Towards reconstructing meaning
when text is communicated electronically

by

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ABSTRACT

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                  Communicative Action, Radicalised modernity, trust, information, space
                  and time, computer-mediated communication

Modern society frequently fails to achieve the goal of improved rationality and this is largely
because the conditions for ideal speech do not prevail. We do not always permit everyone an
equal opportunity to explain their point of view and the force of the best argument does not
always prevail. Communication becomes more difficult when people cannot meet face to face,
but it is also hindered when people cannot contact one another easily. There is, therefore, a
trade-off between using computer-mediated media for communication and speaking to each
other in person. Although meaning can never be shared to the extent that two individuals have
precisely the same interpretation of a concept, and society is not based on individuals uniformly
embracing identical views or values, in every day life consensus needs to be reached and truth
claims, normative validity claims and aesthetic validity claims must be made, debated and
eventually accepted or refuted

Collaboration on substantial tasks that require the development of concepts and reconstruction
of meaning depends on effective communication. In the distributed social structures which have
developed as a result of globalisation it is important that dispersed teams are able to work
together. This includes collaborative learning in distance education.

In the action research undertaken first year Informatics students could choose between doing
team work face-to-face, or as dispersed teams communicating via e-mail or WebCT. The
discussions were recorded and were analysed to identify the different types of communicative

action engaged in. This was done to understand how this group collaborate so that success factors could be identified and proposals be made regarding education in the use of e-mail. It was found that the virtual (dispersed) teams studied did not succeed in collaborating.

Communication ability is defined in this thesis as the skill that compensates for the inherent leanness of the medium used. A number of depictions of factors contributing to successful asynchronous collaboration are provided. Different classes of information and time, trust and communication ability assist in constructing meaning when text is communicated electronically. This led to suggestions regarding improving the communications ability of individuals.

I declare that

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is my own work and that all sources that I have used or quoted have been indicated and acknowledged by means of complete references

P M Alexander

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Chapter 1

Introduction

"Ours is a brand-new world of allatoneness.

'Time' has ceased, 'space' has vanished.
We now live in a global village...a simultaneous happening."

Marshall McLuhan and Quentin Fiore,
The Medium is the Message, Random House (1967)

1.1   Introduction

Computerised information systems have progressed from those that could simply replicate or automate the most simple numeric tasks previously performed by clerks, to those that are intended to convey far more complex information. Information is created so that it can be shared and the expectation may be that any two people reading it would interpret it identically, and hence that meaning would be shared without difficulty. As the information becomes more complex however, it becomes less and less likely that this will be the case and this presents us with one of the key problems of the Information Systems (or Informatics) discipline, namely, how to use technology to assist people to share meaning derived from complex information and how to teach people to use the technology optimally. The central purpose of this thesis is to explore one aspect of modern technology, namely e-mail, and its role in allowing people to share meaning.

This thesis does not try to identify how individuals share meaning in general, but investigates how communicating via e-mail affects the functioning of virtual teams (or dispersed collaborative teams), and in particular, how this influences the viability of such teams in telematic (or web-based) education. Virtual teams have clearly defined objectives, which require the team members to work together on a single project that is not routine, and requires joint problem solving. The research topic is relevant, therefore, with respect to specific new social structures (virtual teams and virtual organisations) and new organisational outcomes (for example, web-based education).

Although the research is carried out within the specific area of interest described above, it fits within the wider area of organisational change management, particularly the adoption and adaptation of technology within organisations. Orlikowski's model of the duality of technology [Orlikowski, 1992a] proposes *"a perspective that positions IT centrally within the process of Structuration"* [Orlikowski & Robey, 1991:5] and this has been applied in various case studies studying use of technology [Olesen & Myers, 1999; Okamura et al, 1995; Orlikowski, 1996; 1992b; 1991]. Orlikowski's model depicts the relationships between institutional properties, human agents, and technology. Not only do organisations use technology in sometimes unexpected ways that reflect their needs and character, but the technology will also bring about changes to the organisation's structures and procedures. The use of e-mail by a task-oriented team will similarly affect the functioning of the team and the team will use e-mail in ways that reflect its individual character.

This research also reflects the change of emphasis in information systems development from developing customised systems to developing tools which are flexible and easy to use. This is a very significant change, as it allows end users at all levels in organisations, and society as a whole, to use technology more actively, and to find, manipulate, and reconfigure information to suit their own purposes. Access to such tools and the information resources that they make available are potent factors contributing to economic and social development. This close and unavoidable interplay between technology and society (including the individual) is the reason Information Systems is considered to be a social science. Information technology tools that access formal databases and retrieve information have been widely adopted in organisations, but technology such as mobile telephones and e-mail is used extensively by individuals in their work and private communication. Thus, the use of e-mail has social consequences far beyond the work environment. There is likely to be an effect on society as a whole, which is similar in some ways to the effect that Orlikowski's model of the duality of technology describes within organisations with a more formal structure and clear purpose. In other words, the adoption of e-mail as a means of communication will result in e-mail being used in ways that are not foreseen, and social structures will themselves begin to change as a result of this use of technology. In particular, in the educational context, the use of virtual teams is likely to produce unexpected team behaviour, unusual new patterns of use and ways of using it, and changes to the educational system. This type of finding has been reported extensively with respect to general use of e-mail.

The research undertaken here differs from the general body of research on computer-mediated communication in its emphasis on collaborative learning. This research has found that individuals, using e-mail as a means of communicating during collaborative work, need extensive training as to how to compensate for the intrinsic leanness of the medium. A variety of frameworks, and depictions of factors and their interrelationships were developed as concepts emerged during this research. These are described further in Section 1.5.

1.2   Motivation for this study

The proposed research contributes to one or more of the future research challenges proposed by Leidner and Jarvenpaa [1995].

> "*Research is needed on technology applications to promote sociocultural learning* " which is described as "*... to immerse students in the content of the material, yet enabling them to communicate and contribute their own ideas and values based upon their own culture*. *... Research is needed on the added value of technology to the learning models. ...*

> *Research is needed on the influence of moderating variables on the learning models and their technological enhancements*"

The research for this thesis makes specific reference to a web-based learning environment. This is appropriate as the concept of sharing complex information and reconstructing meaning lies at the core of education, particular at university level. Along with the unprecedented speed and enthusiasm with which the Internet was adopted came the idea that it could also be incorporated into education. It can be, and is, used widely as a form of electronic notice board, a medium easily accessible from anywhere at any time on which factual information can be stored. The essence of education is not, however, the provision of lecture summaries, schedules, or even allowing individuals access to their own, private, information such as marks or account information. The importance of deeper discussion of topics and the active involvement of the students in these discussions, and thus in constructing their own knowledge, is central to the constructivist model of learning.

Seely Brown and Duguid [1996] say,

> *"Learning, at all levels, relies ultimately on personal interactions and, in particular, on a range of implicit and peripheral forms of communication, some of which technology is still very far from being able to handle proficiently."*

Dreyfus [1999] points out that the claims made for web-based learning tend to be unrealistic and that only the first two stages of learning (the aesthetic where there is almost no commitment, and the ethical where commitment is temporary) can be implemented with information technology. Seely Brown and Duguid [1996] and Dreyfus [1999] emphasise the role of the community of practice in education and the apprenticeship which is served by students. This thesis describes an investigation as to what evidence there is that a learning community can not only survive but prosper when communication is predominantly via e-mail.

An attempt has been made to go beyond the type of research which studies the inclusion of the technology in education from an instrumental point of view and instead investigates the impact of the technology on the process where learners construct meaning. This involves aspects of both impact and effectiveness.

> *"In general, evaluation research in this area, whether quantitative or qualitative, is scarce. There is an urgent need for conducting systematic and rigorous evaluation research to further improve the understanding of the impact and effectiveness of these new learning environments."* [Beller & Or, 1998]

There is also a need to do research on the use of virtual teams, both in education and in virtual organisations, as there is a lack of experience and knowledge in this area. The value of virtual organisations has been questioned [Chesbrough & Teece, 1996], the difficulty of managing dispersed teams has been noted [Handy, 1995] and the possibility of actually collaborating via a lean medium has been queried [Introna, 2001; 1998]. Thus, there are several different lines of research that could be followed. In this thesis the emphasis is specifically on the construction and reconstruction of meaning via e-mail and this is largely independent of the organisational context[*]. The research is therefore equally relevant to an educational environment and a business environment. The unit of analysis is the individual and the team, not the organisation.

> *"... one aspect of structuration that Giddens has repeatedly stressed as central to his concerns, and in which IS play an increasingly important role, is issues of time-space distanciation. For example the use of IS to support the globalisation of organisations, especially those such as professional service organisations for whom their product is the intangible expertise of their members, provides what would appear to be a particularly fruitful site for the exploration of these issues."* [Jones, 1999]

It is specifically in this context that this thesis refers to the writings of Anthony Giddens. Structuration theory as a whole is referred to on occasions but the thesis is not specifically oriented around the concepts making up structuration theory. Nevertheless the intention is to remain true to the central tenets of structuration theory, avoiding all suggestion of determinism, and seeing the human participants as intelligent actors but recognising that unforeseen events can influence outcomes.

Since the intention of this study is to examine how successfully meaning can be reconstructed from e-mail messages, it is essential that the concepts of "information" and "meaning" are examined in detail. In order to do so definitions obtained from a number of different sources are given in Chapter 3 before an attempt is made to arrive at some understanding of basic concepts, namely, data, information, meaning, understanding, knowledge, wisdom and insight, interpretation and learning and appropriation. In Chapter 5, various aspects of computer-mediated communication are discussed. Information Richness Theory, extensions to that theory, and other social definition theories in the context of communication richness are discussed in that context. The topic of the use of the Internet in education, or telematics in education is discussed in the last section of Chapter 5.

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[*]It is important to emphasise that in this thesis, meaning is constructed and shared at the level of the individual and not that of the organisation. Boland [1996] raises concerns about the use of Structuration Theory in studies on shared meaning within organisations as he says meaning cannot be fixed even in policy. This particular problem is not applicable here.

In Chapter 6, Hofstede's [1997] work on cultures in organisations is mentioned as the multicultural nature of South African society is an important factor in this study. The fieldwork undertaken as part of this research involved group work by students and the relationships within the groups is considered a factor requiring attention. Organisational and social culture is one factor. Another is the ability of the team to develop trust within the relationship. Hence, the topic of development of trust in virtual teams is also discussed in Chapter 6.

This variety of different aspects could justifiably lead to the comment that they are not all handled in sufficient depth, that the thesis is fragmented, too long or lacks focus. An attempt has been made to produce a logical and cohesive body of work in which the contribution of all of these aspects has been clearly identified.

1.3   Definition of problem and research questions

The study took place in a multicultural, education environment, using telematic (web-based) teaching. This was an ideal research environment in which to carry out **critical, interpretive, action research to illustrate whether e-mail can be used successfully by students working together on tasks and projects which require them to construct meaning within culturally homogeneous groups.** In order to see whether meaning and individual interpretations can be communicated, the topic of the communication must be more than just factual. It must reflect the point of view of the originator of the message in a fairly subtle way and have an intention to construct a common understanding and potentially also allow for a new view to emerge which is shared by the team. In other words, there should be an opportunity to do collaborative work as a team.

A number of sub-questions were identified and these have been grouped according to the generic research questions for processed-based research proposed by Roode [1993]. (The list of sub-questions and a summary of the findings related to them, or alternatively, references to the associated discussion, are provided in the final chapter of the thesis.) The What is? questions explore the fundamental nature or essence of the research problem. Many of the answers to these questions were found during the literature survey. Nevertheless, this process did lead to some original thinking as different ideas from different sources were compared. In particular a classification of different types of information was devised. The How does? questions were answered by directly observing the phenomena and describing them. Answers to these questions were obtained from both the quantitative and qualitative parts of the research. The Why is? questions explain and determine relationships. The analysis and interpretation of both the quantitative and qualitative data provided insight with respect to these questions. The

final group of questions, the How Should? questions, are answered by means of conclusions reached from the research.

Whetten [1989] explains that the factors that are logically considered as parts of the explanation are essential elements of a complete theory, and that both comprehensiveness and parsimony are required. The long list of sub-questions is contrary to the goal of parsimony. Unfortunately in such a complex topic it is impossible to eliminate factors with any certainty.

1.4 A Road Map to the thesis

The Internet and in particular e-mail is an example of technology that is commonly used in the society of the early 21st century to replace other communications media. This is because it is so convenient (quick, cheap, easy, ubiquitous). This e-mail communication has made virtual teams possible and business-to-business use of the Internet has made virtual organisations possible. One new manifestation of this form of organisation is the use of the Internet in tertiary education. The "*globalising impact of the media*" [Giddens, 1990: 77] began with newspapers and the advent of the Internet has accelerated globalisation to an extent that is having a massive effect on world trade, economics and many other aspects of life including education. The empirical research done in this thesis, and described and analysed in chapters 7, 8 and 9, focusses in particular on the use of dispersed collaborative teams (or virtual teams) within education.

In probing the effectiveness of the use of e-mail as a medium for team collaboration we need to explore underlying concepts and theory. At the most pragmatic level various extensions of the original theory of information richness and issues associated with computer-mediated communication in general need to be explored. This is done in Chapter 5. Concepts more directly associated with collaboration and in particular virtual teams are discussed in Chapter 6. Fundamental concepts regarding information, meaning and learning are discussed in Chapter 3.

As pointed out above, the Internet is the major technology underlying globalisation. Giddens says, " *Modernity is inherently globalising*" [Giddens, 1990: 63]. Globalisation has as its underlying concepts the distanciation of time and space. Hence modernity, globalisation and time and space are discussed in Chapter 4, depending to a large extent on the work of Anthony Giddens. This section contributes to the thesis as a whole by introducing some particular characteristics of radicalised modernity, namely trust and the reflexive project of the self, which are referred to in the final depiction of the role of information in collaborative teamwork (Chapter 9, Figures 9.7, 9.8 and 9.9). Concerns regarding technology and globalisation raised by Giddens are particularly relevant in a discussion on computer-mediated communication.

Chapter 1	Introduction

Theories and philosophies

Chapter 2	**Information Systems Research**	**Chapter 3**	**Data, Information and Meaning**	**Chapter 4**	**Radicalised Modernity and new technologies**

Chapter 2 — Information Systems Research

Objective, subjective, and intersubjective ontologies

Interpretive and critical hermeneutics

Frameworks

Assumptions about the nature of social science

I S research methodologies associated with strategies

I S research methods associated with methodologies

Chapter 3 — Data, Information and Meaning

Data, capta and information; Learning theories

New taxonomy of information

Information[2] rich information

Information[1] lean information

Information[3] appropriated information

Information[4] tacit information

Chapter 4 — Radicalised Modernity and new technologies

Giddens
Modernity
Globalisation
Time
Space
Trust
Risk

Habermas
Modernity
The system and the lifeworld

Modern MIS

Case Study

Chapter 7	Research design

Action research using a critical, interpretive research method

Chapter 8	Problems of diversity	Chapter 9	Evidence of reconstruction of meaning

Summary of the quantitative results[*]   Qualitative results

Chapter 5	Computer Mediated Communication

Information richness
Telematic education

Chapter 6	Virtuality, teams, and trust

Virtual organisation
Virtual teams
culture, trust

Organisations and Technology

Chapter 10	Conclusion

Figure 1.1: A road map of the thesis

A second relevant aspect of this topic is the 'one-sided rationalisation' of modern society (or radicalised modernity). An over-emphasis on efficiency and effectiveness has tended towards the reification or commodification of human life. Habermas has discussed this problem in detail in The Theory of Communicative Action, vol II, *Lifeworld and System: A Critique of Functionalist Reason [1987].* The Theory of Communicative Action is referred two in two different ways in the analysis of the research presented here. The different forms of communicative action are used in analysing the team communications and the concepts of the 'colonisation' of the lifeworld by the system are related to the research. This is introduced in Chapter 2.

Thus this thesis is built up by examining the social philosophy of Habermas, namely the Theory of Communicative Action, together with concepts of globalisation (space and time) and the effect this has on trust and risk discussed by Giddens. The particular role played by technology in late or radicalised modernity is discussed with respect to the system and lifeworld and globalisation. More specifically computer-mediated communication is examined as it used by virtual teams in a dispersed teaching environment. The consequences of this type of communication in the context of collaboration is studied in depth with particular reference to the types of communicative action, communicative coherence, richness of information and aspects related to trust. The overall structure of the thesis is illustrated in the road map in Figure 1.1.

The thesis can be considered to consist of five parts:
- The introduction (Chapter 1)
- A theoretical and philosophical part

   More general theories, including definitions of various views of ontology, and epistemology were examined in this part.

   Chapter 2: This chapter defines and discusses ontology and epistemology. It includes a model of the relationship between forms of rationality and the worlds to which they apply, methodologies, research methods, Information System research is discussed and three new research frameworks[*] proposed. Finally a choice of research paradigm, based on the frameworks, is made.

   Chapter 3: Data, information, meaning, and learning are discussed. This led to a new classification of Information types.

   Chapter 4: Radicalised modernity and new technologies are studied. The interaction between time, space, modernity and information systems is examined with reference to Habermas and Giddens.
- An organisational and technological part

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[*]The model and the research frameworks are described in more detail in Section 1.5, The outcomes.

Theories and research findings related more specifically to technologies were examined in this part.

Chapter 5: Different views of information richness are studied and a discussion of web-based education follows.

Chapter 6: Virtuality, virtual teams, culture, and trust are discussed. Factors affecting trust are identified and team activities are analysed with respect to time, trust and information.

- The action research which was done is described.

Chapter 7: The research design is described.

Chapter 8: A summary is provided of the quantitative data which was analysed with respect to diversity (different cultures). (The quantitative research is described and discussed in detail in a separate paper which has not been submitted as part of this thesis.) This provides an understanding of the context within which the research was undertaken.

Chapter 9: The qualitative data is analysed with respect to reconstruction of meaning. The model from Chapter 2 is used and two new models are created.

- Chapter 10: The conclusion including an overall model of the factors influencing the construction of meaning when text is communicated electronically.

1.5 The outcomes

A variety of outputs have resulted from this research. The What? questions resulted in the classification of types of information. The Why? questions were divided into two groups, those which were related to cultural diversity and those concerned with reconstruction of meaning. The findings constituted the output from this aspect of the research.

The How? questions resulted in the construction and use of three different diagrams highlighting the relationships of key factors.

- The first diagram (Figure 2.1) uses Habermas' Theory of Communicative Action and is a representation of the relationships between forms of rationality and the worlds to which they apply. This was developed in Chapter 2 and applied in Chapter 9.
- The second is derived from the first and is a very simple representation of the interaction between rationalities and intentional behaviour and is used to characterise the communication of different teams. This was developed in and applied in Chapter 9 (Figures 9.3, 9.4, 9.5, and 9.6).
- The third is a graphic overall representation (depiction) of the role of information in collaborative teamwork. This was developed in and applied in Chapter 9 (Figures 9.7, 9.8, and 9.9).

- Finally an overall model is produced in the last chapter (Figure 10.1) in which the interplay of the key factors on the reconstruction of meaning is shown.

A number of subsidiary diagrams have been created which indicate relationships between elements, particularly those to do with trust (Chapter 6). All of these outputs contribute to the final suggestions concerning how virtual teams should be constructed and managed in a learning environment, that is, answering the How Should? Series of research questions.

1.6   Explanation of key terms and concepts

1.6.1   Virtual teams

In this thesis, therefore, a particular type of dispersed group, known as a virtual team, is studied. Virtual teams can be described as " ... *a self-managed knowledge work team, with distributed expertise, that forms and disbands to address a specific organisational goal*" (Kristof et al. [1995] quoted by Jarvenpaa & Shaw, [1998]). Virtual teams are common in virtual organisations and may be considered to be essential in such organisations.

