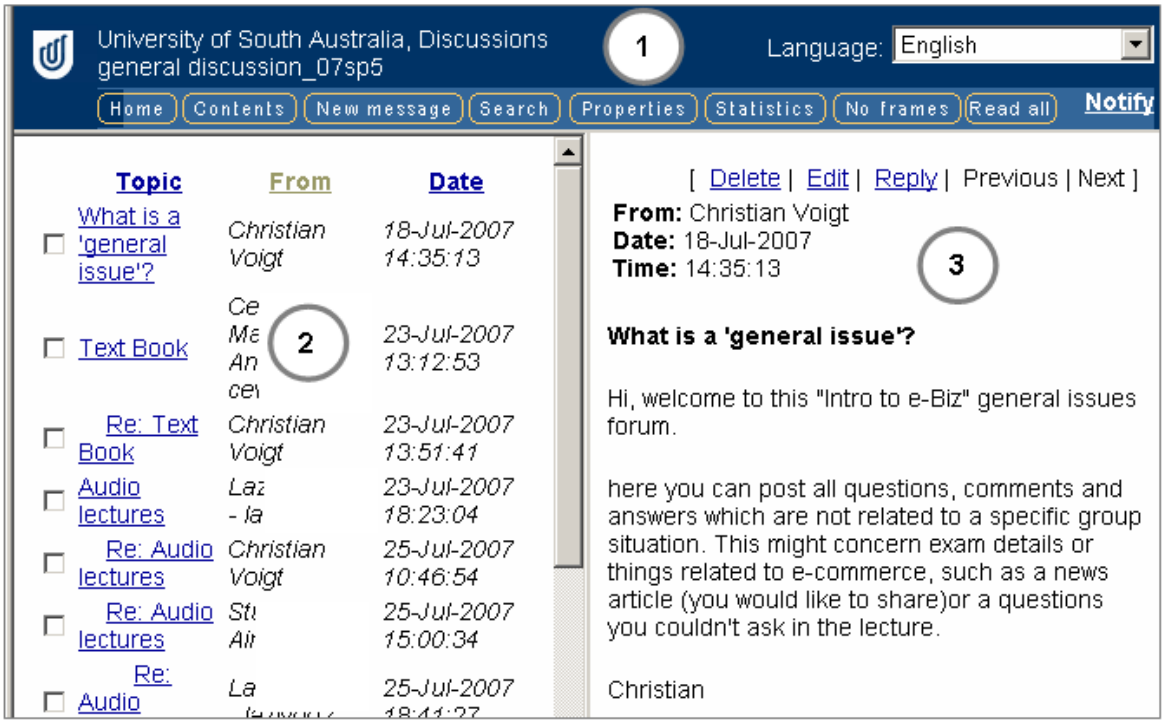

Figure 1-3: UniSA discussion group

The discussion forum (Figure 1-3) comprises three areas: menu frame (1), contents frame (2) and message frame (3). The menu frame contains functionalities such as editing a new message, keyword search or enabling email notification for every new message that has been posted to a specific forum. The notification email includes an URL that links directly to the posting, so that students do not need to log on and check for new messages manually.

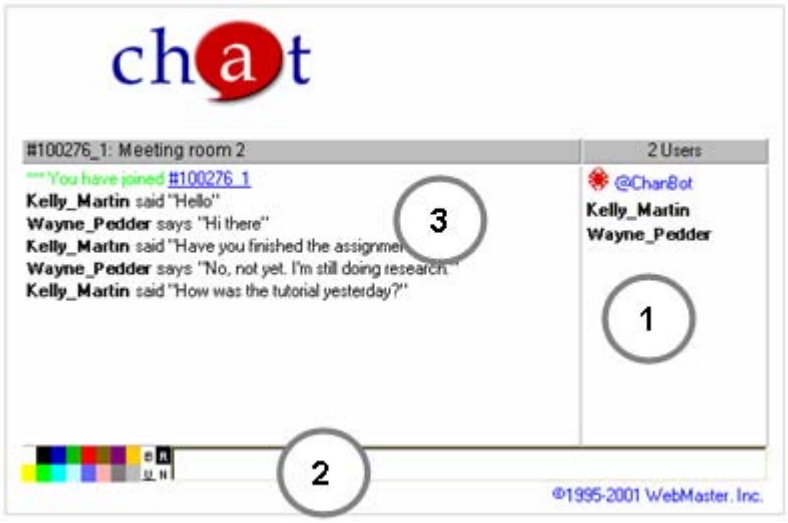

Figure 1-4: UniSA chat room

UniSA's chat room (Figure 1-4) also comprises three areas: list of participants (1), message editing area (2) and ongoing chat conversation (3). The complete chat log file (Figure 1-5) can also be displayed as a webpage, which enables students who could not participate in a chat to follow up on what was decided during the missed group meeting.

6:02 PM		**Christian_Voigt** has joined the room
6:04 PM		**Liu_** has joined the room
6:04 PM	Christian_Voigt	In case anybody joins the chat I will be online for the next hour or so, however it may take me some minutes to answer ...since this window is not always active.
6:05 PM	Liu_	hi christian
6:05 PM	Liu_	may i know by when should we post our answers on the discussion forum?
6:06 PM	Liu_	and also, where should we post it on
6:07 PM	Christian_Voigt	Hi, sure I post the link in a minute
6:08 PM	Christian_Voigt	additionally I am writing an email which explains the first tasks in more detail ... you should have it by tomorrow
6:08 PM	Liu_	thanks
6:09 PM	Christian_Voigt	the forum, however, is under 'case discussions' http://www.unisanet.unisa.edu.au/Discussion/index.asp?SUBJECT=13420&FR=1&DISC=15030&target=_blank

Figure 1-5: Chat log file

Arguably the most powerful technology used in this course was the *Centra® environment*, a virtual meeting and application sharing software solution (Saba 2007). A fairly extensive introduction to the functionalities of Centra is provided at this point, since this product's range of functionalities might be less commonly known than chat-room or forum features.

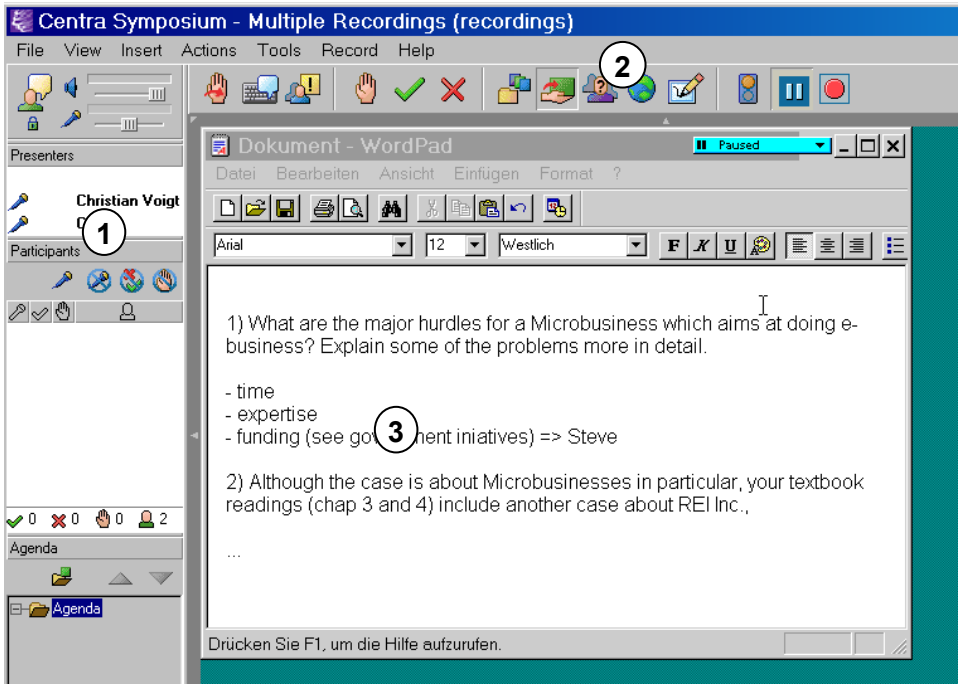

Figure 1-6: Screenshot of virtual meeting room –Centra ®

Centra enables users to hold audio discussions while simultaneously looking at another source of information (for example a shared document or a shared web-page) thus allowing for the convergence of two media. Students use headphones with attached microphones to communicate with one another and manipulate the data in the shared application via mouse and keyboard. Figure 1-6 shows a screenshot of Centra in application-sharing mode. Sharing an application means that one meeting participant hosts the application, in which all participants can change or create content. The view on the shared document is continuously updated so that any changes become immediately visible to all meeting participants.

The Centra application is structured into three main areas to manage meeting participants, sessions and applications (see numbers in Figure 1-6).

1. *Participant area:* The left hand area provides an overview of all meeting participants. This area also shows visual indicators when participants comment on an ongoing meeting without interrupting it (e.g. smiley, clapping hands or a red cross).

2. *Session management area:* A toolbar at the top of the screen helps to switch between different functionalities of the meeting room such as sharing an application, using a whiteboard or recording a session.

3. *Application sharing area:* The central area in Figure 1-6 shows the shared application, in this example a WordPad ® editor.

It is important to remember that the communication tools listed above represent only the officially-supported ICT infrastructure of the University. Additionally, students can set up their own communication networks via email, SMS, Instant Messaging or alternative chat rooms. Sometimes this is referred to as "backchannel communication" (Yardi 2006), as opposed to frontchannel communication or, as McCarthy *et al*. (2004) explain it, 'backchannel' communication is what is communicated unofficially. Though in many cases not accessible by the instructor, unofficial or backchannel communication has been shown to be important in developing a sense of group belonging (McCarthy *et al.* 2004). Moreover, backchannel communication addresses an important aspect of privacy and self-determination, e.g. if a group prefers to discuss a problem without 'being watched', or if a group integrates additional communication media because it allows for greater flexibility, then this needs to be respected by the teacher.

1.6 Significance and Expected Contributions

This research is significant in the context of a growing demand for flexible, high quality forms of online learning. As already mentioned, case-based learning is a well-known form of learning in face-to-face classrooms, however, few attempts have been made to fully apply this learning method in the virtual world of online learners.

As will be shown in the literature review (Section 3.1), existing studies of online case-based learning have several restrictions. Either they were restricted in their use of educational technology (e.g. limiting communication to asynchronous or text-based media only), or in the extent to which case-based learning activities were actually conducted over the Internet (e.g. using a blend of off- and online activities). To the best of the author's knowledge this study is unique in that it combines the following characteristics:

- all collaborative, case-based learning activities occur completely online;
- rich communication technologies such as voice conferencing or application sharing are integrated and evaluated; and
- it considers the development of learning over an extended period of time (11-13 weeks).

In theoretical terms, this study makes a significant contribution to the area of highly interactive online learning. It contributes to the understanding of how learning designs influence and are influenced by learner's actual activities. It identifies issues in performing e-CBL and suggests a conceptual framework based on a synthesis of literature on learning theories, activity theory and computer mediated communication.

Moreover, this research adds to extant knowledge about online learning processes through substantial analysis of a wide range of empirical evidence. Further, by using virtual meeting rooms, this research contributes significantly to the practical understanding of a very innovative, but so far little evaluated, technology (Laurillard 2002, p.155).

Methodologically, this research applies a novel research design to study e-CBL in an iterative and interventionist way (see Chapter 4). Additionally, the study applies an data interpretation process based on Ricoeur's (1976) hermeneutic arc. The significance of this approach lies in its attempt to integrate objectivist and constructivist design rationales (cf. Cronje 2006).

In practical terms, this study contributes to the development of e-learning at higher education institutions. The design of e-CBL as an engaging and effective learning method is extended into an online learning environment. This study aims to provide:

- A conceptual model that organises perspectives on e-CBL and supports the implementation of e-CBL.
- An evaluation framework that ensures efficiency and effectiveness of e-CBL.
- A number of educational design patterns[3] addressing specific issues of online group work such as coordinating online meetings, virtual team building, supporting case discussions or evaluating e-CBL.

1.7 Outline of the Thesis

This Thesis is structured into eight Chapters which describe background, relevant literature, methodology, empirical research and conclusions related to the design of electronic case-based learning.

- *Chapter 1* has provided the context of this research as well as a rationale for selecting the research topic. It specified the research questions and the contributions this study is expected to yield.
- *Chapter 2* is the first of two literature review Chapters and provides the learning-theoretical and pedagogical foundation for this research. It introduces the core activities of case-based learning in general and discusses benefits and perils of the method, in particular developing the pedagogical framework that will inform the design and evaluation of later e-CBL scenarios.
- *Chapter 3* is the second literature review Chapter and examines media choice theories and current findings on technologically-mediated interaction. The central issue addressed in this Chapter is the question of how technology can support and add value to learning. It also discusses existing research on e-CBL, identifying the shortcomings that add to the justification of this research.
- *Chapter 4* discusses epistemological and methodological issues of researching e-learning in a real-world educational setting. The Chapter evaluates various candidate research methods (case studies, action research and ethnographic research) and describes the research approach taken in this study (design based research).

The following Chapters represent the empirical portion of this study and lead to the development and refinement of the e-CBL conceptual model. Each Chapter corresponds to a new research iteration.

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[3] Design patterns have a decidedly pragmatic purpose in that they focus on solving actual design problems rather than giving general design recommendations.

- The empirical analysis reported in *Chapter 5* serves to understand the complexity of e-CBL and uses an activity-theoretical lens to explain the interrelationship of multiple skills and competencies which need to be developed in the course of e-CBL. The result of this first empirical study is a first conceptual model of e-CBL.
- *Chapter 6* applies the conceptual model and evaluates its use as an educational design framework. Though the model developed in Chapter 5 provided a good foundation for guiding students' learning, a component to evaluate the actual discussion process was missing. Based on Garrison's (2003) research into communities of critical inquiry, this second empirical study extends the conceptual framework with a model of online meetings that provides a better understanding of what efforts and benefits imply particular e-learning process for students.
- The third empirical study, reported in *Chapter 7* uses the same design as in the previous two research iterations. The aim here is to identify additional design elements that increase the robustness of e-CBL. These design elements are findings drawn from repeated experiences with the design.
- Finally, *Chapter 8* summarises the theoretical and practical contributions and provides answers to the subsidiary research questions. Limitations of the findings are discussed. The Chapter concludes by proposing plans for further research.

2 THE PEDAGOGICAL FOUNDATION OF E-CBL

The objective of this literature review is to draw on relevant theories and empirical results that can support and justify the initial design specifications presented in this Chapter. Literature reviews may be domain-specific (theoretical) or problem-specific (integrative) (Cooper & Cooper 1989, p.13). The former provides an overview of past research to explain a phenomenon within one domain only, whereas the latter synthesises two or more bodies of knowledge to approach a concrete research question.

This research applies an integrative literature review and draws upon pedagogical as well as technological research. The first body of knowledge helps to define case-based learning in terms of objectives, activities and *learning theoretical foundation* (Chapter 2) and a second body of knowledge will represent potential benefits and constraints of *learning technologies* (Chapter 3) as they are relevant for e-CBL.

Figure 2-1 presents Goodyear's (1999) generic overview of the relationship between pedagogy and technology. Goodyear observed that research in e-learning is seldom purely concerned with either evaluation or development of virtual learning environments but often includes theory-based reflections, which lead to implementations in the real world which, in turn, can promote further reflections comparing the intended with the achieved learning. This interplay between reflection and implementation is indicated through the two block arrows between the pedagogical framework and the e-learning environment.

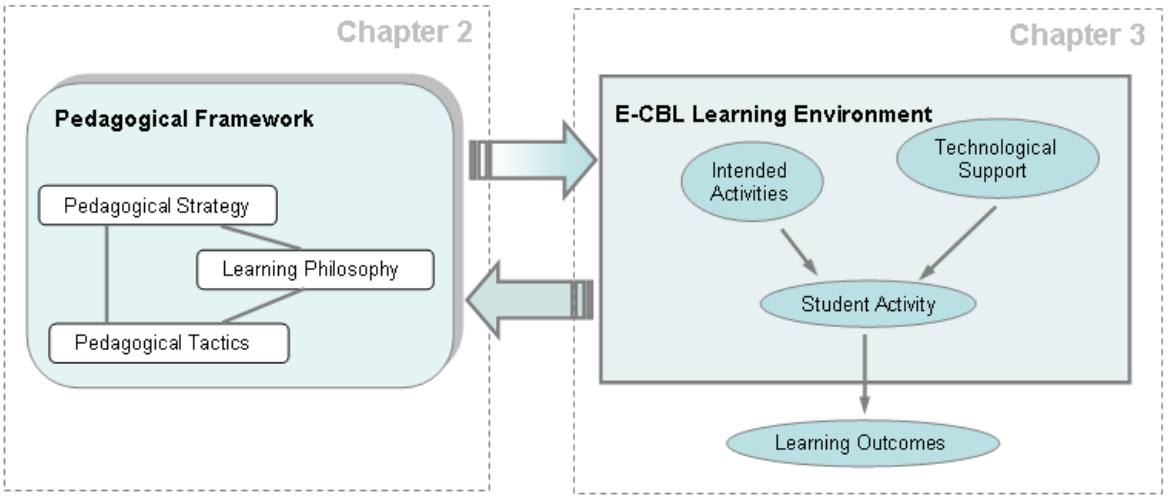

Figure 2-1: Pedagogical framework and learning environment, based on Goodyear (1999)

As can be seen in Figure 2-1 the literature review is split into two parts, partly to improve readability and structure of this Thesis, but also to emphasis the importance of a firm pedagogical conceptualisation of learning which is often missing in technology-centric e-learning research (Jochems, Merriënboer & Koper 2004, p.2).

Literature on electronic learning in general, and electronic case-based learning in particular, often stops short of specifying underlying learning theoretical principles (Janicki & Liegle 2001) or accounting for how technological innovations are actually supporting the implementation of a particular learning theory (Conole *et al.* 2004). This lack of focus on educational issues has been identified as a weakness in the existing e-learning research (Duffy & Kirkley 2004) which warrants commencing with a pedagogical framework.

The following elements of the pedagogical framework in Figure 2-1 are now briefly introduced and provide an outline for the structure of this Chapter.

Pedagogical Strategy: Case-Based Learning (Section 2.1)

The objective of a pedagogical strategy is to communicate the intended learning activities at a higher level (Goodyear 1999). The strategic orientation of the present research project is derived from this case-based learning method. Three variations of case-based learning are presented: the Harvard Method, the Mica Method and the Case Debate Method. However, no clear and undisputed model of case-based learning could be identified which provided a sufficient level of specification for e-CBL. Hence, the Chapter concludes with a set of core activities that were present in all three variations.

Learning Philosophies (Section 2.2)

Based on a clear understanding of what activities may constitute e-CBL, the implications of different learning philosophies are discussed. Garrison & Anderson (2003, p.11) caution that because new technologies can substantially alter the nature of learning activities, it is particularly important to define the educational ideal of an activity. Or, put differently, an electronically-mediated learning activity may lead to different outcomes than its off-line counterpart, so that knowing which educational objective was intended is a precondition if e-learning is to be amended successfully. The foundational perspective for this research is Vygotsky's (1978) conceptualisation of learning as socially and culturally mediated activities. Jonassen (2003), however, argues that multiple explanations of learning can only enrich our understanding and should be considered as complementary rather than mutually exclusive points of views. Following Jonassen's call for multiple perspectives on complementary learning, construction and design of e-CBL may be derived from alternative learning philosophies.

Pedagogical Tactics

Tactics are the detailed steps necessary to enact the pedagogical strategy (Goodyear 1999). The main difference between strategy and tactics is a matter of detail: tactics describe the moves that ensure the success of a strategy. For example, a strategy might suggest group discussions and peer evaluation, in which case relevant tactics would

include recommendations on how to improve commitment to group work or how to handle superficiality in peer evaluations. A particular characteristic is that tactics are often situated, which means they are triggered by or enacted in a specific context (Hughes & Moore 1999; Rangan 1995). For this reason, pedagogical tactics are not included in this Chapter since they would only generate a huge list of instructional actions without apparent relation to e-CBL. However, they will figure strongly in the discussion of *actual* empirical findings (Chapters 5-7) as shaped by particular e-CBL strategies and tactics.

Commenting on the relationships within the pedagogical framework, Goodyear (1999) argues that educators' philosophical ideas, pedagogical strategies and tactics are only loosely coupled: not every pedagogical strategy is grounded on learning theories and a clear set of tactics may not be available for every strategy.

In reviewing the pedagogical side of e-CBL, this Chapter attempts to answer three auxiliary research questions[4]:

- What defines case-based learning as a pedagogical strategy?
- What evidence can account for the *process* of learning?
- What evidence can account for the *outcome* of learning?

The first question concerns the issue of how to design e-CBL as pedagogical strategy or, put differently, what is it that educators and learners must do in order to learn with a teaching case?

The remaining two questions are more relevant to the issue of evaluating e-CBL. If two learning designs are to be compared one needs to account for the process as well as the outcome of learning. Both questions are of great importance in developing an adequate research design which can identify and take account of multiple forms of empirical proof is for learning (Onwuegbuzie & Teddlie 2003).

[4] These auxiliary research question have a predominantly structuring function in this Chapter and prepare the later empirical research aimed at answering the actual research questions as presented in Section 1.4

2.1 The Case-Based Learning Method

The following definitions of case-based learning emphasise learning as an active process starting with some narrative description as the basis for discussion.

> "The case method is an instructional technique that, rather than presenting general concepts and theories, provides situations to analyse and data from which decisions must be made" (Matejka & Cosse 1981, p.2).

> "A case is an account or description of a situation or sequence of events confronting an individual, a set of individuals, or an organization" (Matejka & Cosse 1981, p.3).

> "The objective of the [case] method was to generalize particular decisions into broader understandings of the principles of law" (Merseth 1991, p.243).

Building on these rather abstract definitions of CBL, the next Section provides an abridged example of how a case discussion could be constructed.

2.1.1 Why case-based learning in an e-Business course?

Teaching e-Business (EB) comprises a number of topics grounded in business or information technology which gives the subjects an especially multidisciplinary character (Ngai 2005). Moreover, the rapidly changing landscape of e-Business applications presents a particularly challenging environment within which to keep teaching up-to-date (McBride 2005). Due to the volatility of the subject area, Moshkovish *et al.* (2006) argue that a major challenge is to find a balance between *fundamental knowledge* (the more stable part of models and theories) and *technical skills* (the ever-changing part of applying those models and theories to concrete implementations of e-Business). A similar issue is stated by Gendron and Jarmoszko (2003) who state that finding the right combination of business analysis, hands-on topics and technology theory is an acknowledged challenge in IS education.

In this Section it is argued that the use of real world cases as an instructional method is an excellent way to balance theory and practice, as well as to explore the multiplicity of relationships between such diverse areas as online business models, e-commerce security and business ethics.

A brief discussion of Amazon.com as an assumed teaching case may demonstrate how a real world story about a well-known online bookstore (Spector 2000), can facilitate the application of specific e-business concepts such as a business model (Laudon & Traver 2007).

Firstly, analysing the Amazon case could be motivated by the general question of why Amazon succeeded at a time when so many other dot.com companies failed. While this is

certainly a complex question with no simple answer, a sub-question could ask how Amazon changed its business model over time. Here students are asked to apply eight, otherwise abstract elements of a business model (Laudon & Traver 2003, p.62) to a concrete company. Moreover, students are required to critically analyse each element from an innovation perspective. Thinking outside the box, some students may even question the text book's definition of a business model and apply an alternative one.

A possible continuation of the analysis could evaluate the role of technological innovation, because when Amazon's monolithic web applications could not scale anymore the company changed to a more flexible, service oriented architecture (O'Hanlon 2006). This improved the manageability of software changes, scalability of services and the integration of new service (ibid.). Not only did this improve Amazon's internal operations, it also helped them to become an e-commerce technology platform with an associate program where other companies can sell their products, paying a commission (Thompson *et al.* 2006). At this stage it is important students realize that Amazon does more than sell books, an observation which could open up another interesting branch of discussion: How much diversification is good for Amazon? Should they sell groceries? Why or why not?

As shown in this short example, the richness of real world cases allows discussion to develop in a variety of directions, discovering various aspects that may be equally relevant to the case topic. Students could argue that success depends on many factors and could not be pinpointed to a right or wrong business model. Amazon, for example, had to recognise that a seemingly harmless business innovation such as their attempt to charge customers different prices for the same product based on previous behavioural analysis (Hamilton 2001) had a detrimental impact on their reputation. Once customers realised what was occurring and complained, the company had to reimburse the difference in the amounts paid (ibid). Such an issue could be used to draw students' attention to the role of business ethics in general, responding to Walsham's (1993, p.252) critique that IS education is overly reliant on economic rationality if companies operate in an environment free of moral and ethical values.

Recognising the richness of lines of argumentation is also a precondition of valuing group work, where each member can potentially explore a different area of the case and share their insights afterwards.

2.1.2 What case materials to use?

A distinct element of case-based learning is that it uses stories as vehicles to transport facts, experiences and opinions in a contextualised way, so that readers infer meaning not only from the information included in a case but also from the way the information is presented (Bruner 1990, p.43). Golich *et al* (2000) differentiate *retrospective cases*,

presenting the history of a problem and real outcome, and *decision-forcing cases*, presenting a problem without a solution.

Cases can integrate information from different sources in different media formats such as movie clips, pictures or recorded interviews (Golich *et al.* 2000). Depending on the type of information source used to produce a teaching case, Roberts (2001) offers the following classification:

- *company field cases*, developed in cooperation with a participating company,
- *general experience cases*, where case data are invented in order to illustrate issues,
- *published information cases*, where published sources are used to frame a case.

The present research used company field cases, as well as published information cases based on newspaper and journal articles.

Company field cases had the classical format of a business case study as they are provided by major case clearing houses (e.g. European Case Clearing House or Harvard Business School Publications), comprising around 10 or more pages plus fact sheets or other exhibits in an appendix.

Published information cases had to be used because of the lack of teaching cases addressing suitable e-Business issues in an up-to-date manner, costs involved in acquiring 4-5 cases and also, as mentioned by Sauer & Willcocks (1999), the fact that most case studies are written with a North American background. Hence, using published materials to build up a case provided the necessary flexibility to address the topics of the syllabus including their application to a local context where needed.

2.1.3 Benefits and risks of case-based teaching

Case-based learning differs from other forms of learning in that defining the problem itself is an essential part of the learning process. It is argued that using cases is a form of inductive teaching, increasing the relevance of what is learned and the student's ability to transfer solutions into new problem areas (Böcker 1987). The major alternative to teaching with cases is an approach which presents problems in well-structured and decontextualised form, such as learning through worked-out examples where the problem is defined, analysed and solved before the eyes of the students (Renkl 2002).

The following gives a brief account of the benefits and perils of case based teaching as they are discussed in the literature.

The benefits of case-based teaching

Referring to the importance of problem solving skills, Christensen *at al*. (1987) quote Henry David Thoreau: “Give a man a fish and you’ve given him a meal, but teach a man to fish, and you’ve fed him for life.”(p.9). Thoreau’s quote highlights the importance of teaching how to solve problems independently. Today’s solution of the problem might be outdated tomorrow, but the skill of analysing a problem will still be useful.

In general it can be said case-based teaching aims to facilitate *cognitive skills* (learning curricular content), as well as *meta-cognitive skills* (learning how to learn) (Golich *et al.* 2000, p.3). Figure 2-2 summarises skills the case-based learning method is designed to facilitate as outlined by Dooley & Skinner (1977), Christensen *et al*. (1987), Mauffette-Leenders *et al*. (1999) and Matejka & Cosse (1981).

Analysis and evaluation skills:

- acquire skill in problem analysis
- acquire reasoning skills

Critical argumentation skills:

- develop a sceptical attitude towards unilateral solutions
- develop judgment based on set of moral, business and institutional standards

Communication and group facilitation skills:

- develop active listening
- develop ability to integrate different views

Coordination and decision making skills:

- acquire skill in pooling capabilities and information efficiently
- acquire skill in decision making under uncertainty

Figure 2-2: Skills to be acquired during CBL

Understanding what the case method is good for and how its benefits translate into skills and attitudes is a precondition for teachers who need to

- identify adequate cases and case questions,
- increase the difficulty of cases gradually, and
- define performance evaluation schemas that reflect the above learning objectives (Erskine, Leenders & Mauffette-Leenders 1981, p.47).

The risks of case-based teaching

CBL is no panacea and may need to be integrated with other teaching forms. If a fundamental educational aim is to develop understanding of basic principles and procedures, a more directive teaching approach such as demonstrations or exercises or didactic lectures may be more effective (Shapiro 1984a). A pre-condition of CBL is to have a basic understanding of the domain in which the teaching case is situated, otherwise it would be hard to spot the issues of the case (Dooley & Skinner 1977).

A drawback of case-based learning is that instructors who apply their understanding of the case as a corrective standard to guide the discussion can easily undermine the students' discussion process (Argyris 1980). Argyris noted that in some instances students felt cases have a list of 'preferred' issues and solutions which need to be derived from the instructor's hints rather than from case data (ibid). Argyris concluded that the case method is only as good as the way the method is applied.

Finally, students may react reluctantly to the increased responsibility they are supposed to assume for their learning. The notion that the course of a discussion depends on their own contributions, rather than on the instructor's guidance, is often perceived as an unwelcomed swap of roles (Dooley & Skinner 1977).

2.1.4 Different implementations of CBL and their core activities

Since the inception of the case-based learning method in 1870 in the Harvard Law School (Merseth 1991), the method has been adopted in many other teaching areas such as medicine, economics, accounting, computer science or information systems, to mention only a few (Golich *et al.* 2000). Despite this widespread acceptance of case-based learning, the difficulty lies in the lack of a generally accepted specification of the method. As Dooley & Skinner (1977) remarked in an early review of case-based teaching methods: "The phrase 'case method' embraces such an array of pedagogic practice that the term itself has no precise connotation. There are as many varieties of the case method as there are practitioners." (p.277).

Hence the purpose of this Section is to derive a core set of activities necessary to facilitate the previously described benefits of the method (see Section 2.1.3). However, as Jonassen & Hernandez-Serrano (2002) note, most research on CBL is still conceptual and little empirical research is available that compares the effectiveness of different approaches to implementing the case method.

Arguably the most prominent form of CBL is the Harvard Method as described by Christensen *et al*. (1987) and, more recently, by Erskine *et al.* (1998). Alternative modes of organising CBL are described in the MICA Method (Siciliano & McAleer 1997) which claims to increase students' preparation and participation (Desiraju & Gopinath 2001); and

the Case Debate Method (Stewart & Winn 1996), designed to increase 'buy-in' into the group's case work and, in particular, to foster argumentation skills.

Common to all three approaches is a widening discussion forum. Hence, the three core activities of CBL are

- individual case preparation,
- discussion of the case in a small learning group, and
- presentation of results, which are then discussed once more with the entire class.

Each activity is discussed in detail and linked backed to the objectives of CBL as identified in Section 2.1.3. However the link between a learning objective and a learning activity is mainly an illustration of the potential value an activity possesses, because it cannot be shown which activity truly supports which learning objective.

Activity I: Individual Case Preparation

In this phase the learner needs to understand the available information and comprehend the task. Erskine *et al*. (1998, p.71) recommend a brief reading of the case material asking Who, What, Why, When and How questions. An individual learner might start by asking 'Who are the main players in this case?', including organisations, decision makers and other stakeholders. Once a first understanding of the case has been achieved, Erskine *et al*. (1998, p.73) suggest a more detailed process, working through the case by:

- identifying potential issues based on the information available;
- finding a number of alternative actions addressing those issues;
- defining a prioritised list of criteria which help to rank alternative solutions;
- deciding on one solution and developing an implementation plan;
- stating any assumptions which were made during the analysis of the case.

This first analysis of the case is to foster the student's analytical, evaluative and decision making skill.

Activity II: Small Group Discussion

During this activity a small group of learners discuss different views of the case to see how much their interpretations complement or contradict one another. The following steps are suggested (Mauffette-Leenders, Erskine & Leenders 1999, p.67):

- create a shared understanding of the main issues in the case;
- discuss advantages or disadvantages of key insights gained during the individual preparation phase;

- identify remaining doubts or missing arguments which need to be followed up after the group discussion.

Main learning objectives of this activity are the development of communication skills (e.g. debating the case), group facilitation skills (e.g. integrating the views of all group members) and time management and coordination skills (e.g. deciding when to conclude a discussion that becomes unproductive, or how to coordinate the final write up of the case report).

Activity III: Whole Class Discussion

Many learning objectives from the small group discussion are reinforced in a large group discussion. Additionally this activity provides the opportunity to deepen students' understanding of the case through comparing analysis and recommendations developed by different groups. Though students must not get the impression that there is a single, preferred answer to the case, the instructor can insert a mini-lecture to clarify adjunct material or theories which may prove helpful to revive a discussion if necessary. However, changing to a lecture style should take only a few minutes and it should be made clear that the instructor is stepping out of the discussion process (Shapiro 1984a). Mauffette-Leenders *et al*. (1999, p.77) point out that it is important to consider the “warm-up” and “closing” phase of a large case discussion: the former creates a positive climate for an open discussion and the latter provides some form of closure to the case, e.g. in the form of a brief summary of the discussion up to this point.

Adaptations of the Harvard model

Adopters of the Harvard method found that instructional guidelines were still very broad. For example, the decision whether a case report needs to be submitted or not and what criteria are used to mark students’ participation in the case discussion are left to the instructor, leading to a wide variety of learning scenarios referred to as case-based learning.

In order to specify and adapt the method to a new teaching situation alternative case-based learning models have been developed. The two most widely cited adaptations are the MICA Method (Desiraju & Gopinath 2001; Siciliano & McAleer 1997) and the case debate approach (Stewart & Winn 1996).

MICA Method

Siciliano's and McAleer's (1997) 'Mica method' starts by requiring all students to submit at least one strategic and one operational 'action step'. With this procedure two objectives should be achieved: students are encouraged to consider a case's operational as well as strategic dimension, which prompts them to put the case into its bigger context; and in order to submit an action step, they have to read the case material and cannot hope to free-ride on their peers' comments (ibid).

The Debate Method

Stewart and Winn's (1996) 'debate approach' to CBL suggests organising large group discussion as a debate between two teams, the first of which gives an initial presentation and, after a short break, the other team presents a rebuttal. The remainder of the class is the audience that needs to be convinced of the better case solution and then can ask questions after the rebuttal presentation (Stewart & Winn 1996).

Where do the Harvard, Mica and Debate methods differ ?

Stewart and Winn's (1996) variation of the Harvard method is built around two teams debating pne another to spark competition as an additional motivator to perform well in case discussions. Thereby the authors address the issue that if case discussions are dominated by three or four very active students it is harder for less eloquent students to be heard (ibid).

Siciliano and McAleer (1997) utilise strategic and operational 'action steps' which are prioritised and discussed by the entire class. An important aspect of the Mica-method is that collection of action steps, as well as their discussion during the class, is conducted by a team of students (Desiraju & Gopinath 2001) thus avoiding manipulation of the class-discussion process by the instructor. During the large group discussion the instructor's role is limited to marking quantity and quality of student participation, although the instructor may selectively intervene to direct the discussion (Desiraju & Gopinath 2001).

Regardless of which *modus operandi* is utilised, both methodologies take a group-based approach which differs from the Harvard method by engendering open discussion on CBL – but there is still considerable room for varying interpretation on how exactly the identified core activities of case-based learning should be implemented.

To implement e-CBL in a way that is informed by relevant learning theories, the following Section discusses theories of learning and their implications for the design of e-CBL activities.

2.2 Philosophies and Theories of Learning

As outlined in Section 2.1, case-based learning is a relatively broad concept which does not yet include specific recommendations at the operational level to determine the facilitation of e-CBL on a day-to-day basis. A possible explanation could be the lack of theory guided research, as the method's primary concern has been the linking of teaching and practice rather than teaching and learning theories (Jonassen & Hernandez-Serrano 2002; Merseth 1991). Whether or not they are aware of it, however, all educators hold a philosophy of learning (Brockbank & McGill 1998), consisting of principles and assumptions about learning – usually expressed in the form of learning theories – and the values their proponents attach to them (ibid).

The goal of this Chapter is to make the role of learning philosophies explicit and to identify the contributions different learning theories can make to a more detailed understanding of e-CBL which, in turn, enables the researcher to better reflect on the design, implementation and analysis of e-CBL in practice.

This research will take a 'learning as social activity' perspective, although other views interpreting learning as a primarily conceptual or behavioural change will also be considered as potential sources of complementary explanations[5].

Reaffirming that adopting one learning theory does not require the rejection of other theories, Cronje (2006) points out that although learning paradigms have historically shifted focus from behavioural to cognitive to social aspects, principles from past theories have rarely been refuted. Similarly, Greeno (2006) argues that learning can and should be analysed on multiple levels, considering the activities that engage learners as well as changes in learners' information-structure as a result of these activities.

Discussing behavioural, cognitive and social-constructivist views on learning in the following Sections will help to specify the type of data and explanatory concepts required to analyse the various dimensions of a learning activity. More specifically, this Chapter will address the following auxiliary research questions:

- What evidence can account for the *process* of learning?
- What evidence can account for the *outcome* of learning?

[5] A complementary use of learning theories could be supported by Ulich's (1976) argument that learning theories describe the reality of learning only in a fragmentary way, at a specific level of detail which may or may not be sufficient to support the educator's planning of educational activities.

2.2.1 Learning as reinforced behaviour

Early research on learning began in the late 19th century in the laboratories of Wilhelm Wundt, who attempted to analyse mental processes based on the introspections of his subjects (Bransford, Brophy & Williams 2000, p.6). Later, in light of the unreliability of Wundt's introspective method, behaviourist studies focused more on the observable events from which learning was to be inferred (ibid). Under the paradigm of behaviourism, learning was understood as the formation of connections between stimuli and responses. Central to the formation of these links is the concept of conditioned behaviour, i.e. humans learn in order to avoid undesirable, or to experience desirable, situations (Hergenhahn & Olson 2005, p.10).

Behaviourist studies are closely related to positivism, in that they reject the subjectivity of introspection and base their interpretation on inter-subjectively verifiable facts alone (Winn 2003). Learning, from a behaviourist's point of view, is "a function of building associations between the occasions upon which the behaviour occurs (stimulus events), the behaviour itself (response events) and the result (consequences)" (Burton, Moore & Magliaro 2003, p.9). Grading students' performance can be seen as an application of a behaviourist reinforcement principle (see Figure 2-3). After attending a lecture or reading a textbook chapter, students may be questioned in a tutorial (stimulus); students can then recall the content as they remember it (response) and, if the result is close to the expected solution, the student's performance is reinforced by a good grade (Boghossian 2006). Similar argumentation could apply to grading students' active participation in tutorials or online meetings. These approaches are based on the assumption that learning behaviour can be initiated through extrinsic motivators (e.g. grades) leading to the development of further intrinsic motivation, such as increased self esteem due to the mastery of a new skill (Eom & Reiser 2000).

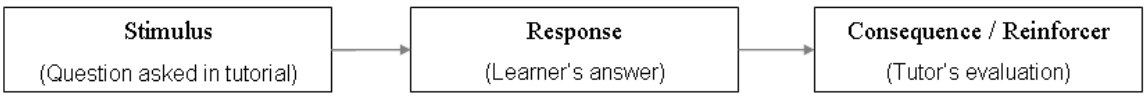

Figure 2-3: Stimulus-Response Chains based on Hergenhahn (2005, 91)

Behavioural learning principles also figure strongly in the design of learning management systems based on programmed instruction. The word 'programmed' refers to the sequencing of discrete learning steps followed by corresponding test items (Gagné, Briggs & Wager 1988, p.21). Such a procedural model is based on the assumption that

- Complex learning objectives can be decomposed into simpler objectives;
- Simpler learning objectives can be instructed directly and combined afterwards to solve complex problems;

- There is an agreement about how to decompose complex learning objectives and the steps required to teach them (Burton, Moore & Magliaro 2003; Jonassen 1991a).

Behaviourist models of instruction have been criticised for two weaknesses. Firstly, even though behaviourist models have proven effective for the teaching of facts, there is less evidence that they are successful in promoting higher-order cognitive skills such as problem solving or applying knowledge in new domains (Palincsar 1998). Secondly, because behaviourist accounts of learning treat the mind as a 'black box', no explanation of what is changing during the learning process is offered (ibid). This shortcoming is addressed by cognitive learning theories, which shift the focus from behavioural to mental processes of learning.

Though not all learning can be explained as a response to previous stimuli, behaviourist principles such as concrete feedback, decomposition of complex tasks into simpler ones, and frequent repetition of tasks can inform the design of case-based learning and teaching.

2.2.2 Learning as conceptual change

Cognitive learning theories have their roots in the information processing metaphor that allocates learning in the mind or the brain (Burton, Moore & Magliaro 2003). Hence the central object of research for cognitive learning theorists is the internal representations of knowledge and how these change according to what is learned. Internal representations of knowledge are discussed using different terms such as 'cognitive structures' (Piaget 1978), 'mental models' (Gentner & Stevens 1983) or 'scripts' (Schank 1975). These representations of knowledge form learners' prior knowledge, direct their attention and influence how learners perceive and interact with their environment.

According to Piaget's (1978) equilibration theory, learners attempt to assimilate their experience into their existing conceptual structures. Such a conceptual structure can be described as a list of defining features which associate a particular case with a more general category of phenomena[6] (Medin 1989). If confronted with information that cannot be assimilated under existing categories, learners need to change or diversify their conceptual structures.

In a case discussion, students may associate business ethics with defining features such as public safety, copyright protection and consumer privacy (Laudon & Traver 2007).

[6] Conceptual structures are fundamental tools for categorising which, in turn, allow people to apply existing knowledge to new situations. This applies to drawing conclusions about what is seen, e.g. feathers, wings, eggs etc. suggest the category 'bird' , and also applies to formulating actions, e.g. fire, house, kids may suggest 'call the kids and leave the house' (Medin 1989).

These defining features, however, may turn out to be insufficient if discussing a case such as Google's business operations in China, where local legislation plays an important role in regulating the information accessible on the Internet (Thompson 2006). Hence, students need to accommodate this information by integrating culture and legislation as additional aspects of business ethics.

As a consequence, students are able to interpret their environment in a more differentiated way (Chi, Feltovich & Glaser 1981) and can avoid cognitive discomfort that might otherwise result from inadequate interpretations (Festinger 1962). However, changing cognitive structures is not an automatic reaction to new or unfitting information. As argued by Simon *et al.* (1995), students can also choose to ignore or trivialise the dissonance between their understanding and any non-conforming information.

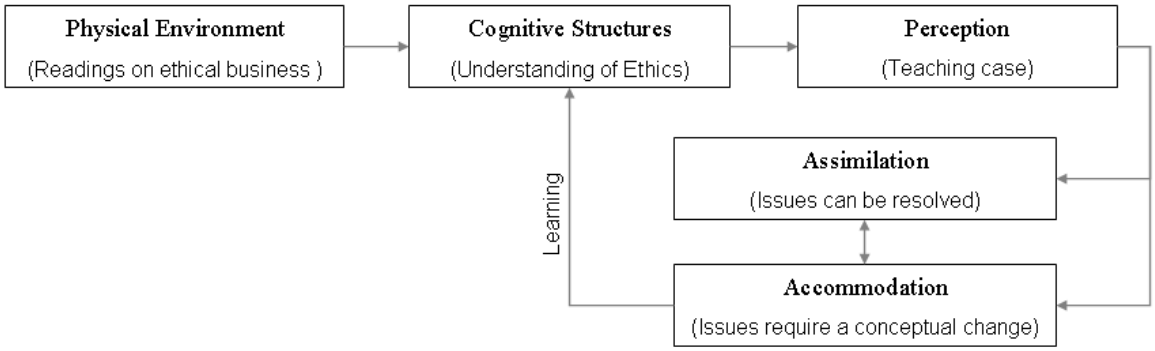

Figure 2-4: Learning as adapting cognitive structures, based on Hergenhahn (2005, p.298)

Figure 2-4 summarises the cognitive construction process based on the example outlined above. In this case, students already had some ideas about business ethics. The process shows how the reading of the case materials (perception) is mediated by the learners' prior understanding of ethics (cognitive structures). In the next step they are either able to assimilate the issues identified or may be required to undertake further research so they can develop a coherent solution.

Though this study on e-CBL does not test what specific cognitive structures have been developed during case based learning, the operationalisation of learning as changing conceptual structures is seen as a helpful tool to make learning visible. Learning can then be evaluated based on what concepts were considered in a case and how these concepts were used for proper argumentation (Jonassen 2006).

With a shift from the behavioural to the cognitive perspective on learning, the next Section considers how social practices influence learning (Bruner 1996).

2.2.3 Learning as social activity

Unlike the previously outlined cognitivist view, which concentrates on learning outcomes as they are achieved individually, a social constructivist view emphasises the process of learning as a form of socialisation or enculturation (Moll 1992).

Based on the work of Vygotsky (1978), socio-cultural perspectives posit that learners construct what they know through actively engaging with their social and physical environment (Dillenbourg *et al.* 1996; Vrasidas 2000). From a researcher's point of view this requires broadening the field of analysis to include the physical and social environment of learners (Savery & Duffy 1995).

Greeno (2006) referred to this as situated analysis of learning activities within larger systems. He argues that studies which observe learning environments (including peers, instructors, software and learning materials) can provide valuable insights for the creation of learning environments. The aim of situated studies is to understand how the characteristics of the environment can promote activities and thus promote learning.

The learners' social environment as zone of proximal development

In social constructivism, the learners' environment is given a double purpose: it presents the reason to learn as well as the means to learn. For example, in their book "*Legitimate Peripheral Participation*" (Lave & Wenger 1991), the authors describe apprenticeship learning as participating in a community of practice where learners can practice the skills of their profession under guidance. Gaining a place in their community is a strong motivator. Taking social relationships as the source of learning, Vygotsky argued that learning proceeds from the environment to the person:

> "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (inter-psychological), and then inside the child (intra-psychological). ... All the higher functions originate as actual relations between human individuals." (Vygotsky 1978, p.57)

To elaborate on the function of the social environment, Vygotsky (1978) developed the concept of a ‘zone of proximal development’ (ZPD). As shown in Figure 2-5, the ZPD refers to the distance between a learner's current level of understanding and the task s/he could achieve under the guidance of another, more knowledgeable person (Vygotsky 1978, p.86). The emphasis in social constructivism lies in the application of knowledge, 'being told' how to solve a problem does not yet advance the learner's current achievement level; what is evaluated is the learner’s ability to practice a skill (Hedegaard 1992).

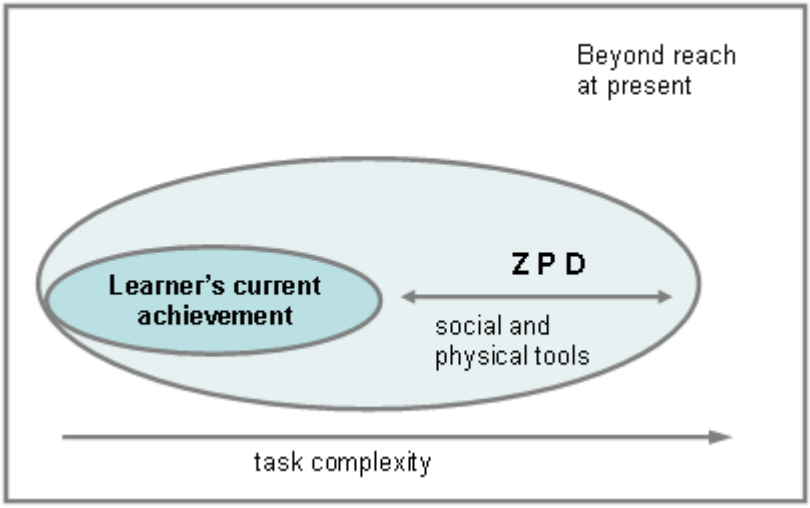

Figure 2-5: Zone of proximal development based on Atherton (2005)

Vygotsky's conceptualisation of learning as social interaction is widely used to describe collaborative forms of learning and is used in Lave and Wenger's (1991) apprenticeship learning model, Brown *et al.'s* (1989) situated learning approach; and Wenger's (1998) communities of practice. All three models emphasis the role of communities as learning environments where individuals can observe and practice how knowledge is applied in different contexts.

Tools and the ZPD

Apart from the influence of teachers and peers, a second important factor that can advance learners in their ZPD are tools. 'Tools' in Vygotsky's (1981a) terminology are all things that can support or shape human actions, differentiated primarily between psychological and physical tools. *Physical tools* could be a map, a diagram or a paper on which calculations are executed (a modern counterpart would be a spreadsheet application on a computer), while *psychological tools* would be signs, methods or heuristics that help individuals to communicate or make decisions (Vygotsky 1981a, p,137). Speech, for example, is a powerful problem solving tool because it allows us to reason about solutions and to include others in the problem solving process (Vygotsky 1978, p.27). Jonassen's (2000) mind-tools could be considered as learning related in much the same way as Vygotsky's understanding of 'psychological and physical tools'.

The concept of tools is particularly relevant for e-learning research as one of the driving questions is what tasks can be done by tools rather than by humans. One approach to this question is to find out what general functionalities have been ascribed to tools in the off-line world.

Tools as objects of reflection

From an educator's point of view, a tool also represents an entity which can be the object of individual reflection, mutual explanations or instruction (Wells 1999. p.294). Hence, critically examining the benefit of a tool can be an essential step in solving and learning about a problem to which the tool has been applied. Once problem solving methods or communication tools have been recognised as more or less adequate tools, their usage is open to discussion promoting meta-cognitive awareness. Mayer (1998), however, argues that having a repertoire of problem solving mechanisms (tools) is only valuable if learners have the necessary skills to select and adapt these tools to specific problem solutions. Similarly, Schraw (1998) shows that knowing why and under what premise a 'tool' has been successful is a crucial condition for learners who want to improve the effectiveness of their learning.

Tools as encoded knowledge

Using a tool requires learners to reconstruct its purpose and use (McDonald, Le & Higgins 2005). Hence tools are usually provided to enhance learners' problem solving capacity, with the result that learners face a double challenge: on the one hand they need to understand the tool in relationship to the task, while on the other hand they need to practise using the tool even though it is not yet fully understood. Both processes inform one another and cannot be completed in isolation from one another (Wertsch 1991).

Learning the knowledge encoded in a tool is a valuable form of enculturation. Becoming an online learner could be seen as a process of learning to use a number of applications that have proven useful to previous online learners. Wartofsky (1979) claimed tools are central to human progress, saying: "The artefact is to cultural evolution what the gene is to biological evolution" (ibid, p.205) and believes tools are objective expressions of knowledge which have been successful in the past. Tools make this knowledge (re-)applicable to new problems which, in turn, makes it possible to continuously improve or invent tools[7].

Tools as activity generators

A particular feature of tools is their ability to generate cognitive (Hokanson & Hooper 2000) and physical activities (Greeno 2006). Of course, they cannot do so against the will of learners (Mayer 1998), but once learners are motivated to engage in a suggested activity, the tools educators have provided can have an influential role in shaping the

[7] The same principle could be applied on a much smaller scale to a group of online learners, who improve their methods and processes over time so that they work in a way that is best for them and can put their experiences into 'cognitive tools' such as work procedures, collaboration rules or a special template to be used at the beginning of the collaborative writing of case reports.

exact execution of a planned activity. Cole (1996, p.119) quotes Vygotsky in explaining how tools shape and generate behaviours and cognitive efforts:

> "The inclusion of a tool in the process of behaviour (a) introduces several new functions connected with the use of the given tool and with its control; (b) abolishes and makes unnecessary several natural processes, whose work is accomplished by the tool; and alters the course and individual features (the intensity, duration, sequence, etc.) of all the mental processes that enter into the composition of the instrumental act, replacing some functions with others (i.e., it re-creates and reorganizes the whole structure of behaviour just as a technical tool re-creates the whole structure of labour operations)" (Vygotsky 1981b, p.139)

Tools and the cognitive simulation of activities

Engeström (1999) saw the principal function of tools as being their role as auxiliary stimuli, on the basis of which individuals can simulate their actions in a given situation (Engeström 1999a, p.189). In other words, a situation is not only analysed in terms of problems encountered, but also in terms of what solutions seem available and which one(s) would work best. The relationship stimulus – mediating tool – response (top of Figure 2-6) represents the mediating function of tools as they substitute the direct link between stimulus and response as assumed in the behaviourist model of learning (Section 2.2.1). The lower portion of Figure 2-6 represents the exploration circle that evaluates how different mediating tools fit the needs of the task as well as the motives of the learner (Vygotsky 1978, p.40).

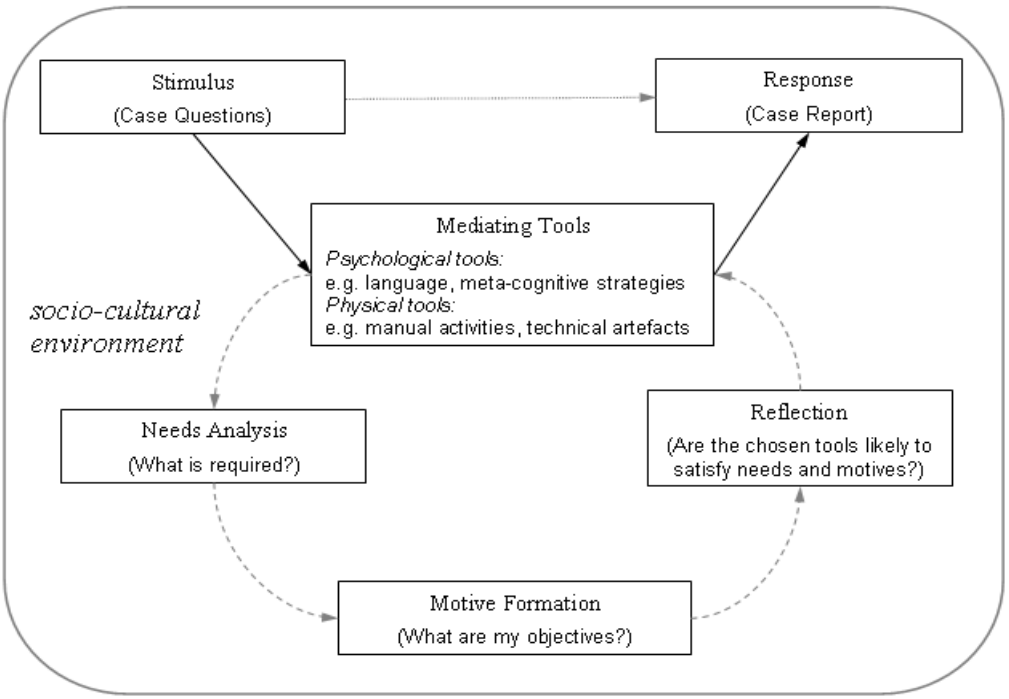

Figure 2-6: Learning as activity simulation

2.3 Summary: Wrapping up the Pedagogical Framework Discussion

The pedagogical framework of this study has been structured into learning strategies, learning tactics and underlying learning philosophies. Starting with CBL as the strategic choice, a set of core learning activities and objectives has been established, thereby answering the first auxiliary research question of the literature review: *What defines case-based learning?*

The answer to this question could be a short recapitulation of CBL's core activities as being: (1) preparing the case individually, (2) analysing and discussing the case in small groups and (3) presenting small group results to the larger plenum of the class where different positions can again be compared and discussed.

However, a critical discussion has shown that a dominating teacher presence and inactive students present a real threat to this method, which led to the development of variants of the Harvard Method such as the Mica and the Debate model (Siciliano & McAleer 1997; Stewart & Winn 1996). In this research, these variations will be kept in mind as a source of inspiration if it turns out that the three core activities by themselves are not sufficient and require amendment.

From the beginning, the researcher has resisted the idea of utilising either the Mica or Debate method because it was not clear what type of problems would emerge and whether the modifications made in the two new methods could then remedy these problems.

In the background of this deliberation has been a commitment to active learning (Section 2.2.3) which implies that students show initiative and responsibility for their own learning as a matter of personal relevance (Dunlap & Grabinger 1996). Contrary to this commitment is the fact that both modifications (Siciliano & McAleer 1997; Stewart & Winn 1996) increased the specifications for CBL activities to a level that might prevent the unfolding of an engaging learning atmosphere based on the interests of all participants, rather than on a tightly structured learning process.

Finding the appropriate amount of structure may well become an emerging research question. Just as too much structure can stifle learners' agency, too little structure can hinder student learning because the level of uncertainty is too overwhelming. De Bono (1976, p.135) calls this the liberating and limiting function of structure. Structure liberates learners from the uncertainty of not knowing what to do next, but it can also prevent them from developing an increased awareness of their own role in the collaborative meaning-making processes, where it is often up to the students themselves to propose and negotiate what matters and what does not (Bruner 1996, p.97). Learning loses its

constructivist nature if activities are done merely because they have been prescribed (Dillenbourg 2002).

Next, in order to establish *what evidence accounts for the process and the outcome of learning*, various learning philosophies which could facilitate a more detailed analysis of learning activities were reviewed. What was looked for were concrete concepts and view-points to inform the design and evaluation of e-CBL in the first empirical study of this research project.

Firstly, a *behaviourist* view of learning served as a reminder of the influence external conditions have on learning. Much of the instructional practice in tutorials or e-learning programs still follows a behaviourist logic of repeated exercises and rewards and critique as corrective feedback (Boghossian 2006; Bottino 2004). As for the *outcome* of learning, behaviourism is not seen as an appropriate learning philosophy to develop the skills necessary for problem-solving or case-based learning (Hmelo-Silver 2004). However, behaviourism can still provide the minimal conditions for a course, such as fail and pass criteria, or guidelines that specify activities quantitatively. This may be useful when there is too little initial learner engagement at the beginning of a course.

Secondly, a *cognitivist* perspective on learning shifted the focus to the mind of learners and the knowledge they bring to a course. The *process* of learning has been characterised as driven by cognitive conflict, i.e. new information that does not fit with existing cognitive structures can lead to desired changes of learners' mental models. For CBL this means that learners need to be aware of their current knowledge and any assumptions they make to analyse a case. Further, the teaching cases need to have the potential to actually cause cognitive conflict (Dillenbourg 2005) that, if necessary, requires learners to change their internal knowledge models.

Finally, learning has been analysed as *social activity* mediated by physical and psychological tools. The focus on activities has shown the importance of practice as a condition for cognitive engagement such as analysing problems or examining the problem solving process itself (metacognition). Furthermore, the literature has shown communities and groups to be effective facilitators of learning, as they provide an environment in which members can observe the usefulness of their peers' ideas and methods, or put their own solutions to the test. Applying this view to e-CBL requires educators to think of engaging sufficiently complex teaching cases to require students to collaborate and reflect upon their collaboration processes. Learning *outcomes* are not seen as being separate from the process of learning – finding out what learners did compared to what they should have done is the basis for useful feedback learners can expect after collaborative learning tasks. In terms of e-CBL, this would mean that learning outcomes are not limited to a final

product such as a case report, but are also visible in discussion transcripts or interim versions of a group report as they represent the process of learning.

In summary, then, it can be said that the pedagogical framework has been informed by multiple strategies (Harvard, Mica- and Debate Method) and multiple learning perspectives (reinforced behaviour, conceptual change and social activity). This approach is in line with the argument that most real world educational activities would require, and benefit, from integrating multiple theories rather than being theoretically one dimensional (Cronje 2006; Quirchmayr & Schweighofer-Quirchmayr 1998).

3 APPLYING TECHNOLOGY TO LEARNING

Even before the introduction of computers into classrooms, the role of technology for learning was already dividing researchers. Studies that claim or deny a significant influence to technologies such as radio, TV or computers abound (Russell 1999). In light of such controversial results, authors have repeatedly pointed out the necessity to consider instructional media in context. Subsequent studies found a plethora of other factors that influence learning so that strong determinism has been abandoned and recent studies emphasise the effects 'with' rather than 'of' technologies (Jonassen, Carr & Yueh 1998). Moreover, Schwabe (2004) argues that with the increasing number of 'new' media technologies (e.g. podcasts or Instant Messaging) and no evident decline of 'older' media (e.g. web pages or chat rooms) the question of which technologies should be used gains in importance.

The objective of this second major literature review is to explore the potential roles technology can play for e-CBL. The previous Chapter laid the foundation for understanding how certain activities, such as analysis, discussion, coordination or sharing one's insights with peers, can promote learning and this Chapter focuses on the research which provides guidelines and explanations for choosing or designing technologies to support a specific learning activity.

However for the problem of media choice it is central to understand the question of how technology and learning relate to one another, which leads to a need to define a new underlying, auxiliary research question for this Chapter:

How can technology support learning?

As mentioned in the Introduction (Section 1.2), there is no lack of critical voices when it comes to the use of technology in education – which raises the question of whether technology matters at all (Bransford, Brown & Cocking 2000, p.194; Cuban 2001) and whether resources spent on learning technologies could be applied more usefully. This research project, however, is founded on the assumption that such a question would be misleading, since technology has no inherent use value – rather, it is the educator's informed choice of when and how to integrate technology which makes the difference (Edelson 2001).

Figure 3-1 gives an outline of the different bodies of knowledge assessed to inform the design of the future e-CBL learning environment.

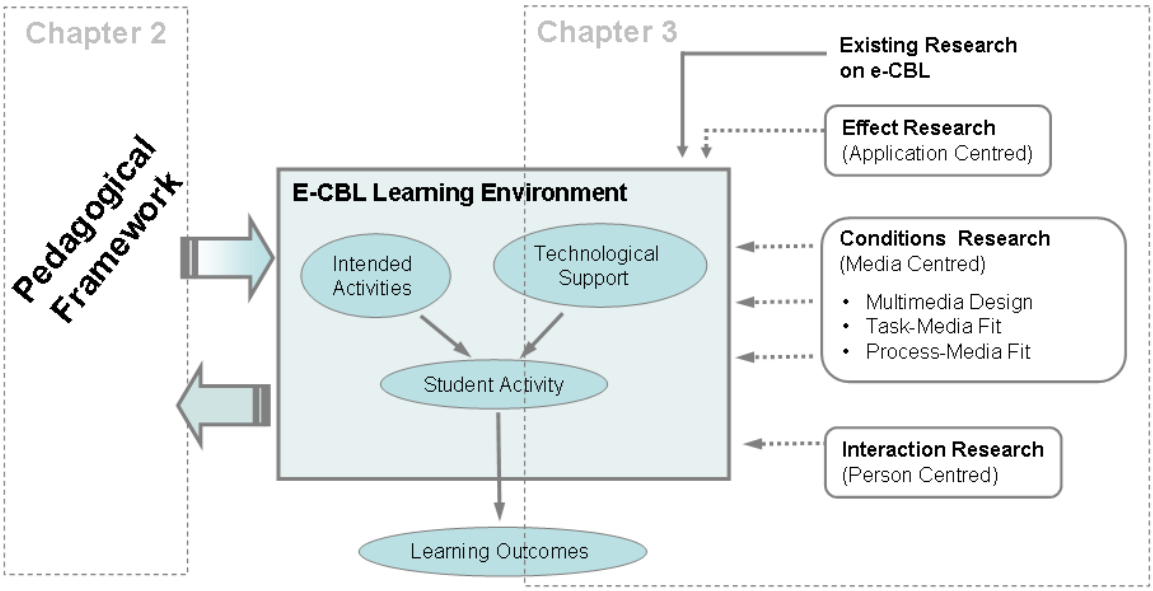

Figure 3-1: Research and theories informing the design of the e-CBL learning environment

The review starts with existing studies reporting experiences of case-based learning in electronically mediated form. An important outcome of this section is an overview of what has been achieved and where shortcomings justify further research as undertaken in this Thesis (Section 3.1).

The Chapter is based on Dillenbourg's *et al*. (1996) characterisation of computer supported collaborative learning (CSCL) research. The authors differentiated three types of research as it developed up to 1995: effect, condition and interaction research. This development was accompanied by a continuous broadening of the empirical scope as well as an increasing diversity of research methods and objectives (Stahl, Koschmann & Suthers 2006; Suthers 2006). The following chapter outline shows how the different research approaches indicated in Figure 3-1 correspond to the individual sections of this chapter.

E-learning applications research (Section 3.2)

Initially, research concentrated on various technologies and compared their effectiveness. At the centre of *effect research* are technological innovations and their consequences. Observed consequences might be positive, e.g. improvement of learning outcomes, or negative, e.g. increasing isolation of students. Section 3.2 focuses on Learning Management Systems (LMS) and e-conferencing tools as these are the technological innovations used to design e-CBL.

Media Theories for learning (Section 3.3)

When the outcomes of effect research proved inconclusive (Clark 2001), the scope of the inquiry broadened considerably. Researchers realised that the effect of any particular

technology depended on the conditions under which that technology was integrated with the educational process (*conditions research*). Characteristic for this research is a contextual approach to e-learning, that considers technological innovations based on a more fine-grained analysis of learners' cognitive capacities (Section 3.3.1) or specific attributes of media and mediated communication processes (Sections 3.3.2 – 3.3.3).

Technologies as person-plus systems (Section 3.4)

However, the specification of more conditions necessary to describe successful e-learning threatened to render scientific analysis meaningless, because the more conditions a model included the less clear it was whether a learning outcome could be attributed to learning technology or to other factors in the model (Salomon 1997b). This led to a third research approach, in which researchers concentrated on effects as they emerged from the interaction of salient factors (*interaction research*). This approach represented a change from models establishing impact factors *a priori* to a view which held that the impact of a learning situation cannot be known in advance. Central to this research is the acknowledgement of learners central role in determining the success of their own learning (Perkins 1997). Technologies and other factors that characterise learning situations are seen primarily see as opportunities to learn. Following Perkins' (1997) concept of person-plus systems, this section argues that research on learning technologies needs to start with the people who use them.

However, before representative theories and studies for can be introduced, an overview of the existing research on e-CBL is in order.

3.1 Existing Studies and the Need for Further Research

Though very little research into e-CBL could be located, the review of the following six studies identifies two major concerns: the potential of media to enhance the representation of the case material (e.g. the value of audio- and video clips); and the effect of ICT on the process of e-CBL.

In an early study on how to represent cases in an online environment, Ward (1998) focused on the conceptual organisation of case materials. He found that web-based cases were primarily perceived as delivery mechanisms rather than as opportunities actively engaged with the material. As a consequence, interactive features of the case, such as self-assessment questions or simulations, were seldom used. Ward (1998) concluded that further research was necessary to design specific learning activities to promote active learning.

Kinzie, Hrabe and Larsen (1998) explored the benefits of case-based learning in an online environment and also reported on difficulties in supporting online discussions. While it was

convenient to access case materials over the Web, they found that case discussions had to be switched to weekly face-to-face meetings. Nonetheless, questionnaires and interviews indicated positive feedback for the case based learning method in general. These authors also reported a variety of collaboration styles (e.g. splitting tasks vs. collaborative writing sessions). However, no further evaluation was conducted into how these different forms of collaboration influenced learners' perception of the method or their learning outcomes.

Parent, Neufeld and Gallupe (2002) implemented the case method off- and online simultaneously and provided a discussion forum where students could post their comments in parallel with the in-class case discussions. Both forms of participation were graded, in class and online. The study showed quality and frequency of postings increased steadily as students became more comfortable with the technology and with one another. However, few students had high participation marks in both in-class and online discussions. The study did not report on any group learning activities and concentrated on the third phase, the plenum discussion of the case. The study relied on content-analysed student postings and information obtained through several post-course interviews.

Heckman and Annabi (2005) compared online and face-to-face case discussions. Online discussions took place over a period of 7 days and face-to-face discussions were conducted during the lecture with discussion groups having between 27 and 34 students. Unlike the previous two studies, Heckman and Annabi (2005) were interested in more detailed underlying learning processes and coded utterances in both discussion modes according to their cognitive, social, teaching and discourse characteristics (Garrison & Anderson 2003). The authors found that less social interaction took place during in-class discussions than in an online environment. However, this could be due to the time constraints of in-class discussions, as well as the fact that students had a visual impression of one another's social presence and therefore had less need to verbalise social interactions. Another result of the study was that face-to-face discussions were much more driven by questions coming from the teacher, whereas in online discussions the instructor took a far less central role (ibid), which was better for the intended student-centred character of case discussions.

A study on how the case method could be transferred into a web-based format was conducted by Frank (2003). The method was implemented within an operations research/ management science course at a German university where a wide range of communication media to support the collaborative aspects were applied. The empirical evaluation of the concept was conducted through interviews inquiring into students' perceptions of the web-based case method. The author's conceptual model for case-

based learning confirmed that the three core activities (Section 2.1.1) could be transferred to an online environment if adequate specifications for communication and collaboration were adopted. However data analysis remained at the conceptual level and few of the necessary specifications were reported.

Another study focusing on mediated collaboration was conducted by Hermann, Rummel & Spada (2001) who compared dyads discussing a case using different communication settings. One half of the dyads collaborated via a video conferencing system and a shared text-editor; and the other half with email, telephone and individual text-editors. The study was conducted in a controlled environment where a medical and a psychology student had 110 min to develop a solution for the case. The authors found that dyads working with limited audio communication had longer phases of individual work than dyads in the video conferencing conditions who tended to worked jointly all the time. It was concluded that learning scenarios in rich environments need to explicitly address the need for individual reflections.

Table 3-1 compares all six studies in five dimensions: (1) Was the representation of case materials discussed? (2) Which of the CBL core activities (Section 2.1.4) were included in the study? (3) Were rich forms of communication supported? (4) Did the analysis include specific interaction processes? and (5) Which evaluation methods were used?.

Table 3-1: Summary of studies on technologically enhanced case-based learning

Author	Materials	CBL Activities			Communication Channels			Processes Discussed	Evaluation Methods
		Individual Preparation	Small Group	Class Discussion	Off-Line	Lean	Rich		
Ward (1998)	Storyboards Diagrams Questions Simulations	X		X		*		-	Survey
Kinzie, Hrabe and Larsen (1998)	Storyboards Audio- and video clips	X	X	X	*			Coordination (in-class)	Survey, Interviews
Parent, Neufeld and Gallupe (2002)	-			X		*		-	Content Analysis, Interviews

Author	Materials	CBL Activities			Communication Channels			Processes Discussed	Evaluation Methods
		Individual Preparation	Small Group	Class Discussion	Off-Line	Lean	Rich		
Heckman and Annabi (2005)	-			X		*		Cognitive Social Teaching Discourse	Content Analysis
Frank (2003)	-	X	X	X			*	-	Interviews, Survey
Hermann, Rummel & Spada (2001)	-		X				*	Coordination (laboratory)	Content Analysis

Shortcomings

As expected, the overview in Table 3-1 shows considerable variety in foci and methods. Only two studies (Frank 2003; Kinzie, Hrabe & Larsen 1998) considered all three phases of the case solving process as suggested by the Harvard method. Three studies (Heckman & Annabi 2005; Hermann, Rummel & Spada 2001; Kinzie, Hrabe & Larsen 1998) included an in-depth analysis of actual learning processes beyond a general evaluation of CBL. Only two studies (Frank 2003; Hermann, Rummel & Spada 2001) used rich communication channels (synchronous audio- and/or video conferencing plus shared applications) rather than lean communication channels (asynchronous, text-based applications).

Data analysis methods included surveys, interviews and content analysis, but only Parent, Neufeld and Gallupe's (2002) study combined observational data (content analysis) and self-reporting data (interviews). The duration of studies also varied significantly, ranging from 110 min (Hermann, Rummel & Spada 2001) to entire study periods (Frank 2003; Parent, Neufeld & Gallupe 2002), although duration of e-CBL is an important variable if technologically supported learning is interpreted as a developmental process. In summary, it can be said that existing studies of e-CBL have three major shortcomings:

1. In many studies limited interaction possibilities are offered to the learners. Voice over IP (VoIP) communication and application sharing are still rare outside laboratory research. Limited opportunities for interaction also inhibit the number of potential interaction patterns that could emerge during e-CBL compared to richer learning environments.

2. Most studies derived their findings either from interviews or from content analysis. However, an in-depth understanding of the effects and side-effects of a learning design needs to use information from both sources: learners' feedback as well as their actual activities as far as they are preserved in the system's transaction logs.
3. These studies did not consider developmental aspects of mediated learning and could have missed changing technology usage patterns over time. Adding time as a variable to the research, the question is whether online learning environments can become more or less successful over time.

Though the above-mentioned shortcomings are derived from research into e-CBL in particular, similar points of critique have been outlined in a larger review of 170 empirical studies on computer mediated communication in education (Luppicini 2007). The author concluded that "there is a great need for research on forms of collaborative learning characterised by long-term engagements between learners in complex learning contexts" (Luppicini 2007, p.173). Moreover it has been argued that, with increasingly richer forms of e-learning, the need for longitudinal studies increases (Barron 2000; Jones, Dirckinck-Holmfeld & Lindtröm 2005; Vogel *et al.* 2001a).

The above outlined gap will be addressed by the present research project through:

- Covering the complete e-CBL process at the individual, the small learning group; and the plenum level;
- Supporting e-CBL with richer communication opportunities; and
- Combining developmental aspects of e-CBL over several weeks with the in-depth analysis of shorter learning processes.

Conceivably there is tension between longitudinal studies and in-depth studies of online learning, due to the amount of data generated over longer periods of time which could result in an unmanageable analytical effort. However, this is not an uncommon challenge when researching complex systems in real-world settings (Lincoln & Guba 1985) and needs to be addressed through a suitable research design[8] (Chapter 4).

Next, as already outlined in this Chapter's introduction, the next three sections describe different research perspectives centering on the effects of technological innovations (Section 3.2), the conditions of learners and learning processes (Section 3.3); and learners' central role in organising their learning (Section 3.4).

[8] The objective will be to limit the number of data points through the selection of representative learning processes (Miles & Huberman 1994, p.176). Another possibility to reduce the amount of data will be to analyse time-slices (episodes) rather than complete learning events (Billings *et al.* 1978).

3.2 E-Learning Applications Research

Technology-centred research, or effect studies in Dillenbourg's *et al*. (1996) terms, concentrates on the use of concrete applications and their effects, which could then be used in comparative analyses.

Because case-based learning as understood in this Thesis is essentially collaborative, the focus of this Section will be on tools to support communication and collaboration between learners. Two specific classes of applications will be investigated: learning management systems (LMS) and e-conferencing tools. Less importance will be given to the computer supported representation of the teaching case[9]. Learners access relevant materials and some of the available communication tools primarily though their LMS, making it an important part of the research setting. Equally relevant is research on e-conferencing tools, raising the question of what experience with e-conferencing already exists.

The researcher is aware that teaching case-material could be presented in other ways, using virtual reality environments such as Linden Lab's 'Second Life' (http://secondlife.com/), or web-based simulations (Semrau, Fitzgerald & Riedel 2001). However, the production of virtual or immersive worlds is still very cost- and labour-intensive – though potential solutions are seen in peer productions similar to the development of open source software (Benkler 2005).

The exclusion of virtual worlds and other applications which do not play a central role in this research has been a strategic decision to keep the research project within manageable bounds. All studies included in this Section concentrate on tools and functionalities which were available within the University's learning management systems, together with a variety of comparatively standard communication tools.

The objective is to define and classify different functionalities of these tools and to discuss the problems and benefits they can bring to the development of e-CBL.

3.2.1 Learning Management Systems (LMS)

Most LMS[10] were developed during the mid 1990s. WebCT and BlackBoard are two of the best known LMSs in the higher education sector (Morgan 2003), with 67% of Australia's 34 universities using one of these two systems (Paulsen 2002)[11].

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[9] Teaching cases in his study are presented in the form of readings, websites and podcasts.

[10] The literature also refers to learning management systems as learning platforms, distributed learning systems, course management systems, content management systems, learning portals, or instructional management systems.

[11] Blackboard Inc. and WebCT Inc. merged in February 2006 (http://www.blackboard.com/company/press/release.aspx?id=812824, viewed 11.10.2007).

LMSs are generally defined as a suite of software tools organising courses, learners, learning materials and learning outcomes (Coates, James & Baldwin 2005). Common functionalities can be grouped into content development, discussion areas, group and learner management, calendar and organisers, synchronous and asynchronous communication channels, and navigation and search functionalities (Lewis *et al.* 2005). However, regarding faculty (academic) use of LMS, a study by Morgan (2003) found little evidence that features of LMS were deliberately integrated into pedagogical course design, even though the most frequently mentioned driver for adopting a LMS was to 'solve a pedagogical problem or challenge' (ibid, p.30). Faculty's primary use of LMS was to reduce administrative costs or simplify repetitive tasks such as making announcements or providing syllabi, external links and other materials or the publication of grades (Morgan 2003, p.38). Morgan's (2003) findings extended more general research on educational technology, noting that success depends more on the creative uptake of a system's features than on its availability (Coates, James & Baldwin 2005).

Coates *et al* (2005) raised the following questions concerning where further research on LMS is required:

- How do LMS affect students' identification with their higher education community?
- Do LMS lead to better usage of institutional resources?
- How do students perceive LMS-mediated interactions with lecturers and peers?

Though LMS are available 24/7 and provide much appreciated flexibility to many students, they can also lead to feelings of isolation and disorientation (Rovai & Wighting 2005). Whereas regular lectures and tutorials provide a rhythm to the advancement of a course, online learning has its own dynamics and requires learners to be much more self-directed and self-motivated (Edelstein & Edwards 2002).

From a technology systems point of view, LMS are connected with other online education systems such as content creation tools, user management systems and accounting systems (Paulsen 2002). Though many LMS already include these functionalities it is often necessary to ensure interoperability with existing systems throughout the organisation. Integration of those multiple systems, though, is still limited (Paulsen 2002)

Finally, an important issue is reusing the content developed for a particular LMS. To ensure content portability between different platforms, several standardisation bodies have defined a number of formats on how to structure or describe learning resources (Marshall 2004; Simon 2002). However, though standards are necessary tools to ensure reuse of learning materials in different environments, they have been criticised for their

impact on the pedagogical aspects of e-learning since their inception (Downes 2003). Whereas some standards deliberately exclude pedagogical specifications, such as the Sharable Content Object Reference Model (SCORM), others, e.g. IMS learning design (IMS-Global 2004) or IEEE's learning object metadata (LOM) include descriptions of how and when learning resources should be used (Innes & McGreal 2002). Critiques of these standards concern mostly scope, depth and purpose, asking how flexible standards need to be in order to preserve educators' creativity (Marshall 2004). Standardisation issues may play a role in a future extension of the present research project when materials or process specification for e-CBL are to be disseminated and applied on different technology platforms.

3.2.2 E-conferencing tools

E-conferencing tools[12] especially those that support synchronous communication have received increased attention in light of a renewed interest in collaborative forms of e-learning (Anderson 2003). Interaction between and among learners and teachers is a key ingredient to the creation of learning communities (Bielaczyc & Collins 1999; Kirschner & Lai 2007) with the negotiation of meaning central to social-constructivist learning (Jonassen 1991b). Due to the scarcity of e-learning related research on richer e-conferencing tools, another research area that needs to be tapped is the domain of computer supported collaborative work (CSCW), where collaboration tools have been on the research agenda for a fairly long time.

One of the earliest categorisations of group support technology tools is Johansen's (1988) time-space matrix (see Figure 3-2). The diagram differentiates four categories based on co-location and synchronicity of the collaboration partners. The examples in each quadrant are not exhaustive and are only to illustrate the different types of collaboration tools.

[12] 'Conferencing tools' include any technology that supports collaboration within groups. Depending on the purpose of collaboration, authors use alternative terms such as decision support systems, document management systems or groupware (Penichet *et al.* 2007).

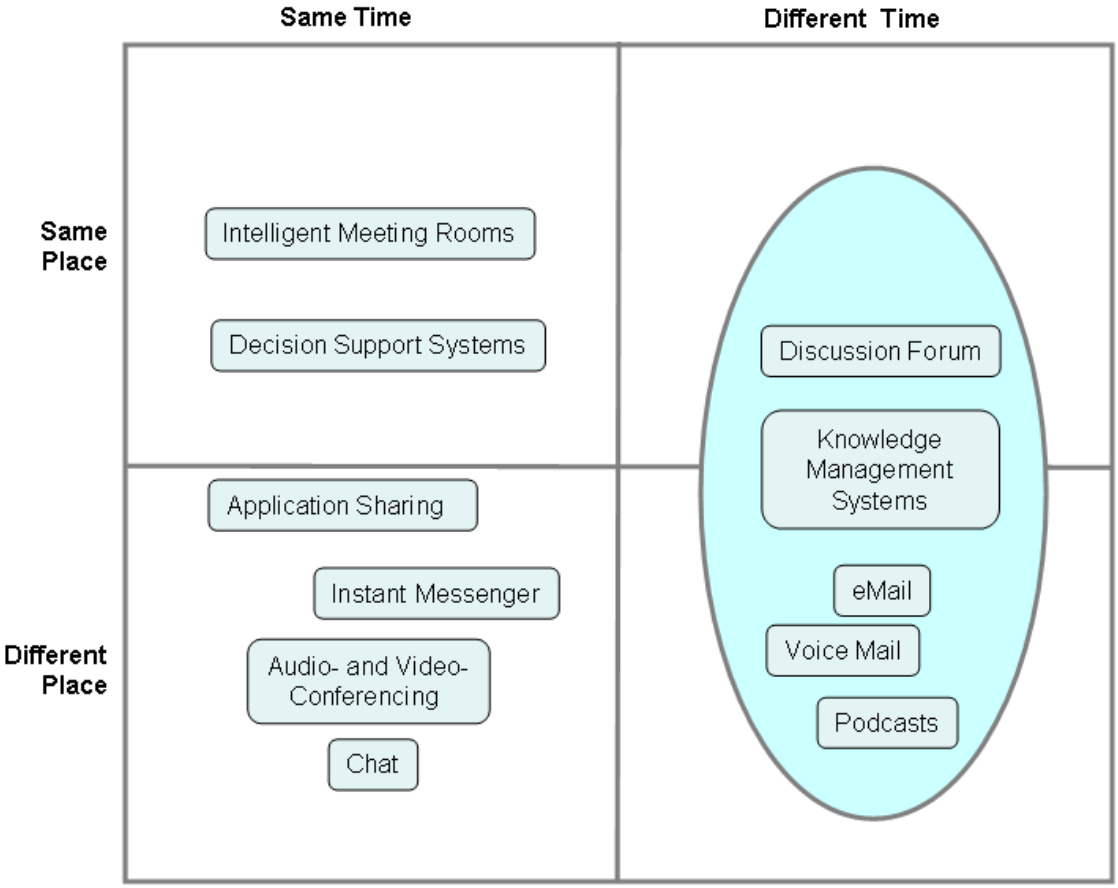

Figure 3-2: Time-space matrix based on Johansen (1988)

However, the boundaries of Johansen's time-space matrix are blurring as communication tools become more widespread and new usage scenarios develop. As indicated on the right in Figure 3-2, communication tools such as email and discussion forums are increasingly used by groups which are not distributed. In these cases flexible dissemination of information is preferred over the effort of attending a meeting (Fischer *et al.* 2001). A similar search for flexibility was found in a study on instant messaging within the workplace (Isaacs *et al.* 2002). The authors observed that instant messaging was especially valued because of its unobtrusive and efficient nature for non-urgent requests.

Much research concentrates on asynchronous forms of collaboration (De Laat & Lally 2004; Rourke *et al.* 2001a; Schrire 2006). Research on synchronous learning tools is less readily available (Shi & Morrow 2006). However, business interest and investments in synchronous forms of training are increasing (Clark 2005) and the search for more engaging forms of e-learning leads an increasing number of universities and teachers to add synchronous communication tools to their e-learning infrastructure (Barron *et al.* 2005; Schullo, Siekmann & Szydlo 2003).

E-conferencing tools and virtual meeting rooms are technologies that enable their users to interact in *real time*. However, as Shi and Morrow's (2006) overview of virtual classroom features shows, available functionalities can go far beyond the mere exchange of messages:

- audio communication (Voice over IP),
- collaborative browsing of Web addresses,
- polling tools that allow users to survey, vote and assess on the spot,
- whiteboards as drawing and annotation tools,
- document and application sharing,
- possibility to record and archive past meeting sessions.

An important factor influencing the dissemination of synchronous communication tools is the improved availability of IT and broadband Internet access, together with the use learners already make of these tools outside the educational context:

- In 2006, according to the Australian government Department of Communications, Information Technology and the Arts (DCITA), 71% of Australians owned or leased a computer, 65% of all households had access to the Internet and 60% of these households had access to broadband technology (DCITA 2006). Compared to 5% broadband households in 2001, the recent figure shows an impressive growth of 1100% over a five year period (ibid).
- A recent Pew Internet & American Life Project found that 75% of online teens in the United States use Instant Messaging, compared to 42% of all online adults (Lenhart, Madden & Hitlin 2005, p. iii). 70% of American undergraduates participate in online communities such as facebook.com and myspace.com and 28% are engaged in online blogging (Salaway, Kvavik & Caruso 2006)[13].

Current research on e-conferencing tools

Though previous research has demonstrated a positive relationship between learner interaction, learning outcomes, and learner motivation (Hill *et al.* 2003; Puntambekar 2006; Tu & McIsaac 2002), usability issues and concrete pedagogical designs still raise many questions that motivate current research in computer supported collaboration (Münzer & Xiao 2005).

[13] In 2006, Australia was in 4th place in the Economist Intelligence Unit's e-readiness ranking, after the US, Sweden and the UK (DCITA 2006). In the absence of equivalent studies for Australia, similar technology adoption patterns might be realistic assumptions for Australian undergraduates.

Shi and Morrow's (2006) study of modelling effective educational technology (MEET) investigated the use of synchronous communication tools by 23 instructors in 18 different community colleges. The objective of their study was to find out to what extent instructors identified good educational practice (as specified by the educational institution's quality framework) with tool-specific features. Their findings supported the use and merits of synchronous forms of online education, but did not associate specific tool features with a discrete quality criterion (ibid). The authors concluded that further research was needed to evaluate tool features as they are applied in different learning contexts.

In order to combine instructional design and synchronous e-learning, Münzer & Xiao (2005) developed the bubble-chat tool which included a predefined learning process in terms of role assignments, turn taking and learning phases to be accomplished. Though the study featured some positive social effects of collaborative learning in general, the restrictive control the tool exercised over the learning process led to a low acceptance level of the technology (ibid).

In order to identify instructional strategies for the integration of synchronous teaching and learning events, Schullo *et al.* (2005) analysed five case studies on a virtual classroom system, Elluminate Live!™ (http://www.elluminate.com). The study discussed instructor-led and student-led learning scenarios and found that appropriate training for instructional staff members was a critical success factor (ibid). A similar result has been reported by LeBlanc *et al*. (2007) who reported significantly improved comfort levels with teaching using a virtual classroom following a training seminar. Despite the training effort, however, some discomfort remained due to a lack of connectedness to the students which made it difficult to gauge their level of understanding (ibid).

Relevant findings

Effect studies can be credited with providing a general picture of when technologies have shown benefits or what negative side-effects have been observed. However, a general problem with effect studies is that they report findings on a relatively high level of analysis (e.g. using tool x, the effect y was observed). In reality these studies offer little explanation to educators who use a similar tool but cannot achieve the same effect. These inconsistent results have led to a more process-centred type of research aimed at unravelling the actual requirements of a task and how these were supported by specific characteristics of a technology.

3.3 Media Theories for e-Learning

After the disappointing results of technology-centred research, researchers recognised that the achievement of the intended media effects was strongly dependent on the process which integrated technology and learning (Dillenbourg *et al.* 1996). The underlying assumption is that media and activities have inherent characteristics which can be matched according to rules of optimal fit (Mennecke, Valacich & Wheeler 2000). Hence, the first goal in this type of research is to specify the essential characteristics of a medium and what this implies for the activities that are to be supported (Straub & Karahanna 1998).

Analysing the characteristics of media and their influence on communication processes has been a long-standing topic of media choice theories, three of which will be presented in the following sub-sections. However, in applying these theories it is helpful to keep their different backgrounds and intentions in mind. Multimedia Theory (Mayer 2005) focuses on information processing and has a predominantly psychological foundation. Media Richness Theory (Daft, Lengel & Trevino 1987) was developed by studying communication efficiency in a managerial environment and focuses on communication content. And finally, Media Synchronicity Theory (Dennis *et al.* 1998) is a revision of media richness proposing that the purpose of communication is a better set of selection criteria to match a tool with a given task.

3.3.1 Multimedia design

The way multi-media information is presented to learners makes a difference to how efficiently this information can be processed. The overall objective of multimedia design is to develop educational multimedia representations that do not overstretch an individual's information processing capacity, but which are still cognitively engaging (Mayer 2005).

Mayer and Moreno (2002) draw upon dual coding (Paivio 1986) and cognitive load theory (Paas, Renkl & Sweller 2003) to develop a cognitive theory of multimedia learning. Based on the assumption that humans use two different channels to process audio and visual information, the authors developed several design principles for multimedia messages as shown in Table 3-2 (Mayer & Moreno 2003).

Table 3-2: Design principles for multimedia messages

Multimedia Principle	Description
Multiple representations (Mayer & Gallini 1990)	Learning increases if verbal information is combined with corresponding graphics.
Coherence of explanations (Mayer, Heiser & Lonn 2001)	Extraneous (not directly relevant) information decreases learning (e.g. background music, embellishing animations)
Temporal contiguity of representations (Mayer & Moreno 2003)	Learning increases if corresponding information is offered simultaneously (e.g. a narration explaining a diagram).

Relevant findings

Though these principles (Table 3-2) have been developed in the context of learning *from* multimedia they can also be applied to communication *through* multimedia. In the context of the present study a multimedia message is what students exchange while collaborating online. Based on this analogy, the 'multiple representations principle' would suggest the use of communication channels that support a variety of information formats (an idea which has been taken up by media richness theory, as explained in the next section). The 'coherence of explanation' principle hints at potentially detrimental effects if inadequate communication media are used, e.g. when a final draft is read out loud during a meeting, the audio information on top of what can be visually read may slow down information processing. And, finally, the 'temporal contiguity' principle would suggest synchronous communication whenever a representation (e.g. the basic structure of a case report) needs to be explained or negotiated.

3.3.2 Media richness and channel expansion theory

Media richness theory looks at media characteristics and how they fit certain communication processes (Daft, Lengel & Trevino 1987). Media richness was developed from social presence theory (Short, Williams & Christie 1976) and empirically tested by studying managers' selection of communication media for different types of message content (Trevino, Lengel & Daft 1987). The available options managers could choose from were face-to-face meetings, telephone, e-mail or written documents.

Daft *et al.* (1987) found that a major criterion managers used to determine how to communicate a given message was the 'richness' of the communication channel, i.e. its capacity to facilitate a shared meaning. Further specifying the concept of media richness they suggested four indicators:

1. *Immediacy of feedback*: How fast could a message be corrected or probed?
2. *Cue multiplicity*: What forms of non-verbal communication are supported (e.g. intonation, gesture, social status)?
3. *Language variety*: What forms of language elements are allowed (e.g. natural language, mathematical symbols, emblems)?
4. *Personal focus*: How well can the medium adapt to different communication purposes (e.g. ability to personalize a message or to reach a large audience)?

The authors found that unstructured and ambiguous information was best communicated by a rich medium, whereas routine messages with little potential for misunderstanding would be more efficiently communicated through less rich (lean) media. Figure 3-3 summarises the relationships within media richness theory graphically.

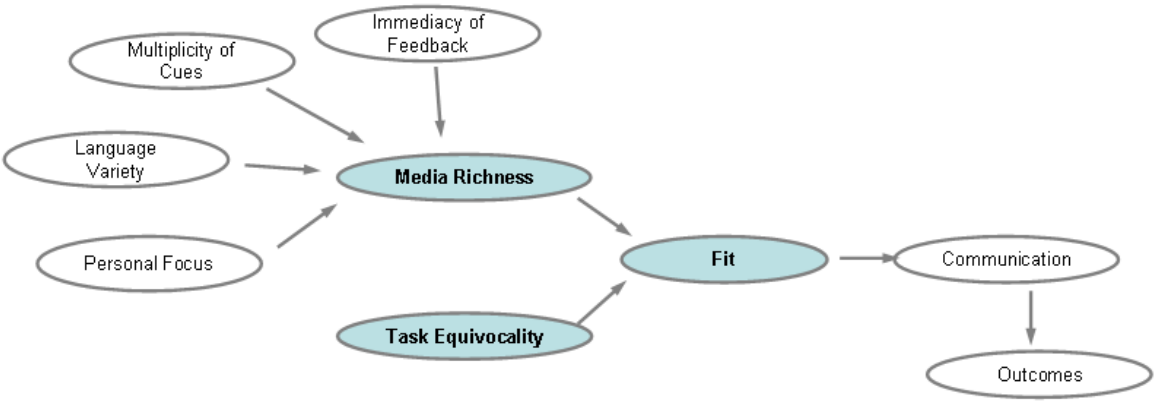

Figure 3-3: Media-Richness Model based on Kinney and Dennis (1994)

However subsequent research designed to confirm media richness theory yielded mixed results, highlighting a number of social factors which can influence the usefulness of a medium, such as users' *media literacy* or how frequently a communication medium is used (*frequency of usage*) (Kock 2005; Robert & Dennis 2005).

Media Literacy: Daft *et al.* (1987) obtained their data primarily through interviewing managers hence, argue Carlson and Zmud (1999), what was measured was the perceived richness of communication according to managers' previous experiences with the medium. But individual users' perceptions can change as they become more experienced with the medium. Consequently, media richness is not a stable attribute of a technology but can be enhanced through users' innovative usage patterns – a phenomena Carlson and Zmud (1999) call 'channel expansion'.

Frequency of Usage: Rice and Love (1987), for example, analysed a large discussion forum which, at the time of the research, had been in use for five years. They found that the quantity of social, non-task-oriented messages increased when users communicated more frequently. Hence, the richness of a medium is also dependent on what type of communication is accepted as appropriate within a particular community, or whether community members already know each other or not (Walther, Slovacek & Tidwell 2001).

Potential implications of media richness theory for e-CBL will be presented at the end of the next section in combination with media synchronicity theory.

3.3.3 Media synchronicity

Robert and Dennis (2005) looked at media richness theory and what this implies in terms of cognitive load for users. They argued that, although some media convey richer information, this information can get lost if communication partners cannot attend to or synthesise the wealth of information due to their limited information processing capacity. For example, video conferencing affords a high level of social information (facial expressions, gestures, intonations) on top of the verbal information, but participants need to actively integrate these cues into their message interpretation processes. Research into video-supported chat showed that, although the visual images served as 'ice breakers' to begin with, they received less attention during later stages of the communication process (Tscholl, McCarthy & Scholl 2005).