> " *The basic building block of virtual organizations is a virtual team*." [Jarvenpaa & Shaw, 1998]

Nevertheless, as these two authors note, virtual teams are also used in many organisations that are not virtual. Virtual teams should be involved in close collaborative rather than loosely co-ordinated work.

> "*Geographically dispersed, cross-functional teams are increasingly espoused for enhancing learning and innovation, especially in research and development activities*." [Sole & Applegate, 2000]

1.6.2   Collaboration

In this thesis collaboration will be understood as a very close form of cooperation in which team members work together on a single or integrated task and jointly construct meaning [Thomas, 2000].

The value of collaborative work, both in an educational environment and in a work environment, is generally accepted. Central to the idea of collaboration is the fact that the participants jointly construct a solution by working together closely and sharing meaning. This is in contrast with co-ordinated work where the participants divide the work and each team member completes one part. As virtual organisations are becoming a frequently encountered type of organisation, research is increasingly being focussed on dispersed collaborative groups made up of participants from the geographically separate parts of the organisation.

1.6.3 Co-operation

Co-operative work is a broader concept which includes tight collaboration and loose co-ordination [De Villiers, 1995]. This is in contrast with Introna's definition. Introna [1998] defines co-operation as that which "*... happens when people engage in the production of a work as if 'one mind or body.' Where there activities fuse together in a way that make the suggestion of separation seem incomprehensible.*" What Introna refers to as co-operation will be referred to as collaboration throughout this thesis.

Computer-supported co-operative work (CSCW) and computer-supported co-operative learning (CSCL) focus on the development and adoption of technology to assist groups working or learning together.

1.6.4 Sociocultural learning

The sociocultural model of learning, a form of constructivist learning, recognises the importance of students working together in teams and actively participating in collaborative learning. This helps students to relate information obtained from outside sources to their own cultures and lifeworlds. This research explores the feasibility and efficacy of e-mail, which is a communications technology commonly available to students, in collaborative learning. This provides a genuine and appropriate example of an attempt to "reconstruct meaning, where text is communicated electronically".

1.7 The underlying epistemology

This research adopts an inter-subjective or social ontology. The works of two social scientists, Habermas and Giddens, have been studied in some depth. Habermas has been studied for two reasons. Firstly, his philosophy of societal rationalisation is based on his theory of communicative rationality. This emphasis on the role of rational discourse in society is closely

associated with meaning and shared meaning and these concepts are central to this thesis. Secondly, Habermas has examined and criticized modern society and, in particular, the role of the "system" (consisting of the economic and administrative systems which are involved in material reproduction) and its influence on the lifeworld. He believes that this influence results in a serious distortion which can bring about the breakdown of interpersonal relationships. Thus, an investigation into the role of technology in the process of personal communication can be usefully informed by his critique of the interaction of the system and lifeworld.

Giddens' explanation concerning the distanciation of time and space also contributes to the theoretical framework within which this study was conducted. Giddens refers to the society of our time as late modernity, post-modern society and finally as radicalised modernity and states that the way in which time and space are viewed and reinvented have an important effect on our society.

A sociocultural model of learning is adopted which is consistent with both the ontology and the Theory of Communicative Action. The influences of social factors on the use of technology (that is, social theories of technology adoption) are recognised.

Orlikowski and Baroudi [1991] refer to the type of research that is conducted here as being concerned with the social processes surrounding Information Systems. In the case of this thesis, the social processes examined are:

- How information technology should be introduced into organisations (in this case a university);
- Computer-mediated support of communication (here this is e-mail); power shifts generated by technology; (A teacher-centred, lecturing approach is modified by including a learner-centred, collaborative component, which can be supported by technology in the form of groupware and communications software. Here we will be referring only to the role of e-mail.)
- This relates to a broader issue, namely, the effect of the widespread use of technology on individuals, organisations and society in general, and this is discussed with reference to Habermas and Giddens.

The research method used, is interpretive action research in which the underlying context is explored in detail. No attempt has been made to search for universal laws. Data is presented directly from field notes and the researcher's experiences, interpretations and observations of participants.

1.8 Limitations and restrictions

How people share meaning, or how one person can reconstruct the content of a message so as to understand it and can build on that understanding by including insights from his own experience, is a fundamental feature of human existence. This process (or ability) is the essential business of teamwork. It is, in a sense, unknowable and is also the domain of philosophers, psychologists and educators. The actual research component of this thesis is limited in its scope to the role that one form of technology (and here the way in which the technology is used must be included), namely e-mail, plays in this process. A formal study of text analysis, discourse analysis and speech act theory was considered to be beyond the scope of this thesis.

1.9 The inclusion of the research frameworks

Chapter 2 includes an extensive review of philosophies of science, epistemology, research paradigms and research methodologies culminating in a series of research frameworks. The first of these frameworks identifies different assumptions concerning human nature, and associates them with Habermas' classification of validity claims. The second links research methodologies to research strategies and the final one associates the different methodologies with research methods. This review could be considered to be unnecessarily detailed, to cover too wide a scope and to repeat material that has been discussed widely elsewhere. It proved to be useful for the following reasons.

- It was important to identify an ontology upon which this study could be founded, and to build ideas from that base. Socially constructed reality and the basic concept of shared reality were identified as being appropriate. Starting from the most basic philosophical level helped the researcher understand the work of Habermas and Giddens and this eventually formed a solid, theoretical (epistemological), foundation for the study. The representation of the relationships between forms of rationality and the worlds to which they apply, which was developed in Chapter 2, was applied in Chapter 8 when analysing the research results.
- The frameworks provide a summary of the review undertaken and provide links between the different levels of thinking about research and methodologies and methods for carrying it out. This assisted in selecting methodologies and research methods which were appropriate for and consistent with the underlying epistemologies.

- This research includes a number of different aspects associated with different disciplines. The multifaceted nature of the research meant that methodological pluralism was advisable. It was necessary, therefore, to examine a variety of approaches and research methods. The choice of research methodologies emerged from the process of developing the research frameworks and the research plan in total was developed using the research framework.

- Although an intersubjective view of reality is adopted for this research, the basic concepts of data, information, and meaning, which are explored in detail in Chapter 3, are also considered from objective and subjective points of view so the three views identified in the first framework are used to analyse these fundamental concepts.

- The development of the framework ensured that the theoretical framework and assumptions were clearly stated from the beginning as Orlikowski and Baroudi [1991] advise. The section explaining the choice of paradigm for the research (Section 2.8) refers directly to the three frameworks.

1.10   The interdisciplinary nature of the research

The topic proposed for this dissertation is intrinsically multidisciplinary. It is of interest in the discipline of Information Systems because it is concerned with the adoption of information technology and its use within an organisation. There are, however, also aspects which involve education, psychology, organisational change, communication science and sociology. There is an additional link to the Information Systems discipline as the research was carried out as part of teaching students Informatics (or Information Systems). The interaction between Information Systems and other disciplines, particularly the social sciences, both in research [Klein, Hirschheim & Nissen, 1991; Landry & Banville, 1992] and in systems development [Dahlbom & Mathiassen, 1995], is widely recognised. Interdisciplinary scholarship, bridging the humanities and social sciences, is a fundamental part of the new scholarship emanating from various European intellectual developments since the middle of the 20th century, including critical theory, postmodernism, feminist theory and cultural studies [Agger, 1998: 10]. Agger says that "*the critique of positivism overlaps and informs the critique of disciplinarity*" [Agger, 1998: 10].

1.11   Conclusion

This research investigates a topic that is of interest to educationalists, managers of virtual organisations, and also those concerned with organisations that are dispersed and have employees working together but not from the same locality. The topic is informed by theories

originating from a variety of disciplines. This complex interaction of interests has made it necessary to study research approaches carefully in order to choose appropriate and pluralist research methodologies. It has also necessitated investigating material and theories from the various associated fields of interest.

The Theory of Communicative Action, developed by Jürgen Habermas, has been identified as the basis upon which the research builds and this is supported by concepts of information, time, space, modernity, globalisation, virtuality, trust and culture. The work of Anthony Giddens was consulted extensively regarding modernity, globalisation, time, space, and trust. Although structuration theory is referred to, the thesis does not focus on it or attempt to build on it in any way.

Chapter 2

Information Systems Research

"Furthermore, the objectivist would say that an interpretation is correct or true if, and only if, the meaning that the interpreter attribute to the text is indeed the same, or corresponds to the meaning that the author of the text intended in the creation of the text.

The relativist would contend that the meaning of a text evolves or changes as the historical, social, political, or moral context in which it is interpreted adapts and changes. Thus, in different historical contexts, different interpretations can be made.

Is this true also of the understanding of any text? Is the meaning of all texts realised only when they are understood? In other words, does understanding belong to the meaning of a text just as being heard belongs to the meaning of music?

Understanding must be conceived as part of the process of coming into being of meaning, in which the significance of all statements - those of art and those of everything else that has been transmitted - is formed and made complete."
[Gadamer, 1975: 146]

2.1 Introduction

This chapter is the first of three which are described as discussing theories and philosophies in the road map of the thesis (Figure 1.1 in Chapter 1). Various different basic ontological assumptions (in Section 2.2) and views as to the nature of society (in Section 2.2.5) are examined. In Section 2.3 we see how these lead to different epistemological views and from there to different research methodologies (Section 2.4) or approaches to research and research methods (Section 2.5). Later on in the chapter these are related to Information Systems research. This is done for two main reasons, to develop a research philosophy appropriate to this project and also to as a theoretical basis for the interpretation of the research which is eventually described in Chapter 9.

As already explained in Chapter 1, this discussion is quite lengthy, starts from fundamental questions and could be criticised as unnecessarily covering ground that has been covered extensively by other authors and is, therefore, inappropriate in a doctoral thesis. It is for this reason that an overview (or summary) of the chapter is provided as an Introduction. The reader might choose to skip over sections if they are not of interest.

There are various reasons why this amount of detail has been included in building the research philosophy.

- The research done for this thesis has various aspects and interacts with several different fields of interest. Research methods needed to be identified that would be appropriate for all the facets. Thus, it was necessary to investigate a number of different approaches to research and, once an appropriate approach was selected, different research methodologies which were consistent with the overall approach could be explored. A pluralist research approach was eventually considered to be appropriate.
- The relationship between ontology, epistemology, research paradigms and research methodologies can be confusing. It was helpful to develop some form of overall structure and framework before the research was planned and actual research strategies were selected.
- Authorities specifically call for, evidence of consideration of alternative research methods in PhD dissertations [Walsham, 1995] as well as evidence that the philosophy underpinning the method has been questioned [Galliers, 1997: 142]
- "... *researchers need to reflect on their own philosophical stance, which should be stated explicitly when writing up their work.*" [Walsham, 1995].

As mentioned above a second purpose is to provide a theoretical basis for analysing the discourse in virtual teams to see whether, and how, they reconstruct meaning. In order to do so the usual objective and subjective ontological approaches are discussed and a third, intersubjective view, which underlies the concept of socially constructed reality, is also introduced. This is used as a new dimension when a set of research frameworks are developed in Section 2.6. These three ways of viewing the world are subsequently used in order to highlight the essential purpose of reconstructing meaning - that of developing a shared meaning in a socially constructed world.

Habermas' Theory of Communicative Action is used extensively as the theoretical basis for this thesis and is referred to throughout. In this chapter the theory is introduced as a critical theory (in subsections 2.3.3.2 and 2.3.3.3) and is related to the research frameworks which are developed. Discussions found in the work of Habermas were relevant to many of the questions that arose as the research framework was developed. Giddens' analysis of modernity was found to be very useful as the links between modernity, information technology and the individual are explored in subsequent chapters, particularly in Chapter 4. This work is introduced only briefly in Section 2.8 of this chapter.

In Section 2.6, the academic discipline, Information Systems, is examined to see what academics and researchers believe are the characteristics and true nature of the subject and how the subject matter lends itself to different epistemological views and research methods. Some of the work of authorities (leading researchers) in the field of Information Systems is referred to in order to present current thinking on Information Systems research. In particular, examples of research in this field which refer to the critical social theory of Habermas are discussed in order to justify the choice of the concept of communicative rationality as a basis for this study. The work of Giddens, particularly Structuration Theory, has been used as the basis of a number of highly regarded research projects in this field and these are also mentioned [Majchrzak, 2000; Barrett, Sahay & Walsham, 1996; Orlikowski, 1996; 1992a; DeVilliers, 1995; DeSanctis & Poole, 1994; Orlikowski & Robey, 1991; Walsham & Han, 1991]. The concept of communicative rationality is discussed again in the context of Information Systems research in Section 2.7.

Finally, in Section 2.9, a pluralistic research approach is selected for this research and an attempt is made to justify the choice of epistemology and this research approach. A variety of strategies can be gainfully applied in Information Systems research and inevitably other approaches that have not been used in this research would provide other points of view, which would also be useful.

2.2 Ontology

2.2.1 Introduction

Before one can start to do any meaningful research on any topic, it is necessary to examine our most fundamental assumptions regarding the nature of the world in which we live and how we perceive it. Different points of view concerning reality have been the substance of philosophical debate as far back as records exist. As seems to be the case with most knowledge, there have occasionally been extremely influential thinkers who have set the debate in new directions and there have been periods during which the thinking has continued in the same general direction while being extended and consolidated. Sometimes it seems as if outside influences, such as wars or developments in technology, have been the stimulus to a new philosophical point of view. At other times, the reverse seems to be true, a new ideology has resulted in changes in government policies, attitudes towards science and so on [Banville & Landry, 1989].

Ontology is defined in the Collins English dictionary [1995] as "*the branch of metaphysics that deals with the nature of being; the set of entities presupposed by a theory*". Burrell and Morgan [1979: 1] explain assumptions of an ontological nature as those "*which concern the very essence of the phenomenon under investigation*". These latter two authors then give as an example the question as to whether reality exists as an objective, external, reality or is in fact the product of individual consciousness and hence is subjective.

2.2.2 The subjective/objective dimension

One of the different ontological approaches can be summarised as a view of the world as **objective** or **subjective**. If an objective view is taken of reality, the assumption is that measurements, taken using instruments that are independent of the observer, can be used to fully describe all aspects of reality. A subjective view of reality proposes that each individual has a unique view of the world that can only partially be communicated (if at all).

2.2.3 Realism or Nominalism

Dahlbom and Mathiassen [1995: 9] indicate that it was during the sixteenth century that the era of "modernisation" saw society transformed regarding traditional beliefs and life styles. Agrarian society was very stable and unchanging with unquestioning belief in religion and authority.

Industrial expansion, including the invention of the machine and the discovery of new continents, seemed to provide the stimulus for new concepts of democracy, revolution and religious upheaval. The more or less simultaneous advances in physics showed that the way in which we perceive the world is not necessarily the way it is. The modern idea of a separation between the subjective view of the world and its objective reality arose from these discoveries and resulted in a movement to discover objective "truth" and describe it in unambiguous terms, using mathematics and formal representations. Galileo (1564-1642), Descartes (1596-1650) and Leibniz (1646-1716) were all in the forefront in formulating this theory that supports a view of the world as a mechanism and forms the basis of modern natural sciences. They believed that "*This conception of the language of mathematics, ..., is that of an ideal language that can be read without interpretation.*" [Dahlbom & Mathiassen, 1995: 29]. This world view is realistic and postulates that the external world exists independently of the individual. This was extended to include the view that the social world has an existence that is as concrete and substantial as the natural world. Hence that the social world can also be described using measurable properties that are independent of the observer and the measuring instruments used.

The romantic world view, beginning towards the end of the eighteenth century, contrasts with the mechanistic view and stresses the subjective where previously the objective had been considered to be of paramount importance. It recognises that stable laws do not control all aspects of the world and that change, and even chaos, are a major factor. This view of the world considers people and how they interpret reality as being more interesting than objective reality. The individual, including artistic expression, unconscious desire and uncontrolled emotional expression, is central to the theories of Freud (1856-1939). Society was the primary focus for Marx (1818-1883). The romantics recognise that each individual has a unique view of the world and that this is in part formed by the context and culture of the society in which that individual finds him or herself. The ontological root of this view is that the external world is not real and is made up of artificially created concepts to which we assign labels and names, purely in order to try to impose our own meaning on them. This is known as **nominalism** [Burrell & Morgan, 1979: 4]. This view can in fact even be taken to its logic conclusion of solipsism in which it is asserted that the only thing we can be certain of is our own being and everything that we think of as external to us is in fact impossible to prove and could simply be a construction of the subconscious.

2.2.4   Socially constructed reality

A third world view, in which the two opposing views, subjective and objective, are partially reconciled, takes the position of the individual as an intelligent actor within society or within a network of other actors, social structures and even artifacts. In this view, the individual both changes and is changed by the larger social structures. The interaction between individuals,

leading to mutual understanding, and between individuals and social structures, is considered to be the basis on which society is formed. For example:

- Hegel argues that we are shaped by society as well as shapers of society [Braaten, 1991: 3].
- Latour's Actor Network Theory refers to "actants" which may be people or artifacts and are linked in flexible, heterogeneous, networks [Latour, 1996].
- Giddens proposed Structuration Theory, in which the human agent may shape the social structure as well as shaped by it (the duality of structure) [Giddens, 1984].
- Gadamer's philosophical hermeneutics highlights the importance of recognising one's own prejudices and the need to interpret text in the larger context and the context in terms of the new text (the hermeneutic circle) [Introna, 1992]
- Habermas' Theory of Communicative Action [Habermas, 1984] is founded on the premise that society consists of participants attempting to reach rational consensus. Social reality is constructed through consensus building and is inherently oriented towards mutual understanding. "*...[R]eason is inherently based upon mutual commitments to standards of interaction or communication.*" [Braaten: 5]

2.2.5 The order/conflict dimension

Although the ontological choice between subjective and objective viewpoints is commonly accepted, Burrell and Morgan [1979:11] make use of a further dimension obtained from sociological assumptions about the nature of society, namely whether society is considered to be stable and amenable to consensus (orderly) or naturally turbulent, perpetually changing, with the primary reason for change being struggles for power (conflict). Combining this order/conflict dimension with the object/subjective ontological dimension produces a two-dimensional table (see Table 2.1), each quadrant reflecting a distinctly different group of social theories. This framework provides a useful way of analysing these theories. It is not going to be discussed in any detail here but in this analysis, Critical theory, the social theories of the Frankfurt school and Habermas in particular, are classified as Radical humanist, that is tending towards a perception of society as subjective and conflicted and not, as will be argued in Subsection 2.3.3.1, as Interpretive.

Table 2.1: Four paradigms for the analysis of social theory (adapted from Burrell and Morgan [1979])

THE SOCIOLOGY OF RADICAL CHANGE Conflict			
S U B J E C T I V E	**Radical humanist** *Frankfurt school and Habermas* Critical theory	**Radical structuralist** *Marxist theory* Conflict theory	**O B J E C T I V E**
	Interpretive *German idealism: Kant, Husserl* Phenomenology Hermeneutics	**Functionalist** *Sociological positivism* Objectivism	
THE SOCIOLOGY OF REGULATION Order			

2.3   Epistemology

2.3.1   Introduction

Epistemology: "*The theory of knowledge, esp. the critical study of its validity, methods and scope.*" [Collins English dictionary, 1995]

Epistemics: "*The interdisciplinary study of knowledge and human information-processing using the formal techniques of logic, linguistics, philosophy, and psychology.*" [Collins English dictionary, 1995]

" *... [A]ssumptions about the grounds of knowledge - about how one might begin to understand the world and communicate this as knowledge to fellow human beings. ... [F]orms of knowledge*" [Burrell & Morgan, 1979:4]

Klein, Hirschheim and Nissen [1991: 5] define epistemology as, "*[T]he nature of human knowledge and understanding that can possibly be acquired through different types of research and the appropriateness of the methods of investigation.*"

These same authors take a point of view derived from Habermas, namely that science is considered to be, "*... a convention - related to societal norms, expectations, and values - engaged in the search for understanding.*" [Klein, Hirschheim & Nissen, 1991] Knowledge claims are supported by the force of the better argument and are not final, as further information may result in them being revised.