By integrating information processing theory with media richness, Robert and Dennis (2005) argued that the *synchronicity* of the medium is a better selection criterion than its richness. Synchronicity is defined as the ability of a medium to concurrently engage communication partners (Dennis *et al.* 1998). The authors specify media synchronicity as *speed of feedback* (as defined in Section 3.3.2), *rehearsability* and *reprocessability* (ibid).

- *Rehearsability:* is the possibility of mentally simulating the effects of a message before releasing it. Rehearsability in face-to-face meetings or videoconferences, for example, is typically low because participants feel committed to maintain communication without major delays, which imposes a limit on the time available to plan, finetune or *rehearse* their messages (Carlson & George 2004). A student who needs to communicate highly consequential news (e.g. not being available for the last week of a project) may therefore prefer to write an email which allows for careful formulation of the message, rather than make the announcement in a virtual meeting.

- *Reprocessability:* is a medium's ability to support the reuse of information. The information exchanged during audio-conferences is extremely transient compared to a textual chat where at least the last few lines remain visible, or an email where the entire message can be reused by simply inserting comments into the original email.

An important condition affecting rehearsability and reprocessability of information is group size. Larger groups leave more time to the individual participant to formulate a message but they also decrease an individual's ability to reprocess the growing amount of information generated in larger online communities (Carlson & George 2004).

Summarising the effects of media synchronicity, Dennis and Valacich (1999) suggest that communication media should be selected according to two fundamentally different communication purposes:

1. *Conveyance of information* aims at gathering and disseminating information. Dissemination is best supported by less synchronous media (low speed of feedback and a high level rehearsability), e.g. e-mail, listserv, forum, file sharing, voicemail.
2. *Convergence on shared meaning* aims at decision making and applying the information that has previously been disseminated. This process profits from higher synchronicity (high speed of feedback and a low level of rehearsability), e.g. face-to-face, video conference, telephone, and chat.

DeLuca and Valacich (2005) provided additional confirmation for media synchronicity theory in a study where virtual teams had the task of redesigning and improving business processes in an organisation. However, the authors also found that previous familiarity between group members played an important role when less synchronous media were successfully applied in convergent processes, a result otherwise conflicting with their theory.

Relevant findings

Table 3-3 attempts to classify particular learning activities according to content (media richness theory) and purpose (media synchronicity theory) of communication by applying media richness and media synchronicity to e-CBL.

The classification is based on the assumption that whenever individual group members bring new information to the case discussion there is a need to disseminate (convey) information. Moreover, sharing new information creates ambiguity in the sense that participants first need to put one another's comments into context, to achieve some common ground that can limit potential misunderstandings (Clark 1996). Once a group

has established its own frame of reference, less back and forth clarification is necessary to establish shared meaning resulting in more structured communication.

Table 3-3: Message content and message purpose in small group discussions

Small Group Discussion	**Media Richness - Communication content is …**		**Media Synchronicity - Communication purpose is …**	
	Unstructured Ambiguous	Structured Unambiguous	Conveyant	Convergent
Share individual case interpretations	X		X	
Agree on principal case issues		X		X
Sharing potential solutions	X		X	
Discuss a solution's advantages and disadvantages		X		X
Allocating sub-tasks		X		X
Collating group report		X		X

However, Table 3-3 presents a problem in terms of identifying which communication medium should be suggested to students for each phase of the case study. On the one hand, sharing interpretations and solutions includes potentially ambiguous content which, according to media richness theory, is best communicated through rich and synchronous channels, yet sharing one's interpretation is a clearly conveyant process that would benefit from an asynchronous communication medium where information can be easily rehearsed or reprocessed.

In summary, then, neither a theory based on the richness of a medium, nor one based on its synchronicity can provide an unequivocal recommendation on how to mediate specific case-based learning activities. Moreover, the categories used in media richness and synchronicity theories are too broad and general to allow for meaningful mapping with real

world learning processes, which makes it difficult to specify plausible media-task combinations (Schwabe 2004).

Consequently, a third approach to studying the relationship between learning and technology is introduced, with the potential to provide a more detailed understanding of e-CBL.

3.4 Technologies as Person-Plus Systems

Researching collaborative e-learning as "person-plus systems" (Perkins 1997, p.106) abandons the idea that a single grand model can describe the complexity of learning in such a way that at any moment the optimal technological support could be suggested. As shown in the previous section, evaluations of media richness and media synchronicity models have led to inconsistent results or were found to be too general to inform the work of practitioners (Schwabe 2004).

Consequently a third research approach is introduced which focuses on conditions and effects as they emerged during ongoing learner interactions (Dillenbourg *et al.* 1996). Learning processes are not analysed on the basis of pre-conceived models of efficiency, but based upon the results learners achieve interacting with their social and technological environment.

This change of perspective puts learners and their intentions at the centre of analysis, which transforms online learning environments into person-plus systems (Perkins 1997). Perkins (1997, p.98) argues that most physical arrangements are just 'cognitive opportunities' without executive functions, which means it is ultimately up to the learner how to use the 'cognitive opportunities' within their environment.

Perkins' (1997) person-plus systems emphasise the active role learners play in changing and configuring their environment in a way that best fits their current understanding of a problem. He also notes that these problem definitions influence learners' abilities to exploit their environment in varying ways. Perkins (1997, p.96) points out that learners in the real world are surrounded by a vast array of physical support systems, which enable access, representation and manipulation of information – although many aspects of selecting the support system and applying it (executive function) are left to the learner. For example, a problem solver may use a white board to draw a conceptual map of the problem, or access a data-base to retrieve some background information which may be temporarily captured on paper before being used to write up a final answer to the problem. Ultimately, the executive function in person-plus systems is critical for learning: if systems take over all decisions (executives) then learners could probably run through computer

aided instructional programs without any effort but also without any cognitive challenge to instigate learning (Dillenbourg 1996).

Hence, two research questions emerge when designing learning environments as person-plus systems:

1. How does learning depend on an adequate distribution of executive functions between learners and environment?
2. What characterises flexible transitions of executive functions within person-plus systems?

The first question will be answered by looking at *distributed learning* (Section 3.4.1), which ultimately includes a decision about what learners need to learn by themselves and what knowledge is put at their fingertips, freeing them from routine efforts that may not contribute to their current understanding (Pea 1997). The second question is addressed by interpreting technology functions as *affordances* (Section 3.4.2), the view that functionalities exist only insofar as they are perceived (Gibson 1986).

The outcomes of such an approach to researching learning environments do not attempt to present technologies as causal factors towards better learning results, but rather as artefacts that can be used in multiple and, at times, unforeseen ways. Dwyer and Suthers (2005) argue that technologies have unpredictable effects because collaboration patterns cannot be fixed technologically. A central purpose of research is then to design learning environments that can support many different interactions, rather than environments that force behaviour into a prescribed path of 'best practice'.

3.4.1 The distribution of cognition and instructions

The concepts of 'Distributed cognition' (Hutchins 1995, p.129; Salomon 1997a) or 'distributed intelligence' (Pea 1997, p.50) emphasize the sharing of cognitive efforts among individuals or purposefully designed activities and artefacts[14].

The concept of distributed learning implies that instructional support can be distributed among tutors, peers and the online learning environment. However, learners interact with their environment as a whole, meaning that the effectiveness of one part of the instructional support system can only be understood if seen in combination with the other, including non-technical, sources of instruction (Lave & Wenger 1991).

Another important implication is that the distribution of executive function between learner and environment can follow a gradual or intermittent pattern. A simple memory aid within

[14] In assuming that knowledge can reside in artefacts, distributed cognition can be associated with a 'learning as activity' position where a similar central role is given to the use of tools (see Section 2.2.3).

the learning environment may be sufficient to start a problem-solving process, before handing back the executive function to the learner (Perkins 1997, p.99).

In summary, distributed cognition is more a heuristic tool to situate electronically mediated learning in its broader educational context. Moreover, it shows the importance of aligning software technologies with other sources of educational support such as peers, tutors' needs, or non-electronic media.

Finally, if cognition is distributed then an important educational goal is the ability to recognise and use relevant information resources and cognitive support tools effectively (Nickerson 1997). This can be achieved either through direct instruction or by means of a culturally aware and mostly self-explanatory design. The latter is researched under the concept of affordances, and is introduced in the following section.

3.4.2 Affordances of technologies

Affordances describe the relationship between a technology, its user and the cultural setting (Gaver 1991). The term 'affordance' itself originates from Gibson's book "*The ecological approach to visual perception*" (Gibson 1986). Gibson argues that humans see and hear because their senses act upon affordances of an illuminated object or the environment carrying a sound wave. Species with different sensory organs have a different picture of the environment (ibid). However, beyond a general agreement that affordances are actionable properties, the concept is not undisputed (Oliver 2005).

Norman (1988) uses this concept to develop his model of user-centred design, i.e. a good design needs to suggest how an object might be used. Central to his interpretation of affordances was the distinction of perceived and real affordances (Figure 3-4), a differentiation that has become very popular for interface designers (Preece, Sharp & Rogers 2002, p.25). The purpose of each element on a webpage should be obvious, for example a button should suggest pushing and icons should indicate clicking. If users try to interact with parts that afford no action then they have perceived a false affordance, e.g. an underlined heading might be interpreted as a link, or if users ignore a link because they think it is a heading then the affordance remains hidden (Figure 3-4).

An important factor in Norman's (1988) use of the concept are cultural conventions. Unlike affordances that are based on the physical characteristics of an object, adherence to conventions can differ from one individual to another and is most likely shaped by different past experiences (Norman 1988, p.190). Affordances' reliance on conventions and the fact that they can remain unperceived also explains why affordances as design recommendations represent probabilities rather than law-like causalities (Kirschner, Martens & Strijbos 2004)

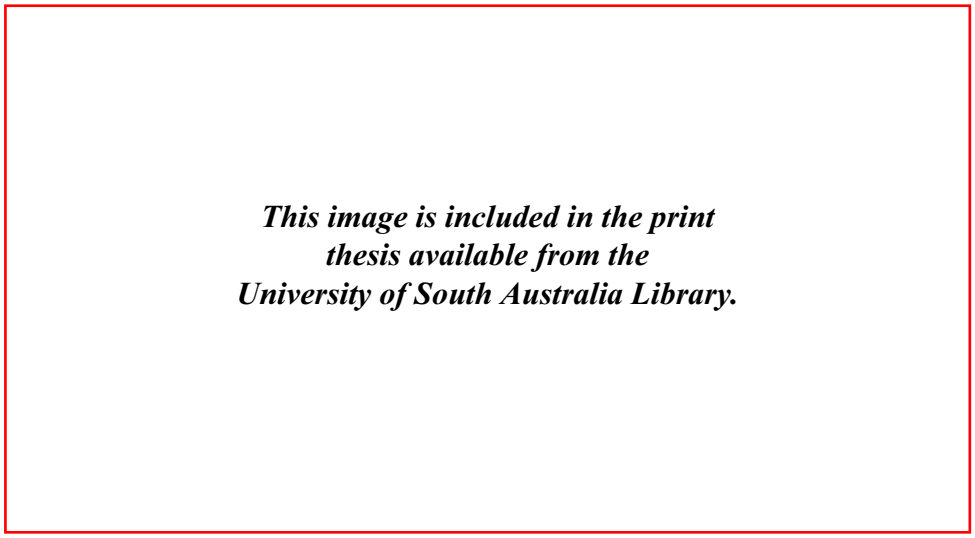

Figure 3-4: Real and perceived affordances (Gaver 1991)

Current e-learning related research based on the concept of affordances

Analysing the use of an educational multimedia CD, Laurillard *et al*. (2000) focused on the affordances, or the lack thereof, to engage in meaningful learning processes. The authors found that students were more likely to browse the content then to work on an answer to the given questions. In a follow-up study, the authors added several new elements (affordances) to the environment such as an editable notepad and an index of sub-goals. These new elements afforded new activities as students could continuously elaborate on their answers and could monitor their level of goal attainment by simply checking against the list of sub-goals (ibid).

Van der Pol *et al*. (2006) compared the affordances of two asynchronous discussion tools by means of the observable learner activities. One system had the functionality of a traditional discussion board (as part of a Blackboard LMS) and the second system allowed shared annotation directly to the specific document that formed the basis for the discussion. Applied under similar conditions these two systems generated different types of collaboration. Whereas the traditional forum included a higher percentage of social, non-task-related communication and produced results which resembled more closely a debate style of communication, the shared annotation tool created a more document-focused collaboration style (ibid). Interestingly, cultural conventions played a role in these results, since postings in the traditional environment included an opening and closing section whereas shared annotations did not (ibid).

Looking at Van der Pol's *et al.* (2006) study, it is evident that although both tools afford discussions, they do so in quite different ways. It is the educators choice how to structure the learning environment in a way that enables learning activities most conducive to the intended learning objectives.

The final study reviewed in this section explores the affordances of media spaces in workplace environments. Media spaces aim at providing affordances that enable collaboration as if participants were in the same room (Gaver 1992). Though studied to a lesser degree, the room metaphor is also used in e-learning related studies, e.g. learners meet online in virtual viewing rooms (Baecker *et al.* 2006) and virtual class rooms (Estes 2004). The assumption is that shared audio and visual information more closely supports coupled interactions (Nardi 2005; Oliver, Dave & Robin 2006). For example, while concurrently working on a shared document users can communicate their intentions, opinions or needs through a variety of channels.

However, Gaver (1992) noted that, strictly speaking, the space metaphor for virtual collaboration environments is misleading and there are limits to the extent to which 'real space' can be simulated. Taking audio clues as an example, Gaver (1992) noticed that shared audio signals in virtual rooms are monophonic, which impedes localising the source of a sound and hence makes it difficult to filter out background noise if one of the speakers participates from a busy environment. Similar limitations have been reported in relation to video conferencing tools (Dourish *et al.* 1996), where the meaning of gestures and gaze is lost due to the lack of a shared 'real space':

- meeting participants often point to objects on their screens which are not part of what is captured by the camera, and
- eye contact is often not possible because users can look at either the image of other participants, or at the camera, but not at both simultaneously.

Dourish *et al.* (1996) concluded that, in these cases, real-world communication may not be the optimal scenario virtual rooms should try to emulate. 'Eye contact' is essentially a mechanism to coordinate turn taking in conversations. However, long term users of media spaces have been shown to develop substitute coordination mechanisms (Dourish *et al.* 1996), which shows that, over time, social conventions can adapt to the medium if necessary. Nonetheless, recent research has attempted to overcome such limitations by creating "spatially faithful meeting places" (Nguyen & Canny 2005) through a combination of multiple cameras which allow each participant to have their own perspective, or through the use of multiple microphones that enable the creation of acoustic environments (soundscapes).

In summary, the theory of affordances postulates that humans interpret their surroundings in terms of their potential for action (Gibson 1986). Affordances are therefore properties of an environment which can be acted upon (Gaver 1991), for example differently shaped door handles which suggest varying actions: pulling, pushing or turning (Norman 1988). Whether individuals recognise affordances depends upon social norms and cultural

conventions (Costall 1995). This is particularly relevant for affordances of artefacts that are the products of prolonged social practices. For example, lectures suggest listening and small groups are more likely to afford a discussion (Laurillard *et al.* 2000).

3.5 Summary: Wrapping up the Learning Environment Discussion

The introduction to this Chapter stated that e-learning is essentially learning facilitated through technology, so that e-learning design can be understood as the specification of a pedagogical scenario in combination with supporting technology (Andriessen, Baker & Suthers 2003b).

Table 3-4 summarises the varying approaches which have been taken to mapping learning activities and support technologies, or to explaining the relationship between technology and learning in general. The first column indicates a gradual change from understanding technology primarily as a condition of human activities, to research considering the interactivity between users and technology, so that technology must be seen as a very dynamic, rather than a stable, condition.

The different approaches reviewed in this Chapter originate from a variety of backgrounds (research *domains*), assuming different learning settings (*scope*) and aiming at different *outcomes* (general selection rules versus case specific interpretations). The categorisation used is not meant to be mutually exclusive and research projects can use multiple approaches. However, studies that actually integrate findings from various domains are still rare (Stahl, Koschmann & Suthers 2006).

Surprisingly, not many references to typical media choice theories such as media richness or media synchronicity as they are used by CSCW and IS researchers could be found in current CSCL studies. For example, a simple scan of proceedings of the international CSCL conference in 2005 (Koschmann, Suthers & Chan 2005) showed no hit for either of the keywords ‘media richness’ or ‘media synchronicity’. Schwabe, Filk & Valerius (2001) raised the question “Why re-invent collaboration?” and suggested further incorporating CSCW research into the CSCL domain. Though a one-to-one transfer might not be possible due to the differences between the worlds of work and learning, media richness and media synchronicity present useful methods of analysing media use at a more fine-grained level (Schwabe 2001).

Table 3-4: Theories informing the process of media selection and design

		Domain*			Scope		Outcomes	
Approach	**Role of Technology**	**ML**	**CSCW**	**CSCL**	**Indiv.**	**Group**	**Gene-ral**	**Specific**
Multimedia Design (3.3.1)	Condition	x			x		x	
Media Richness (3.3.2)			x			x	x	
Media Synchronicity (3.3.3)			x			x	x	
Person-Plus Systems (3.3.4)	Interaction			x		x		x

* ML – Multimedia Learning, CSCL – Computer Supported Collaborative Learning, CSCW – Computer Supported Collaborative Work

In reviewing various approaches to the process of selecting and defining educational media it seems clear that no undebated procedure or model can be recommended at this stage.

How can technology support learning?

This restated auxiliary research question cannot be answered conclusively, although the review of theory has provided valuable candidate concepts to explain the interplay between learning activities and technology. Most importantly, the review has shown that the initial framing of the research question is crucial in determining later findings.

In conclusion, the present research project does not assume the existence of *a priori* media characteristics, but takes a *person-plus view* (Perkins 1997). It therefore assumes that technologies have affordances whose accessibility depends on a number of factors which come into play in unforeseeable ways.

Nonetheless, 'How can technology support learning?' is still a valuable question, where recommendations are needed. Part of the answer lies in the refinement of the question and the way design recommendations are formulated and justified. In this respect a person-plus understanding of learning technologies suggests a number of design principles:

- the validity of design recommendations depends on a thorough understanding of a learner's overall situation in its cognitive, social and organisational dimensions (Rogers & Ellis 1994);

- the success of design recommendations depends on how close an educator's interpretation gets to a design's intended functionality; and
- the interpretation of design recommendations depends on the circumstances under which the design is to be used (Winograd & Flores 1987, p.78).

All three principles are closely interrelated, because educational design principles depend on a teacher's skill in analysing learning situations and being able to interpret and apply design recommendations with flexibility.

Creating knowledge which goes beyond the formulation of best-fit rules will require a suitable research methodology that is able to capture the various facets of technological affordances and distributed cognition as they are encountered in real world learning scenarios.

4 RESEARCH APPROACH

The review of the literature concerning technology enhanced learning contained in Chapter 3 shows that research in this area over the past 25 years has shifted its focus from technology as an impact factor, to technology embedded into the activities of learners (Clark 2001; Dillenbourg *et al.* 1996). This shift has resulted in the development of a range of increasingly diverse research approaches, needed to capture data able to describe person-plus systems (Section 3.4). At a more fundamental level, this diversification of research approaches was designed to increase the inclusion of information relating to contextual influences and the emergent characteristics of e-learning activities (see Barab & Kirshner (2001) for a more detailed discussion of this topic).

Figure 4-1 outlines the line of argumentation followed in this Chapter to: establish the interpretivist orientation of this research; discuss the methodological implications of interpretivism; and provide reasons for the application of qualitative methods designed to transform the abstract principles from paradigm and methodology discussions into specific research activities.

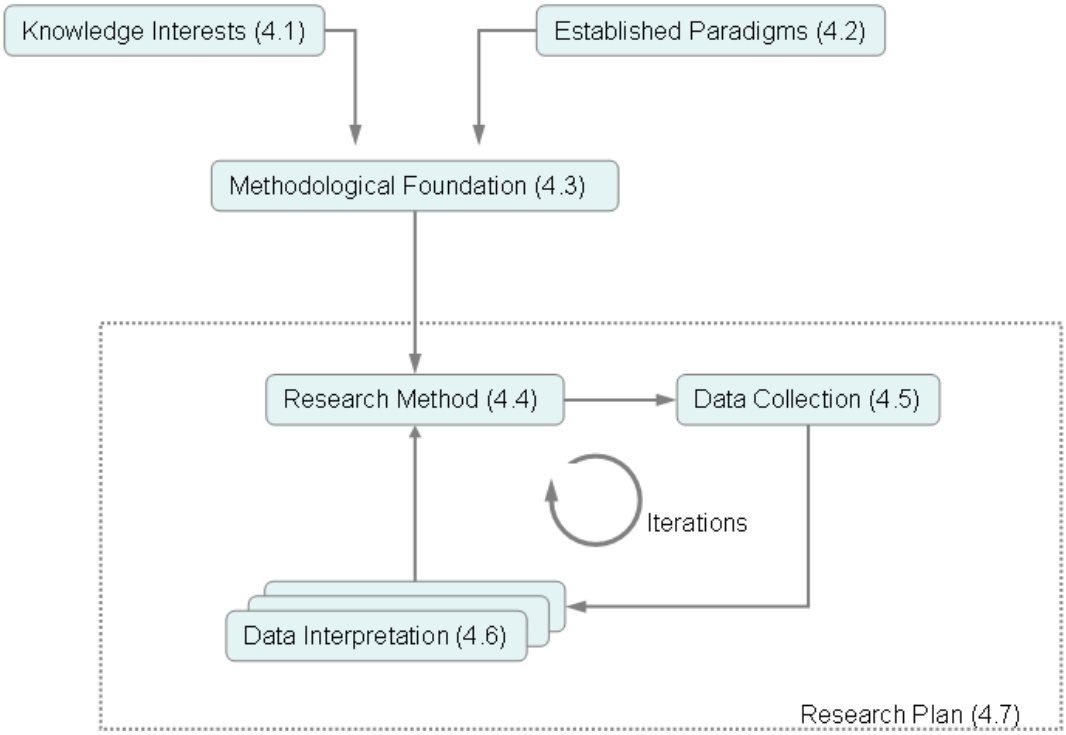

Figure 4-1: Developing the research approach, a chapter overview

The Chapter begins with the starting point of this research project, where a number of *initial choices* are made about how to frame the problem space and its components (Section 4.1). It will be shown that research is not always an exclusively rational process but also depends on researchers' goals, i.e. "knowledge constitutive interests" (1971a) and commonly prevailing research practices, i.e. "paradigms" (1970c).

Section 4.2 discusses *established paradigms* such as positivism, interpretivism and critical theory, outlining their fundamental assumptions and how they differ.

Section 4.3 contains a critical discussion of qualitative research in general (and *hermeneutics* in particular) designed to clarify the features of an interpretivist methodology that allows research into the socio-technical nature of e-CBL.

Sections 4.4–4.6 place this research within the tradition of developmental research approaches based on iterations of data gathering and interpretation (Richey, Klein & Nelson 2003). This has enabled the researcher to explore the field, focusing on a few promising issues at a time and building up interpretations of complex learning situations in a stepwise method. As is typical for hermeneutic forms of inquiry, there is a close link between increasing understanding of a problem area and the specific data collection and interpretation techniques applied, hence the feedback arrow links 'data interpretation' back to 'research method' in Figure 4-1.

4.1 Initial Choices

When starting this work the researcher needed to answer three questions: 'What shall be researched?', "Why shall it be researched?" and "How shall it be researched?' following the path outlined in Crotty (2003).

Though there is no predefined sequence in answering these questions, all three must be considered in conjunction. To explore a phenomenon, researchers may either start with general observations and build a model later (data driven research), or build a model based on a set of theories which is then confirmed or refuted (theory driven research) – or can choose to mix both these approaches (Strauss & Corbin 1998).

What drives the development of a particular research approach was also the question investigated by Kuhn (1970c) and Habermas (1971a). The following two sections of this Chapter introduce Habermas' (1971a) position that research is fundamentally driven by the purpose it serves and Kuhn's (1970c) conjecture that researchers operate within the paradigms that establish the boundaries of what are commonly accepted ways of doing research.

4.1.1 Knowledge-Constitutive Interests

Habermas (1971a) developed his theory of knowledge-constitutive interests in response to the assumption that knowledge could be obtained free of external influences, in a purely rational fashion (Edgar 2006, p.11), and argued that any form of human inquiry is related to at least one of three fundamental needs (or *interests*) of human beings:

- controlling the physical environment,
- improving understanding and communication, or
- emancipation from oppressive systems.

Habermas (1971a, p.308-311) argues that each of these three needs leads to different: problems, lines of arguments and presentations of outcomes. However, knowledge-constitutive interests are not only a matter of personal choice, but have to be seen in a larger social context. In "*Towards a rational society*" Habermas (1987, p.100) argues that from the 19th century onwards science had an ideological function in defining norms and standards for scientific inquiry and public discourse. He concluded that a failure to recognize the ideological nature of the often predominantly technocratic understanding of progress led to neglecting alternative ways of defining and supporting progress (ibid. p.111).

Knowledge-constitutive interests are important for this Thesis in that they demand a clear statement of the purpose for which a research question is asked. Developing e-CBL as defined in this Thesis is based on an improved understanding of the learning and communication processes involved. This improved understanding, however, can be applied for a variety of purposes, e.g. emancipating learners' use of technology or changing technology itself. Clearly stating the knowledge-constitutive interests thus helps to balance different research objectives, such as understanding naturally occurring online learning processes, or increasing their efficiency through fine-tuning learning technologies[15].

4.1.2 Paradigms

Another source of influences researchers receive from their environment is often discussed under the heading of paradigms (Kuhn 1970c) or 'normal science' (Popper 1970, p.51). Though researchers give post-hoc rationalisations for their initial choices, Kuhn (1970c, p.119) argued that decisions about topics and methods are largely

[15] In this case, both knowledge interests are derived from different assumptions about how much of the executive function in person-plus systems should be anchored in the learning environment itself (section 3.4).

influenced by the prevailing paradigms of the time[16]. Ultimately there is no rational proof or algorithm for choosing theories and methodologies and all first reasons are subjective: nonetheless, paradigms represent widely accepted practices that have legitimising effects (ibid).

Kuhn himself never postulated a single, all-encompassing definition of the concept he coined and Masterman (1970) identified no fewer than 21 meanings for Kuhn's use of the term 'paradigm', such as the notion of a universally recognised model, or a set of legitimate questions and principles to guide the research process. Based on Kuhn's work, however, Mingers & Brocklesby (1997, p.242) suggest the following definition:

> "A paradigm is thus a construct that specifies a general set of philosophical assumptions covering, for example, ontology (what is assumed to exist), epistemology (the nature of valid knowledge), ethics or axiology (what is valued or considered right), and methodology." (p.242).

Discussing paradigms is an important part of establishing a methodological frame in order to understand the extent to which existing methodologies are applicable to the research project, and which aspects of the paradigmatic assumptions need to be questioned.

Concerning the first issue, Kuhn (1970a, p.6) makes a distinction between 'normal science' and 'extraordinary science': the former happens within an established framework and the latter emerges due to anomalies and inconsistencies which cannot be solved or explained without changing fundamental, and often longstanding, assumptions in a particular research domain[17].

Hence, paradigms need to be questioned if a research problem is perceived in a fundamentally new way, or when past research has not provided satisfying results[18]. In the next Section, the currently prevailing paradigms are discussed in order to establish the paradigmatic orientation of the present research project.

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[16] Casti (1990) offeres an explanation of Kuhn's discovery of the paradigmatic nature of knowledge and mentions Kuhn's puzzlement about the inadequacies in Aristotelian physics, showing a completely different picture from what is known today. Kuhn realised that Aristotle simply thought in terms of the then prevailing world views, when atoms and quanta did not shape the way of looking at physical phenomena (Kuhn 1970b, p.269). Aristotle's interpretations were rational insofar as they were consistent with the approved standards of his time (Casti 1990, p.39).

[17] Kuhn makes clear that doing 'normal science' is not necessarily less valuable than provoking a 'scientific revolution'. Once a good scientific theory has been developed it is preferable to extend its range and precision rather than engaging in further theory proliferation (Kuhn 1970b, p.246).

[18] A case in point is the sometimes unquestioned adoption of methods developed within the natural sciences to solve problems in social sciences (Polkinghorne 1988; Winch 1967).

4.2 Established Research Paradigms

Paradigms, as defined in the previous Section, comprise a set of accepted aims and methods of research. These foundational concerns can be categorised into *ontological*, *epistemological* and *axiological* questions (Fitzgerald & Howcroft 1998).

Ontology refers to "one's beliefs about what comprises the real world" (Lee 2004, p.6) and how this affects the choice of what to observe and what reasoning process to apply. Examples of ontological constructs are Popper's or Habermas' multiple world conjectures (Klein 2004). For example, Popper (1979, p.153) differentiated between an objective, phenomenological world; a subjective-mental world; and a world of human creations such as language, art and science. Popper concluded that all three worlds are necessary to form sensible explanations: describing one world in isolation would not be sufficient (ibid).

Epistemology or 'theory of knowledge' is the philosophical grounding of knowledge, raising questions like (1) What is knowledge?, (2) How can we gain knowledge? and (3) On what grounds can knowledge be justified? (Bentz & Shapiro 1998, p.32). The first question refers to the demarcation of moral or normative claims from rational knowledge claims (Popper 2002, p.11). The second question refers to the relationship between the observable external world and the observer's internal world (Rorty 1980, p.139). The third question is closely related to the second and refers to the process of justifying knowledge claims through a chain of reasoning (Cling 1997, p.109).

Axiology, or the 'theory of values' concerns the identification of how things are of value to human beings: how knowledge can promote the beneficial and limit the harmful (Hart 1971). Axiology is an important dimension when comparing different research purposes, analytical means, or action alternatives. These alternatives can be evaluated in terms of their outcomes (consequentialism), or on the basis of the ethics of the evaluating agent, according to a 'theory of duties and rights' (Lockie 2008).

Using the three paradigmatic dimensions outlined above, the next three Sub-sections discuss positivist, interpretivist and critical research paradigms[19]. This selection of paradigms follows a widely adopted taxonomy used in a number of social science methodology textbooks (cf. Neuman 2003) and literature reviews from the IS research domain (Mingers 2003; Orlikowski & Baroudi 1991).

[19] In terms of Habermas' notion of knowledge interests, however, it can be said that no paradigm is inherently better than any other, only more or less useful in a particular case (Silverman 2001).

4.2.1 Positivism

According to Bryant (1985, p.1), the most defining characteristic of positivism is the differentiation between observationally accessible and inaccessible phenomena, with only the former being accepted as a basis on which to ground knowledge. Non-observable statements are rejected as being unreliable and metaphysical[20].

Ontologically, positivism tends to decontextualize phenomena, assuming an atomistic structure of knowledge. In positivist social science research, this has motivated a search for law-like principles aimed at 'engineering' social outcomes (Bryant 1985, p.8).

Epistemologically, Bentz & Shapiro (1998, p.26) remark that positivism is often equated with 'the scientific method', based on observations that verify or falsify hypotheses. Research in the positivist tradition focuses on what can be recorded, measured and reproduced; and strives to avoid any impact the researcher might have on the research which could result in a subjective interpretation (Fitzgerald & Howcroft 1998).

Axiologically, positivism rejects normative statements (values and ethics) as possible warrants for knowledge since they have no rational or empirical basis[21]. The exclusion of values has led to research practices which ignore political or social implications: a point heavily attacked by critical theorists during the 'Positivismusstreit'[22] in the early 1960s (Bryant 1985, p.126).

4.2.2 Interpretivism

Interpretivism is "the systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social world" (Neuman 2003, p.76). Interpretivism emphasises the difference of natural and social phenomena and rejects the assumption of human behaviour governed by underlying law-like principles. Unlike physical objects, human beings have an awareness of themselves, as well as motives and reasons of their own (Neuman 2003, p.69). To give meaning to their observations, interpretivists need to understand the context of what is observed (Hammersley & Atkinson 1983, p.9). According to Schwandt (2000, p.191) interpretivism

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[20] Weber (2004) argues that many other assumptions about positivists are overstated or incorrect. For example positivist researchers are aware of the impact artefacts, theories and cultures have on their results and therefore do not believe that human senses merely mirror an independent, objective reality.

[21] Though paradigms are generally considered as constructs preserving a unified set of rules concerning the conduct of scientific inquiry, Bryant (1985) shows that the positivist paradigm developed different versions over time, e.g. philosophical positivism in France vs. sociological positivism in North America. The former was strongly committed to social and political change, while the latter was decidedly value-free.

[22] 'Positivismusstreit' describes the confrontation of positivism and critical theory through their representatives Popper and Adorno. The debate concerned methods of science; and how far scientists are responsible for the consequences of their research (Bryant 1985, p.128).

must be seen as social science's reaction to the insufficiencies of methods taken from the natural sciences. Social sciences aim at empathetic understanding whereas natural sciences are based on abstract explanations. In order to understand, researchers often need to interpret what they observe; and in order to derive an explanation, researchers need to define causal relationships as they exist in the physical world (Neuman 2003, p.77).

Ontologically, interpretivist studies take their data from the social world in its 'natural' state, as opposed to making use of 'artificial' data generated in a laboratory (Hammersley & Atkinson 1983, p.6). In contrast to the positivist split between an observing mind and a 'world out there', interpretive researchers see themselves as part of the world they observe and know that their presence influences their observations (Bassey 1999, p.43). Reality is seen as a construct based on the needs of the researcher, although this does not imply that there is no reality, but rather that no privileged perspective on reality exists (Latour 1999, p.13).

Epistemologically, interpretivism assumes that meaning is derived from constantly interpreting observations against the backdrop of an increasing understanding of the whole situation (Schwandt 2000, p.193), a position compatible with hermeneutics (see Section 4.3). There is no single interpretivist method: phenomenology, ethnomethodology and ethnography can all be subsumed under the interpretivist paradigm (Bassey 1999, p.43). However, a unifying feature is the interpretivists' preference for narrative forms of analysis where a 'thick' description supports the reconstruction of a situation rather than its generalisation (Neuman 2003, p.81).

Axiologically, interpretivists choose research questions that are concerned with practical issues within the realm of the social world (Neuman 2003, p.76). Rather than searching for generalisable research outcomes, interpretivists strive for pragmatic recommendations based on the authenticity of the research (Neuman 2003, p.185). However, though interpretivists seek emphatic understanding they remain unaffected by the interpretive process (Schwandt 2000, p.194). This critique led to the conception of the 'critical theory' paradigm.

4.2.3 Critical theory

Critical theory emphasizes the need to link theory with praxis. Going back to Habermas' (1971a) knowledge interests (Section 4.1.1), critical research has an emancipatory purpose. Applied to IS the aim is to go "beyond the apparent to reveal hidden agendas, concealed inequalities and tacit manipulation involved in complex relationship between IS and their social, political and organisational context" (Cecez-Kecmanovic 2001, p.141).

Ontologically, critical research distinguishes between apparent and actual relationships between people. Critical research differs from interpretivism in that it assumes an objective world of relationships which can differ from how people perceive those relationships (Sarantakos 1998, p.36).

Epistemologically, critical researchers not only want to understand their subjects' situation but also want to enable human beings to change their conditions (Sarantakos 1998, p.38). Therefore critical research goes beyond the mere consideration of context, to question its legitimacy (2005, p.92).

Axiologically, like interpretivism, critical research rejects positivism's reductionist world view. However, critical research also reprimands interpretivists for being passive and neglecting the macro-sociological context (Neuman 2003, p.81). Critical research emphasizes the socio-economic conditions of those being studied. Rather than merely understanding social reality as it is, critical research includes a normative element suggesting how social reality ought to be (Cecez-Kecmanovic 2001).

4.2.4 Paradigmatic orientation of this research

This Section summarises the fundamental foundations for this present research project, derived from the knowledge interests pursued in this study and existing research approaches. So far paradigms have been discussed at an abstract level, based on their ontological (What is part of the research domain?) and epistemological (How do we go about knowing the research domain?) assumptions. However, the literature review (Chapter 3: Applying technology to learning) has already shown that the way in which e-learning researchers have investigated the relationship between technology and learners has changed considerably over time, shifting from a technology- to a person-centred approach. This can also be interpreted as a change in knowledge interests: in the early stages, researchers aimed at controlling the learning environment through sophisticated software environments and, when media effect studies showed increasingly contradictory results, knowledge interests shifted to investigating person-plus systems (section 3.4).

In the context of person-plus systems, the objective of this Thesis (designing electronic case-based learning in a way that balances efforts and benefits) suggests an *interpretivist orientation*. This implies that the research is carried out in natural settings, and that research activities will aim at rich descriptions and a better understanding of how learners engage with e-CBL. However, the identification of which research activities can actually provide this 'better understanding' and 'how' is still an open question that will be answered in the remainder of this Chapter.

4.3 Hermeneutics as Methodological Foundation

A research methodology describes the link between a research paradigm and the entailed research principles (Sarantakos 1998, p.34). Most paradigms are broadly associated with a particular type of methodology. For example, positivism is frequently allied with quantitative methodologies; and interpretivism with qualitative methodologies (Weber 2004). Table 4-1 summarises possible logical connections between Habermasian knowledge interests, research objectives, paradigmatic orientations and a methodology that supports the realisation of the intended research objectives (Klein & Huynh 2004; Oliga 1991).

Table 4-1: From knowledge interests to methodologies, based on Oliga (1991)

Knowledge Interest	Research Objectives	Paradigm	Methodology
technical	More efficient actions based on control	Positivist	Empiricism
practical	Better communication based on a shared set of meanings	Interpretative	Hermeneutics
emancipatory	Agreement based on rational discourse	Critical	Critique

According to the practical interest and interpretivist paradigm adopted for this study the methodology suggested is hermeneutics[23]. Similar to empiricism, hermeneutics includes rational reasoning. Ethical and critical judgement, however, and the capacity to identify what matters during the process of interpretation are necessary skills when conducting a hermeneutic study (Gadamer 1990, p.37).

Bleicher (1980, p.1) characterises hermeneutics as theory and philosophy guiding interpretation and construction of meaning. As a theory, hermeneutics describes the rules of interpretation and, as a philosophy, hermeneutics inquires into the relationship between interpreters and their interpretations (ibid., p.3). However, a more thorough introduction into hermeneutics is necessary to describe these rules and relationships.

A historical overview (Section 4.3.1) will provide an outline of the development of hermeneutic inquiry, which distanced itself gradually from positivist inquiry (through

[23] It is worth noting that the three methodologies in table 4-1 have some overlaps. For example all three methodologies use empirical, i.e. observable, evidence – but then differ in the degree to which they admit non-empirical data such as cultural or normative influences.

methodological hermeneutics); and was only later adopted by social scientists and applied to non-textual data (e.g. critical hermeneutics) (Oliga 1991, p.168).

This discussion of hermeneutics concludes by describing the problems involved in presenting and justifying interpretative knowledge (Section 4.3.2); and the need to find adequate quality criteria for hermeneutic research (Section 4.3.3).

4.3.1 Hermeneutic variants

Hermeneutics originates from interpreting[24] historical and religious texts, e.g. Biblical exegesis (Ricoeur 1981b, p.45). In the 19th century *hermeneutics* and *phenomenology* were developed as a reaction against a predominantly positivist interpretation of science (Schwandt 2000, p.191).

Hermeneutics acknowledges that every observation is an experience mediated by everything else experienced before and simultaneously (Ricoeur 1975). Hence observers cannot differentiate between an essential (or 'pure') meaning and a culturally (or historically) determined meaning, because no observation exists in isolation: "all interpretation places the interpreter in medias res and never at the beginning nor at the end" (Ricoeur 1975, p.91). The task of hermeneutics is to integrate an observer's prejudices and ideologies as they influence the process of interpretation.

Phenomenology looks for the 'thing itself', aiming to describe the phenomenon as if it were encountered for the first time, unclouded by any presumptions, sentiments or culturally determined bias (Willis 1997). However, the challenge lies in describing perceptions without losing their immediacy and re-introducing unwarranted connotations (Crotty 1997). The development of language is inherently cultural, i.e. words accumulate meanings through the ways individuals succeed in communicating with them (Vygotsky 1986). Crotty (1997) suggests that to escape the limitations of language, phenomenology can refer to dramatised and poetic accounts of an event. The main objective is to forego established meaning systems, to which end an unconventional frame of discourse, e.g. poetry or drama, may be more appropriate to achieve the intuitive grasp for which phenomenological studies strive (Willis 1997).

Methodological hermeneutics (Dilthey)

Though Dilthey's methodological hermeneutics endeavoured to oppose the methods of positivism in the natural sciences with a method of inquiry suitable to the human sciences, he still followed positivist scientific criteria such as objectivity and generalisability (Ricoeur

[24] Phillips (2000, p.20) argues that the terms 'hermeneutical' and 'interpretive' can be used as synonyms. The former derives from Greek and the latter from Latin, but they imply the same meaning.

1981b, p.48-53) –that is, interpreting a text as it was intended by the author. This could be done by analysing the text's historical context, which was taken as an objective background. Interpretation is then 're-experiencing' the process of writing. This kind of re-living past experiences was thought to be an adequate and generalisable method because all humans share a common set of psychological functions which enables them to reliably interpret one another's expressions – textual, cultural or artistic (ibid.). In this sense, re-lived experience is Dilthey's equivalent of the positivist's 'objectively given' empirical facts (Bleicher 1980, p. 23).

Although subsequent variants of hermeneutics criticised Dilthey's adherence to the positivist ideal of objectivity, one central insight remained important for the further development of hermeneutics: any human articulation (written, oral or behavioural) could be taken as a 'fixation' of meaning and become the object of subsequent interpretations.

Philosophical hermeneutics (Gadamer, Heidegger)

Unlike Dilthey, Heidegger and Gadamer saw the problem of conceptualising interpretation not as providing an 'epistemology of knowledge' but as finding an 'ontological foundation of knowledge' (Ricoeur 1981b, p.54). The shift to ontology meant that it is not the act of interpreting which gives meaning to our observations, but rather our being in a specific situation which renders some interpretations more plausible than others (Oliga 1991).

The dialectical relationship between partial and holistic interpretations is described as the 'hermeneutic circle', i.e. current expectations and 'prejudices'[25] provide the background for understanding a part which, in turn, shapes what is expected to be the final interpretation of the whole (Gadamer 1990, p.272). Emphasising the ontological foundation, the hermeneutic circle widens considerably in that not only does the whole of what is to be interpreted influence an interpretation, but the whole background knowledge of the interpreter influences their interpretation (Thompson 1981, p.40).

The difficulty of the 'hermeneutic circle' lies in the need to avoid misinterpretations due to the influence of arbitrary expectations and prejudices. Hence, a central concern for interpreters is the formulation of open and authentic questions that do not simply reproduce preconceived interpretation by asking rhetorical questions (Gadamer 1990, p.369).

[25] The term prejudice (Vormeinung) has also a positive meaning, because prejudices do not only distort interpretations, but also preserve traditions and conventions without which everyday communication would not be possible (Gadamer 1990, p.281).

Critical hermeneutics (Habermas, Ricoeur)

Critical argumentation differentiates itself from methodological or philosophical hermeneutic argumentation in that norms and power relations are seen as essential parts of knowledge justification. A central point in Habermas' critique of philosophical hermeneutics is the 'rehabilitation' of tradition as a value and truth-preserving authority (Ricoeur 1981b, p. 66). Gadamer (1990, p.284) argued for the value of history as a source of past knowledge and Habermas (1971a, p.311) argued against history because of its critique-repressing, status quo-preserving function. According to Habermas, one cannot assume scientific debates to be 'value neutral'; rather, scientists' positions are linked with the cognitive interests they have in the matter of research (Section 4.2). Habermas (1971b, p.309) argues that the empirical-analytical method is not problematic per se, only the method's alleged 'value-freedom' and the conclusion that all types of questions can be approached with the same method of inquiry.

Ricoeur (1981d) agrees with Habermas in that hermeneutic inquiry needs to be aware of its ideological nature, but does not believe that the ideological embeddedness of interpretation can be overcome. Rather, Ricoeur emphasises that, although critical evaluation of knowledge is necessary, hermeneutics itself cannot work without regenerating and reinterpreting the past (Thompson 1981, p.66).

Hermeneutic principles

To summarise this discussion of hermeneutic variants, the following principles are offered:

- Every interpretation is circular in a twofold way: (a) the anticipation of the whole influences the interpretation of the part which, in turn, shapes what is anticipated (whole-part relationship); and (b) the interpreter's background knowledge influences what is anticipated as the final interpretation (interpreter-object of interpretation relationship).
- The circularity of interpretation cannot be avoided: it can only be made explicit in order to make interpretations more transparent.
- No interpretation is value-neutral. Interpretations are only more or less suitable to the purpose they serve.

4.3.2 Problems of interpretation: Representation and justification

Research quality cannot be guaranteed through mere adherence to an established school of thought but requires researchers to develop an awareness of methodological issues based on reflection and self-criticism (Seale 1999).

Two methodological issues raised when discussing interpretivist research are often referred to as the *problem of representation* (Whose viewpoint is presented and in what

way?) and the *problem of justification / legitimation* (What justifies an interpretation? or Are there any regulatory criteria that allow differentiating between legitimate and mistaken readings?) (Denzin & Lincoln 2000). Put more simply, how can valid meaning be derived from qualitative[26] data. Miles and Huberman (1994, p.2) relate these problems to the lack of well-formulated guidelines. Unlike researchers using quantitative data, who can rely on clear conventions to justify their findings, there are few quality standards for researchers using qualitative data that could prevent wrong conclusions (ibid).

Problem of representation

The *problem of representation* originates from the existence of multiple viewpoints (e.g. learners, teachers or administrators might name different problems or benefits of e-CBL) and the fact that the final decision about which data are considered and interpreted lies with the researcher. Koch (1996) argues that representation issues require a high degree of detail and transparency in the description of the research process, which give rise to "thick descriptions" (Geertz 1973) typical of interpretivist research. The challenge is to not leave any doubt about the origin of an interpretation and how this interpretation developed over time.

Wolcott (1994, p.12) argues that interpretations result from a meaning-making process from description, through analysis to the interpretation of data.

- *Description*: 'Let the data speak for themselves.'
- *Analysis*: Identify key factors based on a systematic examination of the data.
- *Interpretation*: Derive meaningful insights from data, the context of data and the researcher's accumulated experience.

Consequently, any interpretation needs to clearly outline whether the researcher merely reports data, or synthesises and contextualises data. This way, readers of interpretivist studies have an audit trail that allows them to judge the trustworthiness of an interpretation (Creswell & Miller 2000).

Though interpretations make fewer claims to verifiability than positivist hypotheses, it would be wrong to assume that interpretations in the social domain are completely subjective creations (Crotty 2003, p.48). The extent to which interpretations can be ruled out or evaluated in terms of their correctness is addressed by the problem of justification.

[26] "The word qualitative implies an emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured … in terms of quantity, amount, intensity, or frequency" (Denzin & Lincoln 2005, p.10).

Problem of justification

The need to justify an interpretation arises when several, mutually exclusive interpretations are possible. Hermeneutics postulates that all interpretations start with initial assumptions that direct the interpreter's attention and conceptual frameworks (Ricoeur 1976); and Armstrong (1983) argues that the truth value of an interpretation cannot be derived from the object of interpretation itself but is a matter of shared assumptions. Hence, justifying an interpretation to someone with fundamentally different assumptions about the object of interpretation might be impossible. However, provided that at least some presuppositions are shared, Armstrong (1983) suggests three tests for legitimate interpretations:

- *Inclusiveness:* An interpretation needs to allow for all available information components to be fitted into it. Non-fitting information is considered a "falsifying anomaly" (Armstrong 1983, p.346)
- *Inter-subjectivity:* An interpretation should be considered reasonable by a wider community.
- *Efficacy:* An interpretation should have worthwhile consequences: it should have "the power to lead to new discoveries and continued comprehension" (Armstrong 1983, p.347).

This brief discussion has already highlighted some of the requirements hermeneutic inquiry needs to satisfy in order to justify its conclusions. The next sub-section addresses criteria of qualitative research as they apply to hermeneutic research.

4.3.3 Quality criteria for hermeneutic research

Although the aim of this section is to provide a summary of criteria to gauge the quality of a hermeneutic interpretation, it is important to note that neither method nor criteria can guarantee persuasive interpretations or meaningful conclusions (Smith & Deemer 2000). All they can achieve is to limit the number of permissible interpretations and conclusions in more or less efficient ways (Armstrong 1983).

Table 4-2 takes three research quality criteria as suggested by Lincoln and Guba (1985) and shows their implication for the process of hermeneutic inquiry.

Table 4-2: Research quality criteria

Qualitative Research	Hermeneutic Inquiry
Confirmability	Hermeneutic descriptions of events need to be sufficiently detailed (i.e. thick description) so that interpretive claims can be substantiated by data.
Transferability	Temporal and contextual similarities determine the degree to which findings of can be transferred from one situation to another. Therefore, hermeneutic inquiry needs to deliberately address context. This includes the context of the inquiry as well as the context of the inquirer, i.e. his or her impact on an interpretation (Smith 1984).
Diversity of perspectives	Hermeneutic inquiry needs to account for multiple interpretations whether they originate from different perspectives the researcher can adopt or from subjects perspectives on the events interpreted.

At the start of this Section (4.3) it was stated that methodology provides the link from abstract values stated in paradigmatic form to more concrete research activities developed in the remainder of this Chapter. Consequently, the quality criteria summarised in Table 4-2 also guide the selection and specification of research methods for this research project. Hence the following questions are answered in the next Section:

- Does the research method provide the depth and detail of data necessary to write thick descriptions that allow for auditing?
- Does the research method provide enough contextual information to identify opportunities of transferring research results into similar areas?
- Does the research method seek to cover multiple perspectives to avoid unilateral interpretations, closing off other, potentially more useful ones?

4.4 Candidate Research Methods

Sarantakos (1998) calls research methods the tools of the trade for social researchers. In general, research methods comprise activities to gather organise and interpret data (Miles & Huberman 1994). Based on their fit with hermeneutic principles and the research

quality criteria established in the previous section, three candidate research methods are now reviewed. Due to their widespread use in qualitative studies (Johnson & Christensen 2004), case research, ethnography and design research are included in this review. Clearly, it would have been possible to present a much larger number of candidate research methods – such as action research, critical research or grounded theory which could all be seen as relevant candidates (Trauth 2001) – but in the interest of keeping this Chapter to a manageable size, a pragmatic decision was made to present only the most appropriate alternatives. In the following Sub-sections, therefore, case research, ethnography and design research are introduced through definition, typical research activities and a brief critique.

4.4.1 Case research

Case research is most commonly defined through its focus on single instances of a phenomenon which are researched under authentic conditions (Yin 2003). Case study research is particularly useful to investigate context rich, relatively uncontrolled and dynamically evolving phenomena (Benbasat, Goldstein & Mead 1987). A primary aim of case research is to gain awareness of what matters in a given set of data or, as Stake (2000) puts it, the content of the case cannot be known at the outset of the study and whatever has been anticipated may have little consequence.

There is no generally accepted definition of how to do case research: “case research can be highly structured, positivist, deductive investigation of multiple cases; it can also be an unstructured, interpretive, inductive investigation of one case; lastly, it can be anything in between these two extremes in almost any combination” (Cavaye 1996, p.127-128). Consequently, it is a researcher’s *paradigmatic orientation* (Section 4.2) that influences how open or formalised the implementation of case research should be. The underlying principle of case research is the in-depth analysis of a particular set of data. Case data are not necessarily collected based on sampling logic (quantitative research), but rather based on analytical logic, viz the selected cases should represent the complexity of the field (Stake 2000, p.447). Therefore the researcher’s initial understanding of the issues and his/her intuition about which cases are likely to yield interesting results are crucial for successful case research (Siggelkow 2007).

Case research has been criticised for allowing biased interpretations, unspecific findings and unwieldy data management:

- Firstly, there is the danger that case researchers limit their interpretations to match their own interests and background knowledge (Lee 1989). This, if not made explicit, would present an unjustified bias in the research. The remedy is to give a

transparent account of how case data have been selected and interpreted in order to come to the conclusions presented (Yin 2003, p.10).

- Another point of critique is case research's inability to prove causal relationships (Cavaye 1996). Here it is argued that case research in general is not meant to find causalities[27] but to explore real world events where many variables intersect in causing an event.
- The final critique concerns the feasibility of case research, pointing out that often there is either too little or too much data (Yin 2003, p.13). On the one hand, case researchers are likely to be confronted with more data points than variables of interest, while on the other hand emerging issues may increase the value of data which had previously been neglected (ibid).

4.4.2 Ethnography

Literally translated, ethnography means 'writing about people or cultures' (Sarantakos 1998, p.195). Early ethnographic studies were concerned with describing exotic cultures in order to 'make the strange familiar' (Dourish & Button 1998). Later, ethnographic field techniques were used by anthropologists and sociologists to research more familiar settings such as workplaces and schools. Opposed to positivistic interpretations from the outside, ethnography emphasises *"local meanings"* or the *"actor's point of view"* from the inside (Erickson 1984, p.2). Ethnographic accounts are considered a valuable tool to highlight issues which could not have been identified by interviews or surveys because they required prolonged and intense interaction with the field (Ronkko, Lindeberg & Dittrich 2002).

A particular form of ethnography is *virtual ethnography* when observations take place in virtual settings. This means that no spatial boundaries help to define who, and what, can be observed, and when (Hine 2000). To picture the variety of experiences in online environments, virtual ethnographers need to make strategic decisions in related chains of events, rather then trying to cover all events of '*one place*' (Marcus 1995). This implies that the notion of a spatial field is substituted by the concept of a field of relations (Hine 2000). Virtual ethnography has been criticised for creating 'virtual identities', which may be quite unlike the 'real' learners (Wittel 2000), yet it can be argued that 'virtual identities' are all that matter, since these are the identities which fellow group members and instructors experience (ibid).

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[27] To detect causalities the hypothetico-deductive method is more appropriate since only then can initial conditions be experimentally controlled and causal factors tested in isolation (Hammersley 1992, p. 193).

Ethnographic studies in the educational sector often imply that the researcher is both ethnographer and teacher at the same time (Hammersley 1992, p.135). Though practitioner ethnography is often praised for its focus on practical results, it is also criticised for jeopardising validity due to the researcher's involvement with the field (Dadds 1998; Jacobson 1998).

4.4.3 Design research

Design research refers back to the seminal work of Simon in *"The science of the artificial"* (Simon 1996) and Schön's (1995) concept of *"reflection in practice"*. Both foundations emphasise the primacy of observing technology or any related design artefact in its natural environment and the need for a prolonged engagement with a design to reflect on the design process and the validity of any underlying assumptions (Bell, Hoadley & Linn 2004).

Design research in the educational domain has been defined by the Design-Based Research Collective (2003) through four characteristics:

(1) theories are derived from the study of learning environments;

(2) piecemeal changes are studied iteratively;

(3) design solutions need to clearly describe the benefit of the design; and

(4) the design needs to account for its functioning, rather than simply presenting its effect.

Supporters of design-based research argue that no theory of learning or e-learning can account for all the intricacies of its applications (see also the literature review on the pedagogical foundation of e-learning); and posit that research of learning technologies needs to *"include the aspects of local contexts that affect how designed interventions play out"* (Sandoval 2004, p.213).

Akker and colleagues (2006) highlighted two motives for undertaking design research:

- improving the link between educational research and practice through increasing the authenticity of research,
- improving the robustness of a design recommendation through an ongoing refinement of a design to match the complexity of real world learning scenarios.

Similar motives are set out by Hevner and colleagues (2004) for design research within the IS domain. However, what is important to design research, according to these authors, is the need:

- to identify questions which seem to be at the core of the design problem (the complexity of the problems usually approached would prohibit to address every possible question); and
- to describe one solution that works in depth rather than attempting to compare many alternative solutions.

Figure 4-2 shows the iterative nature of design research. Firstly, a design is submitted based on existing theories or design principles which can then be tested. However, if, due to constraints which lie outside the first design, the result is far from successful, the design needs to be widened and additional design principles may have to be added in order to address these emergent issues (effects & side-effects). In subsequent iterations the researcher can then refine existing principles and also study the impact concurrently-used design principles have upon one another (Bell, Hoadley & Linn 2004). The systematic documentation of initiated and observed changes in the educational setting is crucial to this process.

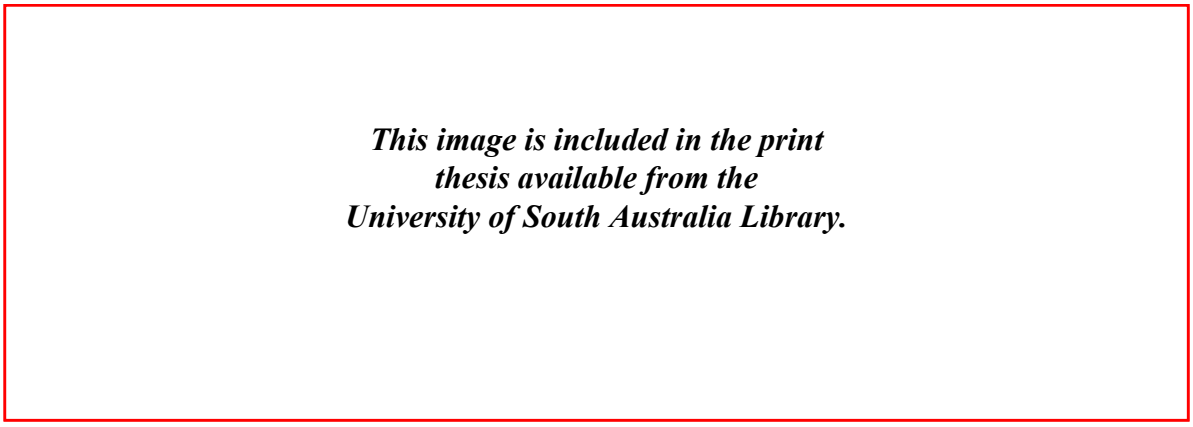

Figure 4-2: Iterations of design research (Voigt & Swatman 2006c)

A central construct for design research are design artefacts as they capture the evolving knowledge of the designer and enable the continuous testing of a design under varying conditions (Bell 2004; Perkins 1986). The oval shapes in Figure 4-2 refer to evolving versions (1st and 2nd design) of a design artefact, such as components and processes of a learning environment. In this way, the notion of an artefact is not bound to evolving versions of software but also includes application guidelines and configurations at a conceptual level (March & Smith 1995).

As with the two previous two research methods, the amount of data necessary to describe research iterations with sufficient detail is critical to design research (Dede 2004); and a lack of established argumentation guidelines on how to epistemologically justify the outcomes of design research iterations as research findings (Barab & Squire 2004). However, according to Maxwell (2004) these points of critique are based on an unfounded hierarchical ordering of methods with randomised trials as the 'gold standard' for rigorous

research. Accordingly, Section 4.3.3 argued that this understanding of rigour is inadequate for most forms of social research and alternative quality criteria have been suggested.

4.4.4 Selection of the research method

The central object of this research is the design of electronic case-based learning. Though all the research methods introduced so far fit the interpretivist orientation of this project, the greatest similarities with the hermeneutic principles (Section 4.3.1) have been found in design research.

Design research offers the following benefits:

- Firstly, the iterative nature of design research responds adequately to the hermeneutics of interpretation, leading to an increasing stock of background knowledge against which emerging details can be interpreted.
- Secondly, design research provides a structure for focusing research activities on the emerging problems of a design, thus ensuring the feasibility of a research project. In other words, researchers can fine tune a design during the time it is used, which is different to research methods that argue for a more distanced, non-interventionist relationship with the field.
- And thirdly, based on the first two benefits, design research was chosen because it combines theoretical exploration and testing in practice in one method.

Case research or ethnography were discarded mainly because they placed less emphasis on the need for an iterative approach to the research problem. Furthermore, the focus on a developing artefact (here the e-CBL learning environment) as a central part of the research approach was unique to design research.

However, Berliner (2002) argues that research methods represent a mainly strategic choice whose adequacy cannot be judged until the research is actually implemented.

4.5 Data Gathering Techniques

The previous Section explained how the current research project was organised at a macro level, where design research is the overarching method linking a number of smaller studies in research loops, thus allowing for continuous refinement of the design and the researcher's understanding of how the design works. Section 4.5 and 4.6 provide a more detailed description of the applied data gathering and interpretation techniques used for this research project.

Data collection comprised surveys of students' experiences and conditions prior to the course, observing learners' online activities; and surveys or in-depth interviews at the end of the course. The empirical data gathering took place over three years (four study periods), involving more than 180 students (Table 4-3).

Table 4-3: Participants and Data Gathering over Time

Iteration	Study Period	Stud-ents	Groups	Entry Survey	Forum	Chat	Centra	Survey [%] / Interviews
1	SP 7, 2004	61	10	-	13	3	-	43%
Centra - Pilot	SP 2, 2005	19	4	100%	4	3	1	47%
2	SP 7, 2005	45	11	100%	11	11	9	6 Interviews 1 Group Interview
3	SP 7, 2006	60	13	95%	13	3	13	57%

Table 4-3 indicates the number of student enrolments and learning groups per study period. It then indicates the response rates to an entry survey asking about previous experiences and individual study conditions (column 'Entry Survey'). Filling in the entry survey was a voluntary exercise, however as indicated by the 95 - 100% response rates these surveys were perceived as highly relevant since the questions concerned students access bandwidth to the Internet or their availability for occasional, synchronous online meetings.

Different study periods introduced different combinations of communication technologies which are indicated by the number of groups who used a forum, chat-room or Centra[28]. As indicated by the numbers in those three columns, the first research iteration started with lean, text-based communication only (forum, chat), followed by a study period where a pilot group used the advanced capabilities of Centra on a voluntary basis. In study period seven of 2005 (2nd research iteration) all groups started with chat for the first half of the course and continued with Centra in the second half. During the third research iteration (SP7 in 2006) the utilisation of Centra was recommended right at the beginning of the course while still leaving the option of using a chat room instead (an option mainly used when technical difficulties prevented groups from using Centra).

Finally, the last column indicates the feedback gathered at the end of the online course through semi-structured online surveys, except for Study Period 7 2005 when feedback

[28] A brief description of the different communication technologies used in this study has been provided in section 1.5.

was gathered through six individual telephone interviews and an online focus group. This change in data gathering was found necessary to take advantage of the greater ability for dialogue provided by in-depth interviews, which allowed the researcher to probe certain aspects of the data or to follow up emerging themes to generate a more detailed picture (Mishler 1986).

The following overview in Table 4-4 differentiates between reactive (highlighted in grey) and non-reactive data collection techniques. Reactive data collection means that the subjects of a study need to react to the data gathering effort of the researcher and, in so doing, a number of validity issues arise (Mishler 1986). Unlike less obtrusive, non-reactive data collection methods such as observations or user statistics, reactive methods create artificial situations in which the accuracy of the responses depend on many factors such as whether the question has been interpreted correctly or whether an answer is socially (un-)desirable (Scholfield 1995, p.37). Hence qualitative studies attempt to increase the trustworthiness of their interpretations through combining data gathered through different methods, a process called method-triangulation[29] (Johnson & Christensen 2004, p.250).

[29] Other forms of triangulation are data-, researcher- and theory-triangulation (Johnson & Christensen 2004). In each case the principle is to cross-check a conclusion through the use of multiple sources (ibid).

Table 4-4: Data collection sources

Data Sources	Indiv.	Group	Class	Format (Text, Audio, Video)	
Interviews	x			Audio recording and transcript	Reactive Data Collection
Group Interviews			x	Audio recording and transcript	
Course Entry **Questionnaire**	x			Text	
Evaluation Questionnaire	x			Text	
Personal Notes	x			Text	Non-Reactive Data Collection
Demographic Data	x			Table	
Emails	x			Text	
Postings		x	x	Text	
Chat Sessions		x		Text	
Meeting Observations		x		Audio and screen recording	
Case Reports		x		Text	
User Statistics (Online Activities)	x			Table	

Table 4-4 includes four data sources (highlighted in bold) that require more complex collection techniques. Therefore interviews and group interviews, questionnaires and observations of meetings will be briefly discussed in terms of their data gathering procedures.

4.5.1 Interviews: Semi-structured and in-depth

Interviews conducted in the context of this study were *semi-structured*, that is initial questions addressed some broad issues after which the interviewee's response determined the direction of further questions (Kvale 1996, p.27). Some initial questions about the role of technology and the way cases were discussed could be derived from the literature review (Chapters 2 and 3). Other questions emerged from the first few interviews

because they seemed to address a common concern (May 2001, p.130) and suggested an important topic for further questions.

In-depth interviews are characterised by their conversational style. The aim of in-depth interviews is to understand the world from the subjects' point of view, their experiences and the way they explain what they have experienced (Kvale 1996, p.1). Consequently the interviewer's role is far less directive than in structured interviews (Fontana & Frey 2000, p.653). Interviewers can, in contrast to the rules of structured interviews, respond to interviewee's questions and contribute their own opinions. An advantage of in-depth interviews is that information is gathered in a less artificial context. Like conversations, in-depth interviews are grounded in a common understanding of the topic and a shared interest in the exchange (Mishler 1986, p.23).

Group interviews

Groups interviews attempt to create a 'snowball effect' (Crabtree *et al.* 1993, p.144) where participants stimulate each others' answers. The group interview carried out in Study Period 7 2005 (Table 4-3) comprised learners from different e-CBL teams and clarified many aspects that had emerged during the interviews. The group interview was conducted using Centra's audio conferencing functionality. It is argued that electronically mediated group interviews may lose some of the potential benefits because of a reduced sense of immediacy and non-verbal cues (O'Connor & Madge 2003). However, in the context of this study, participants lived all over Australia or in different countries so that using electronic communication offered the benefit that students could participate at almost no cost apart from the time spent online. Additionally, all group interviews were scheduled towards the end of a course, so that most learners were already sufficiently familiar with electronically mediated communication.

4.5.2 Online questionnaires

Questionnaires are self-report data collection tools which are answered at a distance from the researcher. Filling in a questionnaire without the researcher's presence increases the validity of the responses, although there is no opportunity to clarify questions whose meaning is in doubt (Bickman & Rog 1998, p.485). The questionnaires used in this study included multiple choice questions, rating scales and open-ended free-text questions. Rating scales measured the attitudes towards a given statement with which students could agree or disagree (Neuman 2003, p.198). All questionnaires in this study were offered online, since this was considered a natural form of interaction with online learners. Response rates ranged from 43%–57% (see Table 4-3). Though these numbers are not interpreted in a quantitative sense, where a low response rate is seen to threaten the representativeness of the responding sample (Bickman & Rog 1998, p.400), it is still

important to obtain sufficiently high response rates to increase the likelihood that a variety of viewpoints is covered.

4.5.3 Online observations

Observations are important sources of evidence in case studies (Bogdan & Biklen 2003, p.55; Yin 2003, p.92), ethnographies (Fetterman 1989, p.45) and design research (Barab, Arici & Jackson 2005). During observations, researchers should not have preconceived ideas about what they are looking for, the observer's interest concerns all activities as they happen, routine events or apparently small incidents (Hammersley & Atkinson 1983, p.28). The overall objective of observations is to get an idea how actors in the field, in this study learners in their virtual environment, see and explain their own world. Observations included asynchronous events such as discussion in a forum that goes on for a week or longer as well as synchronous events in the form of recorded online meetings[30].

One of the main benefits of researching computer mediated communication is the fact that events leave an electronic trail or, as Dillenbourg (2005) puts it, communication is turned into substance. For example, where an observer of face-to-face meetings would need to record observations on video or rely on note taking, recordings of online meetings reproduce the original situation with relative ease and appear less obtrusive. Finally, meeting recordings can be combined with prior postings to the group's discussion board and course coordination emails, adding to the 'thick descriptions' needed for in-depth analyses of connected e-CBL activities.

4.5.4 Ethical research practices

Ethical research implies balance in the "pursuit of scientific knowledge and the rights of those being studied" (Neuman 2003, p.116). In the context of this study a number of steps were implemented to ensure that standards of ethical research practice were met. Firstly, the research was approved by the University's Human Research Ethics Committee and all online students were informed about the researcher's dissertation topic (e-CBL) and how this related directly to the design and evaluation of their ongoing learning activities. Then, depending on the data collection technique, additional measures were taken to ensure that students remained informed about what information was gathered for what purpose; and had the option to withdraw from the study at any time. The following presents an overview of how learners' privacy and information rights were protected in relation to each data collection technique:

Online questionnaires: Participation in the survey was voluntary and anonymous.

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[30] Ethically, it was important that the possibility to record a meetings was managed by the online learners themselves who could interrupt or discard recordings at any time.

Group interviews/ Interviews: All interviewees received a consent form together with a replied paid envelope and were asked to give their written consent. Only interview data from participants who sent back a signed consent form were used for further analysis.

Meeting recordings: During a first online meeting students were made aware that recordings would be particular helpful to study the usage of online meeting facilities but also that recordings could be stopped or interrupted at any time. Additionally, a webpage on the course homepage illustrated how to start, stop and listen to recordings in order to ensure students could understand the technical dimension of the recording process.

Online postings / Chat protocols: All personal data that could be used to identify a participant was removed. Additionally, only the researcher and his supervisor had access to the data.

4.6 Data Interpretation Based on Ricoeur's Hermeneutic Arc

Once data have been collected, they need to be presented and interpreted in a way that enables the drawing of useful conclusions. However, the usefulness of an interpretation must be defined in relation to the purpose of its application (Wallace, Ross & Davies 2003). The introductory Chapter stated the main research objective was designing e-CBL in a way that balances efforts and benefits. For example, a design that increases collaboration, motivation and average quality of case reports would be considered more useful than a design that might produce high quality case reports, but whose learning activities are perceived as tiresome, confusing or irrelevant.

According to the interpretive stance of the research, a fundamental decision was that the research question should not be approached in a purely quantitative manner. The evaluation of learning designs should instead be based on a thorough understanding of what had happened. To provide a 'thorough understanding', data interpretation applied Ricoeur's (1976) 'hermeneutic arc', in which Ricoeur takes up the challenge to integrate objective and subjective modes of interpretation[31]. This challenge is closely related to the major problems of interpretivism as discussed in Section 4.3.2. The question was how to present and justify interpretations without arbitrarily excluding interpretations or admitting a virtually unlimited number of 'valid' interpretations.

Ricoeur (1976) suggests that interpretations cannot be taken as either objective or subjective, but should be developed through a process that includes objectivising and

[31] Ricoeur (1981b, p.145) argues that interpretation consists of both the subjective possession of meaning (understanding) and objective externalisation of meaning (explanation).

subjectivising moves. The hermeneutic arc is based on three epistemological assumptions:

- all interpretations start with a "prejudicial frame of reference" (Ricoeur 1981a, p.95) which needs to be made explicit;
- all interpretations can be *objectively* limited by the structural elements of an observation (Ricoeur 1981c, p.217);
- all interpretations can be *subjectively* expanded by placing an observation into different contextual frames (Ricoeur 1981c, p.218).

Following these three assumption, the hermeneutic arc differentiates between three interpretative stages: surface interpretation, structural analysis and critical, in-depth interpretation (Figure 4-3).

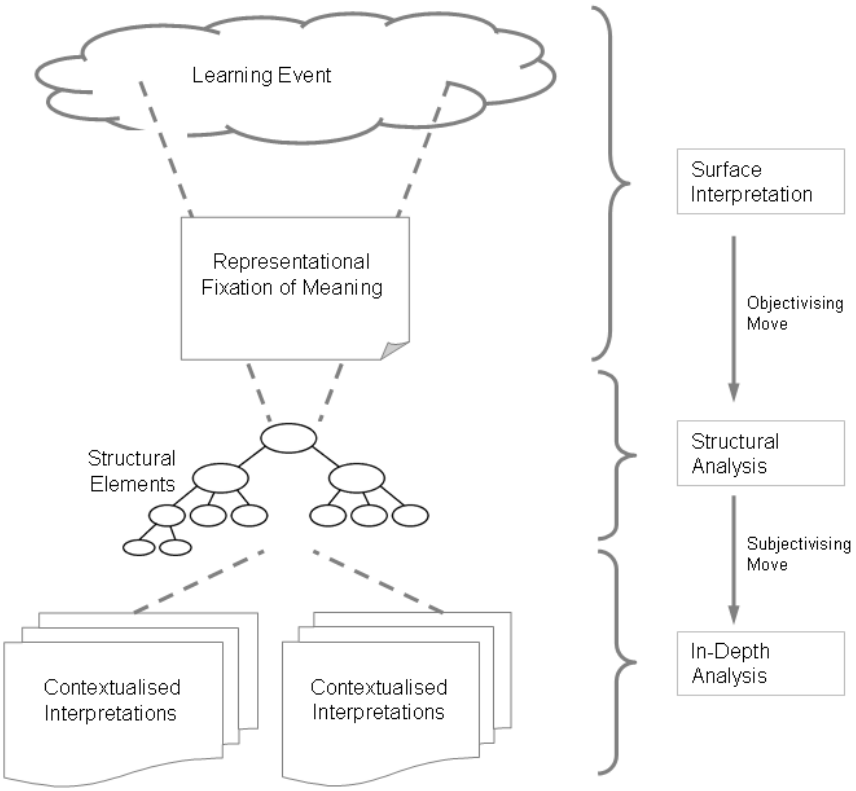

Figure 4-3: Ricoeur's hermeneutic arc

- The first stage *'surface interpretation'* addresses the fact that no observation starts with a blank mind, hence surface interpretations are inevitable (Bleicher 1980, p.220).
- During the second stage, Ricoeur integrates *structural analysis* into the hermeneutic arc as an objectifying force designed to balance the subjectivism inherent to the last stage 'in-depth interpretation'. Structural analysis is used to

keep subjectivity out of an interpretation by focusing exclusively on the elements of the object of interpretation. The idea is that phenomena of the same kind have inherent structures that make them comparable and allow for the formulation of rules that apply to all phenomena sharing the same structures (Piaget 1973).

- *'In depth' or critical interpretation* aims to extend interpretations still further. This is achieved by relating the structures identified in the second stage to their roots in the wider context of an interpretation (Ricoeur 1981b, p.220).

In this way the hermeneutic arc moves from a first subjective surface interpretation, through an analysis of the event's objective structure, to a subjective critical evaluation. For Ricoeur 'objectivity' means inter-subjective agreement, that is, an objective statement implies that other individuals looking at the same evidence could agree with its interpretation (Wallace, Ross & Davies 2003). There are still multiple, but not endless, meaningful interpretations that can be constructed (Ricoeur 1981b, p.182).

In explicitly documenting all three analytical steps the hermeneutic arc is able to present valid knowledge, valid in the sense that it is "plausible, credible, trustworthy, and therefore defensible" (Johnson & Christensen 2004, p.249). Some procedural considerations need to be discussed in order to operationalise the hermeneutic arc more formally.

4.6.1 Surface interpretation: Establishing boundaries

By establishing 'surface interpretation' as a starting point, Ricoeur (1981a, p.87) applies the hermeneutic principle that no interpretation is pre-suppositionless. As soon as researchers approach any empirical evidence they create a first impression. As such, the initial 'surface interpretation', it has been argued, is an inevitable step prior to further analysis.

However, even though this first interpretation is likely to change the more the researcher reflects upon the evidence, surface interpretations establish first boundaries of what is subsequently analysed in more depth. At this early stage of the interpretation process, the scope of a learning event, or put differently, 'the unit of interpretation' (Miles & Huberman 1994, p.25) is limited by its social setting (course, learning groups, individuals) and time (study period, weeks between online meetings, etc.). Consequently, an event could refer to the development of a class over an entire study period or the activities of an individual learner during a single online meeting.

What is needed are criteria that help to justify why an event has been selected. A similar problem has been typical for case researchers[32] (Barrett & Walsham 2004), who suggest

[32]In order to avoid confusion researchers' use of case studies is referred to as '***case research***' and learners' use of teaching cases is referred to as '***case-based learning***'.

four criteria to justify the selection of a case, i.e. a particular set of data limited in place and time.

- The case illustrates and organises existing knowledge (cases as illustrations).
- The case points out the inadequacy or incompleteness of existing knowledge (cases as problem detectors).
- The case endorses the acceptance of new knowledge (cases as convincing arguments).
- The case infers inductively from specific events to general characteristics that shaped that event (cases as qualitative generalisations).

Borrowing from case research, the same criteria will be applied to select starting points for the hermeneutic arc. Technically, surface interpretations are presented in the form of vignettes, which are storylike narrations preserving the chronological flow of the event (Miles & Huberman 1994, p.81).

4.6.2 Structural analysis: Selecting foci of interest

Once boundaries and surface characteristics of the available evidence have been presented, structural analysis focuses on basic elements that are present throughout the empirical evidence (Ricoeur 1976, p.84). For example, a typical (online) discussion is likely to contain requests, critiques, claims or warrants to support claims (Toulmin 1964). However, alternatively a discussion could be analysed with an interest in social networking (Wasserman & Galaskiewicz 1994) or individuals' roles during discussions (Hare 1994). Different interests would suggest different basic elements a researcher can turn to, generating different structuration of data. An overview of how different foci of interaction studies correspond with the use of different analytical categories can be found in Fairhurst (2004).

The benefit of structural analysis lies in its ability to compare different events by identifying common structures. The analytical technique used for structural analysis is content analysis[33] - a particularly useful method to identify emergent categories or test whether assumed categories are relevant for a given set of data (Krippendorff 2004, p.340).

A final point is the issue of objectivity in content analysis. So far it might seem that the formulation of coding schemes is a rather subjective endeavour. However, Ricoeur (1981c, p.213) argues that any structure (viz. coding scheme) which is empirically testable

[33] Neuman (2003, p.312) sees content analysis as an excellent tool to efficiently analyse large amounts of heterogeneous information and transform them into quantitative data.

is open to invalidation[34]. Thus Ricoeur acknowledges that events can be explained in multiple ways, but rejects an arbitrary proliferation of explanations because the observable facts of an event accommodate some structures more than others.

4.6.3 In-depth interpretation: Changing frames of context

The second stage of the hermeneutic arc focused on the structural dimension of learning events, in-depth interpretation shifts interpretation, to how learning events are embedded in students' every-day life (Wenger 1998). Naturally, learners have many other commitments in addition to their online studies, hence what is perceived as an acceptable effort depends on many factors outside a course design, pertaining to students' private lives or problems that can arise from personal incompatibilities between members of a particular group.

Understanding how learning is mediated through conditions that come from outside the designed course environment is crucial if the evaluation aims to combine structural measures with data that describe learners' overall experiences. Lave and Wenger (1991) emphasis the importance of context to derive at meaningful interpretations:

> "Activities, tasks, functions, and understandings do not exist in isolation; they are part of broader systems of relations in which they have meaning. These systems of relations arise out of and are reproduced and developed within social communities, which are in part systems of relations among persons. The person is defined by as well as defines these relations. Learning thus implies becoming a different person with respect to the possibilities enabled by these systems of relations" (Lave & Wenger 1991, p. 53).

In this research, the contextualisation of learning events is based on purposeful framing and perspective taking[35], a technique well-known in ethnographic studies (Fetterman 1989).

Different narrative frames refer to different points of reference. Anderson's (1994) ethnographic study of corporations, for example, described work practices using two different frames. Firstly, the author investigated work commitment in comparison to other social commitments such as family, friends and leisure. Secondly, another frame, substantially different, was used to describe work as a balancing act to fit 'local

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[34] Ricoeur (1981c, p.212) differentiates invalidation from Popper's (2002) falsification in that the former is based on argumentative logic, i.e. whether the facts sufficiently support an explanation or not, whereas falsification is based on empirical logic, i.e. the facts contradict a conclusion.

[35] Framing and perspective taking are essentially literary forms of analysis, which use stylistic means of representation to convey different perspectives on 'local cultures' (Fetterman 1989).

knowledge' of what works with an organisation's rules about how it should work[36]. Similar frames and perspective can be applied to the analysis of online learning events, when students work fulltime and study during evening hours, while trying to decide what is 'really' necessary to get good marks.

4.7 Summary of Methodological Foundations and the Resulting Research Plan

The previous Section emphasised the need to balance two equally important sides of research, the development of a subjective understanding and the dissemination of objective explanations. Prior to that it was argued that an iterative, design focused research method such as 'design research' (Section 4.4.3) is best suited to satisfy the requirements of interpretivist research in general and hermeneutic inquiry in particular. While Ricoeur's hermeneutic arc as a data interpretation technique (Section 4.6) provides the internal structure for each empirical chapter, the iterations of design research structure the presentation of the empirical work conducted between 2004 and 2006. Four study periods were analysed during three iterations, reflecting the testing of changes introduced to the course design over time. Table 4-5 gives an overview including design objectives and data gathering periods per design iteration.

Table 4-5: Overview of research loops

Design Iteration	Design Objectives	Study Period	Empirical Chapter
1st	Implementing the pedagogical model derived from the literature review	SP 7, 2004	Chapter 5
Centra Pilot	Testing the suitability of the Centra application as discussion platform for e-CBL.	SP 2, 2005	Chapter 6
2nd	Applying an activity-theoretical perspective to the design of e-CBL and increase the efficiency of synchronous, online interactions.	SP 7, 2005	
3rd	Improving the robustness of the e-CBL design and develop reusable design components.	SP 7, 2006	Chapter 7

The *first design iteratio*n in 2004 was based on the instructional guidelines offered by the Harvard method (Section 2.1) and the researcher's experiences with face-to-face case-based learning. This design was in use for one study period only, since the subsequent evaluation revealed a concerning low level of actual learner interactions which are a core

[36] Substantially more ethnographic studies could be found in the area of CSCW (Heath & Luff 1991; Hughes, Randall & Shapiro 1992; Suchman 1995) than in CSCL (e.g. Barab *et al.* 2004; McConnell 2005).

requisite for case-based learning to be successful. Understanding the design of e-learning as designing person-plus systems, the questions emerged about the adequacy of a purely pedagogical model and activity theory was found to offer the means to integrate the technological with the pedagogical dimension of e-CBL. This approach was also documented in two publications (Voigt & Swatman 2005, 2006b) reporting on the first offering of e-CBL and the later re-conceptualisation from an activity theory perspective.

The *second design iteration* in 2005 included major changes concerning the teaching cases, explicit recommendations about how to approach case-based learning or the coordination of group work, as well as the introduction of Centra as a virtual meeting room supporting audio conferencing and document sharing. The enhanced e-CBL model focused on scaffolding learners' method and media competence.

Based on this experience, a *third iteration* in 2006 was used to increase the practicability of the e-CBL design model by focusing on specific design elements that had shown to be of particular importance and were not yet sufficiently specified in the existing model.

Design research and the use of multiple theories

Figure 4-4 pictures all three research iterations chronologically. What becomes evident is that that designing, implementing and researching e-CBL are not two separate phases, but two continuous, parallel processes. After every iteration new issues can emerge or old issues need to be revisited from a different angle, revealing necessary changes in the existing design. Therefore, depending on the problems or design intentions motivating a new research iteration, new theoretical influx might be needed. This flexible approach to the incorporation of new theories differentiates design research from more traditional methodologies such as laboratory or case studies, which establish what body of literature are to be used upfront (Peffers *et al.* 2007). The main argument why design research can use multiple theories is its primary focus on design improvement rather than theory testing (Edelson 2002; Figl, Derntl & Motschnig 2005). Sandoval (2004) talks of 'problem-driven' shifts in the research program, when a design solves a problem but simultaneously points at new issues requiring the researcher to modify or extend the theoretical basis of the research. Finally, the strength of design research is not so much in developing theories why a certain design worked or did not work, but in showing that it worked, explaining under what circumstances it worked and suggesting criteria that help to evaluate how well it worked (Hevner *et al.* 2004).

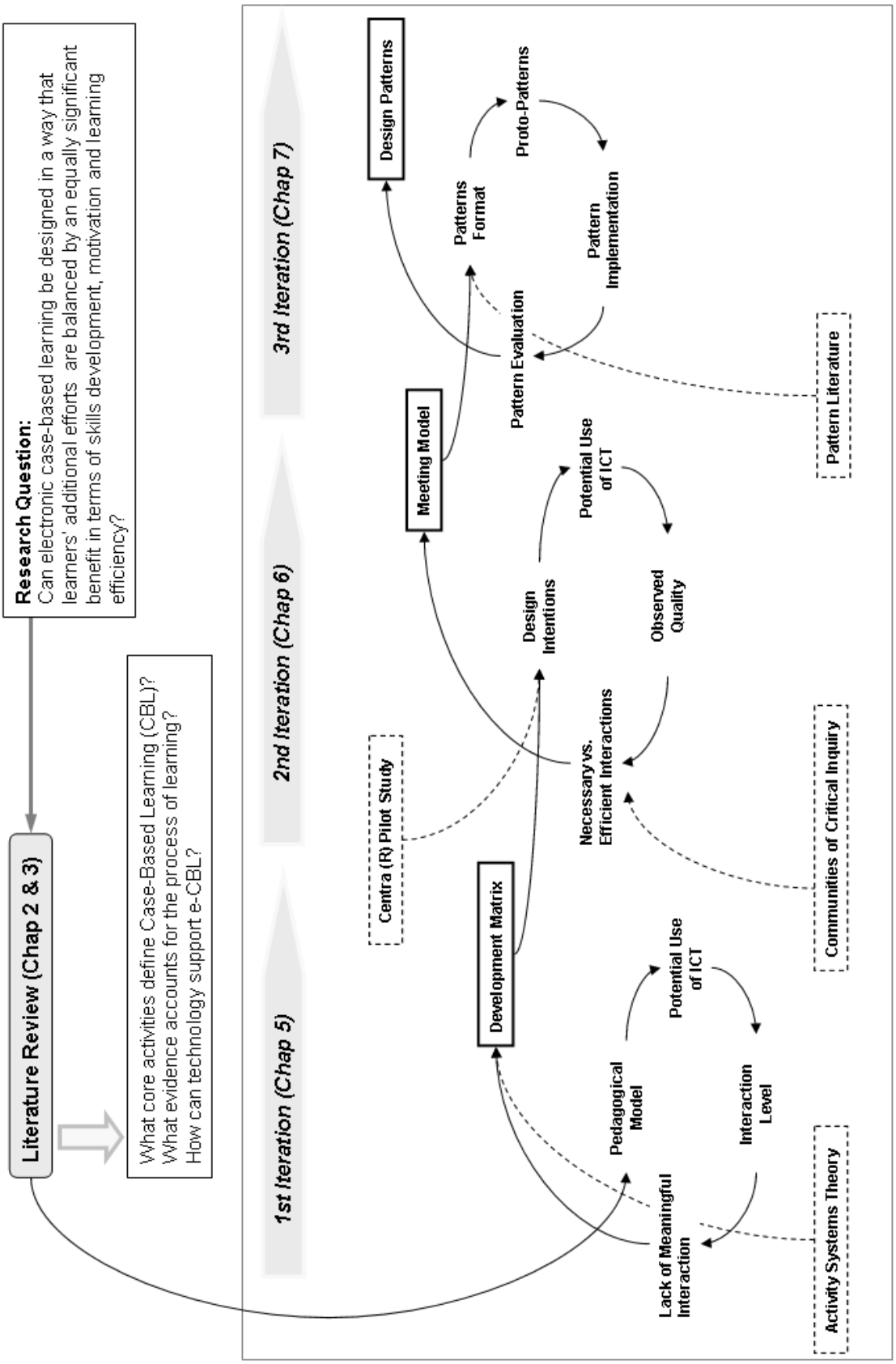

Figure 4-4: Research iterations and the multiple influx of theories

5 CONCEPTUALISING E-CBL

The previous Chapter specified Design Research as the most appropriate research method for this project, suggested the hermeneutic arc as an appropriate qualitative data interpretation technique; and concluded with a research plan (Figure 4-4) outlining three iterations during which design knowledge on e-CBL would be developed and refined. This Chapter presents the testing of the first design, which took place during Study Period 7 (summer semester), 2004. The course ran over ten weeks and its design was founded on instructional suggestions drawn from the Harvard Method (Section 2.1.4) and a technological environment understood as a person-plus system (Section 3.5). Both foundations give raise to the design intentions (i.e. intended learner activities), which are described in Section 5.1.

The core of this Chapter is dedicated to the hermeneutic interpretation of the actual learning events and how they relate to the implemented design[37]. Figure 5-1 shows how the phases of design research feed into the different stages of the hermeneutic arc (the latter providing the structure for this Chapter).

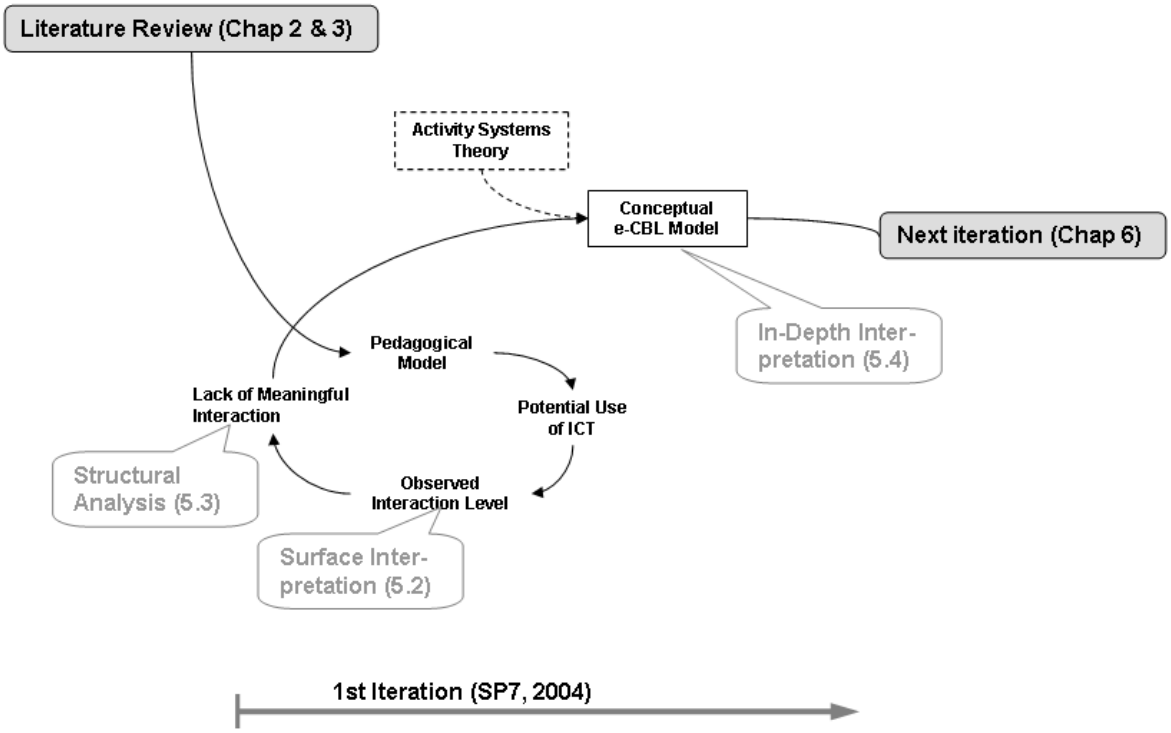

Figure 5-1: Hermeneutic interpretation within the first research iteration

[37] Some results presented in this Chapter have previously been published in Voigt, C. & Swatman, P. M. C. (2005). Instigating Interaction In Electronic Case-Based-Learning (E-CBL). Paper presented at the 3rd International Conference on the eSociety, Malta.

As Figure 5-1 shows more graphically, the stages of this hermeneutic interpretation are linked with Sections of this Chapter, and are summarised as follows:

- Surface interpretation (Section 5.2): According to what the literature predicted as a major benefit of case-based learning, namely intense discussions, the researcher's surface interpretation started with a look at the general activity level of online learners. The bases for this interpretation are readily available indicators such as the number of messages in transcripts of discussion forums or chat rooms.
- Structural analysis (Section 5.3): Selecting the four most active learning groups, a more fine-grained analysis of group interactions through different technologies was conducted[38]. The goal of this analysis was to understand the purpose of those interactions and how they supported collaborative learning through online discussions. Interactions were classified into group and task related interactions and, in order to specify the extent to which online communication can actually resemble the dialogic nature of case discussions, the analysis identified the number of occasions on which students received feedback from their peers. Despite the comparatively high number of chat and forum messages in some groups, a major limitation of this first implementation was the low proportion of task-related and responsive messages during online case discussions.
- In-depth interpretation (Section 5.4): The shortcomings identified during the structural analysis provided both a motivation for and a need to reconceptualise the e-CBL concept . Rather than understanding e-CBL as a combination of learning activities and technologies, e-CBL can now be seen as a development process students embark on when they start the course. The progress of individual learners is embedded in and dependent on a variety of contextual features, not all of which had been addressed in the current learning design. To link learners' activities with the contextual elements that seem relevant in a particular situation, this section of the Chapter explains how an activity systems view was adopted (Engeström 1987), helping to broaden the analysis in a systematic way.
- Lessons learned (Section 5.5): Applying the conceptual tools of activity systems to re-conceptualise e-CBL, a matrix was developed to depict the interdependencies between activities on different levels, such as: (a) activities that develop the skills

[38] At this stage it is important to keep in mind that this selection is not meant to represent online learners in general or the average learning group in this study, as statistical 'sampling logic' would suggest. Rather, these groups were selected because they offered the richest data and were therefore likely to yield the most interesting results in comparing synchronous and asynchronous group work, a data selection criterion which Stake (2000) calls 'analytical logic'.

of individual learners or learning groups and (b) activities that support the mastery of the case-based learning method or the mastery of communication technologies.

The Chapter concludes with a summary of the design areas that need to be considered in any subsequent implementation of e-CBL to facilitate more meaningful case discussions. In transforming the pedagogical model into a conceptual model that strongly considers the requirements of an online learning environment, this Chapter answers the first subsidiary research question:

What are the various dimensions to be considered when developing e-CBL in an online learning environment?

5.1 Design Intentions

Differentiating between design intentions and the hermeneutic interpretation of a design is an important first step in distinguishing between: the objectives of rules and technologies as they were put in place by the researcher; and the actual learning as it was observed and interpreted in this Chapter. Jones *et al.* (2000) have reported that instructional design practitioners are often unsure about the full effect of their online course designs or surprised by results that make them question the correctness of their initial assumptions about adequate learning conditions. Separating expectations from observations can not only enable the design to be evaluated more clearly (i.e. did the expected learning activities happen?) but can also assist the researcher to show his/her changing understanding of e-CBL in the way design intentions change with each iteration.

Overall, design intentions link back to the pedagogical framework (Section 2.3) and need to be reflected in concrete decisions about how learning activities are formulated, assessed and supported. It is fair to expect that, as experience grows, design intentions will become more differentiated and complex. Hence, whereas in this Chapter an e-CBL design comprises tasks, assessment schemas and communication tools, subsequent designs may add further elements such as group forming processes, training sessions and feedback guidelines.

5.1.1 Learning groups

Students were randomly assigned to groups of 5-6 learners. Group structures were heterogeneous in terms of age, nationality, work experience, field of study and geographic location. Since the course was offered as part of the Broadening Undergraduate Education (BUGE) program, which requires students to take at least one course outside their own field of study, no specific entry requirements existed. Students from 22 different study programs enrolled. An analysis of core courses students would have taken prior to doing ‘Introduction to e-Business’ shows that at least 89% of all students had taken at

least one course in which basic topics related to e-Business (e.g. the Internet, the WWW and information systems) were covered (Figure 5-2) [39]. Based on this data it was assumed that even though no prior knowledge of e-Business was required many students brought some knowledge to the course that could be used during case discussions. 'No information available' (8%) indicates cross-institutional enrolments in which case the student's study program could not be ascertained.

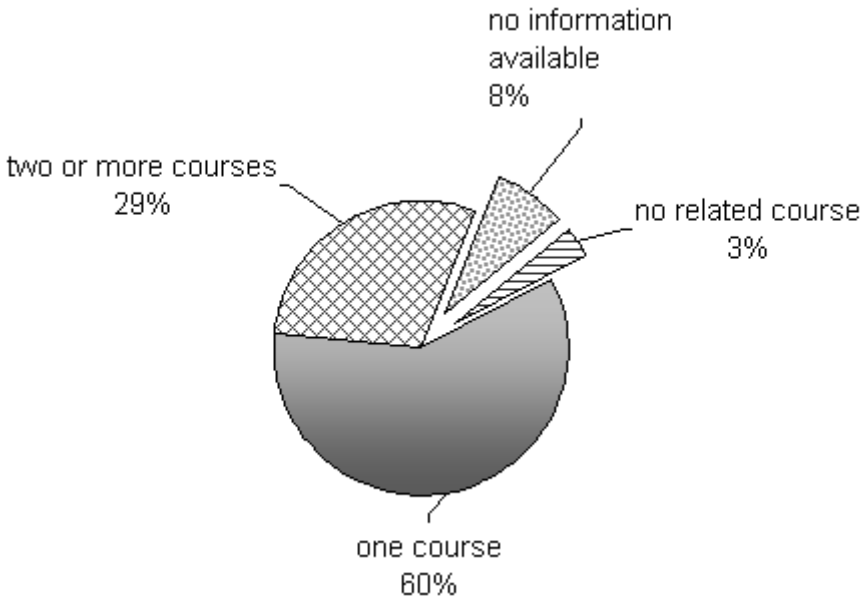

Figure 5-2: Students enrolling in e-Business relevant courses (SP7 2004, n=61)

The course had a fairly balanced proportion of female (57%) and male students (43%); and 30% were international students. The majority of students were between 18-25 years old (Table 5-1). Besides prior knowledge from other courses, another factor contributing to the quality of case discussions is work experience. 39% of all enrolled students in this course were over 26, by which time many students already have substantial work experience[40].

[39] The majority of students in either a first year course "Introduction to Business Information Systems" or "Introduction to Programming".

[40] In a study with 2609 students on Australian universities, McInnis *et al.* (2000, p.39) found that students between 20-24 years worked on average 14 hours per week and students aged 25-29 years, worked on average 20 hours (ibid, p.42).

Table 5-1: Age distribution of students (SP7 2004, n=61)

Age	Students	Percentage
18-25	37	61%
26-35	14	23%
36-55	10	16%

Not all groups were stable over time. Fifteen (20%) of 76 initially enrolled students dropped the course within the first seven weeks. In accordance with the University's enrolment policy, students can withdraw at any time between census day (course enrolment is finalised and fees are charged) and withdrawal day without incurring a fail grade. In these cases the course is indicated as 'withdrawn' and not considered for the calculation of the student's grade point average[41] (UniSA Enrolment 2007). Withdrawals are typically higher during intensive summer school courses during Study Period 7, when courses are offered over 10 instead of 13 weeks.

This fluctuation of learners in the initial weeks of a course has the potential to hamper the efforts of a group to get started. Therefore students were encouraged to immediately contact the course coordinator if a group member could not be reached. As a rule of thumb, a group with less than three active members was either combined with another small group or distributed over several other groups.

5.1.2 Tasks and assessment

During the course each learning group was given small weekly tasks, plus two teaching cases for which a case report had to be collaboratively written. In order to encourage frequent participation in the group's online discussions and ongoing commitment to the group assignments, 10% of the final grade was allocated to "Online Visibility". The marking scheme for "Online Visibility" made it clear that responding to existing postings (either with critical or supportive remarks) would be more highly rated than simple 'one way' postings (*Appendix A.1*) . Online visibility was evaluated every three weeks and marks were published on the course homepage so that all group members knew how their performance was rated.

The first teaching case was taken from the course textbook (Laudon & Traver 2003) and consisted of a two page reading plus associated questions. These cases related directly to the preceding Chapters in the textbook, which also provided the majority of concepts and information necessary to write the case report. The second case concerned an

[41] A grade point average (GPA) is the average of all course grades weighted by the unit value of each subject.

imaginary company that wanted to start an e-dating agency and groups were required to develop a business plan. In this case information had to be drawn from several Chapters and external sources in order to cover such areas as the competitive environment and the functional design for the e-dating service (*Appendix A.1*). For this second assignment, students were also given a copy of an article by Sahlman (1997) concerning the major issues in writing a business plan and they had the option to use a template where the major sections of a business plan were outlined in a generic form.

The underlying intention of offering two substantially different types of teaching cases was to gradually increase the complexity of the task and therefore create an authentic need to work as a group. Mauffette-Leenders, Erskine and Leenders (1999) define 'case difficulty' as having three dimensions, each of which itself has three degrees:

- the *presentation* dimension refers to the amount of the material, how structured it is and how intermingled relevant and extraneous information is (1 – short and concise, …, 3 – long and less organised)
- the *analytical* dimension describes what is required from the student (1 – evaluation of a solution to a given problem, 2 – suggesting a solution to a given problem, 3 – identifying problems and suggesting solutions)
- the *conceptual* dimension describes the degree to which necessary concepts are likely to be identified, as well as the number and complexity of the concepts themselves (1 – concepts are easy to identify,... , 3 – concept identification is difficult and requires support by instructors).

In general it can be said that cases are more difficult: (a) the more unstructured and intermingled with irrelevant information they are; (b) the fewer cues are given; and (c) the more open and undefined the case's outcome is. Applying the three dimensions to both teaching cases, the textbook case was intended to be relatively easy (1,1,1) and the e-dating case was expected to be more difficult (2,3,3). To verify whether the researcher's own judgement of case difficulty at a conceptual level was reflected by the students' perceptions, students were encouraged to rate task complexity in an anonymous online survey at the end of the course (*Appendix A.3*).

Table 5-2: Students perception of case difficulty (SP7 2004, n=26)

	Mini-Case	Business Case
Identifying and structuring the relevant issues was an easy task.(task difficulty)		
Strongly Agree /Agree	69 %	42 %
Neutral	23 %	38 %
Disagree / Strongly Disagree	8 %	20 %

Table 5-2 shows respondents' ratings of task difficulty, which appears to support the initial classification of the two cases. The response rate for this survey was 43%. Identifying the issues in the mini-case was perceived as easy by 69% and problematic by 8%, but this perception changed to 42% and 20% respectively for the business case.

5.1.3 Technology and processes

To enable collaborative work on the case study, groups had access to both asynchronous (discussion boards, emails) as well as synchronous (chat) communication channels[42].

The course was supported by three types of discussion boards: instructor's announcement board, general course issue discussion board; and a group-specific discussion area with access limited to team members only. Postings could contain text but no pictures, although attachments were possible.

Since most students take this course in their second or third year, general knowledge of the University's online learning environment was assumed beforehand and no specific instructions were given on how to use a chat or a discussion forum. However, each course home page includes a default link to an online help system, should questions arise (UniSAnet 2007).

Two further assumptions made concerned: students' ability to structure their asynchronous discussions in the form of threads; and to approach group work in the same way they would have done off-line, i.e. alternating between phases of individual preparation and group meetings. In preparation for the case work, students were provided with an article titled "Learning Information Systems with Cases" (Szpiro & Neufeld 2000), which describes the nature of cases and provides an abridged version of the Harvard Method (define the issues, analyse case constraints, and make recommendations).

With the exception of marking 'Online Visibility', the learning environment did not include a tight structure designed to enforce particular types of behaviour during the case discussions. Rather, a loose design intended students to take charge of their own learning as far as their group processes were concerned (Jones, Asensio & Goodyear 2000). In other words, the researcher's restraint from detailed specifications of communication and collaboration processes was designed to create person-plus (Section 3.4) systems where the executive function was left primarily to the person rather than to the system. This intention seemed justified since it is argued that over-scaffolding learning activities serves simply to reduce task complexity without the intended pedagogical benefit; i.e. learners

[42] Virtual meeting rooms (as described in Section 1.5) had not yet been introduced.

would still welcome the support, but as 'limiters' of their workload rather than true learning aids (Puntambekar & Hübscher 2005).

However, just as too much structure can dampen creative and efficient group work, too little structure can lead to procrastination and last minute efforts to complete the assignment. An often criticised disadvantage of group work is that allocating the responsibility to '*the group*' undercuts an individual's accountability to contribute to the group's effort (Bruffee 1995).

To summarise, the design in this particular study (SP7, 2004) should create a learning environment which:

- Supported learning through discussions (Section 2.2.3);
- Provided loosely structured access to communication tools but did not enforce the use of a particular medium (Section 3.4.2); and
- Suggested a way to collaborate but did not prescribe a particular collaboration process.

How far the researcher's design intentions could be realised and to what extent the underlying assumptions were accurate is the subject of the following hermeneutic interpretation (Section 5.2 – 5.4).

5.2 Surface Interpretation

Surface interpretation has been described as the first impression researchers obtain before they undertake any explicit effort to reduce or transform the available data (Section 4.6.1). This first impression is likely to be formed by data that are easily accessible or, put differently, data that describe learning events at a surface level.

As discussed in Section 4.6.1, surface interpretation aims to form a preliminary understanding of the learning activities that took place and the issues that may need further analysis. This preliminary understanding can be seen as conjectures that define the scope and focus of the subsequent structural analysis, which either strengthen or change the surface interpretation (Wallace, Ross & Davies 2003). When endeavouring to ascertain whether case-based learning in an electronic learning environment would lead to the expected learning events, data to look at were descriptive course statistics

(postings per persons, lines per chat) and the transcripts of students' discussions[43], which provided a first impression of the range of topics in the online discussions.

5.2.1 Level of activity

At a quantitative level, the course included a reasonable amount of learner activities: 61 students posted 2106 forum entries and held 15 chat sessions over a period of 10 weeks. However, breaking the numbers down to group level clearly showed that postings and chat sessions were not homogeneously distributed over all groups. Table 5-3 first classifies activities by communication channel (postings per person, chat sessions per group). Additionally, the table differentiates between stable groups (the first ten groups) and groups that had to be merged because their size dropped below 4 group members during the early weeks of the course.

Table 5-3: Learners' online activities (SP7 2004)

Group	Members	Postings per Person	Chat - Sessions
16	4	48	1
6	5	45	2
5	5	42	1
2	6	41	2
12	4	31	-
3	4	29	-
1	5	24	8
4	4	24	-
11	5	16	-
9	4	22	-
13	*3*	*34*	*1*
8	*3*	*18*	-
14	*3*	*8*	-
7	*2*	*22*	-
10	*2*	*22*	-
15	*2*	*16*	-
13 & 15	*5*	*37*	-
7 & 8	*5*	*9*	-
10 &14	*5*	*17*	-

Stable Groups

Merged Groups

[43] If the purpose were to investigate how far students' gender, age or nationality influences learning, the demographic characteristics of students would have been an alternative perspective to come to a "surface interpretation'.

5.2.2 Use of technology

Given the unequal distribution of chat sessions as shown in Table 5-3, the question arises why only 3 out of 16 groups met more than once online. When groups were encouraged to use a combination of discussion forum and chat room, the underlying assumption was that conveyance of information is supported best by asynchronous communication and that convergence of information (e.g. planning or decision making) is best accomplished through immediate, quasi-synchronous[44] exchange of information (Section 3.3.3).

5.2.3 Surface reading

To clarify the different usage patterns of communication technologies, a first (surface) reading of forum and chat transcripts was undertaken. Of interest was information about what might have stopped groups having follow-up meetings or what motivated groups that had more than one chat session. During this stage the researcher was already able to form a general overview of potential issues and where a more detailed inquiry might be productive and necessary.

Appendix A.4 shows postings from the general discussion forum, which allowed students to direct questions and comments directly to all course members as well as to the course coordinator. These postings indicate a number of different views about the benefit of having online meetings, which are described as:

- An opportunity to solve [not further specified] problems (posting 1);
- The opportunity to contact the course coordinator (posting 2);
- A way to get started and organised as a group and with the topics (posting 2, 3);
- A possibility of improving one's grade for "online visibility"[45] (posting 3); and
- An opportunity to *"enjoy chatting about e-commerce"* (posting 4).

While these entries in the discussion forum show that, to some degree, students were aware of the usefulness of online meetings, reading through the actual chat transcripts revealed some impediments that indicated what might have hampered a more widespread use of online meetings:

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[44] Garcia and Baker Jacobs (1999) point out that, unlike the situation with oral conversations, the message production process is not synchronously available to all participants of a chat session – a condition that can lead to confusion if one participant is still crafting a reply, while others are already starting a new topic.

[45] Though it must be said that marking criteria for "Online Visibility" did not indicate any bonus for having chat sessions (*Appendix A1*).

- Chat was slow to start (taking up to several minutes before the underlying Java applet was running) – *"took a long time for me to open the chat so I thought something was wrong"* (Group 6, 12-Jan).
- Participants got 'kicked out' of the chat room for no apparent reason and had to logon again (a technical problem which could not be resolved during the course);
- Difficult to find adequate meeting times – *"just trying to get online at the same time is a challenge"* (Group 1, 22-Dec);
- Sometimes students logged onto the chat room in the hope of meeting someone – *"hello anyone around"* (Group 16, 13-Dec) – only once during the duration of the course did two students actually succeed in meeting by chance ; and
- Meetings lacked structure in terms of topics and objectives – *"I think we should plan what we will talk about / so that we have a more structure chat"* (Group 2, 15-Jan) and *"Everyone's logged on, but just not discussion about the assignment. We're just super organised gals"* (Group 6, 21 Dec).

Summary 'Surface Interpretation'

Reading both types of transcripts, forum and chat, indicated what might have been barriers for a more widespread use of chat sessions. However, this interpretation at the surface level is based on a distinction between two different types of communication, asynchronous and synchronous. Nonetheless, the question remains whether having synchronous communication in the form of chat sessions actually makes a difference. An alternative conjecture could propose that missing chat sessions are compensated by more frequent postings on discussion boards.

Hence, this question is further analysed in the following section, where synchronous and asynchronous communication are compared on the basis of structural elements which define their quality, such as: purpose, reciprocity and depth (Hogan 1999; Strijbos, Martens & Jochems 2004). By analysing interaction along these three dimensions the researcher was able to judge the value different media could bring to case-based learning activities.

5.3 Structural Analysis

In outlining the pedagogical foundation of e-CBL (Section 2.1.4), it has been made clear that there are concrete activities, such as creating a shared understanding of a case's issues or discussing the arguments for and against alternative solutions, which make e-CBL a valuable learning method. The overall objective of these kinds of learning activities

is to instigate diverse and rich discussions that include contributions and viewpoints from all group members. It had been argued that a benefit of having discussions is the opportunity to engage students cognitively and emotionally (Lave & Wenger 1991). The authors suggest that knowledge which serves to make a point in a group discussion gains immediately in relevance. However, the emphasis on interaction does not deny that students also acquire knowledge in less interactive settings such as listening to lectures or podcasts, with one widely quoted distinction referring to three basic types of interaction: learner-content, learner-educator and learner-learner (Moore 1989). Interaction is thus a valuable concept to describe the construction of knowledge. Although interaction is not always social in nature, Sfard (1998) points out that most conceptualisations of learning evolve around two basic metaphors: the 'acquisition metaphor', focusing on learner-content interactions, and the 'participation metaphor', focusing on social interactions. Taking a participation metaphor approach, this Section investigates how knowledge grows out of social interactions in which learners share and critically evaluate their understanding. Hence, the focus of the structural analysis is on the content and purpose of learner-learner interactions during group work.

Whereas surface interpretation was concerned with information at a course level, structural analysis operates on a more fine-grained level, focusing on group activities themselves. In order to compare the interactions in asynchronous and synchronous settings, the following three questions are asked:

- To what extent were group activities task related? Despite high levels of group activity at a surface level, only a small proportion of these interactions might be relevant to the actual discussion of the case.
- To what extent were students' activities *inter*-actions, i.e. to what extent do later messages relate to earlier ones (Strijbos, Martens & Jochems 2004)? This question is important because interrelated messages can be seen as evidence that group members actually took advantage of the group's diverse knowledge pool. A lack of interrelated messages, by contrast, might indicate that group work was mainly seen by students as a means of sharing the workload, so that a task allocated to someone else could be forgotten about.
- To what extent did online activities cover the various phases of case-based learning, ranging from the identification of issues to the evaluation of alternative solutions?

Content Analysis

The data interpretation technique suggested for structural analysis is content analysis (Section 4.6.2). However, the more than 2000 postings and 4000 lines of chat which

confronted the researcher led to a need to limit the scope of data analysis. A first suitable boundary was time: splitting interactions into two groups enabled only those interactions related to the second case assignment to be taken into account. Survey data had shown that 69% of the students perceived the first assignment (textbook case) to be easy and straightforward, whereas for the second assignment (business case) this number dropped to 42% (Section 5.1.2). Having to master a more complex task meant that student interactions during the last five weeks increased substantially, e.g. during this time 11 out of the 15 chat sessions were recorded.

In order to compare communication based either primarily on chat vs. forum technology, the two groups with the highest number of forum postings (groups 6 and 16) and chat sessions (groups 1 and 2) were selected for further analysis (Table 5-4). To better distinguish the groups in accordance to their technology usage patterns, the groups have been re-named F1 and F2 if they favoured forum communication; and C1 and C2 if a substantial part of their communication took place in the chat room.

Table 5-4: Groups selected for further analysis (SP7 2004)

Group	Forum Postings	Chat Messages
6 ⇨ (F1)	128	67
16 ⇨ (F2)	112	70
1 ⇨ (C1)	63	1918
2 ⇨ (C2)	140	305

Before content analysis could condense and cluster the structural elements contained in the selected chat and forum transcripts, an important preliminary step was segmenting the text corpus, i.e. defining the unit of analysis. To make measures from both sources (chat and forum) comparable, *interaction issues* or chains of arguments were taken as coding units (Poole & Holmes 1995). The fundamental differences between postings and chat messages in length and complexity ruled out coding each chat message individually, so that interaction issues were seen as the smallest common denominator.

An interaction issue consisted of all messages/postings from the same person pursuing the same topic (e.g. “What business functions should be outsourced?” or “Who is going to collate the final report?”). This way, even though a given issue was discussed with more or fewer words using the different communication technologies, what counted was whether the group brought the issue up or not.

Interaction issues were coded along two dimensions (Table 5-5): phase of the case solving process and type of interaction. Looking at this Table vertically, the phases of the case solving process were taken from Mauffette-Leenders *et al.* (1999), and these were then further grouped into analytical and synthesising activities (Hogan 1999).

Horizontally, a second coding scheme classified each interaction issue into non-reactive messages (questions and statements) vs. reactive messages (answers, agreements or disagreements) (Strijbos, Martens & Jochems 2004).

For each group (C1, C2, F1, F2) two tables had to be filled to summarise the groups chat and forum communication. Table 5-5 shows a sample coding table as it was used by the researcher to analyse group C1's chat interaction.

As an example of how this template might work: a snippet from a transcript in which a student raises the question of how much revenue the company should expect is used as an example. First, the students question would be coded as **1A**, because the interaction issue helps to "*define the problem*" (Phase 1), by asking a question (Column A). If another student responds by citing a case reading where a relevant figure is outlined then this would be coded as **2C**, because the student gathered information (Phase 2) while responding (Column C) to the first student (example taken from Group C2, 15th Jan 2004). Where an interaction or sequence of interactions could be assigned to more than one category, the wider context was investigated to decide where it should be placed. For example, if the student had quoted the case reading in responding to a disagreement with a suggested revenue figure, this interaction would have been coded as **5C**, "*justifying a solution*".

Table 5-5: Coding Categories (Group C1, SP7 2004)

Interaction Type / Case Solving Process	(A) Questions	(B) Statement	(C) Response	(D) Agreement	(E) Disagreement
1. Defining the problem − Stating problems and questions concerning task understanding − Defining scope of task − Idea generation (brain storming)	5	14	4	-	-
2- Gathering information − Statistical data upload − Sharing of articles − Making assumptions	9	18	1	5	2
3- Analysing information − Prioritising information − SWOT − Cause analysis − Qualitative and quantitative analysis of case data	-	10	-	8	2
4- Formulating solutions − Taking a decision − Implementation details − Draft versions of individual sections	**-**	**6**	**-**	**-**	**-**
5- Formulating justifications − Reference to a similar case or contextual conditions − Applying theories and models	**-**	**5**	**-**	**1**	**-**
6- Managing group work − Task allocation and deadlines − Meeting times − Document layout and number of pages − Explaining usage of PPT or digital library	**19**	**21**	**11**	**6**	**6**

Analytic Activities

Synthesising Activities

Non-reactive Activities

Reactive Activities

5.3.1 'Task vs. group related' interactions

Only task related issues were to be coded initially, since these were the interactions where cognitive engagement manifested itself[46]. However, analysing the transcripts it became clear that much of the communication was dedicated to coordinate the group's collaborative effort. For example, as shown in Table 5-5, Group C1 raised 90 issues concerning the actual case content (Categories 1-5) and 63 issues in order to manage their group work (Category 6).

In total, out of 756 interaction issues, 303 (40%) were coded as task related, i.e. helping to define the problem, gather information or analyse that information. This means groups spent more effort on discussing how to solve a case than discussing the case itself. It therefore became important to identify whether either of the two communication technologies (chat or discussion board) suggested substantially more task related interactions.

Table 5-6: Task related Interactions (SP7 2004, n=303)

Group	Chat		Forum		Interactions per Group
F1	5	2%	42	14%	**32%**
F2	1	0.3%	49	16%	
C1	90	30%	23	8%	**68%**
C2	46	15%	47	16%	
Interactions per Technology	**47%**		**53%**		

Comparing the amount of communication in chat rooms and forums, Table 5-6 shows that chat communication addressed almost as many issues (47%) as forum communication (53%). Hence, none of the two technologies per se showed an exceeding level of communication.

If, however, interactions are aggregated at a group level it becomes evident that substantially more task related interactions (68%) took place in groups making use of chat than in groups that relied primarily on asynchronous forum discussion (32%). In summary, the results in Table 5-6 show that C-groups, while making greater use of chat, still conducted a substantial portion of their interaction in their forums, so that their higher

[46] At this stage interactions unrelated to task or group management – primarily socialising (e.g. movies seen lately, workplace issues, politics, etc.) – were ignored.

overall activity levels gave them the edge over F-groups which used their forum more intensively but did not establish online meetings.

5.3.2 'Reactive vs, non-reactive' interactions

The next questions was the extent to which individuals received feedback from peers to their postings or chat messages, creating a discussion-like conversation. Out of 303 task related issues, only 67 issues (22%) were generated as peer feedback (e.g. an answer, an agreement or a disagreement, Table 5-5). Achieving productive argumentation is an essential objective in collaborative learning and Section 2.2.3 of the literature review introduced the notion of learning as a social activity, depending on giving and receiving feedback (Bruffee 1993; Poole & Holmes 1995). Nonetheless, CSCL studies repeatedly document difficulties in reaching higher proportions of reciprocal interactions in electronically mediated settings (Baker 2003; Veerman 2003).

Table 5-7: Task related, reciprocal Interactions (SP7 2004, n=67)

Group	Chat		Forum		Group Type
F1	5	7%	8	12%	**34%**
F2	1	1%	9	13%	
C1	23	34%	0	0%	**66%**
C2	16	24%	5	7%	
Technology	**67%**		**33%**		

Comparing argumentative moves in chat and forum transcripts, it can be seen that two-thirds of these reciprocal interactions took place in chat sessions (Table 5-7). One reason might be that chat sessions are similar to everyday conversations, whereas reciprocal interactions are important elements to control turn taking and ensure coherence in the communicative flow (Clark 1996). In this case, the comparatively low proportion of reciprocal interactions in forums (33%) might result from a lack of immediacy. Most forum postings remained uncommented, unless they needed corrective feedback.

The overall higher activity level of C-groups, could be explained with the positive impact of frequent immediate feedback on learner attitudes such as acceptance and satisfaction (Rafaeli & Sudweeks 1997). Rather than seeing merely the effort involved in online meetings, participants might instead see this as a welcome opportunity to meet with peers having a common objective.

5.3.3 'Analytical vs. synthesising' interactions

The final issue was that of the actual purpose of interactions, differentiating between analytic interactions (scoping, gathering and analysing information - Table 5-5); and synthesising interactions (suggesting and justifying solutions). Out of the 303 task related interactions, 97 (32%) were directly related to the generation of solutions (Table 5-8). Most of those interactions took place in the forum (81%). However, the lack of reciprocal interaction was most visible when it came to the generation of solutions. With the deadline approaching, most suggestions were accepted without much further discussion. Forums were used to post solutions to issues that had been allocated to individual group members. This concurs with Synchronicity Theory (Dennis & Valacich 1999), according to which a forum allows for increased deliberation and the material conveyed can be better reprocessed (i.e. included in the final case report) than the messages from a chat session.

Interestingly, at a group level, C-groups had more synthesising interactions than F–groups. One possible reason is that, in holding online meetings, C-groups had more opportunities to discuss their solutions or, alternatively, this could be explained by C-groups being more comfortable in giving and receiving feedback.

Table 5-8: Task related, solution generating Interactions (SP7 2004, n=97)

Group	Chat		Forum		Group Type
F1	2	2%	10	10%	**37%**
F2	0	0%	24	25%	
C1	12	12%	6	6%	**63%**
C2	4	4%	39	41%	
Technology	**18%**		**82%**		

Synthesising activities are crucial for good quality case solutions. Whereas during the analytical phases a case's several issues can still be treated separately, final solutions or recommendations need to be evaluated against the demands of the entire case. What might be an optimal solution for one issue can have detrimental consequences for another (Christensen & Hansen 1987).

Summary 'Structural Analysis'

So far, the structural analysis of this first design iteration has applied a media-centric perspective. Different characteristics of interactions (task-relatedness, reciprocity and depth) have been explored in the context of different communication technologies. Preliminary findings indicate that students who worked through the case solving process

using both chat and forum had more task-related and reciprocal interaction than learners who were only utilising a forum.

It appears that using synchronous communication technologies in case-based learning has considerable potential for enhancing the learning experience. However, chat sessions are not without problems and only two groups were able to establish them as part of their group work routine (Section 5.2). Combining the results of surface interpretation and structural analysis (i.e. problematic issues surrounding the use of chat versus benefits of having online meetings) is the objective of the following third and final stage of the hermeneutic arc and is covered in the following Section.

5.4 In-depth Interpretation

Thus far, case-based learning has been characterised as engaging in differing cognitive activities which were enriched through students' participation in group work. Consistent with this perspective, major design elements had been task and assessment descriptions, and communication technologies (Section 5.1).

However, as some of the barriers to online meetings have shown, what impedes successful argumentation is not necessarily a lack of argumentation skills or unwillingness to engage in group work, but might be a lack of intra-group coordination or media competence (Section 5.2). Linking the available evidence to its several contextual frameworks characterises 'In-depth interpretation' (Section 4.6.3) and allows the researcher to address different kinds of problems, even if they are not directly part of the case discussion process itself.

The previous structural analysis took a '*Learning through argumentation*' perspective (Andriessen, Baker & Suthers 2003a) and was able to illustrate the benefits of having online meetings. In interpreting learning activities as activity systems (Engeström 1987), however, a more comprehensive view of e-CBL can be developed. Hence the holistic approach to learning incorporated by activity systems presents a theory of '*Learning through solving tensions*' (Engeström 2001). However, 'solving a case' and 'solving tensions' are not synonymous, and Section 5.4.2 will outline categories of tensions besides the problem solving induced through the task itself. The next section introduces the conceptual tools of activity systems and applies them to develop a more comprehensive model of e-CBL.

5.4.1 Activity systems

The problem of contextual interpretation is how to get an efficient grip on the vast range of potential explanations (Orlikowski 2000). One particularly suitable approach to the systematic interpretation of learning activities in their broader socio-cultural context are

activity systems studies (Barab, Evans & Baek 2003; Hewitt 2004; Vogel *et al.* 2001b). Engeström (2001) argues that, unlike most learning theories, activity systems do not presuppose a stable set of skills that need to be learned from the outset. The author points out that in real life learners are often required to learn new things to overcome problems whenever and wherever they emerge.

Although on a more general level students follow a curriculum, they may find themselves lacking skills and knowledge necessary to accomplish a given task. However, this could not have been known ahead of time and, unless the student starts working on the task, the ability to predict what skills an individual learner is missing is limited (Wertsch 1991). Hence, activity systems theory argues that acting is a precursor to learning, as opposed to cognitive approaches to learning, which emphasise the development of the individual through instruction (Jonassen & Rohrer-Murphy 1999). In other words, a substantial part of what needs to be learned emerges from doing and circumstances force learners to do things differently: "… we must learn new forms of activity which are not yet there. They are literally learned as they are being created" (Engeström 2001, p.138).

The remainder of this Section introduces the basic components of activity systems necessary to understand the types of problems that can arise from contradictions - or tensions - between these components, which in turn stimulate changes within the activity system, viz learning.

Case-based learning as activity systems

Engeström's (1987) structure of an activity system is a widely-used visualisation to depict an activity in its socio-cultural context (Figure 5-3 shows an adapted activity system to describe case-based learning).

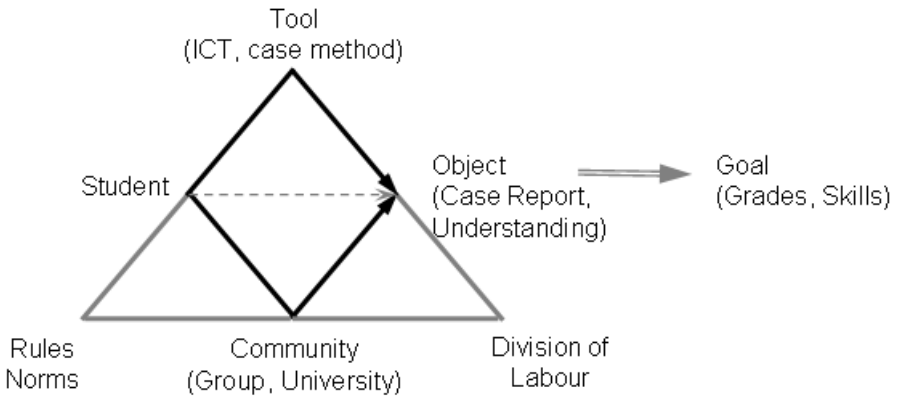

Figure 5-3: The human activity system (based on Engeström 1987, p.78)

Engeström's activity system combines Vygotsky's (1978) tool-mediated activities on a subject level and Leontiev's (1981) collective activities, mediated by norms and

cooperative structures, on a community level. The triangular relationships for both activity types are now described in more detail.

Tool-mediated Activities: Student / Tool / Object

The uppermost sub-triangle of Figure 5-3 depicts an activity (dashed line), mediated by a tool, executed in an object related and goal oriented way. This means that any activity aims to transform an object for a particular purpose. The object itself could be either cognitive or physical (Engeström 1987). For example, a student's understanding of the case is the cognitive object, which finds its material expression in form of a case report, the physical object. Working on both objects is mediated by the recommendations and guidelines as suggested in the case method.

Collective Activities: Student / Community/ Object

Engeström (1987) adds that, though not as visible as the application of tools, every activity is also mediated by the actor's membership in a community (inner, downwards pointing triangle in Figure 5-3).

- Motivations for and objectives of an activity are partially defined by the cultural *rules and norms* of the learner's community. For example, as students progress through their university careers, the norm for what is seen as an outstanding performance changes, that is, this norm is different for undergraduates than for postgraduate students. However, even though these rules/norms are community-wide knowledge this does not imply that they are automatically adopted by all members.
- Whereas norms and rules often refer to tacit expectations that are part of the identity of a group, *division of labour* refers to the more explicit exchange structures within a group that define how tasks and rewards can be distributed (Engeström 1999a). For example, in a group where some students have contributed considerably less effort into an assignment, the question may arise whether all students should get the same grade or how participation can be more balanced in the future.

5.4.2 Types of problems in activity systems

One of the key reasons for looking at activities in relationship to their systemic conditions was the need to describe problems that could not easily be explained within the current design model of e-CBL (Section 5.1). Hence, this Section discusses activities related to

planning and implementing group meetings and how they depend on the consideration of the whole activity system[47].

Engeström (1987, p.87) differentiates four types of problems in activity systems:

- First there are *primary contradictions* of commoditisation, referring to the conflict between the use and exchange value of an activity. The former refers to the more subjective appreciation of knowledge because it will be 'of use' and the latter refers to certificates or diplomas, which transform knowledge into a commodity that has a specific counter value in the labour market (Engeström 1987). For example, Figure 5-3 describes use and exchange value as an 'increase in knowledge' and 'good grades'. Put differently, students who claim to understand but failed to put this understanding into writing (case report) might end up lacking the necessary credentials to 'prove' their skills. A contradiction emerges if an activity does not directly contribute to both goals. For example, the group needs a facilitator who organises meetings and follows up if individual sections are not submitted in time. However, although this presents a good opportunity to learn how to manage a virtual team (use value), the activity is not graded. In a situation where other responsibilities pile up, the student would need to decide whether to continue or to reduce his or her facilitation role. In general, exchange and use values need to be brought into alignment. One way to achieve this is by stressing companies' appreciation of communication and leadership skills (BCA 2006, p.15).
- *Secondary contradictions* are those between the constituents of the activity system itself (Engeström 1987). For example, the suggested method (cognitive tool) for working on cases includes group discussions and a number of analytical tools, such as concept maps, priority lists or cause-effect diagrams. However, there can be a temptation to immediately split the case questions to minimise time spent on coordination. Indicating the elements of an activity system in brackets, the following scenario describes secondary contradictions. Tensions between what is suggested (tool) and what is done (division of labour) can arise if grades (exchange value) are unsatisfying and individual group members start insisting on more collaboration (rules and norms). In this situation the group may either change their workflow as a group (rules and norms) or the more ambitious students may take on a greater share of the workload (division of labour).

[47] Some ideas in this section on how to apply an activity systems view to e-CBL have been published in Voigt, C. & Swatman, P.M.C. (2006). Online Case Discussions – Tensions in Activity Systems. Paper presented at the 6th IEEE International Conference on Advanced Learning Technologies (ICALT), July 5 - 7, Kerkrade, Netherlands.

- *Tertiary contradictions* can arise when activities are prescribed by an outside person. For example, the instructor might suggest peer evaluation so that one group needs to comment on another group's report. However, a student who does not value reading other students work would experience this as a tension. In this case the (instructionally) intended goal of an activity and the goal the student sees for this activity do not match. A similar argument could be applied if the instructor suggests online meetings; if students have low expectations concerning the usefulness of meetings, the likelihood that they will become part of a group routine is reduced.
- *Quaternary contradictions* result if parallel activities compete for the same resources, such as time or bandwidth. For example, exploring the features of a newly offered virtual meeting room may shorten the time left to organise group work or read the case materials.

Summary 'In-depth interpretation'

'In-depth Interpretation' has been broadly defined as interpreting an activity in different contexts/frames (Section 4.6.3). Relating learners' activities to the various elements of their activity systems has provided a method of contextualising e-CBL in different ways and allowed addressing the issue of online meetings in the context of several kinds of tensions typical for activity systems.

5.5 Reflections and Lessons Learned

As a preliminary result, data interpretation throughout the three stages of the hermeneutic arc supported the claim that real time interactions contribute positively to group work. Students who used chat had more task-related and reciprocal interaction than learners who were only utilising a forum (Section 5.3). However, the 'in-depth interpretation' of online meetings raised several issues concerning matters that clearly lay outside the area of task-related interactions and the process of case discussions. The activity systems perspective taken had shown various sources of tensions that can impact the success of e-CBL. To summarise these tensions and identify means to overcome them, a broader conceptual model of e-CBL is suggested. The model is based on the relationships that have already proven to be a useful perspective for activity systems. Finally, this determines the blueprint for the next learning environment and the researcher's future activities during the second iteration of this design research project.

5.5.1 The e-CBL development matrix

Dobson *et al.*(2004) state that the neglect of the socio-cultural context in e-learning design is likely to lead to poor levels of technology uptake. Like Mwanza (2002) and Dobson *et al.*

(2004), the researcher sees the strength of activity systems in facilitating post-hoc interpretations of situations that showed a misfit with their design. However, a widely cited weakness of activity systems is their inability to provide clear design prescriptions (Barthelmess & Anderson 2002; Isssroff & Scanlon 2002; Morris & Joiner 2002). Hence, Roschelle (1998) and Jonassen (1999) suggest viewing activity systems as frameworks that organise the fields of design or research, rather than as a theory which aims to provide concrete design specifications. Using Engeström's (1999a, p.36) words, activity systems are ideal "intellectual tools for reflective mastery of practice".

In accordance with the latter view, Figure 5-4 attempts to transform the different aspects and issues of an e-CBL activity system into an e-CBL development model showing the trajectories of first-time case-based learners.

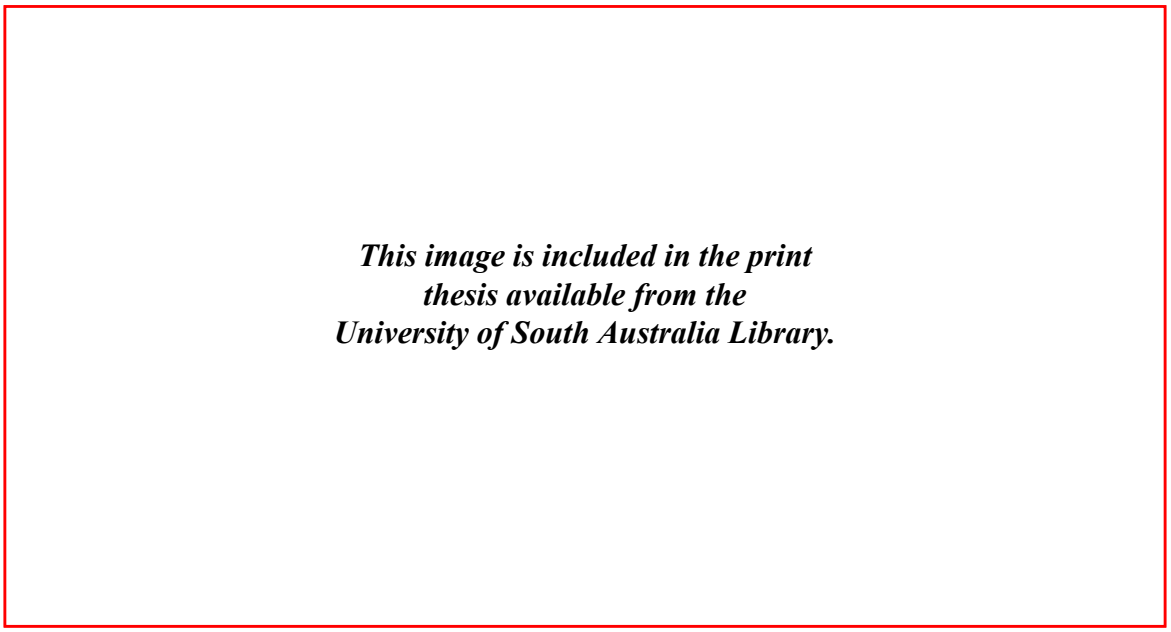

Figure 5-4: E-CBL development matrix (Voigt & Swatman 2006b)

Engeström (2001) summarises five main characteristics of activity systems: historicity, expansive learning, artefact-mediated activities, multi-voicedness and conflict driven learning. These characteristics are now explained in detail and the way they have been captured in Figure 5-4 is indicated in brackets.

Historicity (Emphasising learners development over time)

Unlike 'snapshot' models that try to present static relationships, activity systems are meant to visualise transformations over time. The components of an activity system are not necessarily stable during the time an activity is completed. Understanding an activity in its actual state requires knowing about the activity's history, how was an activity approached in the beginning and what problems had to be overcome (Engeström 1999a).

Accordingly, Figure 5-4 shows the development of learners through various stages until they become participants of a meaningful discourse, viz. a case discussion.

Expansive Learning (Individual and Group Context)

Horizontally, the model in Figure 5-4 is split into individual and group contexts. This reflects the continuous interaction between individual learners and their social context. Bringing case discussions to a higher quality often requires a collective effort. It is not sufficient if individual learners change their learning practices by themselves, they also need to incite similar changes in their peers. Engeström (1987, p.185) therefore speaks of 'expansive learning' or 'expansive transformations'.

Mediated activities (Method and Media competencies)

Vertically, the model differentiates between method and media competencies. The role of tools, cognitive and physical, has been widely discussed in Section 2.2.3. It had been argued that tools enable learners to accomplish new tasks if they understand how to apply them correctly (Perkins 1997). Consequently, a tool (whether this is a virtual meeting room or a method of analysing the information in a case), requires learners to grasp the purpose and potential of the tool. Most learning tools cannot lead to meaningful activities if they are applied in a mechanical or forced way, for example, if students perceive they *have to* use a specific communication channel or go through a prescribed collaboration process without actually receiving any benefit. An important aspect of tool-mediated activities is that mediating tools themselves can become the object of a 'tool-producing' activity, i.e. realising that an efficient discussion process is missing, the group can shift its efforts away from the case discussion in order to agree upon a new 'modus operandi' for their online meetings (Engeström 1999b).

Multi-Voicedness (Individual and Group context)

E-CBL requires students to continuously balance their multiple individual interests and viewpoints; and the objective of the overarching collective activity (cf. Miettinen 2005). As Gutierrez *et al* (1995) point out, the varying agendas of members do not blend automatically and the norms and rules dominating the final shape of an activity are often the result of internal negotiations and tacit power struggles.

Conflict-driven learning (Activity Facilitation)

Conflicts (or tensions, to use the activity systems term) have already been discussed as principal sources of change and expansive learning (Section 5.4.2). Figure 5-4 contains several oval shapes that indicate skills frequently associated with case-based learning (Section 2.1.3). A lack of these skills indicates a potential source for conflict which, if the conflict is growing, confront the learner or the group with the need to change. For example, to avoid simplistic or superficial case discussions, critical thinking capabilities

are a *sine qua non* to shift students' attitude from passive consumers to active problem solvers (Tan 2004). To overcome these conflicts, Figure 5-4 shows potential scaffolds that can assist learners in developing a critical attitude or any other skill as shown in the intersections of individual and group activities on one side and method and media competence on the other.

5.5.2 Developing method and media competencies

The e-CBL development matrix displayed in Figure 5-4 results in four quadrants that will guide the design and support of electronic case-based learning during the following design iterations.

Quadrants I and II

Quadrants I and II of the model showcase discussions in relation to the development of critical thinking (Paul 1993) and efficient teams (Kerr 1983). Many groups saw collaborative learning primarily as a way of reducing workload rather than a method of benefiting from peers' perspectives, or as an opportunity to obtain feedback to their own ideas. However, critical thinking skills support discussions, since few ideas are accepted without question, hence there is a need to discuss the task in the first place. Still it is possible that different expectations concerning group work persist (Salomon & Globerson 1989). How much discussion is sufficient and how each member's contributions can be integrated into the final report are questions that require learners to practice their team and leadership skills.

Quadrants III and IV

Quadrants III and IV indicate the importance of skills that support learners in their online discussions. As Rice (1999) argues, discussions in the online world have their own specific characteristics and simply putting new media at students' disposal is no guarantee of successful collaboration. Firstly, therefore, learners need to learn about the technical issues of the applications they use in order to run online discussions smoothly and without interruption, rather than having to discuss technical details. Secondly, learners need frequent practice in the utilisation of online communications to develop norms and rules that frame their own online interactions. Wertsch (1998) describes the relationship between practicing a skill and developing a skill: "... development often occurs through using a cultural tool *before* an agent fully understands what this cultural tool is or how it works. Such an interpretation contrasts with the standard assumption that an agent must first understand what she is doing before she can do it" (ibid p. 132).

5.6 Summary of First Research Iteration

This Chapter has described the first design iteration of an electronic version of case-based learning. The design focused on basic design areas similar to those needing to be specified for traditional case-based learning settings (case materials; task descriptions, assessment schema, communication channels and guidelines on how to approach case studies). The researcher's assumption was that, in approaching collaborative group assignments, online group work (including online meetings) would naturally evolve. With hindsight it can be said that the researcher underestimated the level of instructional guidance needed to fully develop case-based learning online. However, reflecting on this first iteration, two major results were achieved in terms of re-conceptualising e-CBL and deriving direction for design changes in following research iteration:

- In order to conceptualise e-CBL more broadly, an activity systems view was applied. As a consequence, successful e-CBL was related to both the mastery of the case method, as well as the development of adequate media competencies. However, it has been argued that the level to which the required method- and media competencies can be achieved depends not only on the individual's effort but also on his or her group environment. Consequently, any instructional support measure needs to consider how the skill is promoted, and what practicing the skill requires from the individual on one side (e.g. a critical attitude) and the group on the other (e.g. providing a permissive playground for diverse ideas).
- The developmental model presented and elaborated upon in Sections 5.5.1 – 5.5.2 suggests that additional instructional support is necessary to target specific individual skills, e.g. critical thinking and proficiency in the use of ICT; as well as group skills, such as the coordination of group work flows and the ability to match different communication channels with the requirements of particular group situations in a flexible manner.

The next Chapter looks at the evaluation of an enhanced e-CBL design. Based on the model developed in this Chapter, concrete design changes are specified through the design intentions of the next research iteration (Section 6.1).

6 TESTING AND ENHANCING E-CBL

The previous Chapter analysed student interactions in terms of their main focus (task vs. group management) and reciprocality (reactive vs. non-reactive interactions). The Chapter concluded that additional group- and technology specific factors had to be considered before expected benefits could be realised, which led to the conceptualisation of the e-CBL development matrix.

The main objective of this Chapter is to operationalise, implement and evaluate the e-CBL development matrix and make enhancements where necessary. Figure 6-1 illustrates the Design Research process in the 2nd iteration, showing how design intentions have been derived from a combination of the Conceptual Model (discussed in Chapter 5) and a much earlier Pilot Study of Centra™, undertaken in SP2, 2005. Chapter 6 follows a similar structure to that of Chapter 5, matching the different stages of the hermeneutic arc against the design research elements.

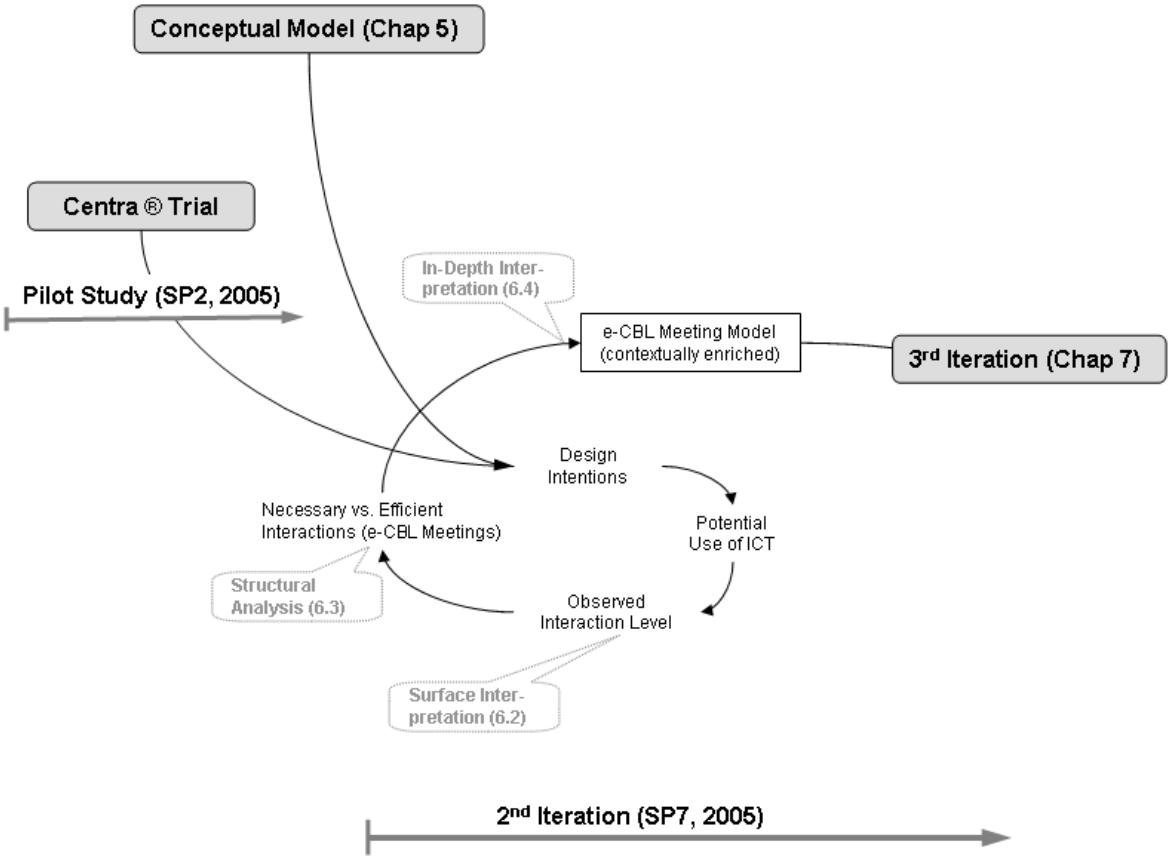

Figure 6-1: Overview of the second research iteration (SP7 2005)

However, before the development matrix could be fully implemented, a pilot study (SP2, 2005) investigated potential benefits or problems of using a virtual meeting room. The lack of studies evaluating the use of virtual meeting rooms for learning groups in non-

laboratory settings meant that no ready to use process description was available. For this reason, the researcher opted for a trial run to test two scenarios from which a process recommendation and suitable configuration details could be derived (Sections 6.1).

The bullet points below outline the steps taken during the second research iteration; identifying the section of this Chapter in which each is described and discussed:

- Design Intentions (Sections 6.2): For this 2nd research iteration, it was necessary to link the skills suggested in the e-CBL development matrix with concrete design measures. Suggested means of support include: training sessions, collaboration scripts, task scaffolds; and the purposeful use of rich communication media.
- Surface Interpretation (Section 6.3): As in Chapter 5, the surface interpretation looked first at the general activity level to identify promising instances of e-CBL which would merit further inquiry. The first part of the section provides an overview of students' first steps as they gain access to the social and technological network providing the infrastructure for their learning experience. The second part summarises student interactions at a group level, evaluating how groups integrated their asynchronous and synchronous communication.
- Structural Analysis (Section 6.4): The purpose of this section is to explain the differences observed in groups' collaboration processes during the surface interpretation. The main focus of this section lies on synchronous interactions, since this was the area where the most significant differences between groups became evident. To describe and later evaluate synchronous learning events, Garrison and Anderson's (2003) criteria are adopted and further specified to fit the requirements of the e-CBL process.
- In-Depth Interpretation (Section 6.5): The interpretation is organised around the experiences of 12 students who participated in either an in-depth interview or a focus group. This allows identification of those activities and situations where the e-CBL design had created favourable conditions for some groups but not for all. These findings are presented as sensitising concepts designated to further enhance the applicability of the e-CBL design.
- Reflections and Lessons Learned (Section 6.6): The findings of the preceding Sections are summarised and their wider implications discussed in the context of the overall e-CBL design.

Finally, the summary at the end of this Chapter includes answers to subsidiary research questions 2 and 3:

SRQ 2: On what basis can the efforts and benefits in e-CBL be evaluated ?
SRQ 3: What are the efforts and benefits of e-CBL from a student perspective?

6.1 Using a Virtual Meeting Room: A Pilot Study

During the first research iteration students complained that the text-based communication media available to them were so inconvenient as to provide a reason for avoiding synchronous online meetings. Motivated by the expectation that a richer medium would encourage more synchronous group work and support communication more efficiently (cf. Procopio *et al.* 2005), the researcher decided to test the use of a virtual meeting room: Centra™. Although this pilot study is a separate piece of empirical work in its own right, it has been subsumed under Chapter 6 to maintain a close link to the subsequent implementation of the e-CBL development matrix, in which technology is only one part of the equation.

The pilot study addressed two questions concerning the efficiency and the reliability of the virtual meeting room: (a) Which functionalities of Centra support the group discussion process best?; and (b) Is Centra a reliable communication medium?.

The expected outcome of the pilot study was a process definition matching the features of the technology against the requirements of the task and thus making the process as simple and intuitive as possible, to minimise the time required to learn the process / system (Dillenbourg 2002). Ideally, future groups should be able to get started after a single, real-time, tutor-led training session.

The pilot study was carried out in Study Period 2 (March-June) 2005, partly because enrolment numbers could be expected to be considerably lower (20-30 external students) than in summer school classes with enrolments anywhere between 60 and 100.

Because no published data or case studies using this particular application[48] for group discussions existed, potential reliability or usability issues were unknown to the researcher. This uncertainty led to the tool being offered to students on a voluntary basis, reassuring them that extensive support would be available and that groups using Centra could discard the technology at any time if they felt it would not adequately support their group work.

Students had access to a seven minute demonstration video (http://www.centra.com/demovideo/index.asp, accessed 10.12.2007) and a link to several tutorials on the Centra homepage, in order to make a decision about whether they would like to participate in a Centra pilot group. Their decision was captured in an entry questionnaire students had to complete at the beginning of the course. The first version of this entry questionnaire comprised eight questions (Appendix D.1) and enquired about the frequency of the

[48] See Section 1.5 for a more detailed description of the Centra Virtual Meeting Room.

student's computer access, type of Internet access; and experiences with other synchronous communication technologies such as Instant Messengers, Internet telephony or Internet conferencing systems[49]. Although the researcher assumed that factors such as broadband Internet access and previous experience with other synchronous communication media might favour students' decision to try Centra, this did not prove to be the case[50]. Students who opted for Centra had a mixed background, largely resembling the characteristics of the course population. Five out of 21 students worked with Centra, including two students on a dial-up connection and one student with no experience in synchronous online communication (Table 6-1).

Table 6-1: Student characteristics (SP2 2005)

Student Behaviour / Experience	All Students (n=21)	Centra Group (n=5)
Accessing the Internet daily	85%	80%
Using dial-up Internet access (<56kbit/sec)	42%	40%
Basic or advanced knowledge of an Instant Messenger	81%	80%
No experience with Internet telephony (e.g. Skype)	90%	80%
Experience with any other conferencing system (e.g. Microsoft's Netmeeting)	21%	0%

All in all, students embraced the opportunity with less enthusiasm than expected. A possible explanation can be found in Coghlan's (2004) distinction between low and high threshold applications. High threshold applications imply less common scenarios for distance learning and are perceived as requiring a steep learning curve, which might discourage students who dislike the uncertainty surrounding a new learning environment.

Working with a group of only 5 students, however, did make it possible to observe the procedural and technological aspects of using Centra for online group work. The dataset from the pilot study comprised the recordings of eight Centra meetings and postings before and after the meeting. The objective was to reconstruct the collaboration process as completely as possible, to identify any difficulty relating to either the application itself or to the way the application was used.

[49] With each subsequent research cycle the entry survey has been adapted slightly, to better capture the informational requirements for implementing e-CBL. (see Appendices B.1, C.1, D.1).

[50] Ease of access (Thompson, Higgins & Howell 1991) and ease of use (Davis 1989) are two major predictors of technology acceptance. However, it was not an objective of this pilot study to test these constructs.

Procedural and technical aspects of Centra

During the evaluation of Centra-supported group meetings the efficiency of information reuse, or *reprocessability* (Dennis & Valacich 1999), became a major issue. Centra discussions are synchronous events embedded in the asynchronous interactions taking place in the discussion forum. It was therefore essential that materials produced in either medium (e.g. forum or Centra) be readily accessible in any other medium. The question was how Centra meetings could build on students' individual preparations and merge these into a single object representing the group's shared understanding.

The evaluation of Centra's *reliability* was addressed by two criteria: monitoring technical breakdowns during installation, or usage of the java-based client software; and communication delays which would mean a serious disruption to the discussion flow.

Limitations of the pilot study

Finally, it is necessary to clarify the limitations of this pilot study. The objective was not to run a comprehensive test of all Centra's functionalities, but rather to understand the technology well enough to be able to use it with a larger group of students. Hence, the main purpose of the pilot study was to decide whether the use of Centra was feasible and beneficial to students engaged in online case-based learning. Additionally, it was not possible to change or extend functionalities in Centra because it is a commercial product with no source code access. Consequently, any difficulty in using the technology has to be accommodated by changing the process rather than the technology – if this is not possible, a different technology must be used.

Teaching cases used

As in the previous iteration (Chapter 5), study groups worked on two assignments: a mini-case and a business case. Although the marks for their case reports remained the same, the weighting of the 'online visibility' assessment category (Appendix A.1) was increased from 10% to 20% to emphasise the importance of the discussion process itself.

The first teaching case, *EBAO Technology: An e-insurance enabler* (Ru & Crossan 2001), was published by the Richard Ivey School of Business, one of the major case study clearing houses in Canada. The case report was due in week six, after relevant topics had been covered in the accompanying lectures. The teaching case had two principal learning objectives: students should (a) recognise the importance of a comprehensive business model in the aftermath of the Dotcom crash and (b) analyse Ebao's service offerings in light of their long term costs and benefits. The following introductory paragraph provides a general idea of how the teaching case was set up.

> Sitting in his office looking over the Pudong New Area of Shanghai, Woody Mo reflected on Ebao's business progress. Since its debut in April 2000, Ebao had stood out as a Web-based technology company serving the insurance industry in China. The company had developed several insurance applications on its Web site. More than 80.000 insurance customers, 4.000 insurance agents and almost all major insurance companies in China had signed up with Ebao's Web site and were using Ebao's applications. In just one year, the company had grown into a 70-person organization with offices in Shanghai and Beijing. While Mo was satisfied with the progress over the past year, he knew that Ebao would face a number of challenges in 2001. How could Ebao sustain its rapid growth in a year full of market downturns? What should Ebao do to fend off the competition? And how could Ebao evolve the current business model in the future? (Ru & Crossan 2001, p.1)

The second case study assignment was, as in the previous course offering (Section 5.1.2), a business case where groups were asked to write a business plan (Sahlman 1997) launching their own business in the e-dating industry (Jackman 2004).

Both case studies required intense collaboration among students. For the first case they had to agree on the issues Ebao was facing to develop a successful business model; and and for the second case they had to decide how to design and implement their own online service (e.g. target group, value proposition, streams of revenue, privacy and confidentiality concerns and marketing communications).

Centra training session

Based on the available functionalities in Centra two potentially useful collaboration scenarios had been envisioned:

- PowerPoint slides in combination with note taking on an electronic whiteboard; and
- Note taking in a shared text editor.

Both possibilities were presented during the training session each participant had to complete prior to the group work. Individual training sessions took an average of 50 min, including practical exercises to become familiar with the learning environment. The following topics were covered (see Appendix D.2 for the slides used during the training session):

- Basic Centra Communication Principles, e.g. that it is necessary to press the Ctrl key to speak, or that an underlying yellow background to someone's microphone indicates that he or she is about to speak.
- The organisation of the Centra interface, e.g. participant area, session management area and application/content area.

- The use of tools to give quick feedback during group discussions, e.g. crosses and ticks to indicate agreement or disagreement, or a smiley face and clapping hands to show more emotional feedback.
- The use of a chat (public and private) in case of a problem with audio communication.
- Uploading and annotating of PowerPoint slides (Figure 6-2) and saving snapshots of the annotated slides.
- Sharing an application such as Microsoft WordPad ® or a Web browser.

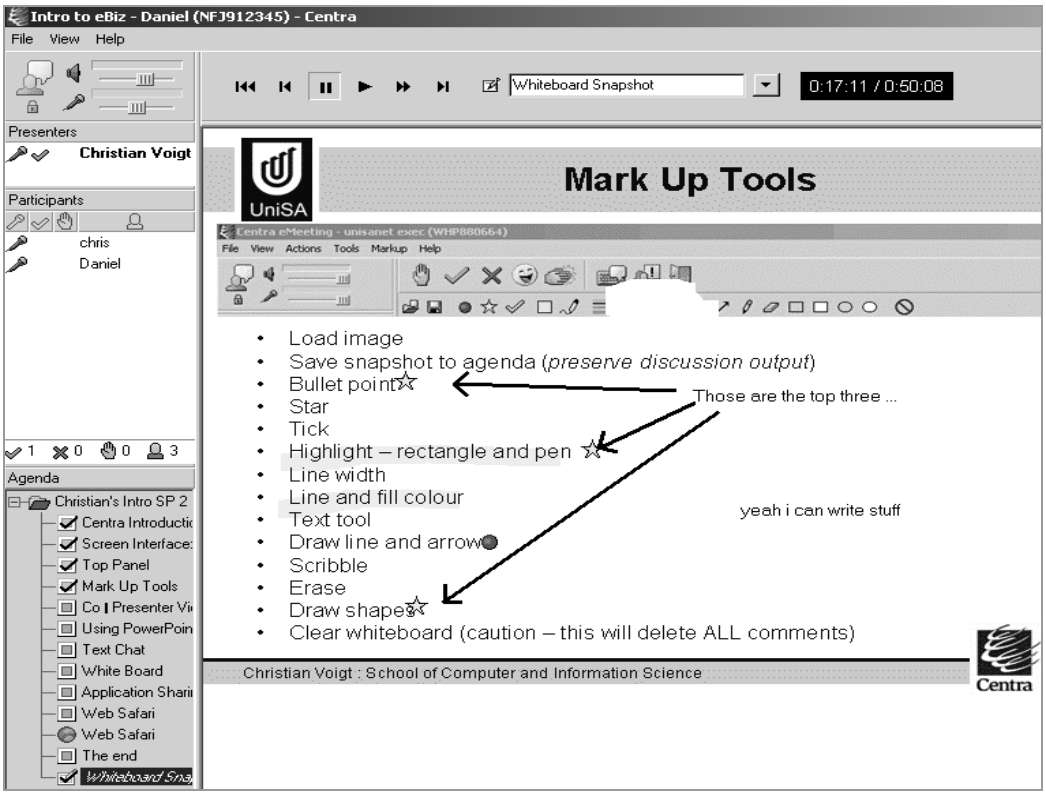

Figure 6-2: Annotating PowerPoint slides in Centra

Next, a brief overview of the pilot groups online meetings is provided. The overview will show two main usage scenarios which are then discussed in more detail.

6.1.1 Overview of online meetings

During the pilot study the Centra group had 9 online meetings with an average duration of 81 min (SD=40.5 min). Except for the first session, the group itself determined the frequency, duration and timing of its online meetings. All sessions were attended by at least 4 out of 5 group members. The online tutor (the researcher) attended the first two sessions, mainly to support technical aspects of the online collaboration, and was online for the first 10-15 minutes during later meetings to answer questions or suggest ways in which to improve meeting efficiency.

The following overview (Table 6-2) describes each meeting in terms of :

- *Duration*: How long did the meeting take?
- *Participants*: How many group members participated?
- *Centra Media*: Which functionalities of the learning environment were used during the online session?
- *Information Input*: What information was taken into the meeting and how was it utilised (this information was important to evaluate how well Centra meetings integrated with the individual case preparation phase)?
- *Meeting Outcomes*: What information was generated and how was it captured (this was likely to influence how easily the outcome of an online meeting could be reused in later meetings, or directly in the case report)?

Table 6-2: Overview of Centra meetings (SP2 2005)

Meet.	Durat. [min]	Part.	Centra Media	Information Input	Meeting Outcomes
1st case study (EBAO Technology: An e-insurance enabler)					
1	85	5	Audio Annotated PPT Chat as note taking tool	Slides from 1 person: − potential issues − who, what, why, when and how	Audio recording − process evaluation − need to post case preparations to forum Chat notes
2	170	4	Audio Annotated PPT E-Whiteboard	Slides from 3 person: − issues and recommendations	Audio recording − task allocation Several whiteboard snapshots
3	63	4	Audio E-Whiteboard	Offline Input: − group members had printed documents in front of them	Audio recording − structure of report − synthesising the input of different members Ranking of issues on whiteboard
4	35	4	Audio	No explicit input	Audio recording − collating and size of particular section

Meet.	Durat. [min]	Part.	Centra Media	Information Input	Meeting Outcomes
2nd case study (Business Case: e-Dating Company)					
5	58	4	Audio Shared Editor	One person's individual preparation WordPad document.	Audio recording WordPad doc: – Business Plan sections – sections allocated to group members
6	120	4	Audio Shared Editor	No explicit input	Audio recording Notepad doc: – Discussing service and business model – Discussing interdependencies between sections
7	60	4	Audio Shared Editor	One document with the input of all 4 members (prepared asynchronously)	Audio recording WordPad doc: – Comments and questions added to each section discussed
8	80	5	Audio Shared Editor E-Whiteboard	Document from previous meeting has been extended.	Audio recording WordPad doc: – Comments and questions added to each section discussed – Discussion about costs on whiteboard
9	65	5	No recording available		

Table 6-2 is divided into meetings 1-4 related to first case study (EBAO) and meetings 5-9 related to the second case study about the e-dating company. Working on their first case the group mainly used a combination of audio communication, annotated PowerPoint slides and/or electronic Whiteboard (see meetings 2 and 3). These meetings will be analysed in more detail in Section 6.1.2.

However, because of the shortcomings of this usage scenario, the group switched to a combination of audio communication and shared editor for their work on the second case study. Benefits and problems of this alternative usage scenario will be discussed in Section 6.1.3.

6.1.2 Scenario I: PowerPoint and Whiteboard

The following discussion is a more detailed elaboration of meetings 1-4 described in Table 6-2. This Section will clarify why it was necessary to test a second scenario (based on a shared editor) and what was learned from using annotated PowerPoint slides.

First, groups started working with a media mix of PowerPoint (PPT) and electronic Whiteboard. The former was to share results of individual preparation with the group and the latter to capture any new or synthesising information generated during the online meeting. This scenario had been favoured over the shared text-editor because initially it was less bandwidth intensive and faster to learn (Driscoll *et al.* 2004).

The following paragraphs give a more detailed overview of how PowerPoint (PPT) and electronic Whiteboard could be applied during the group's case discussions.

Despite emphasising the need to prepare meetings, only one student submitted his preparations prior to the *first meeting*. The uploaded PowerPoint slides were based on Mauffette-Leenders *et al.* (1999, p. 34) steps for preparing the case individually, which included skimming the case, answering who, what, why, when and how questions, reviewing case exhibits and reading the case questions. While these steps are beneficial in becoming acquainted with the case material, they were less suitable for stimulating a discussion. Little of the presented information was questioned or commented upon. With a low interaction level, the meeting resembled more a 'one to many' presentation than a 'many to many' discussion. Though little information could be gained that went beyond what had been presented by one student, it was a fruitful experience because the group reflected on their overall collaboration and discussion process. As a result, the group recognised the need to be better prepared and set meeting targets upfront.

During the *second meeting*, the discussion was based on a PPT presentation which included material prepared by almost all group members. Participants took turns in presenting their issues and recommendations. Better prepared participants frequently commented on one another's thoughts and captured their ideas or questions as annotations on the slide. However, the process was problematic due to the impermanence of the annotations and the need to frequently switch between multiple slides. For example, if the group changed to another slide and had not saved a snapshot of the previous slide then the annotations were lost. Not switching between slides was problematic too, since the group's stock of knowledge was scattered across multiple slides (Figure 6-3). The following figure shows a case in point (all names have been altered): Julian suggests that one of the company's issues is their unfocused investment in new developments ("*spreading resources too thin*"), to which Nigel responds that this is still exacerbated by offering many services for free, leading to the company's financial loss of $2.8 Mill in

2000. Recording the association between the two ideas contained in two different slides was not a straightforward action – merging all issues in one space would clearly be preferable.

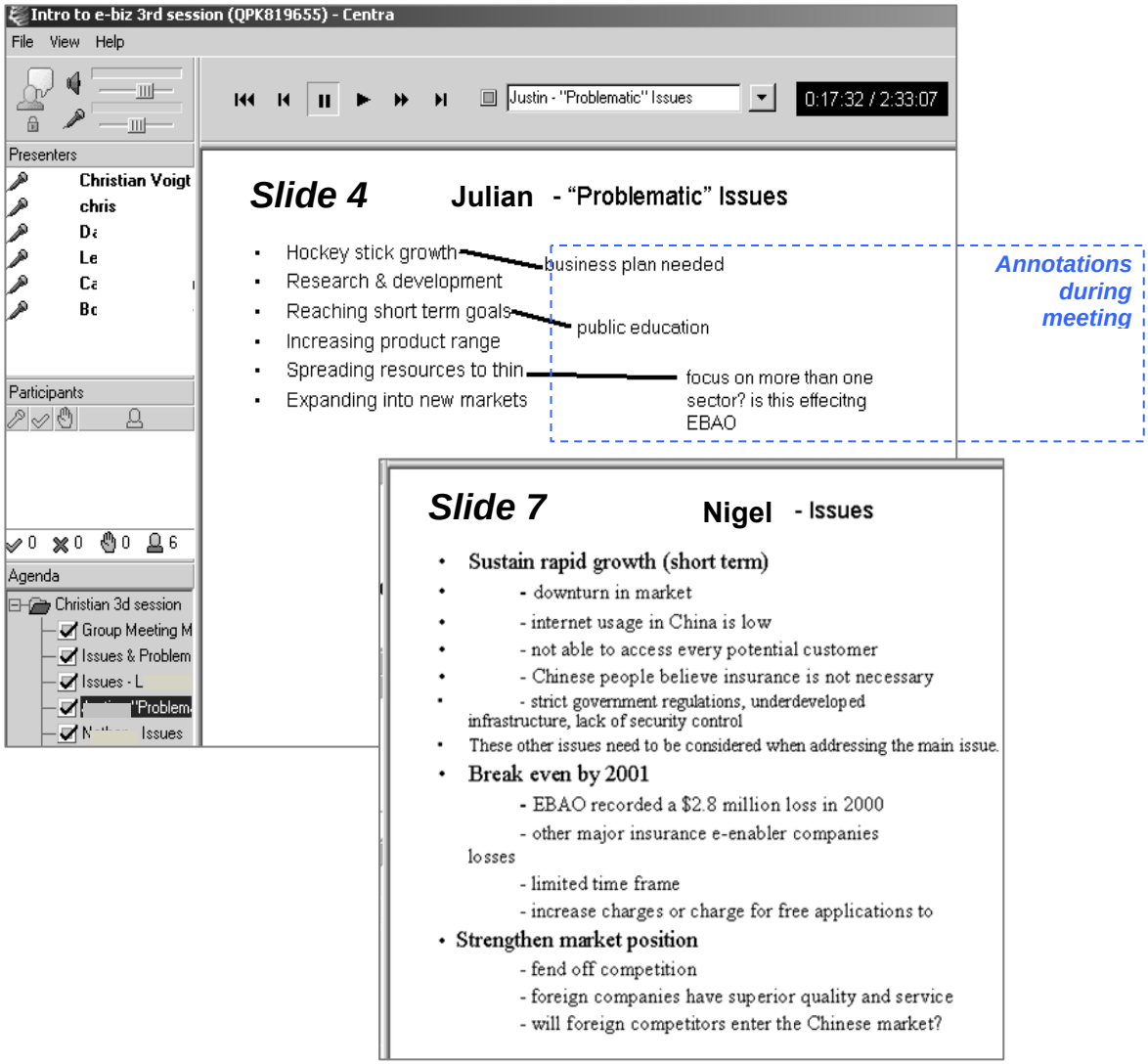

Figure 6-3: Scattered information in a Centra discussion

The group therefore decided to copy their most important issues to a whiteboard, which would also allow them to see whenever they had identified similar issues (Figure 6-4). However, extra care was necessary to avoid accidentally deleting the whiteboard (one click on the erase icon was enough to do this), which happened when the group used the whiteboard for the first time.

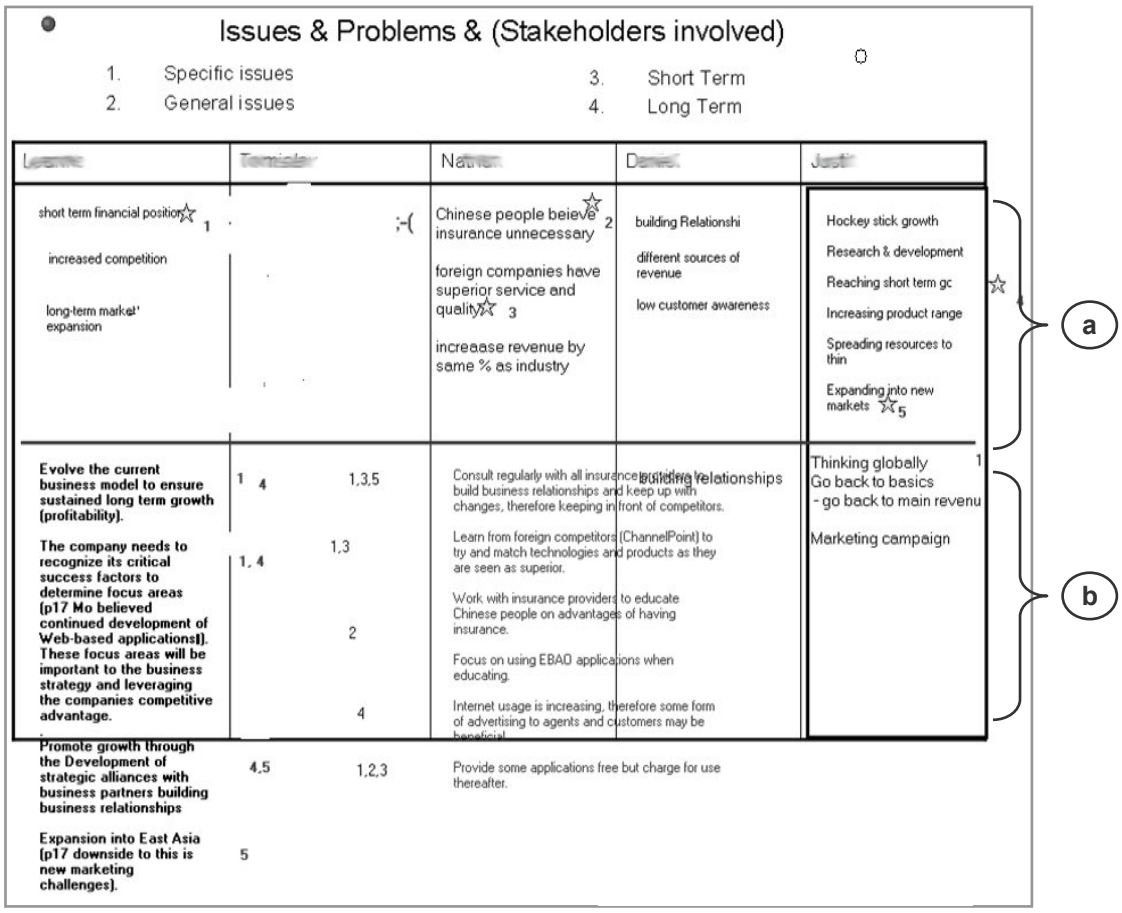

Figure 6-4: Electronic whiteboard use during a Centra meeting (SP2 2005)

Figure 6-4 represents a whiteboard emerging out of the discussion of the Ebao teaching case. The whiteboard was structured by a table which allocated a column to each group member. The upper part (a) of the table contained the issues of the case and in the lower part (b) students wrote or pasted their recommendations. The top of the whiteboard contained a classification into specific vs. general issues and short term vs. long term goals, which was suggested by the researcher. Though the issues were verbally discussed, requiring either a short or long-term solution, the classification was not explicitly applied to the issues. Later, the group marked their main issues with a star, numbering these issues from 1-5 and matching them with the recommendations in the lower part of the table. In this way one issue could be addressed by multiple recommendations. For example, to improve its financial situation in the short term (Issue 1), the group decided that the company needed to rethink its business model, identify its principle competitive advantages, consult its clients regularly and learn from competitors. Towards the end of the meeting all issues were distributed among the group members, and each topic was addressed by two learners. Group members thus worked on two issues each, so that every issue was investigated in-depth by at least two group members.

To summarise, the group's second meeting comprised eight steps:

- discuss everyone's understanding of the case using individually prepared PPT slides,
- annotate slide where suitable,
- save snapshot of annotated slide,
- copy most important issues and solutions into the whiteboard,
- mark broader issues to avoid duplication in the discussion of the case,
- match issues with recommendations,
- save snapshot of whiteboard, and
- allocate each issue to a pair of students.

However, the process was complicated because students had to manage two work spaces simultaneously, annotating slides and making notes on the whiteboard. Moreover, the whiteboard soon showed its limitations in size and in the way it supported editing.

Dillenbourg (2006) uses two metaphors to describe the use of electronic whiteboards: the napkin and the mock-up. A sketch on napkin serves as an ad-hoc explanation of a detail, whereas a mock-up is used to examine aspects of the complete product. Depending on the purpose the electronic whiteboard should serve, different functionalities are required. During the observed case discussion, the group attempted to combine their individual insights by creating a mock-up (outline) of the future case report, but was limited by the reduced editing functionalities of the Centra whiteboard.

Research on workspace awareness has already improved shared usability, however, with limitations in space being overcome by zooming or scrolling, and participants being aware of one another's actions (Abowd 1999; Gutwin & Greenberg 2002). More powerful applications, supporting more intuitive whiteboard interactions will therefore be able to make whiteboards a more appealing option in the future.

During their *third and fourth meeting* (Table 6-2) the group made little use of the whiteboard. Rather than preparing slides, students printed off their draft sections and commented on particular issues by referencing the relevant information in terms of page and paragraph numbers. During these meetings it became clear that a shared 'work space' is not necessarily limited to an area broadcast to each individual's screen.

6.1.3 Scenario II: A shared text editor

Starting from the preparation for the second case assignment (the group's *fifth meeting*), Centra meetings were supported by a shared editor only. One group member (the host) would open an editor on his/her local computer and share this application with the group

(Driscoll *et al.* 2004). The online tutor made clear that it was the host's responsibility to save the document on his/her computer, to avoid losing the changes made during the meeting.

Using Centra's application-sharing functionality had the benefit that the group worked with a single work space, with no space constraints, since a document is easily extended. This approach also took advantage of group members' existing familiarity with Microsoft Word's formatting and editing functions. Particularly useful was the ability to immediately transform comments and decisions emanating from the group discussion into activities for the evolving case report. Adding comments or questions, addressing issues in a different sequence, or combining issues under a new heading were all actions that could take immediate effect. Figure 6-5 shows a screenshot of how a small dot point, "equipment and server", identified in one session, was discussed in more detail during later sessions – including the trade-off between using more expensive but easier to use Microsoft products vs. more difficult to use, but free, open source Unix-based applications. Additionally, the group decided to use a different colour (grey) to highlight the information added during the meeting.

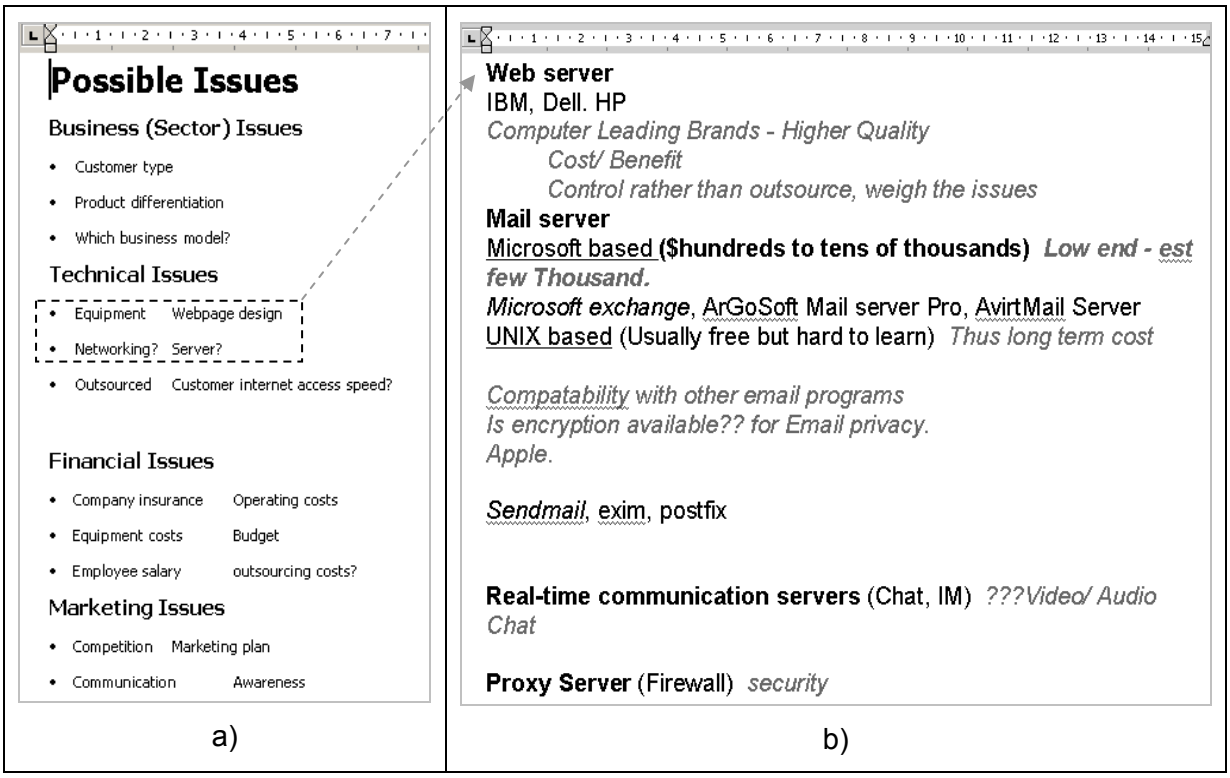

Figure 6-5: A Shared document - a) after the first meeting and b) after the third meeting

These improvements enabled the group's conversational and text manipulation activities to be more tightly coupled than previously (i.e. without application sharing) e.g. switching between: slides, a whiteboard and saved snapshots. Research shows that tight coupling between work and communication space has positive effects on the formation of a shared

understanding and efficient coordination of collaborative actions (Cherubini & Dillenbourg 2007).

Using a shared editor was a much simpler process than the previous combination of slides-whiteboard-screenshots. For their sixth meeting using the shared editor, however, the group took a rather different approach and started with a blank document. The ability to build on previous meetings' outcomes, by continuing with the document produced during the last meeting, was only recognised later. Prior to the seventh meeting then, the group began to compile everyone's updated sections, which then became a master document for all subsequent meetings.

Though one might argue that experimenting with the whiteboard was an unnecessary detour, this is not necessarily the case. Whiteboard space and shared documents can be used for clearly distinct purposes:

- issues concerning the structure or the flow of the argumentation would be best discussed using the whole document, while
- issues that are limited in scope or whose informational basis is separate from the text in the case report can be discussed on a whiteboard (e.g. checking on a cost comparison table or sketching a pie chart to illustrate the ratio of different revenue streams).

However, after the group began working with the shared editor they only used the whiteboard on one other occasion.

The question of whether groups have the necessary flexibility to deliberately make use of a variety of features from the Centra environment cannot be answered on the basis of this pilot study, where changes in media usage were mainly suggested by the researcher. One might even question whether such flexibility is useful: Huysman *et al.*(2003) concept of '*media stickiness*' certainly appears to argue the contrary. 'Media stickiness' suggests that distributed teams develop usage routines during the early stages of group work, which are then seldom abandoned, even when a new usage pattern is likely to be more efficient. The conclusion drawn by these authors is that it is crucial to implement optimal communication patterns at the outset of group work because of the difficulties in changing them at a later stage (ibid).

Next, the second issue to be tested in this pilot study is addressed, i.e. the reliability of the virtual meeting room in terms of delayed communication or interrupted sessions.

6.1.4 Application reliability

Switching from the whiteboard scenario to the shared application scenario also implied a heavier load on the comparatively narrow bandwidth of students with dial-up Internet

connections. Hence a further concern was whether the Centra application could support online collaboration reliably.

Audio quality and screen synchronisation

According to the Server Log-files, at no time did a Centra meeting drop any participants[51]. Troubleshooting was mainly undertaken to improve audio quality or synchronise Centra's content area. Low audio quality was addressed by using Centra's Audio Wizard, where students could fine tune the sensitivity of their microphones or switch between hands-free audio (using voice activation) and key-triggered speech (participants need to hold down the Ctrl-key to speak) (Driscoll *et al.* 2004). It was recommended that students avoid hands-free audio if too much background noise was being picked up. Further, only participants with headset-microphones (as opposed to laptop or PC integrated microphones) were to use voice activated microphones, to avoid audio feedback.

Synchronisation problems occurred if participants had different screen resolutions, in which case the person with the lower screen resolution would only see parts of the shared application or document. In this case the application had to be resized until all participants had verbally confirmed they could see the full size of the remote host's application.

Delays due to hidden activities and high network traffic loads

In order to determine what delays occurred in Centra meetings, pause lengths have been measured in three 15 minute snippets, taken from different meeting recordings (Table 6-3).

Table 6-3: Voice delays in e-CBL related case discussions

	3rd Meeting (21.04.2005)	**4th Meeting** (26.05.2005)	**Meeting (E1)** (07.05.2007)
Episode Length *	15:27	14:36	15:07
Average Length of Pauses	00:21	00:10	00:11
Min. Length	00:02	00:01	00:03
Max. Length	02:24	00:44	00:34
Speech Ratio	42 %	56 %	76 %

* All times are indicated in min : sec

[51] The future roll-out will confirm the stable performance of the Centra application, drop-outs occurred at a rate low enough to ignore.

Recordings were loaded into a ELAN[52], a linguistic annotation tool which enabled quick, 'on the fly' segmentation into speech and pause sections, marking the beginning and end of a pause with a single key stroke. The corresponding timeline was then used to generate the descriptive statistics shown in Table 6-3. Ruhleder and Jordan (2001) investigated the impact of technology induced delays on audio communication and found that delays of as little as one second can jeopardise participants turn-taking requiring repair mechanisms to avoid or minimise misunderstandings.

The average length of pauses in all three meeting samples was 21, 10 and 11 seconds (although there were some widely varying maxima and minima, especially in meeting 3). During meetings 3 and 4 the pause lengths were caused, at least to some extent, by one group member who needed to type his answers in a chat window since his microphone was not working. However, the outcomes of a group where all participants communicated via audio (7th meeting of Team E1, Sp2 2007) did not reduce the average length of a pause. Looking at particular instances it became clear that Centra meetings are multitasking events: members were consulting the course information booklet, distributing a file via email, or searching the Internet for answers (e.g. the question 'what percentage of the Chinese population has access to the Internet?' was answered on the spot). Hence a pause within the Centra environment did not necessarily imply a pause in meeting activities. What helped to increase flow in Centra meetings (see *speech ratio*) was an increasing parallelism of activities that could be observed in later meetings, e.g. a member who was checking information on the course homepage encouraging the group to carry on with the discussion, or having one person taking notes while someone else was explaining their thoughts on the case.

The minimum length of a pause in all three samples never fell below one second. This became particularly obvious in conversations where one would usually expect an immediate response. For example, a question like 'Do you have a printed version of the latest case report in front of you?", would not normally require time to reflect or formulate an elaborate answer – so a delayed response can be disconcerting. Tang and Isaacs (1992) reported that even an average delay of 0.57 sec caused frustration in distributed work teams, which finally switched to speaker phones to resolve this problem.

These findings align with those of Clark and Brennan (1991), who argue that understanding in conversations is bound to a precise timing of utterances. Small delays in feedback make it difficult to identify which part of a sentence requires further explanation and unexpected delays may wrongly be interpreted as hesitating or having difficulty in

[52] For a more detailed Introduction of ELAN see Section 6.4.2.

commenting on an issue. Since Voice over IP (VoIP) applications rely on the TCP/IP Internet standards, which were designed for text rather than voice, participants are affected by network transmission delays or lost data incurred by traffic peaks which can cause unexpected interruptions, deteriorating voice quality or even causing the loss of entire sentences (Goode 2002; Markopoulou, Tobagi & Karam 2003). Since perceptible delays cannot be avoided, it is important to call students' attention to the fact that VoIP introduces unintended delays into communication which requires them to change their habitual ways of interpreting pauses, or to adopt delay compensating behaviours and using a more deliberate process to gather feedback (O'Conaill, Whittaker & Wilbur 1993; Ruhleder & Jordan 2001). For example, the group occasionally decided to take turns in commenting on a particular question, in order to overcome uncertainty about who should 'hold the floor' next. .

6.1.5 Outcomes: Process definition and Centra configuration details

In conclusion, the Centra pilot provided some fascinating insights into the use of asynchronous online work environment - although the most relevant insights for this project were those related to the *process* of working collaboratively on teaching cases.

Process Definition

It turned out that a shared editor was more effective than the PowerPoint-Whiteboard combination, allowing the previous 8 steps (Section 6.1.2) two be reduced to 4:

- post individual case preparations to the group's discussion forum,
- merge all preparations into one document which is then shared during the meeting,
- distribute the changed document after the meeting, and
- update any changes of individual sections prior to the next meeting.

Concerns that voice communication and application sharing would result in major delays for students participating over a dial-up Internet connection did not prove true[53].

The results of a short questionnaire distributed at the end of the study period support the conclusion that the virtual meeting room was a value-adding and reliable means of group work support (Table 6-4).

[53] However, several safety measures were put in place. Dial up users were encouraged to use WordPad rather than Word (Office 2003) and it was recommended that, whenever possible, the shared application should be hosted by a participant having broadband Internet access.

Table 6-4: Feedback Survey (n=12, SP2 2005)

		I enjoyed working on the assignments			Having online meetings was particular helpful			The technology supporting group work was …		
	Feed-back rate	strongly agree/ agree	neutral	Disagree/ Strongly disagree	strongly agree/ agree	neutral	Disagree/ Strongly disagree	helpful and reliable	helpful but unreliable	Insuffi-cient
Not using Centra	9 (43%)	50%	17%	33%	67%	0%	33%	33%	17%	50%
Using Centra	3 (60%)	100%	0%	0%	100%	0%	0%	100%	0%	0%

The main purpose of the feedback survey was not to compare student feedback in relation to the technology used, but rather to obtain additional and more objective data than the researcher's own observations during the pilot study could hope to be. The consistent positive feedback of the Centra group and the mixed feedback from learners using text-based communication, however, need to be interpreted with caution. The 'Hawthorn effect' suggests that groups which receive increased attention or participate in novel practices can improve their performance independently from any performance-improving conditions (Diaper 1990). Groups using text-based communication required far less attention from the researcher than did the Centra group, which received continuous support for its group meetings. Further research is therefore needed in which the researcher's presence is reduced and the collaboration technology is used for a longer time to mitigate the novelty effect of the new technology.

With regard to the influence of the researcher, or the novelty of an intervention, Brown (1992) argues that, unlike traditional experimental research, educational design research does not aim to disentangle the effects of multiple confounded variables. If part of an educational technology's success is its novelty or the increased attention linked to its introduction, this is an acceptable outcome which can be seen as part of the solution. What happens is that technology not only enables change in student interactions but also changes how they think about their own learning (Jackson 2004).

Configuration details

Remaining issues from the pilot study are mainly related to streamlining administrative processes in the background and introducing the technology in such a way that groups can handle most of their problems by themselves.

- *Installation and configuration issues on local computers*

It became evident that few students used the Centra user manuals and instead relied primarily on the information given during the introductory session. However, issues

concerning the installation of the Centra client had to be solved by the students themselves. Several help pages were therefore created so that students could check whether they had the latest Java Version installed, or whether a firewall was impeding their connection to the Centra server, etc.

- *Session management*

During the pilot study groups negotiated their next appointment and informed the online tutor, who then made the Centra booking in the system by reserving the necessary number of seats for the planned meeting duration. Administering meeting reservations for more than 10 groups would, however, imply a considerable additional workload for the online tutor, especially in the case of groups groups requesting the postponement of a meeting at short notice, or wishing to have a last-minute meeting shortly before an assignment is due.

The solution to this problem was to define Centra sessions as 'ongoing', i.e. after the course started this session would be accessible for the following 13 weeks. This way groups could have meetings at any time 24/7; and would not require any further administrative support. In fact, this way groups could also 'individualise' their virtual meeting rooms by uploading screenshots, due date lists, or process descriptions which would be still available during subsequent meetings. The downside of declaring a session as 'ongoing' is that no actual seats are reserved. However, the risk to the requirements of the University's license, which allows for 70 concurrent users, was considered negligible since learning groups consisted of only 4-6 students; and only on rare occasions did more than three groups access their virtual meeting rooms simultaneously[54].

- *Voice activation and full-duplex audio communication*

To increase flow in Centra meetings, minimise delay and create a more natural communication environment, full-duplex communication (i.e. users can speak and hear at the same time) should be enabled for all meetings. Technically, a meeting can be set up to allow for up to four concurrent speakers (Driscoll *et al.* 2004). This way learners can make use of back-channel communication (e.g. 'm', 'huh', 'yeah') to express approval or doubts without interrupting each other, as they do in face-to-face discussions (cf. Clark & Brennan 1991).

Building upon the design experience gained during the pilot study, the second research iteration was able to take full advantage of the benefits of a richer communication medium. However, as indicated in the e-CBL development matrix, media competencies

[54] This solution was only possible, however, because no other course made extensive use of the Centra system. The simultaneous implementation of Centra for multiple courses would place such a load on the University that a significant extension of the licence might well be necessary.

are only one area where students need to develop adequate skills. The other area concerns their method competencies and is discussed in the following Section.

6.2 Design Intentions

This Section describes the second research iteration, designed to test how the e-CBL development matrix could be applied to a course design and what impact it would have on students' learning. The e-CBL development matrix, originally presented in Chapter 5 (Figure 5-4) and summarised in Table 6-5, shows the progress of individual learners as they develop method and media competencies – both as individuals (e.g. building up their own critical thinking skills) and as group members (e.g. being critical and attentive listeners to what the group suggests).