A central question is, Is knowledge real and capable of being transmitted or personal? Can it be acquired or must it be personally experienced?

2.3.2   Positivist

The positivist approach to extending knowledge is based on the premise of a realistic ontology. The researcher is expected to add to an existing body of knowledge by acting as a remote observer and gathering generally quantitative data from which it is possible to deduce laws. Deductive research, which is a systematic method of deriving conclusions that cannot be false when the premises are true [Collins English dictionary, 1995] may be used. This method is especially amenable to formalisation and study by the science of logic. The rationalists (Leibniz, Spinoza and Descartes) chose this approach. Inductive research, is a process of reasoning that is based mainly on experimental evidence. A general conclusion, which goes beyond the information contained in the premises, is drawn from a set of premises. This type of research is also positivist and was chosen by the empiricists (Locke, Bacon and Hume). The laws, or empirical generalisations, mean that the positivist researcher is not interested in particular cases but in general truths that will allow one to explain and predict outcomes. Research can be replicated and hence can be validated or proved. This means that it is necessary to state hypotheses in unambiguous terms and it is for this reason that positivists prefer to state ideas in mathematical terms. Positivist epistemology implies that society as well as nature can be predicted and controlled. Thus the same methods and aims of inquiry can be applied to both the natural and social sciences (methodological monism instead of dualism).

Braaten [1991: 107] claims that Anglo-American philosophy by and large has its roots in positivism. In the discussion of Habermas' views on positivism, she says that there are three principal issues or "*... major points of difference remain between the direction that Habermas envisions for philosophy and social science and the visions that have been dominant on this side of the Atlantic.*"

Proponents of positive research believe that:
• It is value free (unbiased) and that no other form of research can be unbiased.
• All knowledge is scientific knowledge.
• If a concept cannot be stated unambiguously and be proved by means of the scientific method, it cannot claim to be knowledge (methodological monism).

2.3.3   Anti-positivist

Anti-positivist social philosophers embrace a hermeneutic methodology to seeking understanding and knowledge, not in order to control but to gain enlightenment. This epistemology does not try to find generalised explanations or make predictions but instead aims to allow interpretation and hence, ideally, understanding of particular situations. Dahlbom and Mathiassen [1995:225] say that "*...hermeneutics will help us understand the complex interplay of people, methods and technology, and the important role of interpretation, personal interests, and values involved in the use of these techniques.*" These two authors [1995: 215] also say, "*True knowledge is personal*". The supporters of hermeneutic and interpretive research believe that it is in fact a fallacy that the researcher can, or should be, a totally remote observer. They argue that there are some types of information that can only be obtained by means of a dialogue with the subject. In addition they argue that positivists deceive themselves (and their readers) by claiming that their data are value-free or neutral. The unavoidable bias and prejudices of the researcher inevitably have a bearing on the questions asked, the way in which they are asked, and the way in which results are analysed. In addition, subjects, when replying to even the simplest questions, tend to interpret them differently and cannot be said to reply according to a uniform set of standards.

Anti-positivists criticise the positivist point of view because it denies the possibility of change. They view it as a form of ideology that implies that society is ruled by laws and hence that social change is impossible. "*Critical social theory's critique of positivism is its central and most enduring feature.*" [Agger, 1998:5] "*CST endorses the possibility of progress.*" [Ibid.: 4]

Galliers and Land [1987] maintain that it is difficult to reproduce a real-world situation under laboratory conditions. Only a limited number of factors can be studied in a laboratory and relevant factors may be ignored as it is too difficult to assign values to them.

Various authors, for example Orlikowski and Baroudi [1991], divide research strategies that embrace an anti-positivist epistemology into Interpretive and Critical research strategies or paradigms. Jönssen [1991: 376] sees a key difference between Interpretive and Critical research resulting from the view of society as being ordered or in conflict. Interpretive research believes in underlying social order resulting from the shared norms and practices in

organisations. The interpretive researcher does not adopt a critical point of view but attempts to see issues from the participant's point of view.

2.3.3.1 Interpretive

Burrell and Morgan [1979] consider Interpretive sociology to be the research paradigm associated with a subjective ontology and a view of society as orderly. Hermeneutics, phenomenology and phenomenological sociology are given as examples of social theory within the paradigm. Associated schools of organisational analysis (that is, the study of organisations) are ethnomethodology and phenomenological symbolic interactionism. Hirschheim and Klein [1989] call this paradigm Social Relativism. They believe that in systems development "*emancipation by means of rational discourse*" falls within this paradigm and they refer to Habermas in this context, indicating disagreement as to whether Habermas' theories should be classified as viewing society as fundamentally ordered or in conflict. Certainly, the fact that Habermas emphasises consensus and mutual understanding supports the view that his work is more appropriately considered to be within this paradigm. Possibly Myers [1994] resolves this problem by differentiating between "pure hermeneutics" and "critical hermeneutics". This is discussed below. Myers [1997b: 241] characterises interpretive research as being based on the assumption that, "t*he access to reality (given or socially constructed) is only through social constructions such a [sic] language, consciousness, shared meanings and instruments.*"

2.3.3.2 Critical

Critical Theory is a philosophy of science [Jönsson, 1991] and a group of social (not sociological) theories [Agger, 1998] from which a methodology is derived (or on which the methodology depends). It is based on the philosophies of the Frankfurt School. It is anti-positivist and strives towards emancipatory objectives, is generally considered to take the side of the worker rather than the owner or manager and supports the supposition that society is perpetually in conflict. Hence, in the order/conflict continuum (or dimension) in the framework created by Burrell and Morgan [1979], it falls within the area of the Sociology of Radical Change. This group also accepts an intersubjective (or socially constructed) ontological point of view. This group of theories would, therefore, be classified as Radical Humanism [Burrell & Morgan, 1979: 32] or Neohumanism [Hirschheim & Klein 1989: 1207]. Habermas is one of the most prominent contemporary philosophers who have built on this foundation. Most applications of Critical Theory, refer to Habermas' Critical Social Theory (CST) - consisting of theories of societal rationalisation, universal pragmatics and communicative rationality.

These, and in particular knowledge interests and the concept of communicative rationality, will be discussed in detail in the section following this.

Agger [1998: 4] defines critical social theory as a theory cluster that:

- Opposes positivist research. "*Critical social theory's critique of positivism is its central and most enduring feature*" [Agger, 1998: 5]
- Sees the role of time (history, historicty) as very significant and expects rational social progress in terms of a reduction in oppression, exploitation and domination.
- Regards power and domination as institutionalised, that is, embedded in the structure of society.
- Argues against determinism. The future is not preordained in the past.
- Supports multi-disciplinary research and strives for a holistic perspective.

Critical research should foster criticism and reflection and uncover inherent conflicts and contradictions. Its goal is to initiate change. Lyytinen [1992: 171] advises that, "*more concrete and problem-focussed studies of the implications of Critical Theory for IS*" should be undertaken, "*... critical inquiry is concerned with the improvement of the human condition through IS, criticism of alienated and distorted practices, development of alternative IS forms and organisations, and with finding and enclaving an arena of emancipatory IS activity.*" Ngwenyama et al [1997: 120] say, "*... The CST approach is based on the ideals of emancipation from blind technological rationality and uses of IT that enhances freedom and justice.*"

Ngwenyama [1991: 272] says, "*Although critical social theory does not have its own research methodology, many, currently available interpretative methodologies can be adapted to its needs.*"

2.3.3.3   Habermas' Theory of Communicative Action

Habermas followed in the tradition of the Frankfurt school by developing the Theory of Communicative Action as a critical theory which not only explains the evolution of modern society but also reveals the nature and causes of its failures.

According to Habermas, the evolution of society depends entirely on its ability to extend its rationality and this is done by means of discussion between stakeholders and ultimately agreement (that is, by means of mutual understanding and a common commitment to achieving a rational consensus). The three spheres of culture, derived from Kant's faculties of reason, play a significant role in Habermas' Theory of Communicative Action. These are: The theoretical sphere of science, the practical sphere of morality and law, and the aesthetic sphere of personal perceptions. Habermas contends that each of these, which he relates to the objective,
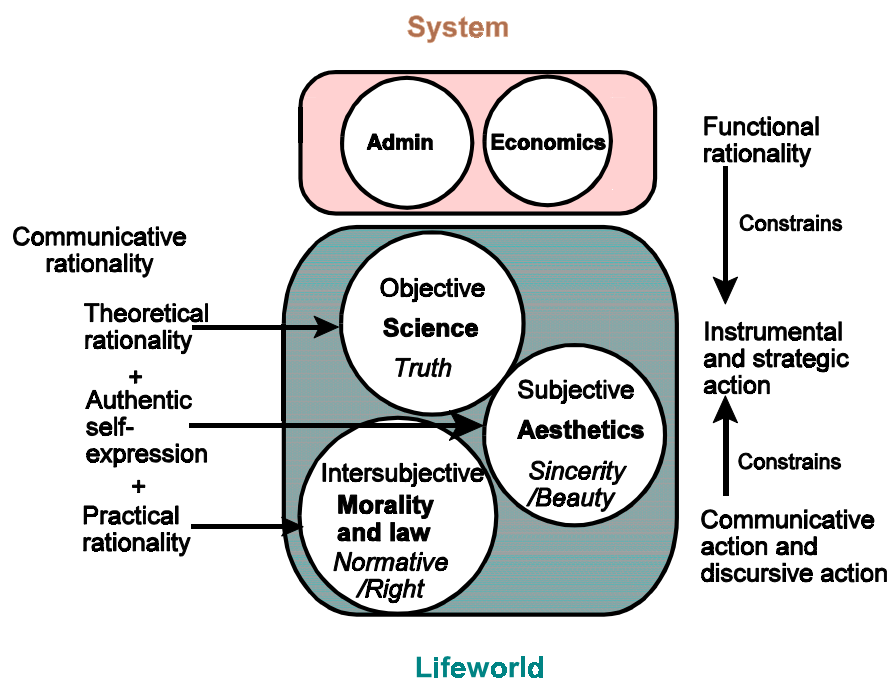
Figure 2.1: Relationship between forms of rationality and the 'worlds' to which they apply

intersubjective or social, and subjective worlds [Braaten, 1991: 61], requires a different form of rationality to be exercised, which together constitute communicative rationality. "*Habermas's conception of communicative rationality encompasses theoretical rationality, practical rationality and the rationality of "authentic" self-expression*." [Braaten, 1991: 72] Figure 2.1 shows how the three spheres are related to the objective, subjective and intersubjective worlds and the various forms of rationality which are applicable. These spheres are applicable to the lifeworld which is both universal and personal. Natural language and behaviour are two forms of action that are used to achieve the goals of the lifeworld.

There are four main types of social action, namely communicative, discursive, instrumental and strategic and they "... *represent different aspects of intentional human behaviour in social setting*." [Ngwenyama & Lee, 1997]. Two of these types of intentional behaviour (or social action), namely communicative and discursive action, are considered to be positive. Communicative action is intended to convey information and hence needs to be clear, complete, and in context, as well as sincere, as the speaker should believe that what he says is true. Discursive action is a more specific form of communicative action, which occurs when two actors do not agree and they justify their opinions by means of convincing arguments. It has the same characteristics of comprehensibility, completeness, context and truth. Thus these two forms of behaviour are manifestations of communicative rationality. The remaining two types of social action, instrumental and strategic action are considered to be negative behaviour and are, therefore, a more limited form of rationality. These types are discussed in more detail later.

As mentioned above, the lifeworld can be considered to consist of three spheres, each associated with a different form of rationality which together constitute communicative rationality. Theoretical rationality is applicable to the objective world of scientific and philosophical knowledge. In this world something is considered to be true if an assertion is made (a truth claim) and is universally accepted. If objections are made to the claim, a process of debate or discourse will be undertaken. The outcome is influenced solely by the force of the better argument. This assumes that ideal speech conditions prevail, that is, that anyone can make a truth claim, anyone else can counter the claim and hence all relevant information will be available. As all participants are committed to achieving consensus on the basis of the most rational argument, there will be no misrepresentation. This theory accepts that truth claims are never absolute as they may be challenged at a later stage and be overturned.

Practical rationality is concerned with determining ethical social norms and also requires universal consensus under ideal speech conditions. Normative validity claims examine generalisable, legal (or justified) needs and interests where, not only does each individual believe that the norm is applicable under all circumstances and should be applied consistently, but that the same norms apply in all societies. These norms govern the intersubjective world.

More frequently, needs and interests are non-generalisable. These personal desires and values, or values belonging to a community, may be considered to refer to the 'good' life rather than the 'just' life. This form of rationality refers to the subjective, aesthetic world and it is not necessary for there to be universal consensus. Aesthetic validity claims are judged according to whether they are sincere (truthfulness).

This multifaceted definition of rationality (concept of rationality) contrasts with concepts in which rationality was simply defined as the choice of means to achieve given, usually material, ends. The more limited view of rationality is called instrumental rationality and tends to result in people being seen as objects that can be used simply in order to achieve the required ends (reification). This inevitably leads to manipulation, domination and oppression of some people by others. Strategic action is similar to instrumental action in that it is manipulative and means-ends oriented. Instrumental action and strategic action are frequently encountered within the lifeworld but since they deny ideal speech conditions they are separate from (they are in opposition to) the concept of communicative rationality.

Habermas recognises circumstances in which another positive form of rationality applies. Functional rationality, which is routine, may be automated and is linked to economic and administrative systems (known collectively as 'the system'). The decisions taken here are neither universal nor personal as they are independent of the agents' intentions. Money and power are the media which are used to achieve the goals of the system. The two forms of positive

rationality, communicative rationality and functional rationality, together constrain instrumental and strategic action.

Habermas uses his concept of societal rationality (which arises from this understanding of the types of rationality and how they are developed) to give two philosophical perspectives. The one is a description of the evolution of rationality and the second is a critique (normative). The critique of modernity gives reasons for many of the negative trends evident in modern society. These are seen as a loss of meaning and antisocial behaviour resulting from one-sided rationalisation. One-sided rationalisation (or the colonisation of the lifeworld) results from inappropriate forms of rationality being applied, in particular where functional rationality (appropriate in 'the system') is applied to the lifeworld.

2.4 Methodologies

2.4.1 Quantitative research

One form of quantitative research is carried out in the positivist tradition. Here an attempt is made to isolate variables and to measure a small number of dependent variables against an independent variable. This requires designing an experiment in which variables that are not being measured are kept constant and hence, in the social sciences, requires a control group to be matched with the group in which the new factors will be present. The data gathered is usually numerical and statistical analyses are used to determine whether the effect of the experimental factors is significant. Quantitative data can, however, also be obtained from surveys and be more descriptive in nature. Such data may be used to support qualitative research or provide a descriptive context for it.

2.4.2 Qualitative research

Qualitative research is carried out when the anti-positivist (interpretive and critical) research paradigms are adopted. Myers [1997a: 240] says that, "*[a] common misconception has been to equate qualitative with interpretive research*". He does not, unfortunately, expand on this. Both text and numeric data are used. Laudon [1989] says that the distinguishing difference between quantitative and qualitative research is the number of organisational units involved, the kinds of questions asked, the manner of reasoning about evidence and the length of time over which the phenomenon is studied.

Busby and Payne [1998] give the following characteristics of qualitative research:

•   holistic
•   phenomena arise through a multiplicity of origins
•   situated
•   grounded, typically starting with data and developing theory by induction
•   recognises diversity
•   based on field work
•   requires adaptability and high levels of cognitive effort, understanding, and self-confidence on the part of the researcher
•   complex and time consuming
•   depends on good planning

2.4.3   Hermeneutics

Hermeneutics can be considered to be either a social theory (embodying the philosophy of Husserl) or a methodology. Klein and Myers refer to it as, " ... *A "bridgehead" for making a contribution to interpretive research methodology.*" [Klein & Myers, 1999] As a methodology it is used to analyse the textual data obtained during qualitative research. It is primarily concerned with the meaning of text or a text-analogue such as an organisation. The meaning is obtained by a process of interpretation in which both the broader picture, as provided by the text as a whole, and the individual parts are constantly interacting and contribute to create a more accurate and complete understanding of the text. This interaction and mutual revision of meaning between the whole and the detail is known as the hermeneutic circle.

Klein, Hirschheim and Nissen [1991: 9] see hermeneutics and critical theory as closely related and that action research (and semiotics) can be used in the process. Burrell and Morgan [1979], on the other hand, have classified hermeneutics as an example of Interpretive Sociology with a view of social order rather than conflict.

Myers [1994:185] says that critical hermeneutics (or contemporary hermeneutics) was outlined by Gadamer and Ricoeur. Alternatively, Habermas developed Critical Theory, Gadamer developed hermeneutics, and Ricoeur linked the two theories [Myers, 1997b]. It is, therefore, an integrative theoretical framework, combining interpretive and critical elements and is in effect a meta-theory. Whereas the original hermeneutics stressed an uncritical understanding, an attempt simply to see the issue from the point of view of the person who wrote the text, critical hermeneutics interprets the content in terms of the present and in relation to the interpreter's own point of view, as well as the time and prejudices of the original author. Hence it takes a broader context into account that would include historical change. For example, knowledge of

external conditions, conflicts and contradictions within the society at the time in which the text was written, which the author might not have been fully aware of and that could have resulted in unintended consequences would affect our understanding of what was written. But also, recognition of idiosyncrasies in the present social system (that affect the way we interpret text) and how these differ from the past, or how they evolved from earlier systems, will add to the meaning acquired from the text itself. Gadamer emphasises that the researcher must be consciously aware of his or her own prejudices and predisposition to prejudge and the role that these play in interpreting text.

Table 2.2: Summary of three theoretical approaches [Myers, 1997b]

Theory	Primary focus	Descriptions
"Pure" hermeneutics	Meaning	Interpretive
	Intentions	"Subjective"
Critical theory	Contradictions	Critical
	Oppositions	"Objective"
		Historical
Critical hermeneutics	Totality of Meanings	Interpretive and Critical
	Social Reality	Subjective and Objective
	Intended and Unintended Results	Historical

Myers draws the distinction between research informed by Critical (social) theory, which always focusses on the class conflict and strives to empower the worker and critical hermeneutics, which he claims does not have a preset agenda. Myers [1997b] says that in critical hermeneutics no final interpretation is ever achieved, as every interpretation must be critically reflected upon. Table 2.2 provides a summary of essential differences between "pure hermeneutics", critical theory and critical hermeneutics.