Table 6-5: Skills within the e-CBL development matrix

	Individual Context	**Group Context**
Method Competencies	critical thinking ⟷	process and meeting coordination ↕
Media Competencies	ICT literacy ⟷	developing social presence/ group cohesion

In the previous research iteration, design intentions were structured by design areas (groups, tasks and technology). The e-CBL development matrix, however, suggests it might be preferable to discuss design specifications in accordance with the competencies they support. The next table provides a summary of which design area targets which e-CBL skill, but its main purpose is to represent design decisions taken for this particular course – so that other possible combinations of designs and skills can be imagined (Table 6-6). For example, there is no obstacle to designing a training session in critical thinking (Van Gelder 2005), combined with specific technologies scaffolding a critical debate through prompting argumentative categories (Van Gelder 2001). Alternatively, a course designer could decide to support group coordination through a shared calendar function, such as that offered by Google (www.google.com/calendar, accessed 11/11/07).

Naturally, however, not every possible design support was used: primarily because e-CBL is a means to an end, i.e. the time allocated to the introduction of learning methods and learning technologies had to be balanced against the time available for students to discuss their e-Business case studies.

Table 6-6: Design areas and supported skills

Design Area / e-CBL Skills	Training	Task scaffolds, Assessment	Script	Technology
ICT Literacy (6.2.1)	X			
Process and Meeting Coordination (6.2.2)		X	X	
Critical Thinking (6.2.3)		X	X	X
Developing Social Cohesiveness (6.2.4)				X

The e-CBL development matrix proceeds from individual skills (ICT literacy and critical thinking) to group skills (developing group coordination and group cohesion). However, when groups began to collaborate, their first decisions concerned technical and organisational aspects of the task, e.g. when to meet and what technological support to use. The researcher's experience from the pilot study suggests that group discussions gain in depth once group members have reached a minimum level of comfort with the technological environment and with one another. Consequently, *ICT Literacy* support (Section 6.2.1) and *Process and Meeting Coordination* (Section 6.2.1) are addressed first to reflect the sequence in which different designs are experienced by learners.

Course demographics and learners' prior experiences

Course demographics[55] indicated a similar student population as in the previous research iteration (SP7, 2004): the relation between female (49%) and male students (51%) was balanced, one third were international students; and the majority of the students (65%) were between 18 and 25 (Table 6-7).

Table 6-7: Age distribution of students (SP7 2005, n=45)

Age	Students	Percentage
18 - 25	29	65%
26-35	10	22%
36-55	6	13%

[55] See Appendix E.2 for an overview of all demographic data across all study periods included in this research.

One section of the entry questionnaire (Appendix B.1) was dedicated to students' previous learning experiences. The results seemed to justify the need for a more comprehensive approach towards facilitating e-CBL:

- 82 % had no prior experience with online learning.
- 42 % had no experience with case-based learning and 54 % had little experience (< 4 case studies).
- 53 % described their previous group work experiences as enjoyable, 29% found them unpleasant; and 18 % could not describe this or had no experience.

Based on the limited experience students brought to the course, the researcher decided groups would need time to familiarise themselves with the learning method and the virtual meeting room, suggesting these two new experiences should be introduced sequentially rather than simultaneously.

6.2.1 Training for ICT literacy

The first skill addressed was ICT literacy – a term often used to refer to people's ability to use digital devices, software; and related infrastructures such as the Internet or databases (Markauskaite 2006).

The research on e-conferencing tools reported in Section 3.2.2 argued that today's students are mostly comfortable with electronic communication media (e.g. instant messenger, podcasting) and may already have a highly active extra-curricular online life on social networking sites (e.g. Facebook, MySpace, Friendster and Xanga). Prensky (2001) uses the term 'digital natives' in referring to today's students. However, a recent survey of 2,588 first year students (Kennedy *et al.* 2007) suggests that expectations about incoming students' familiarity with new technologies might well be overly optimistic; and warns that universities need to cater for students with very diverse technological skills.

In order to identify the technological background knowledge students would bring to the virtual learning environment, they were asked to checkmark every application they had used at least once (Table 6-8). The data gained from the entry questionnaire presented a similar picture to that reported by Kennedy *et al.* (2007), with word processing, searching the Internet and creating a presentation being skills almost all students had, while experiences with Internet-based applications were less frequently identified.

Table 6-8: Students ICT experiences prior to course beginning (SP7 2005)

Application or Service used at least once	Entry Questionnaire (SP7, 2005), n=45	Net generation survey (Kennedy *et al*, 2007), n=2,588
Word	100 %	n.a.
Searching the Internet	100 %	96 %
PowerPoint	89 %	89 %
Using the University's online library	80 %	n.a.
Using an Instant Messenger	62 %	77 %
Creating a Webpage	31 %	n.a.
VoIP such as Skype	n.a.	26 %

A major goal in helping students gain familiarity with novel aspects of their learning environment, was achieving a sufficiently robust level of ICT literacy early on, to assist them in running their online meetings independently. Martin (2000) differentiates between two levels of ICT literacy, going from *practical* to *reflective* competence. The former focuses on how to apply ICT at a technical level, while the latter emphasises the ability to critically evaluate ICT in accordance with the requirements of the situation.

Reflective ICT competence needs to be integrated into the learning process as a means to an end and cannot be taught in isolation (Markauskaite 2006). Ideally, ICT literacy becomes a part of self-directed online learners, who analyse their own situation and can choose and combine different communication channels with fluency as the need arises.

Means of support

Based on the experiences gained during the pilot study, practical literacy was supported by an introductory Centra session, during which all group members practiced basic activities such as:

- using the Centra interface effectively,
- starting a text chat in case of difficulties with the audio communication; and possibly using voice activation (hands-free speaking),
- sharing a document in WordPad and taking notes, and
- recording a session and accessing the recording over the web.

In contrast to the introductory session held during the pilot study, no slides were used this time. Centra sessions were, instead, introduced in a highly interactive way. Nonetheless,

as a backup to the introductory session, annotated screenshots for each step were provided to students before the session so that they had a concise overview of how to use Centra (Appendix B.2). The average time required to introduce Centra was around 30 minutes, after which groups were encouraged to start straight away on their first case study, sharing whatever preparations they had already done. Additionally, solutions to more frequently occurring problems were captured on an online help page (e.g. How to access advanced microphone controls in order to boost audibility.)

Part of the introductory session was dedicated to the discussion of system requirements, the limitations of Centra and typical interaction during case discussions – so that ICT literacy could be brought to a reflective level. Even if these discussions had only limited success, this step was seen as an important preparation for students, since many of them would access text chat or Centra meetings from a variety of settings (workplace, home, hotel room, etc.). If they had a general understanding of: (a) Centra's system requirements, (b) the relationship between audio quality, bandwidth and their local audio settings; and (c) security measures such as firewalls or the ban on using java applications on workplace computers[56], they could anticipate whether they would be able to join a meeting or, when this was not possible, identify an appropriate alternative venue which would allow them to join their group's online meeting.

6.2.2 Coordination through scripts

This Section discusses what design measures supported the coordination of asynchronous as well as synchronous e-CBL activities. ICT literacy training targeted skills that enable students to support their interactions by means of differing technologies. A focus on the group's internal coordination, by contrast, was designed to support them in getting started quickly and applying the case-based learning method in a systematic way.

Salomon and Globerson (1989) have shown that good coordination skills improve outcomes of collaborative learning. Coordination skills are also important for pooling the distributed expertise of group members more efficiently (Hmelo-Silver 2004; Rutkowski *et al.* 2002).

Malone & Crowston (1990, p.361) define coordination as group members' *skills in managing the interdependencies between multiple activities necessary to achieve a shared objective*. When looking at coordination processes in e-CBL, a general distinction is made between coordinating activities, responsibilities and resources outside of meetings (*macro*

[56] Virtual collaboration and telecommuting, while reducing costs and increasing productivity, also presents a security issue, which requires companies to integrate virtual communication channels into their existing security policies (Chen, Volk & Lin 2004).

coordination); and the coordination of interactions during a meeting (*micro coordination*) (Clark & Schaefer 1989; Rummel & Spada 2005). Both forms of coordination have an impact on learning efficiency, complement one another, and can be supported though similar means.

Means of support

Collaboration scripts are a common way to support coordination in electronic settings (Dillenbourg 2002). Scripts are meant to increase the occurrence of pedagogically desirable interactions and to decrease the amount of 'unproductive' interactions, which distract from learning (ibid). Scripts may contain specifications of: (a) individual and group activities, (b) the sequence of activities, (c) the necessary roles and responsibilities (d) any required resources; and (e) the rules that regulate variations of a script during run-time (Dillenbourg & Tchounikine 2007; Kobbe *et al.* 2007). Means by which scripts can be implemented are varied and can take a more or less flexible form, ranging from learners' internal process understanding (cognitive model) or the group's process understanding (social structures), to external process descriptions (action plans) or process help systems (computer-based prompts) (Stahl 2007). Typically, coordination scripts are based on an ideal model of communication (O'Donnell 1999), problem solving (Paul 2000) or social interaction (Weinberger *et al.* 2005). The level of flexibility required for instructional support for collaboration depends on what learners are meant to learn. If, as was the objective of e-CBL, students were intended to develop 'softer' skills such as coordinating a group effort or facilitating critical argumentation (Section 2.1.3), they must be allowed to make errors through which they can learn. This, in turn, suggests more flexible forms of scripting activities. Drawbacks of hard-wired collaboration scripts are (a) they prevent students from reflecting about their collaboration processes, because in most cases they prevent changing the collaboration script, and (b) they assume that an instructional designer could develop the best possible collaboration script without knowing the group's actual situation (Hesse 2007). The question of automated group coordination is the extent to which students can learn about coordinating group activities if they merely follow the prompts.

As with the distinction between practical and reflective ICT literacy (Section 6.2.1), the coordination of e-CBL has both a practical component (How to gather, discuss and synthesise the knowledge of different group members), and a reflective component (How to improve coordination in order to improve the group's collaborative outcome).

Based on the above reasoning the researcher decided on a flexible script in the form of a textual description of the different steps of e-CBL, together with recommendations about which communication tools to use and what effort in time to expect. Learning activities

were scripted at two different levels of granularity (Dillenbourg & Jermann 2007): a macro-script scaffolded the phases of e-CBL according to the Harvard method (Section 2.1.4); and a micro-script sequenced specific tasks groups were required to address during their meetings.

Macro-script

The *macro-script* allowed two weeks for each case discussion (Figure 6-6), not including the time for studying the case individually[57]. During the first discussion week all group members were required to upload individual preparations and discuss the case. During this time all groups could use their own forum, chat and virtual meeting rooms. At the end of this week a case report had to be submitted.

At the beginning of the second week, all case reports were uploaded into a case discussion forum accessible by the entire class (i.e. all online groups). Students had to choose two case reports (excluding their own) to discuss. Discussion criteria followed the principles of critical thinking (another design area explained in the following Section of this Chapter). Since external students have widely varying working hours and time zones, it was only possible for small groups to meet synchronously, so that the discussions of the various group reports during the second week took place asynchronously.

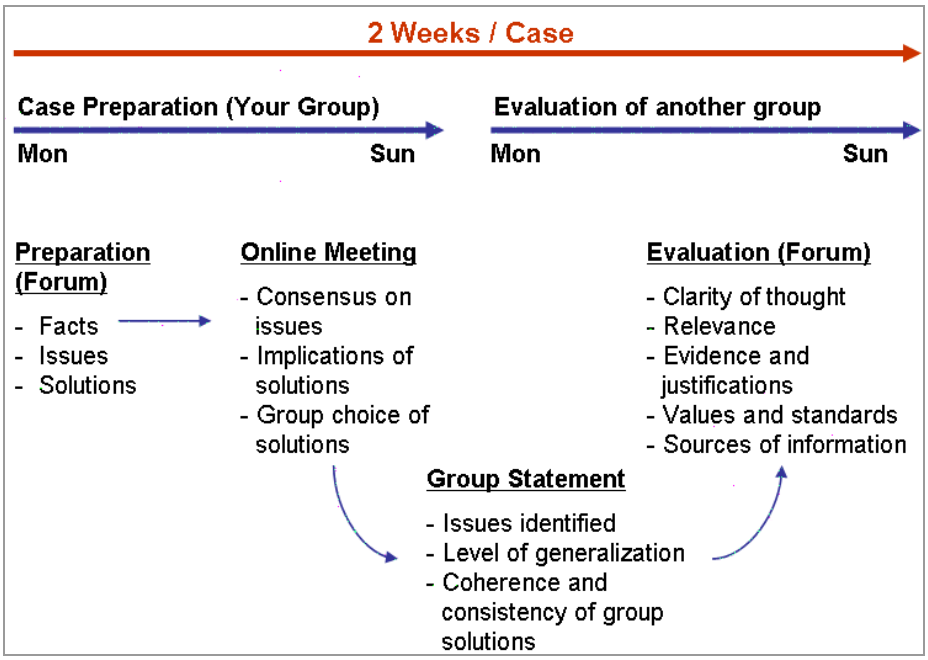

Figure 6-6: e-CBL Macro-script (copy from course homepage SP7 2005)

[57] A complete description of the Macro- and Micro script is available in Appendix B.3.

In terms of the logistical aspects of collaboration, groups were formed on the basis of their availability for online meetings, as indicated at commencement of the course. This helped to minimise the initial effort to agree on a common meeting schedule and catered for learners' need for flexible arrangements that matched their work and family lives (Kazmer & Haythornthwaite 2001).

Micro-script

The micro-script concerning the synchronous discussion of a case was based on recommendations from Mauffette-Leenders *et al.*(1999, p.67):

- determine a meeting facilitator,
- start the meeting by reviewing the case issues,
- analyse the case issues,
- formulate a coherent set of solutions; and
- plan the next meeting.

At this stage the micro-script was not seen as a means to ensure high quality case discussions, but rather to provide students with a general meeting outline which would reduce the complexity of the task. Gragg (1940) argued that case-based learning may initially provoke anxiety and confusion because of the myriad of possible interpretations and no firm direction on the issues – although in experiencing how cases can be solved independently, building upon one another's input, students should become increasingly more self-confident. The idea of using scripts was also motivated by the experience during previous course offerings that short and concise process recommendations were more likely to be used than extensive descriptions of a learning method[58].

Another purpose of micro-scripts was to promote complete chains of argumentation. A review of how students analysed teaching cases revealed that one of the major deficiencies was the lack of rigour and coherence in their argumentation processes (Wolfe 1993). The discussion of problems was not necessarily based on the facts provided in the case materials and solutions offered did not always connect with the problems identified. Moreover, these researchers' experience with in-class case discussions suggested that case discussions rarely proceeded in an orderly fashion from facts, to issues, to alternative solutions and, finally, to recommendations. Students might start with a problem or a final recommendation, in which case they had to look for evidence, connecting issues

[58] Nonetheless the latter was also provided, e.g. the course homepage contained Chapter 4 of Mauffette-Leenders et al.'s (1999) book 'Learning with cases', where small group discussions are introduced more comprehensively.

or solutions to the facts from the case. Consequently, the micro-pattern was presented as a circle that could be entered at any point, but whose logical steps had to be completed to form a coherent argument (Figure 6-7).

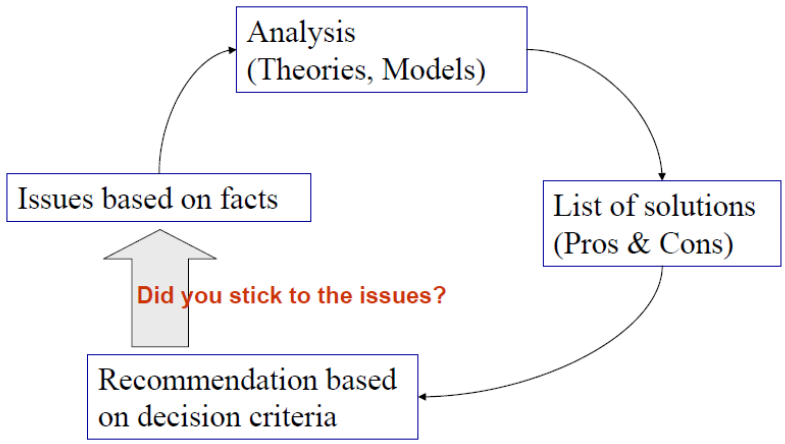

Figure 6-7: Case analysis circle (copy from course homepage SP7 2005)

When students are involved in an online meeting or thinking about their case discussions, scripts should provide them with a quick-to-grasp shorthand for the essential steps of e-CBL. The simplicity of the e-CBL macro-script (Figure 6-6) was achieved through minimising the number of steps and 'chunking' these into coherent phases (cf. Merrienboer, Kirschner & Kester 2003; Miller 1956). Dillenbourg (2002) reported that simpler scripts were more easily understood, memorised and internalised. Internalisation is an important pre-condition for transferable learning outcomes, i.e. applying a discussion script outside the online course environment.

6.2.3 Scaffolding critical thinking

Critical thinking is arguably a major learning objective for higher education institutions and considered one of the 'key skills' in management and information science education (Pithers & Soden 2000; Visser, Visser & Schlosser 2003). Definitions of critical thinking refer to either a process or a set of skills and attitude (Dick 1991; Fischer 2004). A definition by Pithers & Soden (2000), for example, suggest four main skills required by critical thinkers: (1) being self-directed, (2) being able to identify worthy questions, (3) being able to question knowledge; and (4) being able to argue logically, based on evidence. Other definitions identify critical thinking as 'reflective thinking' (Ennis 1989) or 'thinking about thinking' (Paul 2005). Synthesising the many available definitions, '*critical thinking*' in this thesis is understood as the *process of creating and evaluating knowledge in an autonomous, reflective and rational way.*

Critical thinking is closely related to how collaboration and interaction are valued. Forman and Cazden (1985) argue collaboration can simply mean combining efforts to reach a shared goal. Similarly, Dennis (1996) found that sharing information did not ensure that group members would also process and use the available information. Collaboration based on critical thinking, however, adds a quality dimension in that collaboration is not only about sharing individual knowledge but also includes evaluation and integration of individual insights into a wider group knowledge (Barron 2000). The attempt to integrate knowledge stimulates the necessary cognitive conflict which initiates changes in the individual's mind (see Piaget's theory on the adaptation of cognitive structures introduced in Section 2.2.2).

Means of support

Students approaching their first case tend to be overwhelmed by the uncertainties of the expected process, not yet understanding what it means to discuss a case or to apply critical thinking (Tan 2004). If left without guidance, a problem- or case-based learning method can easily fail because students do not engage with the task, addressing problems only at a surface level (Saye & Brush 2002). Moreover, if students are to apply critical thinking, the question arises of what motivates students to engage in critical thinking. Finally, critical thinking creates additional cognitive load (Kirschner, Sweller & Clark 2006). These authors caution that learning methods which disregard the limitations of the human working memory, i.e. its limited capacity to process large amounts of novel information, are less effective. Consequently, design efforts to support the development of critical thinking skills include:

(a) Conceptual clarification and scaffolding of critical thinking;

(b) Including critical thinking into the assessment rubric; and

(c) Providing technologies that allow for active cognitive load management.

(a) Conceptual clarification and scaffolds

In Section 5.5.2 critical thinking was suggested as a means to avoid shallow case discussions and add depth to the analysis of case issues. However, before the process of critical thinking can be scaffolded it is necessary to introduce the concept in such a way that students understand the benefits of a critical approach. Consequently, the question 'What does it mean to think critically?' was addressed early in the course.

The basis for this discussion was a course reading (Paul 1993), where it was suggested that critical thinking depends on analysing and assessing the different elements of thoughts, which include (a) the purpose of thinking, (b) any underlying assumptions, (c) the decisions about what is relevant; and (d) references to theoretical or empirical

warrants. In anticipation of the role critical thinking should take in the context of e-CBL, students were asked to consider these elements during their case discussions.

In what ways can critical debate benefit from scaffolding? Scaffolding is closely related to Vygotsky's (1978) notion of the 'zone of proximal development' (ZPD – see Section 2.2.3). The ZPD suggests that through different types of instructional support, individuals learn to master complex tasks which would otherwise exceed their actual performance level. Typically, the role of a scaffold is to simplify a task, either by offering partial solutions or by giving directions that reduce the amount of trial-and-error before a solution is found (Wood, Bruner & Ross 1976).

Collaborative learning groups, might be more interested in getting the task done than in evaluating alternative solutions (Wu, Farrell & Singley 2002). In these cases, scaffolding means promoting a manageable task, so that learners do not get frustrated and can use the scaffolds, but which is also sufficiently challenging that collaboration and critical thinking cannot easily be substituted by the more superficial approach of simply splitting the task without further discussion (Salomon & Perkins 1998; Webb, Troper & Fall 1995).

Originally, the concept of scaffolding was derived from analysing one-on-one tutoring, i.e. a learner receives support from a more knowledgeable expert (Wood, Bruner & Ross 1976). Latter, scaffolding was extended to include interactions between learners and artefacts, e.g. diagrams, templates or software (Sherin, Reiser & Edelson 2004). However, a critical feature of scaffolds is their dynamic application (Pea 2004). Essential to the idea of scaffolding is that the tutor analyses the learner's situation and estimates the amount of guidance necessary to bring a learner closer to the solution. Therefore, tutors need to develop an understanding of the learner's actual performance level in comparison to the desired skill before they can gauge an appropriate intervention.

When applying the scaffolding metaphor to online learning environments, such a dynamic use of scaffolding is seldom implemented (Pea 2004). The choreography of starting or fading scaffolds is often left with the learners themselves, so that the authors speak of adaptable rather than of adaptive scaffolds. Adaptive applications evaluate activities based on an internally specified learner model (Gweon *et al.* 2006), whereas adaptable applications delegate the decisions about use or no-use of the instructional help elements to the learners, who can then choose between beginner and expert interfaces, or start and stop reminder functions in their learning environments (Jackson, Krajcik & Soloway 1998).

How, then, does scaffolding translate into a concrete e-CBL design? Firstly, the critical thinking scaffold provides guidance in form of critical thinking criteria as suggested by Paul (1993) and Dick (1991). This, however, does not yet consider the need to use scaffolds dynamically. To achieve a reflective rather than a mechanistic application of the

criteria listed in Figure 6-8, students can compare their critical evaluations against the tutor's feedback and the evaluations of their peers.

- **Clarity of thought:** Have you understood the group's case analysis and their recommendations?
- **Evidence and Values:** Is the group's argumentation based on sound information (facts) or opinions? Are enough reasons provided to support the final recommendation?
- **Values:** Opinions are not automatically banned: in many cases a group needs to take a firm position in order to propose a coherent solution. You need to evaluate, however, if the group presented their position clearly in comparison to other, potentially competing, value systems.
- **Relevance:** Do you think the group has covered the relevant issues of the case?
- **Sources:** How do you judge the quality of sources used in the group statement? Are their sources trustworthy?

Figure 6-8: Prompts to scaffold critical thinking based on Paul (1993)

(b) Assessment

When it comes to performance measures and weighting schemes for higher order learning, such as problem based learning, case based learning or critical thinking, many variations exist (Savin-Baden 2004). Assessment schemes vary according to instructors' understanding of the skill to be assessed. However, most authors agree that learner evaluation is an important factor in instructional design, in general, as well as for critical thinking in particular (Ennis 1993). Educational assessment influences the entire learning process and viewing it as a mere certification tool would certainly underestimate its scope of applicability (Dochy 2001).

The main questions in the context of collaborative e-learning and e-CBL are:

- What should be assessed? Should case discussions (*process*) and case reports (*product*) be graded?
- The Harvard case method differentiates between three phases: individual preparation, group discussion and class discussion. If the process is to be graded, to what extent should this include all three phases?
- Should critical thinking be assessed? And, if so, which criteria should be used?

Regarding the first question, there is no widely accepted answer to whether process and product or just one of the two dimensions should be graded. Erskine *et al.* (1998) argue that explaining the educational value of the task should be sufficient to motivate discussions among students. Chidambaram and Lai (2005), however, argue that in electronically mediated groups where members have little or no personal relationship, a frequently encountered problem is *social loafing*, i.e. taking advantage of others' efforts. While some group members aim to explore a problem with a maximum gain in learning, others may prefer to solve the case with a minimum of effort, just meeting the assessment criteria (Hogan 1999).

Although students with a strong orientation towards assessment may expect to be graded for their participation in asynchronous discussions or synchronous online meetings, Macdonald (2003) suggests instead that students should learn how their engagement in collaborative activities can benefit their own learning. Students' primary motivation to attend group meetings should be to improve the group's shared understanding of the case, rather than being geared towards a grade for participation. Least useful were students focusing on how to fulfil marking criteria, regardless of whether this would, or would not, advance their group work.

In light of inconsistent findings from studies on effective assessment, the researcher had to make a decision and opted to grade two of the three phases of the case method (process evaluation) and the case report (product evaluation). The two phases assessed were the students' individual preparations, which had to be submitted prior to the group meeting; and the case discussion with the entire class, where students had to critically evaluate at least two other case reports. Case discussions at a group level were not graded, since these meetings were closely related to planning and writing the group's case report, which was the third assessment component. The group's case report was graded with a group mark, but participation in the case preparation or discussion process was graded individually. Marking criteria for contributions to the case discussion were *clarity, relevance, evidence, values and sources* as these had been introduced with the concept of critical thinking (Figure 6-8).

The main purpose of grading individual case preparations was to avoid scenarios where one or two group members would be completely unprepared for the group meetings, hoping to be briefed during the meetings and thus limiting discussion time. Marking criteria for individual preparations were a subset of the critical thinking criteria listed in Figure 6-8:

- postings were relevant to the case,
- issues and recommendations were stated clearly,
- thoughts and data contained references to their sources.

Using the elements of critical thinking as marking criteria served also to instil a critical attitude into the group work. Groups knew how their work would be evaluated by their online tutor and peers; and therefore be more likely to apply these criteria themselves to anticipate and be prepared for any critique (Kuhn 1999).

(c) Managing cognitive load

As outlined at the beginning of this Section, in addition to following collaboration scripts or using a novel application sharing software, critical thinking scaffolds add to the cognitive load of online learners (Kirschner, Sweller & Clark 2006).

However, though powerful learning environments such as Centra initially increase the cognitive effort necessary to carry out electronically mediated interaction they also help to reduce cognitive load by providing the opportunity to 'offload information' into the shared information space (Pfister 2005, p.54). In this sense 'offloading' means reducing the cognitive load necessary to memorise several aspects of a discussion by creating an external representation of the group's thoughts (Fischer & Ostwald 2005, p.215). Changing this representation helps the group capture the state of its evolving understanding, laying the groundwork for the actual writing of the group report.

6.2.4 Affording social presence

The previous sections primarily focused on the rational or cognitive dimension of learner interactions. Theories on collaborative learning and group development, however, frequently emphasise the importance of social or empathic interactions to support group work and critical dialogues (Motschnig-Pitrik & Mallich 2004; Tu & McIsaac 2002). Rourke *et al.* (2001a) conceptualised social interactions in online learning environments under the term 'social presence', which is defined as "the ability of learners to project themselves socially and affectively into a community of inquiry" (ibid).

Additionally, a large body of literature links social interaction/social presence to the development of functional groups (Johnson *et al.* 2002). One of the first integrative group development models was suggested by Tuckman (1965) who argued that groups go through four sequential stages before they become fully functional: forming, storming, norming and performing. Though later research questioned the validity of Tuckman's stages model (Gersick 1988), social presence remains a frequently mentioned factor contributing to the improvement of group performance (Garrison & Anderson 2003).

Why be concerned with social presence in virtual learning environments?

Martinez (2001) notes critically that many cognitive models of learning ignore the importance of passions and emotions, although the way in which learners perceive their situation emotionally significantly influences their *learning outcomes*. Garrison and

Anderson (2003, p.52) argue that *group cohesion*, a consequence of learners' social presence, is essential to sustain an ongoing commitment to the group's purpose, e.g. learning with cases in an efficient, meaningful and enjoyable way. Other research points to the importance of social presence for *creativity*. Hennessey (2003) found that social presence and group well being related positively to members' intrinsic motivation and the development of innovative solutions.

Additionally, social presence has been found to be a strong indicator of how learners judge the usefulness of their online discussions (Swan & Shih 2005). Especially in collaborative learning scenarios where learning depends on critical enquiry, i.e. debating and confirming the meaning of individual contributions, it is important to create a climate that encourages open discussions without turning into "pathological politeness" (Garrison & Anderson 2003, p.53). As with critical thinking, social presence is not an end in itself but rather a means to enhance case discussions: too much social presence would be counterproductive because it could stifle criticism for fear of offending another member of the group (McConnell 2002). However, if presented with due respect, challenging or critical remarks are what advances the group's learning process beyond a mere exchange of opinions (Rourke & Kanuka 2007).

Means of support

The design intentions in this Section are based on the premise that in online learning environments social presence, communities or cohesive groups cannot be engineered, but only afforded through the pedagogically sound use of technology (Goodyear & Ellis 2007). 'To afford social presence' means that technology enables social interactions by creating opportunities which require and allow for social interaction (Salmon 2003, p.33).

Social presence is closely interwoven with the previous three design objectives: ICT literacy, coordination skills and critical thinking. A lack of confidence in one's ability to use the technology or a lack of coordinated group activities can easily hamper (social) interactions. Similarly, lack of critical debate within a group makes socio-emotional statements appear shallow. McGrath (1991) points out, that most groups focus on their *production* function, i.e. managing the fulfilment of the group's purpose. Only second and third do they *support members,* i.e. the integration and compensation of group members; or maintain the group's social structure (ibid). McConnell (2005) observes, however, that groups need a sense of trust in order to produce collaboratively. This leads to the paradox of group work: only if members can depend on each other, they can work independently, i.e. concentrate on 'getting their part done' (ibid).

Based on the above arguments, three design measures are intended to support social interaction and the development of socially cohesive groups:

(a) Opportunities for sharing social information;

(b) Workload planning; and

(c) Rich technologies.

(a) Opportunities for sharing social information

In Salmon's (2003) model of online education, online socialisation is the second stage for online learners, after they have gained access to their learning environment. One way to promote online socialisation (or the idea of a temporary online community) within this course, therefore, was the use of an *'Introduce yourself Forum'*. Students were encouraged to write about their personal backgrounds, what they expected from this course; and whether they had come into contact with some form of e-Business before, in which case they were asked to share this experience. The intention was to show students that some form of self-disclosure was not only possible but necessary to facilitate online group work: "…the more we know about each other the easier it is to relate to each other's comments and actions" (Garrison & Anderson 2003, p.52).

A second way of supporting social interaction was the creation of *discussions at both a group and class level*. Though this was primarily designed to implement core activities II and III of the Harvard method (Section 2.1.4), it also created two different forums for interaction. More active students who felt they did not have sufficient opportunity to discuss e-business topics in their own groups could compensate for this lack when discussing the case with the entire class. Over time, having both group and class discussion was also intended to form group identities, introducing a competitive element into case discussions as suggested by Stewart's (1996) case debate approach. Groups would then argue for their case reports because this was the point of view they had created during their group discussions. A group identity would then function as a motivator for participation (Rogers & Lea 2005; Salmon 2003, p.33).

(b) Workload planning

The development of social bonds in online environments takes time and, according to Walther (1996), more time online than off-line. Thus, creating opportunities for social interaction is only a first step which needs to be accompanied by the conscious allocation of time to the development of social relationships. Otherwise, groups might feel the urge to jump into production mode straight away and the lack of a social glue, i.e. trust, respect or empathy might become apparent only later if performance expectations are not met (Swan & Shih 2005).

As a means to control the complexity and the level of novelty online learners would have to cope with, course activities were designed in such a way that the first four weeks

(Cases 1 and 2) were mainly dedicated to practicing the Harvard case method and related concepts (e.g. critical thinking) as well as to becoming adapted to online group work and fellow group members (Figure 6-13). The area above the curve indicates the timing of introducing several *communication media*, starting with a test of whether the necessary version of Java was installed and whether the University's chat application could be accessed. The area below the curve shows the various steps by which the *e-CBL method* was implemented.

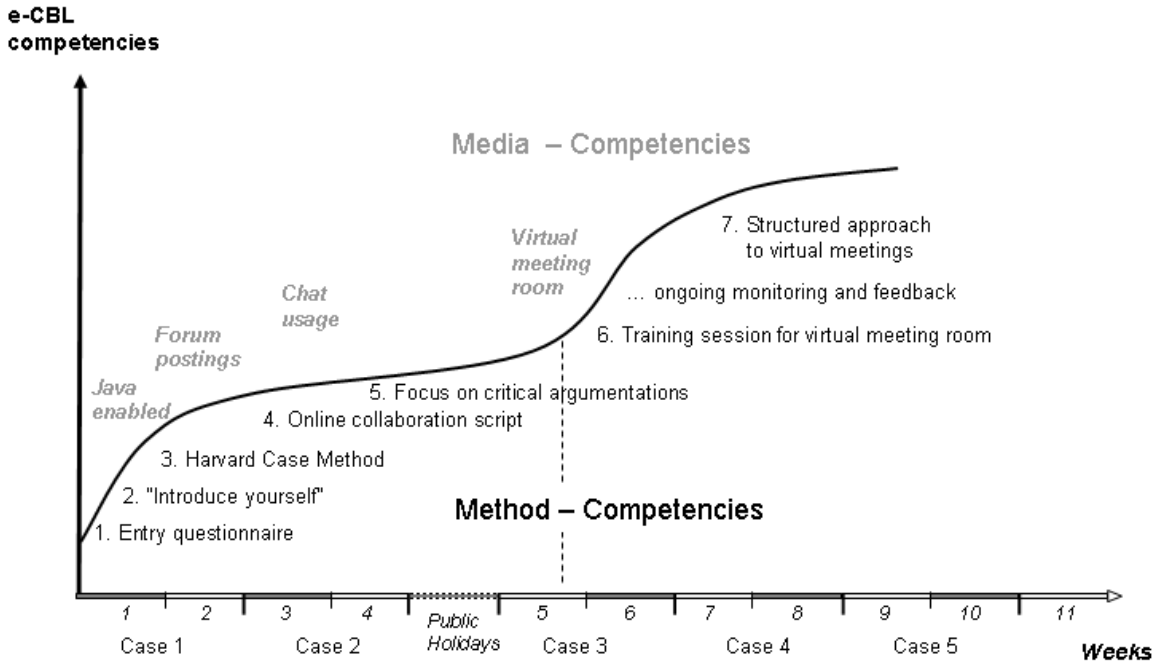

Figure 6-9: Workload planning (SP2 2005)

The Christmas holidays before week 5 offered a natural break, after which groups were expected to start using their virtual meeting rooms (Centra). By this time, it was assumed, group-specific approaches to case discussions had been developed and could be transferred into the richer learning environment of Centra.

The intended gradual increase of e-CBL competencies shows a steeper rise in weeks 1 and 2 as well as in weeks 6 and 7. This reflects the fact that technical mastery is built up faster than reflective mastery (Section 6.2.1). The researcher had argued that reflective mastery resides in the ability to contextualise a skill. For example, a group will relatively quickly be able to run a chat session (*technical mastery*) but may need a number of meetings to recognise which issues to address in a meeting and which need to be dealt with through email following the meeting (*reflective mastery*).

(c) Rich technologies

Research on 'media richness' frequently refers to the link between increased media richness and increased social presence (Section 3.3.2). The two main constituents of social presence are immediacy and intimacy (Short, Williams & Christie 1976):

- *immediacy* builds upon mechanisms to establish a shared meaning, e.g. eye contact or gesture, while
- *intimacy* depends on the possibility of indicating emotional distance or closeness between speakers.

Synchronous communication, though text-based, is intended to increase immediacy (Murphy & Collins 1997). The fast turn-around time of text messages heightens learners' sense of involvement through more reciprocal communication (Section 5.3.2 identified that more reciprocal communication took place in chat rooms than in forums). In addition, the later introduction of voice communication through Centra was intended to add an additional layer of expressiveness to convey individuals' affective or preferential attitudes. Tone of voice is often important in detecting whether someone is stressed, anxious or simply joking (Mehrabian 1981). As with sharing personal information, tone of voice is a means of disclosure, creating social presence (ibid).

This Section has outlined design measures for each competency targeted by the e-CBL development matrix, namely: critical thinking, ICT literacy, coordination skills and group management (see Table 6-5). All design measures have been linked back to existing findings in pertinent areas. To what extent the application of these findings to the current educational design has been successful, will be examined by the following analysis based on the three stages of the hermeneutic arc.

6.3 Surface Interpretation

In analogy to the first research iteration (SP7, 2004 – described in Section 5.2), the surface interpretation reviewed the general activity level of the online course and found a scarcity of synchronous meetings, a phenomenon which was then analysed in more depth by comparing synchronous and asynchronous interactions. A similar approach was taken for the second surface interpretation of SP7, 2005. A general picture of the groups' online activities is now presented in order to identify promising instances of online interactions that can lead to richer insights.

However, from a hermeneutic point of view, it is pertinent to mention that, for this second research iteration, not only did the course design change but also the researcher's own engagement with the theory. The developmental matrix presented at the end of Chapter 5 influenced the way 'first impressions' were formed. A similar effect can be found in the

progressive advancements of design research. According to Hevner *et al*. (2004) and Carlsson (2005), progress in design research includes new models and frameworks which improve researchers' and practitioners' ability to pinpoint and analyse problems more effectively.

Additionally, the introduction of a new communication technology (Centra) further increased the complexity of the online group work to be observed. Therefore, the surface interpretation in this second research iteration addresses more issues than did the first, since the researcher brought more expectations and presuppositions to a richer set of data.

The surface interpretation starts with students' first steps in the online course, namely introducing themselves to one another and testing their access to the various synchronous communication technologies (Section 6.3.1). After that, the activities of each group are visualised and interpreted in order to identify groups whose interaction processes justify further in-depth analysis (Section 6.3.2).

6.3.1 Gaining access: Socially and technically

When students begin an online course they will naturally explore the course homepage for information on assessments, course materials and communication tools. However, with their enrolment in an online class they not only gain access to a network of digital tools and materials, but also to a social network of peers, tutors and course managers (Haythornthwaite 2001). Collaborative learning depends on students being able to operate within both types of networks, exchanging information and building relationships with their peers. This Section specifically looks at how students started networking at a social as well as a technical level.

Initial socialising

During the first week of their course, students were encouraged to introduce themselves in a general discussion forum. To give an example, the researcher introduced himself with three paragraphs concerning his study and work background, expectations for the course and some personal information relating to a non-academic area. The question is what use was made of 'Personal Introductions', i.e. how were they composed or perceived? The data from which an answer to this question can be interpreted are students' personal introductions. All students in the course posted an introduction, although the scope and detail of each account varied considerably (Figure 6-10).

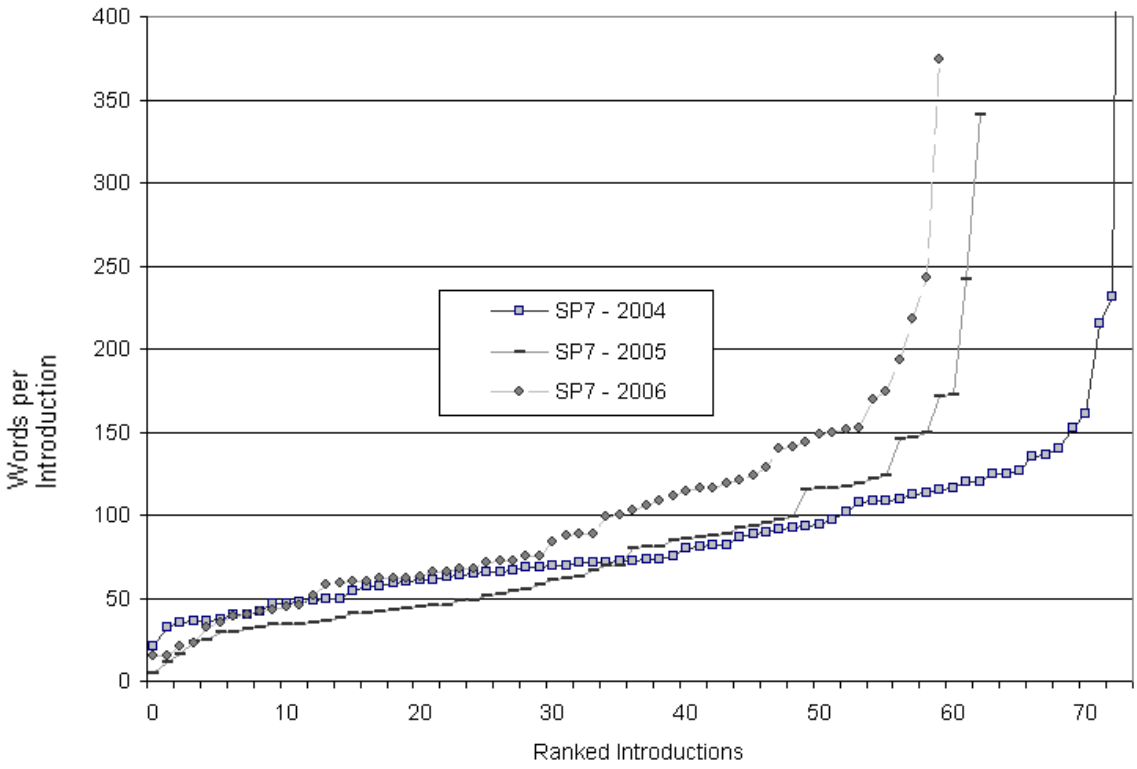

Figure 6-10: Personal introductions (SP7 in 2004, 2005 and 2006)

Students' introductions ranged from one-liners such as "*Hello, my name is Joyce*" to 370 word statements describing previous job experiences, extra-curricular passions and family commitments. Table 6-9 summarises how much students wrote in their introductions[59]. Quartiles separate a set of data into four groups. For example in Study Period 7, 2006, the shortest 25 % of all introductions used fewer than 60 words, while the longest 25% of all introductions include more than 122 words.

Table 6-9: Personal introductions (SP7 in 2004, 2005 and 2006)

	SP7 - 2004	**SP7 - 2005**	**SP7 - 2006**
Lower Quartile	59	41	60
Median	73	62	80
Upper Quartile	109	96	122

[59] The forum 'Introduce yourself' had similar results in all three studies but is only analysed in this Chapter, so that Table 6-9 includes the analysis for all three years: 2004 - 2006.

Some students included concerned or enthusiastic statements about what to expect in the course, such as:

> "This is my first Summer school course, I'm not sure what to expect" or
>
> "I really like the idea of learning via cases as used by this course. I haven't had experience with this before, but I learn best by trying something myself, followed by observing and understanding what others do in the real world."

Others introduced themselves with a humorous note, admitting their unfamiliarity with the learning environment as in a posting titled "*Hi it is not really me!*". In this case two students introduced themselves using the same computer and login so that both postings showed the same sender although posted by different persons. The student explained the incident and concluded:

> "I have plenty to learn in relation to studying on line but had my first lesson today! We have had a good laugh to start us off on the learning process."

Similar variations could be found regarding students motivations for taking the course. For some, it was a core subject they had to take, but had little other link to the subject matter:

> "This is an area I have no knowledge of and feel totally out of my comfort zone!"

whereas others hoped to learn something they could use in their current occupation:

> "I've been doing this for a number of years now, and decided to come to Uni to get a solid foundational knowledge that would 'fill in' some gaps in what I already know".

These introductions revealed parts of the students study context, valuable information for creating a social network and developing feelings of connection with the course. One student, who lived in Scotland while studying this course received the following reply to his introductory posting:

> "It must be fun thinking about summer school subjects at the beginning of a Scottish winter :) There is just something bizarre in that isn't there !"

Even such a comment on the seasons is valuable in creating a social climate that allows for open communication, unlimited by (possibly unconsciously held) rules of what can be posted and what not. As argued in Section 6.2.4, online communities need to develop mutual trust without self-censorship, i.e. no question should be considered too foolish.

As an opportunity to create a platform where participants could present themselves socially, the 'Introduce yourself' was certainly useful: particularly because students were prepared to share personal information. In a later interview, one student noted that he

printed the introductions written by all his group members prior to his first online meeting so that he would know who he was talking to (G3 - SP7, 2005).

Accessing the digital network

No difficulties were reported in accessing course materials or discussion forums, therefore this Section will concentrate on text chat and Centra. One important issue was ensuring students tested their learning environment early enough to allow sufficient time for solving a problem or finding an alternative way of accessing the application. For this reason, an open access text chat and Centra event was configured which could be accessed 24/7 in order to test whether students would be able to communicate with their groups.

In addition, more frequent access problems were discussed in a general discussion forum so that all course participants would learn about the requirements and constraints involved in using the chat and Centra. Developing this awareness of the physical constraints of their online environment was necessary to avoid students being caught by surprise, or not being able to access a meeting they had already planned.

An analysis of how many of the 45 students enrolled in the course actually tested their access revealed that :

- 77% tested chat access prior to the start of group work; and
- 33% accessed the Centra test event prior to week 7, when groups started using virtual meeting rooms.

As expected, the start of the chat sessions was comparatively uneventful, but problems with accessing Centra, were more frequently mentioned – a surface impression that will be confirmed by the interviews reported later in this Chapter. In some cases students opened a parallel chat session to guide a peer through the installation process of the Centra client software. Depending on the student's IT background knowledge and the available bandwidth, the installation process could take between 5 and 20 minutes, because installing the Centra client required a 10 MB download.

Further accessibility problems arose from compatibility issues with other browsers such as Mozilla Firefox (General Discussion Forum, 03.01.2006) or Apple's Mac OS X operating system[60] (eMail 02.01.2006). In these cases many students were willing to use alternative computers (perhaps one belonging to a friend or to the University's computer pools). However, an increased use of the University's computer barns revealed that some machines had had their microphone inputs disabled, so that only the considerably more

[60] Based on this experience, the future course entry questionnaire (SP7, 2006) includes a question about which operating system students used (Appendix C.1).

expensive USB microphones would work with them (eMail 16.01.2006). Fortunately, this problem could be solved at short notice by means of a central script which updated the computer's configuration. .

These examples demonstrate that even when the server application runs reliably, the uncontrolled environment from which students attempt to access their learning application can become a hurdle – despite the proclaimed 'anywhere, anytime access' of electronic networked learning (Jones, Asensio & Goodyear 2000). Using more powerful applications for e-learning implies greater susceptibility to differences and changes in the general IT landscape. For example, Microsoft's introduction of Internet Explorer 7 in February 2005 and Windows Vista in February 2007 put Centra out of action until an updated client software was developed and supported by the University[61].

6.3.2 Doing group work online: Frequency, duration and medium

After the first research study (SP7, 2004; described in Section 5.2.), group activities were summarised quantitatively, separated into synchronous and asynchronous meetings. At that time this approach was appropriate because the main bulk of the information was exchanged asynchronously through forum postings, with the exception of three groups which held regular synchronous meetings.

One year later, in SP7 2005, the variety of course activities had changed considerably (Table 6-10), with synchronous communication becoming a common feature of online group work. No group had fewer than five meetings over the course of 11 weeks. Overall, students in this iteration of the course held a total of 34 hrs of Centra meetings and 31.6 hrs of text chat meetings. The increase in synchronous meetings was accompanied by a decrease in asynchronous communication (while the average learner posted 32 messages in SP7 2004, this decreased to 14 messages in SP7 2005). Besides the fact that learners met online in the second iteration of the course, another possible reason for this decrease could be the more structured design of this iteration: groups were allocated fixed meeting times and the submission of individual preparations for each case was made mandatory. Hence, fewer postings were necessary to coordinate meeting times or call for the input of other group members.

Following the adoption of the more powerful Centra learning environment, two thirds of the groups changed their meeting format from text chat to voice chat and application sharing. However, the accumulated time groups spent in online meetings varied considerably,

[61] To support IE7 took about 8 months (http://support.centra.com/eventshelp.asp#70, accessed 04.12.2006) so that in the meantime students were asked to continue using IE6 and to abstain from changing to the new browser version.

ranging from 2.7 hrs to 5.5 hrs for chat room usage and from 3.1 hrs to 10.1 hrs for the virtual meeting room.

Table 6-10: Learners online activities (SP7 2005)

Group[62]	Members	Postings per Member	Chat Sessions	Chat [min]	Centra Sessions	Centra [min]	Total [min]
1	4	22	3	166	4	186	352
2	5	7	5	285	1	77	362
3	6	11	5	185	8	610	795
4	4	24	4	331	3	264	595
7	5	12	4	206	3	135	341
8	5	10	4	162	1	90	252
9	5	10	5	169	4	271	440
10	4	23	5	258	4	337	595
11	4	8	4	135	1	64	199

Whereas in SP7 2004 the objective of the structural analysis, was a comparison of predominantly chat-using groups vs. predominantly forum-using groups, the SP7 2005 communication habits, shown in Table 6-10, show a more complex picture. The issue was no longer whether to meet online or not but, rather, *how often, for how long and where* to meet (i.e. text chat, Centra or off-line). It is argued in this Thesis that a better understanding of how a particular online learning group makes decisions about the frequency, duration and location of their meetings can assist in further improving design support for e-CBL.

Group processes as Gestalt systems[63]

In accordance with the qualitative, hermeneutic methodology of this study, no attempt has been made to establish correlations between, for example, meeting duration and learning outcomes. However, it is the objective of a *surface interpretation* to identify worthwhile cases for the subsequent *structural analysis* phase. Rather than identifying these instances based on the numerical information shown in Table 6-10, a *Gestalt systems*

[62] After the first assignment, groups five and six had to be merged with groups one and four because the number of active learners in each of these groups dropped below three.

[63] 'Gestalt' is a German noun meaning 'shape', 'form' or 'unit' (http://www.m-w.com/dictionary/gestalt, accessed 05.01.2008)

(Nicolopoulou, Koštomaj & Campos 2006) approach is taken, based on a diagrammatic presentation of these data within their chronological context. Based on the idea of Gestalt systems, the researcher argues that the chronology of events can reveal associations (i.e. an emergent Gestalt) not easily seen in a tabular presentation of data, e.g. how group meetings relate to one another, or to impending submission due dates.

The theoretical understanding of 'Gestalt' was developed in the psychology domain and relates to humans' perceptual organisation as a process of meaning-making (Bruce & Green 1985, p.97). The main tenet of Gestalt theory is that "our perception and understanding of objects and events in the world depends upon the appearance and actions of whole objects and not of their individual parts" (Winn 2003, p.82). In order to be able to interpret group processes as a Gestalt, each group's activities (to the extent they were recorded electronically) are visualised in a diagram (Figure 6-11). The timeline from weeks 2 - 10 is shown on the category axis, the number of postings is indicated on the first value axis; and the duration of meetings is shown on the second value axis. The four vertical, dashed lines indicate the dates on which the group submitted its case report. The different interaction media are symbolised by bars for postings, rectangular shapes for chat sessions and round shapes for Centra sessions.

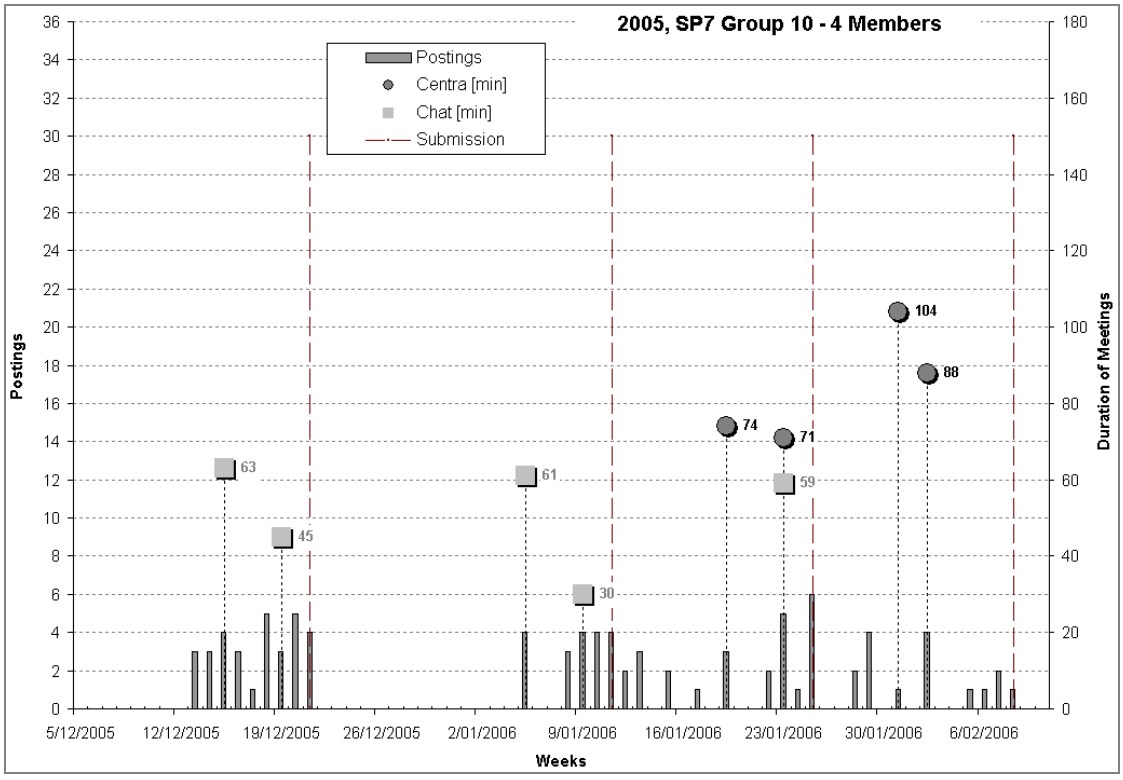

Figure 6-11: Group interactions (Group 10 / SP7 2005)

Gestalt systems and the process of interpretation

Getzels (1985) argues that when problems require novel solutions, defining the 'right' questions from the beginning is as essential as producing correct answers afterwards.

Therefore one of the objectives of surface interpretation is to advance further analysis in productive directions. The moment when a researcher looks at his/her data and 'sees the point' is when a differentiation between 'figure' and 'ground' is made (cf. Bruce & Green 1985, p.99). Salient relationships form a figure and unrelated data fade into the background. Hence researchers can experiment with different figures by bringing different constellations of data points to the fore (Wertheimer 1959). A well known representation of the figure–ground relationship was introduced by the Danish psychologist Edgar Rubin (1886-1951). Figure 6-12 can either be seen as a black vase or as a pair of two white faces. Rubin's vase is a classic example of how a single picture allows for multiple interpretations.

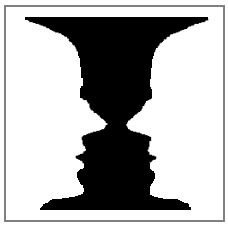

Figure 6-12: Vase or face[64]

Koffka (1935, p.19) argues that Gestalt principles[65], such as figure-ground formations, also apply to thoughts or problem-solving processes. Certain information is taken as background but can deliberately be brought to the foreground. What Gestalt systems suggest is to systematically reframe data that are interpreted (i.e. by changing the spatial boundaries). Aligning Gestalt systems with surface interpretation, the following process is suggested:

- Firstly, an overview chart of all electronic activities is generated for each group. These diagrams can be interpreted from two different perspectives: Either all group activities are seen as one process over the length of the entire course (*Course Perspective*) or they are interpreted as a chain of four different processes, separated by submission due dates (*Due Date Perspective*)[66]. From a Course Perspective, for example, drawing a horizontal line through Figure 6-11 at 70 min

[64] Picture taken from http://en.wikipedia.org/wiki/Rubin_vase (viewed 15.01.2008)

[65] Gestalt principles operate even if we are not always aware of them. Humans group objects according to their proximity, similarity and their ability to form a whole (Bruce & Green 1985, p.101)

[66] The distinction between course and due date perspective was made after the interaction diagrams of all groups became available. The group perspective could be equalled with Tuckman's (1965) four stages model (forming-storming-norming-performing) according to which later case discussions would build upon norms and routines developed during earlier case discussions. The due date view corresponds with Gersick's (1989) transition model, according to which group behaviour is patterned by the immediacy of due dates.

would separate all Centra sessions from all chat sessions. Even though voice communication allowed students to communicate more in a shorter time[67], it is evident that overall meeting duration increased with the use of a richer medium. Possible explanations could be group inefficiencies, the greater attractiveness of the virtual meeting room, or ongoing technical breakdowns.

- Secondly, for each group a data set is generated comprising emails, forum transcripts, chat transcripts and Centra recordings. Based on an initial reading of these data, it is attempted to generate a preliminary explanation for the questions that emerged out of the process diagrams.
- Thirdly, those groups whose activity diagrams raised interesting questions that could not be sufficiently explained by a surface reading of the available transcripts and recordings became candidates for inclusion in the structural analysis. These candidate groups were then checked to see whether they provided a sufficiently rich data set. Although textual communication was recorded automatically (forums and chat rooms), virtual meeting recordings had to be triggered by the students themselves – 23 of the 28 meetings were recorded (i.e. 82%). Reasons for not recording a meeting could be that students had either forgotten to start the recording or had decided against recording the meeting, an option the researcher offered deliberately (see Section 4.5.4). Finally, preferred groups were those which: raised interesting issues, provided an almost complete data set; and where some of the members participated in either an interview or the focus group. The focus group was important because it provided an opportunity to complete the results of the structural analysis (content analysis) with the way in which the students interpreted their own processes (interviews).

Applying these three steps, Table 6-11:

- shows each group's process diagram,
- offers a first interpretation from a course and due date perspective (to the right of the diagram), and
- provides a brief vignette of any particularities (below the diagram) that would recommend specific group interactions for further analysis.

Light-gray, rectangular shapes indicate text chat sessions; dark-gray, round shapes indicate Centra sessions; and the height of a shape indicates the duration of a session.

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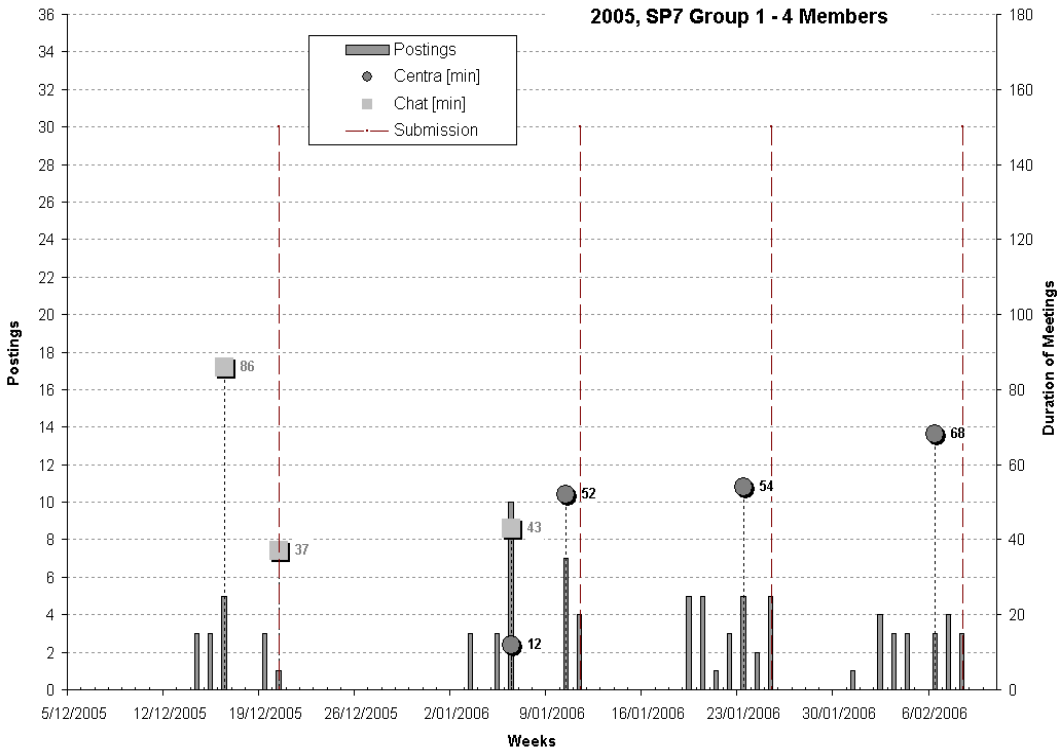
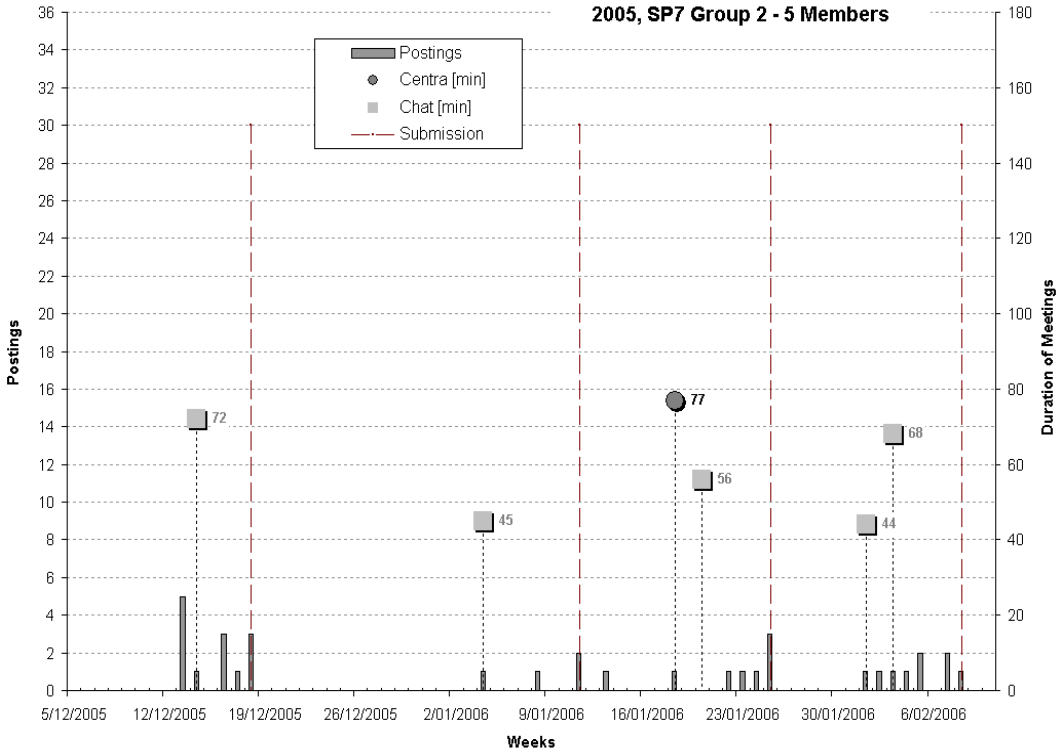
[67] Depending on whether the person is more introverted or extroverted, Lee and Nass (2003) found speech rates of between 184-216 words per minute. For information throughput in a text chat, however, only touch-typing world champions reach up to 200 words per minute (Rumelhart & Norman 1982). Non touch-typists achieve only a maximum of 40 words per minute (Buckle & Turner 1992), less than a quarter of the speech rate.

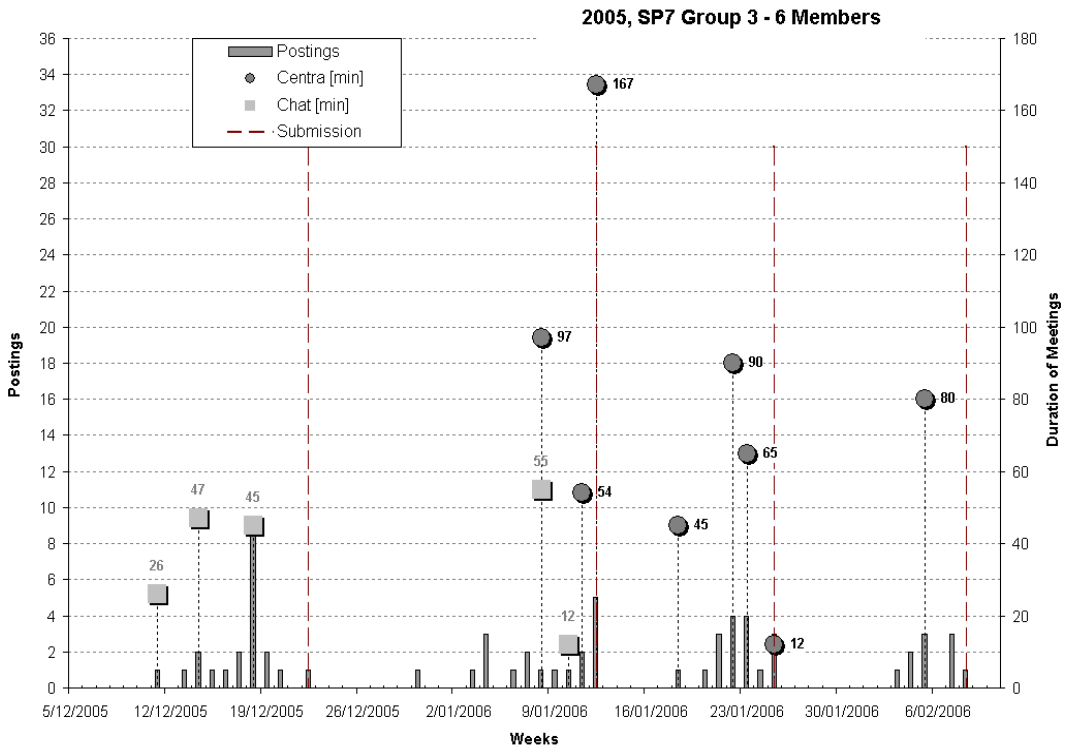
Following the discussion of individual group behaviours, questions are derived from cross-group comparisons. Anticipating later findings, such questions might include: why one group spent almost twice as much time online as another group; why several groups had the same number of meetings (e.g. groups 1 and 10); or why one group had eight meetings while another group decided to continue with chat meetings (e.g. groups 3 and 2).

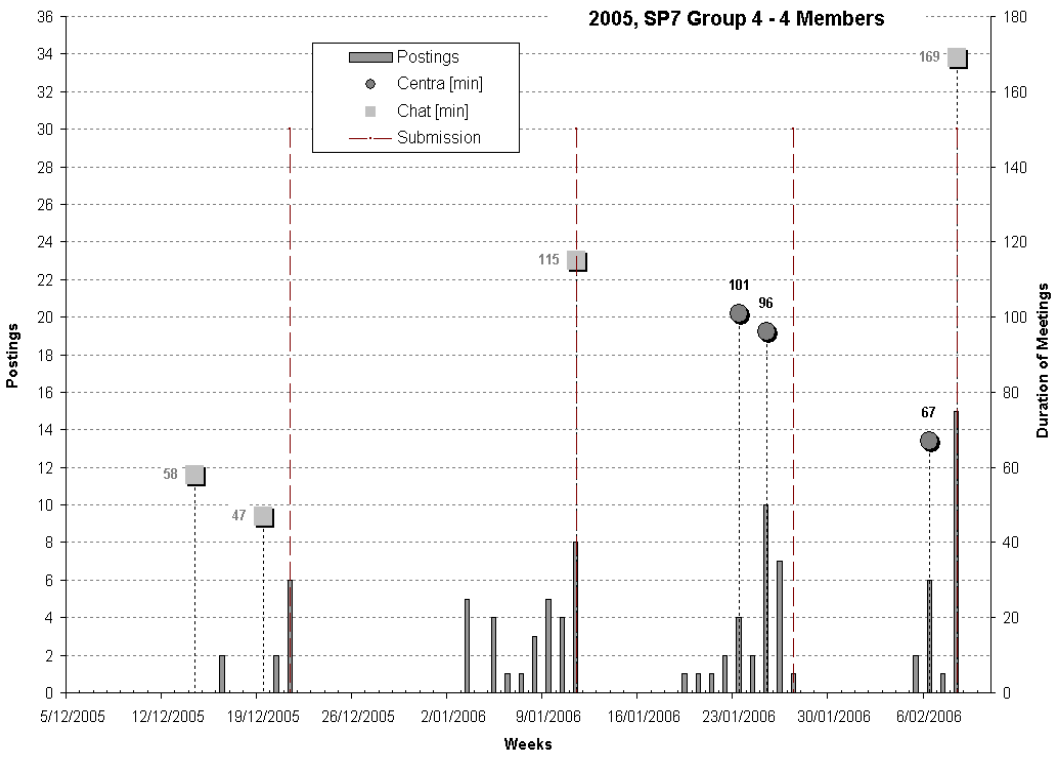
This table is fairly lengthy, but offers the reader the opportunity to compare the group activities in a very brief and succinct form.

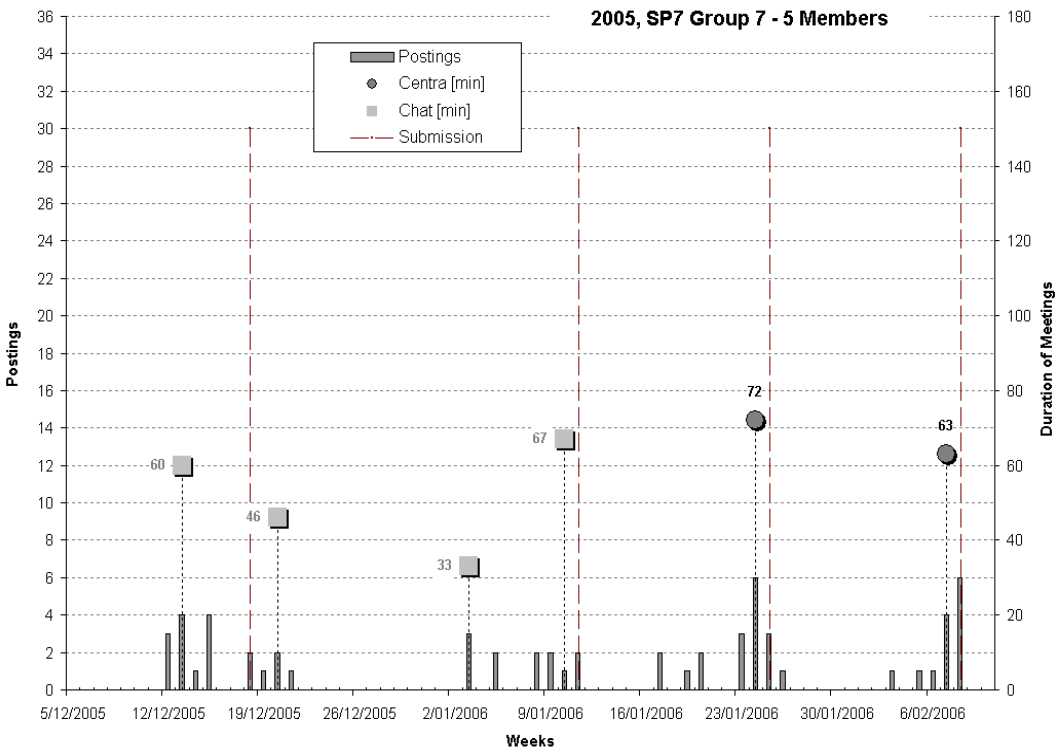
Table 6-11: Overview of online interaction per group (SP7 2004)

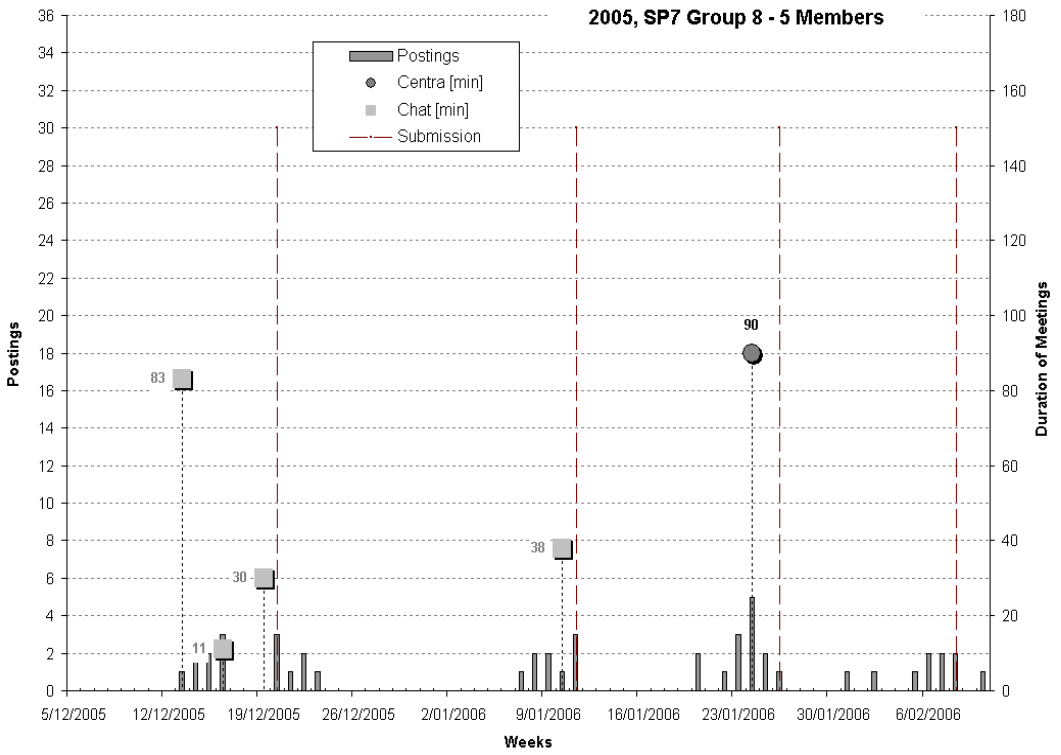
Group	Process Diagram & Diagram Discussion
1	
	Course Perspective − Centra session took generally longer with exception of the first chat meeting − Meeting durations show a slight increase **Due Date Perspective** − For the first two case assignments the group had two meetings, for the last two cases one meeting was held. **Missing Centra recordings**: − session 1 and 2
	Vignette: The first case discussion was mainly driven by two group members Out of initially four group members one dropped the course during the first two weeks and another contributed only sporadically. The first chat session was attended by two members only, it was also the longest meeting the group had. This first meeting was focused on discussing draft-answers group members had submitted prior to the chat meeting. After the first assignment a new member was allocate to the group, who had already substantial experience with Centra. Later Centra meetings were then facilitated by this new member due to her expertise. However, this group member also prepared the meetings intensively in a topic related way by compiling other members draft-answers. In comparison to other groups, G1 had the shortest and least varying durations of Centra sessions. The group is interesting in terms of how students differences in technological expertise lead to the emergence of roles (e.g. technology experts become meeting facilitators).

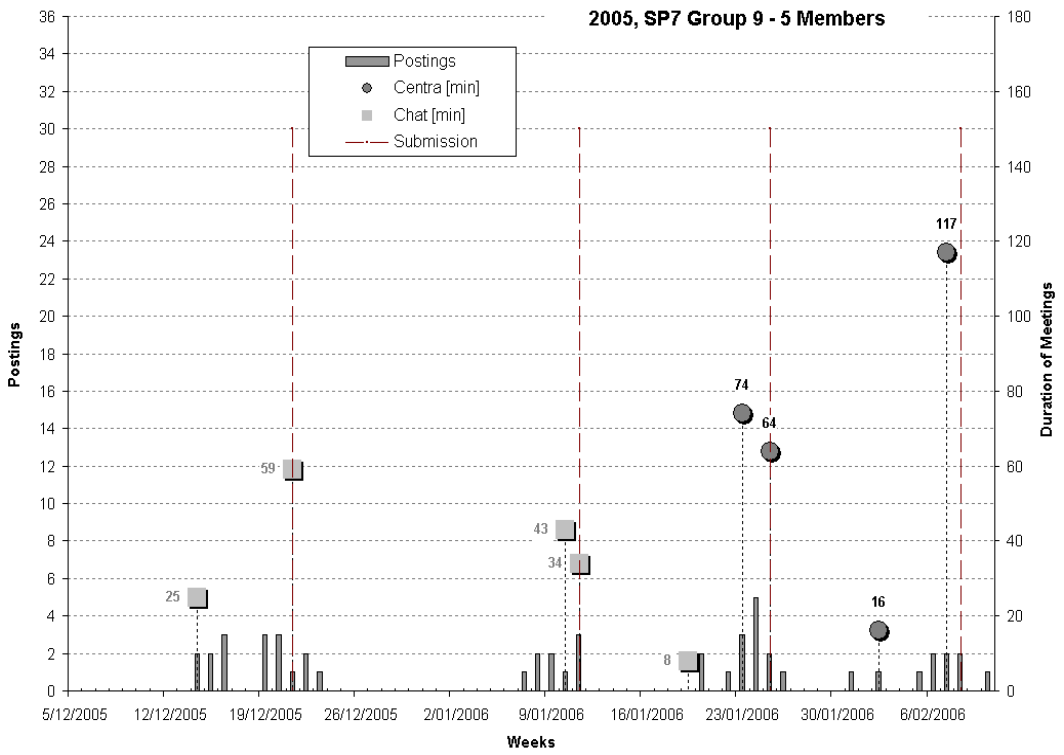
Group	Process Diagram & Diagram Discussion
2	
	Course Perspective − After a single session with Centra, the group continued to have meetings in the text chat room − Only few postings in comparison to other groups **Due Date Perspective** − For the first two case assignments the group had one meeting, for the last two cases this increased to two meetings. **Missing Centra recordings:** − None
	Vignette: Similar to G1, one group member dropped the course early on and two new member joined the group from the defunct G6. The salient point for this group is that they never adopted Centra. A first reason was that one student used his workplace laptop on which he could not make any changes such as installing Java or the Centra client, alternative venues of joining synchronous group activities were either not available or considered as not convenient. A second reason might be the lack of confidence in their language skills by two non-English speaking background students. Unfortunately none of the two international students in G2 was available for an interview, which could have corroborated this assumption.

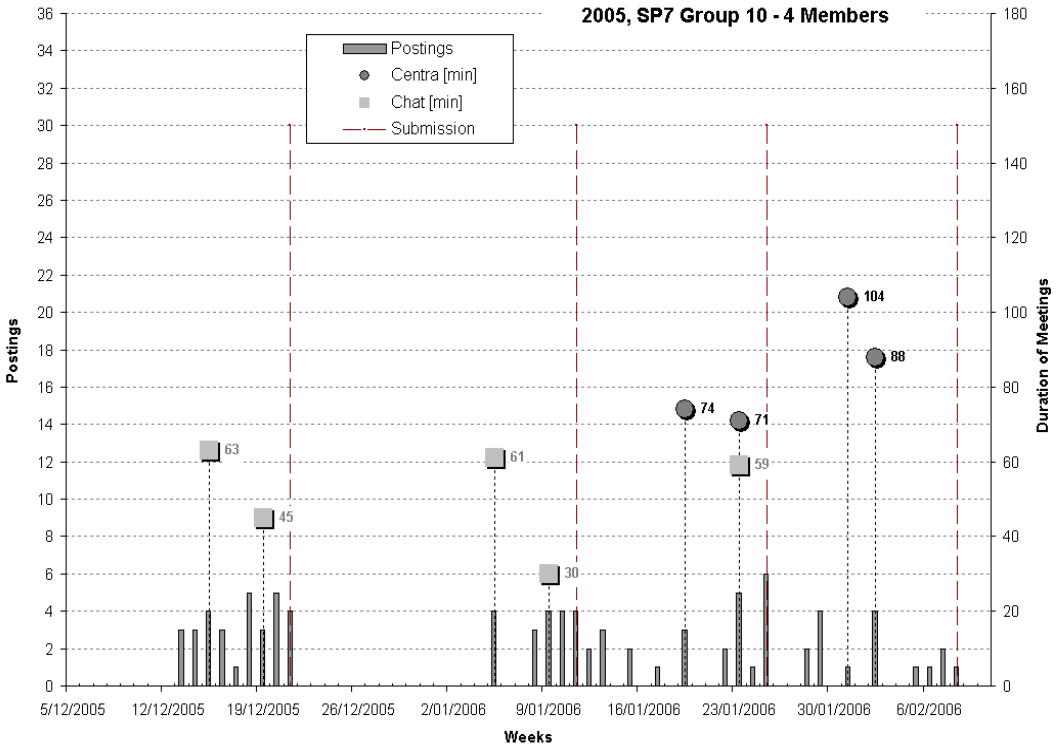
Group	Process Diagram & Diagram Discussion
3	
	Course Perspective − Generally, the group made frequent use of the virtual meeting room − Compared to other groups, group 3 had the longest Centra meetings prior to the submission of the second case − As with group 1, most Centra sessions took longer than text chat sessions **Due Date Perspective** − Group started with three chat sessions for the first assignment, three Centra session for the second and third case and only one meeting prior to the last case − No regularity in duration or scheduling can be detected **Missing Centra recordings:** − None
	Vignette: In the beginning G3 was a group of students who could not commit to evening meetings either because some students worked in shifts or because they took the course in countries with different time zones. For example one student was located in Scotland (9.5 hrs behind South Australian Time) and another student was in Malaysia (2.5 hrs behind). From all groups, G3 had the most Centra meetings. Characteristic for the group was its flexible approach to group work in that some meetings were deliberately set up by two or three group members who would then work on a particular aspect of an assignment. What makes this group interesting are the many different tasks the group used Centra for, ranging from case discussions to note taking, browsing the web collaboratively or editing the final case report.

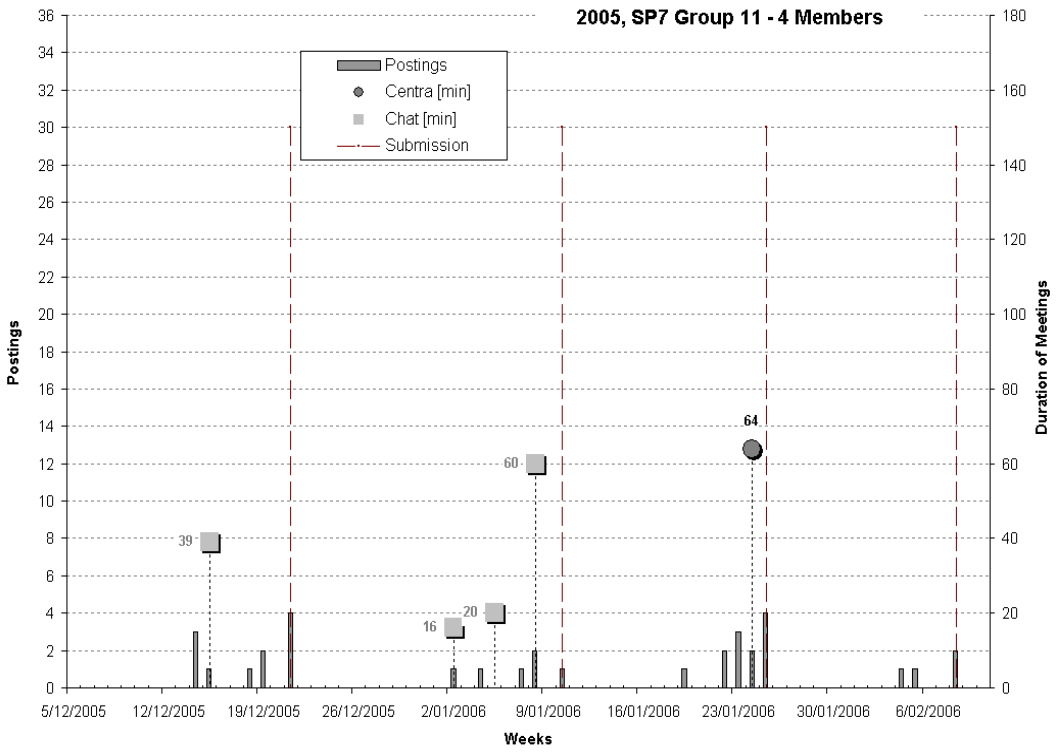
Group	Process Diagram & Diagram Discussion
4	 **Course Perspective** − Group started to have Centra sessions relatively late − Centra sessions got gradually shorter − Many posting in comparison to other groups **Due Date Perspective** − One long chat session on the submission date for case two, two meetings in preparation for case 3 **Missing Centra recordings:** − none
	Vignette: Initially G4 had two active group members and two new members from the defunct G4 joined the group after the first case. The first introductory session was attended by one group member only so that in the second Centra meeting the first 40 minutes were spent with socialising and exploring how application sharing works. Apart from exploring Centra the group discussed who should concentrate on which question without, however, discussing the content of the case. The second meeting was attended briefly by the online instructor/researcher to explain application sharing again and also to elaborate on a suitable collaboration process. For their third Centra meeting the group had prepared a word document which already included the case questions and some initial dot points. The switch to the text chat was necessary after a student could not access Centra for the group's last appointment. Overall, G4 had a slow start, preparation for meetings was limited. The group could be taken as an example for an unstructured approach to group work with little prior preparation. However, similar experiences had already been made during SP7, 2004 (Chapter 5). Without preparing the case students are forced to generate ideas on the spot. If little background knowledge is available then the discussion runs the risk of lacking substance and becoming superficial.

Group	Process Diagram & Diagram Discussion
7	 **Course Perspective** − Two Centra sessions not substantially longer than text chat sessions **Due Date Perspective** − Single Meeting shortly before the submission of cases two and three **Missing Centra recordings:** − Session 2 (only the last three minutes were recorded) *Vignette:* Similar to G4, the group's first Centra meetings lacked preparations, therefore the group spent a large amount of time on reading each other's preparations during the meeting, an activity better done asynchronously. Moreover, it seemed that few knew what to say resulting in long pauses between individual contributions. Since the second Centra session has not been recorded, it is not known whether the group learned from this experience. On a sidenote though, the group used an innovative ad hoc approach for reading their case preparations simultaneously by sharing two documents in parallel.

Group	Process Diagram & Diagram Discussion
8	
	Course Perspective − Little synchronous group interaction **Due Date Perspective** − Single Meeting shortly before the submission of cases two and three **Missing Centra recordings:** − None
	Vignette: It was problematic for the group to agree on meeting times due to changing work commitments. Group activities were very much driven by a single person, who allocated sub-tasks. The task of collating and submitting the whole report, however, was rotated between the different group members. Despite an enthusiastic reaction to the introduction of Centra no further meetings were held, alluding to other work and study commitments.

Group	Process Diagram & Diagram Discussion
9	
	Course Perspective − Centra session took longer than chat meetings (except the third Centra session) **Due Date Perspective** − Two meetings before each due date **Missing Centra recordings:** − Session 3 (only three last minutes available)
	Vignette: After the first introductory Centra session, the group started discussing a single member's case preparation which then was gradually transformed into the final case report. For the last case report one member prepared a document already including sections from all individual contributions. However, similar to G7 and G4 reading this document during the meeting was very time consuming. Later, the group started editing the case report, the substance of the case report, however, was not discussed except on an editorial level.

Group	Process Diagram & Diagram Discussion
10	
	Course Perspective − Centra sessions took longer than text chat sessions − Consistency in online meetings **Due Date Perspective** − Two online meetings before each due date − Every second meetings is shorter than the first one **Missing Centra recordings:** − Session 2 and 4
	Vignette: During their first chat session G10 addressed the question of how to organise online meetings, i.e. whether they should meet and split the tasks or whether they would prepare their answers and discuss them in the chat afterwards. Although the group decided for the latter, subsequent chat meetings were more concerned with logistical aspects, deciding who collates which question and by when, and whether another meeting is necessary. A review of the chat transcripts indicated that first and second meetings were not substantially different in character. Differences in duration depended mainly on the extent social topics were discussed. Interestingly, the fifth text chat session which was a continuation of a Centra session that could not be continued due to technical reasons was exclusively discussing details from the case materials, including lengthy messages discussing the interplay between online privacy and e-marketing. The group used Centra's application sharing functionality for note taking as well as for analysing pertinent WebPages during their meetings. The Group is interesting since it shows a relatively constant commitment to synchronous interaction in both media, text chat and Centra.

Group	Process Diagram & Diagram Discussion
11	
	Course Perspective − Two Centra sessions not substantially longer than text chat sessions **Due Date Perspective** − Single Meeting shortly before the submission of the third case report and no meeting for the last case report **Missing Centra recordings:** − none
	Vignette: For the first two case studies, G11 discussed aspects of the case questions. What was noticeable after reading the chat transcripts and listening to the group's single Centra recording was the absence of socialising interactions. The Centra session was interrupted by long intervals of silence and "Can you hear me?" questions which were answered positively. However, no fluent conversation evolved during the first 30 minutes. Misunderstandings seemed to be caused by difficulties with the English language, exacerbated by an average audio quality. Though not a focus of this research, G11 raises the question whether communication media have to be evaluated differently if international student language difficulties are to be considered. The short reaction time in audio conversations could be seen as a disadvantage for students who, in a text chat, could benefit from the slower paced communication.

6.3.3 Outcomes: Supporting and limiting factors for e-CBL meetings

In summarising the surface interpretation of the groups' online interactions, a number of generic factors can be identified which either support or limit constructive case discussions. These factors relate to the level and kind of preparation individual group members brought to the meeting, the type of tasks in which they engaged during the meetings; and how they used text chat and Centra to support or complement their group discussions (Table 6-12).

Table 6-12: Supporting and limiting factors surrounding e-CBL meetings

	Supporting Factors	Limiting Factors
Meeting Preparation	Productive discussion seemed to emerge if the majority of a group had submitted individual preparations prior to the meetings and were familiar with everyone else's preparation. Depending on whether it was a first or a follow up meeting, groups started with the case questions only or question plus notes from the previous meeting.	Chapter 5 already stated that a lack of preparation stifles in-depth discussion. (Even though under favourable conditions, prepared students might bring unprepared students up to date and a discussion develops from there on.) However, if one student's preparation takes the form of a finished case report, there is a risk that this version is accepted without criticism and proper discussion.
Meeting Activities	Beneficial activities tried to integrate all group members points of view while maintaining a rigorous evaluation of the issues raised.	Activities that were not part of a group interaction tended to hold up or interrupt meetings (e.g. reading, editing and formatting the report).
Use of Technological Support	Centra was used to share multiple sources of information, e.g. past discussion postings, relevant WebPages or the course homepage.	The technology was limiting if used for activities that did not require application sharing, e.g. distributing a document via email and reading it on one's own computer is more convenient than scrolling through a shared document.

Identifying conceptually interesting and rich data sets

Combining the per group interpretations in Table 6-11 with the derived factors from Table 6-12, Table 6-13 indicates the groups' performance quality in each category (+ high, - low and O average). Groups which feature most of the categories in a positive way are considered conceptually interesting for the structural analysis described in the following Section. Checkmarks in the last two rows of the table indicate whether a member of the group participated in an interview or focus group at the end of the course.

This process of data selection during surface interpretation resembles theoretical sampling rather than statistical sampling (see also Section 4.6.1). Theoretical sampling is opposed to the more common technique of random sampling used to represent populations statistically (Polkinghorne 2005, p.141). The purpose of theoretical sampling in this research is to maximise the contribution a sample makes to the understanding and theoretical conceptualisation of the e-CBL design put in place. As is typical for interpretive research, the objective is not to accumulate evidence that a behaviour (or group characteristic) exists more or less frequently, but to show the wider implications linked to the differences groups show in preparing, facilitating or technologically mediating their online meetings (cf. Dey 1999, p.5).

Table 6-13: Group selection for structural analysis (SP7 2005)

	G1	G2	G3	G4	G7	G8	G9	G10	G11
Meeting Preparation	+	-	+	-	-	+	-	O	+
Meeting Activities	-	-	+	O	-	-	O	+	-
Technological Support	O	-	+	O	+	-	+	+	O
∑	0	-3	3	-1	-1	-1	0	2	0
Interview Data	✓		✓				✓	✓	
Focus Group Data	✓		✓		✓	✓	✓	✓	

In selecting the two groups G3 and G10 which performed well in all three areas, the following structural analysis concentrates on understanding what contributed to the quality of the groups' e-CBL meetings, and to what extent these groups followed or adapted the recommendations of the course design (Section 6.2). Another issue is an evaluation of the meetings' efficiency. While it is already clear that both groups had more active and versatile learning experiences than other groups, they nonetheless show substantial variations in the amount of time they invested in their synchronous online interaction, with 800 and 600 minutes for G3 and G10 respectively (Table 6-10). The average for all nine

groups was 430 minutes. Moreover, both groups offer the advantage that conclusions drawn from the structural analysis can be completed with interview data presenting the learners' own interpretation.

6.4 Structural Analysis

Within the hermeneutic arc, structural analysis aims to define those elements which are characteristic of most of the empirical instances to be researched (see Section 4.6.2). During the first research cycle, the structural analysis concentrated on: degree of task-orientation, reciprocal interaction; and amount of synthesising solutions during online group work (Section 5.3). One of the findings from that cycle was that students spent a relatively small proportion of their online time discussing the task or responding to peer messages.

The surface interpretation described in Section 6.3 has shown that, during this second research iteration, groups spent substantially more time in synchronous meetings in general – but also showed substantial variation in the frequency and duration of their online meetings. The objective of this Section is to find out what caused these variations and whether they say anything about the quality of an online meeting.

To judge the quality of online meetings, a set of categories describing the different facets of online learning is needed, based on which naturally occurring learning events can be compared with one another. For this purpose, Garrison and Anderson (2003) suggested a comprehensive framework describing interactions in computer-mediated communities of critical inquiry. The authors started from the premise that an essential goal in higher education is to promote critical inquiry, which allows learners to test and improve their understanding (see also the social-constructivist learning paradigm applied in this research, Section 2.2.3).

Garrison and Anderson (2003) argue that, for a community of critical inquiry to function appropriately, three elements need to be established: cognitive presence, social presence and teaching presence.

- *Social presence* refers to the wider social/emotional environment of learning interactions. Participants in a computer-mediated critical debate are 'real people' and rely on social interactions to avoid misunderstandings or to solve sensitive problems.
- *Cognitive presence* is the amount of domain-related discussion that leads to the construction of shared meaning in a group.

- *Teaching presence* is the degree of structure provided by the teacher. A low teaching presence can result in unfocussed interactions or no interaction at all.

Garrison and Anderson's online communities of critical inquiry are taken as a basis for suggesting similar categories for a community of case learners (Figure 6-13: righthand side). The first category 'social presence' remains unchanged, but the categories of 'cognitive presence' and 'teaching presence' required modification in order to align the terminology used to evaluate and design e-CBL. Firstly, cognitive presence has been more specifically labelled as critical thinking, although both constructs refer to similar analytical steps such as sharing and debating differing points of view (Garrison, Anderson & Archer 2000). Secondly, teaching presence is specified as the degree of coordination of online group work, which is influenced by the scripts (Section 6.2.2) and scaffolds (Section 6.2.3) put in place by the instructor.