2.4.4   Ethnography

Prasad [1997] defines ethnography as a methodology (and hence associated with a specific ontological and epistemological view) rather than a method that simply implies a set of techniques and methods. It is related to interpretive, qualitative fieldwork. Ethnographic research, in general, sets out to investigate how, for example, systems in organisations, " *... affect social interaction and the creation of shared meanings.*" [Myers, 1997b]

Ethnographies are similar to interpretive in-depth case studies but the researcher spends more time in the field and is more intimately involved in the social group that is being studied. There are three basic differences between case studies and ethnographic research. The ethnographic research does not have formulated research questions and hence avoids preconceived ideas, it avoids all semblance of logical positivism and does not have hypotheses or rival hypotheses but tries to develop a "thick description" of what actually occurs and, finally, it does not proceed according to a time schedule [Yin, 1989]. In ethnographic research not only are interviews and documentary evidence collected as data, but data is also collected during participant observation. This type of research occurs over a significant period of time (for example, eight months in the case of Orlikowski [1991]). Myers indicates that it is in this way that the ethnographer searches out and analyses symbolic forms. Prasad refers to the use of "thick description" in which the full context is included to ensure that deeper meanings are uncovered.

Prasad [1997] emphasises that it is essential in ethnography that the social situation be understood from the point of view of the participants (subjects). Myers [1997b], on the other hand says that the ethnographer does **not** need to empathise with the subjects.

As he did with critical hermeneutics, Myers [1997b] has defined critical ethnography as a particular form of ethnography that is informed by critical hermeneutics. Critical ethnography differs from classical ethnography in various ways, most importantly in that it recognises that social systems change over time and that the historical context is important and that a critical viewpoint is adopted.

2.4.5 Phenomenology

Phenomenology embraces the concept of purely objective truth but it is nevertheless not a positivist research paradigm and the analysis of research results is not statistical or even interpretive. It is instead purely conceptual or cognitive. The researcher consciously tries to strip away preconceptions and prejudices in order to arrive at an objective view of the phenomenon and hence its true essence. This is done in an iterative or stepwise fashion by means of reductions where assumptions are identified and set aside or "bracketed". In this way, the "true nature" or "true meaning" of something can be reached. In contrast to a positivist view point where the epistemology seeks to find out "how things work" by conducting controlled experiments to detect underlying rules, phenomenology seeks to find out "what things are" and describe them accurately. Hence the research methods used for data collection are more likely to be ethnographic or case studies. In phenomenology, as for all anti-positivist research paradigms, it is not possible to prove that the findings obtained are true. Instead the researcher has to rely on other people accepting the reliability of the method and on an instinctive recognition of the truth of the description.

Boland [1985] explains Gadamer's view of phenomenology as being an intersubjective one in which researchers attempt to recognise their own prejudices while discussing or debating issues. Thus, understanding of issues requires interpretation and active attempts to reach a more objective point of view.

According to Boland [1985] the phenomenological approach does not seek only to describe a phenomenon objectively, but also to view it critically and seek to change it. Hence, according to this point of view, phenomenology is closely associated with Critical Theory and critical hermeneutics.

2.4.6 Pluralist research strategies

Klein, Hirschheim and Nissen [1991], together with many other authors [Myers 1997a; Mingers & Brocklesby, 1996; Jackson, 1992; Landry & Banville, 1992; Orlikowski & Baroudi, 1991] make a plea for methodological pluralism. They classify research approaches into five groups.

- Supremacists who believe that there is only one appropriate method for finding the one truth or reality;
- The contingency approach, which proposes that there are a range of methods each having its own strengths and weaknesses and that the appropriate choice depends on the focus of the research. The problem with this is how to decide what is a good match of problem and method, as the contingency approach implies that there is still only one truth and one appropriate method for finding it.
- Pluralism, on the other hand, suggests that there is no "correct" approach. Different approaches will identify and clarify many different points of view, all of which may simultaneously be valid and valuable and all of which are biassed. As no single method can ever capture all the richness and complexity of reality, the use of a variety of approaches will allow a more complete understanding of the phenomenon to be built up. This approach accepts that claims of truth may be revised (or are in a perpetual state of revision);
- Eclectics say that a mixture of the best from a variety of approaches will be most fruitful for a specific problem;
- Dialectics is based on the concept of two dominant approaches involved in a struggle. Eventually, from this struggle, a third approach emerges.

2.5   Research Methods

2.5.1   Case studies

A case study "*... is a way of organising social data so as to preserve its unitary character.*" [Craig Smith, 1990]. Case studies take the context of the events being researched into account and hence provide a much more complete understanding of the meaning of results and conclusions drawn from them, including their limitations, than is generally the case with positivist research. During a case study a social situation is identified that will provide an apt illustration of a general principle or which, when analysed, will reveal a general principal. An extended case study is a study of a process, over a period of time, during which information emerges.
Yin [1989] expects the researcher to structure case studies by

> a) identifying specific research questions before the research begins,
> b) "*emulat[ing] logical positivism in developing rival hypotheses and collecting external evidence bearing on these questions*" Yin [1989]
> c) doing fieldwork in a systematic way according to a planned schedule.

Walsham [1995] considers Yin's position to be that of an "*implicitly positivist stance in describing case study research*" but agrees that this approach emphasises "how" and "why" questions that are central to interpretive research approaches.

Data is generally collected during unstructured or semi-structured interviews and from unpublished documents and newspaper and magazine reports, and these are analysed using an interpretive or phenomenological research paradigm. The researcher adopts the role of an objective observer as far as possible, although it is recognised that there will inevitably be a certain amount of subjectivity. Craig Smith [1990] sees the fact that it is impossible for a human to be entirely objective in studying aspects of the human world as the basic epistemological problem of social science. He points out, however, that the researcher must also be sufficiently in touch with the issue to be able to make sense of the research findings.

Most Management Information System issues simply cannot be studied completely using laboratory based positivist research methods as they are too complex and it is impossible to identify all the variables, let alone measure or control them. The MIS issues are nevertheless important and valid, general conclusions can be reached by studying specific contexts using the case study approach. Craig Smith [1990] argues that research methods that are "approved" (that is, quantitative research methods) should not dictate what is important research terrain. It is

wrong to determine what issues are researched according to how easily they can be studied using standard research methods.

It is possible to use positivist, interpretive or critical research methods within case studies [Klein & Myers, 1999]. An example of a positivist approach would be using questionnaires together with other purely numeric data collection methods followed by statistical analyses to determine correlations. This is not recommended as the sole means of collecting and analysing data, as the advantages of rich description are lost and the disadvantage of a small and unrepresentative sample may be present. It is, however, possible, and probably desirable, to combine interpretive and numeric methods.

The use of a case study allows the social unit to be studied and to be represented as a whole. It is important to note, however, that the researcher must simplify the description to some extent in order to highlight the elements which are considered to be important. Case study research is a method of organising data and, ultimately, of reaching conclusions from that data. Theories based on case studies are built using logical inference instead of the statistic inference techniques used in positivist research. These theories are validated by theoretical and practical discourse, that is, the truth claims made by the researcher can be challenged and debated and will be judged according to the strength of the arguments put forward by the various parties. The plausibility of the argument, rather than the fact that findings can be replicated, determines whether the research findings are accepted. Hence, despite the fact that only a few cases are studied, general conclusions can be reached by means of logical argument. The cases studied are selected not according to how typical they are perceived to be, but rather on how well they illustrate the point being made, that is, their explanatory power. It is possible, therefore, that atypical and even extreme cases may deliberately be chosen.

As with other approaches, it is essential that research is done systematically and is well planned. Interviews should be tape recorded and transcribed. The researcher needs to be aware of problems that can arise, such as biassed and invalid data. This is obtained when interviewees give insincere input (for example, when they try to provide answers that will please the interviewer, simply out of politeness). The way in which the data will be analysed (for example how it will be categorised) may be difficult to specify precisely ahead of time and it is likely that there will be a number of false starts to this process.

The choice of a research methodology that is appropriate to the matter being researched will determine whether the results are meaningful to people who did not participate in the research, that is, the external validity of the research. A case study approach is indicated where the phenomenon cannot be studied outside its natural setting and the variables cannot easily be isolated or accurately measured quantitatively.

2.5.2 Action research

Action research can be considered to be a special case of case study research. Jönsson [1991] gives a detailed explanation of what he considers action research to be. One definition might be that the researcher actively brings about change while doing the research. There are two important components in the research, namely, the processes of generating change and generating knowledge [Stowell et al, 1997: 161]. The dual importance of theory and action are central to this research method. An additional consideration is that there should be a mutually satisfactory outcome between the two interests represented by these two components, that is, between the researcher and the organisation.

The researcher, together with participants from the host organisation, proposes changes and tries them out. Hence, the researcher is a visible and active participant, not just an observer, and embraces and promotes certain values quite openly. The research does not seek to determine simple, unidirectional laws. It is carried out in unique situations and hence cannot be replicated or generalised in the way positivist research can be. Nevertheless, it should lead to the researcher gaining insights that could be applied to other situations where similar circumstances are recognised.

Action research has the following characteristics:
- It is a science of practice, that is, is applied within the real or natural context not in a laboratory. It is action oriented as its name suggests.
- It is a collaborative process in which the researcher *and* the other participants are jointly involved in seeking insights.
- It is a learning process. This follows directly from the previous point. It encourages and stimulates problem solving.
- As it is a process, it is part of an ongoing search for better ways of doing things. It does not usually produce final solutions although it may produce partial solutions, improvements or even errors that indicate the need to change direction.
- A hypothesis is not proposed before the data collection is started, as is the case with positivist research, but the researcher attempts to keep an open mind, allowing theories to emerge. It is accepted that there is a great deal of uncertainty in these theories. This is not really a problem. The theory (or story) may reveal useful aspects even if it is not completely sound.
- Contradictions and areas of conflict or differences of opinion are actively sought and hence there is a certain amount of risk in bringing previously unacknowledged grievances and power struggles into the open. This type of research is, therefore, low on control.

- Complexity and uncertainty are inevitable and acceptable.
- The data collected is largely in the form of text and largely unstructured.
- More than one opinion or point of view is sought, partly to uncover problems and partly to validate conclusions.
- Historicity is recognised. The decisions and actions taken here and now are unlikely to be the same as those chosen yesterday or tomorrow, by other actors, or in some other place.
- Because it is action and learning oriented, the research is by definition relevant.
- It may yield uninteresting or no findings. [Truex, 2001]

A number of these characteristics can be identified as being characteristics of anti-positivist research and of critical or interpretive research.

Stowell et al [1997] give a number of practical guidelines for doing action research. They believe that it is important that the client organisation understands clearly that the research being undertaken is action research, what action research is intended to achieve and that outcomes are difficult to predict as the "*catalytic potential of IS may create unimagined issues*" [Stowell et al, 1997: 163]. There is also a need for careful planning and management of the research for two reasons. Firstly, in order for the results to be accepted as sufficiently rigorous the data must be collected and recorded systematically. Secondly, the goal of achieving learning must not be overlooked at any time. The fact that the research is undertaken amidst the complexity and hubbub of a real workplace environment can make it difficult to ensure that both of these requirements are met and hence the planning must specifically be geared towards making practical arrangements that will allow for them.

2.6   Information Systems Research

2.6.1   Introduction

"*The interpretive approach can be applied to IS implementation research, the advantage being that it is able to deal with the social and political nature of information systems implementation.*" [Myers, 1994: 185]

Hirschheim and Klein [1989] adapted Burell and Morgan's schema [1979] to one specifically intended for information systems development but that is also useful in deciding on appropriate Information Systems research methodologies and methods (Refer to Table 2.3).

Table 2.3: Four paradigms for Information Systems Development (adapted from Hirschheim and Klein [1989])

Conflict				
S U B J E C T I V E	**Neohumanism (radical humanist)** Theoretical basis: Habermas' Theory of Communicative Action, Critical Social Theory Methodologies: emancipatory approaches	**Radical structuralism** Theoretical basis: Dialectic Materialism Methodologies: Trade union led approaches	**O B J E C T I V E**
	Social relativism (interpretist) - Theoretical basis: Symbolic Interactionism, sense making and emerging meaning are a function of experience and hence unique, not rationalist, and relativist Methodologies: SSM and participatory group work, and ethnographic approaches	**Functionalism** - Theoretical basis: instrumental reasoning, objective reality, naive realism, Methodologies: order- structured analysis, "hard", information engineering approaches	
Order				

This is appropriate if one accepts, as is now usual, that Information Systems is a social science. It allows the researcher to deliberate on the various possible ways of seeing the world into which Information Systems must fit and, in particular, how this researcher personally views the world so that an appropriate theoretical basis can be studied and applied consistently. These authors illustrate the applicability of the framework by describing four different information systems, each one of which was developed using a different theoretical paradigm.

2.6.2   Information Systems Research framework

The following research framework was derived in order to try to systematically review research methodologies and link them to ontologies and epistemologies with the ultimate aim of assisting in determining whether selected methodologies and methods are appropriate considering the research philosophy adopted. The framework is made up of three separate tables. The first uses the scheme for analysing assumptions about the nature of social science developed by Burrell and Morgan [1979: 3]. However, in line with criticism by Probert [1997:48] of the "binary opposition" of the simple Objective versus Subjective philosophical view proposed by the originators of this scheme, it has been extended to include a third alternative that I have labelled Intersubjective. (Walsham [1995] refers to the work of Archer (1988) who distinguishes between 'external realism', 'subjective idealism' and ' internal realism'. These correspond to a large extent with the 'objective', 'subjective' and 'intersubjective' ontologies proposed here.)

Intersubjectivity proposes not that there is no objective reality, nor that individuals do not each have unique views of reality, but that there is a third factor, the negotiated reality obtained by individuals reaching mutual understanding by discussing and ultimately agreeing what the "truth" is. The Objective view of reality is an exclusive one, proposing that everything can be measured and that reality is independent of the observer and unchanging. The Subjective view is also exclusive and contradicts the Objective view. It says that there is no external, absolute reality but only individual concepts. By contrast, the Intersubjective view reconciles both of these views and includes the additional factor, the contribution of groups, organisations, or society in constructing reality.

The extended scheme (Table 2.4) indicates the ontology, epistemology and perception of human nature associated with each of the philosophical views. The term "duality of structure", used by Giddens, is adopted as the perception of human nature related to the Intersubjective view. It refers to the fact that an individual's actions and beliefs are influenced by the structural properties of society but at the same time the social structures are themselves always subject to change as the result of the influence of individuals. An attempt is then made to link the validity claims from Habermas' Theory of Communicative Action and his Knowledge Interests into the scheme. The scheme then gives characteristics of the methodologies used in social research for each of these views.

The second research framework (Table 2.5) shows the research strategies that are aligned with two of the epistemologies identified in Table 2.4. The third epistemology, methodological pluralism, is not included as it manifests itself as a combination of the research strategies and goals of the other two. Instead interpretive and critical research strategies, which are both forms of anti-positivist research, are compared with positivist research.

The third and final framework in the set (Table 2.6) reflects yet more specific characteristics of research. This framework has been separated from the previous one as methods are considered to be largely independent of epistemology [Galliers, 1997:154; Myers, 1997a: 241]. The link between Table 2.5 and Table 2.6 is the methodology (though this may in fact be tantamount to linking back to epistemology). A new group of methodologies, not mentioned in Table 2.5, is included in Table 2.6, namely the group of non-empirical methodologies. This links up with a framework for classification of Management Information System research strategies provided by Alavi and Carlson [1992] in which they discriminate between non-empirical strategies (based on ideas) and empirical strategies (based on observation).

Table 2.6 (and to some extent Table 2.5) refers to more tangible characteristics of research methods and strategies and hence becomes more specific, and more controversial. Galliers [1997: 152-153] refers to criticism of the framework he had proposed in earlier publications.

**Table 2.4: An extended scheme for analysing assumptions about the nature
of social science**

Ontology		Objective Realism	Subjective Nominalism	Intersubjective (Social) Socially Constructed Reality
Epistemology		positivism prediction and control	anti-positivism explanation and understanding	methodological pluralism the full spectrum
		prescriptive and normative	descriptive	the full spectrum
		basically fixed (a-contextual and a-historical)	perpetually changing	historicity (contextual and historical)
Human nature		deterministic	voluntaristic	duality of structure
Type of methodology		nomothetic inductive and deductive	idiographic emergent and grounded	idiographic but not relativist cooperative
			interpretive	emergent
				mutual understanding and consensus
Habermas [Ngwenyama, 1991:272]	**Rationality**	instrumental	dialectic	communicative
	Spheres of culture*	theoretical sphere of science	aesthetic sphere	practical sphere of morality and law**
	Validity claims	truth	sincerity	normative
	Knowledge interests	technical		emancipatory and practical***
Perspective		etic (outsider)	emic (participant)	emic empathetic or critical
		value free	not value free	not value free

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*From Kant's faculties of reason [Braaten, 1991: 15-16]

**This ontology will embrace all three spheres of culture, validity claims and knowledge interests. However the practical sphere is unique to the social world.

***Ngwenyama [1991: 272] classified the emancipatory knowledge interest as inner-subjective and practical knowledge interest as shared subjective. Held [1980: 317-319] also discusses emancipation as associated with "*self-understanding and autonomy of action*" and reflection but says that there is some ambiguity and evidence of a change in Habermas' thinking regarding the emancipatory interest. This can now be seen as addressing or correcting domination, which is a systematic distortion in communication between people. Emancipation, as seen in terms of Systems Development, and the application of Critical Theory in action research, seems to be more Intersubjective. Note that *Knowledge and Human Interests* was an early work and many of the concepts in it have been substantially revised.

Table 2.5: Information Systems Research methodologies associated with strategies

Research strategy	Positivist	Interpretive (Hermeneutics)	Critical (Hermeneutics)
Epistemology	positivism	anti-positivism	anti-positivism
Type of research goal	prediction and control	understanding	emancipation
Research outcomes	laws	models	emancipatory models
	hypotheses	frameworks	emancipatory frameworks
	theorem proofs	new concepts, insights, or theories	new emancipatory concepts, insights or theories
	tools	new applications	changed organisation or system
	IS instruments		
	techniques		
	methods		
	application of models		
Methodology	measurement	participant observation, discussion, and textual analysis	critical observation and textual analysis particularly of power structures, discussion, and intervention
Examples of methodologies	hypothetico-deductive experiments	interpretive case study, action research, holistic ethnography	interpretive case study, action research, critical ethnography, phenomenology

Table 2.6: Information Systems research methods associated with methodologies

Methodology	Empirical			Non-empirical
	Positivist	**Interpretive and Critical**		
	measurement	observation, discussion, and possibly intervention		conceptual
Research environment	laboratory field	field study		researcher or research group
Data type	largely numeric	largely text		ideas
Data collection processes and sources	Observe[*]: Case studies and surveys Experiment: Field and lab experiments, action research, simulation			Review[**]: Literature and experience
	lab experiments, field experiment, survey, simulation case study[***], action research[***]	case study [****], action research [****], ethnographic study, phenomenological study		thought experiments
Instruments	**Positivist**	**Interpretive**	**Critical**	reflexive, discourse, induction
	measurement, counting, induction, deduction	interviews, questionnaires, formal and informal documentation	interviews, questionnaires, formal and informal documentation, participant observation	
Data analysis & synthesis	quantitative statistical	qualitative hermeneutics	qualitative critical hermeneutics grounded	conceptual

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[*]These entries apply to both of the empirical methodological groups. Galliers includes as part of his framework an "*orthogonal relationship between research philosophy and method*". The research philosophies are given as Positivist, Interpretivist [sic] and Critical [Galliers, 1997:153].

[**][Galliers, 1997:153]

[***]Case studies and action research can be positivist, interpretive or critical [Klein & Myers, 1999]. Positivist case study and action research are undesirable although possible. For example, groups of students can be used as subjects in a controlled lab experiment to carry out tasks that are emulations of those of systems analysts, managers or some other group, in an attempt to measure responses.

[****]As for footnote ***, but instead of simply observing, the researcher actively seeks to influence outcomes.