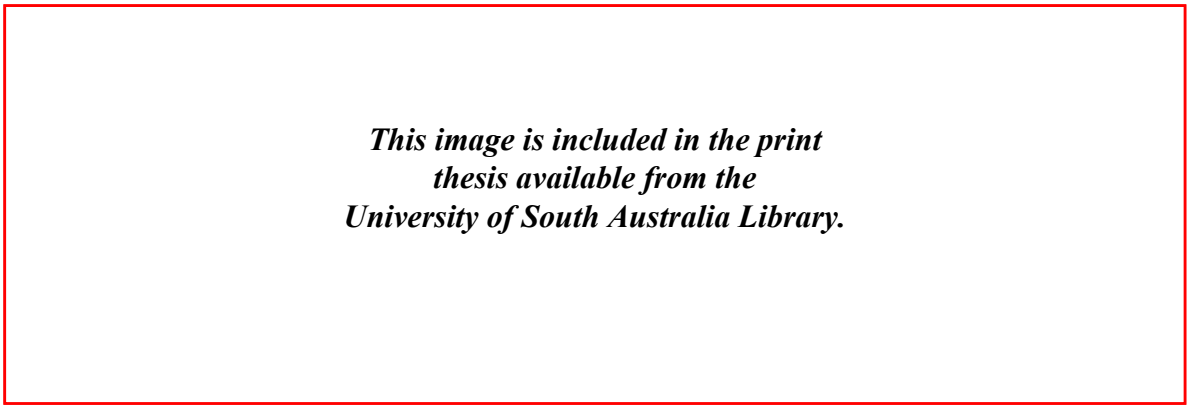


Figure 6-13: From Critical Inquiry (Garrison & Anderson 2003, p.28) to e-CBL

The categories shown in Figure 6-13 enable the fine-grained content analysis of online learning activities necessary to evaluate specifically designed learning conditions as they relate to social support, critical thinking and coordination (Section 6.2).

The remainder of this Section build on these categories: Section 6.4.1 defines which empirical data provide evidence for each of these categories; Section 6.4.2 describes the process and the technologies used to transcribe and code online meetings as well as the sampling strategy used to manage the wealth of data; and Sections 6.4.3 and 6.4.4 discuss the implications of the structural analysis: (a) What are the emergent or lacking qualities of online meetings? and (b) What conclusions can be derived from the changing proportional relations of the categories over time?. The final contribution of the structural analysis is a model, derived from the coded observations, explaining possible activity paths in online meetings and supporting the identification of inefficiencies during those meetings.

6.4.1 Defining the structural elements of e-CBL

Social presence

Social presence can be evaluated either on the basis of user perceptions (Gunawardena 1995), or on the basis of statements conveying a sense of social presence. Rourke et al. (2001a) developed an analysis template suggesting interactive, cohesive and affective responses as indicators for social presence (Table 6-14). These authors used a grounded theory approach (Strauss & Corbin 1998) to develop their indicators and emphasised the tentative status of their theme – although later studies reapplied the template successfully with only minor changes (de Bruyn 2004; Stacey 2002; Swan 2002).

Table 6-14: Social Presence Categories (Rourke *et al.* 2001a)

Indicators	Description	Example / Comments
Affective interactions		
Emotions	Emoticons, capital letters, use of repeated punctuation marks	;) "Hello, Hello anybody out there?"
Humour	Teasing, irony, understatements, sarcasm	[meeting took 10 min] That was a long meeting … LOL
Self-disclosure	Reference to personal life, showing vulnerabilities	Sorry guys, I can't even spell anymore ...
Interactive interactions		
Judgement	Expressing an emotional judgement / (dis-) agreement	well done guys ! cool !
Assistance	Asking or offering advice or help	let me know if you need help
Cohesive interactions		
Social Talk	Non-task related topics	I am really getting hungry now
Vocatives	Addressing participants by their names	Hey, John
Group Identity	Using inclusive pronouns 'we, our, us' or 'group'	There is a vast amount of opinions and we have to come up with a group opinion for this one

Trans-national programs in higher education are on the rise, many of them use e-learning in some way or another (McNaught & Vogel 2004). With regard to social presence in cross-cultural teams it is also necessary to consider learners' socio-cultural background and how this influences learning and communication standards (Vogel *et al.* 2001c). Zhao and McConnell (2006), for example, reported that although there is no reason why Chinese students could not engage in collaborative learning, the traditional dominance of competitive and individual forms of learning means that they would have less experience with the benefits and challenges of working in a group.

Researching communication in distributed virtual teams (U.S. and Thai), Sarker (2005) found that which communication styles are valued and what function is attributed to social talk is largely defined by learners' own culture. Other culturally influenced differences in collaboration styles have been identified by Kim and Bonk (2002) concerning the pragmatic, theoretical or social orientation of messages. These authors found that, where U.S. students were more action driven, Finnish students were more theoretically driven and spent more time sharing their cultural background.

And finally, an important factor influencing social presence is language skills. Studies have found that international students can experience anxiety when required to debate in a second language because they feel insecure about their linguistic accuracy as well as the cultural appropriateness of their contributions (Yildiz & Bichelmeyer 2003).

Critical thinking

With critical thinking as a significant skill to be fostered in higher education institutions, different approaches to defining or quantifying critical thinking have been developed in the past. Critical thinking is either seen as a set of attributes (Newman *et al.* 1997) or as a process of reflexive thinking and argumentation (Garrison, Anderson & Archer 2001).

Newman *et al.* (1997), for example, outline ten characteristics to identify the level of critical thinking in learner discussions. These authors argue that a debate's degree of critical thinking is evidenced by statements that are relevant, important, novel, unambiguous, open to new knowledge, integrative, justifying, sceptical, pragmatic and diverse. Paul (1985), however, argues that critical thinking is a process linking various statements rather than the property of statements in isolation. In line with Paul's argument, the present research applies a phase model as described in Garrison *et al.* (2001)[68]. The authors argue that the more events are allocated to the upper phases III and IV of the knowledge inquiry process the higher the level of critical thinking (Table 6-15).

[68] Alternative models can be found in Gunawardena, Low and Anderson (1997), Perkins and Murphy (2006), or Bullen (1998).

Table 6-15: Critical Thinking Categories (Garrison, Anderson & Archer 2001)

Phase	Description	Examples
I. Triggering	A problem or issue triggers the need for critical inquiry.	>> [referring to a list of dot points] we have traditional markets, browser behaviour etc. but we didn't mention click stream
II. Exploration	Learners reflect upon multiple sites of the issue. Relevance of issues is negotiated.	>> Should we include 'secondary data research' under marketing ?
III. Integration	Multiple ideas are integrated in order to construct a meaning of the whole. Criteria that help to decide which ideas will be included or left out are discussed.	>> if you allow cookies they collect your data which ca be used next time you log on >> I think it's a valid point to include that you can't tell where your personal information ends up
IV. Resolution	The constructed meaning is tested. Learners discuss the implications of their solutions, e.g. whether the initial problem has been solved or whether unanticipated side-effects could invalidate the solution.	>> maybe it comes down to a point where online adds are much more focused than during the early days of e-commerce because of better data capturing

Coordination

Malone (1988) defines coordination as the management of interdependencies between activities. Within CSCL, however, interdependencies can be as diverse as developing a shared understanding of the task, managing the time available to fulfil the task, or organising the dissemination of supporting information (Rummel & Spada 2005).

It is therefore useful to further distinguish between managing immediate (micro) and long-term (macro) interdependencies. Immediate interdependencies control the flow of synchronous events, e.g. what is done next in a meeting, whereas long-term interdependencies concern activities that take outside an online meeting (cf. Rummel & Spada 2005).

Immediate and long-term interdependencies are, however, closely related. With every issue that emerges during an online meeting, the group has to decide (micro-coordination) whether it wants to resolve the issue immediately, or later (after the meeting). Equally, deciding that the group needs to research an issue before it can be discussed productively (macro-coordination) has an impact on the required follow-up activities of the group.

In summary, micro-coordination includes all activities which control the progress of a meeting, while macro-coordination includes all activities that manage interdependencies becoming effective after the meeting. Table 6-16 shows criteria indicating when coordination refers to micro level activities (Barron 2000) or macro level activities (Rummel & Spada 2005).

Table 6-16: Assessment Categories for Micro- and Macro-Coordination

Indicator	Description	Examples
Micro Coordination (Barron 2000)		
Shared Task Alignment	Establishing common goals and achievement strategies (agenda)	>> I think we have enough arguments but we could go on talking about click stream
	Referencing other group member's ideas	>> I think Shaun has suggested a few amendments for this
Joint Attention	Establishing a shared centre of attention (document, central idea)	>> I will bring notepad on as well
	Monitoring each others progress	>> Yes I can see the information you mean.
Mutuality	Following up ambiguities rather than ignoring them	>> sorry what did you say?
	Respecting turn-taking norms	>> anybody else wants to say something?
Macro Coordination (Rummel & Spada 2005)		
Time Management	Establishing a general plan (global management)	>> maybe short postings from each of all of us might be the best way to decide what the consensus of the opinion is >> I think it's better if everyone attempts the whole case before we split up the questions
	Checking plan against actual state of the work (local management)	>> Yes I had a look at it yesterday
Coordination of Work	Division of content related tasks (e.g. topics to investigate)	>> I still have to post something on question 3 >> I still have to add references to my section

Indicator	Description	Examples
	Division of roles (e.g. who does the collating. formatting or final reviewing)	>> Do you want me to put it up on the discussion board ?
Distribution of Knowledge and Material	Sharing or requesting materials and ideas	>> I think we need the input from Stuart's section
	Posting interims results	>> I write the meeting notes and post them later

6.4.2 Purposeful sampling and coding of e-CBL meetings

At the end of the surface interpretation (Section 6.3) groups 3 and 10 had been identified as having sufficiently promising collaboration processes to warrant further analysis. Both groups also stood out due to their more sophisticated use of the virtual meeting room, going beyond mere note taking.

In a first step, a text chat and a Centra meeting were selected in order to reflect the different media conditions during the course. The meetings selected should reflect experienced groups, so that only a subset of meetings for each group were considered (see Table 6-17).

McGrath (1991) argues that having access to groups 'with history' is actually one of the benefits of studying naturally occurring groups. Because laboratory studies often assign subjects to groups on a random, short term basis they study less realistic "zero-history groups" (Yoo & Alavi 2001). The advantage of studying sufficiently experienced groups is that they show genuine rather than exploratory use of technology. Genuine use happens if the group can use the technology in a fluent way without major interruptions to the task solving process whereas exploratory use aims primarily at understanding the tools functionalities regardless of whether they can be use to support case discussions or not.

Table 6-17: Coded case discussions (SP7 2005)

Group	Meeting	Participants	Recording	Coded
G3	3rd Chat	4	45 min	66 %
	5th Centra	5	90 min	33 %
G10	3rd Chat	3	50 min	60 %
	3rd Centra	3 (+1 in Chat)	82 min	36 %

To make transcription and coding feasible, a time sampling strategy was applied – as described by Billings *et al.* (1978) and used in other studies of computer mediated interactions (Kahai & Cooper 1999; Walther 1995; Zigurs, Poole & DeSanctis 1988). Billings *et al.* (1978) found that for small sets of categories (i.e. four or less) coding 20% of the entire interactions provided a valid representation of completely coded processes. In this study audio sessions were coded to at least 30% and text sessions to at least 60%. In order to account for different phases in online meetings, ten minutes at the beginning, at the end, and in the middle were selected.

Assuming different phases in online meetings seemed plausible based on previous studies of problem solving groups (Bell 1982; Fisher & Ellis 1994). The reason why none of these models has been used for e-CBL meetings is because they all focused on a particular perspective, e.g. task progression, conflict resolution or group cohesion (Bell 1982); and none included all the coding categories suggested to evaluate e-CBL meetings.

Technical realisation

All transcripts were coded in Excel, which was an excellent tool to experiment with different ways of aggregating and visualising the results. The lack of means to manipulate and present results visually in flexible ways was also a reason to discard nVivo, a popular analysis tool in qualitative research (Welsh 2002).

Chat transcripts were already available in a text format and could be coded in a straight forward way. The recorded Centra sessions, however, were transcribed using ELAN 3.3 (EUDICO Linguistic Annotator), a tool developed by the Max Planck Institute for Psycholinguistics in Nijmegen, Netherlands and available under a general public license (http://www.lat-mpi.eu/tools/elan/download, accessed 04.02.2008). ELAN allows for transcribing and coding multimedia corpora by linking annotations to the audio and video stream (Berez 2007). The resulting XML file can be exported as a formatted transcription text including duration and labels of each coded segment. ELAN includes several search and navigation functions that make it easy to select specific instances of recorded meetings or find a specific situation in a recorded case discussion through keywords.

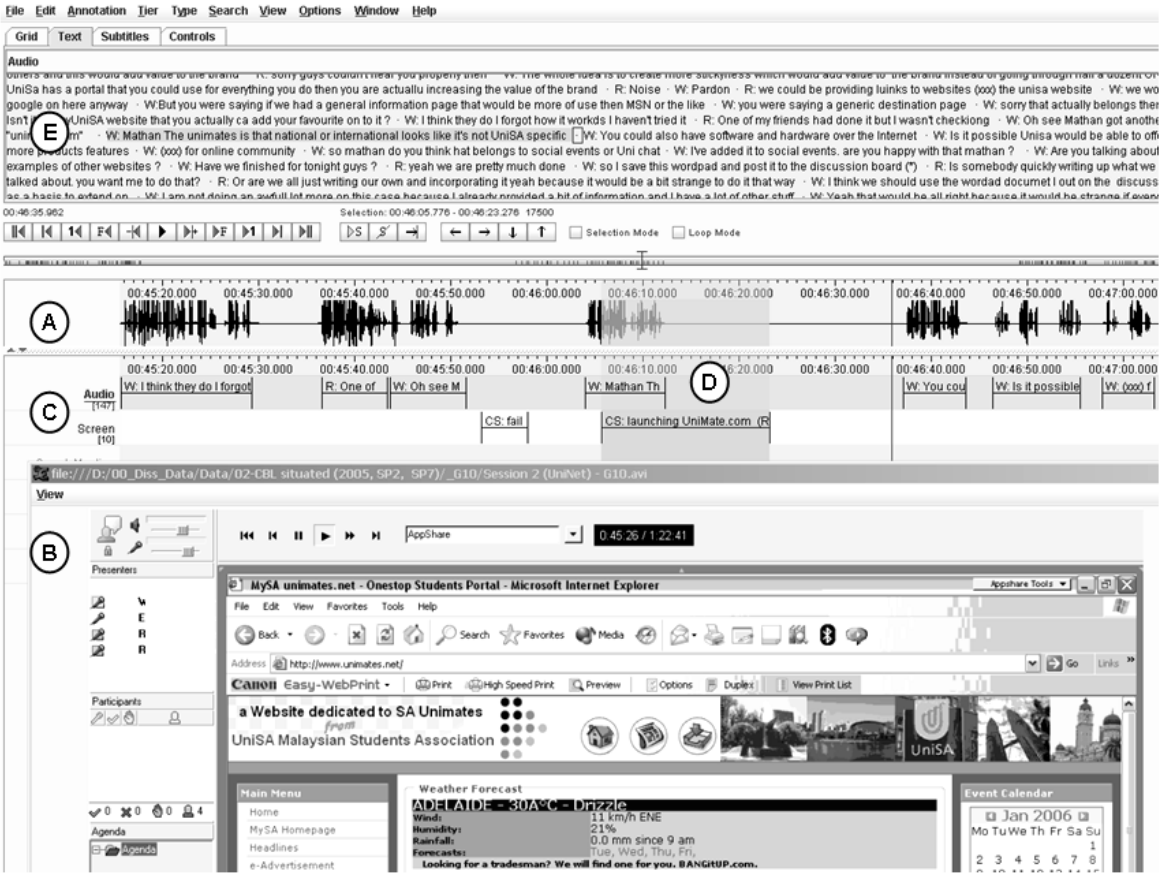


Figure 6-14: Transcribing in ELAN

Figure 6-14 shows a screenshot during the transcription process. Areas (A) and (B) refer to the audio and video streams linked to a timeline. The presentation of 'in sync' audio and video streams is important to obtain a coherent picture of online discussions and the way information on a shared screen interacts with the information exchanged verbally[69]. Area (C) represents transcription or coding layers. Audio communication and screen changes have been transcribed separately. At any moment the section played back is highlighted (D) and can be put into the context of the surrounding transcript (E).

6.4.3 Emergent and missing qualities of online meetings

Online meetings were selected mainly on the basis of the richness of their interactions in terms of content and flexible usage of technology. However, other factors are also important to understand the environment on which the following structural analysis is based. A first glance at the data reveals the heterogeneity of the online meetings regarding the number of participants (three to five) with contributions to the overall conversation ranging from 1% to 64% (Table 6-18).

[69] Appendix B.4 shows a sample transcript of Group three's Centra session including screenshots of documents the discussion referred to.

Table 6-18: Descriptive statistics of text chat and Centra meetings

	Text Chat		Centra	
Group	**G3**	**G10**	**G3**	**G10**
Words transcribed	1322	1064	2532	1400
Participants and their contribution [percentage of words transcribed]	M – 44% S – 26% D – 25% T- 5%	R – 36% MR – 32% E – 32%	M – 33% D – 30% S – 21% R – 15% T – 1%	R – 64% W – 35% E – 1% MR (via chat – no record)
Speech time (out of 30 minutes)	-	-	59 %	38 %
Average length of pauses	-	-	7 sec	8 sec
Median of turns [words]	10	6	14	7

Further research in this direction could investigate how this variation in contributions impacts individuals' learning or the group's wellbeing. Disproportional contributions to the discussion process might indicate the dominance of a particular group member, which can cause less confident group members to withhold their opinions (Pena, Walther & Hancock 2007). Moreover, as discussed in Section 6.4.1 (Social Presence), different communication technologies call for different communication and language skills. While text chat allows non-English speaking background students to craft their messages, this is more difficult in fast-paced audio communications. And another issue international students may face are cultural difficulties in deciding when to speak or how to grab the floor without appearing impolite (Chalmers & Volet 1997).

Speech ratio and average length of pauses was captured for Centra sessions alone, due to the quasi-synchronous nature of text chat that does not allow measurement of the actual time someone takes to write a contribution (Garcia & Baker Jacobs 1999). One member of group 10 joined Centra via text chat which might help to explain the difference in speech time between Groups 3 and 10. However, speech time ratios of 59% and 38% indicate that the verbal exchange of information is only one side of the interaction in Centra, which is why the title of this Section speaks of 'emergent meeting activities'. The question is which non-verbal activities add to or detract value from online case discussions. The average length of turns (ranging from 5.6 to 19 words) can be seen as an indicator for greater syntactic complexity in Centra meetings, allowing for the communication of more reasoned statements (cf. Ferreira 1991). For example, a learner might simply describe a relevant concept (short turn) or describe the concept and offer reasons why and how the concept applies to the case (long turn).

The following visualisations of coded group processes (Table 6-19) provide more detailed information about what happened during online meetings. Horizontally, the diagrams are organised by turns and, orthogonally, the intensity of a coding category is expressed through number of words per turn. For Centra sessions a turn has been defined as all statements uttered by a person in one go (cf. Clark, Herter & Moss 1998). If there is a longer period of silence (> 2 secs) or another person grabs the floor, a new turn begins. For chat sessions a turn is the entire message posted by one person. If a turn contained evidence of more than one category, the words pertaining to different categories would be coded separately, i.e. one turn can be split into different categories. For example, a turn like "*I am just reading through it all now Jane, ...*" (Turn 11a, Chat-G3) and "*... I have been working on another assignment today and have just submitted it so I have come back to e-biz*" (Turn 11b, Chat-G3) would add nine words to the category of micro-coordination, because they explain their current unavailability (Turn 11a), and 20 words to social presence, because they explain what prevented them from reading earlier peers' postings (Turn 11b). The objective of this turn-by-turn analysis is to understand what it actually means if, for example, a group starts off with 42% Micro-coordination and 37% Social Presence (see text chat G3, Table 6-20). Such an understanding is necessary before percentages per phase can be compared meaningfully across different meetings.

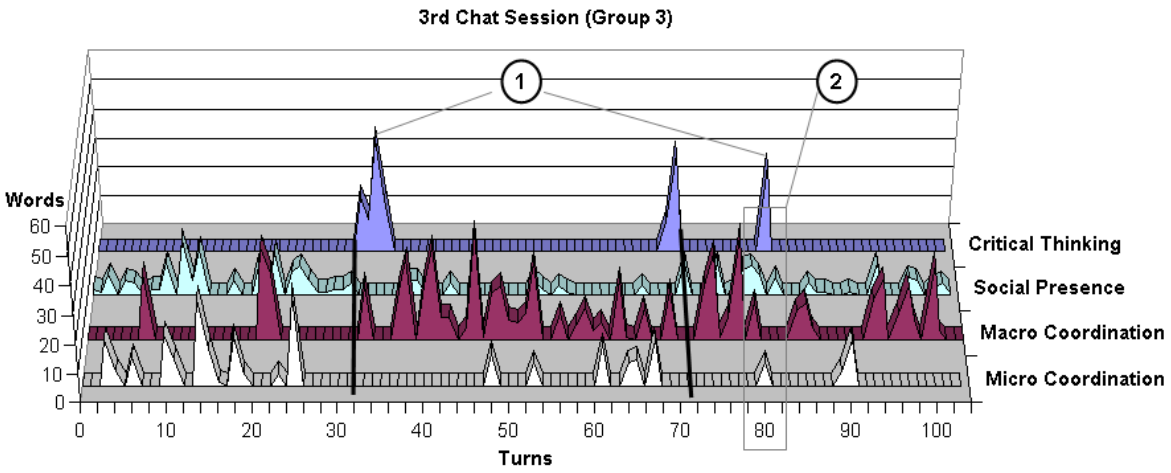
Validity and reliability of content analysis

Krippendorff (2004) defines content analysis as a "research technique for making replicable and valid inferences from texts (or other meaningful matter) to the context of their use" (p.18). What does this imply? *Validity* of content analysis is foremost secured by transparent descriptions of the applied coding scheme, including examples of where the scheme had already been used successfully (Rourke & Anderson 2004). *Reliability* of content analysis is determined by the degree to which a person applying the same coding scheme and reasonable background knowledge would come to similar conclusions (Krippendorff 2004, p.212). A common test of the reliability of a content analysis is Holsti's (1969) reliability coefficient or percentage agreement, which is calculated by dividing the number of all coding decisions upon which two coders agree by the total of all coding decisions made (Rourke *et al.* 2001b).

To test the reliability of the coding categories, both sessions of Group 3 have been coded by a second coder. The coder had previously been an online tutor for the course but was otherwise not involved in the research project. Riffe *et al.* (2005) suggest that a good percentage agreement should be about 80%. This benchmark was almost achieved with percentage agreements of 79% for G3's Centra session and 77% for G3's Chat sessions.

Table 6-19: Activity sequences in online meetings (SP7 2005)

Text Chat – G3



Phase I

- Group members clarify whom they should expect to participate in the session.
- The meeting continues with an update of who has done what so far.
- The two spikes in Macro coordination refer to a discussion of the group's past work and the final exam date.

Phase II

- Second phase starts with addressing a problem of not having a clear definition of a concept, central to the case study.
- The subsequent coordination effort relates to who will ensure flow between the individual sections of the group's case report.
- Other coordination issues are interims due dates and word counts per question.

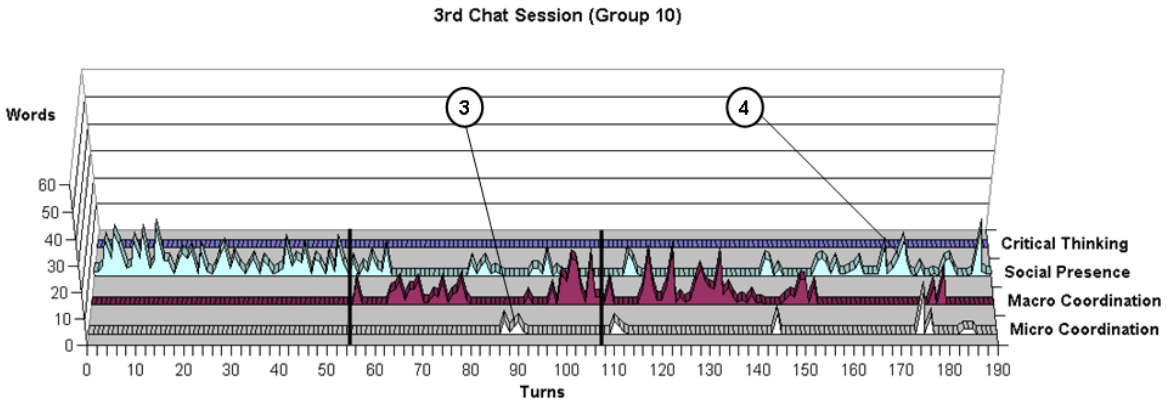
Phase III

- Macro-coordination continues to dominate the meeting. Issues are who is going to submit the final version of the assignment and how the group should organise a last revision.
- The critical thinking spike refers to a tax and currency issue of small businesses offering their services internationally, whereupon a group member offers to integrate this in their section.

(1) Critical remarks remain relatively isolated leading to macro-coordination (activity planning), i.e. deciding who would follow up the issue at a later stage.

(2) This second marker refers to a problematic situation where one person is engaged in two different topics, so that overlapping discussion threads make it hard to identify the intended recipient of a chat message.

Text Chat – G10



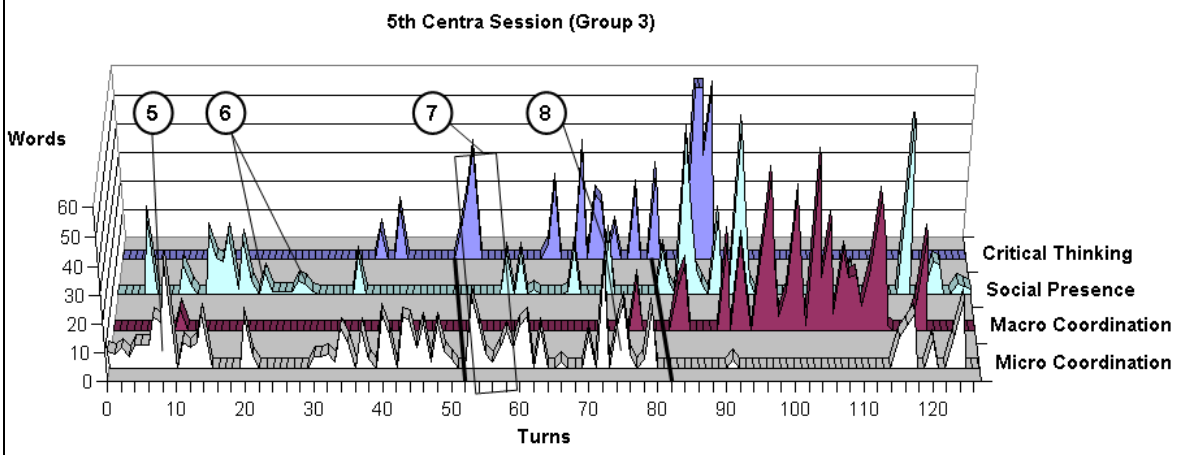
Phase I	Phase II	Phase III
− In an unusual start, the group discussed the common wealth games that took place during this week.	− The second phase starts with the revelation that nobody had really prepared for the case. − The coordination deals mainly with preparing an upcoming Centra session, e.g. hardware and system requirements.	− During the last ten minutes the group discusses whether they could split the task or not. Finally they decided that it would be better if everyone could post some points for each case question.

(3) Marker 3 refers to a chat message containing a link to the instruction on how to test Centra, which is subsequently discussed. Hence even in a lean medium, learners can switch between different sources of information (e.g. text chat and Web).

(4) Marker 4 indicates an interesting reference to the researcher's ability to read the meeting transcripts. However, they put it into perspective as the following quote shows:

" … Christian is gonna look at this transcript and go 'what the' / we got a bit off topic, but we got to know each other better / I think he would appreciate that "

Centra – G3



Phase I

- The first phase sets up the Centra environment, i.e. launching the application to be shared etc.
- The second concentration of micro-coordination (after turn 30) reviews previous postings on the discussion forum. The two spikes in critical thinking refer to the evaluation of the information reviewed.

Phase II

- The meeting continues discussing various issues concerning e-marketing. Similar to marker 3, the meeting includes off-line resources as students continuously reference the relevant pages in their textbooks.

Phase III

- The last phase is used to arrange for the completion of out-standing tasks. First, it is discussed whether another synchronous meeting is necessary and second, the group discusses which tasks could be done in parallel.

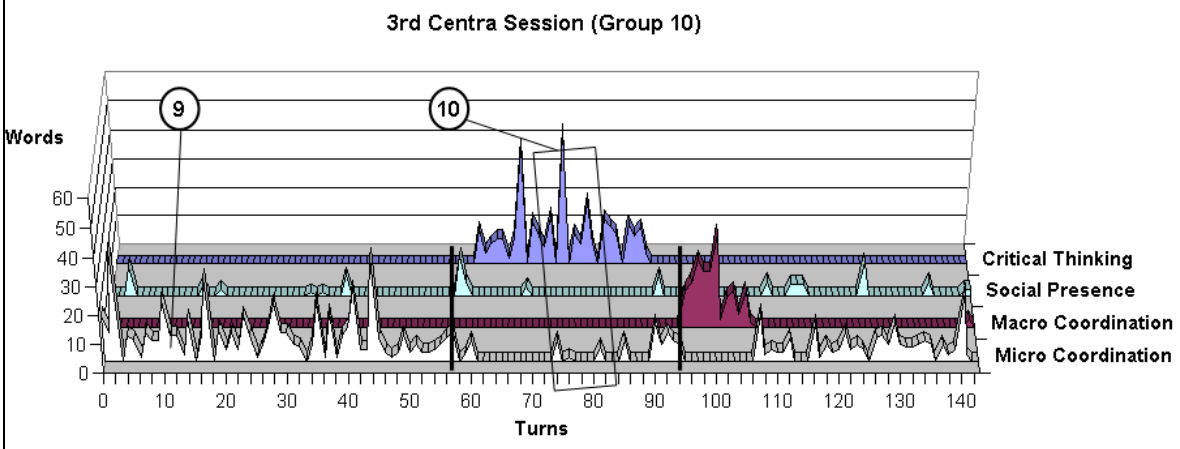
(5) In this spike of micro-coordination, one student shows another student how they can format postings in the online forum: a hands on exercise to increase the readability of postings.

(6) Social presence is difficult to build up if technical issues interfere. In this case a student joins the meeting and the group needs some 40 secs (10 turns) to establish whether they understand each other or not.

(7) Unlike marker 1, where critical remarks led to postponed (follow-up) activities, right after turn 52 it can be seen how critical comments on the task lead to immediate actions. This could be looking up information that confirms a claim or scrolling to the relevant section in the case report where the information is to be included.

(8) Towards the end of phase 2 (turn 77), contributions of individual students become more complex, including information that covers multiple coding categories. The following turn, for example, includes three messages. *Macro Coordination*: “If I can collect my thoughts maybe I post something or whatever where I was just headed” / *Critical Remark*: “they talk about the television campaigns generating extra sales and the cost per purchase is seventeen dollars as opposed to eleven dollars for online sales” / *Social Presence*: “but it's all a bit mushy in my own thought so I don't think I am explaining it very well”

Centra – G10



Phase I

- Similar to group 3, group 10 needs to launch and share the note taking application. However, they realise that the host of a session should have broadband Internet. Hence, almost the entire first ten minutes are spent in understanding and configuring ways of how to collaborate in Centra (despite the fact that many of these issues had been addressed in the Centra introductory session).

Phase II

- The critical discussion in this phase looks for services and information to be offered on a student portal.
- The micro-coordination at the end of phase 2 discusses where to put the several ideas gained.

Phase III

- Similar to G3's Centra meetings, the third phase was about what needed to be done after the meeting.
- The relatively large portion of micro-coordination at the end of the meeting is due to the fact that the draft was distributed among all group members during the meeting.

(9) The long time to set up the meeting was also related to a lack of awareness of who is doing what and what is happening if nothing happens in the virtual meeting room. The former is indicated by questions about who is editing the document or launching an application, and the latter shows in frustrating comments if no responses can be obtained without any hints to whether a student left his computer or had to restart the application.

(10) Marker 10 is actually a combination of markers 1 and 7 and shows how increased ease of use and flexibility with Centra can have a positive impact on the meeting. A large portion of phase 2 is dedicated to the discussion while in the background one student launches a relevant webpage of another student community portal from where different ideas could be drawn. Another student takes notes (in parallel) which are shared once the webpage has been discussed. In this instance the group found a way to work concurrently on mutually completing activities, thereby increasing their productivity.

Summarising Table 6-18, emergent activities are those which were not specifically recommended during the Centra introduction, but were instead developed by the groups themselves (relevant markers are indicated in brackets):

- hands-on activities, explaining the functionality of a tool or HTML tags (4)
- editing and structuring case reports, opposed to documenting the discussion (7)
- parallel use of different media to support a single discussion topic (3,7,10)

In contrast to emergent activities, disruptions of the meeting process indicated a lack of activities to compensate for the reduced awareness of:

- who was the intended recipient of a message (2),
- whether the other participants were experiencing technical problems (6), or
- who was manipulating the shared workspace (9).

6.4.4 Outcomes: Necessary and efficient activities in online meetings

The detailed analysis of these four meetings suggests that the phases seem to follow a discernable pattern of activities. A more consolidated view of the data per phase now allows for a model that explains focus and function of the different activities in each phase. The underlying rationale is that observations of well-functioning groups can lead to recommendations on how to structure and manage e-CBL meetings, i.e. 'best practices' grounded in observation (Miles & Huberman 1994, p.270)[70].

Table 6-20 lists the two most coded interaction categories in every meeting, separated into phases I, II and III. In all samples the sum of these two categories exceeds 75% , which justifies speaking of primary or 'focal' interactions per phase.

[70] With the same approach Gersick (1989) developed her group transition model based on observations and thus was able to offer an alternative to Tuckman's (1965) four stages model, which was derived from a meta-analysis of previous empirical studies of group development.

Table 6-20: Primary meeting activities per phase and medium (SP7 2005)

Phase/ Medium		Text Chat	Centra
Phase I	G3	Micro Coordination (42 %) Social Presence (37 %)	Micro Coordination (63 %) Social Presence (31 %)
	G10	Social Presence (100 %)	Micro Coordination (96 %)
Phase II	G3	Macro Coordination (60 %) Critical Thinking (23 %)	Critical Thinking (42 %) Micro Coordination (38 %)
	G10	Macro Coordination (66 %) Social Presence (28 %)	Critical Thinking (72 %) Micro Coordination (18 %)
Phase III	G3	Macro Coordination (60 %) Social Presence (24 %)	Macro Coordination (50 %) Social Presence (26 %)
	G10	Macro Coordination (52 %) Social Presence (37 %)	Micro Coordination (44 %) Macro Coordination (36 %)

Based on the four meetings analysed, phases I and III show, in a proportionally stable way, first and second coding categories. In both media conditions, *phase I* indicates a focus on micro-coordination, i.e. setting up the meeting at a technological and content-oriented level, combined with socialising interactions. *Phase III* was primarily dedicated to the organisation of follow-up activities, such as coordinating the subsequent updating of report sections. A change in focus occurred in *phase II*. During text chats the integration of most critical remarks was postponed, i.e. students would look at it after the meeting. In Centra sessions, however, critical remarks were more frequently integrated into the case discussion with immediate effect, e.g. a webpage was consulted or the point was further developed by another group member.

The case-specific findings of Section 6.4.3 and the phase's primary interaction types are integrated in Figure 6-15. The model refers to the three phases:

(I) meeting setup / socialising,

(II) discussion / micro-coordination, and

(III) coordination of outstanding activities / socialising.

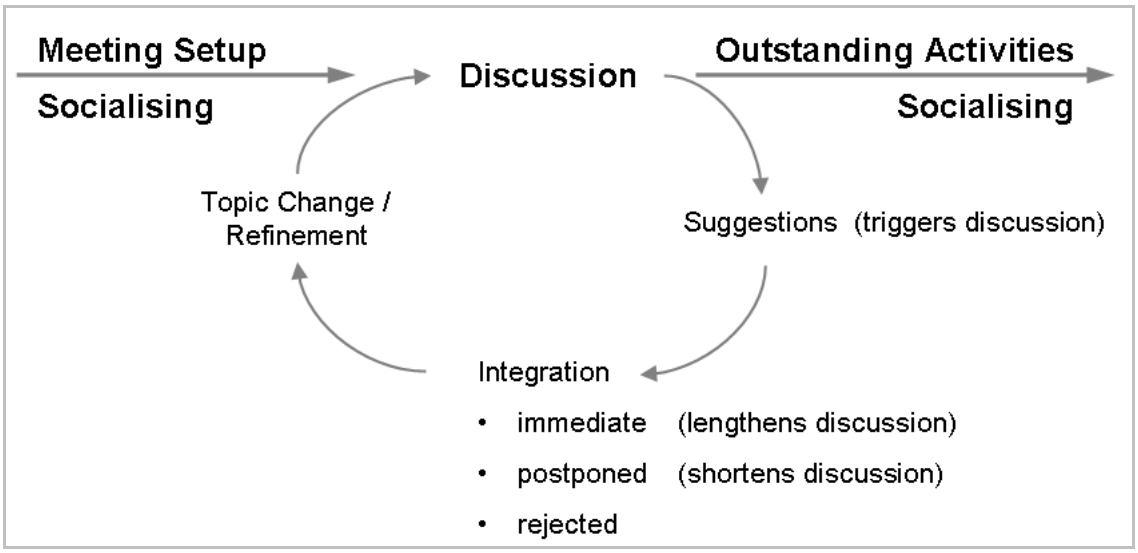


Figure 6-15: The e-CBL meeting model - shifting focus of meeting activities per phase

This model does not make any reference to different media conditions. As discussed in Section 3.4, communication technologies are enablers but not determinants of online interactions. Regardless of the medium, individuals can decide about the flow of their discussions, i.e. whether to refine or postpone an issue. Numerous studies have shown that groups communicating with text-based, asynchronous media can still develop social presence and critical thinking skills (Duphorne & Gunawardena 2005; Jeong 2003; Rourke *et al.* 2001a).

However, what can be said is that critical remarks more often developed into a productive debate within the richer environment of Centra than they did in the text chat. A good illustration is a comparison between group 3's text chat and its Centra session. The text chat included 12% of critical thinking in three clearly separated spikes, whereas the Centra session included 23% of critical thinking based on a longer sequence of spikes in phase 2. Unlike text chats, Centra sessions afford more possibilities to follow up critical issues collaboratively. Whether by adding to an evolving case report, changing a formulation, or using a shared editor, richer technologies allow group members to see the immediate effect of their discussions – which can spark further ideas and comments.

6.5 In-Depth Interpretations

In-depth interpretations aim to present empirical evidence in different contexts and perspectives (Section 4.6.3). Whereas the previous structural analysis evaluated the e-CBL design by analysing learners' activities within a theoretical framework (Garrison & Anderson 2003), this Section evaluates the e-CBL design based on how learners experienced the design. A good way to capture what matters to learners is interviews, because then the learners themselves specify the context in which they interpreted an activity (Seidman 1998). For example, based on the structural analysis, some e-CBL group processes seemed rather inefficient but individual group members could still value their experiences because they were able to develop new skills in using a virtual collaboration environment. These skills might not have had a strong impact on their actual group performances, but could still be interpreted as useful due to their potential applicability in learners' working lives.

This Section interprets the data from six in-depth interviews and a focus group. The interview question are organised into three blocks (study orientation, group work and tasks, technology support), which were derived from an understanding that all e-CBL activities are embedded in activity systems (Figure 6-16).

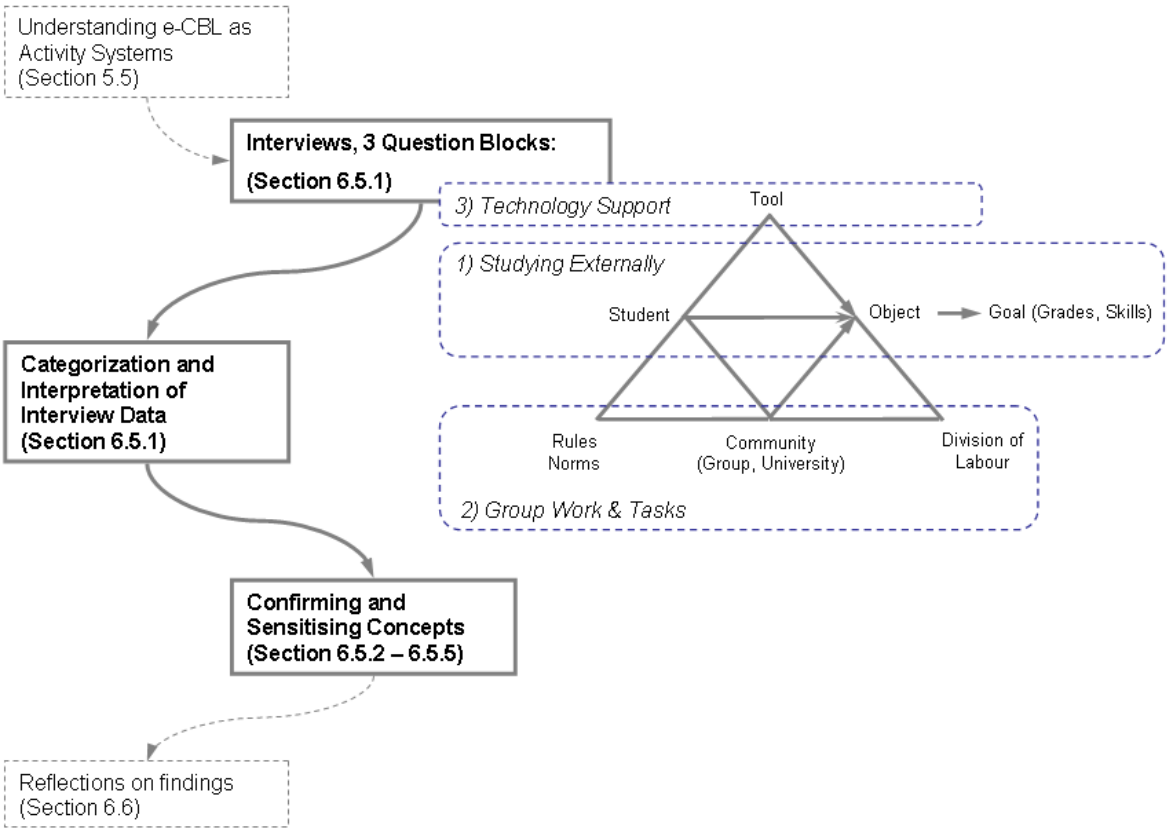


Figure 6-16: In-depth interpretation based on interviews (SP7 2005)

After the interview topics are introduced, the Section continues by describing the organisation and setting of the interviews. The analysis of interview data is then accounted for in two separate steps: firstly, interview data are aggregated across various sources and, secondly, similar concepts are aggregated under a common theme. The in-depth discussion of these themes is organised around sensitising concepts leading up to the suggestion of future improvements for the e-CBL design.

6.5.1 Interviewing online case learners

The need to integrate learners' own perspective was emphasised by Rourke and Kanuka (2007, p.106): "Participants' understandings have been largely overlooked in a body of research that privileges analysts' preconceptions about what is relevant, salient, and problematic about online discussion". These authors argue that if, for example, computer-mediated discourse should contain more critical argumentation, it is necessary to understand how students experience their online interactions themselves and why they do what they do.

The data gathering technique used in this Section are semi-formal, in-depth interviews (Section 4.5.1). One of the main tenets of in-depth interviewing is to allow for a conversational style where the interviewer imposes his/her agenda as little as possible so as to create a climate that encourages the emergence of issues and comments considered important by the interviewee (Seidman 1998, p.70). The researcher used a set of reminders concerning the implementation of interviews concerning the way follow up questions should be worded or what type of questions could help to encourage interviewees to further elaborate on their answers (Appendix B.7).

Interview topics

An interview guideline has been developed that suggests a number of broad questions in order to address different facets of the online experience of external students. As depicted in Figure 6-16, interview topics were organised around three dimensions of activity systems: (1) students' objectives and study conditions, (2) students' perceptions of group work as a determinant of their individual learning; and (3) students' comments on how the technology supported or hindered their online interactions.

The following questions were used in the interview (an overview with all prompts per question is included in Appendix B.6).

1st Question Block: Studying externally

- What is it like to be an online student?
- How many subjects did you take this summer school ?
- What did you get out of this course?

2nd Question Block: Tasks and Group Work

- How did you find the case studies in the course?
- How did you prepare for case studies?
- How would you describe the groups approach to case studies ?
- How did the group organise for online meetings?
- What was collaboration like in your group?
- What did you do during the online meeting ?
- How did you combine and collate the individual preparations into the final case statement ?
- Every second week your group's case report was uploaded … What feedback did you get?
- What made a feedback useful to you?
- What made you reply to the feedback you have got.
- How did you go about giving feedback to peers in the course?

3rd Question Block: Technology Support

- How did you get along with the technology ?
- How did you go about learning the technologies?
- Could you describe a typical chat meeting ?
- Could you describe a typical centra meeting ?
- Closing question: What would you like to have changed in this course?

Organisation of interviews and focus groups

The same topics were addressed during the interviews and the focus group. By having a focus group in addition to the interviews, the researcher could benefit from a group dynamic where learners respond to or comment on their peers' answers (Kitzinger 1994). For example, one person might raise a problem and propmt another participant to report on how the same problem was solved in his/her group (Krueger 2000).

Suitable interview candidates were selected in the same way as group meetings were selected for the structural analysis (Section 6.4.2). The purpose was to obtain insights from highly active students who took the initiative in developing their group's collaborative processes, as well as from students who had sensitising experiences during the course, such as working in low-involvement groups, major hurdles in accessing the technology, or dominating peers. Focus group members should also have been sufficiently active in their respective groups that they could realistically talk about their experiences with online group work.

Table 6-21 lists all participants in interviews and focus groups. To preserve their anonymity, all participants are referred to with an identification code consisting of their group number and a running identifier, consisting of numbers for interviewees and letters for focus group participants.

Table 6-21: Interviewees and focus group participants (SP7 2005)

Group	Interviewees	Time	Gender	Age	Focus Group (90 min)	Gender	Age
1	Student 11 Student 12	75 min 71 min	M F	42 30	Student 1A	F	22
3	Student 31 *Student 32**	98 min *55 min*	M F	42 26	Student 3A	F	23
7	-	-			Student 7A	F	25
8	-	-			Student 8A	M	26
9	Student 91	67 min	M	23	Student 9A	M	37
10	Student 101	109 min	F	53	Student 10A Student 10B	F M	20 24

* No written consent form sent back.

In total, 13 student (29% of the course) participated in either the focus group or an interview. The information from one interview could not be used since the student was overseas and did not send back the consent form (a sample of which is available in Appendix B.8).

Students were interviewed over the phone so that interstate and overseas students could be included. Other benefits of telephone interviews were the low costs for interviewees, e.g. no transportation costs, and the possibility to schedule interviews during more convenient times in the evening. The interviews were recorded by splitting the phone line and connecting one line to the computer via a voice modem (Figure 6-17). Phone calls were recorded with TRx phone recording software, available for AUD 21 (http://nch.com.au/hardware/setup/callrec /analog.html, accessed 10.01.2008).

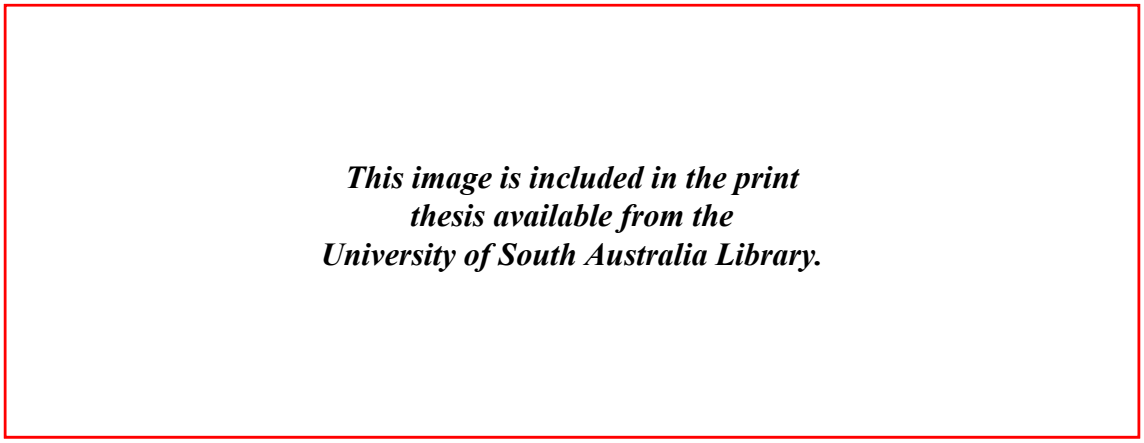


Figure 6-17: Interview Recording - Single Line Analogue Setup with Voice Modem[71]

[71] Picture taken from NCH Swift Sound, distributor of the TRx phone recording software. (http://nch.com.au/hardware/setup/callrec/analog.html, accessed 10.01.2008)

Interview recordings were saved as .wav files and transcribed using ELAN, the open source application which had already been used to transcribe Centra recordings (Section 6.4.2).

The focus group was facilitated through the Centra application, where the session could be recorded without difficulty, since this was supported by the software itself. An often cited downside of doing interpretative research using computer-mediated-communication is the lack of non-verbal cues necessary to organise flow during a focus group interview (Johns, Chen & Hall 2004). However, studies with chat or forum based focus groups found that groups adapted to the communication medium and could generate the interaction that is essential in focus groups (Williams & Robeson 2004). Moreover, since the focus group took place in the very same environment students had used for the past 5-6 weeks discussing their cases, a minimum of familiarity with the medium could be assumed.

Presentation of interviews and focus group data

Patton (2002, p.439) suggests three approaches to reporting qualitative data:

- Storytelling (using chronologies, flashback),
- Case studies (based on critical incidents, individual learners), and
- Framework (organised by processes, issues).

In this study, interview data have been organised according to the processes and issues they address (framework approach). Relevant processes and issues are derived from activity systems, which makes them a common basis for e-CBL design (Section 6.2), interview questions (this Section) and interview interpretation (Section 6.5.2 - 6.5.6).

In order to analyse all responses across the various interviews and the focus group, transcripts were loaded into nVivo 7, a commercial software package suitable for the analysis of large amounts of qualitative data[72]. NVivo allows the user to interrogate data at different levels, ranging from a first level organisation of the data through descriptive codes to creating a web of analytical codes that presents the data from a variety of perspectives (Welsh 2002). Using nVivo 7 in this research offered a twofold benefit: firstly, answers from different sources could be combined under a common topic and, secondly, the large amount of transcript data (some 30.900 words) could be filtered by selecting only sufficiently meaningful snippets, leaving 41% of the data for further interpretation.

[72] A fully functional trial version can be used for 30 days (http://www.qsrinternational.com/products_nvivo.aspx, accessed 10.01.2008).

Table 6-22 shows an overview of the categories of activity systems used to organise the data. The categories are sorted by number of words and it can be seen that the interviews and the focus group have been most fruitful in revealing aspects of how technology (8.9%) and the case-based learning method (6.4%) influenced learning. This is not surprising since both topics stood at the centre of the interview questions[73]. Not expected, however, was the low number of comments about the exchange value of learning (0.4%), e.g. the assessment scheme. Substantially more comments could be extracted regarding the use value of learning (3%), e.g. the actual skills learners could apply outside the course.

Table 6-22: Dimensions of activity systems (SP7 2005)

Activity Systems Category	Words	Percentage
3_Tools - Technology	2745	8.9%
3_Tools - Cognitive	1977	6.4%
2_Community (Reference to ...)	1941	6.3%
1_Developing Tool or Process	1829	5.9%
2_Rules & Norms (Informal)	1210	3.9%
1_Student (Conditions)	1073	3.5%
2_Division of Labour (Formal)	913	3.0%
1_ Use Value	813	2.6%
1_ Exchange Value	136	0.4%

In using nVivo primarily as an organisation and filtering tool, the researcher decided against using the extensive coding functionalities of the software that create several layers of codes, which then lead to the emergence of themes (Welsh 2002). Defining a theme is a complex process during which the researcher switches between reading the data and constructing or discarding potential interpretations (Kaczynski 2004). However, concerns have been raised about whether software packages in qualitative research allow for the necessary flow and creativity to recognise themes in qualitative data (Smith & Hesse-Biber 1996). Kaczynski (2004) emphasises that it is not the usefulness of qualitative analysis software packages in general which is under debate, but rather their specific

[73] Naturally, these percentage are driven by the questions and prompts given during the interview. To some extend, however, they also reflect the willingness of interviewees to refer more frequently to some topics than to others. For example, asked about their online collaborations, students did more readily refer to organisational or technological aspects than to the benefits and values of collaboration.

functionalities and whether their design is sufficiently informed by the needs and requirements of qualitative researchers.

The researcher limited the use of nVivo to a first level organisation because it was felt that further coding would fragment the data in a way that constrained rather than supported the identification of themes.

Figure 6-18 shows the main areas of nVivo: (A) transcript area, (B) coding area – see Table 6-22 for an overview of all codes – and (C) coding stripe, where the researcher can see which codes have been used where.

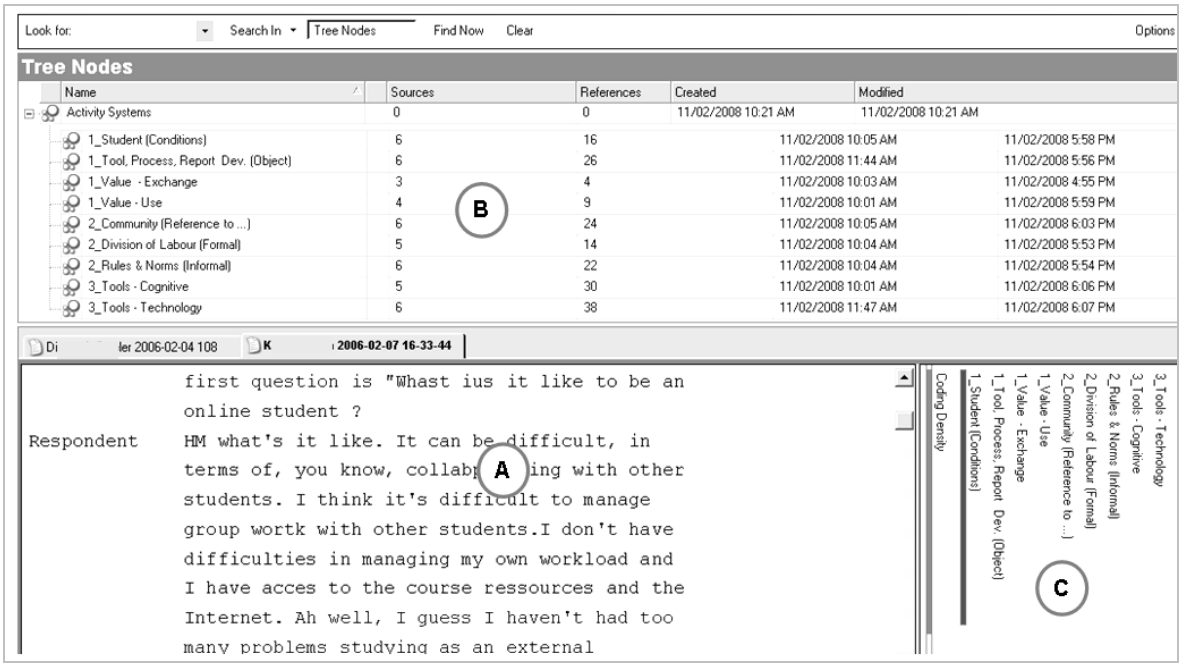


Figure 6-18: Categorising interview data in NVivo 7

Text snippets are selected in (A) and linked via drag and allocated to categories in (B). After all transcripts had been analysed, 9 reports (one for each coding category) were generated. The reports contained all pertinent text segments including a reference to their original source document. Although these reports imposed a first interpretative scheme, they were still coherent enough to allow for the emergence of genuine themes.

Interpretation of interviews and focus groups

The interpretation of the interviews and focus group aims at the extraction of themes from the answers, aggregated under a particular category. In order to extract or develop those themes, the nVivo 7 reports have been further consolidated by combining similar responses under a heading in a word document. The resulting word document contained some 40 sections with 1-5 answer snippets per heading. The document was then exported into MindManager 5 (http://www.mindjet.com/, accessed 10.01.2008), where

each heading was automatically transformed into a topic on the mind map. Next, several branches were subsumed under an overarching theme until the following mind map emerged (Figure 6-19 or Appendix B.9 for an enlarged mind map).

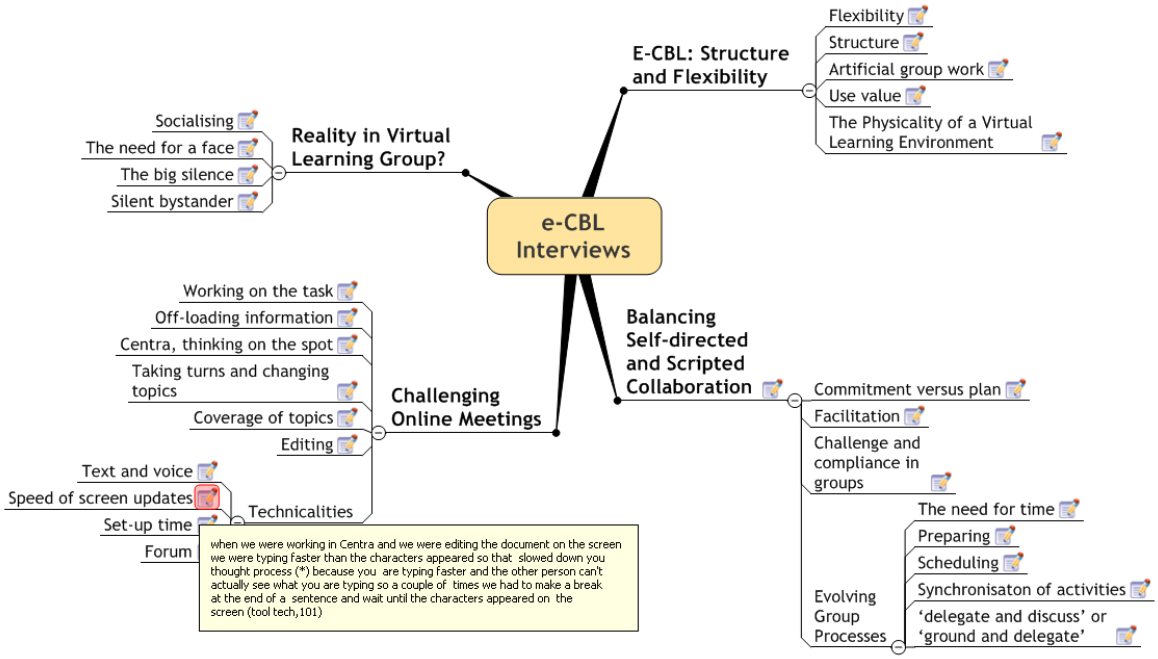


Figure 6-19: Mind map of emerging themes[74]

Finding themes in qualitative data is an essentially creative task (Bentz & Shapiro 1998, p.87) and Shneiderman (2000), an expert in information visualisation and human-computer interaction, argues that finding appropriate ways to visualise data and processes is a major enabler for free (viz creative) associations between the elements of a problem or an activity. Using a mind map, sub-topics can easily be grouped under a new theme (main branch) or reorganised by shifting a subtopic from one branch to another until the map summarised the interview data in an effective and meaningful way.

The following discussion of themes (Sections 6.5.2 – 6.5.5) is structured around sensitising concepts (McConnell 2005; Patton 2002, p.456). Sensitising topics can help to recognise the ambivalence of many design and structuration measures. For example, in several instances comments showed a tension between the request to have group work monitored more closely (to stop free-riders) and a bemoaned lack of flexibility due to the need to coordinate group work[75]. Blumer (1969, p.148) explains that, unlike definite concepts, which refer to a specific set of attributes to look for, sensitising concepts

[74] An advantage of MindManager ® is that the information from the original transcriptions can be accessed at any time by clicking on the document icon right to the name of the topic.

[75] Quote: "I mean it's good to give flexibility for the individual preparation but there is no restriction to get it done by a certain time and then you are relying on the good will for group work" (Student 11).

indicate only a direction along which to look – in the above example a tension between flexible and structured modes of collaborating online. The benefit of developing sensitising concepts is that they can enhance the existing e-CBL design, by highlighting limitations or potential contradictions as perceived by the students. The discussion of the themes refrains deliberately from bolstering students comments through references to the literature. Rather, the themes presented are to be corroborated by the respondents own words: "The point of analysis is not simply to find a concept or label to neatly tie together the data. What is important is understanding the people studied" (Patton 2002, p.457).

6.5.2 E-CBL: Structure and flexibility

The first theme that emerged out of the question block on studying externally (Appendix B.6) made clear that a challenge students[76] faced early on was aligning what they knew from previous external studies with the unfamiliar concept of e-CBL (a-c).

> *(a) As an external student I was used to planning things myself a lot more. I got two major assignments and I could fit them in when I wanted and with this online course it was in some ways more like an internal course. You know there is an obligation to prepare every week for tutorials. That's the only aspect I struggled with, getting in the routine of thinking 'I can't actually do things at my own time…' But once I got the hang of it, I managed my non-study activities around it much better. Just this initial impact, oh my goodness, I have to do this every week (Student 11).*
>
> *(b) I think I have done one previous external study before which wasn't online in the fashion that this course was. They just handed out hard copies of everything in paper form (Student 91).*
>
> *(c) I haven't noticed that myself, but a lot of people say that external studies are not very structured and then you are 3 weeks into the course and you are way of the mark where you need to be. But I found with e-Business it has been quite structured and there wasn't the opportunity to fall behind (Student 31).*

Although students were concerned with the incremental deadlines, they also appreciated the new forms of interactivity which made the course more interesting (d-f).

> *(d) … it's a good change from the monotony of contact hours and assignments especially since I work fulltime so yeah it was good to get that because of the flexibility (Student 8A.)*
>
> *(e) I think it [e-CBL] also reinforces the university's quality, because it does require you to get of your bottom and look for things yourself and that in itself can be a learning experience (Student 101).*

[76] Student-IDs which include only numbers indicate quotes from interviews, whereas those with letters show that the quote originates from the focus group.

(f) *In an external course I read the book, I do the assignments and post them back. But online suggests there is going to be a much richer delivery electronically. If I am studying online, I will spend on technology and if I study externally, I will spend a lot on stamps .. (Student 31).*

Group work

Another contentious topic was the course's reliance on group work. These concerns, however, were mostly related to general issues which working in groups implies independently of on- vs. off-line study. Students found it difficult to deal with group members who had low expectations or could not make meaningful contributions to the group assignments (a-c).

(g) *I am a mature age student and I had always problems with group work at the university - it doesn't really reflect real life, where you work in teams that are put together because of their abilities. There are professional expectations. But a random group is a real mixture … some people want to just get through with a P1 and they do the minimum and that's why I find it an artificial thing (Student 11)*

(h) *… the group response was mostly my point of view. and so I didn't see any value of working together in a group. I might have as well posted my response as group response, because probably 80% was what I had put down in my original preparation (Student 12).*

(i) *The litmus test whether or not they had participated was what they had posted to the group discussion board .. We didn't sort of gage participation by attendance of meetings or anything else (Student 31).*

Using teaching cases

Even though collaboration was difficult at times, overall, the concept of using cases as the basis for collaboration was perceived positively (a-c).

(a) *I don't think I had ever done something like this before. You use the information straight away in a sort of very practical way. Once I got into the swing of it …I thought this is good, you are reading a couple of chapters or whatever and then you are doing the case. It made it more relevant. Because otherwise I think however hard lecturers try in some courses, basically I just learn stuff for the sake of learning it and the good thing about the case study was the theory side of it, you immediately applied it to something real. For me that was like .. Oh that's like in some technical subject where you learn some code and then you apply it (Student 11)*

(b) *The Microbusiness case was a very practical exercise because that leads itself into thinking about how can you adapt the e-environment to a Microbusiness. ... (Student 101)*

(c) *… they were real life companies. There were a lot of current lessons to learn and I found that even answering the question made you think broadly about business like revenue models and how e- commerce links into business and the whole business structure. How you can use marketing with e- Business … (Student 8A)*

The physical environment of virtual group members

An issue the researcher had not yet considered concerned the physical location from which students accessed their online meetings. Even though they had the flexibility to login from anywhere, the following quotes highlight the importance of a relatively undisturbed and quiet environment.

> (a) *I am married with three young kids ... and I have a full time job. So the triangle of study, home and work is always a difficult balance… I guess, when you are going to a tutorial to the university on a particular night, that has a more tangible structure for the people around me, rather than saying 'I have to duck off to the computer now and you need to be quiet while I do this'. Anybody who has got kids will know that everything between 4 and 8 o'clock at night is a witching hour. And of course, if you are lucky enough to be studying internally then you got away from it. (Student 31)*

> (b) *Also with the voice activated microphone you get a lot of background noise. A couple of times when I was talking to <name> I could hear the other students [in the computer lab] while she was talking … Maybe they could have a room aside for students doing this course (Student 101)*

Future improvements

Based on the analysis of this first theme, three conclusion can be drawn:

- Students' expectations should be managed upfront and pro-actively.
- The current e-CBL design needs to include measures to safeguard against free riders.
- The physicality of students' access points matters. Whereas computer pools could provide soundproof areas for online learners, students who participate from home may have more difficulties to find a quiet place from where to participate in audio sessions.

6.5.3 Balancing self-directed and scripted collaboration over time

Whereas the first theme weighted the cost and benefits of e-CBL in terms of structure and flexibility, this theme explores student's collaboration at a more fine-grained level. At the centre of the theme are groups' abilities to observe and self-manage their learning.

First of all, it became evident that students did not take well-functioning teams for granted:

> (a) *We were fortunate that we were all fairly committed to the course so we didn't have to nag people to get down to the motion (Student 101).*

> (b) *I think I was pretty lucky with the group because we were all fairly responsible people (Student 10A).*

(c) *The relationships I developed with the study group for this course are by far and away the best I had ever established with any tutorial group in an external course (Student 31).*

Continuous effort

Depending on the conditions in their teams, students took different approaches to organising their group work. It seemed important, however, that groups made a sustained effort to improve their team work on a technological (a, b), organisational (c) and methodological (d) level in order to improve their collaboration processes.

(a) *Everybody is doing it in a rush so we are sort of grabbing the technology and using it as best we can. But we were still primarily using email as a way to get things done quickly (Student 9A).*

(b) *I spend half an hour playing with it, gaining confidence … we had three case studies where we used Centra and we were just getting better and better at it (Student 101).*

(c) *… the more case studies we had, the better I got at organising it (Student 12).*

(d) *Once people got the hang of giving feedback, it became better. Because it started off like, well you did good .. once they realised they could be critical without being nasty, they made a number of good points. Not only about the structure and stuff, but also about the issues you raised (Student 101).*

It needs to be kept in mind that basic guidelines had already been put in place as part of the course design, particularly through collaboration scripts or the critical thinking scaffolds (Section 6.2). However, these guidelines often had to be adapted to the group's needs or required finetuning to make them work (e, f).

(e) *Basically we started off trying to have a set time for each case but this sort of faded away very quickly. People had things coming up at the last minute and they couldn't attend the meeting (Student 11).*

(f) *I just found it difficult to settle down and type up the response and when I did actually do that and I sent it to the other group members, they already had done a lot of work on it so a lot of my work was repetition. Just my timeline was not in sync with what the other members were doing. (Student 101).*

There was, however, a fine line between being too permissive, letting 'free-riders' get away, and establishing norms that would ensure fair distribution of efforts (g).

(g) *There were obviously cases where people couldn't make it for various reasons but we were able to establish that where people couldn't make it they contributed to the group in some other way (Student 31)*

Integrating online meetings into group work

The focus group revealed two different approaches to integrating online meetings into the group work. Both approaches required that everyone in the group prepared all questions

(a). If this did not happen, as indicated in the second quote, the meetings were of little value (b).

> *(a) We were going to delegate each question but we found that when everybody posted their own answers sometimes people interpreted the question differently so we had more variety in the answer when everybody posted to the same thing (Student 10A).*

> *(b) I felt I had to motivate the students in my first group (pause) to join in with me, with the group discussion. Because I really wasn't getting from them that many ideas and also they had left their preparation until the last minute so it didn't give me enough time to look at that and I also don't think that they looked at my preparation. So by the time we met online we didn't had much to discuss with one another or it was very much one way (Student 12)*

In the first approach ('***delegate and discuss'***), the group started with allocating specific case issues to individual members who would then produce a first draft answer based on the preparations of their peers. In a next step the group would meet in order to discuss and refine their answers. In this case group work proceeded from asynchronous preparation to synchronous finalising.

> *(c) … the way we tried to tackle the questions was to break them down into smaller chunks and then one person would focus on one section more than the others. and then the individual contributions could be used by the others and they would try and get together bits from everybody to make something more final before we actually met (Student 3A).*

With the second approach ('***ground and delegate***'), groups started by having a meeting, discussing the case questions and allocating sub-task to individual group members afterwards. These groups proceeded from synchronous preparations to asynchronous finalisation. However, participants of the focus group perceived the first approach, going into the meeting with a draft, as the more advantageous one (d).

> *(d) That sounds like a great idea I wish we had thought of that. What we have been doing is posting up our individual submissions and the we just get along and read everyone's and look what we need actually expand on it etc. delegated that and just get one person to pick bits and pieces from everyone, like the best bits and put it all together (Student 7A)*

Another decision groups had to make was whether they wanted to work in smaller sub-teams of 2-3 members. Although not mentioned in the course outline, some groups found the possibility of meeting as sub-teams a helpful measure to shorten the duration of the meeting with the entire group (e).

> *(e) We just called those meetings and were taking the approach that if the majority of the people could make it then we would hold it there … I think that save a lot of time in terms of meetings for the group where we had all four. But overall we had more time because we worked in pairs to sort it out first. I think this was the most efficient way to do it (Student 31).*

Facilitation of online meetings

Another issue that required groups' self-management was to find a modus operandi facilitating the flow of their discussions. While one group stated they did not need a facilitator (a), others reaffirmed the benefit of having a facilitator (b, c).

(a) *We didn't have a facilitator or leader, we all seemed to pull our own weight and volunteered for things. So we didn't really need someone who told us what to do (Student 10A).*

(b) *All the meetings we had, whether that was Centra or the chat were much more successful if one person took the lead, asked for everyone's opinion question by question and then moved on (Student 8A).*

(c) *At the end of the day we didn't struggle to find someone to act as the facilitator we didn't had to actually appoint anybody … we would have a couple of minutes some relaxed communication and then someone would step up to the mark and way you go (Student 31)*

Critical or cautious peers

Whereas preparing and facilitating a meeting could be seen primarily as costs, the benefit of online meetings was clearly related to the extent other group members enriched or changed one's own understanding (a, b). Critical remarks, however, were also perceived as a sensitive issue, because students could take the critique personally (c).

(a) *… so what I was really looking for, was someone to help and change my mind and give me a different perspective (Student 12).*

(b) *… someone may suggest that this position could be augmented by this bit over here and you sort of either accept that or develop a position that counteracts that and whatever way you go, your own position is strengthened if you discuss it with others. (Student 31)*

(c) *And that's sometimes the problem if you get a group exercise doing a single response, because sometimes the group members don't want to appear to be discriminatory to another person so they allow content that's not particular worthwhile (Student 101)*

Future improvements

With respect to collaboration scripts that are to regulate group work and online meetings, it is important to include room for change. Groups need to understand that it is unlikely they will get their group processes right immediately and that experimenting with different approaches is part of their experience in becoming self-directed learners. Additionally, the course design needs to strongly encourage the cultivation of dissent by illustrating how challenging another's view can be productive.

6.5.4 Challenging online meetings

Once interviewees and focus group had raised their issues at a mainly procedural level, i.e. how to coordinate and integrate different activities, the researcher directed the topic to

the more technological dimension of e-CBL. The first remarks confirmed what was found in the structural analysis, namely that chat sessions were primarily used to organise group work; and the discussion of case related issues increased once students had access to Centra.

> (a) *Then we didn't really use the online chat sessions much to prepare our work. It was more to organise when we were going to meet next and when we were going to have our own answers on the discussion board … we never worked on a group thing together on the text chat as when we worked with Centra (Student 10A).*

Integrating screen and voice

However, this benefit was coming at a cost. Groups had to gather experiences with the particularities of computer-mediated communication. A major issue was the efficient coordination of presenting and updating the screen while maintaining the discussion verbally. Some groups opted to prepare a central document prior to their first meeting (a) while others, however, chose to work with hard copies that could inform their online discussions off-line (b).

> (a) *I did pull out the points of each respondent and I put them into one document to share in Centra because I found it easier to look at that on the screen and to talk about each point (Student 12).*

> (b) *I just found it much easier to print it out it just allows you to scan it so much quicker just to get my head around it so basically I highlighted it all so I could see where each person thoughts were (Student 91).*

Moreover, the increased pace and immediacy of Centra meetings was also perceived as a challenge as one student said: "*It's very difficult to think on the spot - specially when you are using Centra" (Student 12)*. The number of simultaneous tasks (monitoring the communication environment, managing the note taking and keeping the discussion on track) could be overwhelming if not shared between different team members.

> (c) *You are looking at what's on the screen so you are busy what's happening in front of you reading the text messages - in Centra you know you have to control the environment with the keyboard and you have to look if some have their hands up and all that's happening on the screen as you are trying to think about it on the spot about what to say next … (Student 12).*

Parallel activities

To successfully manage Centra meetings, groups needed to recognise that their meetings required facilitation at different levels. While one group member was guiding the group on an organisational level, exchanging information on a technical level had to be supported by all group members. For example, rather than having the facilitator take notes, the following group used the chat to send the fully formulated ideas which were to be included

into the report to the application host, who could then paste them directly into the document, where they could be discussed by the entire group.

> (a) *We fairly quickly found that we needed to operate in a white board type of manner where one person would do all the typing and everybody would discuss and suggest things. And as a workaround we found that even in a small group of two - when we were trying to put a document together ...one person would be controlling the application and if the other person wanted to insert some text we would actually use the text chat and type in the sentence you wanted to include and we would just pick it out of the text chat and paste it in (Student 31).*

Future improvements

Future Centra training sessions need to address how to coordinate activities in parallel. This does not necessarily mean allocating specific functions to each group member (e.g. scribe, facilitator, information provider), but could be achieved by explaining what activities can be done in parallel and how they could be coordinated.

6.5.5 How real is a virtual learning group?

The previous theme showed what benefits and costs a richer collaboration environment implied for online case discussions. Throughout the interviews, however, participants commented also on how the virtual meeting room changed the way they related to their fellow team members.

> (a) *The thing I found most enjoyable was that even though we were external students you had a chance to form relationships with the people in your group and actually become friends with them. Because I had external courses before and you really had no contact with anybody … but doing assignments online and chat online puts a face, oh well a voice, to the person. It's much easier to work with a group and actually feel as a part of the course instead of just random (Student 10A).*

This was not a direct consequence of the medium alone but also of the group's self-understanding and its decision to allow for social interaction. The following comments show that other groups clearly had a more instrumental self-understanding (b, c).

> (b) *Oh I wish we would have been like that. In our group we had very busy people so we couldn't really chat about how are you or what are you doing (Student 1A).*

> (c) *… those meetings online aren't social meetings. They don't know me, I don't know them. They don't care about me and I don't care about them. … we are each trying to get through the work and get along and get the best grade we can (Student 12).*

Other groups, however, were more open to everyone's personal circumstances and could therefore create a climate where group members could own up to their weaknesses and adjust their contributions to the best of their abilities (d, e).

(d) *And if something came in between, we were fairly confessional to each other. <name1> had the least academic workload, so she was instrumental in setting dates and times and things. <name2> has three subjects he is doing and he had quite an extensive workload but then one of his majors is in IT so he already had a lot of information in his mind (Student 101).*

(e) *I am not particular technology literate, I work by trial and error, but I have good experience with critical analysis so I think the group could still benefit from me .. (Student 101).*

Naturally technology could not substitute for students' preparation, so that at times online meetings were perceived as difficult (f) or not very inclusive (g).

(f) *… when we actually got into Centra it was at times quiet uncomfortable because a lot of people weren't actually talking. There wasn't a lot of communication, it was like everyone was waiting for someone to say something (Student 7A).*

(g) *In a face-to-face meeting it is very conspicuous if you are sitting there and you don't say a word and with Centra you can be in a group and people can talk and you don't notice that they only said one thing in the whole meeting (Student 11).*

Future improvements

As suggested by some interviewees, Centra should be introduced earlier. This way the technology can enable rich interactions to support the social formation of groups right from the beginning. Moreover, the question of 'Why does social interaction matter?', should be discussed with the group in one of its first meetings to promote an understanding of how trust and flexibility can influence the group's productivity.

6.5.6 Outcomes: Further design improvements from a student perspective

The objective of this Section is to capture students' experiences of the e-CBL course. The primary question was 'How did students perceive their efforts and gains associated with e-CBL in the context of their day to day life?'. Questions were grouped around three topics: studying externally, tasks and group work; and technology support.

Data from 5 interviews (7 hours) and 1 focus group (1.5 hours) were first organised according to nine categories derived from an activity systems perspective (Table 6-22). Further aggregation of these categories led to the emergence of four main topics which were presented in more detail and are summarised in Table 6-23. Improvements are changes that can be implemented straight-forwardly, whereas cautionary remarks hint at potential pitfalls or negative side-effects to be considered in future research.

Table 6-23: Cautionary remarks and improvements from a student perspective

Theme	Cautionary remarks	Improvements
Structure and Flexibility of the e-CBL design	The weekly or fortnightly commitments of group work can be experienced as too high a workload by students who are used to a maximum of three due dates per course. Group work, on- or off-line, is quickly perceived as inefficient or problematic, if members judge each others capacities and expectations as too different.	The different nature of this online course needs to be communicated up-front. Students need to know what to expect and experience online group work first hand in order to decide whether this course is right for them. The design needs to include a clear process how groups should proceed if they feel a group member is not contributing his or her fair share.
Self-directed and Scripted Collaboration	The current collaboration script (Section 6.2.2) is relatively coarse-grained. Students themselves need to differentiate between what should be done by everybody and when individuals should start specialising on a specific issue. Groups were well aware that being critical with each others work was necessary to improve the quality of the group's results. However, they also felt that too much criticism could harm the group's overall well-being.	The scripts and scaffolds used to structure the three phases of e-CBL have proven useful. However, the provisional nature of scripts and the benefit of flexible arrangements needs to be emphasised. Two different approaches to preparing e-CBL meetings have been identified: '*delegate and discuss*' and '*ground and delegate*' (Section 6.5.3). Both approaches could be suggested to future e-CBL teams.
Challenging Online Meetings	Monitoring and steering a virtual meeting can be overwhelming if managed by a single person.	Future Centra trainings session need to emphasise differences between organisational and technological aspects of meeting facilitation.

Theme	Cautionary remarks	Improvements
Virtuality in Learning Groups	Although virtual meeting rooms had been perceived as beneficial to enhance each others knowledge, they do not prevent group members from being passive. More active participants can find this problematic.	What happens if group members simply attend rather than participate in a meeting is not yet specified, but two first steps are conceivable. First, it is necessary to find out how a particular group member prepares for a meeting and second, an online tutor could encourage the group to ask for each other's contribution more actively.

6.6 Summary of Lessons Learned and Reflections

In order to maintain a close link between the discussion of the empirical data and any findings, major outcomes have been presented at the end of each step within the hermeneutic process (Surface interpretation - 6.3.3, Structural analysis - 6.4.4, In-depth interpretations - 6.5.6). Therefore, in this Section a brief summary of the lessons learned should suffice as a basis for some further reflections on the findings.

In addition, this Section includes brief answers to subsidiary research questions 2 and 3, addressing the benefits and efforts of e-CBL.

SRQ 2: On what basis can the efforts and benefits in e-CBL be evaluated ? (Structural Analysis)
SRQ 3: What are the efforts and benefits of e-CBL from a student perspective? (In-depth Interpretation)

Pilot study

The major contribution of the pilot study was in the definition of a basic process description for e-CBL meetings. Sharing a word processor was more effective than annotating PowerPoint slides or using a whiteboard.

A shared editor provided a single, extendable information space. By contrast, using PowerPoint implied multiple, separated information spaces (slides), while synthesising information on a whiteboard was limited due to its non-extendable format.

Moreover, learners could easily import their individual preparations into a shared text document which could then be continuously updated, synchronously as well as asyn-

chronously. Additionally, students had the benefit of already working directly towards the expected group outcome, being a case report.

Surface interpretation

The surface interpretation of learning activities during the second research iteration revealed two findings: firstly, groups had substantially more online meetings than before (Section 6.3.2) and secondly, the average time individual groups spent in online meetings varied considerably. To understand the latter, it was necessary to gain an insight into what influenced the duration of online meetings, and what role these played within the overall e-CBL process. Based on a case by case analysis of nine teams, a first set of supporting and limiting factors was identified. Apart from this first understanding of what influenced the quality of e-CBL meetings, the major input from the surface interpretation was the identification of 'rich process teams', that could be further analysed.

Structural analysis

While the surface interpretation (Section 6.3) showed a general increase in learning activities, Section 6.4 put two text chat and two virtual meeting room sessions under the microscope in order to gain a more fine-grained picture of online meetings.

SRQ 2: On what basis can the efforts and benefits in e-CBL be evaluated ?

Based on Garrison and Anderson's (2003) framework of critical online inquiry, a set of four theory-based evaluation criteria (micro-coordination, macro-coordination, social presence and critical thinking) was applied to analyse the groups' synchronous online interactions.

This evaluation basis proved successful to the extent that, at the end of the structural analysis, a phase model could be suggested to explain the different durations of online meetings based on groups' differing activity foci (Section 6.4.4). This model contains a sequence of three phases: meeting set up, discussion, and coordination of future activities. No assertions, however, have been made regarding the duration of each phase. The researcher argues that what happens during a meeting depends largely on what preparations have preceded the meeting. For example, the degree to which members are comfortable with their learning environment can shorten the time needed to get a virtual meeting started, just as more knowledgeable group members can substantially contribute to the discussion process and maintain a meaningful discussion for a longer time.

Hence, the e-CBL meeting model needs to be seen within the context of the general e-CBL development matrix (Section 5.5). Focus of this matrix was the development of technical and methodological skills as preconditions for meaningful case discussions. Combining both models, Figure 6-20 suggests that the duration of a particular phase is closely linked to the overall development of the group, e.g. whether social relationships

have already been developed, whether the group is comfortable with the technology, or whether internal group norms persuade individuals to prepare for meetings.

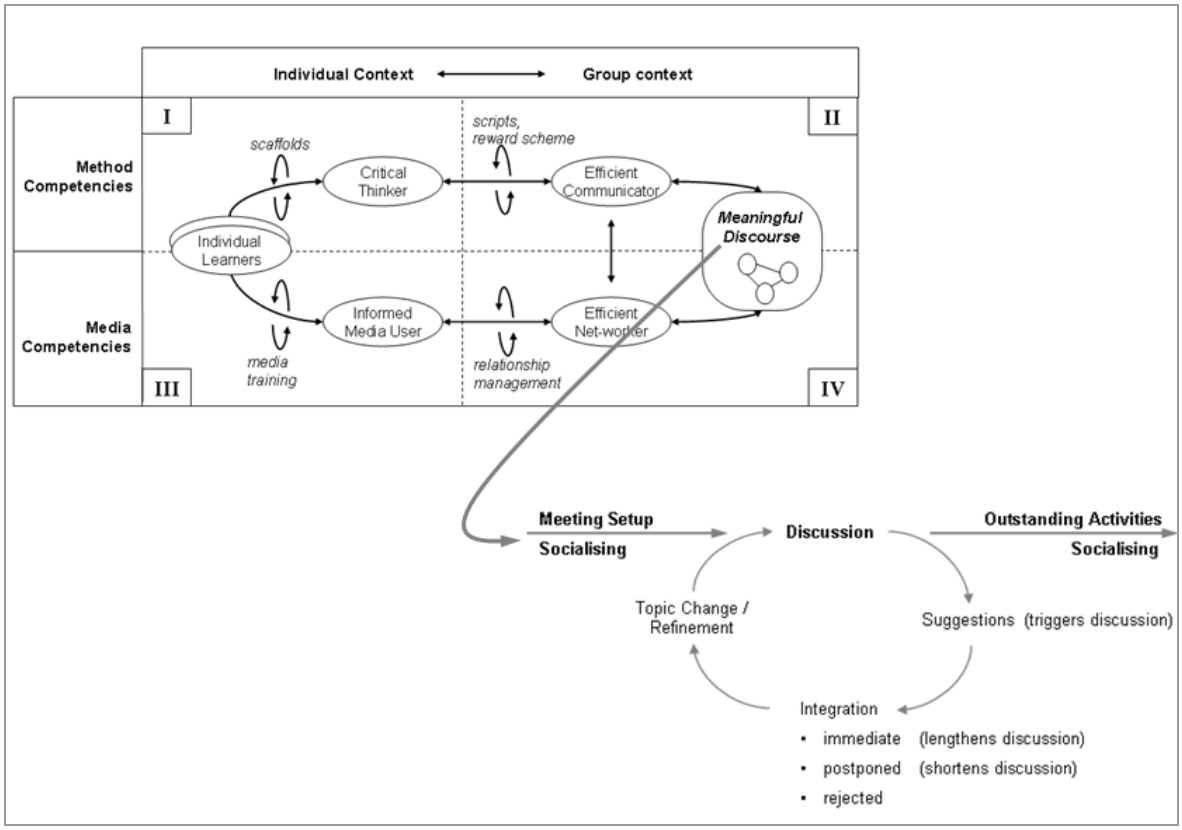


Figure 6-20: The e-CBL meeting model as an enhancement of the e-CBL development matrix

Additionally, the first and third phases of e-CBL meetings contained significant portions of social interaction. Social presence theory suggests that at the beginning of an online meeting, social interaction creates a climate of trust which then allows group members to openly discuss their issues without threatening group cohesion (Browne & Hausmann 1998). Similarly, at the end of a meeting, social interaction is important to demonstrate commitment to the group's success, i.e. sharing a concern that individuals are indeed able to accomplish their tasks.

While the first and third phases seemed to be unaffected by a change in medium (e.g. text chat or virtual meeting room), the second phase (case discussions) shifted its focus from coarse-grained coordination of the task to more fine-grained discussions of detailed issues when groups started using the virtual meeting room. However, a side effect of using the virtual meeting room was an increase in micro-coordination activities, managing the flow and display of information in several communication channels (e.g. audio, screen, interaction symbols).

In conclusion it can be said that the introduction of the virtual meeting room facilitated more task related, critical arguments (benefit). However, significant portions of time were necessary to explore and finetune the concrete usage of the technology (effort).

Moreover, the final reflections in Section 6.6 indicated that deciding whether an activity is beneficial or adverse requires referencing the group's overall development stage. A meeting with a strong focus on social interaction might be necessary in the early phase of forming a group, but the same meeting might be harmful to the group's best interest if an impending due date needs to be met.

Finally, with this model in mind, online tutors can discuss the efficiency of meetings with the groups themselves. In most cases the efficiency of meetings can be linked to the factors identified during the surface interpretation (meeting preparation, activities during meetings and use of technological support). However, not all activities unrelated to critical thinking are signs of concern. With the possible exception of the text chat meeting of group 10, which spent some 54% of the coded meeting on social interaction (Table 6-19), most group activities serve a purpose.

Even if substantial parts of meeting time were dedicated to micro- and macro coordination, this helped to overcome technical difficulties or establish the rules guiding asynchronous collaboration after the meetings. However, if only one group member could benefit from the group's effort, these activities were necessary but not efficient – an effect commonly described as social loafing (Chidambaram & Tung 2005).

For example, if one group member did not read the step by step guide on how to use Centra, the group had to bring this individual up to the group level of application usage. Chidambaram and Tung (2005) caution, however, that it is not always a lack of engagement that leads to non-participation, but also the perception that an individual's contributions to group work are dispensable. To counteract the latter effect, the model in Figure 6-15 underlines the importance of social interaction to promote trust and accountability. Group members need to know that their willingness to support peers is not abused (Stacey 2002) and that their contributions will be accepted even if they turn out to be irrelevant.

In-depth interpretation

All social phenomena need to be investigated within a particular context (Silverman 2001). During the structural analysis, this context was set by the researcher, differentiating between social interactions, micro- and macro-coordination and critical thinking. However, the risk of such a theory-led approach is the possibility of overlooking some implications of online meetings not captured through the structural analysis of observational data. Although the structural analysis approached efforts and benefits from a theoretical point of view (Garrison & Anderson 2003), the in-depth interpretation focused on students' perceptions of e-CBL and how they defined the value (or effort) of online meetings.

SRQ 3: What are the efforts and benefits of e-CBL from a student perspective?

To address SRQ 3 it was necessary to include as many different groups as possible. Not all groups had a majority of high performers. Groups who had to manage 'free riders', showed fewer interactions in general and experienced their online meetings as inefficient. These groups had also different criteria to judge the benefit of group work and rich communication technology. For example, group work was experienced as problematic if a meaningful input from peers was lacking. Similarly, voice communication was seen as superficial or awkward if students attended without preparation and did not know what to say. These comments need to be considered in future extensions of the e-CBL design (see Table 6-23 for a full overview of all findings).

The importance of considering both theoretically informed as well as student perspectives is highlighted by Silverman's (2001) argument that all meaning is constructed locally, in accordance with the circumstances of the meaning maker. For example, if an e-CBL design suggests online meetings in order to benefit from multiple viewpoints on the case's issues, locally, this argument can be invalidated by students' past experiences of unprepared peers and wasted meeting time. The e-CBL design was based on an *idealised conception* (Silverman 2001, p.298) of 'online groups', whereas interviews can reveal *localised conceptions*, held by learners after they had experienced online group work over an extended period of time.

However, new implications of e-CBL not only came from feedback made by groups which had problems in involving a majority of their members, but also from well performing groups. Interviewees suggested that Centra should be introduced from the beginning since this improved the 'reality of group work' considerably or, as one interviewee explained, putting a face (or voice) to the people you work with made it a lot easier.

7 TOWARDS A REUSABLE E-CBL DESIGN

While the last two Chapters focused on the conceptual level of the e-CBL design (see Figure 6-19), this Chapter concentrates on possible reuse of the e-CBL design, beyond the current research context. The Chapter applies a *design pattern* approach which introduces design guidelines in the form of problem-solution pairs, combined with contextual information to ensure the design's inter-relationship with environmental factors is also captured (Goodyear 2005). The concept of design patterns as used in this research was first promoted by Alexander and colleagues in the late 1970s through their book '*A timeless way of building*' (Alexander 1979):

> Every pattern we define must be formulated in the form of a rule which establishes a relationship between a context, a system of forces which arises in that context, and a configuration which allows those forces to resolve themselves in that context (Alexander 1979, p.252).

In this definition, the principal elements of a pattern approach are solution, problem and context.

Solution: A pattern describes a solution to an archetypal problem in a general way, but is not a recipe which can be applied without understanding: the relationships described within the pattern itself; and those existing between the pattern and its neighbouring patterns (Alexander 1979, p.223). Patterns still need to be adapted to local conditions – they are a kind of modular knowledge which refers to other patterns at different levels of abstraction, best represented in terms of scalar relationships (Salingaros 2000).

Problem: After identifying what captures the quality of a design (solution) in a particular situation, Alexander describes the problem in terms of forces dominating the scene (problem description). Forces are constraints on the quality of a pattern.

Context: Alexandrian patterns require contextual specifications for when the problem is most likely to be encountered and when the suggested solution is most likely to be successful.

Much of the appeal design patterns have for practitioners is due to the disappointing results of traditional design recommendations which only partially fit the needs of the educator or designer (Coplien 2004; Niegemann, Hessel & Domagk 2004). Where an abundance of paradigmatic and theoretical perspectives can be confusing, patterns aim to reduce the abstract nature of theories and to support practitioners by explicitly referencing the context within which an educational design operates. It should be noted, however, that research on e-learning design patterns is still relatively new, with only a comparatively few

studies having considered their effectiveness, or designers' uptake of design patterns (Motschnig-Pitrik & Derntl 2003; Sharp, Manns & Eckstein 2003; TELL 2005).

The main objective of this Chapter is to describe further design findings in such a way that other designers can easily grasp the main intentions of a design and decide on its suitability for their own work. This requires the inclusion of contextual as well as operational information to show how a design can be adapted to local opportunities and constraints (cf. Fernie *et al.* 2003; Roth 2001).

Chapter Outline

Unlike Chapters 5 and 6, which provided an in-depth, holistic understanding of e-CBL, Chapter 7 formulates design knowledge in the form of design patterns which follow their own specific rules of analysis and presentation. Consequently, the hermeneutic arc is not re-applied to the analysis of the data: instead, the chapter is structured on the basis of a description, implementation and evaluation of the suggested proto-patterns (see Figure 7-1).

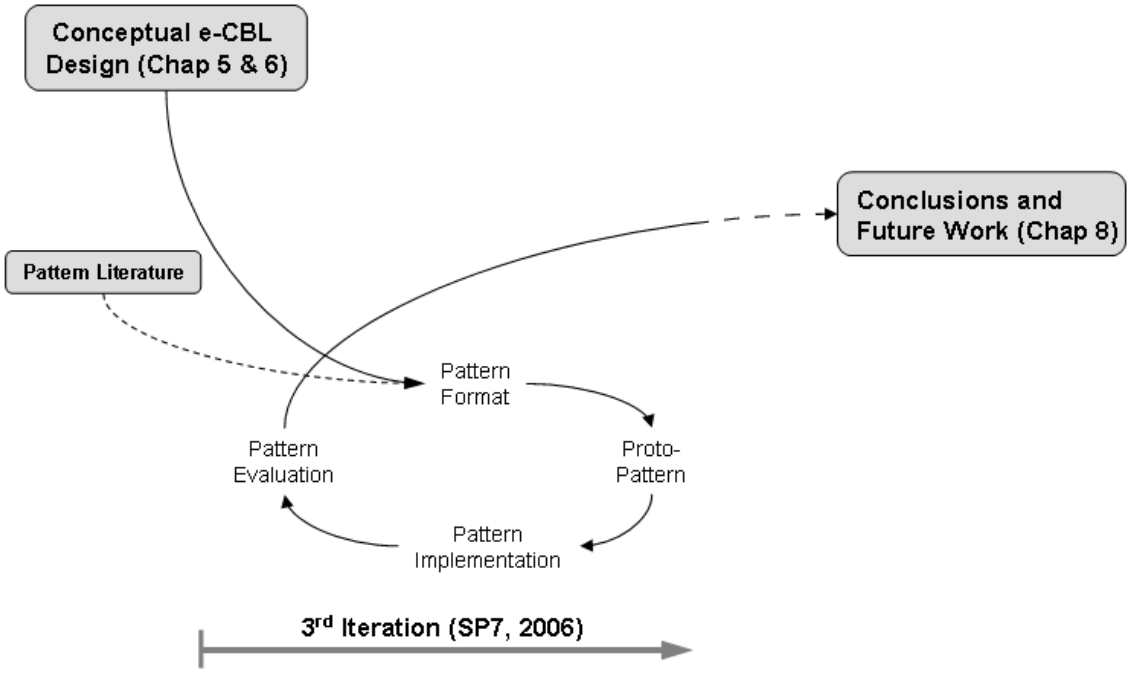


Figure 7-1: Overview of the third research iteration

- The Chapter starts with a brief justification of the need for design patterns, namely the difficulties of sharing knowledge (Section 7.1) and continues with a critical review of the pattern literature[77], leading to the suggestion of extending the classic pattern description format 'problem-context-solution' with a fourth descriptor: 'evaluation' (Section 7.2).

[77] The evaluation of different pattern formats has been previously published in Voigt and Swatman (2006).

- Section 7.3 introduces five Proto-Patterns: 'Writing case studies', 'Planning course activities', 'Getting individual case-learners started', 'Getting group discussions started' and 'Giving feedback to case studies'. Each pattern is described using the four descriptor categories introduced in the first two sections of this chapter.
- The chapter concludes with a summary of these proto-patterns in the context of the e-CBL framework and a note on the evolving nature of patterns as they are applied more frequently (Section 7.4).

7.1 The Difficulty of Sharing Knowledge

Issues of sharing knowledge are frequently discussed and described in the knowledge management literature, especially in reference to the elusive nature of knowledge, most frequently noticed when organisations try to locate and capture knowledge in a form that can be reused later (cf. Nonaka & Nishiguchi 2000).

In discussing the conditions for sharing and reusing knowledge, Fernie *et al.* (2003) point to three characteristics of knowledge which must be considered if it is to be reused successfully in a different context:

- Knowledge is personal - that is, knowledge can be seen as a functional relationship between a person and information leading to action (Nonaka & Takeuchi 1995, p.59).
- Knowledge is explicit and tacit - Polanyi's (1962) dictum 'we know more than we can tell' implies that knowledge is not a transferable commodity, but needs to be re-contextualised, i.e. a person who wants to apply knowledge must first make sense of it (Lanzara & Patriotta 2001).
- Knowledge is collective - Collective knowledge includes, for example, shared values and understandings that are characteristic of the domain or community in which individuals can apply their knowledge (Tsoukas & Vladimirou 2001). The collective nature of knowledge implies that new knowledge must go through a process of socialisation or enculturation before it can be successfully used as part of a community's domain knowledge (Wenger 1998).

These three dimensions also pose challenges when it comes to sharing and reusing design knowledge for e-learning solutions (cf. Jochems, Merriënboer & Koper 2004).

The researcher suggests that many of these issues can be addressed directly by means of design patterns. However, based on a review of how patterns were applied in other domains, such as architecture and software engineering, the researcher also argues that the success of a design pattern is largely dependent on the specifics of its representation (discussed in more detail in the following Section). What information is provided in a

pattern is essential for other designers' ability to decide whether the pattern is relevant to his/her problem, whether it is trustworthy (cf. Levin & Cross 2004); and whether it could be adapted if necessary (cf. McDonald 2006).

This leads to the fourth subsidiary research question of the thesis: how can e-CBL design patterns present knowledge in a way which optimally supports educational designers' need to re-construct and evaluate the recommended design solution?

SRQ 4: How can e-CBL design knowledge be formulated to support its reusability?

Based on the pattern format developed in response to SRQ 4, it is then possible to enhance the conceptual e-CBL design through design patterns which address the issues identified as constraining the value of e-CBL in general – and online meetings in particular (see Sections 6.3.3 and 6.5.6).

SRQ 5: What design patterns can increase the practicability of the e-CBL framework?

7.2 E-Learning Design Patterns

This Section focuses on reviewing and analysing how patterns can support the reuse of design knowledge. Firstly, a brief summary of the benefits of e-learning design patterns is offered (Sub-section 7.2.1). The following Sub-section (7.2.2) discusses how successful the application of design patterns has been outside the area of architecture, e.g. software development and, recently, also in e-learning. This will highlight a number of criticisms which have been made concerning the format of a pattern, i.e. what information is included in a pattern description and why this is included.

The researcher argues that pattern descriptions include a number of assumptions which, if not made explicit, limit their potential for re-use. Sub-section 7.2.3 then discusses what information is recommendable to include in order to help potential users of a pattern to reconstruct both the pattern's underlying logic as well as its 'cultural background', e.g. value systems and research paradigms applied. Finally, in Sub-section 7.2.4, the identified issues are matched against a group of existing pattern descriptors and a more comprehensive format for describing patterns is suggested.

7.2.1 General Benefits of Design Patterns

In addition to their strong emphasis on disseminating practice-relevant knowledge, design patterns have three further objectives:

- increasing the reusability of design knowledge (Harrer 2006),
- providing a 'lingua franca' for designers (Erickson 2000) and
- empowering the future users of a design (Jessop 2004).

The aspect of *reusability* made design patterns a very popular concept in the software engineering community, when an influential pattern collection was published by Gamma and colleagues (1995). These authors defined design patterns as "…descriptions of communicating objects and classes that are customized to solve a general design problem in a particular context" (Gamma *et al.* 1995, p.3).

The notion of design patterns as a *lingua franca* among designers was suggested by Erickson (2000) who argued that many design projects involve the collaboration among a number of experts with differing backgrounds. In such a situation, design patterns abstract from the technicalities of a situation and describe the problem in terms of constraints and solutions in a way which is accessible to all the contributors, independent of their background.

Closely related to developing a design language which broadens participation in the design process is the aspect of integrating and *empowering* the future users of a design, i.e. the learners (Jessop 2004). By presenting design knowledge in a 'commonsensical' form, design patterns can be used to communicate the intentions of a design, if this is not self-evident. Knowing about the underlying design patterns enables users to take full advantage of a design (Erickson 2000).

7.2.2 Pattern usage in different application areas

In this Section, the current pattern-related discussions in the disciplines of software development and educational technology are briefly reviewed. Taking into account the fact that patterns have been a topic of discussion for over a decade in software development (Gamma *et al.* 1995), however, this review has been limited to the works of a comparatively small number of authors – those who seem to encapsulate the views of pattern researchers within their field and who have been most frequently cited by later authors.

Software development

Though the link between Alexandrian architecture and software engineering goes back as far as 1968 (Coplien & Devos 2000), wide-spread adoption of design patterns only occurred when object oriented design and programming became the dominant approach (Gamma *et al.* 1995). Not all patterns, however, need to be object oriented. Coplien (1997), for example, takes a broader approach and notes that the definition of a pattern is (again in the Alexandrian tradition) the solution to a problem in a context, whatever that solution might be – reaching beyond classes, objects and methods:

> Software pattern practitioners have turned to patterns as reaction against this unsatisfying aspect [the formal and scientific grounding of software design with no reference to any value system] ... (Coplien 2004, p.7).

Coplien's and Gamma *et al's* statements about patterns highlight some critical issues accompanying the usage of software design patterns: 'What counts as a pattern?' and 'What contributions to the design process can be expected from patterns?'

Another, more open approach to the use of patterns is taken by Fowler (1997), who sees them as a way of formulating suggestions which may or may not be accepted by his clients. Regardless of whether a pattern is accepted or not, he emphasises, patterns are about clients getting to know their own systems. He argues that patterns have only a limited application potential outside the context in which they were created; and he delegates the final decision on when and whether this can occur to the respective domain experts. Fowler also points out that the validity of a pattern depends on the use of a common framework, which defines the conditions under which it can be used in the future. If we take the reuse of software components as an example, such a framework could be a Visual Basic environment, or object oriented technology.

E-learning Patterns

Although the literature on design patterns in architecture and software development has provided useful evaluation studies for a considerable period, the idea of using design patterns for e-learning is a relatively new phenomenon. The current range of existing patterns in e-learning is characterised by the variety of purposes for which they are used, which is also reflected in the variety of their representational formats: ranging from *computer languages* (formalised representations, such as mark-up languages or programming languages), to *meta-languages* (e.g. UML, E²ML) and *natural language* descriptions (such as narratives or tables). This can be seen as an attempt to represent patterns in a human as well as a machine-readable format.

Computer languages: Efforts to create libraries of templates and learning resources link design patterns to the reuse of learning objects in different contexts, suggesting either a best practice *sequence* of learning objects, or a best practice *combination* of learning resources (Green *et al.* 2006a). Adaptation to context is mainly seen as matching learning object meta-data with learner profiles (ibid.). Though patterns can be transformed into physical representations, it is cautioned that the use of highly automated patterns may: (a) impede adaptation, since this would imply additional encoding effort; (b) constrain the creativity of the designer, who generally prefers to take 'what's available' than 'what's most appropriate'; or (c) lead to a mismatch between the learning situation and pattern due to an overly general specification of pattern-related conditions and restrictions (Green *et al.* 2006b; Heath 2006). The last point, in particular, highlights the fundamental question of the degree to which a learning situation can be analysed algorithmically (Dreyfus 1992).

Meta-languages: Motschnig-Pitrik & Derntl (2005) stress the importance of meta-languages such as UML to mediate between pedagogic design and software design. Care is needed, however, when using UML as the specification tool of choice because, although UML models reduce complexity by means of abstraction and modelling perspectives such as case views, activity views or interaction views (Rumbaugh, Booch & Jacobson 1999), parts of the semantic information included in the UML diagrams may remain hidden if the reader is not familiar with UML syntax.

Natural language: Peter Goodyear (2005) identifies design patterns as new conceptual tools requiring a demand analysis. Demanded are "customizable, re-usable ideas ... there is no visible demand for complex methodologies …" (Goodyear 2005, p.82). This approach differs from the two previous ones because Goodyear begins by sharing design ideas whose primary representation is textual. The benefit of a textual representation is that it is unlikely to impose itself on the designer, since alterations are made easily. Textual representations also have a wider potential audience, which at some stage may even include the learners themselves.

7.2.3 Reusability issues of design patterns

As the previous Section has shown, the concept of design patterns has been embraced by designers from a number of different backgrounds. No matter whether patterns as a design construct were widely accepted and adopted by a research community as has been the case with software developers (Gamma *et al.* 1995), or were viewed with less enthusiasm – as was the case with architects (Salingaros 2000), issues relating to their application reappear in surprisingly similar forms across the various domains. These issues parallel the problematic nature of the knowledge sharing process discussed in Section 7.1, namely, that the representation of design knowledge needs to support other designers re-construction, evaluation and acculturation of the 'to-be-shared' design knowledge (Figure 7-2).

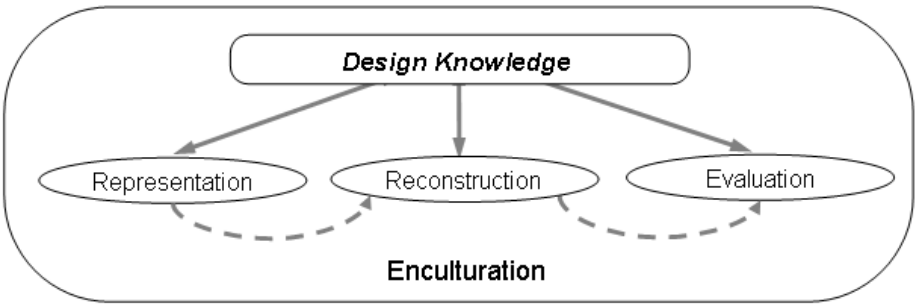


Figure 7-2: Representation, Re-construction, Evaluation and Enculturation

Knowledge reconstruction: make the pedagogic pattern value base explicit

Alexander *et al*. (1979) were striving for universally valid patterns, i.e. patterns that could be applied independently of their temporal and geographical context. Alexander asserted that a "…purely intuitive approach to architectural design was no longer capable of adequately responding to the complexities of industrialization, urbanization and social change" (Grabow 1983, p.6). However, while Alexander's argument may be viewed with sympathy, it is not clear that this issue can be resolved through the application of a single set of patterns. Protzen (1978) points out that many statements in Alexander's pattern description are either inconsistent or of little empirical value for the formation of a coherent theoretical system; and then invokes the support of Feyerabend (1988), who argues against 'all-encompassing-theories' which, by excluding alternative views, close themselves to any criticism and run the risk of becoming ideologies.

Hence, rather than assuming universally valid patterns, those who want to reuse a pattern need to know its pedagogical basis, otherwise a pattern might not be understandable because another designer could start with different premises. Though some patterns may be independent of any pedagogical background, others change their meaning if interpreted within a different educational paradigm (Marshall 1996).

A good example is assessment-related patterns, where the instructor's understanding of what are valuable learning objectives and what role learners should play in achieving these is directly related to the way student assessments are organised. Instructors working within a social constructivist value system, for example, will place greater emphasis on the student's own contribution to the learning process (McConnell 2002), whereas instructors using cognitive approaches may focus their assessment on the level of acquired knowledge as the most reliable source of evidence for whether learning has taken place (Savin-Baden 2004).

Knowledge evaluation: include data and methods applied

Software designers often cite the description of pattern usage provided by Alexander and colleagues:

> Each pattern describes a problem which occurs over and over and again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice (Alexander, Ishikawa & Silverstein 1977, p.x)

This perspective focuses on the 'when' and 'what for' of patterns, but neglects the justification of patterns. This might be less problematic in software development where reusability of designs is an established practice so that patterns can be backed up with numerous examples (Gamma *et al.* 1993).

In order to evaluate an educational design pattern, however, it may be necessary to include references to a pattern's effects (empirical data) and how these effects could be captured (method). This would enable users of instructional design patterns to evaluate and, possibly, improve the way they have implemented a pattern, generate a stronger basis for the pattern and increase the credibility of educational technology design patterns in general (cf. Hammersley 2007)

Knowledge enculturation: identify cultural idiosyncrasies

The previous two points emphasised the requirements a reusable design must satisfy (i.e. enabling a user to mentally reconstruct and empirically evaluate a design). Enculturation of knowledge, however, is more concerned with the environment in which a design is to be re-implemented. This acknowledges the fact that, while design solutions are most probably developed by instructors, other stakeholders (e.g. colleagues, administrators, tutors and, naturally, students) are involved in making the design a success. The culture of these stakeholders has a significant influence on the way in which a design can be implemented. Schein (1996) defines culture in institutions as a combination of visible norms, exposed values and deeply held assumptions. Applying Schein's concept of culture to patterns as design artefacts, two questions emerge: (a) do the inherent values of the patterns align with the users' culture(s)? and, (b) what do we know about the users' culture(s) in the first place?.

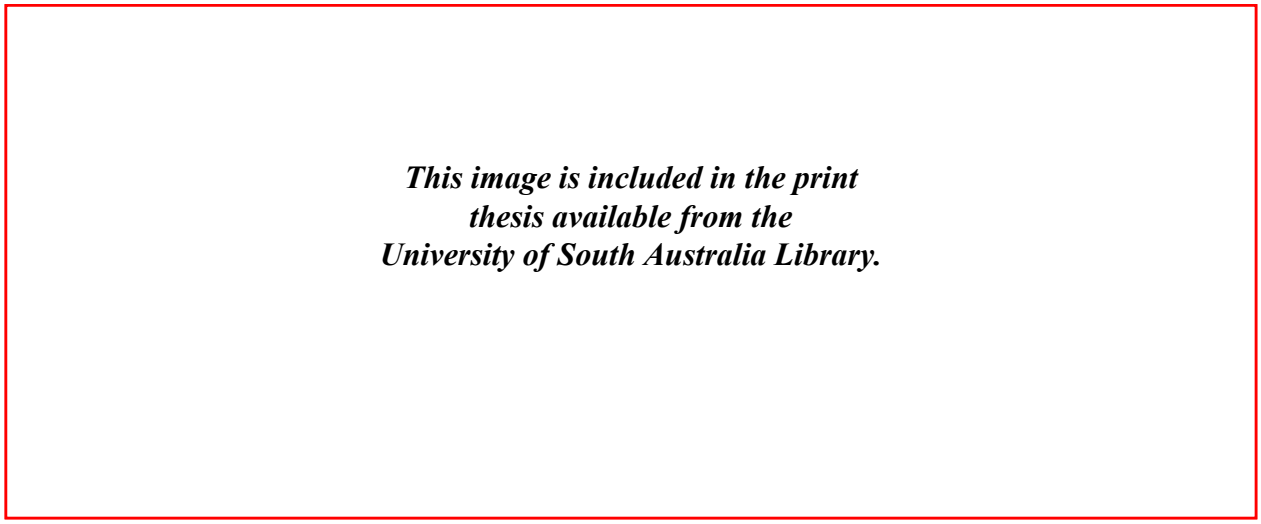
Hence, the reusability of a design might not only depend on information about how a design can solve an educational problem, but also on how the design was supported or hindered by the culture (expectations and values) of other stakeholders.

7.2.4 Outcomes: a specified pattern description format

To develop a more detailed pattern format, 15 pattern-related projects were analysed so as to capture existing description practices (Appendix C.2). A synthesis of the various pattern description formats used is offered in Table 7-1. However, as outlined in the previous Section, a major reusability issue has been a lack of sufficiently detailed references concerning how the benefit of a pattern was assessed (and how it could be assessed again, if needed). In order to provide the user of a pattern with the necessary means of assessing that pattern, the traditional triplet of *context*, *problem* and *solution* is extended by a fourth category: *evaluation* (Table 7-1). The researcher is aware that this represents a change in the use of the pattern format which so far has been understood to capture 'approved' knowledge. However, since the dissemination of patterns in areas other than software development has proven to be problematic (Section 7.2.2), it seems reasonable to provide a means of evaluating the performance of a pattern to the users themselves.

Table 7-1: Pattern Descriptors (Voigt & Swatman 2006a)





How to apply the extended pattern format

The researcher is aware that, in suggesting 35 descriptors, he has significantly increased the effort required to describe a pattern. Gamma *et al.* (1995) developed the most detailed pattern format to date, using 16 descriptors. The lack of effective pattern dissemination, however, seems to justify this approach. To simplify the pattern description process, therefore, Table 7-2 shows how each reusability issue is addressed by a number of pattern descriptors.

Table 7-2: Reusability issues addressed

Reusability Issue	Relevant Descriptors
Reconstruction	Learning-theoretical design values are included in the contextual description of a pattern. 'Pedagogical basis' (#3) refers to the pattern author's assumption about learning and what is taken as a benchmark to determine design quality. Pattern conditions (#2) describe context as a prohibitive as well as an enabling factor, thereby increasing the transfer of negative and positive design expertise captured in a pattern. Abstract principles (#18) and concrete examples (#27 and 28) support the designer in learning and understanding a pattern's meaning. The responsibility for deciding whether a new design condition makes it necessary to alter or discard the pattern is left to the designer. The degree to which a principle is malleable is captured by descriptor 26.
Evaluation	Descriptors 29 to 31 represent the 'how' of the evaluation, i.e. the 'data and method' perspective on patterns. Additionally, descriptors 32-34 describe general pattern quality characteristics. They indicate the desired evaluation outcome dimensions (coherence, stability and status of patterns) which need to be addressed in addition to the evaluation of pattern-specific outcomes.

Reusability Issue	Relevant Descriptors
Enculturation	Including specific domain characteristics (#4) helps to understand the invariable part of the context which, if variable in the user environment, may lead to the development of a different pattern.

7.3 E-CBL Proto-Patterns

So far, reusability issues have been discussed and a design pattern format has been suggested to address these issues. It is not necessary, however, to reformulate all findings from previous Chapters into a pattern format. Rather, patterns are seen as complements to the conceptual framework developed in Chapter 5: the e-CBL development matrix. Table 7-3 suggests five patterns intended to support design decisions which have not yet been thematised in the existing conceptual framework, such as the writing of case studies and the planning of course activities (Patterns #1 and #2), or initiating and maintaining the case-discussion process (Patterns #3 - #5).

Table 7-3: E-CBL issues and Proto-Patterns

E-CBL Issues	Proto-Patterns
How can case materials support authentic and productive case discussions? (see Section 6.5.2)	**#1** Writing Cases that create positive interdependence
What chain of activities can support students gradual mastery of e-CBL while leaving enough time for team building? (see Section 6.5.5)	**#2** Planning course activities that challenge but do not overstretch
How can novice case-learners be supported on a technological, methodological and organisational level? (see Section 6.5.4)	**#3** Offering materials and training to get e-CBL started
How can the course design help to synchronise group's collaborative effort while preserving flexibility for the individual as much as possible? (see Section 6.5.3)	**#4** Structuring group processes without taking the lead
How can feedback encourage meaningful case discussions? (see Section 6.5.3)	**#5** Giving feedback that improves future case-work

Table 7-3 represents a quick access guide for deciding when a particular pattern is helpful (Sharp, Manns & Eckstein 2003). The following Sections describe each design pattern using the descriptors already suggested in Section 7.2.4, categorised into: context,

problem, solution, extending the original triplet; and evaluation. However, before proto-patterns can be described, a brief explanation of how the presented patterns can be evaluated is required. The primary goal of including an evaluation section is not to replicate the original research which provided the basis for the pattern in the first place, but to find out whether a design pattern had the intended impact or not.

Evaluating patterns

The main instrument for evaluating the patterns suggested in this research was a semi-structured online questionnaire (Section 4.5.2) comprising rating scales and open-ended, free-text questions (Appendix C.4). This technique was selected in preference to alternative techniques such as observations or interviews, because of the relative ease with which it could be used to evaluate several course designs; and because of the anonymity it offered to students wanting to report negative experiences (Dreher & Maurer 2005).

However, the downside of online questionnaires is that they provide less rich data, with the result that unsatisfactory design ratings are potentially difficult to explain and, consequently, difficult to improve. Hence, the questionnaire combined the possibility of rating a design element (A) and commenting on it in an open-ended text field (B) (Figure 7-3).

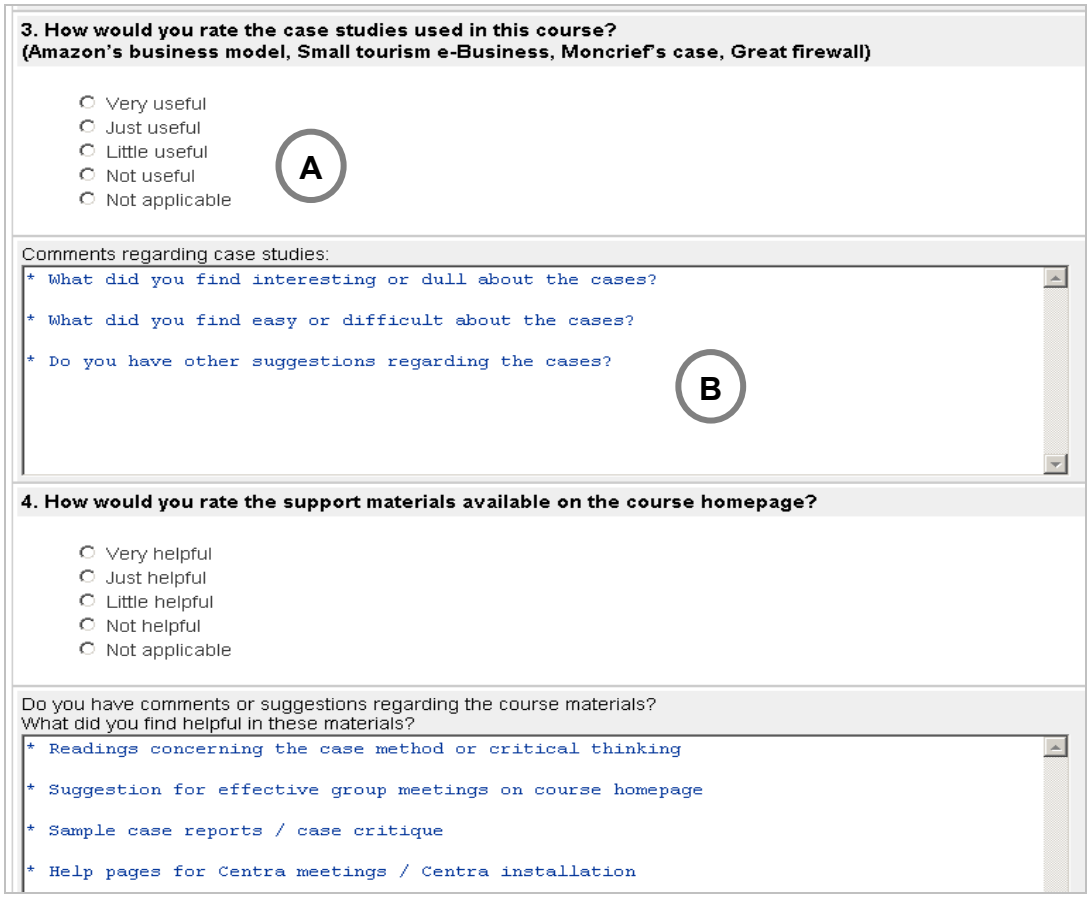


Figure 7-3: Rating questions and open-ended comments

To persuade students to fill in the comment fields, which in previous online questionnaires (e.g. SP7, 2004) had often been ignored, the researcher included prompts that specified what a related comment could include. Although these prompts could be overwritten, most respondents chose to write comments in-between the prompts. Often, students would use the comment fields to explain their rating or how it depended on factors from outside the specified question. With 80% of all respondents providing additional feedback in at least every second comment field, a more comprehensive understanding of students' concerns was obtained.

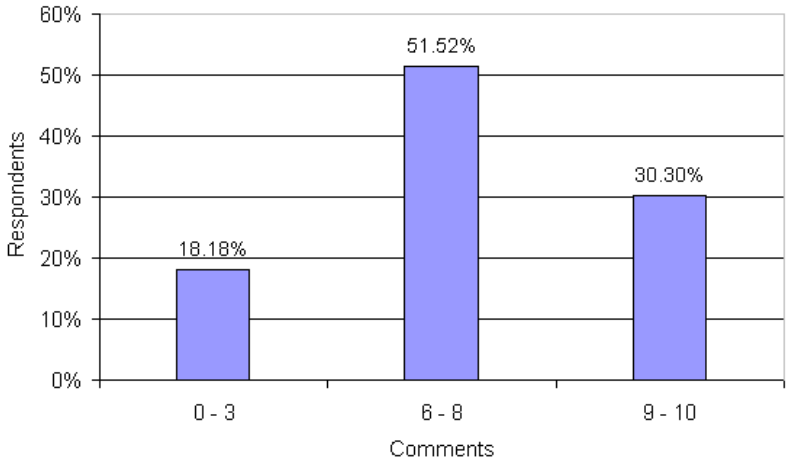


Figure 7-4: Comment fields used out of ten (n=34, SP7 2006)

At this stage it is useful to remember that, so far, the e-CBL design knowledge has been extracted from a limited context and still needs to be endorsed through repeated applications and evaluations, before the following *proto-patterns* achieve a pattern status (Sharp, Manns & Eckstein 2003).

Design refinements to the conceptual e-CBL framework can now be discussed in the form of e-learning design patterns. The descriptors listed in Table 7-1 will serve as guidelines, although not every descriptor is necessarily known right from the beginning. This reflects Alexander *et. al's* (1977, p.3) argument that complex design patterns cannot be created in 'one swoop' but require patient, piecemeal growth. Hence, the more a pattern is used, the more it can be refined and its argumentative basis strengthened.

7.3.1 Pattern #1: Writing case studies

Context

A distinct element of case-based learning is that it uses stories as vehicles to transport facts, experiences and opinions in a contextualised way so that readers infer meaning not only from the mere information included in a case but also from the way the information is presented (Bruner 1990, p.43).

Learning cases have several functions:

- they should present a larger, more general class of problems (Roberts 2001);
- they need to include several reasonable alternatives to create a constructive conflict (Shapiro 1984b);
- they should refer to real persons or groups to make the case more relevant and absorbing (Sauer & Willcocks 1999).

These functions need to be supported by the case readings as well as the case questions. The well thought out formulation of questions is particularly important, given the majority of learners are undergraduate students with little or no experience in e-CBL.

Problem

Cases that neglect any of the above functions may fail to engage the learners. Worse, incoherent or unrealistic cases can cause frustration or indifference. Hence the question is 'How can case materials support authentic and productive case discussions?' (see Section 6.5.2)

If confronted with poorly designed cases, students are hampered in their effort to apply the case solving process because the material itself does not support a proper debate.

Learning cases are unsuitable if they are

(a) not controversial enough to arouse a debate,
(b) not complex enough to require a group effort or
(c) if questions lack interdependency that would require group members to exchange and build upon one another's insights.

The need to both align learning cases with the course curriculum while also actively addressing issues (a) to (c) may prevent instructors from using existing case studies offered by providers such as the European Case Clearing House (http://www.ecch.com/) or Harvard Business School (http://www.hbsp.harvard.edu/hbsp/case_studies.jsp). Other issues which might prompt instructors to write their own learning cases are the costs involved in acquiring 4-5 cases per student and the fact that many case studies are written with a North American background (Sauer & Willcocks 1999).

Solution

According to Roberts (2001), most case writing starts with deciding on a general topic, which is then broken down into its various issues which determine the *materials* needed to discuss those issues. Furthermore, *case questions* are developed in a way that help students to scope their analysis and *case notes* are designed to ensure that all online tutors can support and assess students' discussions in a similar fashion.

Materials: If instructors decide to produce their own learning cases, newspaper and journal articles are useful resources for keeping cases relevant and up to date, in which case Roberts (2001) speaks of 'published information cases'. Using published materials to build up a case provides the necessary flexibility to address the topics of the syllabus, including the possibility to choose an Australasian context when suitable. Case materials do not have to be limited to text but can also include different media formats such as audio streams (e.g. an interview with a key decision maker) or websites and movie clips (e.g. to discuss the issues with a particular company's e-marketing efforts).

Questions: Questions are key elements to focus case analysis and lead case discussions to greater depth. In this context, questions are an excellent means of scaffolding students' approach to cases (Section 6.2.3) by including hints to key aspects of the case (Wood & Anderson 2001). However, it is important to avoid controlling students' discussion paths and to let them work through a case independently (Christensen, Hansen & Moore 1987, p.15). Careful formulations of case questions are particularly necessary to ensure that learners do not expect too much guidance from the questions themselves, thus running the risk of missing out on issues where their critical thinking is required (Paul & Elder 1996; Perkins, Jay & Tishman 1993).

Case notes: Case notes are a valuable aid for online tutors to compare their own and the case author's understanding of the case. However, it is emphasised that case notes are not designed to provide a complete solution of the case; and that case teaching needs to preserve its flexibility (Christensen, Hansen & Moore 1987; Lundberg & Winn 2005).

> This unpredictability [of case discussions] is a major strength of case method teaching. It both minimizes boredom and helps trigger the sort of creative energy that can make discussions memorable, because spontaneity is an exiting, powerful stimulus to original thought (Christensen, Hansen & Moore 1987, p.10).

Nonetheless, to facilitate the work of online tutors who have only limited time to prepare case discussions, each case is described in terms of learning objectives, case questions, potential issues, integration with the subject matter; and ideas about how the case can benefit from group work. The descriptions of the four case studies (as discussed with the online tutors in SP7, 2006) are available in Appendix C.3.

Evaluation

The evaluative question for this pattern was 'How would you rate the case studies used in this course?' In total, 56% found the four case studies *very helpful* and 41% *just helpful*.

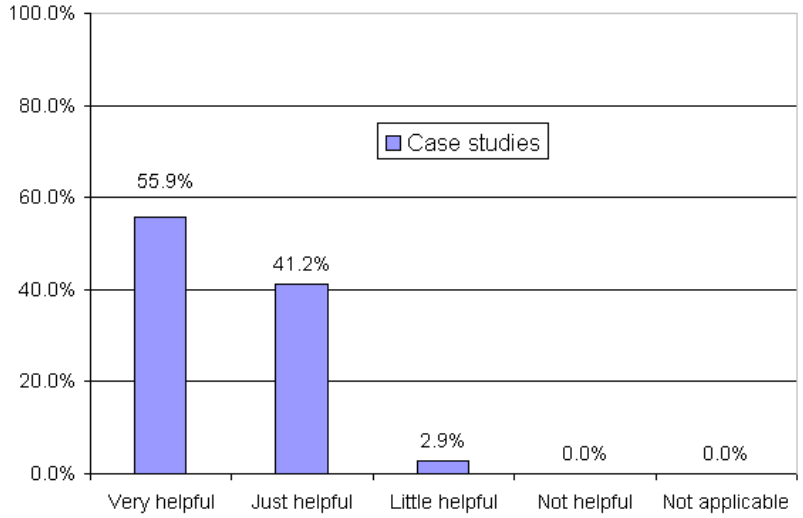


Figure 7-5: Rating of case studies (n=34, SP7 2006)

The comments elicited by the three sub-questions highlighted below, concerning what made cases attractive to students, assisted in identifying what should be retained from the current approach for future learning cases and what should be reconsidered because of the feedback received[78].

What did you find interesting or dull about the cases?

Students found case studies interesting because they prompted them to *think outside the square*. Or they found them *extremely interesting* or *eye opening* to the point that they found it problematic to keep their analysis below the word limit. As one student commented: *I don't think I found anything particular dull about the cases; I think the interesting thing was learning about all the theoretical concepts that could be applied to real-life business situations.*

What did you find easy or difficult about the cases?

The last case addressed a topic regarding China's internet surveillance practices and business ethics. A Chinese student found this difficult to discuss since the available materials did not *reflect the truth to his knowledge*, hence the student questioned the *neutrality of the documents*. Another frequently mentioned difficulty of case studies was finding the right scope of analysis since there was a *large amount of information that could be deemed relevant*. In this context the importance of well functioning group discussions became evident, as some students stated how beneficial group discussions were in overcoming the initial problem of identifying issues.

[78] The answers to these sub-questions are discussed using verbatim quotes highlighted in italics.

Do you have other suggestions regarding the cases?

Most suggestions made in answer to this question were related to the problem of group work, e.g. case studies should be made *individual work*. Others mentioned that it would be important to *update the case studies* to keep them relevant. A point that was confirmed by the selection of materials: *I've taken a case-based course before, and the cases for that subject read like business reports. Using newspaper articles and the like really helped, as it made them much more interesting, and a pleasure to read through.*

7.3.2 Pattern #2: Planning course activities

Context

Online students require a high level of self-directedness. Not having fixed appointments for lectures and tutorials requires students to set their own due dates and organise their time accordingly. Course outlines help to structure activities on a weekly basis and should include a plan for activities that promote the multiple skills necessary to fully engage on e-CBL: social presence, critical thinking and coordination (Section 6.4.1).

Problem

Problems emerge if students have little experience with online studies and underestimate the challenges arising with virtual group work. They then run the risk of either being surprised by the amount of initiative expected of them, or being overwhelmed by the many new things they have to learn in a relatively short time. The former can emerge from a clash between the actual course structure and what students anticipated; and the latter from misjudging the time necessary to initiate and accomplish tasks in an online environment.

Initial course activities need to aim at getting students connected to the relevant materials and their fellow learners, i.e. to their technological and social network (see Section 6.3.1). With regard to students' social network it has been argued that the quality of interpersonal relationships is of crucial importance for a group's ability to minimise or manage possible group problems in the future (Swan & Shih 2005). Similarly, in order to become comfortable with their potentially new technological environment, learners need frequent opportunities to practice and explore the available collaboration tools without the pressure of an impendent deadline. Hence the question is 'What chain of activities can support students gradual mastery of the technological and organisational aspects of e-CBL while leaving enough time for some group building?' (see Section 6.5.5)

Solution

The suggested solution is comprised of two parts:

- a preliminary course information website to manage students' expectations; and
- a schedule that gradually increases the complexity of course activities.

Firstly, students should know well in advance what they can expect of a course in which they enrol. For this objective, a preliminary course information website provided essential course details such as the course's main topics, the case-based learning method, assessment details and specification of what communication media were used in the course (Figure 7-6). Based on these preliminary requirements, students can make an informed choice of whether are interested in taking this kind of online course[79].

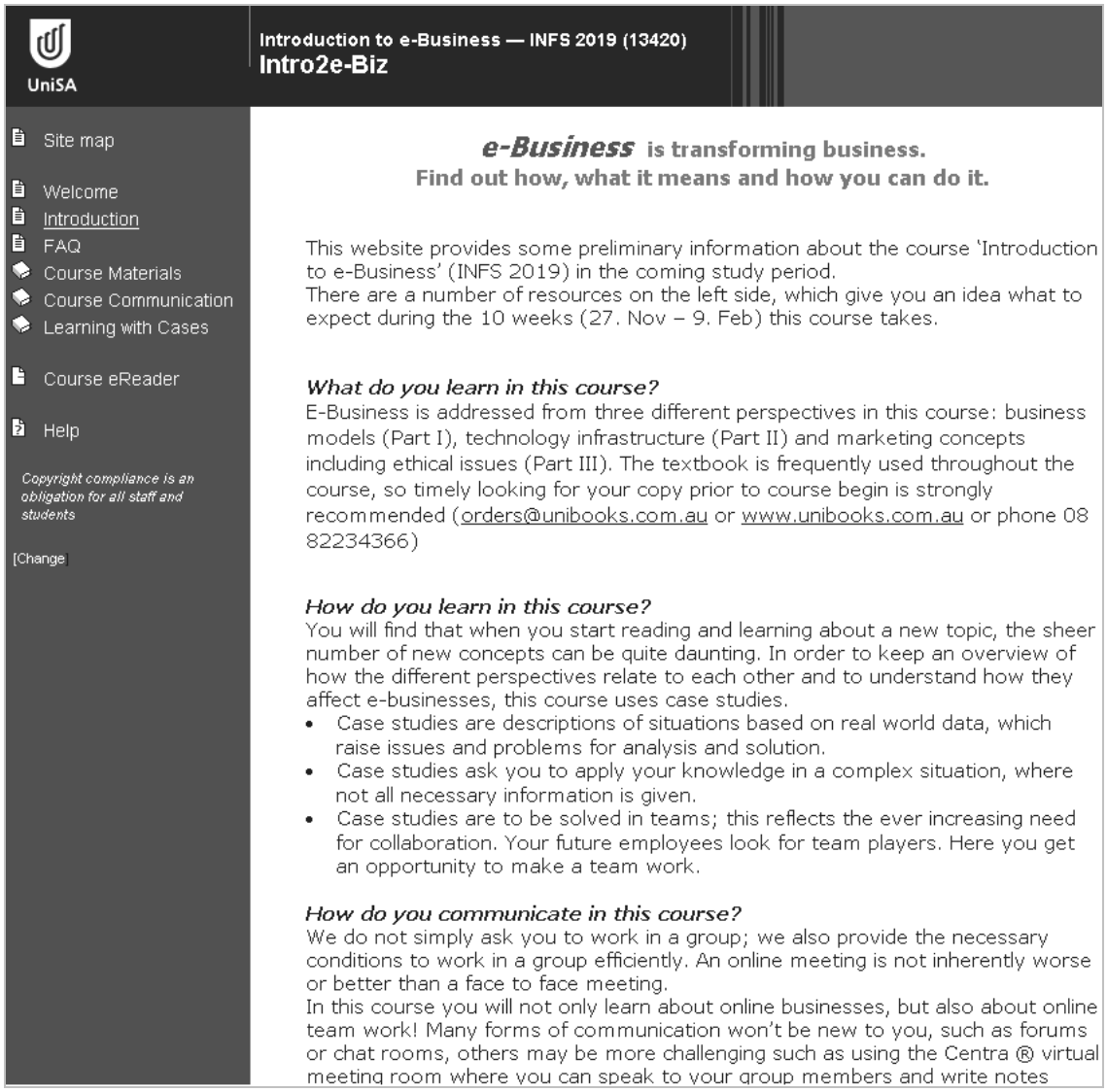


Figure 7-6: Preliminary course information (SP7 2006)

[79] Many external student work full- or part-time, for example 76% in SP7, 2005 (n=45), and 75% in SP7, 2006 (n=60). In some cases students know that they are going to change their work or living places and hence need to make a careful decision about how many courses they can study under these conditions.

Secondly, the course outline needs to ensure that students are fully integrated into their online groups by the end of the first three weeks (Figure 7-7).

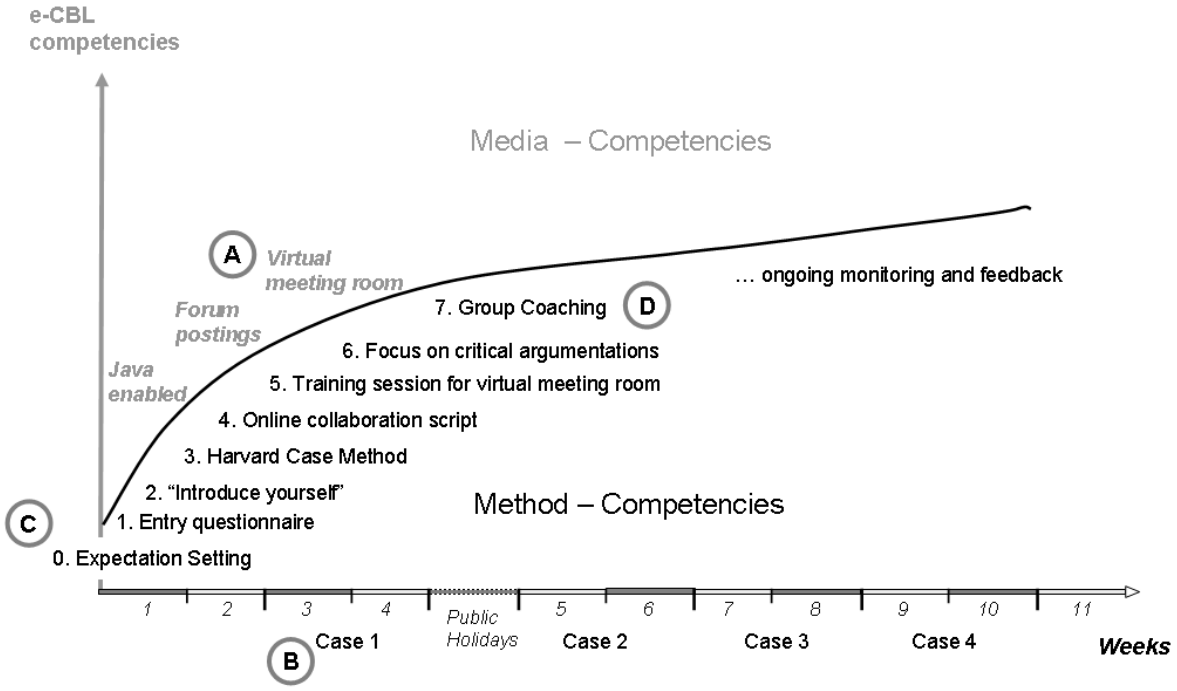


Figure 7-7: Scheduling course activities (SP7 2006)

Figure 7-7 is an improved version of the course outline presented in Section 6.2.4. The following changes have been introduced:

(A) Centra is used right from the start as is can boost students' ability to connect socially and explore the technology in more detail over the next 10 weeks;

(B) The number of case studies has been reduced from 5 to 4, leaving the first two weeks for the introduction of the online course environment and group formation;

(C) A course information website manages students' expectations upfront;

(D) A greater emphasis is put on actively coaching groups which are struggling with the collaborative aspects of e-CBL.

Planning the appropriate course activities depends on a thorough understanding of the course's enrolment. Hence, part of the solution is the questionnaire at the beginning of each course (Appendix C.1) indicating the general level of students' experiences with studying externally and using Internet-based communication technologies (Table 7-4).

Table 7-4: Learners' prior experiences (SP7 2005, SP7 2006)

	SP7, 2005 (n=45)	SP7, 2006 (n=60)
Experiences		
Past experiences with online learning	18%	25%
Some experience case-based learning	58%	62%
Positive experience with group work	53%	52%
Unpleasant experiences with group work	29%	17%
Technical learning conditions		
Dial-up Internet access (< 56 kbit/s)	49%	18%
Non-Windows operating system	- *	3%
Prior use of the Internet		
UniSA online catalogue	80%	73%
Instant messenger	62%	72%
Webpage editing	31%	43%

* A question about students' operating system was included after a number of students could not access the virtual meeting room in 2005 because they used Apple Macintosh operating systems or Unix derivatives.

A drastic change in the characteristics of the enrolment population could trigger changes to the activities outlined in Figure 7-7. For example, increasing experiences with online learning and case-based learning might prompt online instructors to place less emphasis on the methodological aspects of e-CBL and introduce more tools to support e-CBL, which are not mentioned at the moment to keep novelty to a manageable level. For example, virtual groups could use social bookmarking services to share resources they find during case preparations (Wilson *et al.* 2006) or social networking sites could be set up beyond the boundaries of a single course (Downes 2005).

Evaluation

The effectiveness of the first part of the solution, the preliminary course website, is evaluated using Web metrics (Weischedel & Huizingh 2006) that were gathered through Google Analytics (www.google.com/analytics/), a free service which offers traffic measurement and navigation analysis through the inclusion of a Java-Script segment on the website to be monitored. This enables online instructors to gauge how much the provided upfront information has been used.

Four months prior to the start of the course and up to Week 3 of the course, the site received 632 visits by 400 visitors. Visitors spent on average 2:20 min on the page and

more than 50% explored the course description in more detail by accessing further materials linked to the website (Figure 7-8).

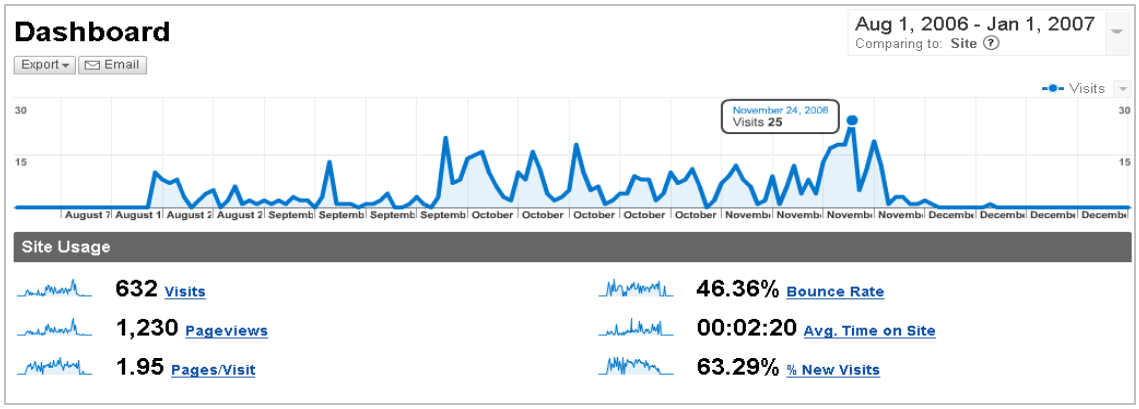


Figure 7-8: Preliminary course information - Google Analytics (Aug –Dec 2006)

The second part of the solution, the planning of course activities, was evaluated based on students' workload measured in hours per week and their rating of the course, i.e. whether they would recommend the course to other students or not (Figure 7-9).

79% said they would recommend the course, which could be taken as an indicator that, overall, students were satisfied with the course. In order to evaluate the workload, however, different answer categories need to be used in a future questionnaire.

Initially, the researcher assumed that most students would spend up to three hours per week working on this course. However, 70% spent more than 3 hrs per week, which is a reasonable amount since full-time students are supposed to invest 10 hours per week per subject (http://www.unisanet.unisa.edu.au/learningconnection/student/learningAdvisors/fwOncampus.asp, accessed 01.02.2008). Hence, in a future evaluation of course activities it would be useful to ascertain whether a significant proportion of learners work more than the recommended ten hours for the course.

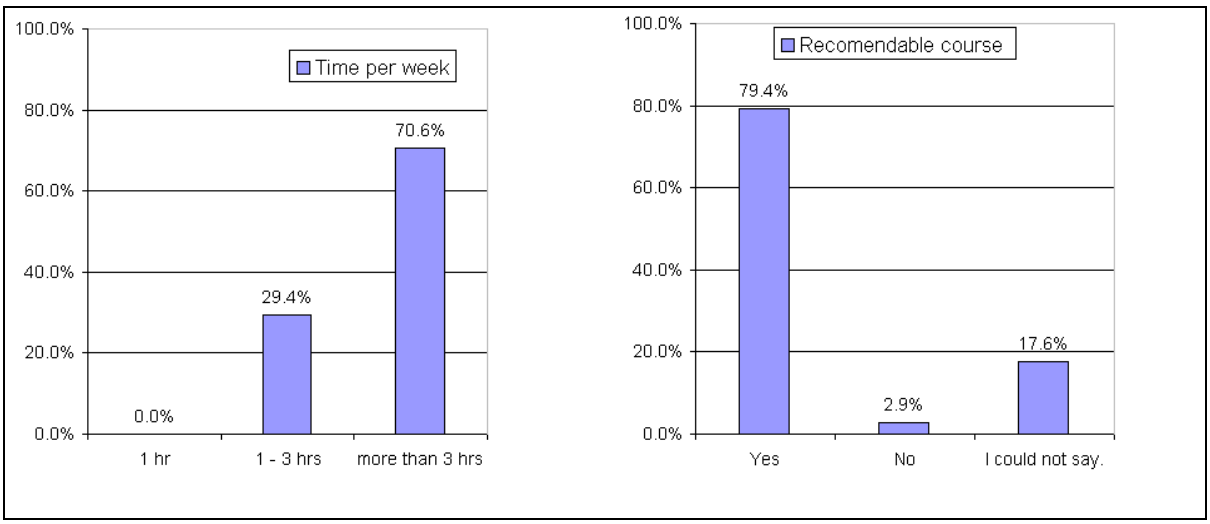


Figure 7-9: Hours per week and course experience (n=34, SP7 2006)

7.3.3 Pattern #3: Getting the individual case-learners started

Context

Novice case-based learners often find it hard to get started due to uncertainty about how to best tackle a case (Gragg 1940; Wassermann 1994). They find the range of potential issues overwhelming and find it difficult to analyse the case materials in a systematic way. Time-poor students may be reluctant to start a course with readings about the applied teaching method before they can address the course work itself. Hence, instructional support should be concise and focused on students' immediate needs in mastering the task (Gog, Paas & Merrienboer 2004). The underlying conceptual framework for e-CBL illustrates how case-learners need to develop skills at an individual level (e.g. media literacy, critical thinking skills), which they can then apply in their group discussions (Figure 7-10).

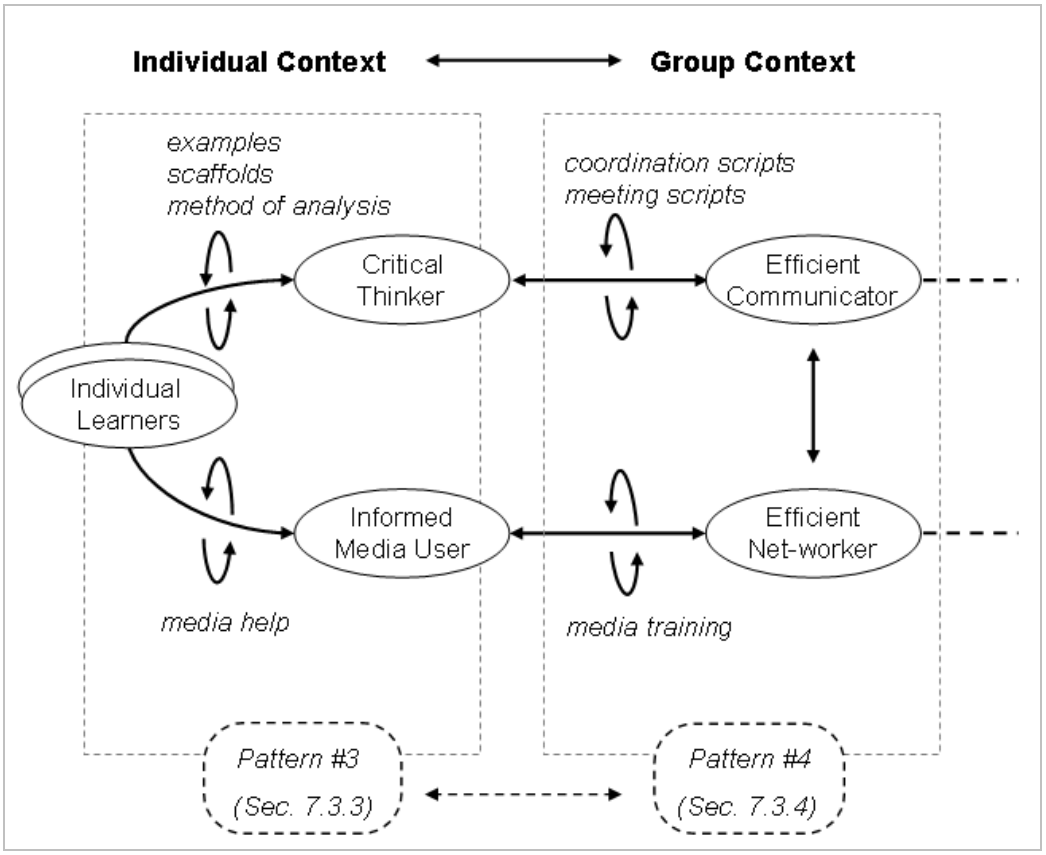


Figure 7-10: The interplay between individual and group context

The bidirectional arrow between the individual and group contexts indicates their inter-dependence. Preparations undertaken by individual learners have an impact on group discussions, which in turn influence what is prepared for future meetings; and how this is prepared. For example, learners may initially underestimate the importance of critical thinking and consequently spend little time on reading the related support materials. Later, however, they can go back to those materials after realising how critical thinking skills benefit their ability to identify a larger variety of alternative solutions or to present stronger arguments to back up their recommendations.

Problem

Even though general guidelines are available, individual students may remain passive, either because they find the level of instructional detail insufficient, or because they are waiting to see how their peers approach the tasks. In an online environment, the uncertainty of how to go about discussing a case is exacerbated by the lack of personal interaction with tutors and peers during face-to-face sessions which could be used to share experiences verbally.

Both issues, students' perception of instructional guidance as being too coarse-grained and a lack of opportunities to learn from others, can lead to inactive groups. The question is therefore, 'What guidance and support material gets online learners started in an efficient way?'.

Solution

This pattern concentrates on supporting an individual learner through two strategies:

- Learning by examples (Chi *et al.* 1989); and
- Modular presentation of solution procedures (Gerjets, Scheiter & Catrambone 2004; Gog, Paas & Merrienboer 2004).

Examples of successful case reports from past learning groups, as well as snippets from an interesting exchange of critiques and rebuttals in an asynchronous case discussion, give students an idea of what to aim for. A sample report or case discussion can be seen as a form of encoded declarative knowledge (Anderson 1987), e.g. knowing that this is what a case report might look like, given a specific set of materials and questions. Learners can then approach their own case study by analogy, after they have seen how another group: derived issues from facts in a case, suggested alternative solutions; and provided an argument for their final recommendation.

Modular solution procedures refers to the fact that learners must not only understand what they want to achieve, but also how to get there (procedural knowledge) (Gog, Paas & Merrienboer 2004). Help can be offered in the form of scripts or scaffolds that describe solutions in a number of steps or sub-tasks. As described in Sections 6.2.1-6.2.3, scripts and scaffolds can be applied to technological problems (e.g. installing, exploring and finetuning the virtual meeting room), as well as to methodological problems such as how to critically analyse a case (see Section 2.1.4). Modular solution procedures aim at reducing the cognitive load which complex procedures impose on learners (Gerjets, Scheiter & Catrambone 2004). The modularisation of a procedure means that complex events are broken down into individual events, decreasing the number of process steps learners have to keep in mind while working on the case (ibid.).

Figure 7-11 shows how modularised support was implemented through several different navigation levels. The navigation bar on the left-hand side leads learners through the three main stages of the case method: individual case preparation, group work and whole-class case discussion (1). Each phase is represented by a folder containing two or three WebPages that summarise the main concepts for each phase (2). Each page, in turn, includes a number of links to original backup readings – which, in Figure 7-11, are shown as in-text references (3).

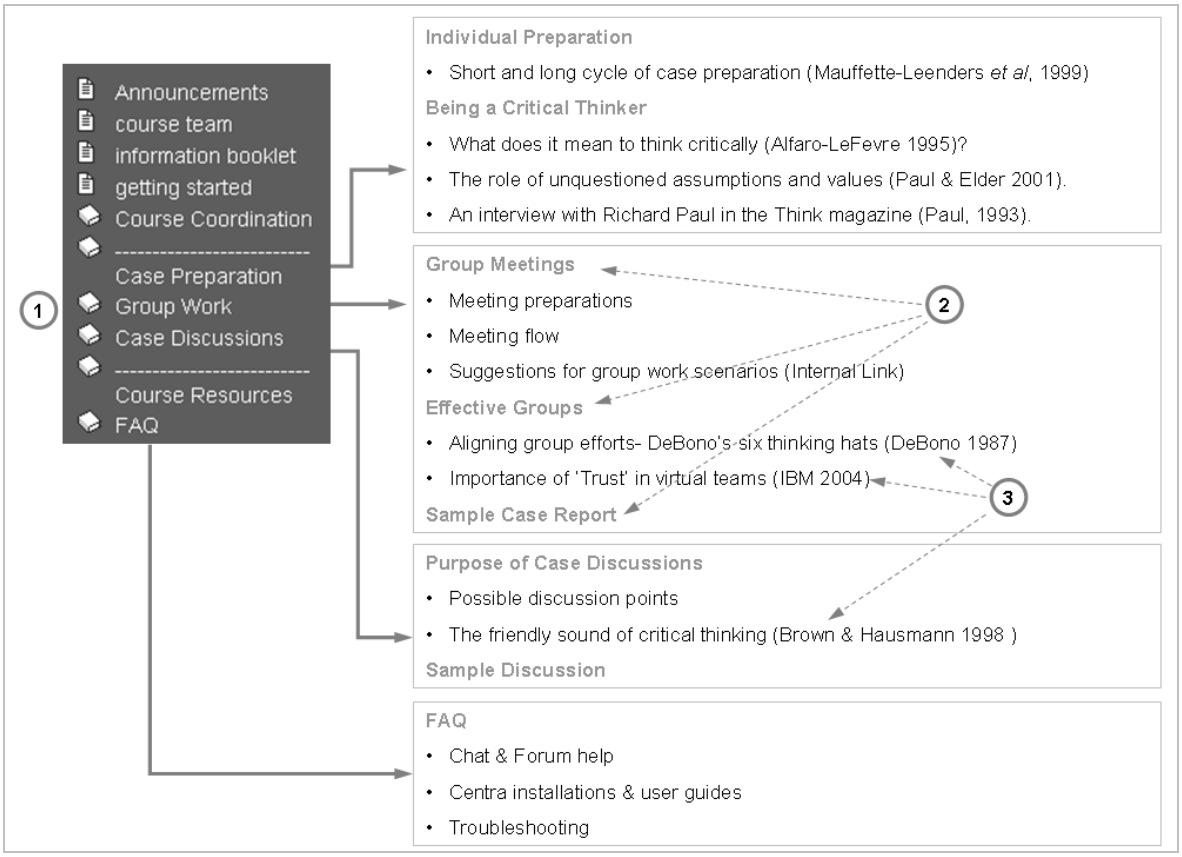


Figure 7-11: Modular solution procedures through different navigation levels (SP7 2006)

Evaluation

Before group work starts and students' level of understanding and activity becomes visible in their interactions with the group, it is difficult to evaluate the extent to which they have engaged with the technology or read up on the case-based learning method.

As with the previous pattern evaluation, web-metrics are used as an indicator for the popularity of support materials. Figure 7-12, for example, shows that the Centra installation page was accessed most frequently during the end of November and the very beginning of December, followed by two spikes during the first half of December. The curve can be interpreted as an indicator of when learners started to consider the use of Centra. Major spikes towards the end of December, however, might have been a cause for concern, because by then the installation page should be of little interest to learners.

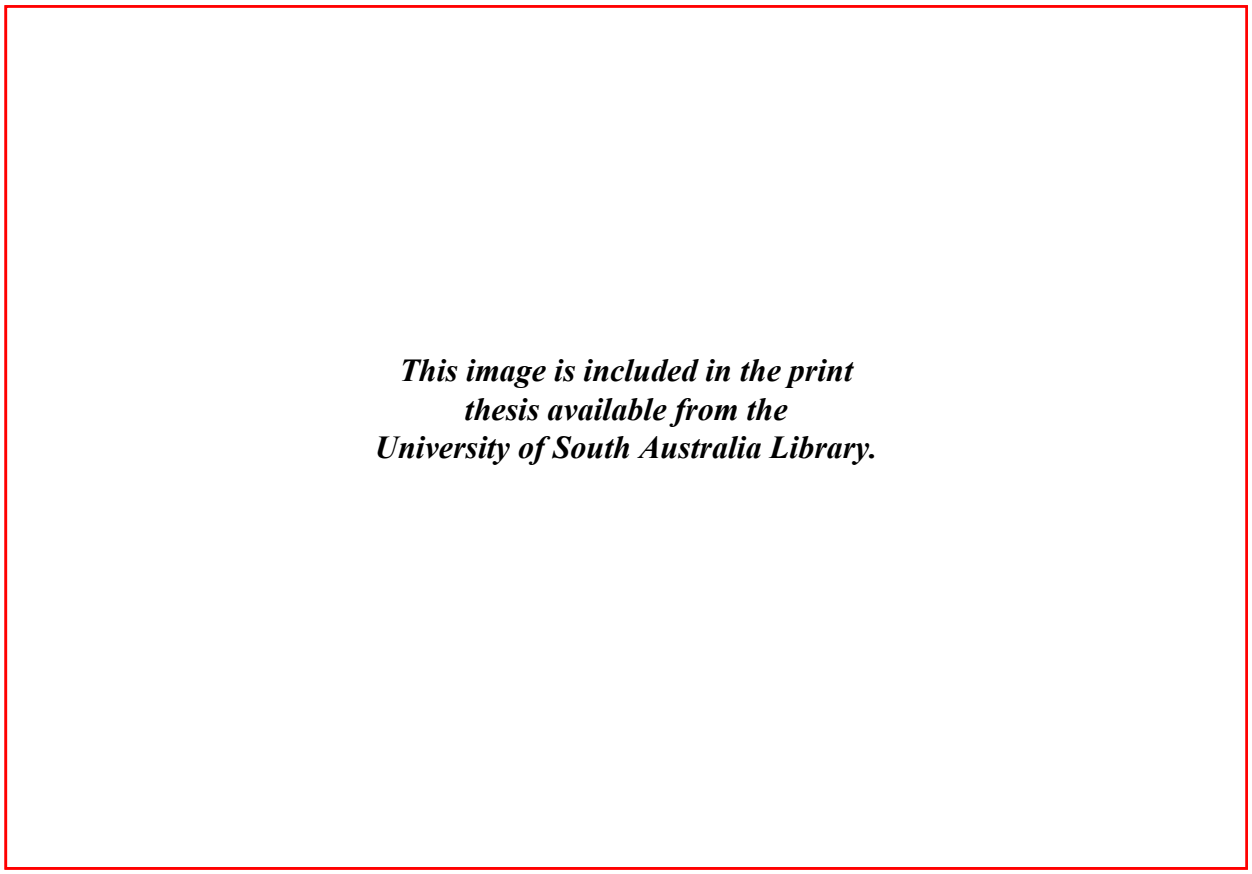


Figure 7-12: Web-metrics for Centra installation web page - Google Analytics (SP7 2006)

An overview of page views over time is provided in Appendix C.4 and a summary of the usage statistics is offered in Table 7-5. The table lists pages ordered by their number of page views, which can be interpreted as an indicator of the page's usefulness, i.e. students would revisit a page that included helpful information. At the top of the table is the 'efficient group meetings' page, that provided information on how to prepare and run e-CBL online meetings. The Centra installation page which ranked second has already been discussed, and the sample case report ranks third confirming its value as a way to illustrate what is expected in the course.

Table 7-5: Access statistics for support web pages (SP7 2006)

Page	Page views	Bounce Rate	Avg. Time on Site	Visitors
Efficient Group Meetings	1063	86%	1:13	118*
Centra Installation	364	67%	3:44	55
Sample report	262	84%	1:21	44
Podcasts	220	82%	1:50	54
E-Business News Links	112	90%	0:56	28
Chat Help (Troubleshooting)	110	64%	2:37	16
Sample Feedback	101	88%	1:11	14

Page	Page views	Bounce Rate	Avg. Time on Site	Visitors
Gateway Pages				
Individual Case Preparation	3080	71%	1:41	388
Group Development	5125	77%	1:32	502

* Visitors are differentiated by their IP address, so a student using two computers is counted twice. This explains visitor numbers larger than the actual enrolment of the course.

Page views and visitors numbers for the last two pages are not comparable because these last were 'gateway' pages, i.e. students would open a folder and these pages would be displayed by default, even if learners were ultimately interested in another page within this folder. This arrangement was developed deliberately, however, because of the importance of the information included.

A helpful measurement concerning the modularisation of support information is a WebPage's 'bounce rate': the percentage of visitors who leave the webpage without having accessed any other link provided on that page (http://www.google.com/analytics/). Figure 7-13, for example, shows that 71% of all visits to 'Individual case preparation' accessed only this webpage and 5% (still 105 visits) accessed at least two back-up readings before they left the page.

Depth of Visit	Visits	Percentage of all visitors
1 pages	**1,460**	70.98%
2 pages	**386**	18.77%
3 pages	**105**	5.10%
4 pages	**57**	2.77%
5 pages	**24**	1.17%
6 pages	**13**	0.63%
7 pages	**4**	0.19%
8 pages	**4**	0.19%

Figure 7-13: Depth of visit for information related to 'individual case preparation' (SP7 2006)

Monitoring how often students accessed the support materials allows instructors to develop an understanding of what information is particularly useful and what online resources need to be recommended more strongly or should be changed because of low visitor numbers.

A second means of evaluating the several support materials is to ask students themselves to rate the usefulness of those materials. 44% found the support materials '*very helpful*' and a further 44% found them '*just helpful*' (Figure 7-14).

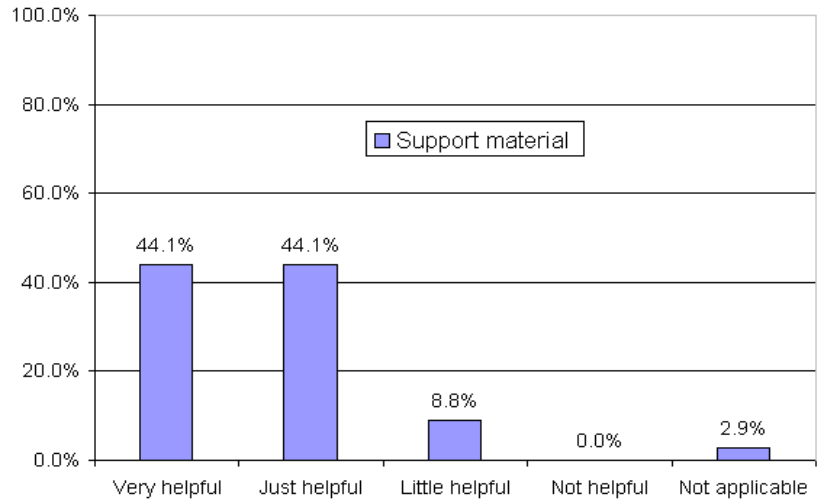


Figure 7-14: Ratings of support materials (n=34, SP7 2006)

Students' free text comments help to better understand what materials were more (or less) appreciated and why. Again, students' verbatim quotes are highlighted with italics.

Readings concerning the case method or critical thinking

Comments concerning readings on critical thinking ranged from '*truth be told I seldom used these'* and *'would have been good if all group members had read these'* to *'good to give some extra information before the group set out to work on the case study'* and *'I was completely lost at the beginning when it came to case work and the readings related did help a bit but not a lot. It may have been more helpful for a tutor to go through this in the first centra meeting'.* These comments underline the interdependence of critical thinking skills and case study work on the part of the individual learner; and the need to apply these skills to the whole group.

Suggestion for effective group meetings on course homepage

Though recommendations for effective group meetings were perceived as generally useful, students also made it clear that often the main issue is not a lack of knowledge but a lack of commitment. As one student put it: '*Useful, but let's face it, only works when you have a committed group*'. At this point some students asked for a more interventionist approach by the tutor, who should: set meeting times, lead students through the meetings and ensure group members' preparation, because: '*some people just do not care and won't show up unless there is a consequence*'. However, rather than taking a lead in groups which were struggling, the course management team emphasised its role as

facilitators. This did not mean they would not intervene, but it was made clear that groups needed to make a visible effort to overcome their own problems before a tutor would intervene in their group process.

It also became evident that the recommended process descriptions needed to be handled flexibly and could not substitute for negotiation of tasks and responsibilities: *at times it [the recommended process] just didn't seem practical considering everyone's differing life styles and each persons individual perception of how a group should function effectively*. Moreover, formal structures were less important if the group had a shared understanding of their goals: '*We chose not to follow these [recommended processes], instead going with less formal meetings. We all knew what each meeting would be about, which was good enough for us'*.

Sample case reports and sample case critique

The samples put up on the course homepage were mostly valued because they '*gave an idea of expectations*' and learners who had no prior experience with case-based learning, in particular, used them as a starting point: '*excellent!! until I read that I had no idea what to do, how to set out the reports and what was required in the critiques*'. Others suggested that a set of guidelines about how to write case reports should be provided rather than a set of examples. Future support materials could include a combination of both.

Help pages for the installation and use of Centra

Students' comments about Centra help pages depended largely on their ICT skills. Learners who had a good understanding of the technological side felt they did not need this assistance: '*Personally, I thought there was too much information for me. However I can understand how it'd be useful for the less tech-savvy.*' Whereas learners who had never used a similar application before appreciated the screenshots and the video snippets because they reduced uncertainty about how online meeting would look: '*I was extremely concerned as I had no idea how this would work*'.

7.3.4 Pattern #4: Getting group discussions started

Context

External students need to collaborate from a variety of geographical locations and e-CBL emphasises discussion, for which various types of collaboration technologies (email, forum, text chat and virtual meeting rooms) are suitable. Groups need to develop their own optimal mix of asynchronous and synchronous interaction, in accordance with their specific group conditions. However, before students get to know their peers and while they are still unsure about what exactly is involved in discussing a case and writing a case report collaboratively, instructors must create the initial conditions that facilitate groups'

coordination efforts and offer a process definition groups can rely on until they are in a position to finetune the process according to their own needs.

Problem

Meaningful case discussions are difficult to achieve. Students need to prepare for discussions and agree on a suitable meeting time that allows everybody to attend. Due to the diversity of the external student population, e.g. different work and family commitments, this can become problematic.

This conflict can be exacerbated if group members have varying ideas about which collaboration tool to use and when to use it. For example, some group members might suggest holding an online meeting early on to create a shared understanding of the case, whereas others might prefer to have a meeting rather late in the process to ensure a coherent case report. Hence, the overall question is 'How can the course design synchronise the group's collaborative effort while preserving as much flexibility for the individual as possible?'.

Solution

The suggested solution consists of three parts: an entry questionnaire, a macro-script and an online training session with the whole group.

In the first week of the course, students are asked to fill in an *entry questionnaire* (Appendix C.1) in which they indicate: (a) the evenings they would be available for occasional online meetings; and (b) their experience with online learning, case-based learning and different forms of ICT. Groups are then formed by the course coordinator, initially on the basis of 'student availability', i.e. only students who indicated the same evening can be put into the same group and, secondly, with the goal of forming groups having a balanced ratio of novice and more experienced learners.

The case method itself is communicated in the form of a *macro-script* (Dillenbourg & Tchounikine 2007), defining which activities are undertaken by the individual and which by the group (Figure 7-15). Additionally, the script makes a suggestion as to whether the activity is best done synchronously or asynchronously. The three main activities in the script (preparations, online meetings and peer evaluations) reflect the three stages of case-based learning (Section 2.1.4). The script is an improved version of the script used in the second research iteration (see Section 6.2.2). The major change consists of emphasising the need for a group document that already contains every group member's ideas, which can then be discussed and refined during the online meeting. This group document can be compiled by a single group member who extracts the ideas from the

individual postings, or the group document can be generated by having each group member contribute to the group document sequentially.

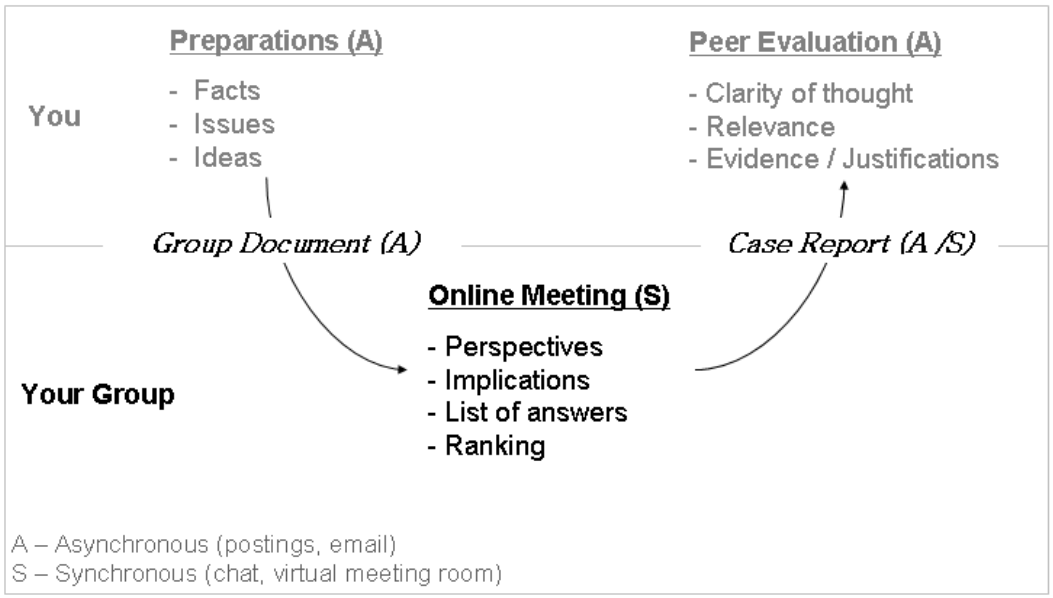


Figure 7-15: E-CBL Macro-script

The third component of the suggested solution is an *online training session* during which the macro-script illustrated in Figure 7-15 is explained; and particularly useful features of the virtual meeting room are practiced. A major benefit of the training session is that the use of e-learning technologies can be demonstrated within the context of specific tasks, e.g. collaborative browsing and annotating of a webpage is demonstrated within the context of evaluating the quality of a company's web-presence.

Evaluation

Although case-discussions can be done asynchronously, the underlying value basis of this pattern emphasises the importance of synchronous interaction as an efficient means of quickly building a shared understanding of the case and generating new insights through the more immediate exchange of ideas possible in a virtual meeting room.

A first indicator of how successfully synchronous online meetings were adopted by the groups can be obtained from descriptive statistics on the frequency and duration of online meetings (Figure 7-16).

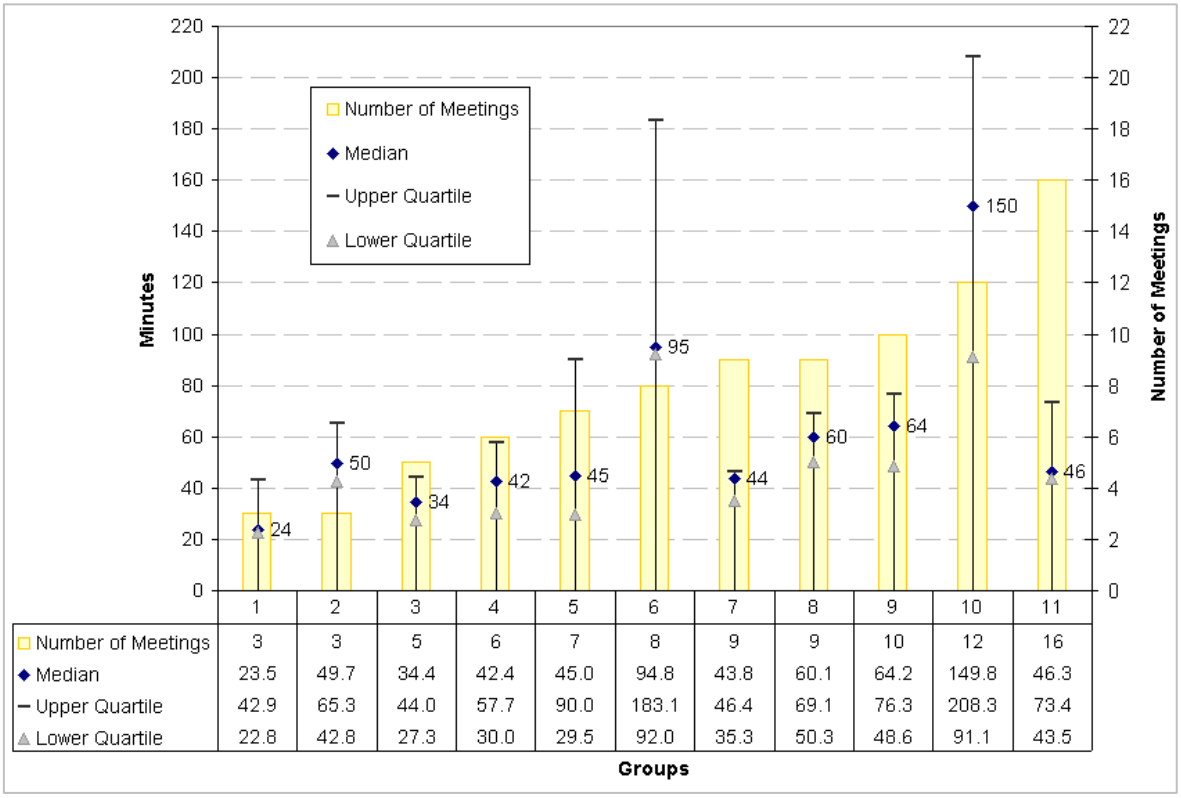


Figure 7-16: Frequency and duration of online meetings (SP7 2006)

Figure 7-16 shows the activity level of eleven groups ordered by number of meetings. Although a closer look at actual group communications would be necessary to enable tutors to understand the groups' problems, these data can be taken as first clues to whether or not a group benefits from online meetings.

Based on the researcher's experience from previous course offerings, it was recommended to schedule at least one (adequately prepared) group meeting for each of the four case studies and to allow at least 45 min for each online meeting. With the possible exception of the first three groups, most groups met these recommendations (Figure 7-16).

Another indicator of whether students managed to master Centra was how useful they rated their Centra meetings (Figure 7-17). 67% found their Centra meetings very useful or just useful and 23% found them to be of little or no use.

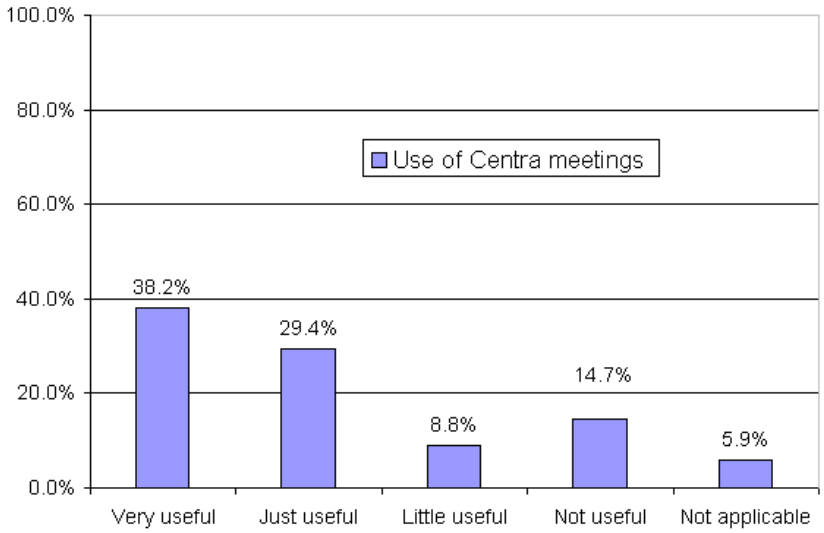


Figure 7-17: Usefulness of Centra meetings (n=34, SP7 2006)

Both results however, i.e. frequency and rating of Centra meetings, need to be read in combination with students' free-text comments. Clearly, the usefulness of a meeting depends on many factors, including: the level of preparation which individual group members bring to online meetings, or the level of confidence of non-English speaking background students in their oral language skills so that they participate actively in their group discussions.

Other statistics that can shed light on how well virtual meeting rooms were integrated into the groups case-based learning processes included the time students spent in Centra: ranging from a minimum of 1.8 hours to a maximum of 29 hours, which equates to an average of 2.6 hours per week (Table 7-6) – although not all meetings were attended by all group members, which has an impact on the value of online meetings. Nonetheless, it can be said that even low participation ratios of around 65% did not necessarily mean groups would have fewer meetings, as can be seen from groups 9 and 11. In cases such as these, instructors would need to look at more detailed statistics to find out whether it is always the same students who cannot/choose not to attend meetings and, if so, whether this has been balanced through other types of contribution.

Table 7-6: Total meeting time and average meeting participation (SP7 2006)

Group*	Number of Meetings	Median Meeting Length [min]	Total Centra Time [hrs]	Members	Average Meeting Participation
1	3	23	1.8	4	75%
2	3	43	2.8	5	46%
3	5	27	3.5	5	88%
4	6	30	4.4	4	80%

Group*	Number of Meetings	Median Meeting Length [min]	Total Centra Time [hrs]	Members	Average Meeting Participation
5	7	45	7.5	3	90%
6	8	92	17.0	5	92%
7	9	35	6.9	5	80%
8	9	50	7.9	5	68%
9	10	49	12.6	5	64%
10	12	91	29.8	5	70%
11	16	44	18.4	4	65%

* Groups have been numbered serially to preserve anonymity.

Lastly, group discussions are evaluated by the students' own rating of their group work experience (Figure 7-18). Most students found their group work '*enjoyable*' (47%) or '*very enjoyable'* (12%), although a substantial percentage described their group work as *unpleasant*' (38%) or '*very unpleasant*' (3%).

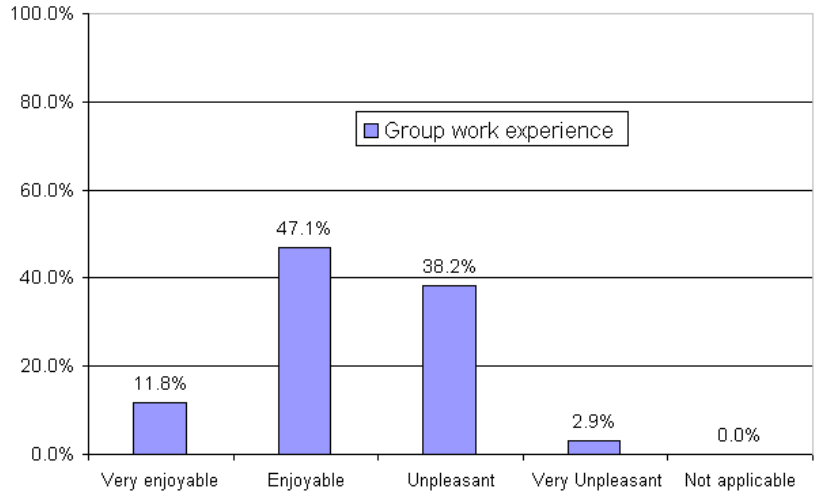


Figure 7-18: Rating of group work (n=34, SP7 2006)

This relatively high level of discontentment is linked to comments like '*many people prefer to sit back and let others organize*' or '*I tried out all my co-ordination, leadership; mothering skills listening to why the dog ate my homework etc., why people could not turn up on -line or with their work at the agreed discussed timeframe.'*

The feedback made it clear that, even though many groups manage to work through the cases, the management of free riders was a major problem: '*Working totally on-line is difficult as there is no real repercussions for those who don't commit; they do not need to see you face to face with their excuses; its an easy way out for them. In the working world people are accountable and must toe the line or they are out. I would have preferred to*

work with people who had the same work ethic as me, people I know and can confront if they are not performing their share of input.'

Although students were repeatedly told that situations of this kind can be dealt with by the tutors, students felt reluctant to 'dob in' their peers. The pattern could be improved by the addition of a component which provides ongoing data about the involvement of each student, e.g. number of postings, percentage of group meetings attended, or students' speech time in meetings. This would enable tutors to address problematic participation patterns proactively.

Those groups which had more committed group members commented on the value of having the opportunity to practice coordination and leadership skills: '*Personally I have always felt my abilities in this area were sorely lacking. While I would still prefer to defer any leadership roles within any given group provided that there was a suitable candidate or candidates available, I feel more able to assume a role of leadership within the group than previously should the need arise.*' or '*…it surprised me. I was able to take on a leadership role I usually wouldn't. However the leadership role was shared in our group which is really a good thing.*'

The evaluation of this pattern has shown that even though step by step recommendations were provided, groups required a wider variety of support. In cases where group members show signs of free riding online, tutors need to intervene earlier and in a more proactive fashion.

7.3.5 Pattern #5: Giving feedback to case reports

Context

Assessment is arguably one of the most efficient forms of feedback and an important driver of students' learning activities (Knight 2004). The way in which learning is assessed is a direct expression of what is valued by the instructor, while the way learners perceive the assessment in a course is likely to influence their study approach and priorities. Macdonald (2003, p.378) states that: "… it is common knowledge that assessment related tasks attract student attention at the expense of non-assessed tasks". Therefore, if exploring and discussing a case collaboratively is an important element of e-CBL, this must be reflected in the assessment scheme.

Problem

The challenge of assessing e-CBL is twofold: firstly, how to assess the outcome of case-based learning is in itself a controversial question (Savin-Baden 2004) and, secondly, not only should the assessment scheme evaluate the outcome of past efforts but it should

also offer a clear incentive to increase involvement in collaborative group effort when necessary.

Using Macdonald's (2003) differentiation between assessing the product and the process of collaborative online learning, the following assessment requirements can be formulated:

- The product, i.e. the content of the case report, is largely unspecified. One of the purposes of case-based learning is comparing a variety of views and suggestions for a specific case, rather than developing a homogeneous view of the case. Hence, the quality of a case report depends not only on what issues have been identified, but also on the thoroughness of the argumentation around the issues.
- The process of collaborative online learning requires the instructor to demonstrate that all group members are expected to contribute in a balanced way; and that a failure to do so has consequences.

The problem in developing a suitable assessment scheme is that it must be detailed enough to indicate the strengths and weaknesses of the case report, but still general enough to allow tutors to give feedback in a flexible way, so that they can address the unique problems of each group.

Solution

In terms of assessing the product, the quality of the case report is evaluated by means of a marking template based on Biggs & Collis' (1982) SOLO (Structure of Observed Learning Outcomes) taxonomy. The second challenge, stimulating collaboration through assessment, is addressed by discussing the value of each group member's participation during the online training session, as well as making it clear that participation levels markedly below the group average can lead to lower grades.

Feedback template

SOLO (Structure of Observed Learning Outcomes) uses five stages to describe the learner's increasing understanding of a topic (Biggs & Collis 1982). The five stages stand for different degrees with which students are able to: (I) recognise concepts, (II) make connections between these, (III) understand their importance, (IV) interpret the concepts within a context; and (V) eventually generalise and transfer their understanding to new domains (Biggs & Tang 2007).

The e-CBL feedback template (Appendix C.5) includes three categories:

- Variety and Depth of analysis & recommendations;
- Coherence and consistency of argumentation; and
- Report is clearly structured, referenced and easy to read.

Variety and depth of analysis applies the five stages suggested by Biggs and Collis (1982) to the group's argumentation. 'Variety' addresses the range of issues and solutions identified, with a differentiation being made between more and less relevant arguments. 'Depth' refers to the degree to which a concept is connected to other concepts, either to explain an issue in more detail or to apply it to a new context. The second marking category, *coherence of argumentation*, examines the overall flow of the argument and emphasises the need for a common understanding of the case from the beginning, as well as a need to exchange drafts frequently during asynchronous work on the case, so that contradictory arguments can be avoided (Figure 7-19). Finally, a third category '*structure and referencing*' addresses formal aspects of report writing and research. This category became necessary when the number of plagiarism cases increased and issues of intellectual property and the scholarship of learning[80] needed to be discussed more explicitly.

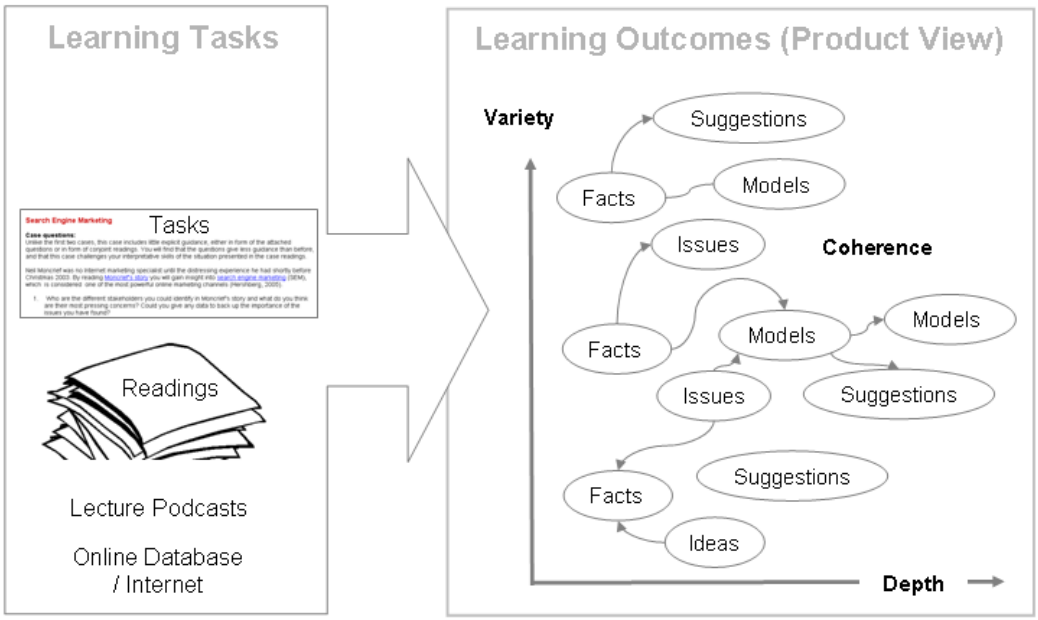


Figure 7-19: Case report assessment scheme

Figure 7-19 illustrates how different resources can be used during the case discussion (readings, podcasts and academic databases). Every case study contains some core materials which lead to a set of given issues and solutions. Groups which read more widely are likely to identify more issues and view points. However, all three dimension determine the quality of a case report in conjunction. If groups come up with a wide range

[80] To illustrate the problem, in a study of four Queensland universities (1206 students), Brimble and Stevenson-Clark (2005) found that 40% of students regarded plagiarism as 'minor cheating' and 11% as 'not cheating at all'.

of issues but fail to present them in a coherent way, this needs to be included in the feedback they get.

Assessment discussion

Rather then trying to pre-empt all questions through very detailed regulations, the assessment process is discussed during the first synchronous online session. This enables instructors to induct students into the culture of assessment and react to students' concerns on the spot (TELL 2005)[81]. Additionally, instructors can explain how groups should organise their group work to meet the assessment criteria more efficiently (see 'Hints for group work' in Appendices C.3.1 – C.3.4).

Evaluation

47% of the students rated the feedback they received as '*very helpful*' and 38% rated it as '*just helpful*' (Figure 7-20). As part of the online questionnaire, the feedback and assessment generated comparatively few comments, potentially confirming Falchikov's (2004) finding that, too often, the importance of an assessment grade overrides the information in the written feedback, implies that students interpret feedback as a form of judgement rather than as a means of supporting ongoing improvement.

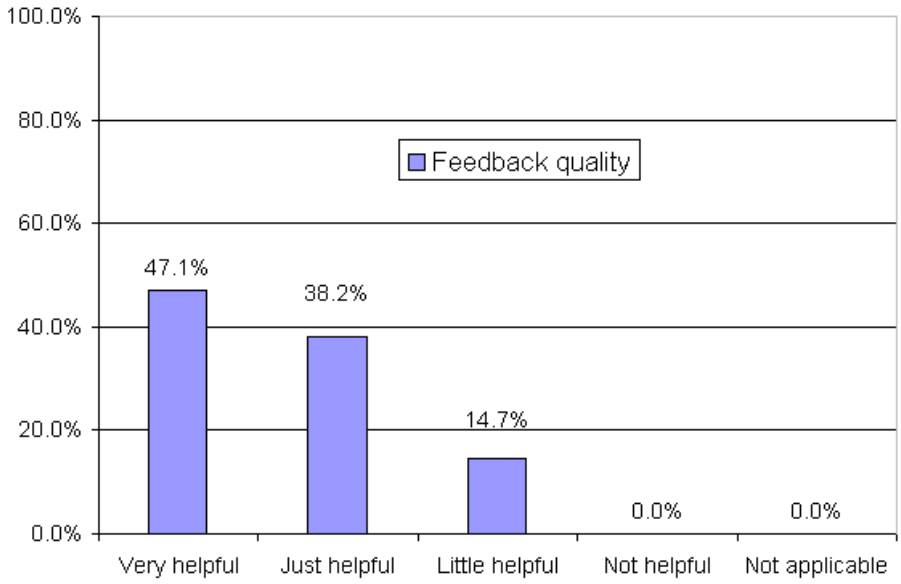


Figure 7-20: Rating of Feedback (n=34/ SP7, 2006)

The few comments obtained related to the importance of timely feedback so that recommendations could be considered when working on the next case study, or mentioned positively their practical experience of feedback: '*I think that the feedback in regards to the cases was really good - they helped us identify any problems so that we*

[81] Alternatively, forms of collaborative assessment could be applied, where students and online tutors determine their assessment criteria in conjunction (McConnell 2002).

were able to rectify them in the following cases' or '*Nice. Showed areas that could be improved and were descriptive - a vast improvement on other courses'.*

7.4 Chapter Summary and Reflections

This Chapter has reported the third research iteration, which sought to reuse and enhance the design knowledge and related insights in such a way that it can easily be accessed and reused beyond this research project.

The Chapter concludes by summarising the subsidiary research questions as they were posed at the beginning of this Chapter.

SRQ 4: How can e-CBL design knowledge be formulated to support its reusability?