These criticisms arose largely because the framework was interpreted as rigidly classifying research approaches as inevitably being positivist or anti-positivist. There are a variety of factors to be taken into account before deciding whether a particular research method is positivist or not, such as the type of data collected and the methods used to analyse the data. The second (Table 2.5) and third table (Table 2.6) are, therefore, presented simply as guidelines. Galliers and Land [1987] classified Information Systems research approaches according to the social grouping that they could effectively be applied to, namely, whether they were appropriate for studying systems at the level of the individual, organisation or society as a whole. They also tried to indicate for each of these research activities whether they incorporated technology and/or methodology. Neither of these elements have been reflected in the framework provided above.

However, nominalist and socially constructed reality can be related to individuals and groups (organisations or society) respectively. Galliers has revised his original taxonomy slightly. The original Galliers taxonomy [Galliers & Land, 1987] was grouped into "*modes of traditional empirical approaches*" and "*modes of newer approaches*" but was subsequently altered to "*modes for traditional positivist approaches (observations)*" and "*modes for newer post-positivist approaches (interpretations)*" (Galliers [1997: 151] referring to [Galliers, 1993:96, 1994:97])

Since then Galliers has reconsidered the matter completely and suggests [Galliers, 1997: 153] that it is too simplistic to try to classify research methods as belonging exclusively to one or other philosophical research strategy. Different approaches could possibly be used at the different stages of research where the two main stages are data gathering (observation, review and experimentation) and distillation (analysis and synthesis). Myers [1997: 240] also has misgivings about tying methodologies to epistemologies. Galliers still stresses that it is essential to clarify the underlying philosophy of the research undertaken [Galliers, 1997: 142].

2.6.3 Information Systems as an emerging discipline

The epistemology adopted by researchers should influence their choice of research method - although theory and epistemology (paradigm) under-determine method (that is, there will still be a choice of methods and other factors will also influence this choice) [Mingers & Brocklesby, 1996]. The type of subject being researched is one of these factors. This then leads us to consider what types of subjects are generally the focus of Information Systems research and what methodologies are used.

The classic discussion on the nature of Management Information Systems (MIS) by Banville and Landry [1989], *Can the Field of MIS be disciplined?,* gives a classification of "intellectual fields" that was derived from Whitley's model using three dimensions, namely functional dependence, strategic dependence and strategic task uncertainty. Functional dependence analyses how

coherent the discipline is in terms of the way in which knowledge builds on previous knowledge and also how much standardisation there is regarding methods and ways of presenting findings. Strategic dependence examines the social or political factors within the discipline, such as competition for research funds, influence of practioners on the field and the degree of agreement regarding which aspects of the field are important. Strategic task uncertainty measures the stability of research focus. According to this schema, Management Information Systems was determined to be a fragmented adhocracy with a high degree of task uncertainty (rapid turnover of research topics), low degree of strategic dependence (funds are generally available and hence the competition for funding is not very fierce) and low functional dependence (the newness of the field, interdisciplinarity and flexibility resulting from the other two factors result in a lack of set standards and progressive work on clearly demarcated research directions). Hence, "*[R]esearch is rather personal and weakly coordinated...*" [Banville & Landry, 1989: 56]. This does not, however, mean that the discipline is not justified as an independent and quite well established field of intellectual endeavour.

It seems likely that a certain degree of maturity is developing in the field of Information Systems in comparison with ten years ago when this article was published. This is evident in at least a degree of acceptance of the view of Information Systems as a social science, a move away from quantitative research and a growing body of publications soundly based on social theory [Avison, 1997]. The multi-disciplinary character of Information Systems remains central to it. This means that there is a need for a flexible approach to teaching (curriculum design and teaching model) [Avison, 1997; Spaul, 1997] and research, along with solid understanding of the theories and developments in associated disciplines [O'Donovan & Roode, 2001; Jones, 1997] and the development of a theoretical base specifically for Information Systems. The discipline also continues to evolve, subject as it is to forces within its context of significance and cultural structure [O'Donovan & Roode, 2001]. On the less reassuring side, the immense growth of demand for IT related vocational training, together with the dynamic nature of the technology itself, has meant ever increasing teaching loads on lecturing staff and less time for research and serious consideration of underlying issues.

Methodological pluralism in both Information Systems research and Information Systems development is both a symptom and outcome of the fact that Information Systems is a fragmented adhocracy. In general it seems to be accepted that this is not only acceptable but largely desirable [Hirchheim et al, 1996; Mingers & Brocklesby, 1996; Jackson, 1992:88; Landry & Banville, 1992; Orlikowski & Baroudi, 1991; Banville & Landry, 1989: 56]. It is also useful to combine more than one approach within a single research project in order to use triangulation to confirm findings. Kaplan and Duchon [1988] give an example of such a pluralist or mixed method approach. The two authors, more or less independently, followed a qualitative and a quantitative research approach into the same research circumstances. The insights obtained from the two

approaches were very different, and neither could reasonably have been expected to be obtained from the alternate approach but together they provided a more complete understanding. Similarly Trauth and Jessup [2000] used a combination of quantitative and qualitative research, finding that well chosen combinations complement one another.

2.7 Habermas and Information Systems Research

2.7.1 Epistemology

What aspects of Habermas' thinking are applicable to the field of Information Systems? First of all, Information Systems is now explicitly recognised as being a social science and hence it makes sense to look to social theory for a theoretical basis. As a modern theory of societal rationalisation Habermas' critical theory of society meets this first requirement.

Habermas identifies three human knowledge interests, namely the Technical Knowledge Interest, applicable to scientific knowledge and technology and hence to the technological facets of Information System; The Practical Knowledge Interest related to social consciousness and humanity; And Emancipatory Knowledge Interests to do with norms of justice and freedom. Both Ngwenyama [1991] and Hirschheim and Klein [1989] have related these to Information Systems research and development. However, the book *Knowledge and Human Interests* to which these authors refer was written in 1968, and Jablonsky [1991: 298] indicates that the concepts have evolved to an extent where it is no longer valid to refer to these early writings. Hirschheim, Klein and Lyytinen [1996] used the earlier concepts as well as the Theory of Communicative Action to create an extensive framework for Information Systems development. Thus the earlier ideas have not been abandoned but simply revised and the underlying issues are still relevant to our field. They are included in the concept of communicative rationality as truth claims, normative validity claims and aesthetic validity claims. These were discussed in Subsection 2.3.3.3.

A second, independent, epistemological issue that is directly relevant to Information Systems research and development is that of positivism. Habermas is highly critical of the point of view that the social sciences, and in this case Information System, must be treated as natural sciences and hence that only positivist research is valid. But "*... does not argue that it is never appropriate to study human subjects with the methods of a causal, nomological science. Rather the claim is that a science that restricted itself to this procedure would - by itself- be incapable of understanding social reality.*" [Held, 1980: 307].

2.7.2   Theory and Practice

Habermas' refers to theory and practice in two different contexts. Firstly, in social research where the theoretical (or metatheoretical), methodological and empirical levels [Braaten, 1991: 77] are used by the critical theorist to study society. And secondly, as communicative rationality which incorporates theoretical rationality, practical rationality and the rationality of "authentic" self-expression in the every day functioning of society ultimately leading to the evolution of a more rational society [Spaul, 1997: 77]. Lyytinen and Hirschheim [1988: 23] identify two of Habermas' five forms of argumentation [Habermas, 1984: 23], namely theoretical discourse and practical discourse, as being the most important for Information System. It is important to note the meaning of these two terms. Theoretical discourse is the form of argumentation used to examine controversial truth claims in the cognitive-instrumental realm or objective world. Practical discourse is used to validate normative truth claims and hence is practised in the intersubjective world.

Ngwenyama [1991: 269] says that all critical social theory views theory and practice as being inseparable. This view contributes significantly to Habermas' anti-positivist stance, even with respect to the natural sciences, as it means that, "*... science cannot be fully comprehended merely as a formal abstract system, but must be understood as a product of concrete social activity.*" [Held, 1980: 306]. Hence, in the social sciences, research cannot only take place in a laboratory under controlled conditions and cannot consist simply of discovering laws that regulate behaviour. Information Systems is an applied science and hence, whether we are studying existing information systems or developing them, we need to focus on both theory and practice.

The theoretical framework provided by Habermas, particularly in the Theory of Communicative Action, but in the entire body of his work has been used by academics in developing Information Systems theory. It forms the basis for both research and developing information systems [Hirchheim et al, 1996; Mingers & Brocklesby, 1996; Jackson, 1992; Ngwenyama, 1991; Hirschheim & Klein, 1989] and justifies the very existence of the discipline of Information Systems [Jones, 1997; Spaul,1997]. Habermas' work can also be used in a very practical way in the development of systems [Dahlbom & Mathiassen,1995: 254; Lyytinen & Hirschheim, 1988] and in designing and carrying out the practical part of research [Lacity & Janson, 1994; Klein, Hirschheim & Nissen, 1991].

There is need for a close interaction between theory, practice and academic research in Information System, as there is in all disciplines which can be labelled "applied sciences". In fact at times it is difficult to differentiate between Information Systems research and development of

information systems (particularly when action research is being undertaken). Orlikowski and Baroudi make the point, "*Indeed, a major goal of information systems research is to have an impact on information systems practice; that is, the findings of information systems research are intended to inform and improve the development and use of information systems in organizations." [1991: 11]* Every information system is unique and hence something can be learned from every development exercise. Various authors have called for the interaction between Information Systems practioners and academics to be increased and strengthened [Avison, 1997: 129; Galliers, 1997: 146].

2.8   Giddens and Information Systems Research

Structuration theory has been used as a theoretical basis for a number of highly regarded research projects in Information Systems. Amongst these are those carried out by Barrett, Sahay and Walsham [1996], DeVilliers [1995], Orlikowski [1996; 1993; 1992; 1991], Majchrzak [2000] and Walsham and Han [1991]. In general the research which has been undertaken with Structuration Theory has used Orlikowski's model of the duality of technology, and Adaptive Structuration Theory [DeSanctis & Poole, 1994], as its basis. The research has described the duality of structure in terms of institutional structures, in which computing and information technologies are highlighted as resources, and the system. Problematic areas in this use of structuration can arise from the material nature of computer-based information systems, as structures, in Giddens' terms, are 'traces of the mind' [Jones, 1999]. This has led particularly to criticism of Adaptive Structuration Theory as being directly contrary to Giddens' principles because it is a contingency-type model which is used largely for positivist, experimental studies [Jones, 1999: 124].

There seem to be fewer research projects that refer particularly to Giddens' more recent writings [2000; 1990] (and Giddens and Pierson [1998]) in which he confronts the problems of late modernity including the effect of technology on it. Walsham and colleagues [Barret, Sahay & Walsham, 1996] have explored links between information technology and social transformation with reference to Giddens.

2.9 Choice of paradigm for this research

2.9.1 Choice with reference to the research framework

The design for this research will be described in detail in Chapter 7. A brief outline is given here in order to justify the choice of research paradigm. The research carried out for this thesis involved studying the way in which first year Informatics students at a university develop a shared understanding of the concepts which they need. As the main research goal was to understand whether e-mail can be used successfully by students, working in culturally homogeneous groups, on tasks and projects which require them to construct meaning, it was recognised that this research should be anti-positivist and should use both quantitative and qualitative data.

In order to develop such an understanding it was essential to obtain a rich description of the educational environment and the students' views of that environment. In such an environment there are several units of analysis embedded within one another [Yin, 1989]. In this case there are two, the individual and the team. Students were to be studied as individuals and would complete questionnaires. The large quantity and numeric nature of the data, the single time-slice aspects of the collection of this data and the ways in which the data would be analysed are all indications of positivist, quantitative research at this level. Despite the fact that this aspect of the research is predominantly descriptive, it is interpreted from a cultural and contextual perspective allowing it to be considered, at least in part, interpretive [Orlikowski & Baroudi, 1991]. Students, however, were in teams, and the attempt to determine the nature of the sharing of meaning over a period of time within the team forms the qualitative part of the research. There were not many teams, the data is textual or spoken, the method of analysis had to be hermeneutic and required an understanding of context.

Examples of the kinds of questions that were posed are:
- Whether there was evidence that first year students improved their understanding of basic Informatics concepts during discussions when they worked on assignments in teams.
- To what extent this was evident in virtual teams.
- How the students chose team members and how this would affect the efficacy of the team.
- To what extent the learning environment would affect the feasibility of such a study.
- How the students interpreted the learning environment.

A full set of the research questions is given in Appendix E, together with a summary of the findings.

(In order to make it easier to refer to, Table 2.4 is now repeated as Table 2.7 but the Objective and Subjective columns are omitted.) The intersubjective nature of the research was clearly identified as it was focussed on forms of communication and learning. In Table 2.7 it can be seen that methodological pluralism is appropriate. The related view of an understanding of knowledge is contextual and historical and human nature both affects and is affected by social structures (duality of structure). Communicative rationality is essential in order to achieve genuine learning. Again referring to Table 2.7, this is all consistent with the Intersubjective view.

Table 2.7: An extended scheme for analysing assumptions about the nature of social science for the Intersubjective view only

		Intersubjective (Social)
Ontology		**Socially Constructed Reality**
Epistemology		methodological pluralism
		prediction, control, explanation and understanding
		prescriptive and descriptive
		the full spectrum (contextual and historical)
Human nature		duality of structure
Type of methodology		idiographic but not relativist
		cooperative
		emergent
		mutual understanding and consensus
Habermas [Ngwenyama,1991 : 272]	**Rationality**	communicative
	Spheres of culture[*]	practical sphere of morality and law
	Validity claims	normative
	Knowledge interests	emancipatory and practical
Perspective		emic empathetic or critical
		not value free

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[*]From Kant's faculties of reason [Braaten, 1991: 15-16]

Critical hermeneutics would be required to interpret not only the data collected but the influence of the environment or context on the individual and vice versa. The research was intended to be critical (in the sense used by Myers [1997b] and explained in Section 2.4.3, that is, with no preset agenda). It was foreseen that the diverse groups (different cultural groups of students and groups with different status - represented by the students and lecturing staff) would have different and sometimes conflicting interests. However, the research goal is not unilaterally emancipatory.

The main purpose of the research, as noted at the start of this section, was a detailed understanding of both the context and the particular process of constructing meaning. According to the second part of the research framework, Table 2.5, this is a hermeneutic research strategy. This table is repeated as Table 2.8 retaining only the essential columns. Observation (as a participant but also in case of the face-to-face teams as a detached observer), discussion, textual analysis and intervention were seen to be suitable methodologies. The use of an interpretive case study together with action research was considered to be appropriate (noting that Klein and Myers [1999] and also Jönssen [1991] specifically allow for interpretive action research and not only critical research).

**Table 2.8: Information Systems Research methodologies
associated with Hermeneutic strategies**

Research strategy	Interpretive (Hermeneutics)
Epistemology	anti-positivism
Type of research goal	understanding
Research outcomes	models
	frameworks
	new concepts, insights, or theories
	new applications
Methodology	participant observation, discussion, and textual analysis
Examples of methodologies	interpretive case study, action research, holistic ethnography

Thus, it was appropriate to carry out a single, in-depth case study using action research. The research is generally empirical, although literature has been reviewed. The researcher has drawn on her own experience and that of other lecturers, and reflection and discourse have been used to probe the ideas (hence non-empirical methods have also been used). The data sources indicated in Table 2.9 as appropriate for interpretive research were used. Instruments considered suitable for data collection were interviews, questionnaires and documentation. In the actual research, use was made of recordings of discussions and this indicates that not all observation was as a participant but that the lecturer participated to some extent in the e-mail discussions. According to Table 2.9 this use conforms with an empirical study, using an interpretive methodology. The research qualifies as an intensive field study with the data source being action research. The instruments used to collect data are appropriate for this type of study and the analyses done in Chapters 8 and 9 will also be according to the framework.

Table 2.9: Information Systems research methods associated with empirical methodologies

Methodology	Empirical	
	observation, discussion, and possibly intervention	
Research environment	field study	
Data type	largely text	
Data sources	Observe: Case studies and surveys Experiment: Field experiment, action research, laboratory, experiment, simulation	
	case study, action research, ethnographic study, phenomenological study	
Instruments	**Interpretive (Hermeneutics)**	**Critical**
	interviews, questionnaires, formal and informal documentation	interviews, questionnaires, formal and informal documentation, participant observation
Data analysis & synthesis	qualitative hermeneutics	qualitative critical hermeneutics grounded

2.9.2 Preliminary research plan

2.9.2.1 Anti-positivist

- The research would be carried out by interacting with a real social unit rather than in a laboratory setting and hence it would clearly not be positivist research but action research. Jönssen [1991] quotes Argyris et al [1985: 237] as follows, "*Action research is when scientists 'engage with participants in a collaborative process of critical inquiry into problems of social practice in a learning context' . The main feature of action research is that it is 'expressly designed to foster learning about one's practice and about alternative ways of constructing it' "*. Hence although there is no specific client or contract in this case the proposed research is considered to be action research.
- No attempt would be made to create a matched control group or to identify dependent and independent variables. (The reasons for this will be discussed in detail in Chapter 7, but briefly it was believed that, for ethical reasons, students should be allowed to decide for themselves which study option they wished to use.)
- No specific hypotheses would be set up prior to the research.
- The research would not make use of a single time slice but would be carried out over a period of about eight weeks.

2.9.2.2 Collaborative

- The lecturing staff of the university, the students, and the researcher would all be involved in decisions regarding how the research would be done. In particular, students would be allowed to decide for themselves whether they wanted to participate and to what extent. This would, therefore, be a collaborative effort between the researcher and other stakeholders and a variety of opinions would be actively sought.
- Every effort would be made to make it clear that those who participated would use a learning model which differed from the one that they were in all likelihood accustomed to and hence they would be involved in a process of change.
- The research environment was clearly complex as nearly one thousand six hundred students were registered for the module, three different study options were to be offered, three different lecturers would be affected and this would all occur during the normal schedule for the semester.
- A great deal of uncertainty was inevitable. There would be no way of predicting how many students would choose each of the study options.
- The researcher would be an active participant and not an unbiased observer.

2.9.2.3   Study options

*   Students could elect to work as face-to-face teams during scheduled lecture periods.
*   Others could elect to work as face-to-face teams but during times which they scheduled according to their own convenience.
*   The final group could work as virtual teams, communicating via e-mail.

2.9.2.4   Data sources

*   A large amount of data would be collected from different sources. The data collected was expected to be a mixture of text (from the interviews, recording of face-to-face team discussions and e-mail, and open questions on the questionnaires), and quantitative data (from part of the questionnaires).
*   The face-to-face teams who chose to meet outside class would be required to record their work sessions (audio only).
*   All the students would complete questionnaires before and after completing the assignments.
*   In addition a number of semi-structured interviews would be carried out.

2.10   Conclusion

In Section 2.6 of this chapter a research framework was developed consisting of three parts, namely,
*   An extended scheme for analysing assumptions about the nature of social science;
*   Information System research methodologies associated with research strategies;
*   Information System research methods associated with methodologies

As was noted, there are inherent dangers in developing such frameworks as they might give the impression that there is a fixed and generally agreed set of rules which specify that certain instruments, data sources, methods of analysing data or research environments may only be used in order to arrive at particular research goals, outcomes, and methodologies. In fact this is not the case. Another obvious problem with the set of frameworks presented in this chapter is their complexity. The frameworks were developed as a summary and to help Information Systems researchers to obtain an overview of how various elements may be used. The relationships between these elements is intended only as one possible configuration.

Researchers need to associate theory and the initial research design and data collection processes during the actual collection and analysis of data and to present this as part of the final product of the research [Walsham, 1995]. It is hoped that this set of frameworks will be useful in creating links that are consistent in terms of underlying philosophies. The set of frameworks was used in planning this research, as is explained in Section 2.9.

The broad context of Information Systems as an emerging discipline, and as projected by the types of research undertaken, was used in order to verify aspects of the frameworks in an informal way. Support for the use of more than one methodology was provided as evidence of the acceptability of a pluralist approach and examples (from an important body of reputable research that use the same theoretical bases as will be used in this research) are referred to. An honest effort has been made to identify a research perspective that is compatible with the research and the researcher's own beliefs and outlook.

> "*What is required is that researchers understand the implications of their research perspective, and act in ways that reflect that knowledge. ... researchers should ensure that they adopt a perspective that is compatible with their own research interests and predispositions.*" [Orlikowski & Baroudi, 1991: 24]

An important outcome from this chapter is derived from the discussion of Habermas' Theory of Communicative Action. The concepts summarised in Figure 2.1 are used in the action research to analyse the discourse by the student teams. This is presented in Chapter 9.

Chapter 3

Data, Information and Meaning

"Information Systems are data becoming information in consciousness; organizations are socially constructed through language, and our reasoning about both these processes takes place in dialogue." [Boland, 1985]

3.1   Introduction

This is the second chapter which establishes the theoretical and philosophical basis for the thesis. Key concepts are examined. These concepts are "data", "information" and "meaning" and an associated concept, "learning". Various definitions of the concepts, obtained from various sources, are considered in the light of the three ontologies which were discussed in Chapter 2. Hence, objective, subjective and intersubjective aspects of each of them are noted in Section 3.3. An attempt is made to understand what other authors mean by "information" and to identify different types of information as it is necessary to clarify the types of information that can be communicated by information systems to people, and by people with each other, before considering the more complex issue of how this information is associated with meaning. Habermas' Theory of Communicative Action, which was discussed in Chapter 2, is referred to again in order to explain how, in the process of sharing information, people reconstruct meaning.

Learning is a specific case of sharing information and constructing meaning and this is discussed in Section 3.6. It is necessary to study existing learning theories in this context, all be it rather superficially. This discussion provides a useful foundation for Chapter 5 where specific teaching and learning activities and environments are discussed. In particular it provides an explanation of the particular model of learning underlying the team activities which are the basis of the research for this thesis.

The theoretical and philosophical discussion is continued in Chapter 4, where the relationship between information systems and modern society is discussed. The factors contributing to the richness of information, particularly when it is communicated electronically, forms the focus of Chapter 5, and hence the classification developed in this chapter is built on further there.

3.2   Relevance of the concepts

The concepts of "data", "information", "meaning" and "learning" are vitally important in a number of different contexts that are represented by well-established academic disciplines or fields, which are usually accepted as separate. Disciplines in which the concepts "information" and "meaning" play significant roles are Information Systems (Informatics), Information Science,

Communication Science, Sociology, Philosophy and Education, all of which are considered to be social sciences. Whereas "learning" has always been considered to be primarily the specialist area of education, it has now also been recognised as being of importance in all organisations with issues of improving learning within an organisation and of retaining and sharing knowledge now being seen as of importance in Information Systems. Hence, learning theories, as well as critical social theories, are relevant in this discussion. Initially, the concepts as used in each of these disciplines appear to be very similar but on closer study different emphases and implications become evident.

Convergence of technologies plays a role in the overlap of interests, particularly between Informatics, Information Science and Communication Science. Examples of different aspects of this are easily identified. Computer technologies are now essential in modern libraries and are used routinely. Computer *applications* relevant to libraries are common, such as those for accessing catalogues to find out where the printed copy is located. Compact, digital forms of *storage* are used increasingly and these electronic copies of publications can be accessed by telecommunication technologies. Thus, virtual libraries are just one example of a virtual organisation. *Telecommunication technologies*, such as transmission via a satellite, are used in television broadcasts and by organisations delivering reports to members of a committee. *Data types* previously used exclusively in one field, such as sound and video (often referred to as multimedia), are now used by them all. Hence, the kind of information that the different disciplines focus on, as well as its format and the technologies used to store, process and transmit it, are becoming similar.

The ubiquitous, ready-at-hand use of technology as a tool by "the man in the street" and in virtually all aspects of radically modern[1] life, even those that are not mentioned in the list of disciplines directly associated with information, has also contributed to the blurring of the lines between what is considered to be in one area of specialisation and another. Technology is often used in educational, medical, and legal settings in ways similar to those encountered in commercial organisations and issues concerning how it influences the effectiveness of the organisation and interpersonal relationships within it are relevant in all environments. Globalization, which is rapidly affecting every aspect of modern life, could never have occurred without the infrastructure provided by technology.

The links between the different disciplines are not solely dependent on the rapid advance of technology in the twentieth century. These have been recognised by erudite thinkers completely

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[1]Giddens refers to the social structures of the late 20th century as "radicalised modernity" [Giddens, 1990: 149 - 150] or post-modern (not to be confused with post-modernity as used by Lyotard [Giddens, 1990: 2 - 3]).

independent of any references to technology. For example, Habermas, a social philosopher, is very aware of the ideas expressed by Piaget, an educational psychologist, and those of Austin and Searle, who developed and extended Speech Act Theory. As pointed out in the previous chapter, Habermas' Theory of Communicative Action has been used by academics and developers of information systems.

This section of the thesis touches on a complex field of knowledge which has been deliberated on by deep thinkers since the earliest times and forms the basis of many philosophical theories, namely, how we can make our knowledge and experience explicit. Dahlbom and Matthiassen [1995 : 36] say that the Aristotelian way is to formalise knowledge by setting up rules and criteria that describe the concepts exactly. Plato on the other hand made use of illustrative examples and the new instance could be compared with the typical or standard example to see if the same concept was applicable.

The extent to which the topic is investigated here will be limited. An attempt will be made to identify some similarities and differences in the way these concepts are perceived in some of the contexts (excluding Information Science and Philosophy for the most part) and in so doing express exactly what is intended by the title of the dissertation. The way in which the terms are being redefined within Information Systems particularly, as technology develops, will also be discussed. Occasionally intriguing questions arising from the juxtapositioning of ideas and contexts will be raised but not answered.

In "Information, Systems and Information Systems: making sense of the field", Checkland and Holwell [1998] confirm the need to define these important basic concepts rigorously. Firstly, many definitions exist and they differ in ways that may be significant. Secondly, it is important to agree as to what the terms mean, not in order to impose terminology [Checkland and Holwell, 1998: 88] but in order to ensure that you *can* differentiate between the underlying concepts, share this common understanding and go on to explore the ideas further. This is an important justification for including detailed definitions of each term even though it is likely that these will continue to be used informally and loosely in practice.

The development of more advanced Management Information Systems, Strategic Decision Support Systems, and Knowledge Management Systems and entirely new forms of technological support for all levels of employees are discussed very briefly in Chapter 4 to illustrate why the definition of basic terms in Information Systems is undergoing subtle and frequently unacknowledged change.

In this chapter the basic terms are discussed in more detail than is customary. The different aspects which are identified are classified according to the various ontologies identified in the research framework in Chapter 2.

Some aspects of the complex definitions that are developed indicate an objective, realist, view of the world and imply that data, information and eventual meaning are based entirely on undisputed facts. The material being communicated is independent of the personal knowledge of the individual who receives them, and needs no interpretation. The implication is that all persons reading output produced by information systems will understand it in exactly the same way, make the same decisions based on it and will be in complete agreement.

Other aspects of the definitions emphasise the individuality of each person and support a subjective, nominalist, ontology. Here the belief is that no two people will understand a report in exactly the same way, as no two people have exactly the same background of experience and prior knowledge. Thus, the material being communicated is interpreted by the recipient according to his lifeworld, prior experience and knowledge. In addition, these aspects recognise that information systems do not need to be restricted to mechanistic, functionalist systems and hence will include material that is not purely factual.

Some aspects reflect a socially constructed reality in which we recognise that society is based fundamentally on the ability of people to communicate with one another. Hence, there are pre-existing, shared, meanings, or shared meanings can be reached by means of discourse. The material is communicated with the express intention of sharing meaning.

Each of these points of view is illustrated by means of definitions and quotations, obtained from texts in which computerised information systems are the main focus of discussion. Definitions are rarely examples of a single unadulterated view but include aspects of more than one.

3.3 Data, capta and information

Classically, in introductory texts on Information Systems, information is considered to be the output from an information system, with data (raw, unprocessed, collected "facts") being input. This is a very simplistic view and is often qualified by saying that the information only becomes useful if it is in context and is meaningful.

3.3.1 Definitions of data

"*Data: A representation of facts, concepts or instructions in a formalised manner suitable for communication, interpretation, or processing by humans or by automatic means.*"
(Hicks [1993: 668] quoted by Checkland and Holwell [1998])

Three aspects of data can be identified. These correspond with the three ontologies, realism, nominalism and socially constructed reality and the corresponding beliefs about physical and social reality (objective, subjective or intersubjective). As a result they emphasis the different possible roles of data, namely, to:
- Record objective facts which will be understood in exactly the same way by everyone;
- Record absolutely any type of concept, with no guarantees as to its accuracy or validity, which will be interpreted in all sorts of different ways by individuals;
- Use agreed structures and conventions for representing information, recording it and transmitting it, all in order to communicate it.

The objective view tends to assume that all data processing will be automated. The subjective view is very different in that it emphasises that if data are processed using a computer, the output is still only more highly structured or reformatted data. The intersubjective view allows for the possibility that data may be processed either by computer or directly by a person.

3.3.1.1 The objective point of view of data

The objective view makes the following assumptions about data.
- They are factual, resulting from recording of measurable events, or objects.
- They record particular instances of reality.
- Introna [1992: 2.42] takes a purely objective view of data, proclaiming them to be "*Aperspectual, ahistorical, acontextual*".
- They are explicit as they are in a fixed, recorded form.
- Hence, they can be communicated digitally.
- Modern society generates enormous amounts of data that record details of individual events and objects.
- This objective point of view accepts that the data are validated in the sense that they must be measured and recorded accurately. Certain logic checks as to the reasonableness of the data can be done to try to determine whether the data capturing instruments or processes have failed. Data can be shown to be true if they correspond to reality.

The definitions that follow are examples of those that refer only to the objective characteristics of data:

> *"Data represent unstructured facts."* (Avison and Fitzgerald [1995: 12] quoted by Checkland and Holwell [1998])

> "*Data: Facts collected from observations or recordings about events, objects or people.*" (Clare and Loucopoulos [1987: 2] quoted by Checkland and Holwell [1998])

> "*Data: The raw material of organizational life; it consists of disconnected numbers, words, symbols and syllables relating to the events and processes of the business.*" (Martin and Powell [1992: 10] quoted by Checkland and Holwell [1998])

3.3.1.2 The subjective point of view of data

On the other hand the subjective view makes the following assumptions about data.
- The data are not necessarily true or accurate as not all errors can be detected automatically and not everyone will necessarily agree that they are a true representation of a particular fact.
- Some data record subjective opinion, not facts. If data can represent opinions and concepts, they are not truly objective.
- Data represent information and are the only way we can make information explicit.
- Nothing but data can be communicated digitally or in any other way. Only data are transmitted, be it by means of a telecommunications medium, in printed form, or directly without using any technology.
- Data have absolutely no meaning. They acquire meaning only when appropriated by a human recipient.

The definitions that follow are examples of those that include subjective aspects. These definitions include characteristics which have been highlighted as being objective or intersubjective as well.

> "*Data: Natural language: facts given, from which others may be deduced, inferred. Info. Processing and computer science: signs or symbols, especially for transmission in communication systems and for processing in computer systems, usually but not always representing information, agreed facts or assumed knowledge; and represented using agreed characters, codes, syntax and structure.*" (Maddison [1989: 168] quoted by Checkland and Holwell [1998])

> "*By themselves, data are meaningless; they must be changed into a usable form and placed in a context to have value. Data becomes information when they are transformed to communicate meaning or knowledge, ideas or conclusions.*" (Senn [1982: 62] quoted by Introna [1992])

3.3.1.3   The intersubjective point of view

• The purpose of data is to permit communication.
• Information exists before data. Some version of that information can be retrieved from the data.
• Data must be recorded in a formalised structure and knowledge of this structure must be shared as prior shared meaning. They cannot be totally unstructured or no-one would ever be able to process them, but they can be reorganised into more complex structures during subsequent processing. The structure will result from language syntax and semantics if the data are in the form of text, or in the case of numeric or symbolic data, will depend on the predesigned layout of database records, forms or even the position of the data on a physical object. (We know something about what a number plate denotes from its position on a car even if the format is unfamiliar.)
• They are represented using agreed characters, codes, syntax and structure. A predetermined, agreed way of coding and decoding must be associated with this representation. A stream of bits is not data unless someone has the key by means of which it can be decoded.
• The fact that data are both recorded and have some structure makes them potentially useful - they are in a form suitable for subsequent interpretation and processing. Other information can be inferred and deduced from them and they can be associated with other data. They have potential meaning.
• They have an implied context and history. If the data have been captured or a procedure exists to capture them, a purpose has already been recognised.

Example definitions:

> "*Data: Facts, concepts or derivatives in a form that can be communicated and interpreted.*" (Galland, [1982: 57] quoted by Checkland and Holwell [1998])

> "*Data are formalized representations of information, making it possible to process or communicate that information.*" [Dahlbom & Mathiassen, 1995: 26]

3.3.2   Definition of capta

In Checkland and Holwell's terms [1998] the objective facts are data before they are captured but capta once they have been captured as part of an information system or even in interpersonal communication. Hence, what is generally considered to be data, the input to a computer program, is not data but capta as it has a specified format, has a purpose, is meaningful to the program and has context. The data are thus the vast numbers of objective facts that exist in the universe and that could be measured and be collected. The capta are those that have already been identified as worth collecting and for which a form of representation has been chosen. The process of selecting capta from the data is a mental one and may be done subconsciously. This process is generally simply a matter choosing to pay attention to particular facts. Capta are richer than data as they are recognised as relevant (which implies that they are in a context). The fact that context and potential or actual meaning adds to the richness of data is included in many of the definitions of information found in introductory texts for Information Systems students, for example, Lay, Eccles, Julyan and Boot - The principles of business computing Fourth edition [1993:535] and Avison and Fitzgerald [1995:12] quoted by Checkland and Holwell [1998].

Unstructured text such as is found in e-mail and newspapers may be closer to Checkland and Holwell's concept of data, as it is left to the processor (that is, the human reader or receiver) to decide what to use and how. Processing is not specified or automated.

Those data which an individual (or system) considers to be of interest and hence pays attention to are selected and become **capta.** However, Checkland and Holwell say that processing may be more complex and the data may be classified, that is, associated with other data [1998: 89]. There is, however, some ambiguity in this regard as this is subsequently described as meaning attribution and occurs when capta becomes **information**.

3.3.3   Definitions of information

Definitions of information depend on the way in which the term "data" is defined. The major point of difference is whether information can be produced by an automated process and how this information, which is also digital, recorded and can be transmitted, differs from data.

3.3.3.1   The objective point of view

- Information is output from a computer program.
- The systems analyst decides what output will be useful. This output remains useful and meaningful regardless who the recipient is.
- The processing which produces the information includes summarising in order to reduce the volume of data.
- Data may be associated with other data, which may be obtained from different sources, to produce the information.
- The processing (classifying, linking, summarising, sorting, presentation) adds value in the form of potential meaning. The less structured data are less useful and less meaningful than the more structured information.

In the definition that follows "**a** meaning" seems to imply that the meaning is fixed and not open to interpretation and, therefore, this definition refers only to the objective characteristics of information:

> "*Information has a meaning ... (it) comes from selecting data, summarizing it and presenting it in such a way that it is useful to the recipient.*" (Avison and Fitzgerald [1995: 12] quoted by Checkland and Holwell [1998])

3.3.3.2   The subjective point of view

- Data become information only once they have been appropriated by the human recipient. Hence, the output from any computer program is still data.
- The added value of information (compared with data) results from the recipient appropriating the new data, interpreting them and placing them in context by combining them with existing personal information.
- Some authors consider data to be information only if they are used by the recipient in making a decision.
- Data become information only if they include something previously unknown to the recipient.
- Introna considers information to be historical, contextual and perspectual [Introna, 1992: 2.42]. It is moulded by the life experience (erlebnis) to provide understanding.

The definitions that follow are examples of those that include subjective aspects. These definitions also include some characteristics which are considered to be objective or intersubjective.

> "*Information usually implies data that is organized and meaningful to the person receiving it. Data is therefore raw material that is transformed into information by data processing. Information can be defined in terms of its surprise value. It tells the recipient something he did not know.*" (Davis et al [1985: 30] quoted by Introna [1992])

> "*Information: (1) Data that has been transformed into a meaningful and useful form for specific human beings. (2) The meaning that a human assigns to data by means of the known conventions used in its representations.*" [Lay et al, 1993: 535]

> "*Information is that which results when some human mental activity (observation, analysis) is successfully applied to data to reveal its meaning or significance.*" (Galland [1982: 127] quoted by Checkland and Holwell [1998])

> "*Information is the particular instances of reality as experience, perceived or understood by an individual in a specific context.*" [Introna, 1992:2.37]

> "*... information comes into being as the receiver appropriates the data and gives it meaning*" [Introna, 1992: 2.39]

3.3.3.3   The intersubjective point of view

- Aspects of shared meaning and discourse (validity claims [Braaten, 1991: 14]) are characteristic of this point of view.
- The recipient has participated in the systems analysis and hence has influenced the process and has said what output was likely to be meaningful to him and others using the system.
- More advanced, database-oriented, systems allow the user to formulate queries and interact directly with the data in the database. Hence, there is a more dynamic process where the user's judgement is combined with the power of the technology.
- Information "has meaning" which can be communicated versus "is meaning" in the objective point of view.
- Information must be put into some context "*... in order to understand something, we already need a preliminary understanding of it*" [Dahlbom & Mathiassen, 1995: 32]. This

preliminary understanding must be shared in order for a new shared understanding to result.

preconceptions plus information = interpretation => knowledge

"*To produce information we have to interpret what we experience and make explicit what we know.*" [Dahlbom & Mathiassen, 1995: 26]

3.4 Discussion

There are a number of levels of information which are used in different ways and carry different kinds of meaning. The fact that these are all commonly referred to as information can be confusing.

3.4.1 Information[1] - lean information

The first sort of information is data (or capta) which has been processed electronically (summarised, sorted, classified, analysed or simply collated and associated with other appropriate data), reformatted and made available to someone who is expected to find it meaningful and useful (and may act on it). The processing associated with the production of this type of information is mechanistic and procedural and can be described by an algorithm. The processing is done deliberately in order to add value. Since this processing was not done by a person, in Checkland and Holwell's terms [1998] this is still capta. In Habermas' terms this type of information is the manifestation of functional rationality (administrative systems).

The intention is, therefore, that:
- The information will be used to initiate action or decisions within a clearly delimited scope of function and time, or should be available when action and decisions are required. Its purpose is unambiguous.
- Hence, it generally has a short useful life.
- It has a limited readership for whom it is meaningful and who are authorised to access it. The person who creates the specification of the program that will produce this type of information, specifically intends to produce information that the reader will react to and has a relatively stringently defined target group in mind who is expected to be very familiar with the context and share the frame-of-reference.
- The information is necessary either because it is not already available or to reduce uncertainty by confirming facts.

- Provided that the context is explained, this information is not ambiguous. For example, the trade deficit may be given in a recognised format, for a specified currency, for a specified country, on a certain date, calculated according to a procedure for which a description and explanation are available.
- It is specific, not universal, and hence acontextual, ahistorical and not perspectual leading to local knowledge (functional rationality) rather than wisdom or universal knowledge (theoretical rationality).