This question has been addressed by showing that, before knowledge can be reused, it must be shared. Knowledge sharing was then briefly analysed from a knowledge management perspective, highlighting the fact that knowledge has explicit and implicit parts and needs to be individually understood, as well as collectively accepted, before it can be reapplied successfully.

The concept of design patterns was then introduced as a way of optimally capturing the explicit and implicit dimensions of design knowledge. A literature review had shown that the strength of Design patterns was based on their unique combination of practical examples, context knowledge and abstract, theoretical foundations.

However, examining how successful the pattern concept has been when applied in a variety of design areas revealed further issues specific to the domain of e-learning. It appears that educational design knowledge needs to include information about its pedagogical value basis, the way it depends on stakeholders other than educators and learners and, finally, it should include information about what data and data collection techniques can help to verify the success of a pattern. In response to these issues a list of 35 pattern descriptors has been suggested as guide for future efforts to author educational design patterns.

SRQ 5: How can the e-CBL design be further extended to increase its practicability?

With the newly developed pattern description, the in-depth interpretation in Section 6.5 has been re-visited and remaining issues have been addressed by a design pattern. The list is not exhaustive and every new implementation of e-CBL could add new design patterns, depending on what problem and solution pairs repeat themselves.

However, as a continuation of the second research iteration, the following five proto-patterns have been described and evaluated.

Pattern #1: Writing Case studies

Pattern #2: Planning course activities

Pattern #3: Getting individual case-learners started

Pattern #4: Getting group discussions started

Pattern #5: Giving feedback to case reports

Figure 7-21 shows how design patterns target specific development processes within the e-CBL development framework. Pattern #3, for example, aims to overcome typical problems novice case-learners can encounter when they start working on their first learning case. Problems such as not knowing how to get started are resolved by presenting information at different levels of depth and detail, corresponding to the level of uncertainty a learner experiences. Pattern #4 then aims to support the coordination of collaboration outside and during online meeting. Scripts provide suitable process description and media training sessions demonstrate how specific combinations of ICT can be used to support the group's online discussions.

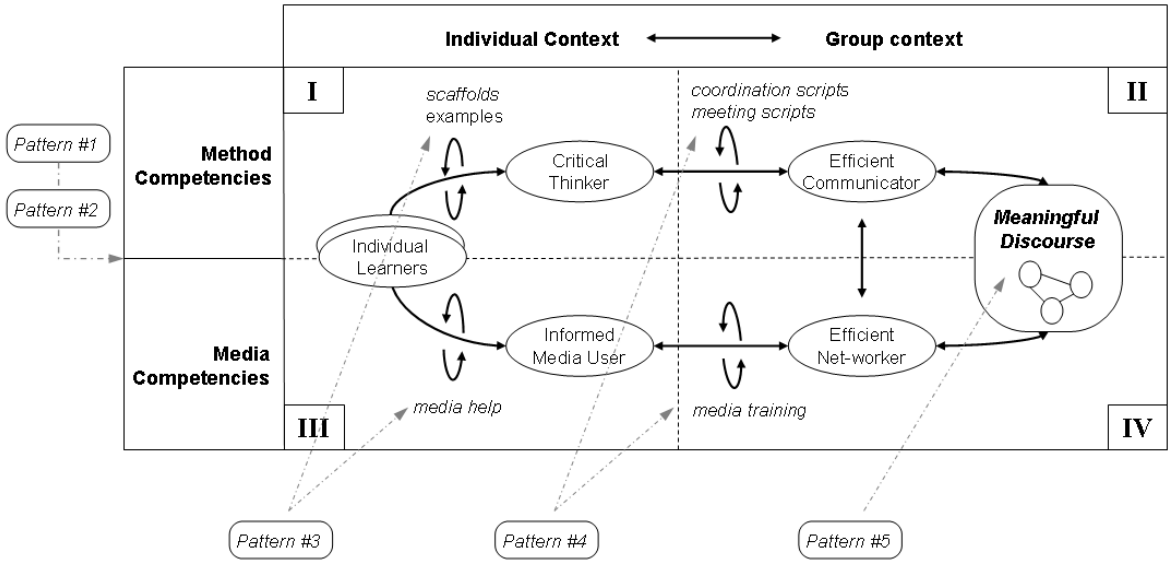


Figure 7-21: Development matrix and design patterns

Patterns #1 and #2 are concerned with the basic conditions of e-CBL in that they discuss the importance of engaging case material and carefully planned course activities which allow sufficient time for students to engage with the different dimensions of e-CBL. Finally, pattern #5 aims to encourage groups to evaluate and reflect on their past performance to

identify where the group could have profited from better coordination or a more thorough discussion.

In accordance with the answer to SRQ4, all patterns have not only been described in terms of context, problem and solution, but also included a section on how the impact of a pattern can be measured. The evaluation sections have shown that learners comment on e-learning designs holistically, i.e. learners are aware that the value of their own personal preparation depends on the overall preparation level in their groups. Or, to give another example, following a coordination script is only useful if group members are committed to their group's success, rather than just going through the motions of complying with the recommended sequence of steps.

Students' reactions to the various patterns have shown the need for further finetuning of the patterns described in this chapter. This confirms Sharp *et al's* (2003) comment that "…any pattern effort is work-in-progress" (p. 327) and that multiple patterns applied simultaneously surface interdependencies which, over time, transform a set of patterns into a pattern language.

This Chapter concludes the empirical investigations of e-CBL in practice. Being the last of three research iterations, during which several design ideas have been developed and tested, the Chapter provides clear, operational guidelines (design patterns) to implement e-CBL design patterns beyond this research project.

The next and final Chapter summarises the answers to all the research questions posed at the start of this Thesis, reflects on the Thesis' theoretical and practical contributions; and addresses potential issues linked to the dissemination of e-CBL patterns and what opportunities might result from future research.

8 CONCLUSION AND FUTURE WORK

Building upon the findings of previous Chapters, Chapter 7 described the final research iteration of this research project. The major outcome of Chapter 7 was a set of design patterns to improve the reusability of e-CBL.

The goal of the present Chapter is to review this Thesis, as follows :

- Section 8.1 summarises the theoretical foundations of the work and revisits the three research iterations;
- Section 8.2 provides explicit answers to the research questions;
- Section 8.3 clarifies the limitations of the research findings;
- Section 8.4 outlines the contributions of the research to theory and practice; and
- Section 8.5 suggests opportunities for future research.

8.1 Project Summary: The Evolution of the e-CBL Design

This project explored the extent to which case-based learning can be implemented electronically and identified the associated efforts and benefits. This Thesis has argued that a large proportion of the educational benefits to be obtained from case-based learning (both on- and offline) depends on the encouragement of a critical debate. Based on a social constructivist perspective of learning, e-CBL is designed to create a learning environment which offers frequent opportunities for meaningful discussions. The meaningfulness of a discussion depends on the actual development and the immediate needs of the learning group. The researcher argues that learners need to have at their fingertips technologies with which they feel comfortable and which they know how to apply in accordance with their intentions and actual circumstances.

By conceptualising, implementing and testing design interventions, the researcher developed a better understanding of e-CBL in terms of the challenges it poses to online learners, what actually happens during case-based learning processes and, consequently, what design measures help to support the activities of case-learners in virtual environments.

The research was developed through three research iterations which took place in 2004, 2005 and 2006: each lasting over eleven weeks. The three iterations followed a design-research approach, utilising the following structure (Design-Based Research Collective 2003):

- Firstly, existing research and theories inform design conjectures which are implemented in an interventionist and piecemeal fashion; and

- Secondly, both the intended and unintended consequences of the design are described, interpreted and transformed into further design improvements.

The summary in the following sections shows how every research iteration set out to improve on particular issues of e-CBL, resolved them to varying degrees; and identified new issues to be dealt with in the subsequent research iteration.

The first iteration led to the principal activity-theory-based framework, the e-CBL development matrix (Chapter 5). The research project continued to substantiate this framework by means of the analysis of more fine-grained aspects of online collaboration, leading to the e-CBL meeting model (Chapter 6); and concluded with the formulation of a set of design patterns (Chapter 7) as complements to the overall design. Figure 8-1 illustrates the complete, three-part design research structure of this thesis, including the overarching research question which this research project was designed to answer, together with the subsidiary research questions associated with each part of the research project.

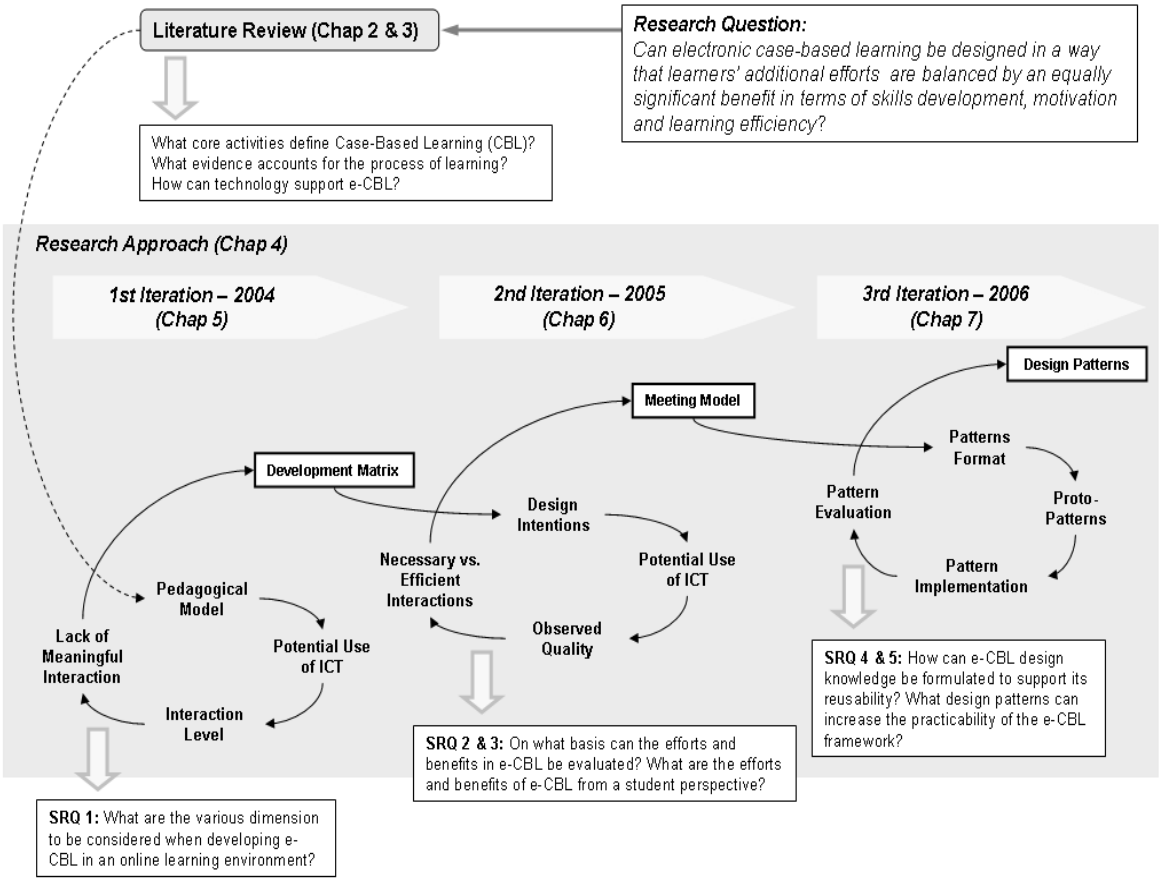


Figure 8-1: Overview of Design Research Iterations

All three research iterations were undertaken within the context of an entirely online course, "Introduction to e-Business", at the University of South Australia: involving 61 students in the first research iteration, 45 students in the second and 60 students in the third and final iteration.

To analyse learning events in their natural settings, this project combined the research loops identified in Figure 8-1 with a process of data interpretation based on Ricoeur's (1981c) hermeneutic arc. Interpretation based on the hermeneutic arc was a systematic three stage process: (1) describing first impressions, (2) analysing the structural elements of a learning event and (3) applying different angles of interpretation (ibid.).

8.1.1 Iteration I: Starting with a pedagogical model

The main inputs to the first design implementation were drawn from the 'case method' as described by Mauffette-Leenders *et al.* (1999) and Christensen and Hansen (1987). Groups were randomly formed and followed a description of case-based learning identical to that given to internal students. No particular online collaboration process was specified: firstly, because no comprehensive design model for online case-based learning was available and, secondly, because the researcher wanted to see to what extent students could develop their own learning processes in such a loosely structured learning environment. Technologically, the groups had access to standard communication media such as discussion boards and text chat room.

After the completion of the online course, a first review of usage statistics showed a surprisingly low uptake of synchronous communication (only three out of sixteen groups met more than once synchronously). Additionally, groups had various assumptions about why they should meet online, ranging from 'complying with course recommendations' and 'getting in touch with the course coordinator' to 'splitting group work'. These initial insights showed that a widespread recognition or appreciation of synchronous group work could not be taken for granted.

A comparison between two groups which primarily used chat meetings and two groups using primarily forum postings identified two phenomena: (1) groups using chat meetings had substantial forum communication, suggesting that in these cases chat was not necessarily a substitute for asynchronous communication; and (2) chat interactions were much more reciprocal than forum interactions, i.e. chats showed visible traces of knowledge construction through students evaluating and extending one another's ideas.

Therefore, a major result of this first research iteration was the re-conceptualisation of case-based learning based on an activity-systems perspective. Activity systems (Engeström 1987) provided an excellent tool to understand, analyse and, subsequently, design case-based learning contextually. Looking at online collaboration from an activity-systems point of view led to the e-CBL development matrix, which was then used as a theoretical framework for the following two research iterations. A major implication of the development matrix has been the recognition of the need to broaden the research scope and analyse the development of students' methods and media skills over time.

The design used during this first iteration concentrated on the pedagogical dimension of the case method. However, the limited occurrence of actual case debates made it clear that students' engagement in e-CBL needed to be understood as a trajectory from novice to experienced online learners. Therefore, the subsequent design needed to include provisions to support students in overcoming the initial hurdles, allowing them to gradually develop the skills required for collaboration in virtual groups.

8.1.2 Iteration II: Understanding synchronous online meetings

A fundamental step at the beginning of the second research iteration was the introduction of the Centra virtual meeting room: a rich medium for collaboration. Due to the scarcity of studies evaluating the use of rich virtual meeting rooms for case discussions, a pilot study was conducted before the commencement of this iteration. This pilot study identified a suitable process for getting groups started and tested Centra's reliability in terms of availability and communication quality.

The identified process comprised four main steps: post individual case preparations, merge all preparations into one document, discuss and edit the document during online meetings; and update the document prior to the next meeting.

In addition to the virtual meeting room, several other new design measures were introduced in this second research iteration, including:

- A tutor-led training session which was held to improve students' ICT literacy;
- The development of readings and task scaffolds to foster a critical thinking approach and, in turn increase the depth of case-discussions; and
- The development of specific activities for the course outline to encourage students to deliberately exchange social information, in the hope these would positively influence groups' social cohesion.

A first interpretation of data representing the amount of electronic collaboration showed a substantial increase in synchronous group work, although the accumulated meeting time per group ranged from 199 minutes up to almost four times this much (795 minutes). This raised the question of how to explain these differences and what this increase really meant for the quality of e-CBL.

Based on the content analysis of four transcripts (two chat and two Centra sessions), student activities were categorised into: social presence, critical thinking; or macro/ micro-coordination (Garrison & Anderson 2003). The consolidated findings from all four sessions led to a meeting model which integrated the different processes occurring during online meetings; and offered a credible explanation for the different meeting lengths encountered.

Additionally, six interviews and one focus group were conducted in order to capture students' experiences of e-CBL. It became evident that, although students appreciated the structural help and the richness of the communication medium, many groups expressed concern about idle students not pulling their weight. This emphasised the need to maintain an ongoing discussion evaluating the group's collaboration process to communicate that: online tutors could not substitute for the group's own coordination effort; and that 'social loafing' would not be an acceptable way of successfully completing the course.

8.1.3 Iteration III: Formulating reusable design solutions

The third research iteration had two objectives: firstly, the remaining issues identified in the student interviews needed to be integrated into the e-CBL design and, secondly, it had become clear that the design elements should be presented in a way which would support their future reusability beyond the research project.

Both objectives could be realised by means of design patterns. Through linking design patterns to specific quadrants within the development matrix the model could both grow as well as include the operational and contextual information necessary to apply the design in different contexts.

After a review of the design pattern literature, 5 proto-patterns have been suggested:

Pattern #1: Writing Case studies;
Pattern #2: Planning course activities;
Pattern #3: Getting individual case-learners started;
Pattern #4: Getting group discussions started;
Pattern #5: Giving feedback to case reports.

The researcher has argued that acceptance and uptake of a design pattern is subject to communicating the means of evaluating that pattern, hence, each proto-pattern also includes a description of how to evaluate it: mainly by means of web-metrics and online learner feedback gathered through a semi-structured online questionnaire. More extensive field studies are needed, however, to justify the transition from proto- to fully developed patterns.

8.2 Revisiting the Research Questions

The principal question motivating this research project was:

> *Can electronic case-based learning be designed in such a way that learners' additional efforts are balanced by an equally significant benefit in terms of skills development, motivation and learning efficiency?*

Following an iterative design-based research approach, as summarised in the previous Section, this rather complex question has been answered by means of a number of sub-questions (Table 8-1).

Table 8-1: Sub-questions per research iteration

1st Iteration – 2004	SRQ 1: What are the various dimensions to be considered when developing e-CBL in an online learning environment?
2nd Iteration – 2005	SRQ 2: On what basis can the efforts and benefits in e-CBL be evaluated ?
	SRQ 3: What are the efforts and benefits of e-CBL from a student perspective?
3rd Iteration – 2006	SRQ 4: How can e-CBL design knowledge be formulated to support its reusability?
	SRQ 5: What design patterns can increase the practicability of the e-CBL framework?

Targeting one or two specific research questions, each research iteration delivered a part of the final e-CBL design. Figure 8-2 combines the findings of the three research iterations into a multi-component e-CBL design: (I) development matrix, (II) meeting model; and (III) complementary design patterns.

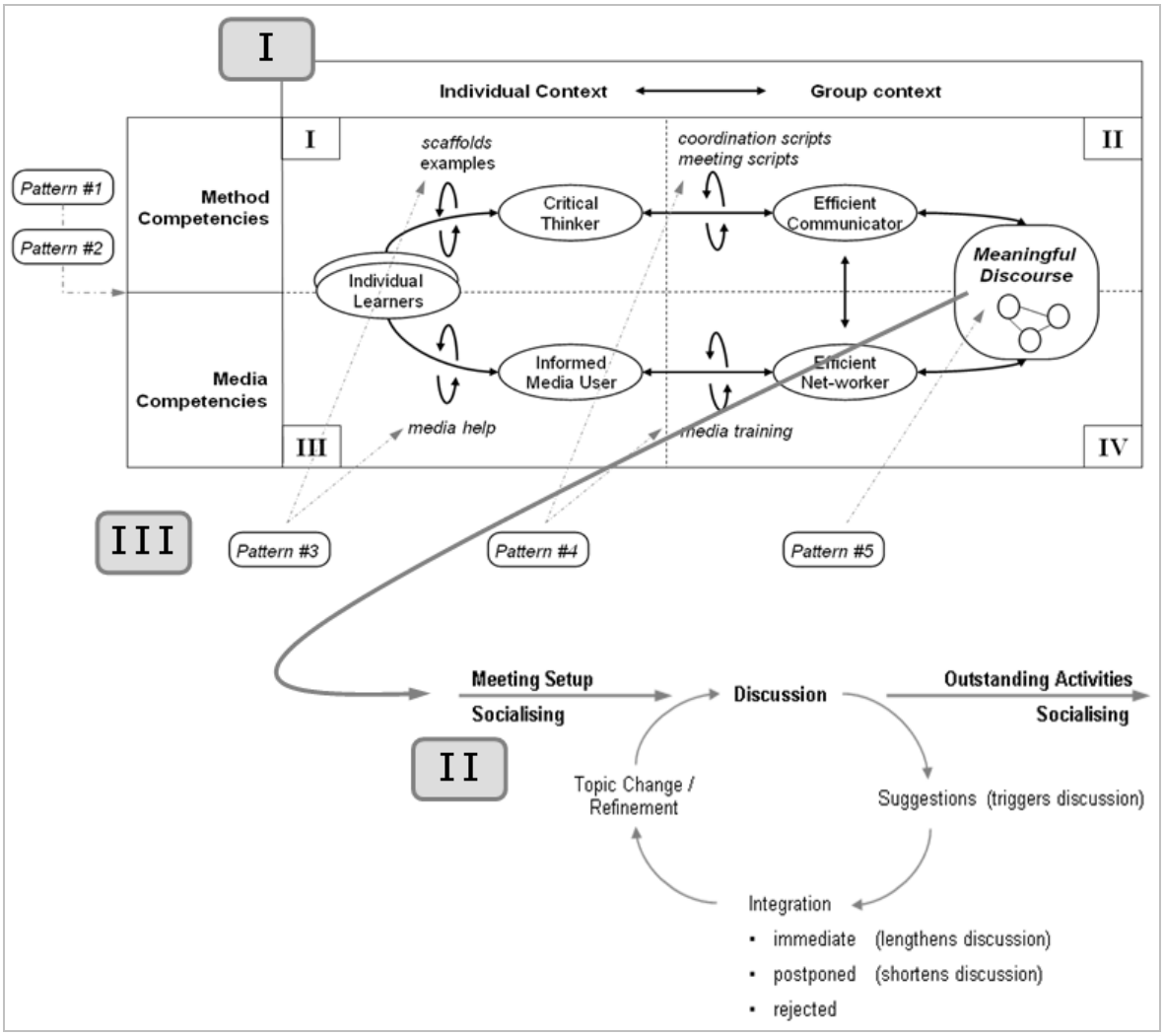


Figure 8-2: Overview of the final, multi-component e-CBL design

SRQ 1: What are the various dimensions to be considered when developing e-CBL in an online learning environment?

Initially, e-CBL was implemented according to the steps outlined in the Harvard method. However, the literature review produced little explanation for how the three core activities (individual case preparation, small group discussion and plenum discussion) could be appropriately facilitated in an online environment. Consequently, the data gathered during the first research iteration led to a more comprehensive understanding of the multiple and complex issues online case-learners have to manage. Returning to the literature on socially and technologically mediated action (Engeström 1987; Vygotsky 1978) the e-CBL development matrix was created (Figure 8-2, Component I). Finally, the four quadrants of the matrix helped to determine and organise the various dimensions to be considered when developing e-CBL, comprising learners method- and media-related competencies plus the provision of opportunities to apply these competencies as individuals and as part of their groups.

SRQ 2: On what basis can the efforts and benefits in e-CBL be evaluated ?

Based on the general design framework developed in response to SRQ1, the educational design in the second research iteration was able to address upfront many of the issues that had plagued the first implementation of e-CBL. Initial coordination problems were solved by forming groups according to members' availability for online meetings; and the potential to increase the efficiency of online meetings was created through the use of a virtual meeting room (Centra). However, although students had access to considerably more support elements than before, they were still required to manage their meetings in a largely self-directed manner and had to negotiate and decide why and for how long they should meet online.

With a stronger emphasis on the value of synchronous online events, negotiating how to collaborate during the case work became more laborious: meetings had to be prepared, meeting outcomes needed to be followed up and additional tasks emerged as students had to call for meetings, facilitate them and follow up on the decisions made. These additional activities were then associated with their potential benefits in terms of *social presence, coordination* and *critical thinking* (Garrison & Anderson 2003). Although it could be argued that, for example, groups having less interaction would naturally have less coordination effort, it is also clear they would have fewer learning opportunities, viz. opportunities to benefit from e-CBL. Groups which held online meetings did benefit from these in multiple ways: developing group identities, practicing their group- and technology-related skills and, finally, improving the quality of their reports based on critically reviewing one another's input (Figure 8-2, Component II). Hence, efforts and benefits in e-CBL can be evaluated on the basis of all these categories: social presence, coordination and critical thinking. Each activity category can contribute to the quality of e-CBL. Whether or not a particular effort is justified, however, needs to be decided on the basis of the group's specific needs and opportunities.

SRQ 3: What are the efforts and benefits of e-CBL from a student perspective?

SRQ 2 evaluated e-CBL at a theoretical level, while the present question was answered by asking students for their individual experiences with e-CBL. It became clear that, while the support of intra-group coordination and the rich online learning environment was appreciated, these benefits took a back seat when groups had to deal with overt social loafing or overly dominant behaviour by individual group members.

In summary, students interpreted efforts and benefits of e-CBL similar to what the theory-led evaluation suggested under SRQ 2: Online meetings required extra coordination effort and could take up substantial amounts of time on one side, but were acknowledge as valuable means to increase the quality of group work on the other side. Concerning the

latter, students declared that online meetings changed the way they perceived their groups, which in turn influenced how they contributed to or felt committed to the group's case discussions.

However, online meetings cannot be presented as a panacea to group problems. Whenever group members perceived major inequalities, either in commitment to the group's effort or in the quality of the work produced, they called for a more interventionist tutoring process, i.e. tutors should use their authority to 'step in' and take charge of the group. Learning seen from a constructivist point of view, however, would question such an approach and aim for more educational measures, where groups receive increased guidance but would still have to manage their own collaboration processes. Future work is planned to develop mechanisms to detect early signs of free riding, allowing tutors to address issues before these can damage the group's working climate.

SRQ 4: How can e-CBL design knowledge be formulated to support its reusability?

This question was answered by investigating the issues of sharing design knowledge and identifying design patterns as a suitable approach to address these issues. Based on a review of the uptake of design patterns in such diverse areas as architecture, software development and e-learning, the researcher has suggested extending the classical design pattern triplet formulated by Alexander *et al.*(1977) with a forth category 'evaluation'. Hence, in order to support its reusability, e-CBL design knowledge is described using the following dimensions:

- The context within which a design problem-solution pair is likely to be successful;
- The issues that define the design problem;
- The solution that resolves the problem; and
- The evaluation that indicates the impact of the solution.

Moreover, the reusability of e-CBL design knowledge is not only supported by the specific pattern format, but also by the way the description allows the reconstruction of a pattern's meaning through the combination of abstract design principles with concrete design examples (Voigt & Swatman 2006a).

SRQ 5: What design patterns can increase the practicability of the e-CBL framework?

Design patterns have not only been discussed at a theoretical level, but have also been formulated to strengthen the practicability of the *development matrix*. Under SRQ 4 students' feedback concerning the efforts and benefits of e-CBL highlighted a number of issues that needed to be explicitly addressed. Design patterns have been formulated for case writing and course activity planning (Patterns #1 and #2) as well as for introducing the case method to the individual learner (Pattern #3) and getting group work started

(Pattern #4). Finally, a pattern has been suggested for assessing case reports (Pattern #5).

The suggested collection of five design patterns is not a complete solution. Nonetheless, in combination with the development matrix they provide a foundation for an effective e-CBL learning environment and, based on the existing design representation (Figure 8-2), more design patterns can be added as they become necessary.

Finally, the answers to the subsidiary research questions enable the main question of this research project to be addressed.

> *Can electronic case-based learning be designed in such a way that learners' additional efforts are balanced by an equally significant benefit in terms of skills development, motivation and learning efficiency?*

This can be answered with a 'yes', contingent on the use of the appropriate design recommendations outlined under each subsidiary research question. The design recommendations within this Thesis have been bundled and organised within the e-CBL development matrix and further specified through the five design patterns described in Chapter 7. Frequent practice of method and media skills has been shown to be an important factor in leveraging the benefit of e-CBL. A major source of additional effort has been the increased need for coordination that comes with the more interactive nature of a case-based course design. Those students who embraced the challenge of virtual teamwork appreciated the social support available in their groups and found the structuring of their personal learning through interactions with others helpful.

More research, however, is needed to support groups in their dealings with (persistent) problems created by social loafing on the part of some group members. Though not a focus of this project, preliminary ideas on this topic have been formulated under the fourth pattern (Section 7.3.4). Moreover, this research project has also confirmed that technology, by itself, is not a guarantor for learning efficiency. Learning applications can improve process efficiencies if students recognise these as 'affordances' (Chapter 3). Although process recommendations are provided in this Thesis, an important skill of self-directed online groups is the critical monitoring of their own learning processes and the adaptation of these to the group's specific constraints and opportunities.

8.3 Research Contributions

As stated at the beginning of this Thesis (Section 1.6), the aim of this research project has been to contribute to the development of highly interactive forms of e-learning, exploiting the richness of current information and communication technologies. This Section is divided into several subsections: contributions to factual and theoretical knowledge; and to the practice of collaborative online learning.

8.3.1 Theoretical and empirical contributions

A major outcome of this Thesis is the e-CBL development matrix based on Vygotsky's (1978) concept of socially and technologically mediated activities. This development matrix makes an important conceptual contribution to the socio-cultural understanding of learning. In addition, evaluating the model in practice has produced a wealth of empirical evidence indicating the relevance of the socio-cultural approach to e-learning design.

Much of the past research in computer mediated communication (CMC) or computer supported collaborative learning (CSCL) has concentrated on developing or testing theories that could offer 'best fit rules', matching particular activity categories with a specific communication medium. McConnell (2006a), however, argues: "We know little of what actually takes place in an online learning community and what members of communities do in those settings" (ibid, p.4). Hence, this research has proceeded differently, studying e-learning as it happens naturally in real-world settings, and thus contributing to the specification of collaborative e-learning as 'situated action' (Suchman 1987). For example, in formulating the e-CBL meeting model (Figure 8-2, Component II) the researcher does not prioritise any particular activity but argues that groups need to align meeting activities with the immediate needs of the group's situation. This means that if the group experiences a conflict of clashing work ethics an initial, prolonged phase of social interaction might well be helpful or, if the main objectives of a meeting had not been negotiated upfront, a substantial amount of micro-coordination might be necessary before the actual case-related discussion can begin.

This Thesis also makes a contribution to the literature on design patterns by identifying factors which encourage or impede the uptake of patterned design solutions (Voigt & Swatman 2006a). In terms of the reusability of an e-learning design pattern, the researcher argued that a section on how to evaluate the pattern's success is potentially an important ingredient for improving its dissemination and acceptance, given the limited empirical evidence for some patterns.

Many of the suggested design patterns are based on well-known instructional principles, for example Pattern #4 'Getting group discussions started' is based on macro-scripts as described in O'Donnell (1999) and Pattern #3 'Getting individual case-learners started' is

based on the concept of scaffolded explanations (Wood, Bruner & Ross 1976). However, these principles have not been applied in a normative way, i.e. they were not presented as standards or reference processes, rather they were provided as potentially useful processes which still had to be adapted to fit a group's specific needs[82]. In evaluating the feasibility and success of such an approach, the importance of time, frequent practice and exploration proved to be a major finding. Students repeatedly mentioned the importance of exploring new ways of collaboration and reflecting on the efficiency of existing group work practices. Hence, this research reaffirms the educational value of scripts or scaffolds, if paired with self-reflection and a wish to improve group work.

8.3.2 The Praxis of e-learning

This research project has contributed to the practice of online learning by designing and implementing the core activities of case-based learning in a virtual environment. Throughout the research project problems were identified for which instructional and technological solutions have been suggested.

The e-CBL development matrix serves as an organiser of several design areas which have been proven necessary to gradually support the development of meaningful online discussions. The model emphasises the importance of developing all four quadrants of the online group learning process in several cycles (Figure 8-2, Component I). Rather than suggesting a linear process, the model suggests that learners frequently switch between gauging their performance based on their interaction with the group and improving their individual skills – if perceived as necessary. The wish to improve can either be triggered by significant differences between the group and one's own performance, or because the existing process is not satisfying and a better role model has to be set.

Finally, evaluations of the e-CBL design as a whole (second research loop) as well as of particular design patterns (third research loop) have shown that most students enjoyed their learning experience, felt less isolated and appreciated the social network they could build up during the course. The design is not yet perfect, however, and future opportunities for improvement have been identified – such as integrating mechanisms which monitor individual students' contribution to group work and enable tutors to intervene more proactively.

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[82] Scripts can give the illusion that they contain all the necessary steps to solve a given problem. Plans and scripts, however, are only guidelines at a certain level of detail. In reality a substantial part of the task must be managed in an 'ad hoc' fashion to actively adapt a plan to the local conditions (Suchman 1987, p.28).

8.4 Research Limitations

As in any research project, the boundaries which made this investigation possible are also limitations that excluded other (potentially interesting) data and questions as part of the investigative effort.

Single course environment

Applying educational design-based research principles made it necessary to have some control over the educational setting in which the research was conducted. In order to implement changes in the course design on the basis of the ongoing analysis of course data and student feedback, the scope of data gathering was therefore limited to a single course environment.

Though data were gathered over an extended time interval (2004-2006), student cohorts changed each year. In order to evaluate the extent to which students could transfer their newly acquired experiences and competencies to other courses, longitudinal monitoring of learners over a number of study periods would be necessary (which was not possible). In order to see whether students could reapply and disseminate their learnings within new online groups, future research might choose to keep research subjects constant and observe their performance in several different courses. Such research could also have the catalytic effect of spreading the use of virtual meeting rooms in external course offerings (provided they include group work), as students frequently voiced their hopes that this technology would be used more often across the University.

Limited technological choice

Because a main objective of this study was to observe students' learning processes *in situ*, only those technologies supported by the University's IT department were considered practical options during the research project, a fact which was particularly important with substantial enrolments of up to 70 students. The research project has shown that updated browser versions or new operating systems can interrupt students' ability to link with server applications. In these cases it was crucial that learning technology applications could be updated at the most appropriate time. In addition, having the system maintained externally was fundamental to minimise down times or data losses after unplanned system outages.

Since it can be argued that lacking interactions or surface discussion could, at least partially, be caused by missing functionalities within a learner's environment, new technologies clearly need to be tested and integrated into e-CBL, once IT support issues are solved.

The ideographic nature of this research

The choice of an ideographic research approach, aiming to explain individual cases on their own terms (Minichiello 1995, p.32), can be seen as a limitation to this project. This would suggest that further nomothetic research aiming to develop rules that apply to a class of situations would be necessary to justify the application of the e-CBL design outside of this research project.

However, the present research project did not aim to develop 'law-like' design rules in a positivist sense (with an established validity for a given population) and, though future research could explore the effects of e-CBL design measures on a statistical basis, the suitability of such research for educational practice is frequently debated (Hammersley 1997; Hargreaves 1997). For example, Hamersley (1997, p.144) argues that, unlike the natural sciences, educational research is typically non-cumulative, with many questions needing to be revisited, so that they cannot be considered as solved as long as legitimate doubts are voiced. Hamersley continues pointing out that the reason why educational research turned to qualitative methods in the first place was the realisation that knowing 'what works in general' cannot be applied indiscriminately; and knowing when to deviate from general solutions is an important part of an educator's skills (ibid).

8.5 Future Work

This Section describes opportunities for future work which became apparent during the research project. Each opportunity will be addressed at a mainly conceptual level and backed up with a rationale about the benefits to be envisaged from such work.

Future dissemination of the e-CBL design

So far e-CBL has been implemented in one course environment only. A future project could therefore look at the possibilities of reusing the e-CBL design in other case-based courses. An interesting question would be how changes in subject matter or course level (e.g. Masters or other Graduate Studies) would influence the viability of the design.

Addition of new design patterns

More design patterns might become necessary to enhance the design's ability to respond to a variety of group and learning issues. In addition, it is likely that new patterns will become necessary if the design is used by someone other than the researcher. Many course activities might have been executed in a particular way due to the researcher's tacit knowledge about how to implement a design (Polanyi 1983, p.7). Ways of developing the existing design patterns or eliciting new patterns have been suggested in a publication currently under review (Voigt n.a.).

Staff development

What deserves more attention but has not been focussed upon in this research is the way online tutors understood their role and needed to learn how to facilitate e-CBL. In collaborative learning settings, tutors undertake little direct instruction and need to shift their focus to co-participation and group facilitation (McConnell 2006a, p.188). During e-CBL, for example, tutors do not merely disseminate solutions to given problems but are required to facilitate a discussion process which enables the group to develop its own understanding of issues and solutions.

However, a more widespread application of e-CBL would probably require a more systematic approach to tutor support and development[83]. This would include timely preparation, the possibility of experimenting with different settings, the customisation of the design; and effective workload management strategies (cf. Sheehy *et al.* 2006). Moreover, in light of tightening financial environments, necessary resources have to be negotiated between tutors and managers. Contrary to aspirations during the early days of e-learning, the preparation and delivery of online education has repeatedly been shown to require more rather than less time than does conventional education (Rumble 2001).

Merging on- and off-line

Garrison (2000) pointed out that a major challenge for e-learning in the 21st century is to integrate structural constraints of learning, e.g. media choice or instructional method with the transactional aspects of learning, e.g. collaboration or moderation. As a first step, e-CBL has attempted to master this challenge by enabling richer communication and interaction processes.

Virtual meeting rooms such as Centra, however, could lead to blurring boundaries between internal and external students. This might be particularly beneficial where external student groups are significantly smaller than their internal counterparts. Attending lectures or tutorials is often not an option for external students because they live in remote areas or have full-time jobs that do not allow for attending lectures during business hours. With Centra, however, the question becomes whether students could participate in 'live' online lectures for a limited time period of 80-100 minutes. This option is currently under discussion and could be the subject of future research.

First experiences with such a setting have been reported by Ruhleder (2004), who offered lectures to internal and external students simultaneously and found increased levels of

[83] In the present research project, only the third research iteration included the work of two online tutors who interacted frequently with the researcher (course coordinator) to discuss tutoring questions as soon as they emerged.

interactivity in both groups. Internal as well as external students could post questions or comments related to the ongoing lecture which the lecturer would attend to in intervals of 20 minutes. Nonetheless, it is clear that there is significant room for additional research within this area.

Inclusion of new technologies

Listed as a research limitation, the technology for group support was limited to those software applications supported and maintained by the University. However, the e-CBL development matrix is not bound to any particular software product. The use of a two-dimensional virtual meeting room such as Centra (www.centra.com) could be replaced by a three-dimensional meeting environment such as Second Life (www.secondlife.com) or Active Worlds (www.activeworlds.com). Of course, such a change should be preceded by a clear idea of what benefits a spatial dimension could bring to the discussion of cases. Early findings hint at new opportunities for representing cases, for example, information concerning offices, shop floor areas or shopping malls can actually be represented within such an environment. The ability to contextualise information is currently explored in medical and health education, where students can navigate the facilities of a hospital (Boulos, Hetherington & Wheeler 2007). Problematic, however, are collaborative scenarios geared towards the creation of an artefact, e.g. a case report. Future research needs to show how successfully 3-D worlds can integrate (or simulate) document oriented applications such as Google Docs (www.docs.google.com) or BSCW[84] (http://public.bscw.de).

Another possible extension of e-CBL might be tools that enable students to develop their own case studies (Carroll & Borge 2007; Xiao, Carroll & Rosson 2007) or the use of mobile devices to further increase the flexibility of e-learners (Vogel *et al.* 2007).

Group Coaching

Although the collaborative aspects of e-CBL had many positive implications, it became clear that 'social loafing' (see Section 6.5) by a single unmotivated learner could negatively influence the working climate of the entire group. A potential way to manage 'social loafing' might be by deliberately addressing students' attitudes towards learning. The current framework targets predominantly cognitive (e.g. critical thinking and media literacy) and social skills (e.g. work coordination and group facilitation) in order to facilitate collaborative learning. *Whole-person learning* (Motschnig-Pitrik 2006b; Rogers 1983),

[84] BSCW stands for Basic Support for Collaborative Work, a collaborative platform developed by Germany's Fraunhofer Institute, which manages the storing and sharing of group documents and which is provided free of charge to educational institutions.

however, suggests a third factor: the attitudinal qualities and dispositions of learners and educators towards their own learning and learning settings.

Whole-person centred learning strategies could inform future implementations of e-CBL in order to overcome persistent collaboration issues. Using a whole-person learning approach Motschnig-Pitrik and colleagues could show significant improvements in learners' (and educators') awareness of their learning processes, their own involvement and how this related to their personal learning needs and preferences (Derntl & Motschnig-Pitrik 2005; Motschnig-Pitrik 2006a). In this context an interesting question would be whether the intensive levels of negotiation and facilitation in whole-person learning (Rogers 1971) could be sustained in a purely virtual environment.

8.6 In Conclusion

A significant part of this research project has been concerned with understanding and facilitating the process of learning. Learning the basic skills of virtual interaction and group coordination was, however, essential in getting case-based learning 'off the ground'. This Thesis has confirmed that group processes cannot be assumed to emerge automatically but need deliberate promotion. The final e-CBL design has been shaped over time through analysis and reflection about actual teaching and learning practices. Groups which achieved 'flow-like' (cf. Csikszentmihalyi 1991) collaboration found the course structure hugely rewarding. Of course, seeing a struggling group transforming into a buzzing, self-directed group has also been an incentive compensation for the researcher. However, unknown issues can surface each time a new cohort of students start discussing their cases online. Hence, the project of designing collaborative e-learning is unlikely to come to a definitive end in the sense that it has reached a perfect state where no further improvements could be conceived.

Given the frequent emphasis on the need to become a reflective e-learner, e-tutor or researcher in online education, it seems appropriate to conclude this Thesis by quoting Schön (1995) on design: "[The designer] … shapes the situation, in accordance with his initial appreciation of it, the situation 'talks back', and he responds to the situation's back-talk. In a good process of design, this conversation with the situation is reflective. ... the designer reflects-in-action on the construction of the problem, the strategies of action, or the model of the phenomena" (ibid, p.79).

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A First Design Iteration (Sp7, 2004)

A.1 Assessment Specifications

Assessing "Online Visibility" (10 %)

Assessing your online activities is designed to provide you with some external motivation to use the online learning environment to its full extent, and gain as much advantage as possible from learning in groups.

You are required to undertake individual research to investigate questions which will be posted to the "General Discussion" Board. You should then post your ideas to your "Group Discussion" Board. Be concise and try to make your point as interesting as possible. Than read the postings of the other students and respond to them. If you don't understand the meaning of a posting made by a team member or how a specific information is related to the task, ask for further information. Two sorts of contributions will be assessed – your own original ideas; and your comments on your colleagues' contributions.

Not all weekly activities need to be discussed (those which require a discussion will be clearly indicated). Once a discussion thread has started it will be available for postings until the end of the course and is NOT limited to the week in which the topic to be discussed was issued.

This part of the assessment is worth 10 % of the overall marks for the course. Marking criteria within "Online Visibility" are:

- Understanding of the issue
- Evidence of online research
- Quality of argument

Presentation (Readability / Attractiveness)

Assignment 1: Mini - Case Study (15 %)

Assignment 1 requires you to research and present a real-world case study in the form of a group Powerpoint presentation and a brief report. The cases assigned each relate to an important and very relevant aspect of E-Business in practice and in analysing your group's case you will learn a great deal about the complex issues involved in running a business online.

Because it is assumed that you have never read or presented a 'teaching case' before, the case each group presents will be drawn from your text book so that you have access to the maximum amount of material to help you get started. You will need to read the case carefully and, in both your presentation and your report, answer the questions associated with that case.

Membership of groups will be posted on the course web site by the end of Week 2, and will be arranged to maximise diversity within groups. If you have any particular issues in relation to group composition you should contact the Course Coordinator immediately. Cases will be made available

to you at the end of Week 3 of semester, once group memberships have been finalised.

You will find that other people have already analysed these cases – clever Web searching may well turn up a great deal of useful information and even enable you to locate presentations made by groups at other universities on this very case. There is no reason at all why you should not make use of this material to inform yourself about the case and/or to help you structure your thinking. But the report and Powerpoint presentation your group submits must be your own work. Although your tutor and lecturer will be delighted to see you using your initiative to find out other people's views on the case you analyse, it is your own ideas you must present.

Remember: poor use of research materials, such as unacknowledged sources and overlong quotations or direct copying may affect not only presentation marks but also demonstrated understanding, demonstrated independent research and a convincing argument. Extreme cases will be considered to be academic misconduct

It is essential that all ideas within your report be properly referenced. You can find a guide to the Harvard style of referencing (author-date) at
http://www.unisanet.unisa.edu.au/learningconnection/students/Lguides/Harvard%202002.doc
Failure to acknowledge sources within your essay, or direct copying of material from other sources (whether or not those sources are acknowledged) will be heavily penalised. This assignment is worth 15% of the overall marks for the course. Marking criteria and weightings within the assignment are:

Identification of major issues - 20%
Quality of analysis/use of sources - 20%
Recommendations - 30%
Justification of recommendations - 20%
Presentation quality - 10%
This assignment will be marked for the group, with all students within the group receiving the same mark, unless the Course Coordinator is advised of exceptional circumstances.

Assignment 2 – Business Case (25 %)

This is the major assignment for this course and sensible groups will start working on it straight away. If you leave the work until after the mid-semester break, you may well find that you will not have sufficient time to do the background research and the analysis required. Students are expected to plan their semester's work so that the assignment can be handed in on time.

This assignment requires you to work as a group to design a business plan for an imaginary company which has decided to move many of its marketing and sales activities online. Each group member will take one component of the business plan and will be marked individually on that component. The group as a whole must then ensure that these individual components are seamlessly integrated, so that the report reads coherently and clearly. Each group will present its findings in the form of a PowerPoint presentation as well as a written report.

The business plan is a joint document, and one student in each group is responsible for ensuring

that the plan reads like a seamless document. Your business plan should follow the outline suggested at the start of this assignment handout. It should not be more than 20 pages long (1.5 line spacing , Arial 12 pixel), although you may attach appendices, if you need to. It should be professionally presented – after all, this is the work of 4/5 people and will attract a major share of your marks for this subject.

This part of the assessment is worth 20 % of the overall marks for the course. Marks will be allocated to individual students for their own section of the report (that is, each student will receive his/her 20 % on the basis of his/her section of the report). Groups will, however, lose marks if the assignment is not coherent and does not read like one consistent document. It is therefore possible for individual students to do better than other members of their group on their own individual sections of the report – but if the report does not read like one complete document (i.e. if students simply write their own section and do not attempt to work as a team to make the report read well) then the entire group will be penalised – every student in the group will lose marks in this case.

A.2 Procedural Recommendations

Mini Case (SP7, 2004)

Each of these cases has a description of the case situation, followed by a set of questions. Your group task is to: Write a brief report (no more than 4 A4 pages, 1.5 spaced, cover sheet and references go apart), using Microsoft Word, in which you answer these questions fully.

This will involve:

- Reading the case carefully and identifying the issues involved
- Researching additional information from the web and/or other text books and/or journal articles
- Providing a (brief) summary of the case – no more than about half a page – which sets the scene for your recommendations
- Answering the questions specifically
- Justifying your answers (i.e. why does your group believe that your answers are the right ones)
- Providing a list of the references you have used in your research and in your assignment itself

Assignment 2: Business Plan

This assignment requires you to work as a group to design a business plan for an imaginary company which has decided to offer an e-dating service. Each group member will take one component of the business plan and will be marked individually on that component. The group as a whole must then ensure that these individual components are seamlessly integrated, so that the report reads coherently and clearly.

You will find in the UniSA Library's "Course Reserve" collection (and as download from the course

webpage) an article entitled “Lovers in the Air”, by Christine Jackman. This article was published originally in the Valentine’s Day edition of The Australian Magazine this year and is meant to familiarize you with the topic.

It is essential that all ideas within your business plan are properly referenced. Although Assignment 2 has a more commercial character, figures and data need to be referenced. Failure to acknowledge sources within your essay, or direct copying of material from other sources (whether or not those sources are acknowledged) will be penalised.

Background

A group of entrepreneurial students (you) decide to establish an online business. You are all enthusiastic and you know that with your recently acquired e-commerce knowledge and your general understanding of internet technologies this is an easy task.

Purpose: You all agree that in order to get financial support or to gain access to interesting business partners you should write down your vision and details for its implementation in a business plan. A good insight in the general purpose of a business plan can be found in

http://www.unisanet.unisa.edu.au/Resources/13420/S3%202004/Assessment/Business_plan_Harvard%20Business%20Review,%20Vol.%2075,%20Issue%204.pdf

Comments on how to proceed:

- initially the company consists only of the members of your group, but you might employ additional staff or outsource some activities if necessary
- everything you do bears costs which should be reflected in the financial section, differentiate between start-up costs and operating costs
- unlike your first assignment, writing a business plan requires more decisions to be taken by yourself – creativity and sound research skills have to be combined from the very beginning
- to discuss the strategic outline of your business you should do some reading and agree on a specific time to discuss your thoughts using chat
- you should upload any material / URL’s you consider relevant to minimize group-time spent on information gathering (the trick is to add a brief reasoning why a given article should be useful for the group)

There is also a template available http://www.unisanet.unisa.edu.au/_Resources/13420/S3%202004/Assessment/Assignment%20Template.doc

A.3 Feedback Survey



Survey : Introduction to e-Business (INFS 2019)

Thank you for accessing **TellUs** - ***Introduction to e-Business (INFS 2019)*** **.** Your responses to this questionnaire will be anonymous. This questionnaire will provide feedback to the staff member responsible for this survey.
Please select a response indicator for each question ,fill in the text response(s) where applicable and click on **"Submit"** button to save your responses

Key to the characters	
SA	Strongly agree
A	Agree
N	Neutral
D	Disagree
SD	Strongly disagree
NA	Not applicable

	SA	A	N	D	SD	NA
1. **Assignment 1 (Mini-Cases)** The material for my mini-case was appealing and interestingly written.	○	○	○	○	○	○
2. The questions for the mini-case were clear and I knew what was expected.	○	○	○	○	○	○
3. Identifying and structuring relevant issues related to the mini-case was an easy task.	○	○	○	○	○	○
4. Discussing the mini-case within a team was particularly helpful.	○	○	○	○	○	○
5. I could have used more support on how to write a case-report.	○	○	○	○	○	○
6. I would have liked to use telephone communication to enrich my collaboration with other students.	○	○	○	○	○	○
Assignment 2 (Business Plan) The task description for my business plan was appealing and interestingly written.	○	○	○	○	○	○
8. I knew what was expected of me in writing the business plan.	○	○	○	○	○	○
9. Identifying and structuring relevant issues related to the business plan was an easy task.	○	○	○	○	○	○
10. Discussing the business plan in a team was especially helpful.	○	○	○	○	○	○
11. I could have used more support in how to a write business plan.	○	○	○	○	○	○
12. I would have liked to use telephone communication to enrich my collaboration with other students.	○	○	○	○	○	○

Text response

Any comments on how to improve learning with **cases** ....

Any comments on how to improve learning in **groups** ...

Submit Reset

A.4 Excerpts from Forum and Chat Transcripts

All excerpts from chat and forum transcripts exclude names to preserve confidentiality. Students' messages are presented as they appeared, complete with misspellings, abbreviations or colloquial expressions.

ID	Entry
1	2-Dec-2004 / 22:08:31 **Re: First tutorial...** My understanding is that we do the work for ourselves - reading ans qu etc - which is good for understanding & exam prep.... Then we discuss on the discussion boards - raise any issues etc - and if having probs can arrange with other students to meet in chat and discuss.... I'm sure if I have this really wrong Christian will correct me :-) (Student D, T15)
2	14-Dec-2004 / 23:30:13 **Let's chat & to Christian** I'm wondering if any of you guys have tried using the Summer Chat here? The chat room is very easy to use (I used this one before to discuss with my group members when I studied the course Communication & Media last semester). I hope this could be a good topic starter and it's gonna be helpful for those who wish to discuss any doubts they have, especially in the tutorial works, assignments and all. As for me, I'm available for Chat everyday after 10.30pm - perhaps except the weekends :) ... To Christian: We'd like to chat with you as well (I believe I'm not the only one who wishes so). So, when are you normally available to drop in for a quick chat? :) (Student A,T5)
3	22-Dec-2004 / 1:13:52 **encourage chat** I agree with Christian and want to encourage everyone to nominate some times they will be available to chat within your group and just get in there and go for it because it is an easy starting point and it works. Some may be able to participate at certain times and overtime everyone will be able to participate because it appears that the chat room is a major tool in this course to help assess, navigate into and encourage group organisation amongst many other attributes especially online visibility as the basis for achieving in this course. i work shift and we talk to the shift people either side of us and have periodic meetings with all shifts and it works. similar with

	chat. (Student C, T5)
4	23-Dec-2004 / 16:34:06 **anyone who wants discussions** i will have online presence and be available for chat about any case study etc even if you are not in my group 5, over Christmas. just let me know or tell me your preferred chat times. I will be in Brisbane over Christmas 25-29 and will have laptop and 3G card and texts so will be online every day more or less. i enjoy chatting about e commerce and much more so if your team mates are unavailable, I will be around cheers … (Student C, T5)

B Second Design Iteration (SP7, 2005)

B.1 Entry Survey

Explain changes in questions compared to SP2, 2005

Total number of respondents: 45

---

1. Heading: This survey helps me to know a little more about students taking this course, and what extra help you might need.

---

2. Question: Please enter your name:

---

3. Question: Please enter your UniSA email and, if necessary, any additional e-mail (this could be an e-mail you check more frequently) where you would like to receive course related information :

---

4. Question: What sort of Internet connection (bandwidth) do you use?

Option 1: Dial Up connection	22 (49%)
Option 2: DSL or Cable connection	22 (49%)
Option 3: I don't know	1 (2%)

---

5. Question: Is this your first online course?

Option 1: Yes	37 (82%)
Option 2: No	8 (18%)

---

6. Question: Do you have any experiences with case studies / case reports?

Option 1: I haven't any experience so far.	19 (42%)
Option 2: I have had some experiences. (< 4 cases)	24 (54%)
Option 3: I have done many case studies (> 4 cases)	2 (4%)

---

7. Question: Do you have any work experience outside the university (part-time or full-time)?

Option 1: Yes	34 (76%)
Option 2: No	11 (24%)

---

8. Question: How would you describe your experience with group work so far?

Option 1: I haven't any experience yet.	3 (7%)
Option 2: It was a mostly enjoyable experience.	24 (53%)
Option 3: It was a mostly unpleasant experience.	13 (29%)
Option 4: I could not really describe it.	5 (11%)

---

9. Question: Mark all activities you have done at least once..

Option 1: Using a text processor (e.g. Word).	45 (100%)
Option 2: Looking for information on the Internet.	45 (100%)
Option 3: Preparing a presentation with PowerPoint.	40 (89%)
Option 4: Using an Instant Messengers? `	28 (62%)
Option 5: Using the university's online database.	35 (80%)
Option 6: Building a webpage	14 (31%)
Option 7: Editing of images or videos	21 (47%)

---

10. Question: What times could you attend to occasional online meetings. Mark as many options as possible.(Pls bear in mind that not all students in this course are based in Adelaide.)

Option 1: Sunday evening	24 (53%)
Option 2: Monday evening	25 (56%)
Option 3: Tuesday evening	29 (64%)
Option 4: Thursday evening	21 (47%)
Option 5: None of the above	6 (13%)

(please use the following comment box to indicate a suitable day)

---

11. Question: Comments ….

B.2 Centra Quick Guide

Starting an online meeting

To access your Centra Session

- got to http://www.centra.unisa.edu.au/
- click on 'Attend a meeting'
- your meeting ID is usually 'ebiz01', 'ebiz02', etc. the number indicates your group number, this ID should be valid for the rest of the semester
- than sign in with your UniSA email address

- once you have accessed the system yo have got full ‘co-presenters’ rights

You are encouraged to use the system whenever you want to, you are not bound to any specific days or times[1]. This way you can agree on meeting times with a very short notice and manage your meeting times with flexibility, e.g. if just two people work on one task they could meet earlier or stay online after the meeting ... just as you would do in a traditional meeting.

Some small talk at the beginning should help to find out how well everybody can hear you or if there is any need for you to ‘tune’ your microphone (see online help concerning ‘audio tunning’).

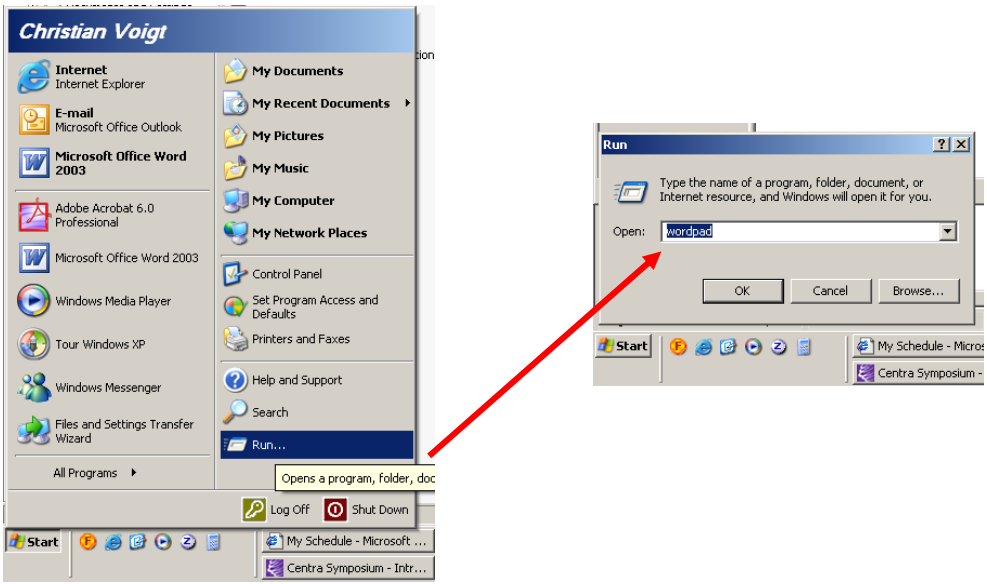
Taking notes during a meeting

Using voice communication gives you the possibility to capture any ideas, examples group decisions or future tasks on a ‘shared document’. This is just like using a whiteboard in a traditional meeting with the additional benefit of electronic editing (e.g. ‘copy and paste’ or simply changing the order of a task list).

The potential benefit of Centra over the chat is that you actually leave the meeting with a product which can be used for the final group statement whereby after a chat session you start pulling bits and pieces together pretty much from scratch.

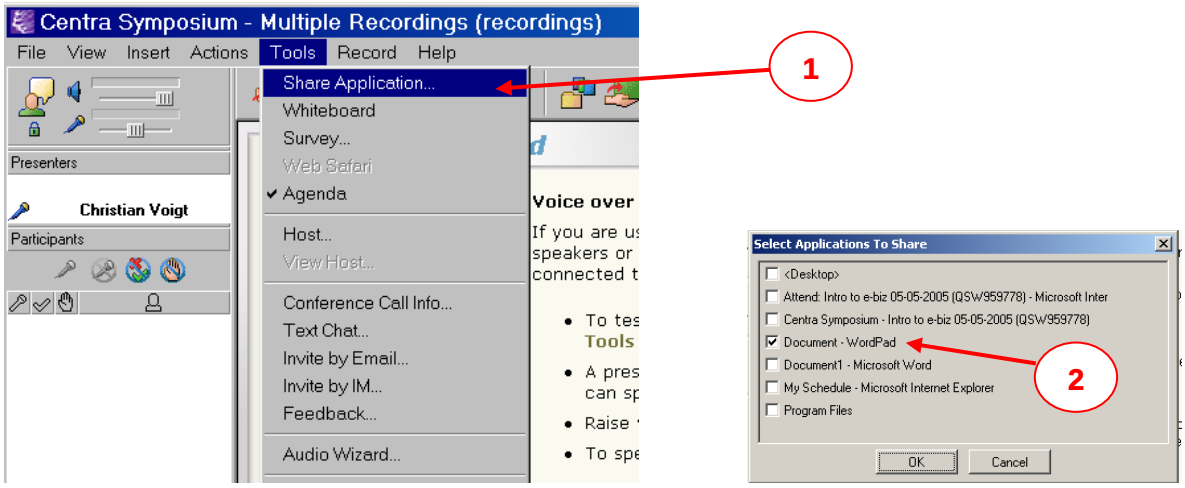
The following steps need to be done by the person taking down the notes in order to share his/her view with the group (if possible this role should be taken by a person with DSL (broadband) Internet connection):

Open the application you want to share – in this case WordPad – by clicking on “Run” and than type in “WordPad” and press OK.

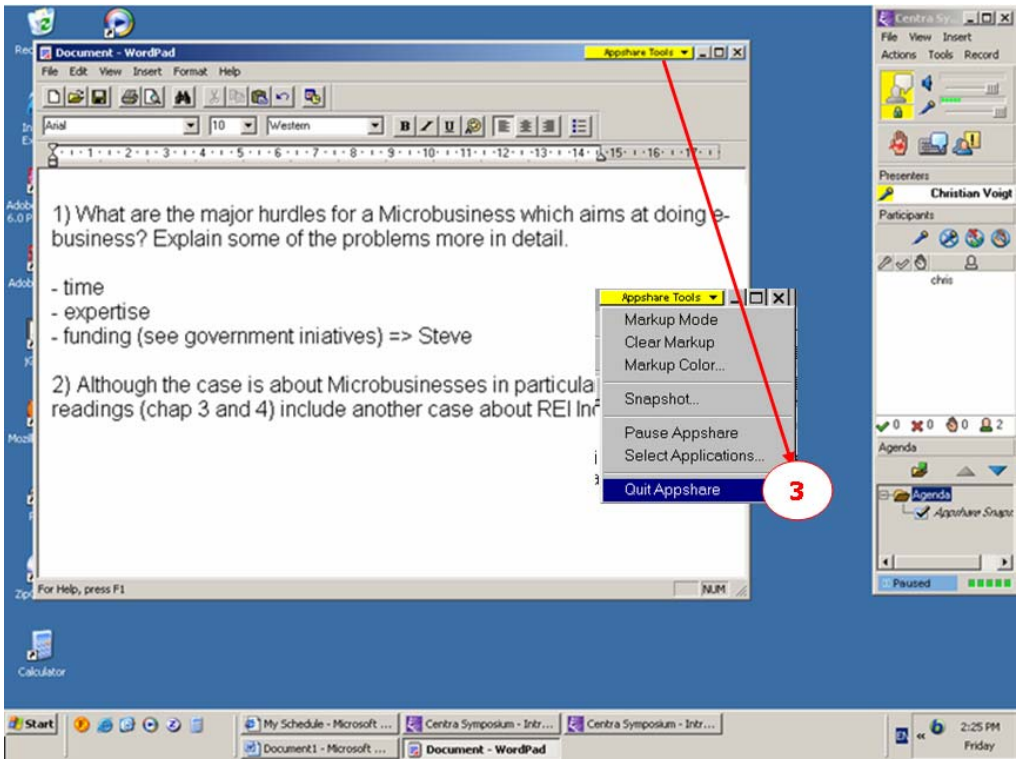


[1] The meetings are set up in a way which allows 24/7 access but don’t guaranty the availability of seats at any time. This is not a real problem, since it is unlikely that the whole system is fully booked. However if I get to know from any planned meeting I do the necessary checks to avoid any surprise.

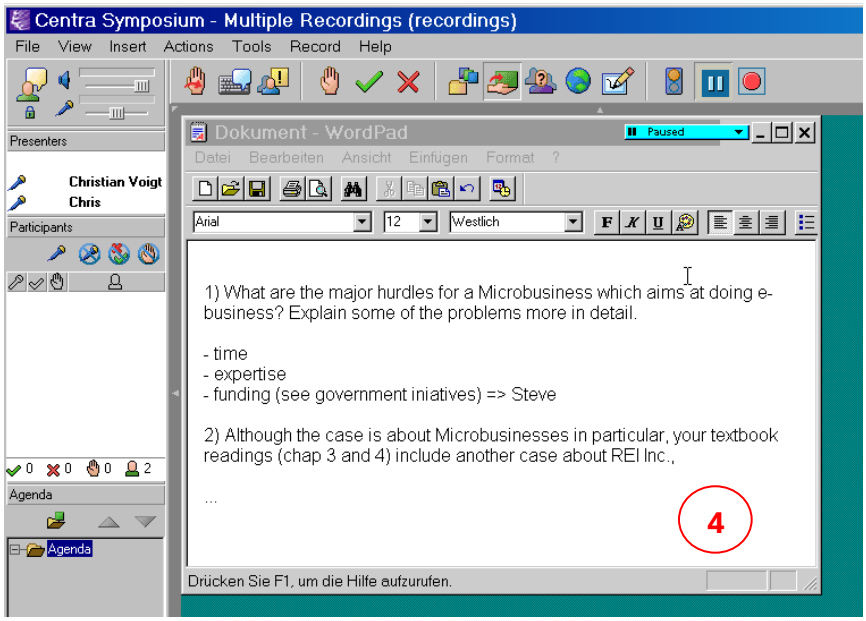
In Centra select the first item under “Tools” which is “Share Application” (1) than check the box of the application you would like to share (2) … (this way you could share any other application previously opened, I recommend ‘WordPad’ because this demands the least bandwidth for sharing.



Then the view of the person who takes the notes changes, presenting two windows (the shared WordPad document on the left and Centra on the right). If you want to leave the this modus click on ‘Appshare Tools’ and select ‘Quit Appshare’ (3). **Don’t close** the document without saving it, otherwise the content will be lost and with any other work you do on your computer it doesn’t do any harm to save it every 15-20 minutes.



And this is how the shared document (4) is seen by anybody else:

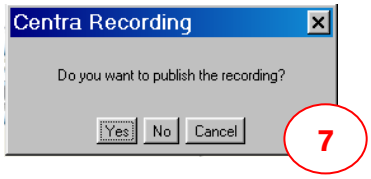


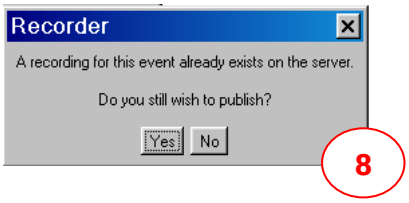
Recording a meeting and accessing a recording

Recordings of online meetings are useful if you want to reproduce how you came to a certain decision. It is also useful for a group member which could not attend a meeting but would like to catch up. If for any reason you would like to stop the recording, press the pause button (5) and resume it with the record button (6). Recordings are only visible to the course coordinator and group members.

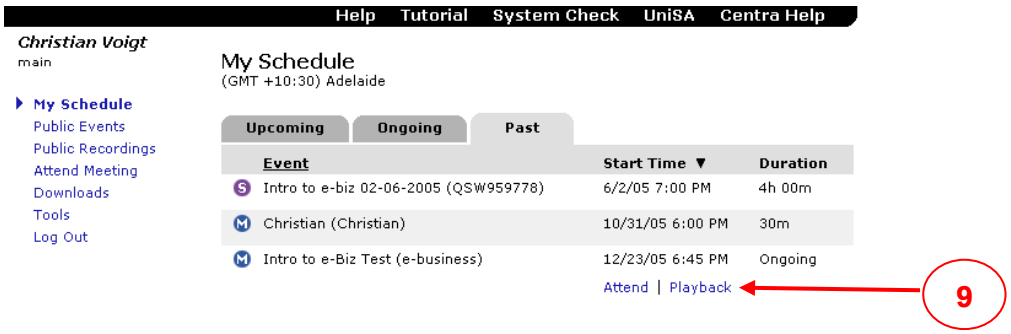


The last person leaving the online meeting will be asked to publish the recording and needs to click on 'Yes' (7). For future meetings you will be advised that there already exists a recording, nonetheless you must still publish, clicking on 'Yes' (8).





After the group meeting has been published it can be accessed by logging into Centra with your student ID and password at http://www.centra.unisa.edu.au/ . Clicking on 'Playback' (9) allows you to either stream the meeting or download the file directly to your computer.



Troubleshooting during an online meeting

As a rule of thumb you should avoid starting to test the system minutes before your group is going to meet. If you encounter a problems it's always easier to look for the cause without time pressure. Following a list of potential problems and what you can do about it …

I'm in session and suddenly I can't hear anyone speaking anymore. The yellow equalizer bar tells me that they are speaking but I can't hear them.

Without leaving the session, run the audio wizard (it's under the "Tools" menu). Go all the way through the wizard to the end. This should restore your sound.

Why is the audio so choppy in session? I'm losing several words from each sentence.

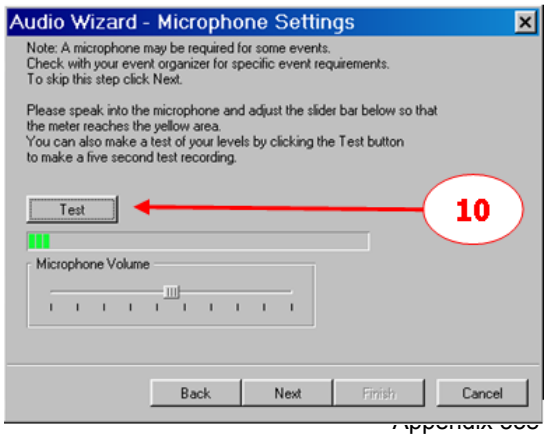
Centra requires a certain bandwidth to be able to function correctly. If you are using a 56 k modem (Dial up), the problem is generally that your internet service provider (ISP) is experiencing heavy volume on their network. Try quitting the session and reconnecting to your ISP to get a better connection.

Why can I hear everyone speaking but they can't hear me?

This could be due to one of several causes.

Be sure that your microphone is plugged into the right location. It should be plugged into a port on your computer that is most often pink or red. Do not use headset microphones that use one plug for both the earphones and the microphone. If you have the choice, USB-headsets are more reliable than two prong headsets. If you go to one of the University pools, connect your headset directly to the computer don't plug it into the desk above.

Under the "Tools" menu select the "Centra Audio Wizard". Make sure you can record and hear yourself loud and clearly when testing your microphone (10).



B.3 Learning with cases: Micro- and Macro-script

Copy from course webpage (SP7, 2005):

Learning with Cases

This section explains how you should work through the cases in this course. Experience with earlier courses has shown that group work is not as simple as it seems and the following rules are to help you to organize the group efficiently and avoid misunderstandings. However, learning in groups requires some flexibility from everybody and open communication throughout the course.

With the exception of the first week (where groups are not formed yet), groups prepare a case statement during one week and evaluate a group statement from another group in the following week (see Figure 1)

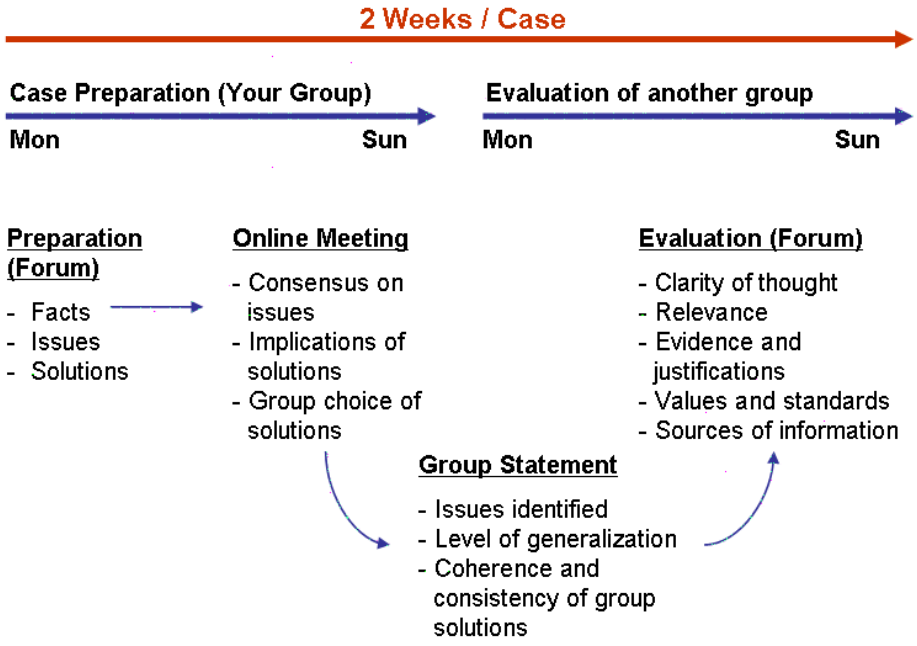


Figure 1: Preparation, discussion and evaluation process for each case

Copy from course webpage (SP7, 2005):

Phase 1: Case preparation

You will be assigned to a group of 4-5 students in the beginning of week 3. As a result of phase 1 every group generates a group statement about the case of 2000 – 3000 words.

1) **Read the case** and the materials given for the case

2) **Prepare the case** individually and post your preparation to your group discussion forum on the course homepage (folder 'Case Preparation'). A typical posting could be structured like this (see also Figure 2) :

(A) Identify relevant issues related to the case questions and provide evidence (facts) for the issues recognized

(B) Identify relevant concepts and models from the textbook (see Table 1) or other

resources which are suitable to explain and solve the issues. For additional research use UniSA's online databases and the Internet.

(C) Identify possible courses of action (solutions) for the company or person in charge to respond to the issue.

(D) Provide a list of all resources used for your argumentation. Please consult the Harvard-Style-Guide if you do not know how to reference academically



Figure 2: Screenshot with prompts how to structure a 'Case Preparation' posting

3) **Meet as a group online** (groups are made up of students who have indicated the same timeslot for online meetings in the 'Course Entry Survey') The result of your group meeting is a coherent statement about the case (See Figure 3). The difference between an individual, preparatory posting and a group statement is that the latter represents a coordinated synthesis of a all your opinions. Successful meetings require a minimum of planning (agenda). Calculate some 30 or 40 minutes for your group meetings.

However this requires that everybody joins the meeting already prepared. Group meetings are not the place to start a joint case analysis. The following guidelines are to ensure you use your online meetings productively:

Determine a meeting facilitator, who organizes and leads through the online meeting (for each case this role must be assumed by a different person). The facilitator is not the sole person responsible for the meeting's outcome but leads you through the following stages:

Start the meeting with reviewing the issues the group as a whole had identified. Does everybody agree about what the main issues are and why? It is important that you reach consensus at this point in order to address the issues from the same direction.

Differentiate between short-term issues and long-term issues of a more strategic character.

Put together a coherent set of solution. This means you need to discuss the implications of the various solutions suggested to make sure they do not contradict each other. A typical example for an uncoordinated recommendation would be a group suggesting a increased marketing effort, the adoption of the latest security systems and a general cut down of costs.

Before you close the meeting ask everybody if there are any questions left. Then determine who is going to facilitate the next meeting.

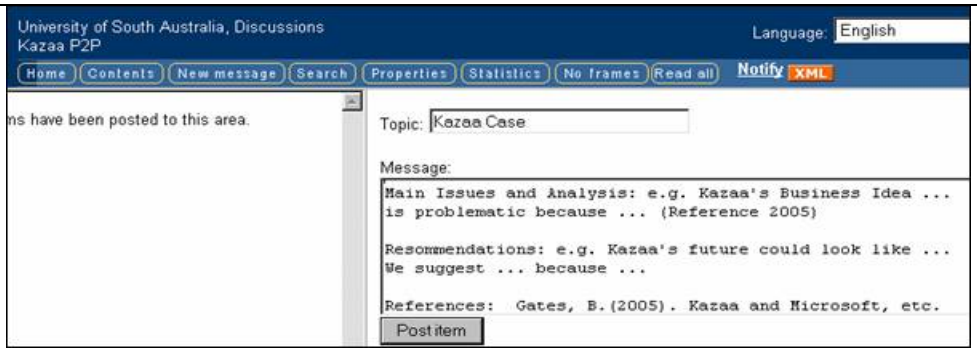


Figure 2: Screenshot with prompts how to structure a 'Case Statement' posting

Prior to the first online meeting you should read pages 61 – 73 about small group case discussions, the relevant excerpt is provided on the course homepage, folder 'Learning with Cases':

Remember: There is more than one 'right' solution for each case. However it is important that you see that solving issues in isolation is not the way to get a solution for the whole case.

Phase 2 – Evaluation of another group statement

At the beginning of every second week I post the group statements to the case discussion forum, where they are discussed / evaluated by the whole class.

- You must evaluate at least two other group statement. The first group statement for evaluation will be assigned to you, the second will be a group statement of your choice.
- Evaluated groups should try to defend their statements if they feel critique is biased, unfounded or just not correct.
- Evaluators should respond to counterarguments their evaluation might get.

Most solutions are based on subjective values, it is important to keep in mind that you evaluate case statements and not people. Different groups will offer different interpretations and solutions to the case. However at this stage not all issues are well presented and some of them might be even wrong. Therefore the main objective in phase 2 is to scrutinize the solutions suggested by other groups. To make a qualified evaluation you should use the following criteria:

Clarity of thought: Before you can evaluate anything you have to make sure you understood it. If you feel like the other group is too general, ask for concrete examples. In order to make your evaluation constructive, you need to name the phrase you didn't understand rather than saying that you don't know what the group is talking about.

Evidence and Values: Do you think the groups argumentation is based on sound information (facts) or opinions. Has the group given enough reasons to support their solutions.

Values: Opinions are not automatically banned, in many cases a group needs to take a firm position in order to propose a coherent solution (consider the question of "Freedom of expression" vs. using the Internet to prepare terrorist activities). You need to evaluate, however, if the group clearly described their position whenever there are many competing value systems.

Relevance: Do you think the group has covered the relevant issues of the case? Why or why not would you include alternative views?

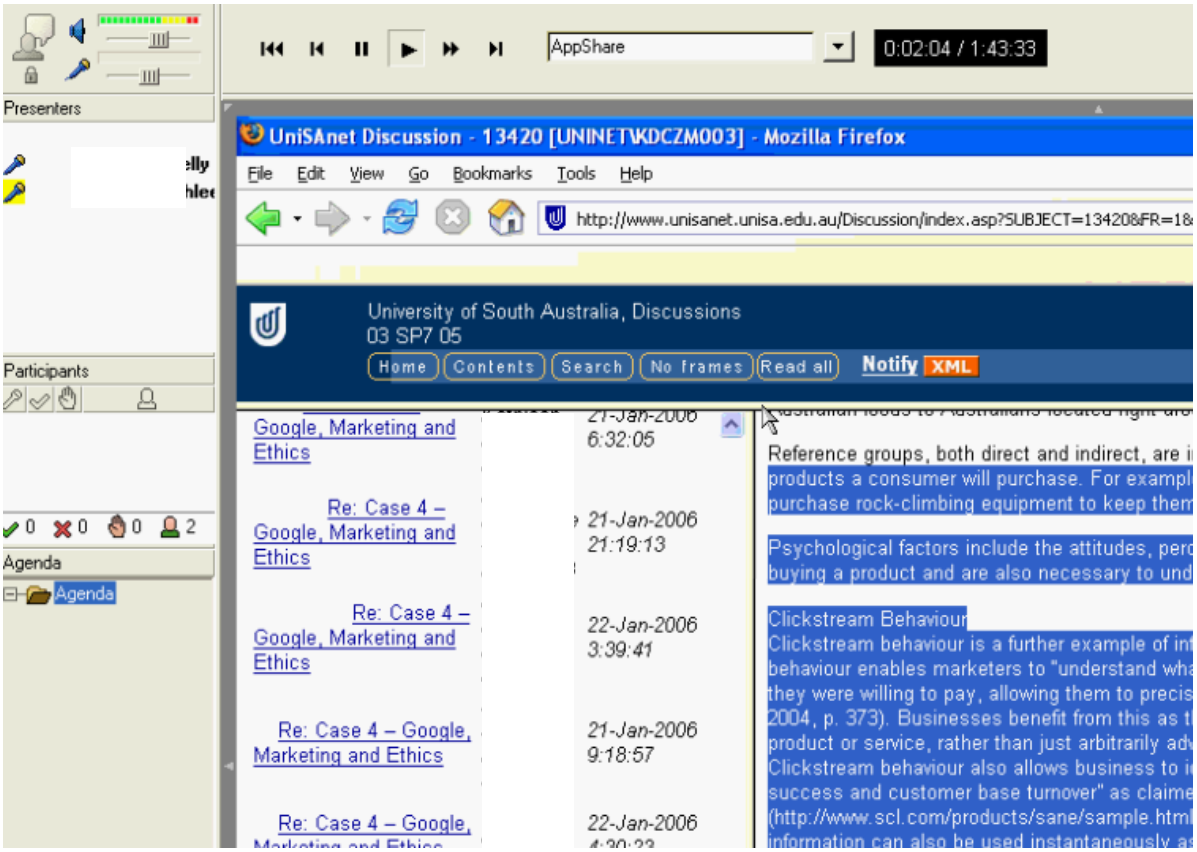
Sources: How do you judge the quality of sources used in the group statement? Is the cited source trustworthy? (Journal articles usually use peer reviews to ensure quality. General websites rely on the credibility and reputation of their authors. (E.g. because Don Norman is an expert in design, I would not hesitate to cite his webpage http://www.jnd.org/ , but I would be cautious to use this source for more strategic decisions.)

You need to post your contributions in the first half of the week rather than in the last possible moment. This way groups get a chance to respond to your evaluation.

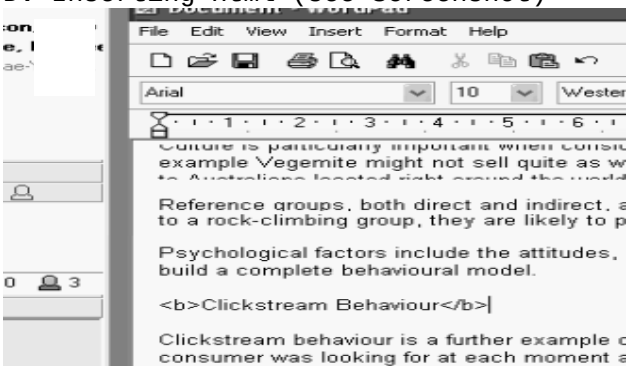
B.4 Sample Transcript – Centra Session

D - Dana	**T - Tang**
K- Katherine	**S - Sandrine**
J - John	**SE – Sebastian**

D: Ok that should be up now.
(2.8)
K: Yeah I can see that
(0.68)
D: I will bring notepad on as well.
(5.36)
D: you get that too?
(3.12)
K: Yep I have. I can't edit it though.
(0.7)
D: No, I think you shouldn't be able to. I think last time this was a system glitch only because Christian was in there and he might have some power user access rights. I am not sure.
(1.9)
K: That's coo I can see it anyway so.
(1.2)
D: Alright I bring in my last posting because your posting was more about question 2 and 3. right?
(3.0)
K: Yep that's right the last one you posted is probably the one we should start with.
(2.7)
D: Ok I bring in Question one and then we can have a look at what John has covered. Other than that I think I just have to fix up the HTML and we reasonably good to go.
(3.0)
K: Yeah I had a look at it Yesterday and I think we have some pretty good stuff in here.
D: Copying posting from Forum (see screenshot below)into WordPad

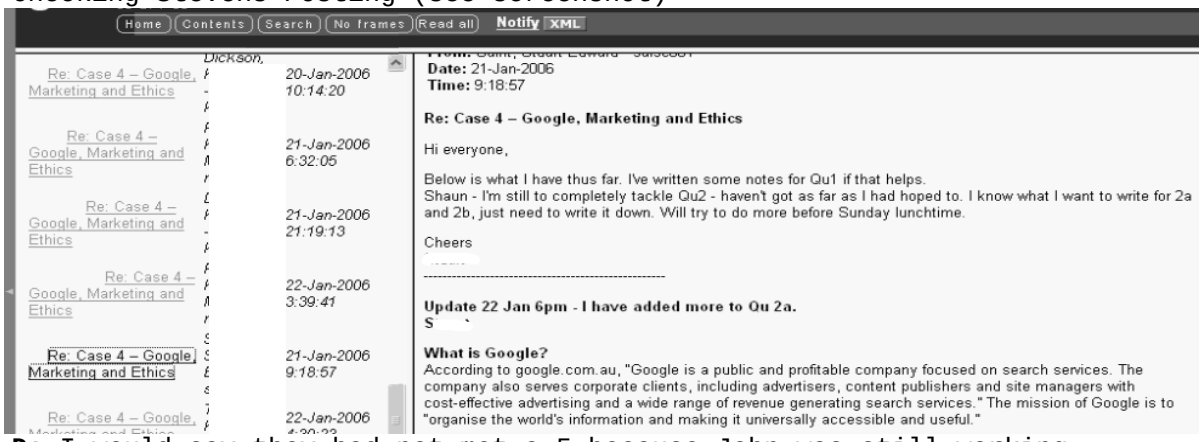


D: I don't remember how to do this stuff now. Was that right?
(5.9)
K: Yeah it's fine I can read that.
(2.8)
D: I just checked I got the right HTML stuff
Se: Sebastian joins Meeting room
(4.7)
S: Sandrine joins Centra
(5.7)
D: Al right so that works. I just tested it in the discussion board to see if it works right. Other group commented on how header makes it easier to navigate through the text and I would say we further do this.
(3.12)
K: Ah that's cool I was also wondering how you guys are doing it.
D: Inserting Html (see Screenshot)



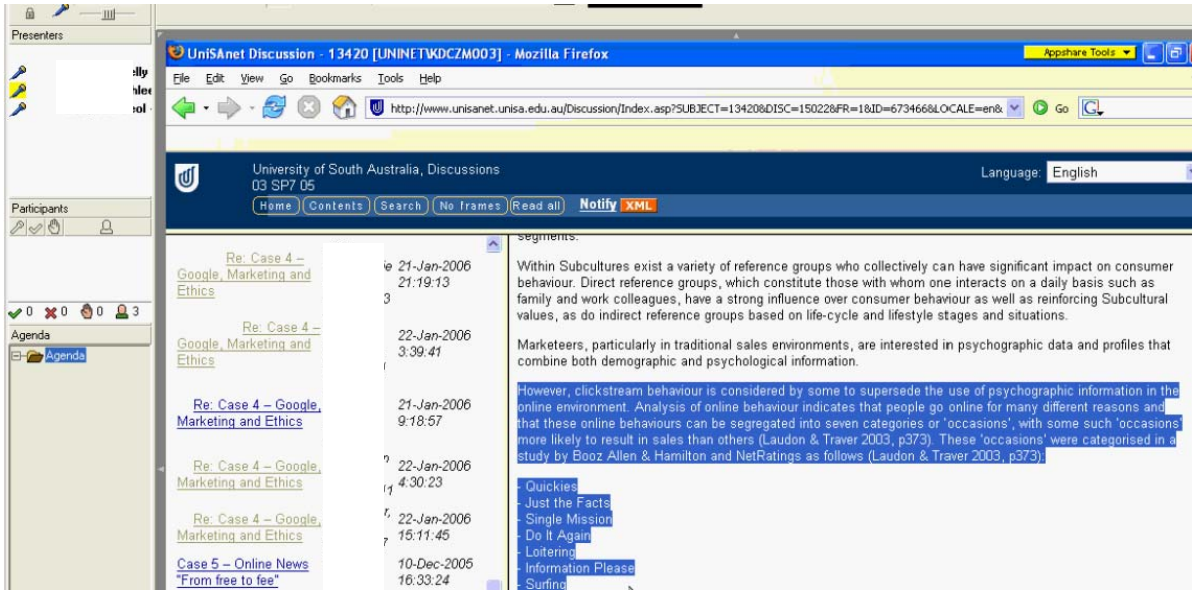
D: The bolds are not that hard to do as you can see.
(2.1)
D: But I haven't mastered the color changes yet I ended up to past the text into FrontPage and change it that way
(5.7)
K: Sounds Tricky.

(4.5)
D: I probably made it harder than I needed to but with some words it worked and with other it didn't
(52.48)
D: All right that looks good. Hm you just want to run though this and that through what John's put on and see. ?
D: Checking bold headings in Forum Posting
(0.7)
T: Tang joins Centra
(0.9)
K: Yeah that sounds good
(4.42)
D: I just noticed Steven had updated it today.
(0.4)
Se: Hello
(2.0)
D: Hello
(1.3)
Se: Hello
(1.8)
D: Hey Sebastian how are you?
(1.0)
Se: Fine thanks and yourself?
(2.4)
Se: Hello?
(2.17)
D: Can you hear us?
(1.5)
Se: Can you hear me?
(1.3)
D: Yeah I can hear you!
(4.8)
Se: Very Good.
(8.8)
K: We were just doing question one before the rest joins the meeting.
(10.5)
D: I think Stevens amendments are more for question two
Checking Stevens Posting (see screenshot)



D: I would say they had not met a 5 because John was still working
(1.3)
D: I think he had not much to add so let's move on to John.
(3.58)
K: Ok that's cool.
D: Commenting on John's Posting, enumerating content traditional markets. browser behavior etc.
(0.5)
K: I think it's enough information on that I think we don't need to be too in depth on that
(3.0)
D: Yeah I think hat's right we have given a few definitions and

(0.9)
D: With click streams and all that and the browsing occasions that result in sales we didn't really mention that
(6.0)
K: I remember that I was wondering if we needed them in there or maybe we just mention them
(5.4)
D: (Reading Section on Click stream behavior) maybe it fits in with the first paragraph of the section
(3.42)
K: Yeah I agree, the first paragraph ..
Copying section from forum to notepad (See Screenshot)
(5.2)

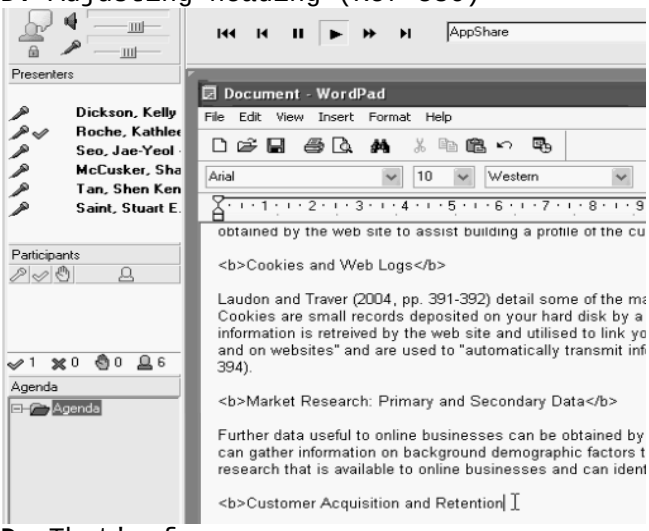


K: Maybe that first sentence "click stream behavior is considered as .." should go further to the top?
(0.4)
D: Deleting Paragraph marker
(0.53)
D: Like that?
(4.46)
K: Maybe you could paste that first sentence about click stream behavior after the first sentence as well
(4.6)
D: (Reads the sentence that would result)
D: Copies sentence
K: Yeah that's perfect

********** Coded Section II **********

K: Hand up
K: So for example they remember your preferences ? (talking about cookies)
(3.44)
S: Yeah that's right, they put the cookie on there, record what you have done and use them when you visit them a second time.
J: Hands up
J: I am inclined to agree that extending cookies - here we go - the other thing we could extend upon was web bugs that could be quite problematic particularly if you get the executable portion coming through with them. But I don't know whether we talk about that

further on, being a problem from the consumer perspective. That could be a more appropriate place.
K: Hand up
K: Yeah maybe that should go into question 2 as a problematic issue for the consumer.
(11.3)
D: How does that read ?
(5.4)
J: Very good?
(9.2)
K: Yeah I think that's fine as well.
(8.4)
D: Because I was typing up I didn't pay attention to what you were saying guys so you want to expand on web bugs as well - is that right?
(1.77)
J: Perhaps under question 2 under consumer perspective
(9.9)
D: Not a problem so shall we move on to market research, primary and secondary data. Again if you have a question raise your hand and if not say yes (*)
(23.1)
K: Dana just one thing Customer acquisition is a heading so we should put that in bold as well.
(1.2)
D: Adjusting heading (Ref 536)



D: That's funny
(6.56)
S: just a really small typo, shouldn't it be undertaken in the second sentence ?
D: inserting ' undertaken'
(0.2)
K: yeah that should be undertaken
(3.9)
J: should we also mention under secondary bits that is not necessary data that's already aggregated and that part of secondary research includes aggregating data from various sources
(1.72)
D: updating section with John’s suggestion
(0.5)
D: How's that?
All: Green ticks
J: sensational
(6.1)
D: I love that enthusiasm we are all in the green al right then 'customer acquisition and retention'
(40.0)

J: I wonder whether or not we feed in some of the stuff with respect to online marketing that came out of chapter 8 and the costs of delivering an advertising message and the likely sales that relate from that
(22.6)
D: Sorry just looking through the text to find what your are saying (* longer pause - reading)
(36.7)
D: Are you talking mainly about the cost of emailing and how that's cheaper then via snail mail to send catalogues and things or ?
(1.8)
J: Yeah I am actual just flipping through chapter 8 myself to see if I can find a reference to exactly what I was suggesting the cost of - I a still looking at 546 (* reference to textbook) 70 or 80 cents a pop for traditional mailing costs yeah costs per thousand of adds delivered and I read somewhere else yeah sorry I just have to collect my thoughts here (* Baby chatter in the background)
(7.41)
D: Inserting point about email marketing and editing the section on 'Customer retention'
J: This is the trouble if you can't spend the time annotating the reading properly you spent ages looking for a point.
(14.1)
J: The information I was actually thinking of was discussed at the bottom of page 472 it talks about spending as much as 250 on marking and advertising
(15.5)
D: I have sort of amended it a bit leading up to what we mentioned before about the costs via email was that page 456?
(1.7)
J: Yea I think it was
(3.6)
J: If I can collect my thoughts maybe I post something or whatever where I was just headed - hey talk about the television campaigns generating extra sales and the cost per purchase is seventeen dollars as opposed to eleven dollars for online sales but it's all a bit mushy in my own thought so I don't think I am explaining it very well
(11.2)
J: That looks good.
(4.3)
D: I am just looking where we can put in the bit about the lower costs to acquire customers over the Internet.
(20.2)
J: Maybe we come down to a point where much of the advertisement is more focused than during the e-commerce one period because of better capturing and aggregation of data maybe (*)

********** Coded Section III **********

S: Tang and Jaen does this help you guys out at all in trying to answer it? to answer it
(6.6)
Se: noise (though micro is flashing)
(12.9)
S: yeah, just - Sorry Tang
(16.5)
T: Yeah I think you guys just put something on the board and then just compile together
(3.0)
J: My feeling on this one is that basically there is a vast amount of opinions and we might have to come up with a group opinion how we think it relates between Google and Microbusinesses and there is a number of particular valid points and we probably have to get on the

same page with this one maybe short posting from each of all of us might be the best way to decide what the consensus of the opinions is

(8.9)

K: That's what I would do as well just put into it my opinion that I am not happy with the fact that my personal information is collected by Google because of the ramifications and how it can be used and that they don't have a strong enough privacy policy to prevent that things are used inappropriately in the future

(2.5)

J: Likewise I share real concerns about profiling by aggregation I guess the real concern is that the bigger organizations like Google and Microsoft have the power even now or in the future to store and aggregate all kinds of information whereas the Microbusiness around the corner doesn't have the power to sort o aggregate this stuff and even if they did it just seems to be less of a concern but I think it's a valid point that you made about regulation and the fact that this stuff that is collected by Microbusinesses could end up on the net anyway ad could end up on the Google database

(3.8)

K: I think it's amazing that so many people have concerns about the big brother approach by the Government but Google's collecting so much more details, sensitive personal information about people and seems to be getting away with it at the moment

(4.03)

J: I think there is a general level of naivety there about just how much of the activity is logged and although everybody realizes that it's logged I don't think you sort of stop and think about it. how it could be aggregated and build up a sort of picture of me and who I a and what I do

(4.6)

K: Yea I totally agree I had no idea until I was looking into this I had no idea just through businesses collecting your data through registration form etc.