3.4.2   Information[2] - rich information

What then is the type of information that is not the output from a computer process, such as information in newspapers and text books - text which is intended to inform? Is the difference between Information Systems and Information Science which of these two types of information the subject tries to make available or accessible? This 'information' has been carefully put in context (explained) and a human has done this processing but it is in artifact form (the information is printed on paper or displayed on a computer screen) and is a commodity. In Checkland and Holwell's terms this is still capta, as it is external to the human mind. In Habermas' terms, the intentional behaviour which produces this type of 'information' may be strategic or communicative action and the communicative rationality would be authentic self-expression referring to the aesthetic sphere. It might be instrumental if it consists largely of instructions such as a manual or recipe book.

This type of information, which will be called Information[2], has the following characteristics in comparison with Information[1].

- It is not as likely to initiate immediate actions or decisions as Information[1] but is intended to initiate thought and to influence the reader by altering his lifeworld.
- It is produced deliberately for a purpose but this purpose has less well-defined scope and the expected outcomes are less specific.
- It has a wider readership. (The newspaper is not prepared for one specific reader, it is prepared with the intention to inform.)
- It is relevant for a longer period.
- It is less structured than information produced by a computer and has more complete sentences and fewer tables.
- It handles more of the type of information which is "soft" and cannot easily be expressed in terms that are exact or precise. Hence, readers need to interpret the information to a greater extent than the first type. It is for this reason that it is likely to contain more redundant information and that the context is usually explained in greater detail - except where it is assumed that the context is already known, in which case the information may be very difficult for "an outsider" to understand.

- It handles more complex information, where more explanation is required. (Although this might not be considered to be discourse because it is not interactive or a dialogue, it can certainly present one or more sides of an argument and try, by force of the better argument, to convince the reader of a particular "truth".)
- It is sometimes specific but may also attempt to explain universal "truths".
- It is perspectual in the sense that most complex information, formulated by a person, includes that person's perspective, slant, or bias.

The two types of information are related: Both are intended to present facts (and in the case of Information[2], may include opinions) in a form which will probably (hopefully) communicate meaning to the recipient. In Information[1] ambiguity is avoided. In Information[2] ambiguity may be inevitable and is sometimes courted. Information[1] is "lean". Information[2] is "rich". The more subtle and equivocal a text is, the richer it may be considered to be. It is easier to refer to both lean and rich information as information even before it is appropriated and hence, for the moment, neither Introna's nor Checkland and Holwell's terminology is used.

Both Information[1] and Information[2] are processed data in a sense. In the one case, a computer has done predetermined calculations and processing to produce the information. In the second case, a person has either intuitively or deliberately processed the information and combined it with his or her unique world view, possibly analysed, synthesised or evaluated it but definitely expressed it in an individual way. As with all aspects of technology, appropriate fit between the task and the technology is important although it is not the only factor involved in adopting a specific technology. Rich information corresponds largely with "thick information".

> "*In fact in one area - so called thick information - management technology can be dangerously limiting. As defined by Henry Mintzberg of McGill University, thick information is irrational, subjective, intuitive knowledge that transcends what can be categorized on an MIS report.*" [Davidow & Malone, 1992 : 170]

3.4.3   Information[3] - appropriated information

When a human acquires information and mentally processes it, some form of learning occurs. The user or acquirer of information relates it to existing knowledge and information and a third type of information results. During this process meaning is attributed to the information. It is possible to assimilate isolated facts but it is easier to remember information that can be related to an existing mental landscape (or a world view, or mental model). Information[3] is personal and mentally stored and has meaning. This is the richest information. It is impossible to express it exactly and completely. Hence Information[3] cannot be transferred. It may change from day to day. It probably does not correspond entirely with anyone else's version. How it is structured is unknown. The creation of Information[3] is the process of learning. Further learning can occur

without further input of Information[2], as the learner restructures the information and associates it with other personal beliefs, values and knowledge. This is the 'true information' according to Checkland and Holwell [1998] and Introna [1992].

Introna [1992] explains the process of developing understanding in terms of the hermeneutic circle. Interpretations of text follow a cycle in which a new element is interpreted alone and then in terms of the larger text. This results in a re-interpretation of the meaning of the text as a whole. The new element may then be re-interpreted in terms of the new understanding of the complete text. Thus, the individual starts off with certain prior knowledge or prejudices in order to form an initial understanding of a text. This new information is then related to the larger context of the learner's lifeworld (traditions, economic and social situation) and he arrives at a new understanding of the lifeworld. New understanding now influences the more particular interpretation of the text and this will be modified. Once again the modified information will be related to the broader context, and once again this might be adjusted to reach a consistent view. This process will continue until the new information and the larger picture no longer have any inconsistences.

3.4.4   Information[4] - tacit information

Certain types of information are more difficult than others to put into words. Tacit information may be difficult to verbalise. In fact some skills, such as balancing while riding a bicycle, do not
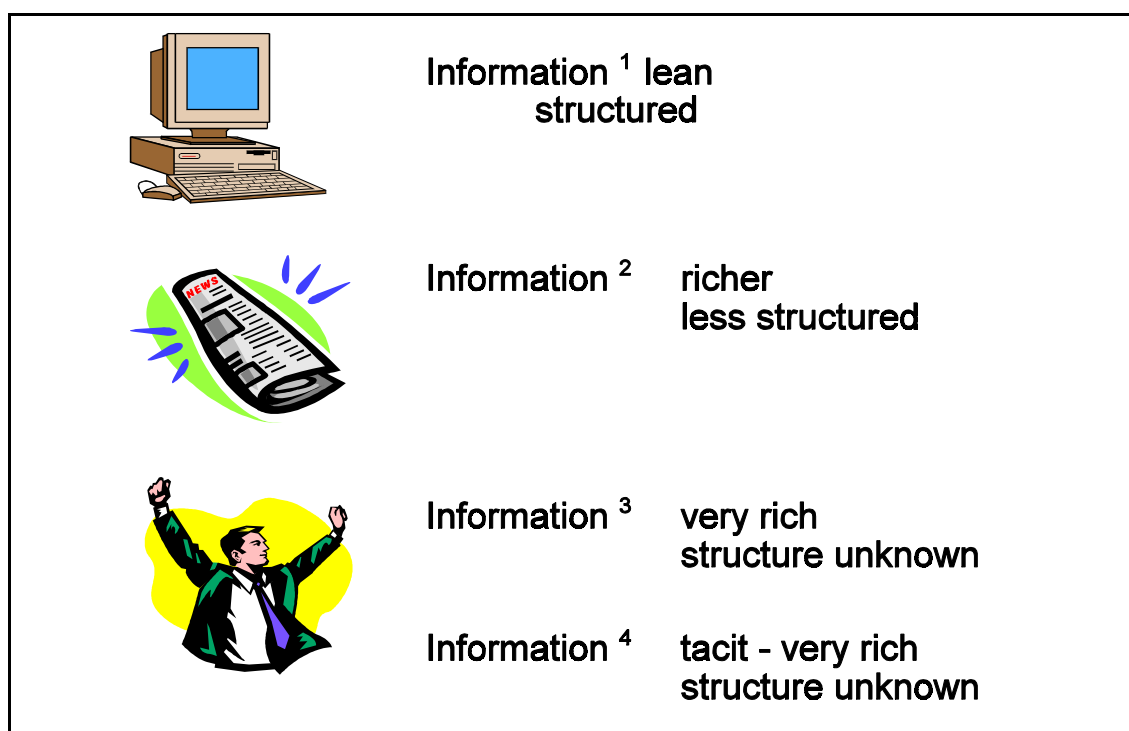
Figure 3.1: Taxonomy of types of information

seem to have words that describe them. Hence, this information is usually imparted by demonstrating it and by the recipient learning by trial and error or practising the skill.

FOREWARD LOOP FOLLOWED BY THE LEARNER
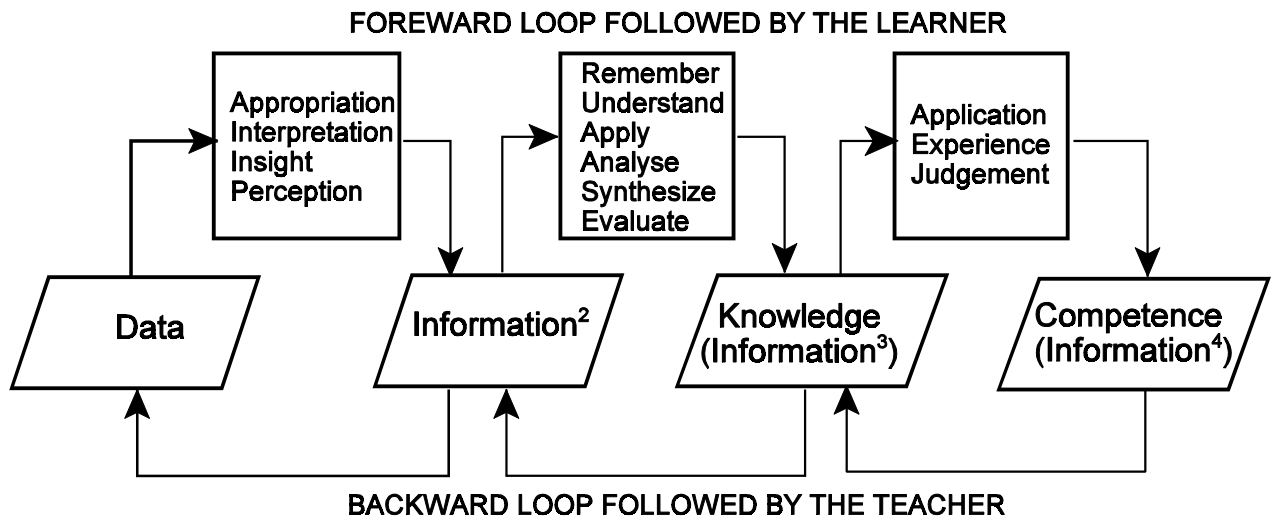
Figure 3.2: Adapted from De Villiers [1995: 83] Model of the teaching and learning process

Another type of interpersonal communication that it is difficult to achieve in formalised exchanges of information is "brain storming" , (problem solving where a small team or only two people exchange ideas). These may often be verbalised as fragments of conversation which do not seem to make a lot of sense when transcribed and where leaps of logic are particularly fruitful. The term "on the same wave length" seems to imply the idea that the participants have evoked already existing, matching, world views. Hence, they need fewer words to refer to a concept that they share and may naturally relate concepts that they both consider are appropriate. Eventually they will arrive at a conclusion or solution that they both find satisfactory.

This creative problem solving is not considered by this author to be tacit. It stems rather from having a compatible background and language of practice (a large degree of existing shared meaning) but is also stimulated by fast response and even interruption so that concepts are moulded before "they set". Introna [1998] is concerned with the fact that cooperation needs this type of intimate and rich communication and that this will be impossible to achieve in technologically supported environments. This seems to point to Information[4], which is tacit. Figure 3.1 illustrates the four types of information.

3.4.5   Making Information[3] explicit

When a person expresses Information[3] as words, music or anything else, it becomes Information [2]. It loses part of its context, its meaning is once again only potential, it may not be

well expressed and hence be prone to misinterpretation. This is explained by Dahlbom and Mathiassen [1995: 33] and illustrated in Figure 3.2, based on a diagram in De Villiers [1995: 83]. Mingers [1995], using Dreske's terminology, refers to this as making analogue information digital. Codified information, that is, Information[1] is by definition already explicit and is, therefore, easy to copy and has little natural protection. Tacit information, because it is very difficult to capture and make explicit can be lost permanently when, for example, an experienced member of staff retires [Chesbrough & Teece, 1996].

3.5 Meaning and learning

3.5.1 Personal meaning

Meaning is closely related to learning and knowledge. It is the result of a personal process where an individual converts information to a form which is related to his own world view. Hence, it is a purely human aspect of information processing which occurs when an individual extracts meaning from Information[1] or [2]. He appropriates it, relates it to existing Information[3] and converts it to Information[3]. Appropriation is the hermeneutic process during which new information is incorporated into the larger structures of existing, personal information. Mingers [1995] refers to a process of conversion of information from an analogue form, reflecting objective reality to a digital form. (Mingers acknowledges Dreske as the originator of this concept.) This is a not very accurate way of explaining the loss of information that occurs as a result of the filtering process that is an unavoidable part of appropriation. Not all aspects of the available information can be appropriated, whether the input is in the form of Information[1], Information[2] or the analogue form provided by our senses during direct observation of an event.

Interpretation is an essential activity in understanding and converting Information[1] and Information[2] into the personalised information which is part of one's world view and frame-of-reference. It is coloured by prejudice, as the existing Information[3], which includes prejudice, is used in the process of understanding (interpreting) the new information.

What is information for some people would be meaningless to others. In this case it is not even capta as there is no way that the person (or procedure or computer) can use it. Just as a file whose data structure is unknown is useless or a telephone conversation between people who do not speak a common language cannot inform either of them, so information that does not get understood is of no value. Information which has not been appropriated by a user has no meaning, it only has potential meaning - as music not only needs to be played but also heard.

Mingers [1995] identifies different "levels of meaning" which are developed progressively during the reception phase in a meaning system. These are processes during which meaning is constructed or information is interpreted. The first is understanding, and corresponds largely with appropriation as described above.

> "...*in which the receiver comes to understand the primary meaning of a sign or linguistic message. ... This is the level of meaning that can be expected from all competent speakers of a language. .... that is, the digitalized information without the analogue message*" [Mingers, 1995: 299].

The second is connotation, during which other meanings, beliefs and implications, which are associated with the new information are recognised. This includes nested consequences, that is, recognising predictable subsequent events. It seems that Mingers sees this as association of the new information with the subset of Information[3] which can be considered to be objective, uncontested, factual information. The third level of interpretation is intention. Here the individual meaning and implications of that meaning for action are developed. Hidden meanings in text or messages that are deliberately equivocal, or where meaning is implied or hinted at rather than being stated unambiguously, are revealed here.

Each level of interpretation in fact adds "richness" and meaning to information which may originally have been quite scanty and "lean", either because that was all that was available, or because of the filtering that took place during appropriation. The more Information[3] that is available, the more efficient the appropriation process can be - the less new information has to be absorbed.

Mingers also identifies a second phase, the production phase, in which the information which has been interpreted during the reception phase is applied or generates action.

3.5.2   Shared meaning

The description of meaning given above indicates that meaning is unique in that no two individuals will possess the same version of Information[3]. What then is meant by "shared meaning"?

Habermas' concept of societal rationalisation has as its essence the idea that:

"*... the social construction of social reality is part of the process of social change. Social reality is constructed through what Habermas calls communicatively rational action, or communication between participants attempting to reach a rational consensus. ... Communication, according to Habermas, is inherently oriented towards mutual understanding, and the standards that govern communication are therefore conditioned upon reaching mutual understanding and, ideally, rational consensus (CES, 3).* " [Braaten, 1991: 13]

"*This mutual commitment enables one to recognize one's own and the other's respective places in an intersubjective shared world;*" [Braaten, 1991: 14]

Thus, the whole concept of society and the way in which it develops is, according to Habermas, based on members of society reaching consensus, that is, sharing meaning by means of rational discourse. This relies on the ideal of "ideal speech" which allows rational discourse by requiring all interested parties to be allowed to participate in the debate and to be heard and that the final consensus be based solely on the force of the better argument. The ideal strives, therefore, for a situation where everyone has the same Information[3], at least as regards truth and norms. This is, however, an unattainable ideal. The best we can achieve is a narrowing of the gap between different lifeworlds and interpretations. A double hermeneutic process can be said to occur here in which I interpret (within my own lifeworld and coloured by my own prejudices) what you say. But what you said was an inexact (digitalised in Mingers' terms) version of your interpretation of reality. It is even possible that the recipient of a message will not only ideally reconstruct the meaning and hence understand exactly what she is told but might also understand **better** than the originator of the message because the existing knowledge which she possesses may be greater or more relevant than that of the originator.

The four types of social action named in Habermas' Theory of Communicative Action, namely instrumental, communicative, discursive and strategic provide a different way of classifying information according to the purpose for which it will be used. Hence, Mingers' process of interpreting the intention of information or a message is relevant as it will indicate which type of discourse is appropriate if it is necessary to challenge the information or even to seek further explanations.

- Instrumental action is where the actor considers the opponent to be an object or instrument. The message is likely to be in the form of giving instructions or orders. Reference to the context must be part of the message.

- Communicative action sees both the communicator and recipient as actors in the social context and has the purpose of achieving and maintaining mutual understanding. This implies a need for clarity, completeness, contextuality and truthfulness of the message. Validity claims are made in terms of the truth, rightness or sincerity (or truthfulness) of the argument. (Comprehensibility is also sometimes included but this seems to be related more to the concept of ideal speech whereas the validity claims are based more on the content of the argument.)
- Discursive action occurs when two actors do not agree and hence involves debating an issue. Since the arguments need to be understood by the opponent, clarity, completeness and context are important. In addition a rational outcome cannot be achieved unless all interested parties are allowed to contribute and their arguments are judged fairly.
- The last of the communicative actions is strategic, where the actor is trying to achieve an advantage by influencing others. There is some similarity between strategic action and instrumental action as in both the actor is not engaged in a dialogue. None of the validity tests need apply to strategic action.

Mingers has related his levels of meaning to Habermas' validity claims as shown in Table 3.1. Information[1] is most likely to be the basis for instrumental action (uncontested factual information leading to action). Communicative action requires rich text messages, that is, Information[2]. Discursive action may require both types (1) and (2) to achieve clarity, completeness and context. Strategic action depends least on facts and most on how the message is formulated and hence is definitely Information[2].

Table 3.1: **Mingers' levels of meaning related to Habermas' validity claims**

Mingers' levels of meaning		Habermas' type of social action	Habermas' validity claims
reception	understanding	instrumental, communicative, discursive	comprehensibility
	connotation	communicative	truth rightness
	intention	strategic	sincerity
production	intention	instrumental communicative, strategic, sincerity	
	generation		truth rightness effectiveness
	action		

3.6 Learning

3.6.1 Introduction

Maturana, as quoted in Winograd and Flores [1987: 45] defines learning as follows:

> "*Learning is not a process of accumulation of representations of the environment, it is a continuous process of transformation of behaviour through continuous change in the capacity of the nervous system to synthesize it.*"

> "*Learning is a change in behaviours as the result of experience*" [McNally, 1977:14]

There is a definite relationship between the process of learning and the one of developing meaning. Meaning has to be developed during all human activity, be it while listening to the news on the radio or simply recognising that the cat is asking for food when it rubs itself against your legs as you are making coffee in the kitchen early in the morning. In order to learn one must develop meaning but not all construction of meaning is recognised as learning. Learning implies that there is influence from outside in the form of new information and a definite outcome. Generally someone learns to do some specific thing or learns about a specific topic. Hence, there is often a conscious goal to understand a particular topic or master a particular skill. Sometimes there is a teacher who is deliberately assisting the learner in the process. The intention of learning is to retain the new skills and knowledge developed.

Alternatively one could view learning as the more advanced levels of mental processing beyond simply trying to interpret fairly unambiguous messages. Meaning is constructed during all levels of learning but is also involved at a level that is considered to be more temporary or more superficial than learning.

3.6.2 Philosophies of knowledge acquisition

3.6.2.1 Introduction

There are a variety of theories associated with education. These include theories of the development of the child (for example, Piaget), ways of classifying activities associated with learning (Bloom's taxonomy) and theories that set out to explain how people learn.