(9.9)

J: I am heading down the track that the best way for each of us is just pop up a short statement and then we combine that into one statement that represents a consensus

(6.7)

J: Tang likes the idea anybody else ?

(3.4)

D: That's fine. as I said I already put a couple of paragraphs up there and Kathleen did as well which should be useful for them so I don't know whether that's enough, so are you happy with what you have got there or do you want John to look at it although you know they 've already got a lot with question 2 and I don't think it's fair that we expect you guys to do a question that has three extensive parts and spend so much more time on it.

(5.8)

J: I still have to post something on question three for my individual preparation anyway and I guess Tang and Sebastian really need to make sure they get the input from Steven and me so they can be in a position to post something

(5.7)

J: sorry about that background noise

(5.1)

S: Yeah I will try and get some notes together on question three as well as John said which I need for the individual preparation anyway

(4.6)

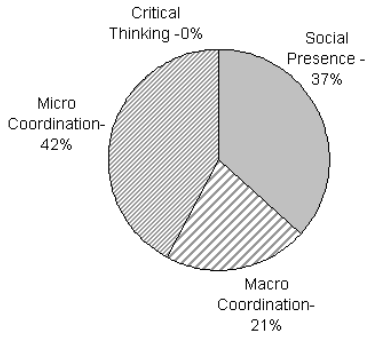
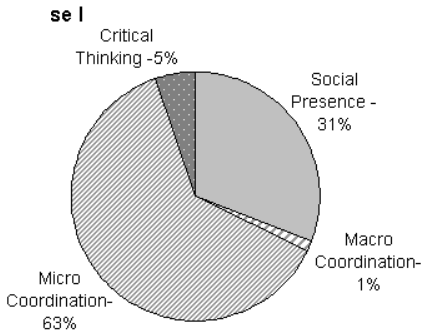
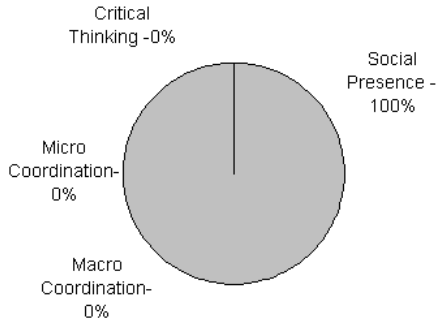
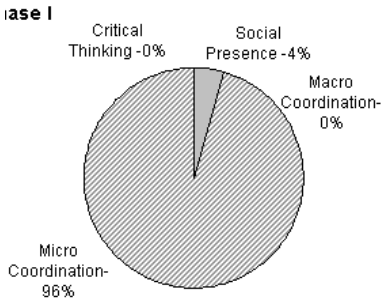
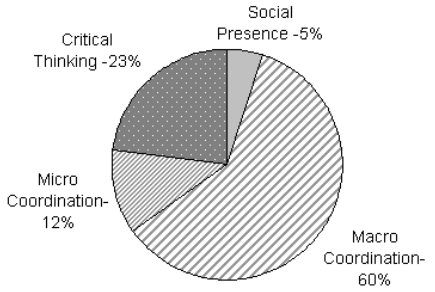
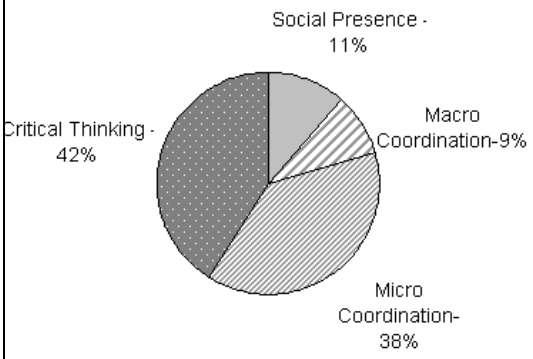
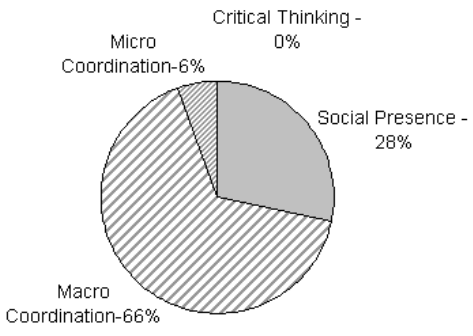
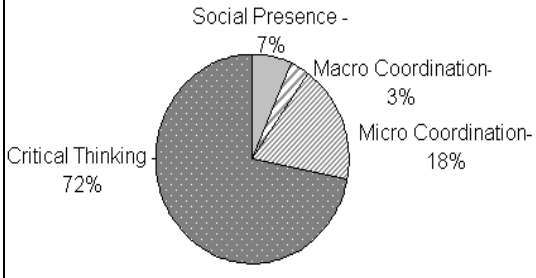
J: So I guess Steven and I are looking at getting together sometime tomorrow night and either we can put posting up what came out of that for question two and maybe Tang and Sebastian wan to plan to do the same sort of thing and we are looking at a compilation session maybe Tuesday

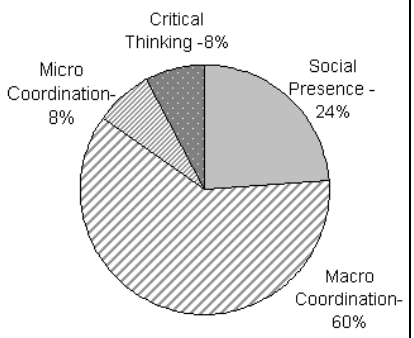
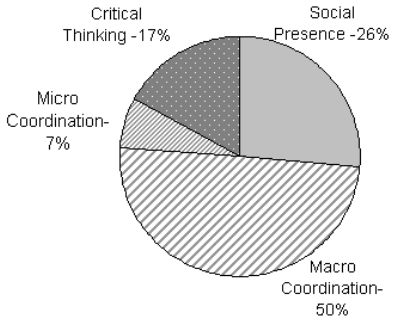
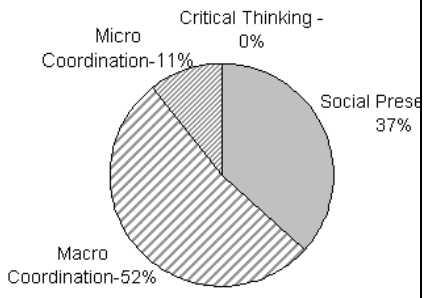
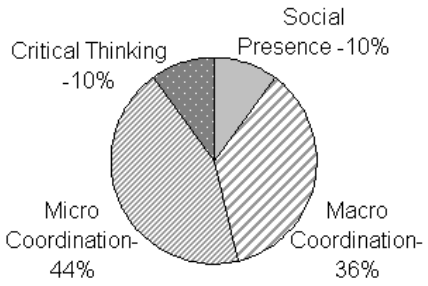
(8.1)

S: It's probably something that I prefer to do over email rather than getting together in Centra again if that's ok with everyone else ? (*)
(2.2)
J: I m fine with that
(6.9)
K: Yeah that would be better I've got meetings every day this week by 9:30 in the morning - to difficult for me to translate it into Adelaide time this means I can only really meet for half an hour so it's the easiest to do it over email
(4.6)
S: so perhaps we put a deadline for myself, John, Tang and Sebastian to get a combined response up as of the first thing Tuesday morning and then we can collate it and get everyone to make comments over the following 24 hrs before Wednesday. Does that sound ok?
(3.0)
All: Green ticks
(1.0)
S: Sweet. ok so Sebastian and Tang that's ok with you guys to get your question ready by Tuesday morning Adelaide time ?
(2.7)
T: Yeah ok
(2.67)
S: John and I do the same and if you like just send an email around just to let us know of the combined response and then we get everyone to comment did we say that we just append our questions to question one or should we keep it separate for now - I can remember what you said ?
(1.8)
J: I was jus thinking that what we could do is cut and paste from the various postings into one
(2.9)
S: So we got Dana’s and Katherine’s final for question one up there if we just append our two and three on the end of that by Tuesday morning and get everyone to run through that is that OK ?
(2.0)
J: yeah I would have thought so
(3.8)
S: All right then so that will be the plan then and I will just as a double up send an email around so that first things Tuesday morning
(2.25)
J: So you and I are going to get together some time tomorrow I would prefer later rather than earlier
(1.5)
S: Late is going to be better I got Cricket so I will email you tomorrow if that's ok are you able to check your email during the day tomorrow ?
(1.5)
J: Yeah I have it all forwarded to work anyway
(2.0)
S: Ok I will know our cricket deadline tomorrow morning and I will send you an email and we will organize a time
(2.3)
S: So in the early part of tomorrow night I will finish of my individual posting and get that up so if Tang and Sebastian want to pick up on anything I may add to question three it should be available by sort of middle of the evening
(6.46)
S: Yeah and I will post something on three tonight so Tang and Sebastian if you want to have a look later on tonight I should have some more notes on question three
(3.1)
T: All right
(8.9)

S: Is there anything else to add at all from anyone ?
(4.7)
J: Dana have you posted that response we have worked on in this session yet ?
(2.9)
D: Yeah hat's cool up there it's called Case "Google and ethics question one final" it's completely with references etc. so it's all ready to go just for Tang an Sebastian's, Katherine's and my points are in the posting of 19th of January and also the one from today from Katherine she has expanded on some other stuff a little bit more as well so if you need anymore than that or of you are struggling let us know as well (* trying to integrate ?)
(4.8)
K: I just have to add some references into question one
(7.6)
S: Just one last suggestion if you made a question one final answer it would be good if Tang and Sebastian put up a question three final so we know where everything is at (*)
(10.4)
J: so I think we are just about done aren't we
(0.3)
S: A star to Dana and Katherine for getting it done well done
(1.9)
J: Sensational where is that bloody applause I can't find (Centra icon)
(15.25)
S: Fantastic who wants to hang around to finish the recording off
(3.9)
D: That's fine I will do it you guys head off and I will hear from you via email in the next couple of days
(2.4)
K: Nice talking to everybody
(1.8)
J: Ok, bye bye
(1.7)
S: See ya

B.5 Activity Focus during Online Meetings

Phase/ Medium		Chat Sessions	Centra Sessions
Phase I	G3		
	G10		
Phase II	G3		
	G10		

Phase/ Medium		Chat Sessions	Centra Sessions
Phase III	G3		
	G10		

B.6 Interview Questions and Guidelines

Introduction (3 - 5 min)

Many thanks for your participation

- The purpose of the interview is to understand your experiences and opinions regarding this online course.
- The meeting is planned to take around 60 min.
- I am going to record this meeting so I don't miss any details and can review the material if needed.
- I guarantee that the recording is for research only and won't be published in any form.
- I need to ask you if you feel comfortable about this?

I would like to make 3 comments on the nature of this interview:

- Since I am interested in YOUR experiences, there are no right and wrong answers
- You should not hesitate to express critical view points. Regarding this interview I will change my role from course coordinator to interviewer. The more you could ignore my course coordinator side the better.
- Although I might give explanations to clarify questions etc., I need to avoid evaluative comments on your answers. This way I am not leading your answers beyond the issues I am addressing in my questions.

1st Question Block: Studying externally

What is it like to be an online student?

- self-directed learning
- contact with peers and lecturer
- combining different worlds

How many subjects did you take this summer school ?

- Workload
- Flexibility of scheduling
- Special conditions (Christmas period)

2nd Question Block: Tasks and Group Work

What did you get out of this course?

- grades
- e-business knowledge
- group work experience
- communication technology experience

How did you find the case studies in the course?

- what was difficult , enjoyable (adequate for undergraduates?)
- could you relate to things you see/ hear about online businesses (relevance)

How did you prepare for case studies?

- How fitting were those materials?
- How did you go through the material (skimming, in-depth)
- Was it sufficient ? too much

How would you describe the groups approach to case studies ?

- how often did you have contact, which medium did you use
- who was taking the lead,
- what meant it to you if someone told you what to do
- reference to script
- logistical problems

How did the group organize for online meetings?

- difficulties
- using the scripts

What was collaboration like in your group?

- free riders
- dominant members, missing initiative
- what did you like / dislike about your group work?

What did you do during the online meeting ?

- exchanging opinion
- coordination of next steps

How did you combine and collate the individual preparations into the final case statement ?

Every second week your group's case report was uploaded … What feedback did you get?

- did it help
- meaningful

Can you describe what made a feedback useful to you?

What made you reply to the feedback you have got.

- what did you expect from a worthy feedback

How did you go about giving feedback to peers in the course?

- how did you select the second case for evaluation
- did you find the provided evaluation categories useful

3rd Question Block: Technology Support

How did you get along with the technology ?

Could describe a typical chat meeting ?

- how was communicating like
- difficulties
- did you look at transcripts of chat sessions

Could you describe a typical centra meeting ?

- what was different
- anything you find especially valuable using centra
- like / dislike
- what functionalities did you use ?

What was an impediment to communication / group work?

- audio quality
- interface complexity
- slow reaction
- lack of a plan

Did you hear audio recordings of past meetings ?

How did you go about learning the technologies?

- previous knowledge
- experimenting gradually
- reference to media help folder 7 emails

What would you like to have changed in this course?

- workload
- group work
- technology
- amount of feedback

Thank you very much for your participation.

****

B.7 Interview Implementation Guidelines

Careful wording of prompts

- ask for stories 'Tell me about one particular event which …' however be aware that good stories can be embellished
- ask for examples of generalizations
- ask carefully for clarification: 'Can you tell me again .. ' again implies that the participant was unclear (Seidman 1998, p.66) better say 'Could you restate ... '

- ask for the ideal situation “How would the ideal online group collaborate? ” (Minichiello 1995, p. 90)
- ask for motivations (e.g. What keeps you from doing this, what encourages …) (Krueger 2000, p.15, 24)
- ask for ‘inner voice’ rather than getting the ‘public voice’ / Saying ‘challenge’ instead of ‘problem’ or using passive forms often indicates the use of the ‘public voice’ (Seidman 1998)
- structural questioning “What is important for you in an online learning environment” shows how participants structure their experiences (Minichiello 1995, p.88)
- contrasting questions “comparing chat and centra – advantages and disadvantage” (Minichiello 1995, p.88)

Things to avoid

- avoid leading questions e.g. ’Did you really mean this?’ Or ‘How satisfied were you with the technology?’ Better: ‘What was using the technology like for you?’
- avoid asking ‘Why‘, ‘Why’ is interrogative and implies rational reasons whereby many times people take decisions by impulse e.g. translate ‘why’ into ‘what’ (Krueger 2000, p. 59) Better: What did you dislike … ?
- avoid giving examples, they provide ideas but they also ‘limit the thinking of the respondent’ (Krueger 2000, p.61)
- don’t ask to remember – this triggers a memory blockade – ask directly ‘What happened’ rather than ‘Do you remember what happened? (Seidman 1998, p. 74); Better: use open questions, they establish the territory to be explore while leaving the direction to the participant: ‘ Could you take me through/ reconstruct an online meeting?’ (Seidman 1998, p.70)
- take notes to follow up things rather than interrupting the participant, e.g. ‘a while back you talked about’ (Seidman 1998, p. 71)

General rules to keep in mind

- funnelling (from general, public to specific, subjective) (Minichiello 1995, p. 84)
- not giving a priori all detailed questions but let participants find their own agenda this ensures you capture ‘their hierarchy of importance’ (Kitzinger 1994)
- do not ask for opinions but rather the details of their experience upon which their opinions may be built (Seidman 1998, p.12)
- use mile markers in order to keep track of ‘time per question’ (Krueger 2000, p.43)
- share your own experiences if they connected to what was said as long as they don’t distract or shift the focus
- establish analysis criteria beforehand and ask for clarification if an answer cannot be fit into interpretative frame (Kvale 1996, p.557)
- do cross check information (Minichiello 1995, p.94)

Kitzinger, J. (1994). The methodology of Focus Groups: the importance of interaction between research participants. Sociology of Health and Illness, 16(1), pp.103-121.
Krueger, R. A. (2000). Focus groups : a practical guide for applied research (3rd ed.). Thousand Oaks, Calif.: Sage Publications.
Kvale, S. (1996). Interviews : an introduction to qualitative research interviewing. Thousand Oaks Calif.: Sage Publ.
Minichiello, V. (1995). In-depth interviewing: principles, techniques, analysis. Melbourne: Longmen Australia Pty Ltd.
Seidman, I. (1998). Interviewing as qualitative research : a guide for researchers in education and the social sciences (2. ed.). New York: Teachers College Press.

B.8 Interview Consent Form

CONSENT FORM

Project title..... Studying online with cases .....

Researcher's name..... Christian Voigt .....

Supervisor's name..... Prof. Paula Swatman.....

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that recording material will be securely retained for seven years. The material can be accessed only by the researcher and the supervisors of this research project.
- I understand that I will be audiotaped during the interview.

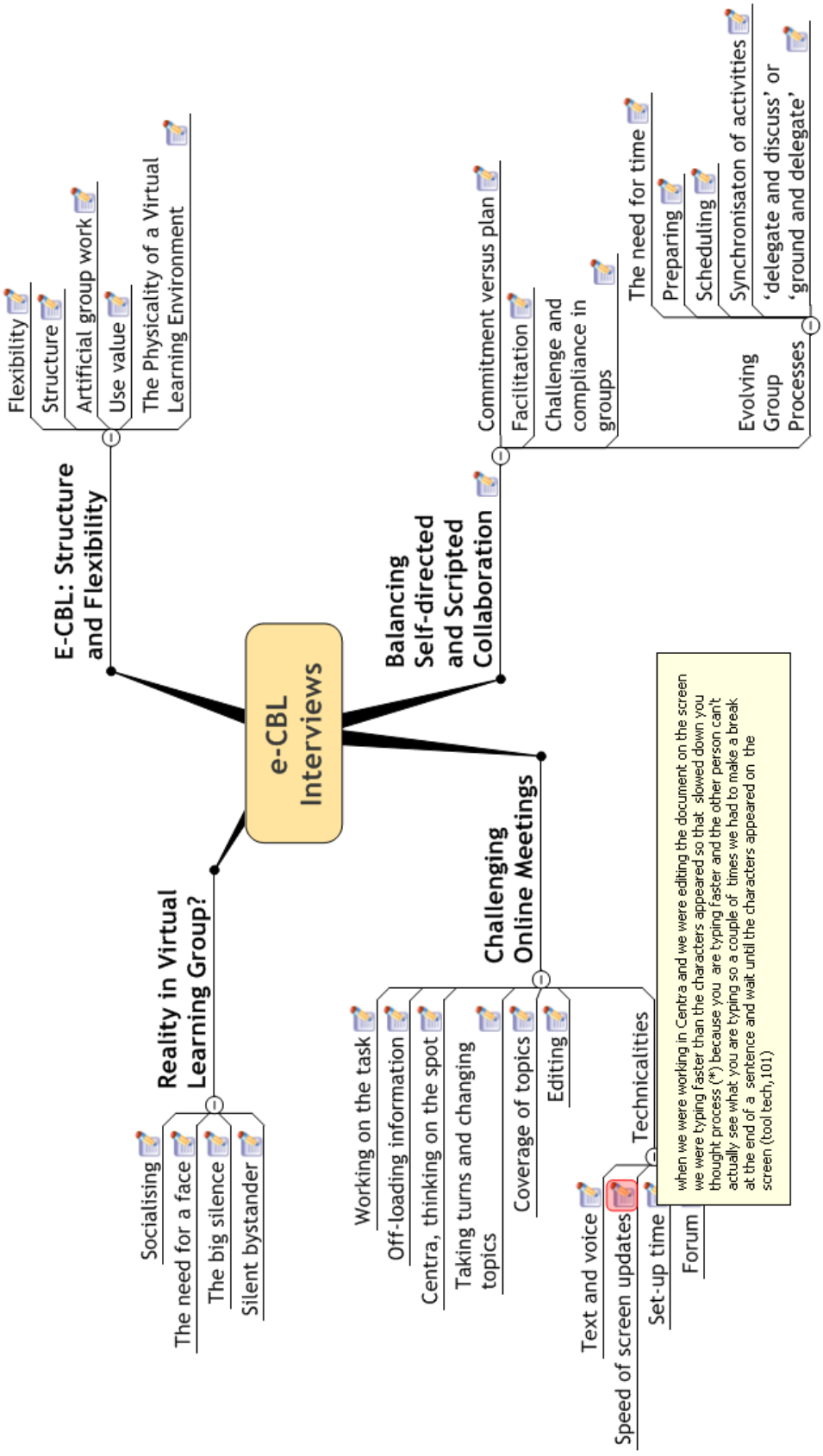
Name of participant.....

Signed.....**Date**.....

I have provided information about the research to the research participant and believe that he/she understands what is involved.

Researcher's signature and date.....08/ 02/ 2006

B.9 Mind map of emerging themes



C Third Design Iteration (SP7, 2006)

C.1 Entry Survey

Explain changes in questions compared to SP7, 2006
(new questions are marked with a star)
Total number of respondents: 60

---

1. Heading: This survey helps me to know a little more about students taking this course, and what extra help you might need.

---

2. Question: Please enter your name:

---

3. Question: Please enter your UniSA email:

*** 4. Question: What operating system do you use?**

Option 1: Windows	55 (92%)
Option 2: Macintosh OS	2 (3%)
Option 3: Unix/ Linux	0
Option 4: I don't know / No response	3 (5%)

---

5. Question: Is this your first online course?

Option 1: Yes	45 (75%)
Option 2: No	12 (20%)

---

6. Question: Do you have any experiences with case studies / case reports?

Option 1: I haven't any experience so far.	23 (38%)
Option 2: I have had some experiences. (< 4 cases)	29 (48%)
Option 3: I have done many case studies (> 4 cases)	5 (8%)

---

7. Question: Do you have any work experience outside the university (part-time or full-time)?

Option 1: Yes	45 (75%)
Option 2: No	11 (18%)

---

8. Question: What sort of Internet connection (bandwidth) do you use?

Option 1: Dial Up connection	11 (18%)
Option 2: DSL or Cable connection	44 (73%)
Option 3: I don’t know	1 (2%)

---

9. Question: How would you describe your experience with group work so far?

Option 1: I haven't any experience yet.	4 (7%)
Option 2: It was a mostly enjoyable experience.	31 (52%)
Option 3: It was a mostly unpleasant experience.	10 (17%)
Option 4: I could not really describe it.	12 (20%)

*** 10. Question: How many hours per week would you be able to spend for this course?** The feedback from 49 students indicated an average of 11 hours.

---

11. Question: Mark all activities you have done at least once..

Option 1: Using a text processor (e.g. Word).	56 (93%)
Option 2: Looking for information on the Internet.	57 (95%)
Option 3: Preparing a presentation with PowerPoint.	51 (85%)
Option 4: Using an Instant Messengers? `	43 (72%)
Option 5: Using the university's online database.	44 (73%)
Option 6: Building a webpage	26 (43%)
Option 7: Editing of images or videos	31 (52%)

---

12. Question: What times could you attend to occasional online meetings. Mark as many options as possible.

Option 1: Monday evening	47 (78%)
Option 2: Tuesday evening	44 (73%)
Option 3: Wednesday evening	43 (72%)
Option 4: Thursday evening	35 (58%)
Option 5: None of the above	7 (7%)

(please use the following comment box to indicate a suitable day)

---

13. Question: Comments ….

C.2 Pattern Definitions

The following Table I provides a systematic overview of pattern descriptors. The first column lists all descriptors classified according to Alexander's pattern constituents: *context, problem* and *solution*. The second column provides a label for each descriptor; and the third column includes an explanatory question to facilitate the semantic interpretation of the descriptor. Each of the remaining columns corresponds to a pattern-related publication, referenced by a shorthand identifier (e.g. 'Fo' for Fowler (1997)). At the intersection between a descriptor and a publication, a field is marked by a cross if the descriptor is included, or marked by a cross in brackets if the publication mentioned the descriptor but did not formalise it.

An index for the shorthand used is provided in Table II (Pattern research related to architecture and computer / information sciences) and Table III (Pattern research related to educational technology).

Table I: Overview of 16 pattern related projects

Category/ Descriptor		Explanatory Question	Architec.		SW-Development						Educat. Technology						
			AI	Ko	Ga	Co	LS	MMP	WVE	LDP	GJPSG	DM	Go	APRS	HAD	Di	BB
Context																	
Problem Context	**1**	Under which circumstances the problem is likely to occur?	X		X		X	X	X	X	X		X	(X)			
Pattern Conditions	**2**	Under what conditions the suggested solution should or should not be applied (positive and prohibitive conditions?	X		X		X	X							X	X	X
Paradigmatic Conditions	**3**	*What is the epistemological frame of reference to formulate a Pattern? (behavioristic, cognitivistic, social constructivist)*															
Domain characteristics	**4**	What contextual characteristics need to be preserved ? (e.g. profitability, universal access, equal chances - usually the invariables)		X													
Composite Patterns	**5**	How does the pattern complete a larger pattern ?	X									X	X				
Networked Patterns	**6**	Any other patterns making use of or being used by the pattern.	X		X		X	X			X	X	X	X			
Similar Patterns	**7**	Which patterns are closely related and how are they different ?			X							X				X	
Problem																	
General description	**8**	***What describes the problem ?***	X		X	X	X	X	X			X		X		X	X
Conflicting forces	**9**	Which are the forces in conflict ?	X		X	X	X	X	X	X	X		X			X	X
Exemplified Problems	**10**	What are examples of poor design ?			X									X		X	
Problem Scope	**11**	At what scale does the conflict occure (e.g. task, course, program, learning organization)?		X								X					
Deepness	**12**	How deep does the conflict reach?		X													

Category/ Descriptor			Architec.		SW-Development						Educat. Technology						
		Explanatory Question	AI	Ko	Ga	Co	LS	MMP	WVE	LDP	GJPSG	DM	Go	APRS	HAD	Di	BB
Substance	13	What are the structures and activities involved? (physical environment, activities, institution) ?		X													
Solution																	
Name / Title	14	What summarizes the solution ?	X	X	X	X		X	X	X		X	X	X	X	X	X
General Description	15	***What describes the solution?***					X		X	X	X			X	X	X	X
Introduction	16	What is the pattern's intent ?	X		X		X					X	X				X
Aliases	17	What are other well-known names for the pattern ?			X			X									
Principle	18	What general principles give base to the solution?				X	X	X	X							X	
Pattern visualization	19	What displays the pattern best ?	X														
Structural Changes	20	What characterizes the physical / structural environment ?	X	X		X						X	X		X	X	X
Activity Changes	21	What events / activities need to be sustained ?	X	X		X					(X)	X	X		X		X
Participants	22	What are participating elements and what are their responsibilities ?			X		X					X			X		
Participants Interactions	23	How do the participating elements collaborate to carry out their responsibilities ?			X		X					X					
Interaction Diagram	24	How can the relationships within the pattern be visualized ?	X				X					X	X				
Consequences	25	What are the effects and side-effects of the pattern ?			X	X	X			X						X	
Pattern Flexibility	26	Which aspects of the solution can be varied independently ?			X											X	
Prototypical Information	27	How would a concrete implementation look like ?			X				X			X		X	X		X

Category/ Descriptor			Architec.		SW-Development						Educat. Technology						
		Explanatory Question	AI	Ko	Ga	Co	LS	MMP	WVE	LDP	GJPSG	DM	Go	APRS	HAD	Di	BB
Known use	28	Where was the pattern already implemented ? (including successful and failed implementations)			X		X		X	X		X		X			
Evaluation																	
Evaluative Data	29	What is the empirical background of the pattern (observable evidence)?	(X)									X		X			
Evaluative Context	30	*What methodology guides the evaluation of a pattern? (e.g. interpretivist, positivist, critical theory)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Evaluation Method	31	*What data gathering methods were used*															
Stability	32	Is the pattern stable and self - sustaining? (e.g. Alexander's 'Living patterns')	(X)														
Coherence	33	Does the pattern integrate with other patterns?	(X)														
Status	34	How well is the pattern established?	(X)							X							
References	35	Where can further explanations be found? (based on in-text citations throughout the pattern description)										X	X				

Research Domain	Reference	Shorthand
Architecture	Alexander (1979, p.152) / Alexander, Ishikawa & Silverstein (1977, p.x) Kotsiopoulos (1982, p.73)	Al Ko
Software development	Gamma (1995, p.6) Coplien (1996, p.48) Lukosch & Schümmer (2006, p.604)	Ga Co LS
Systems analysis	Fowler (1997, p.6)	Fo
Systems reengineering	Lloyd, Dewar & Pooley (1999, p.12)	LDP
Human Computer Interaction	Welie, Veer & Eliëns (2000, p.315) Molina, Melia & Pastor (2002, p.162)	WVE MMP

Table II: Pattern research related to architecture and computer / information sciences

Educational Technology	Shorthand
Pattern-based teaching of programming concepts (Green, Jones, Pearson, & Gkatzidou, 2006a, Appendix)	GJPSG
Person-centred e-learning & blended learning at the University of Vienna (Derntl & Motschnig-Pitrik, 2005, p.122)	DM
E-Len project: EU funded program to advance the systematic use of networked multimedia computer technologies (Goodyear, 2005)	Go
A pattern language for Learning Management Systems (LMS), National Technical University of Athens (Avgeriou, Papasalouros, Retalis, & Skordalakis, 2003, p.14)	APRS
Collage: Collaborative learning design editor based on patterns (Hernandez-Sebastian , Asensio-Perez, & Dimitriadis, 2005, p.78)	HAD
Collaborative learning patterns, SRI Internacional (DiGiano et al., 2002, p.39)	Di
E2ML: Educational Environment Modelling Language (Botturi & Belfer, 2003, p.2)	BB

Table III: Pattern research related to educational technology

Alexander, C., Ishikawa, S. & Silverstein, M. (1977). A pattern language : towns, buildings, construction. New York: Oxford University Press.

Avgeriou, P., Papasalouros, A., Retalis, S. & Skordalakis, M. (2003). Towards a Pattern Language for Learning Management Systems. Educational Technology & Society, 6(2), 11-24.

Botturi, L. & Belfer, K. (2003). Pedagogical Patterns for Online Learning. Paper presented at the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2003, Phoenix, Arizona, USA.

Coplien, J. O. (1996). Software patterns: Design utilities. Computer, 29(10), 48.

Derntl, M. & Motschnig-Pitrik, R. (2005). The role of structure, patterns, and people in blended learning. The Internet and Higher Education, 8(2), 111-130.

DiGiano, C., Yarnall, L., Patton, C., Roschelle, J., Tatar, D. & Manley, M. (2002). Collaboration design patterns: conceptual tools for planning for the wireless classroom. In Wireless and Mobile Technologies in Education (WMTE'02) (pp. 39-47).

Fowler, M. (1997). Analysis patterns : reusable object models. Menlo Park, Calif.: Addison Wesley.

Gamma, E., Helm, R., Johnson, R. & Vlissides, J. (1995). Design patterns : elements of reusable object-oriented software. Reading, Mass.: Addison-Wesley.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. Australasian Journal of Educational Technology 21(1), 82-101.

Green, S., Jones, R., Pearson, E. & Gkatzidou, S. (2006). Accessibility and adaptability of learning objects: responding to metadata, learning patterns and profiles of needs and preferences. ALT-J, 14(1), 117-129.

Hernandez-Sebastian , D., Asensio-Perez, J. I. & Dimitriadis, Y. (2005). Computational Representation of Collaborative Learning Flow Patterns using IMS Learning Design. Educational Technology & Society, 8(4), 75-89.

Kotsiopoulos, T. M. (1982). Reading The Oregon experiment. Building and Environment, 17(2), 69-85.

Lloyd, A. D., Dewar, R. & Pooley, R. (1999). Business process and legacy system reengineering: A pattern perspective, Article 24. Communications of AIS, 2, 1-40.

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C.3 Case Writing: Objectives, Materials and Case Questions

A case can focus on several skills such as analysing a situation, respond to an issue or evaluate a response to an issue. However, all three skills (analysis, action or evaluation) are interrelated and necessary to work through a case.

The following case overview specifies the main purpose for each case and difficulty level with regards to the case's analytical, conceptual and representational dimension (Mauffette-Leenders, 1999).

	Amazon	Small Business	SE Marketing	Internet control
Case Focus (%)				
Analysis	60 (Q1,2)	30 (Q1)	40 (Q1)	40 (Q1)
Action	20 (Q3)	50 (Q2)	20 (Q2)	-
Value Judgement	20 (Q4)	20 (Q3)	20 (Q3)	60 (Q2,3)
Case Difficulty				
Analytical (What is asked?)	Medium (most questions include already a frame for the answer)	High (broad questions, learners need to identify a suitable framework)	High	High
Conceptual (What is already given?)	Low (most concepts are already included in case readings)	Medium	High (more than average additional research required)	Medium
Presentational (How clearly is it presented?)	Medium (magazine article)	Medium	Medium	Medium

The following four sections describe each case based on its learning objectives, case issues, the way the case relates to the course topics and any hints about how group might work through the case collaboratively.

Fundamental learning objectives are principally derived from the textbook and represent learning on a more generalisable level, compared to the *case issues* which represent the more 'technical' or 'operational' level of case based learning.

Case questions and issues are the first help to focus the learners readings of the case material and, because they scaffold the analysis of the cases, help to adjust the degree of analytical difficulty (the more general the question, the less information learners can derive from the question itself, the more they rely on their own interpretation and structuring of the material.)

Course Mesh: Deliberately, there is no 'case solutions' section. Case markers and case discussion facilitators need to develop their own understanding of the case, so they can flexibly react to students' case interpretation by relying on their own view rather than on a given "approved solution", which could be misleading and, most probably, would be incomplete. However, tutors preparation is facilitated by a number of pre-selected information:

Course mesh – particularly useful models, methods and concepts form the textbook

Additional case material – reflections on case issues which are either more up to date (e.g. newspaper or news magazines) or contain more specific information (journal articles). This section represents the gain students could have from additional research effort (the huge majority of add on materials was found via EbscoHost research data base)

Group aspect - depending on the case type, a group can have varying benefits to students. It has been shown that merely pointing to the general benefits of a group work is not enough. Lacking initiative, or positive group work experiences, groups rush to the seemingly most logical way of splitting the work by questions. This undermines the whole purpose of case studies, which is to develop analytical and solution generating skills. Case based learning (CBL) should be perceived as dealing with wholes rather than with artificial parts. Hence each case includes a brief suggestion on how to handle the *group aspect* of the task.

C.3.1 Case 1: Amazon's business model

Case type:

Focus on Analysis

Amazon is a well-known case, a fact that should facilitate your group in getting started. Amazon is 'well documented' – being one of the few survivors of the dot com crash in 2000. Amazon's CEO, Jeff Bezos was person of the year 1999 in Times Magazine, so between hype and truth you can expect a great variety in terms of quality information. The abundance of material poses the problem of being selective, i.e.

- evaluating the source of the information,
- determining the relevance of the information (according to the case questions) and
- structuring information meaningfully

Fundamental learning objectives

- the changing nature of e-commerce (Laudon & Traver, 2007, p.35)
- business models (Laudon & Traver, 2007, p.58)
- to a lesser extend this case shows also the role of innovation to maintain growth, this is actually the point where the case becomes very interesting but also a bit complicated

Case issue

- necessity to consider e-business model elements to become profitable (shift from revenue to profit)
- e-business needs to be driven by customer needs rather than available technologies (see three perspectives: Techn., Society, Business)
- the power of a brand (an online bookstore as grocery retailer and technology provider?)
- future challenges:
- strategic choice: Amazon's future?: retailer or Internet platform provider
- law suits, e.g. lack of services for third party retailer using Amazon's infrastructure or due to copyright issues
- business complexity through increase in data, inventory and logistics
- further cost reduction
- efficiency

Case questions

How would you describe Amazon's business model? Include a brief definition of a business model.

- Do you think Amazon's business model changed over the years or not? How would you explain your answer? How has e-business changed in general since 1995?
- What makes an e-Business model successful in your opinion? Would you call Amazon's current state a success or not? What data or examples can you give to underpin your answer?
- Which challenges do you see for Amazon's future development? What strategic options for change does Amazon have to be prepared for those challenges? Which one would you recommend? Could you provide some reasons for your recommendation?

Course mesh

The case matches well with chapters 1 & 2. It's important to encourage textbook usage and additional research simultaneously. Two chapters correspond 100 pages, this might be a good opportunity to make use of the group as a resource, e.g. split the reading and recommend relevant sections in form of summary dot points.

Another point that should be communicated is that the textbook is likely to provide structural aids in form of models or frameworks which could shape the case report. And additional research provides the flesh to the bones, seeing what this implies in practice.

In terms of creativity, it is always said that cases have no right answer, however this doesn't mean they don't need to be structured. So if someone is not using a business model frame then there should be a good substitute to look at the case (e.g. Porters 5 forces, or online consumer behavior model)

Useful concepts in Chap 1:

- unique qualities of the internet (Laudon & Traver, 2007, p.14)

- B2C and B2B (Laudon & Traver, 2007, p.17 & 18)
- A short history of dot.com IPOs (Laudon & Traver, 2007, p.32)
- three perspectives: business, technology and society (Laudon & Traver, 2007, p.38)
- Useful concepts in Chap 2:
- business model plus details (Laudon & Traver, 2007, p.58)
- industry structure and analysis (Laudon & Traver, 2007, p.91)

Case material

'Ideas' in Amazon.com : get big fast. Spector (2000, p.24-32)

Amazon at 10: Profitable at last (Laudon & Traver, 2007, p.3)

Jeff Bezos' risky bet (BusinessWeek online, 2006)

Additional case material (placed in add on folder for tutors only)

- Amazon's SWOT analysis
- Bezos on value proposition (O'Hanlon, 2006)
- about passion and optimism (Walker, 2004)
- print on demand (Ward, 2005)
- law suit against Amazon (Italie, 1999)
- Amazon into consumer electronics (Wolf, 2004)
- podcast about Amazon web-services: http://www.itconversations.com/shows/detail297.html
- Amazon's service oriented architecture (O'Hanlon, 2006)

Group aspect

Groups who simply split questions and collate face the problem of lacking coherence: questions 1 and 2 and questions 3 and 4 need to be aligned. A challenge (Q4) is most likely something that threatens success (Q3).

diminished variety: specially Q3 and Q4 allow for a variety of approaches, success (Q3) can be defined in terms of financial results, name recognition, intellectual assets, the power to innovate, market share etc. – here each members could analyze one 'aspect of success" The same applies to Q4, each student could follow up one challenge

Links to previous cases

none in this case …

C.3.2 Case 2: An e-Business solutions for a small business

Case type:

Focus on Action

Whereas Amazon is a big name “out there”, small businesses should represent something closer to students daily experience. What options do micro and small businesses have to increase market share, visibility, improve client relationships in order to finally boost their revenues.

The initial lack of ready to use material poses the problem of

- structuring: recognizing what determines the need for specific e-commerce technologies
- creativity: identify alternatives for how to cater for the different technologies needed
- focus: the list of potential issues is almost endless, what are the top 5 or so short and long term issues to capture on 4 pages ?

Fundamental learning objectives

- e-commerce is business model driven (business objectives lead to system functionalities which require certain information) p.196
- describe the process of building comprehensive e-commerce solutions (including security issues and various payment options)
- understand in-housing and outsourcing decisions in the light of integrated site-building tools

Case issue

- identifying the broad range of issues involved in any e-commerce solution (e.g. as soon as a business supports financials transactions online security should become a concern)
- prioritizing those issues according to business objectives and local conditions
- weighing the pros and cons of different build your own versus from the shelf versus outsource approaches
- thinking outside the ‘shopping website’-box: tourism ‘products’ to be auctioned, last minute bookings over mobile phones

Case questions:

Imagine yourself charged with the task of describing an e-business solution for Aldgate Lodge Bed & Breakfast: http://www.aldgatelodge.com.au/rooms.htm (the case is fictitious and we just use their webpage to provide a common starting point for all).

The owners already have a website for promotional purposes. However they plan to increase their number of rooms considerably and would like to automate some aspects of the booking process, Additionally they would like to improve bookings during the low season.

Being aware that more and more people plan even short trips online they figured that e-commerce would be a good way to go. The owners asked several experts for a first business proposal (no more than 4 pages). Originality, comprehensiveness and feasibility are the main evaluation criteria for your proposal determining whether you get the job of implementing your ideas or not.

1. Just as in the real world nobody can tell you everything you need to identify. Browsing chapters 3-6 of your textbook will help you to identify potential issues you need to take care of. Additionally you may simulate what a potential customer would look for or expect when accessing Aldgate’s new website to make a booking.
   What principal changes and enhancements would you suggest to Aldgate’s website?

You may assume that Aldgate's owners are not e-business experts. In order to appreciate your suggestions they will need some brief explanations or data that can back up your recommendations.

2. Once you have identified what needs to be done, you should also describe the way to get there. Put simply, how would you go about implementing the redevelopment of the website?
   Unfortunately you can not get any information about the available budget. So far the only comment in this respect was "If it makes sense we will find the money." However you have got the impression that Aldgate's owner are quite keen to do some of the site implementation by themselves. Consequently you give careful consideration to the question of what could be done by the business owners and where would they need outside support. However you need to make sure the owners understand the limitations of a 'do-it-yourself' approach.
3. *Extra question:* Last but not least you think of your chances to seed the opportunity for some follow-up business later on. To do this you need to include a preview of future development possibilities. What other internet related technologies could you mention that would leverage Aldgate's business in the long term future? *(Because this is a bit beyond the scope of an introductory course you may get up to 2 extra marks for innovative, out-of-the-box ideas presented in a clear and meaningful manner.)*

Course mesh:

There are only two additional readings but 4 chapters attached to this case. Regarding the amount of readings this is the most challenging case, So coordinating group efforts will be vital. Chap. 3 is more about the understanding the basics in case someone has no idea at all how the Internet is working. I don't really see any of chap 3 's concepts directly contributing to the case. Chap 4. is the most relevant source of information. Chap 5 and 6 consider additional aspects of security and payment. Those aspects do not need to be explained but to be chosen according to their functionality (e.g. stored value is probably no option but pay pal is).

useful concepts in chap 3: "Internet Infrastructure"

- domain names p.123 "URL should match your business?"
- HTTP p.126, 159 "What is involved in having an online presence?"
- Application and Middleware layer p.131 "What is involved in having an interactive online presence?"
- latency p.133, p.140 "Why do you wait for web pages?"
- Wireless application scenarios p.149
- access to your webpage from different devices and browsers
- how to communicate / interact with your clients p.166, p.176

useful concepts in chap 4: "Building e-comerce websites"

- SDLC p. 194 "How to get started ?" a phase model
- matching information requirements with system functionalities p.195
- choosing merchant software p.213
- choosing hardware p.216

- site design and annoyed clients p.225
- outsourcing versus DIY p.199-201

useful concepts in chap 5: “e-commerce security”

- the problem of dealing with an “invisible client”, p.253
- the problem of viruses p.257-259
- the problem of hackers p. 262
- how to secure data transmission p.269, p.278
- how to secure your data p.282
- assessing risks p.285

useful concepts in chap 6: “e-commerce payment modes”

- how to charge clients? credit cards, stored values, p2p systems p.308
- considering the risk of ‘exotic payment forms’

Case material:

From retailing to e-tailing (Calkins, Farello & Shi, 2000)

Outsourcing makes sense when DIY is no bargain (Laudon & Traver, 2007, p.199)

Even easier e-commerce (Clyman et al., 2005)

An Australian Guide to doing business online (http://www.e-businessguide.gov.au/)

Additional case material (placed in add on folder for tutors only)

- Microbusinesses going to use online auctions (D. H. Freedman, 2000)
- Small tourism businesses and e-commerce (Morrison & King, 2002)
- An Analysis of Factors Which Influence Small Businesses' Decision to Have a Website and to Conduct Online Selling (Mohan-Neill, 2006)
- Auctioning Tourism Products over Mobile Devices (Giaglis, Tsamakos & Kourouthanassis, 2002)

Group aspect :

Consistency is required to answer Q1 and 2. (every change suggested needs to be included into the implementation plan) Due to the large amount of readings it is recommended that group members split reading chapters early on to identify what might be relevant / needs to be included in the case report. They could then meet and put together dot points for each chapter based on everyone’s preparation.

Other task-aspects that could be split:

- different implementation scenarios, e.g. build from scratch (?), site building tools (e.g. LAMP solutions), Pre-Built templates (e.g. Yahoo Store).
- pros and cons of different payment mechanisms

Links to previous cases

Microbusinesses rely on sound business models just as Amazon does. So question one would very much benefit from a business model perspective (e.g. What’s the value proposition?, How can the value be communicated (marketing)?, To whom do you want to communicate (market share)?, What’s the difference between you and your competitors? What are your personal resources?

C.3.3 Case 3: Search Engine Marketing (SEM)

Case type:

Focus on Analysis

Unlike the first two cases, this case includes little explicit guidance, either in form of the attached questions or in form of conjoint readings. A critical point could be that students assume the same level of guidance as before and in face of reduced guidance lower the depth of analysis.

To avoid superficial case work, students should be made ware of the particular challenge of

- being creative in order to identify as many issues as possible
- being thorough in following-up sub-issues as they emerge from their initial discussion

Fundamental learning objectives

- understand purchasing decisions
- understand basic marketing concepts
- identify main technologies to support online marketing

Case issue

- understanding Moncrief's dependence on Google in particular and the Web in general
- seeing the full picture of stakeholders: searchers/ customers, Moncrief, other online merchants, Search engine optimization companies and Google
- understand Google's conflict of interest when providing organic listings and getting revenues from paid placements
- most importantly – Moncrief's case is really of a symptom of the underlying battle between Google and search engine optimizers. The optimizers using 'search engine spam' such as link farms to get higher rankings and doorway pages to extract click through fees from affiliation networks.
- in the end Moncrief joined Google's AdWord program

Case questions:

Neil Moncrief was no Internet marketing specialist until the distressing experience he had shortly before Christmas 2003. By reading Moncrief's story you will gain insight into search engine marketing (SEM), which is considered one of the most powerful online marketing channels (Hershberg, 2005).

1. Who are the different stakeholders you could identify in Moncrief's story and what do you think are their most pressing concerns? Could you give any data to back up the importance of the issues you have found?
2. Which recommendations could you give Moncrief to solve his dilemma in the short and long term. What arguments would you use to convince him of your recommendations?
3. How would you qualify Google's lack of care for Moncrief's problems? Google being Google, do you think they should have acted differently? Whatever your opinion, try to give some reason.

Course mesh:

Chapter 7 looks into the general marketing landscape and is important to understand Moncrief's alternative venues. As the reading states so far he achieved his business success almost without any marketing effort, just pure organic search listing did the job of promoting his business.

Chapter 8 is more relevant to understand the technical details of SEM, it's various implementations, conditions and goals. This chapter provides also some practical advice for multi-channel marketing or how to fine-tune a webpage.

useful concepts in chap 7: "Basic marketing concepts"

- online consumer behavior p.370
- types of online sessions p.373
- browsers and buyers p.375
- intentional acts p.377
- augmented products p.379
- market segmentation p.382
- impact of online technologies on marketing p.387
- advertising networks p.400
- affiliate marketing p.407

useful concepts in chap 8: "Marketing communications"

- online advertising p.441
- paid inclusion (Yahoo) p.449 (you pay to be crawled/ indexed more frequently – fine tuning opportunity)
- search engine advertising p.448-455
- multi channel marketing p.467
- visitor conversion ratios p. 473
- ranking criteria p.485-487

Case material:

The search economy – Moncrief's story (Battelle, 2005, p.153-164)

Making sure your website gets found (Goldsborough, 2005)

Additional case material (placed in add on folder for tutors only)

- various short comments on SEM: (Hershberg, 2005),
- good glossary (Brooks, 2006)
- alternatives to SEM (L. Freedman, 2006)
- the Australian picture (Lyons, 2003)
- SEM tunning (Daly, 2006) (Fischer, 2006; Vass, 2006) (Wax, 2006)
- click fraud (Quinton, 2006)
- multi – channel marketing (Hershberg, 2006)
- adwords API ("Google gives advertisers more control over AdWords system", 2005)

Group aspect :

Again consistency is required to answer Q1 and 2. (every issue identified needs to be addressed with solutions) Beside reading the short case, students could identify and split a number of topics (not questions) prior to the first group meeting, where they become sort of 'experts' (e.g. online consumer behavior, click fraud, SEBASTIAN , Google's CRM).

Following up parallel options would help answering Q3: one part could justify Google's poor customer relationship with Moncrief as shown in the case and the other part could condemn it

Links to previous cases

Again marketing is a fundamental part of a Business Model (case 1) and is not an end in itself. There is also a remote link to case 2 since much of the SEM activities are outsourced, a decision that faces all the general issues related to outsourcing – such as lack of control or supervision, at times complex processes in case something needs to be changed.

C.3.4 Case 4: Business behind the "Great Firewall"

Case type:

Focus on Value Judgement

This case does not ask for any recommendations or solutions. The case takes a historical approach and requires students to understand how online companies generate political and social issues, and that there are no 'apolitical' alternatives of action.

The case requires the application of evaluation criteria and their discussion in a different cultural context. In comparison, this case includes substantially less readings (just one textbook chapter). Additionally the assumption is that groups have achieved smooth communication habits, dominate technology sufficiently and feel comfortable enough to embark on a more extensive discussion.

The integration of cultural issues does also favour the combination of students with different national backgrounds.

Fundamental learning objectives

- explain why e-commerce raises ethical, social and political issues
- describe a process for analyzing ethical dilemmas
- understand the conflict between national and Internet governance

Case issue

- Google's reputation within and outside of China
- growing market share of Baidu and Yahoo
- Google's accessibility after the installation of the 'Great Firewall' (in 2002?)
- cultural differences concerning free speech and political activism
- particular issue is that restrictions are based on 'self-censorship'
- how to preserve the image of an end-user oriented search engine in face of such censorship (e.g. disclaimer, no e-mail or blogging service)
- Google's compromise: is little change better than nothing if you think of what could have been?
- potential Implications of e-commerce (e.g. after yahoo handed over Shi Tao's email data he got 10 years in prison) – should western companies abide by local laws if this contradicts the ethical values in their own countries
- impact of internet regulations on future e-commerce endeavours (theoretically each country could build a great firewall?)

Case questions:

1. What issues was Google facing when deciding how to enter the Chinese search engine market? Try to identify as many issues as possible and describe briefly what makes them controversial and who are the stakeholders involved. You may put Google's approach in context with what other global players (e.g. Microsoft, Yahoo, etc.) have done.

2. How would you judge the approach Google has taken to solving the issues (try to apply the principles of ethical business practices in your answer)? How would you describe the importance of those principles to the Chinese end-users?
3. The case readings address cultural differences between China and international corporations. Should Western companies abide by local laws if they contradict ethical values in their own countries? What would speak in favor of or against changing ethical values?

Course mesh:

The case addresses only a small part of the entire bandwidth of business ethics. Other issues would be user privacy, public safety or copy right. Though they are not mentioned explicitly in the course reading they could figure in the case report

- privacy – Searchers using blacklisted key words can be identified.
- public safety – government specially targets political activism ?
- copy right – Baidu (Google's major competitor) get's one quarter of its traffic through a website enabling search of mp3s.

useful concepts in chap 9: "e-commerce and ethics"

- moral dimensions model p.503
- basic ethical concepts: responsibility, accountability, and liability p.504
- privacy p.508
- information gathering on the internet p.510
- who governs the Internet p.547

Case material:

Google's China Problem (And China's Google Problem) (Thompson, 2006)

Internet Filtering in China (Zittrain & Edelman, 2003)

Additional case material (placed in add on folder for tutors only)

- yahoos legal battles (Andersen, 2002)
- Google suffers a week from hell.pdf => accused of double morale
- journal article about Nazi memorabilia on Yahoo (Le Menestrel, Hunter & de Bettignies, 2002)
- ISP's, international router producers and censorship in China (Cherry, 2005)

Group aspect :

The main objective is to not get trapped in an easy one-sided argument (e.g. you should never hand over personal data and not support Chinese restrictions of free speech, period) one could ask what about the patriot act then? Several students could investigate parallel cases such as the Yahoo case (Shi Tao), Microsoft censoring Chinese Blogger in the states or Cisco's role as Router provider, or another one could look at how Chinese themselves feel about the issue.

Links to previous cases

On first sight, ethical principles are not part of the business model equation. However they could be a competitive advantage and violating them could have a serious impact on a company's market share. Business driven means driven by offering profitable values to customers and this includes privacy and ethical behavior.

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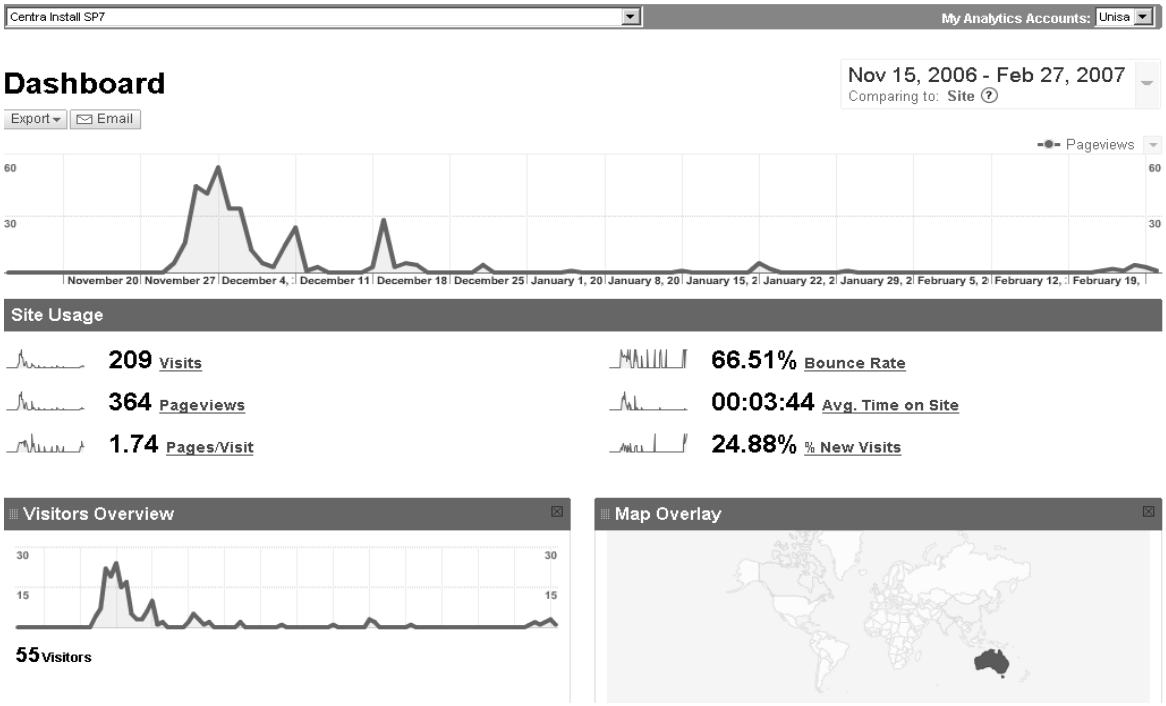
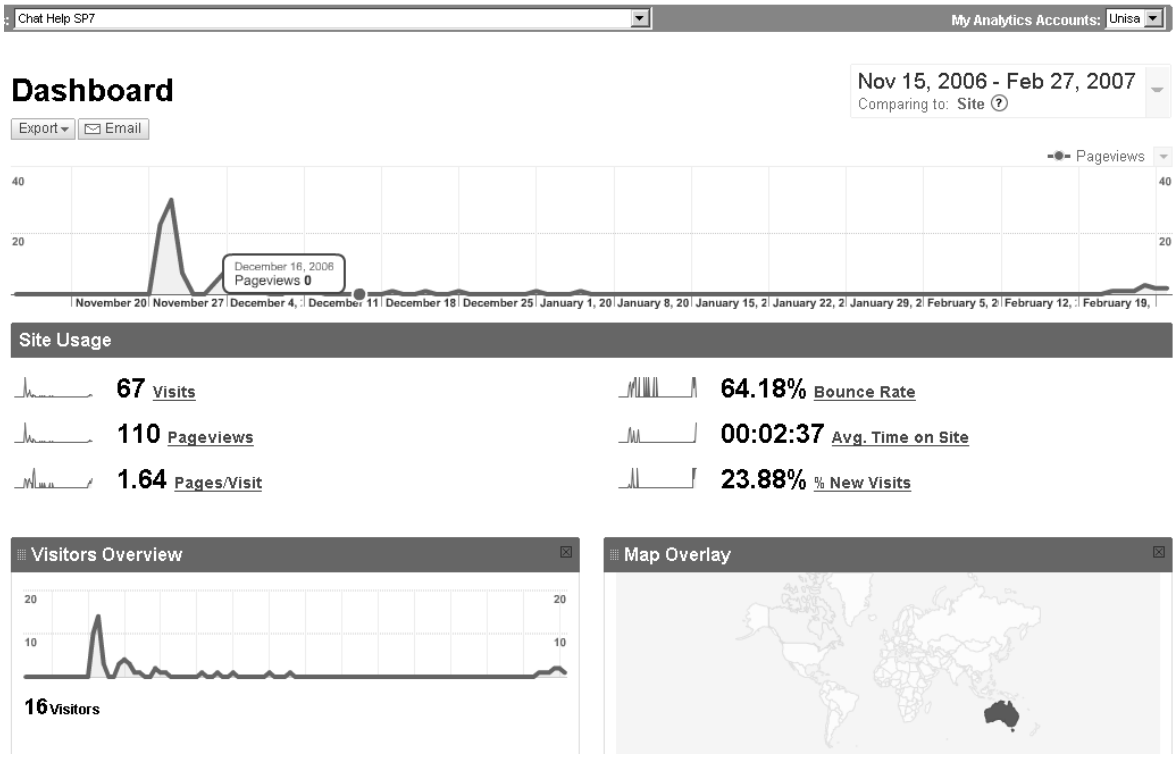
C.4 Web metrics for e-CBL support pages

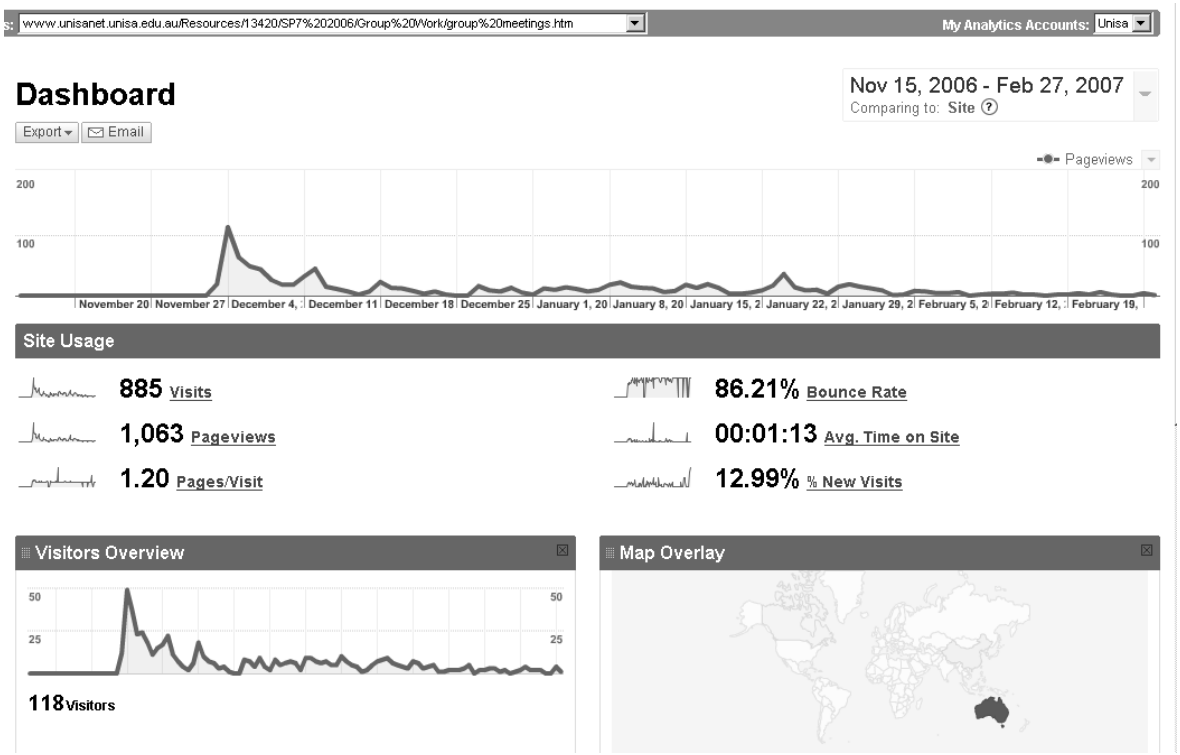
Centra installation



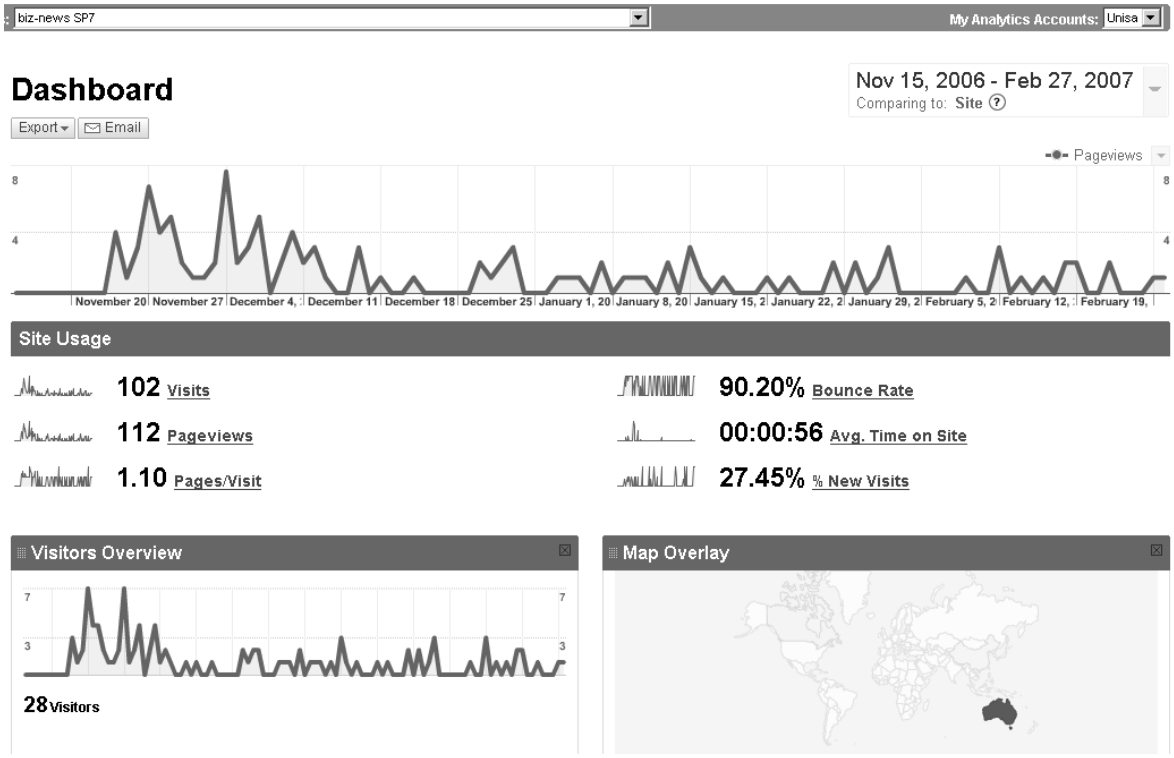
Chat help



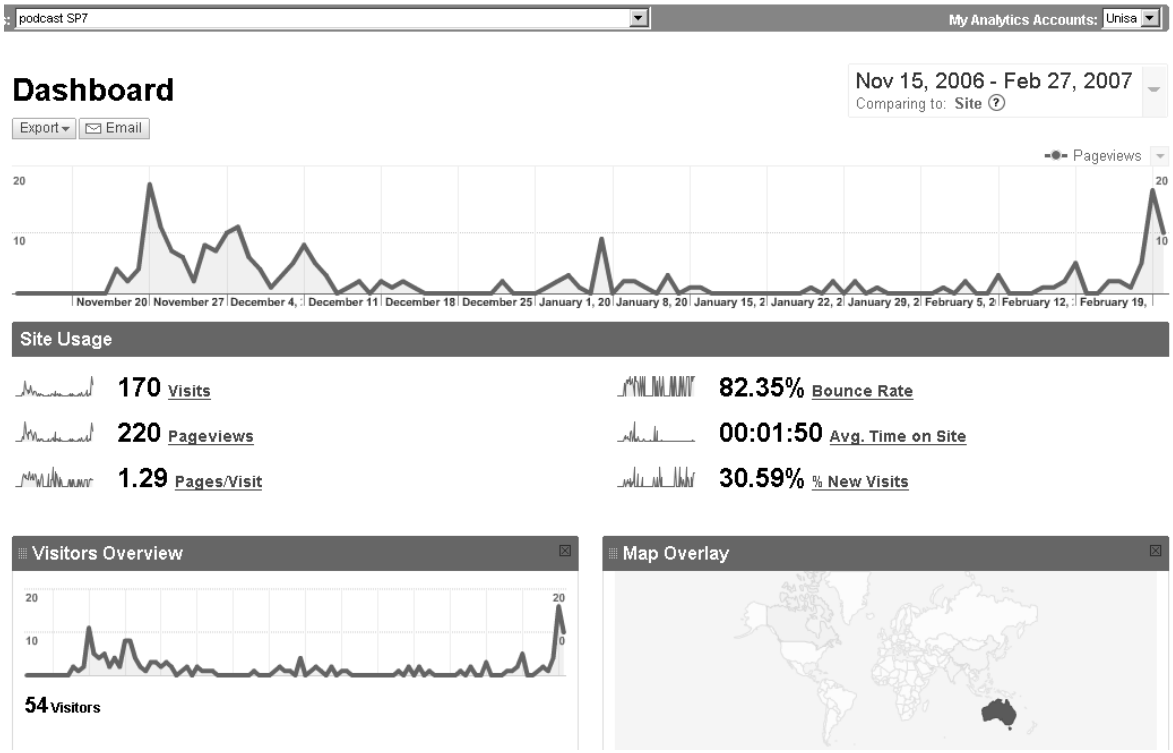
Effective group meetings



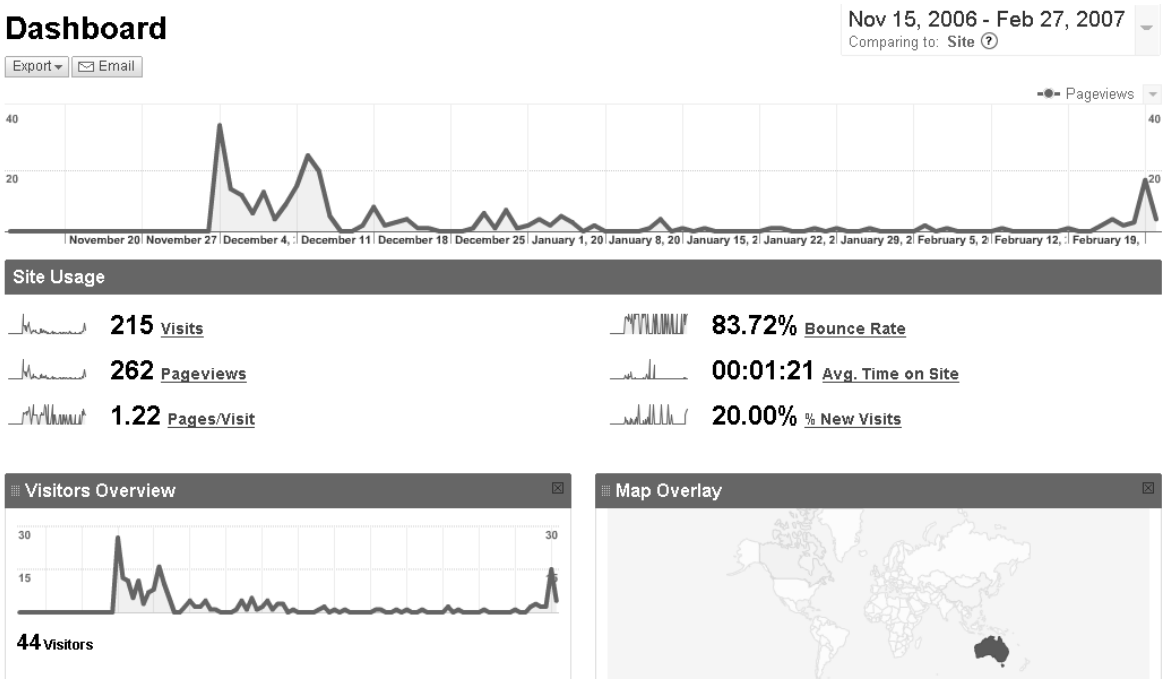
E-Business news links



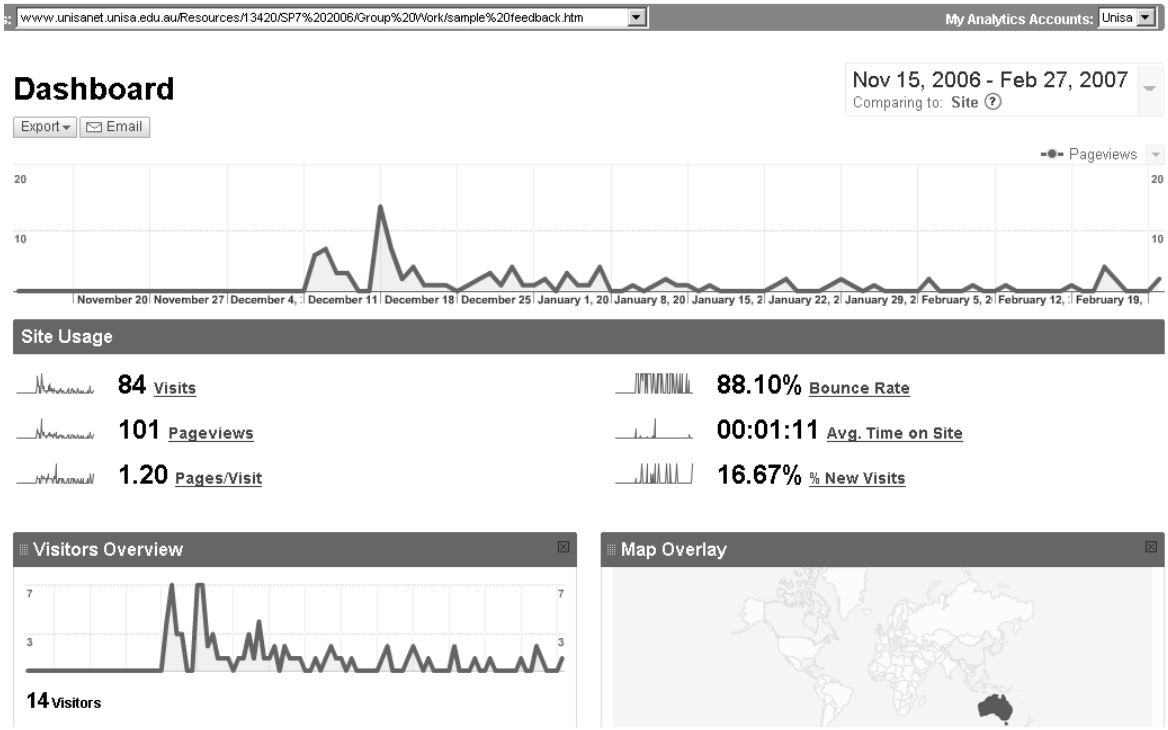
Podcasts



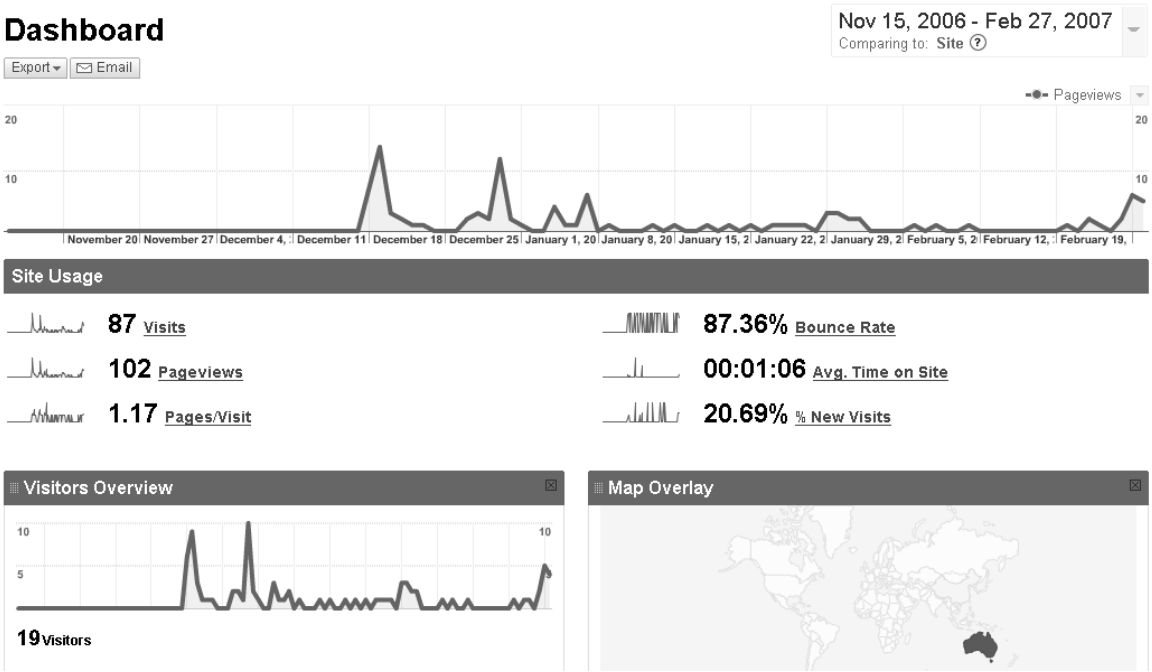
Sample Report



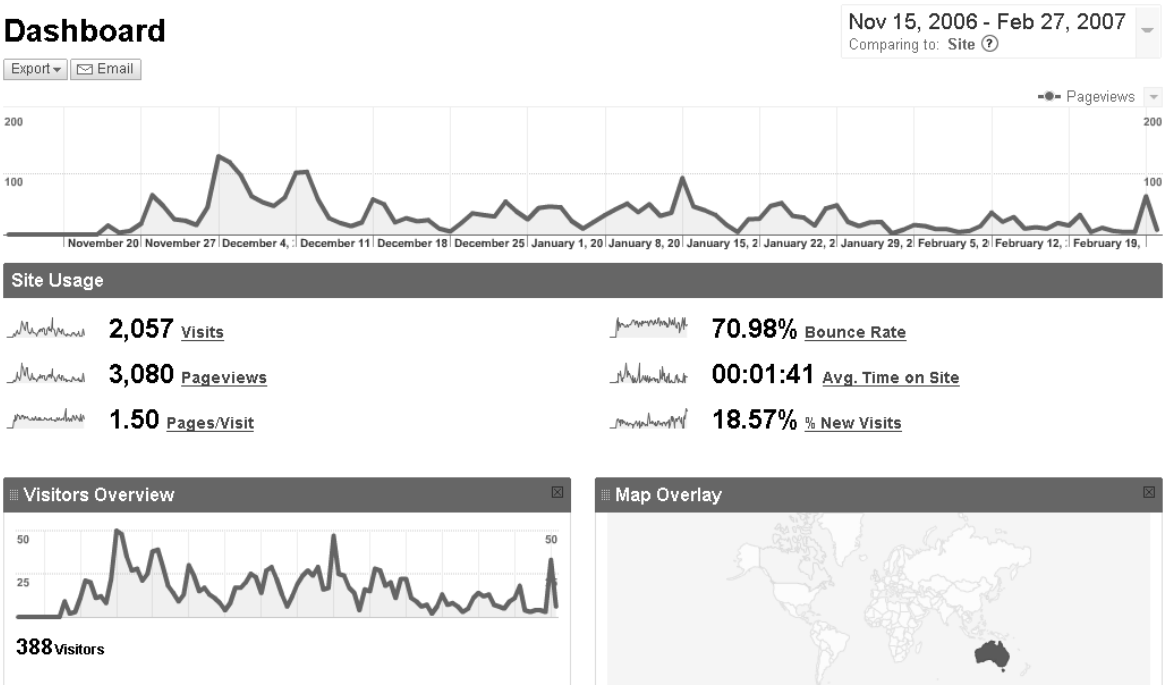
Sample Feedback



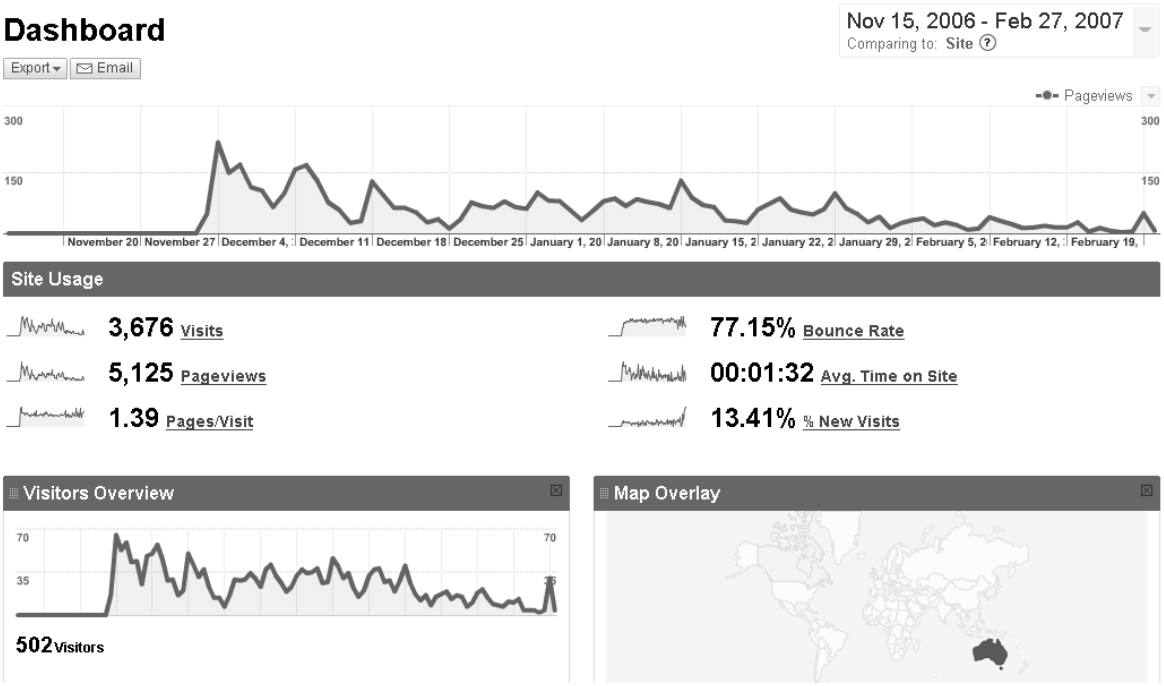
Purpose of class case discussion



Individual preparation & Critical thinking (Gateway Page)



Effective groups (gateway page)



C.5 Assessment Form

University of South Australia

Assessment feedback

Group XY

Introduction to e-Business INFS 2019

Case Report " *name* **"**

Case Marking Criteria	Perfor-mance	Comments / Things to improve
max. 40 marks for … Variety and Depth of analysis & recommendations	**30**	• Q1: structuring Q1 would have benefited from adopting a Business Model perspective, you started successfully with value proposition and revenue streams but missed out on competitors and potential markets etc. (alternatively you could have referred to relevant sections throughout the report) • Q2: how would you define 'uniqueness' of online news? Is it just the choice of topic? Later on you consider choice of media and interaction level – this may make it unique as well. • Q3: implications of 'emerging forms of news media' aren't clear, isn't it just another form of competition?
max. 25 marks for … Coherence and consistency of argumentation	**15**	• Q1 though the ethical dilemma is clearly an issue it's not entirely clear how it fits into the description of the WPC service • Q1 thousands of unconcerned users do not necessarily prove a concept to be ethical • the link between Porter's forces model and charging for online content is not entirely clear (did you refer to 'Customer's Bargaining power?)
max. 10 Marks for … Report is clearly structured and easy to read Sources included and referenced according to the Harvard Referencing Guide	**5**	• minor issue: sort references alphabetically ! • minor issue: some parts are 1.5 line-spacing others are single spaced • Q3b: NineMSN and "Times reader" stories lack references
max. 25 Marks for … Case discussion	**20**	• Does the group show a firm understanding of the concepts they use? (knowing that) • Are those concepts applied in a meaningful way? (knowing why)
out of 100 marks :	**70**	

C.6 Feedback Survey

Feedback SP7, 2006/2007 - "Intro to e-Business"

Survey Instructions - How to use this survey?

This survey contains single choice and free text questions. The answer boxes for free text questions include some points you may consider when answering the questions. A good way to think of this feedback form would be to imagine a written interview.

This survey is seeking as much detailed feedback as possible. Your responses will be very important information in determining the future design of this course. You may need some 20 - 30 minutes to complete the survey.

Many thanks, Christian Voigt

1. How do you rate your expertise using computers?

- ○ Beginner (I have just started using IT)
- ○ Average user (I am comfortable with Word and PowerPoint)
- ○ Expert (I am studying IT / IT is part of my hobby)

2. How much time per week did you spend with this course (on average)?

- ○ Less than 1 hr
- ○ 1 - 3 hrs
- ○ More than 3 hrs

Comments regarding course workload:

```
* Did the workload meet or exceed your expectations?

* Do you think fortnightly deadlines are better or worse than, for example, two major
assignments?

* How well could you integrate coursework with your other daily life activities?
```

3. How would you rate the case studies used in this course?
(Amazon's business model, Small tourism e-Business, Moncrief's case, Great firewall)

- ○ Very useful
- ○ Just useful
- ○ Little useful
- ○ Not useful
- ○ Not applicable

Comments regarding case studies:

```
* What did you find interesting or dull about the cases?

* What did you find easy or difficult about the cases?

* Do you have other suggestions regarding the cases?
```

4. How would you rate the support materials available on the course homepage?

- ○ Very helpful
- ○ Just helpful
- ○ Little helpful
- ○ Not helpful
- ○ Not applicable

Do you have comments or suggestions regarding the course materials?
What did you find helpful in these materials?

```
* Readings concerning the case method or critical thinking

* Suggestion for effective group meetings on course homepage

* Sample case reports / case critique

* Help pages for Centra meetings / Centra installation

* Any other materials?
```

5. How would you rate the feedback to your case reports?

- ○ Very helpful
- ○ Just helpful
- ○ Little helpful
- ○ Not helpful
- ○ Not applicable

Comments regarding the feedback to case reports:

6. How would you rate the support for your group management from the teaching staff ?

- ○ Very helpful
- ○ Just helpful
- ○ Little helpful
- ○ Not helpful
- ○ Not applicable

Do you have any suggestions or comments regarding the group management?

```
* What impact did the marking of group management have on your group work?

* How did your tutor / course coordinator help you solve group issues?

* Anything else
```

7. How was your experience of group work in this course??

- ○ Very enjoyable
- ○ Enjoyable
- ○ Unpleasant
- ○ Very unpleasant
- ○ Not applicable

8. How would you describe your learning from working in a group?

```
* How did this course contribute to your active listening skills? (e.g. following a paths
of reasoning different to your own ideas)

* How did this course contribute to group coordination and leadership skills?

* Any further comments / suggestions?
```

9. How would you describe your group's performance?
You may rate each aspect in the textbox below as '*high*', '*medium*' or '*low*' and then add any commentary after that.

```
* How would you rate the degree of coordination in your group?

* How would you rate motivation and commitment in your group?

* How would you rate the support for each other in your group?

* Any further comments / suggestions?
```

10. How would you describe your learning from the preparation and discussion of the cases?
You may rate each skill in the textbox below describing your learning as '*high*', '*medium*' or '*low*' and then add any comment

```
* How did this course contribute to your critical thinking skills? (e.g. considering
different perspectives)

* How did this course contribute to your problem solving skills? (e.g. looking for
feasible / creative solutions)

* How did this course contribute to your argumentation skills? (e.g. giving good reasons)


* Any further comments / suggestions?
```

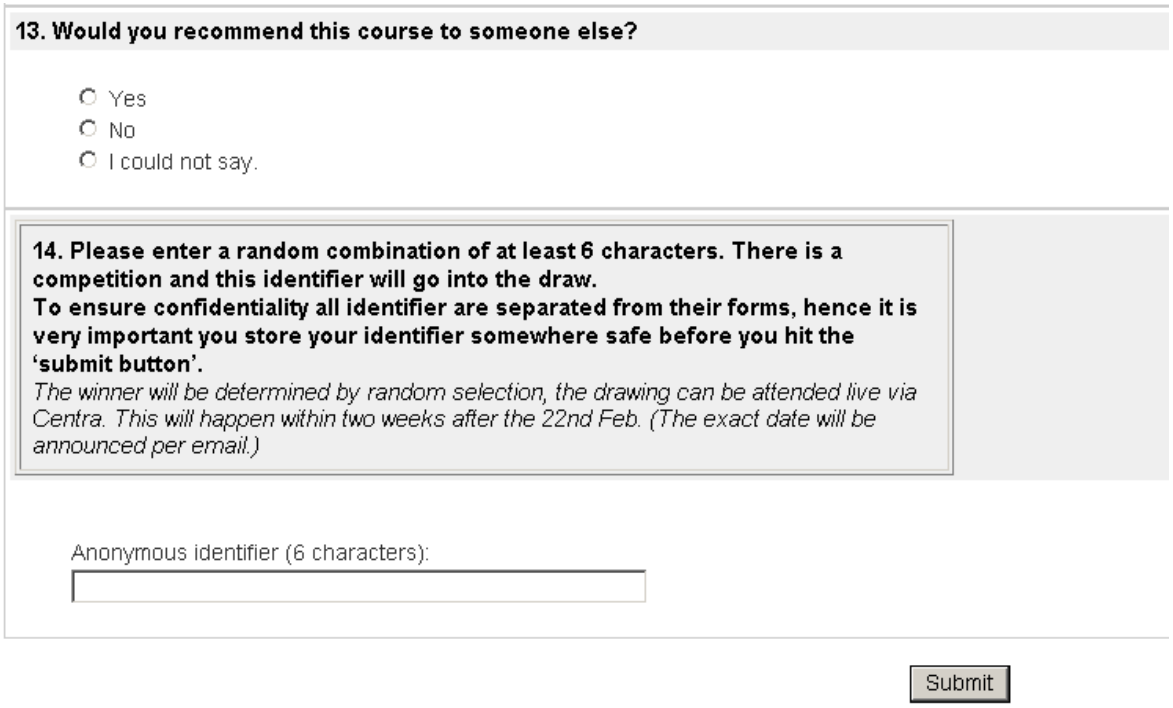
11. How would you rate the usefulness of Centra meetings?

- ○ Very useful
- ○ Just useful
- ○ Little useful
- ○ Not useful
- ○ Not applicable

Comments regarding Centra meetings:

```
* How easy or difficult was it to agree on meeting times?

* How did Centra meetings contribute to your understanding of the cases?

* How did Centra meetings contribute to the forming of a 'group feeling'?

* How did you capture the results of your Centra meetings?

* Did you listen to meeting recordings?

* Any further comments / suggestions?
```

12. In your experience, how are online courses different from traditional, face to face courses?



D Centra Pilot Study (SP2, 2005)

D.1 Entry Survey

Replies are indicated in brackets …
Total number of respondents: 21 (100%)

1. Question: Your email …

---

2. Question: How often do you have access to your computer?

Option 1: Daily	18 (85%)
Option 2: 3 times a week	3 (15%)
Option 3: Less than 3 times a week	0
Option 4: I don't know yet	0

---

3. Question: What sort of Internet connection (bandwidth) do you use?

Option 1: Dial Up	9 (42%)
Option 2: DSL or Cable	12 (58%)

---

4. Question: Instant messenger (e.g. MSN, Yahoo)

Option 1: I haven't used it before.	4 (19%)
Option 2: I know the basics.	9 (42%)
Option 3: I am an experienced user.	8 (39%)

---

5. Question: Internet telephony (e.g. Skype)

Option 1: I haven't used it before.	19 (90%)
Option 2: I know the basics.	2 (10%)
Option 3: I am an experienced user.	0

---

6. Question: Internet conferencing systems (e.g. Netmeeting)

Option 1: I haven't used it before.	16 (76%)
Option 2: I know the basics.	4 (19%)

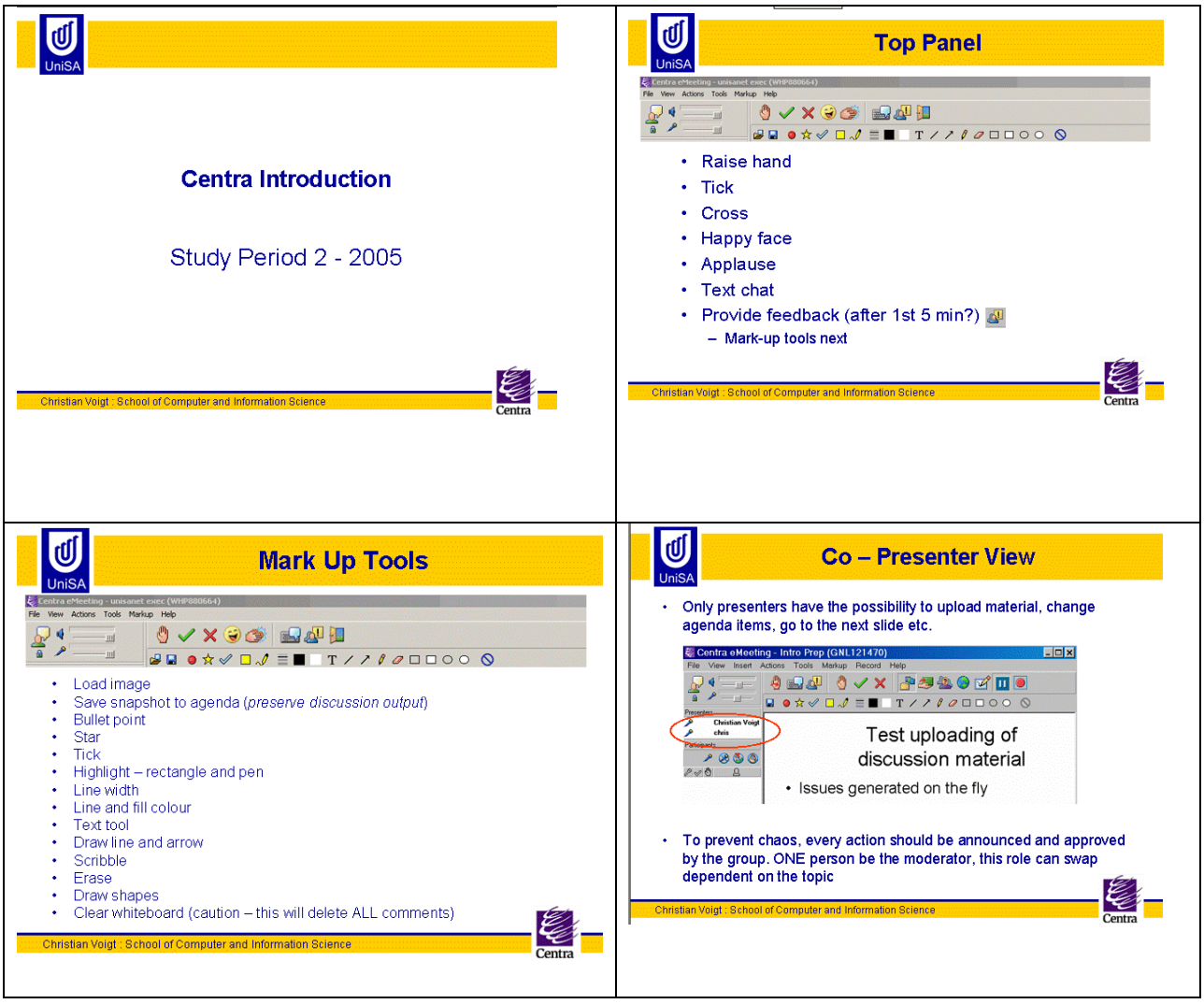
Option 3: I am an experienced user. 1 (5%)
---

7. Question: How would you like to communicate for your group assignments.

Option 1: Chat 15 (71%)
(http://www.unisanet.unisa.edu.au/myHelp/resources/student%20help/Chat%20groups/Overview.htm)
Option 2: Centra - virtual classroom 6 (29%)
Centra Product description: http://www.centra.com/products/symposium/index.asp
For a quick intro - highly informative video (7 min) at
http://webreal.centra.com/CentraSymposium.wmv

8. Question: Please fell free to make any comments …

D.2 Centra Training Session



Using PowerPoint

- In preparation of any meeting you can submit ppt to the moderator (presenter)
  - **Possible items could be**
    - Issues for the agenda
    - Preliminary answers to be adapted during session
    - Give input even if you can't attend every session
    - Screen shots
- Try to upload "Test-Uploading.ppt"
- Any slide can be altered and new version is attached at the end of the agenda
- Any Agenda item can be printed – unfortunately only one by one (File ----> Print)

Text Chat

- There are public and private (send to …) chats
- "Urgent" – chat window pops up on the other persons screen, otherwise keyboard background changes to yellow indicating
- Usage:
  - When audio fails
  - Keeping issues and decisions (conveniently tagged with names)

White Board

- Visual explanations (Cause and effect, hierarchical relations, concept maps)
- More complex drawings should be prepared beforehand
  - .giv and .jpg files can be uploaded on the fly
- White Board content is preserved as long as you don't "clear background"

Application Sharing

- Presenter can provide group with any application he/ she likes
- By giving application sharing rights to group members, they can use the tool as if it were on their own computer



- Test: Excel … Bandwidth demanding

Web Safari

- Take the group to relevant resources on the Web e.g ebao's clients
  http://www.ebaotech.com/solution/clients_en.shtml

  Any useful information catalogue