Learning models can be classified as being behavioural or cognitive and can in turn be associated with the different beliefs about physical and social reality (that is, objective, subjective or intersubjective). An example of a behaviourist learning model is Objectivism. Constructivism and socioculturalism are both cognitive models but emphasise the subjective and intersubjective points of view.

3.6.2.2 Behaviourism

Behaviourist models of learning follow the ideas that originated with Pavlov and were continued by Skinner. The central idea is that learning occurs as a result of the learner recognising a stimulus and responding in a predictable way. The use of positive reinforcement (rewards or praise) when the required behaviour is exhibited encourages the learner to react in this way whenever the stimulus is encountered. This theory is built on the supposition that there is an objective world that everyone will perceive in the same way and that everyone can be taught to react in the same way. Hence, teaching and learning involve a transfer of knowledge which will result in the learner eventually obtaining an exact copy of the knowledge of the teacher. The teacher is in control of the process. This theory assumes that "... *the purpose of the mind is to act as a mirror of reality rather than as an interpreter of reality.* " [Leidner & Jarvenpaa, 1995]

Amongst these models are those referred to as Objectivist [Leidner and Jarvenpaa, 1995]. In the learning of Mathematics, Platonism and Logicism view reality as being objective [Matthee, 1998]. The objectivist approach is the one mostly used at tertiary level. Lectures are a good example of teaching according to such a philosophy. This approach assumes that students learn best in locations, such as classrooms, which are removed from outside distractions and that intensive study for relatively short periods is most effective, such as hour-long lecture periods. Leidner and Jarvenpaa [1995] suggest that this approach is most suitable for factual or procedural-based learning.

Variations of the basic Stimulus-Response theory exist. Thorndike proposed three primary laws which determine whether learning takes place [De Villiers, 1995]. Firstly, the learner must be ready (presumably this includes physical maturity as well as motivation). Secondly, the association must be built and strengthened as a result of practice and repetition. Finally, the outcome must be rewarding.

3.6.2.3 Constructivism

The Constructivist philosophy, as explained by Alavi [1994], says that learners must be actively involved in the learning process. The learners acquire, generate, analyse, manipulate and structure information in order to construct knowledge. Information forms an essential basis for learning. The new Information[2] must be interpreted, elaborated on and related to other Information[3]. Thus, a relatively subjective view of reality is adopted as each person's reality is different. This approach is learner-centred with students controlling the pace and formulating their own questions. Nevertheless, most constructivists acknowledge the existence of an objective world and believe that learning involves a hermeneutic process in which new information is interpreted by the learner. The interpretation is coloured by his existing prejudices but is then compared with the different interpretations offered by others (teachers, classmates or reference books). The learner will gradually or incrementally adjust his personal interpretation until, ideally, the subjective reality for this particular piece of knowledge is very close to the universal objective reality.

> *"Gadamer's point would seem to be that anything new can only be understood in terms of what one already knows. The first step in understanding is based on what one already knows or the tradition within which one finds oneself. If the process of understanding stops after the first step then, yes, it is subjective. But if one continually opens oneself to the text and continually re-evaluates one's understanding against the text, one will be able to complete the meaning through the process of understanding."* [Introna, 1992:2.23]

Piaget is considered to be primarily a supporter of constructivism as he emphasises the role of the learner in discovering knowledge and not the teacher.

Radical constructivists take a more extreme view as they believe that there is no shared understanding and that each individual discovers or constructs his own view of the world, building unique schemas. They sometimes go as far as to say that knowledge cannot be taught or learned from books [Thomas, 2000:87].

Even if radical constructivism is not accepted, constructivists recognise that different people have different learning styles and should be encouraged to consciously recognise this and hence improve their learning effectiveness and efficiency.

The following characteristics of constructive learning are derived from those given by Simons ([in Duffy et al, 1993] cited by De Villiers [1995:79]).

- The learner must be *actively* involved.
- The learner will interpret the new information in the *context* of existing information.
- The resulting knowledge will, therefore, extend existing knowledge as additional meaning is *constructed*.
- The learner must be aware of the *goals* towards which he is working.
- The learner must ensure that he is still on course and *progressing* towards the goal.
- The learner must be *conscious* of his way of learning.

There is no real reason why these requirements cannot be achieved in a lecture but it is the learner who must actively participate during the lecture. The lecturer cannot ensure that this learning occurs. However, this approach is well suited for topics where relationships can be determined, multiple representations compared and a real-world context explored. It is not suitable for acquiring a fixed set of preordained, factual knowledge [Leidner & Jarvenpaa, 1995].

3.6.2.4   The sociocognitive learning theory of Piaget

The sociocognitive model is an example of constructivism. Piaget's writings illustrate how children naturally acquire skills and knowledge without having to be taught them. Piaget believed that all humans develop cognitive abilities in a more or less fixed sequence and at predictable times in their lives. Piaget did not set out to develop a theory specifically relevant to education or teaching but his work concerning the stages of intellectual development, as well as his explanation as to what kinds of intellectual structures can be formed at the various stages and how these are developed, is extremely relevant in this context.

Piaget identified two functional invariants which apply to all stages of intellectual development, namely adaptation and organisation. These concepts are closely linked to one another. Organisation refers to the intellectual structures or schemas (or schemata) that the learner develops and makes use of as strategies for solving problems. These strategies are reasonably specific (for example, schemas for doing addition and schemas for reading maps). More complex schemas are created by combining existing schemas. Hence, arithmetic can be combined with map reading to find the shortest route between two places.

> "*Thus as intellectual development proceeds, the individual's schemas become more complex, differentiated and capable of greater generalisation to situations yet always organised and integrated.*" [McNally, 1977:7]

The second functional invariant, adaptation, involves two activities, namely assimilation and accommodation. During assimilation data are input from the environment and interpreted in terms of current cognitive structures. The new data may not fit the existing schema exactly and accommodation occurs in order to adapt the schema and in so doing reconcile the most recent experience and the previous experience to an acceptable degree. In this way equilibrium is reached but this is a temporary condition as the human mind is constantly assimilating new data and accommodating existing schemata. In fact, this intellectual curiosity and adaptation of intellectual structures is a fundamental characteristic of mankind. It is important to note the difference between the schemas and the facts or content that a person remembers. The same facts will be interpreted or even be recollected differently if the schema being applied has been revised. Schemas are not typically forgotten whereas facts may be. Schemas correspond to some extent with tacit knowledge and may be difficult for the learner to explicate.

A description of the stages of intellectual development is unnecessary in this context since, at tertiary education level, all students can be expected to have reached the final stage, that of formal operational functioning, in which the individual can handle abstract concepts. At this stage the learner can use hypothetic-deductive reasoning and has a uniform logical system which can be used systematically to isolate variables and hence determine relationships between them. The learner is capable of understanding assertions or propositions independently of concrete examples and can examine these critically. When new concrete facts are assimilated, the learner can be expected to look at the circumstances from a broad perspective and associate information from other sources and obtained at other times. Hence, the learner can identify logical relationships and can integrate concepts, seeing how various factors and their relationships interact.

Since the learner at this stage does not need to work from concrete examples in order to understand concepts, the use of language, either spoken or written is used more in reasoning and learning than prior to this phase. (The student is capable of interpreting explicit, lean Information[2] into rich Information[3] or tacit Information[4] .) Nevertheless, active participation by the learner in the learning process is still required even though it is not necessary that the learner is given as much practice in manipulating the concrete examples.

> Richmond [1970: 94] says, " *... learning at any age needs contact with concrete reality. Piaget expresses this as follows: 'The subject must be active, must transform things, and find the structure of his own actions on the objects.' Piaget Rediscovered, p. 4)*"

Richmond [1970:108] says specifically that, even in the period of formal operations, "*... [t]he need for contact with the concrete remains in order that potential generalizations may be modified*." McNally [1977: 74] confirms this, "*... he is clearly in favour of true activity methods, ...*"

Piaget makes the distinction between figurative and operative aspects of knowing. Figurative knowing is associated mostly with the perception or image of the object and hence is fairly passive. It is the more superficial knowledge of the static, material characteristics of objects. The operative aspect is closely associated with meaning and is significantly influenced by the existing intellectual structures (schemas) and will probably result in adaptation of these structures. This type of knowing is more active, in that the learner assimilates the new data. It is encouraged by providing the learner with opportunities to actively interact with the environment. The learner discovers concepts by means of this interaction followed by reflection, leading to the formal abstraction of relationships [McNally, 1977: 101]. Figurative knowing is, therefore, likely to involve memorising, while operative knowing involves understanding.

The social interaction of the individual is an essential part of learning. Richmond [1970: 95] quotes Piaget as follows,

> " *'... without interchange of thought and co-operation with others the individual would never come to group his operations into a coherent whole ...' (Intelligence, p. 163.)*"

and specifically advocates group work.

McNally [1977: 87] says

> "*The facilitative effects of interpersonal interaction on intellectual development are important for all levels of thought but become particularly important in adolescence with the development of formal thinking.*"

One aspect of intellectual development, from babyhood, involves the learner's concept of self, of others and ultimately of groups and interaction. Initially the infant has no real concept of either himself as an entity or others. In time he realises that objects have permanence, the objects can be people and eventually, at about the age of 6 or 7, that he himself is also an object. An extremely important stage is reached when the child is able to imagine things from someone else's perspective, read social signs and master the concepts of social acceptance and rules. This has implications for learning as it is only by recognising a difference in opinions and perspectives that a learner will be motivated to accommodate them in his existing schema. Hence, we can trace a progression from subjective to objective to intersubjective, although at all times the concept of self is present. This final stage of intersubjective understanding is probably never entirely mastered and is linked to emotional maturity as well as intellectual maturity. It is this skill that is extended and exercised during the collaborative learning and virtual teamwork that is the subject of the research in this thesis.

Piaget's concept of the stages of intellectual development has immense importance for what material is presented to learners at specific times during their education. Material which is too advanced, because relevant schemas are not available, will simply be ignored. Material that is too simple will cause boredom and the learner will lose interest. Hence, material must be moderately novel and above all the learner must be able to relate it to his previous experience and current cognitive structures [McNally, 1977: 11-12].

3.6.2.5   The sociocultural learning theory of Vygotsky

Socioculturalists believe that the ideal of subjective interpretations of reality being as close as possible to a universal objective reality is in fact not desirable. They emphasise the fact that a learner will only readily accept and understand concepts that he can relate to his own environment, culture and history. Each individual will also have a unique interpretation of reality which reflects his unique lifeworld. Vygotsky emphasises a social origin for learning. Thought is a form of "inner dialogue" modelled on interaction between people [Thomas, 2000]. Learning is seen as a social process that involves human beings in communication with one another. Hence, he advises that teams should be made up of more advanced learners and less advanced learners so that the learners can learn from one another. This is, therefore, a model that fits in with an intersubjective view of social and physical reality. Despite the fact that both sociocultural learning theory and constructivism are both cognitive models, they differ with respect to how closely the subjective interpretation should coincide with objective reality.

3.6.3   Bloom's taxonomy

Bloom's taxonomy of educational objectives [1956] is widely accepted and consists of two groups of objectives. The first is knowledge and the second consists of intellectual abilities and skills. He defines knowledge as "*... recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure or setting.*" [Bloom, 1956: 201]. This includes knowledge of: terminology, specific facts, conventions, trends and sequences, classifications and categories, criteria, methodology, principles and generalisations, theories and structures. Thus, this level includes the recall of highly complex and abstract concepts. Since the use of "knowledge" to identify this category of educational objective is somewhat misleading, I will refer instead to "recall".

The next group of objectives are those in which meaning is applied or constructed. *"The abilities and skills objectives emphasize the mental processes of organizing material to achieve a particular process."* [Bloom, 1956: 204] The abilities and skills in this group are: understanding (comprehension), application, synthesis, analysis, and evaluation. Knowing the rules of a game

such as chess is at the lowest level, memorisation. Being able to actually play the game is at the next level. Being able to play well, by foreseeing the possible results of a move which may only be significant several moves ahead and thus planning strategies by planning several moves, would demonstrate the ability to synthesize information and analyse it. Choosing between different strategies shows an ability to evaluate.

The process preceding learning is the subconscious process of appropriation where information is decoded and part of it is selected for attention and further processing. Learning theories, such as that of Bloom, can be used in analysing the levels of constructing meaning which follow appropriation. The first level of learning involves remembering facts, at least in short term memory. Meaningless data can be remembered in the short term but they exist as a collection of unrelated facts which are difficult to recall. The new information must be related to existing information in long term memory in order for it to be accessible in future. Even if someone can recall an observed fact that seemed completely meaningless when it was observed and there is no explanation as to why that fact was remembered, it will be remembered in some context. This shows that some interpretation and association (some development of meaning) precedes any learning.

This appropriation is followed by a level of learning during which the learner applies the facts. Analysis involves further interpretation of the information. Synthesis involves associating it with previously acquired information. As was pointed out above, there is a certain amount of inherited information accessed by means of links between the new information and existing information. ("Nested in" is the term used by Mingers [1995] which he attributes to Dreske.) The highest level of Bloom's taxonomy is evaluation. Here inconsistencies or contradictions between the new information and existing knowledge are recognised and an attempt is made to reconcile them. During the reconciliation the original, lifeworld knowledge may be modified or the incoming information may be queried (practical discourse) until the inconsistencies can be resolved. This critical process is an essential process of learning and understanding.

During any learning, aspects of more than one of these learning processes will be required and there is a need to interpret information and associate it with existing information during all of them.

3.6.4   Conclusion

As is the case when defining the concepts of data, information and meaning, learning can be seen from a variety of perspectives. The consensus which most authors reach is that it is necessary to incorporate aspects of all the learning theories when teaching, although the choice of a specific strategy at any stage will depend on a number of factors.

"No particular model is the best approach; indeed, different learning approaches will be
appropriate depending on the circumstances- course content, student experience,
maturity, intelligence, and instructor goals, skills, and preferences, amongst others.
[Leidner & Jarvenpaa, 1995]

3.7   Conclusion to chapter

In this chapter the basic concepts required in order to understand how meaning can be shared
were examined. In Section 3.2 it was noted that these concepts are used in a variety of
academic disciplines. In Section 3.3, an attempt to define the terms began by reviewing how the
concepts of data, capta, and information have been defined traditionally in the context of
information systems. In a further attempt to understand what information is, different types of
information were identified in Section 3.4. These are all capable of carrying meaning and
different types can carry meaning which is more or less rich. (The idea of the richness of
information will be explored further in Chapter 5.) Information[1] can be created by computerised
information systems and is limited to factual information. Information[2] is communicated using
any of a wide variety of media, recorded on an external medium or spoken. It may be equivocal,
and make any of the three validity claims (truth, right or beauty reflecting the three spheres of
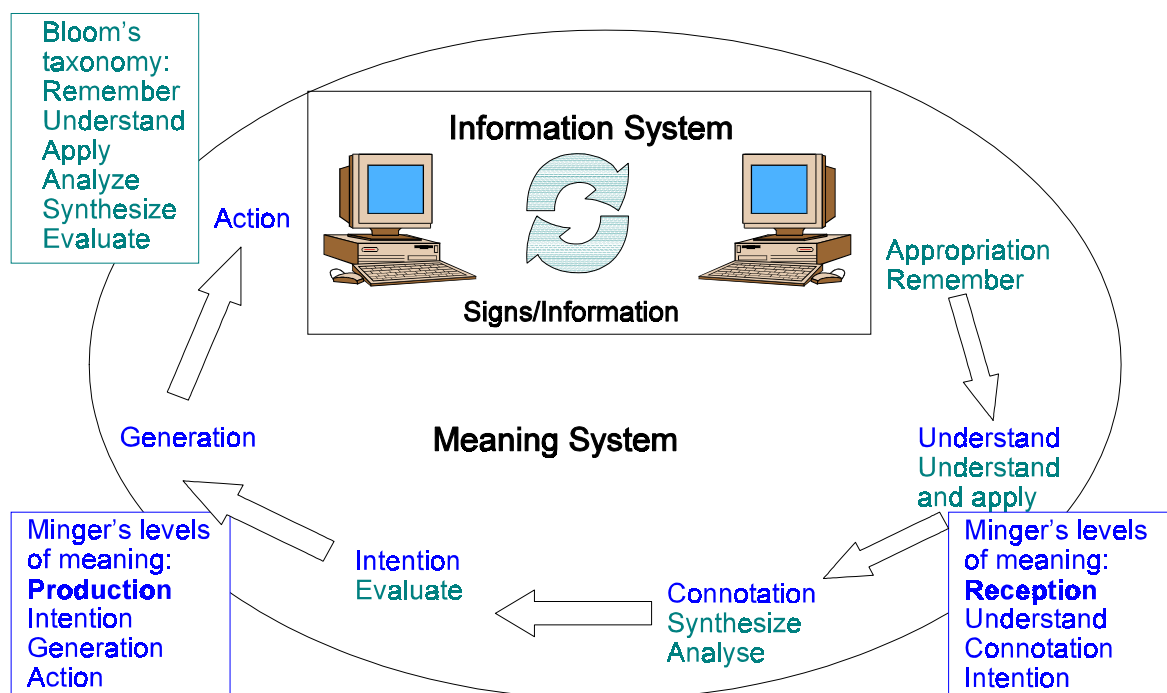
Figure 3.3: Information system as part of a meaning system
(adapted from Mingers [1995])

the objective world, the intersubjective world, and the subjective world). Information[3] is the internal personal view of the world held by any individual and this includes tacit knowledge (Information[4]) which is difficult to make explicit.

In the discussion in Section 3.5 the relationship between information and meaning was explored. Basically information carries meaning but this meaning is only immediately accessible in the form of Information[3] and Information[4] and can only be communicated as Information[1] or Information[2] . As shown in Figure 3.3 (adapted from Mingers [1995]) any Information System must be seen as part of a Meaning System and information systems must be designed with this in mind. The relationships between information, meaning and learning can also be detected by noting how different forms information are suitable for processing automatically (data and Information[1]), communicating (Information[1] and Information[2]) and understanding (Information[3] and Information[4]).

Three different models, namely the well-known data cycle, Minger's cycle showing levels of meaning - Figure 3.3, and De Villiers' cycles of teaching and learning - Figure 3.2, show that information which exists in digital or explicit form, is communicated, interpreted, initiates decisions, and may result in action being taken. The action may be in the form of communicating ideas or may result in new events, which are recorded in turn as further digital information or data.

As is indicated in the cycle of teaching and learning [De Villiers, 1995] there is a clear link between the discussion regarding information and meaning, and the processes of learning and teaching. This aspect was explored further in Section 3.6 by referring to learning theories and in particular the constructivist philosophy of learning which collaborative learning is based on. The research described in Chapters 7, 8 and 9 explores collaborative teamwork with respect to the effective sharing of meaning by dispersed or virtual teams. Hence, the research draws on this chapter in a variety of ways. It refers to theories of learning, the concept of communicative rationality and general ideas concerning information and how it can be communicated particularly when Information Technology is used in some way in the process.

In the next chapter this discussion will be continued by examining information from the perspective of the increasingly important role it plays in modern society. Hence, it will be studied from a more philosophical point of view relying on the insights obtained from Habermas and Giddens.

Chapter 4

Radicalised modernity
and new technologies

**"*Time, space, and causality are only metaphors of knowledge,
with which we explain things to ourselves.*"**

Friedrich Nietzsche, Samtliche Werke: Kritische Studienausgabe,
vol. 7, p. 484, selection 19[210],
eds Giorgio Colli and Mazzino Montinari, Berlin, de Gruyter (1980)
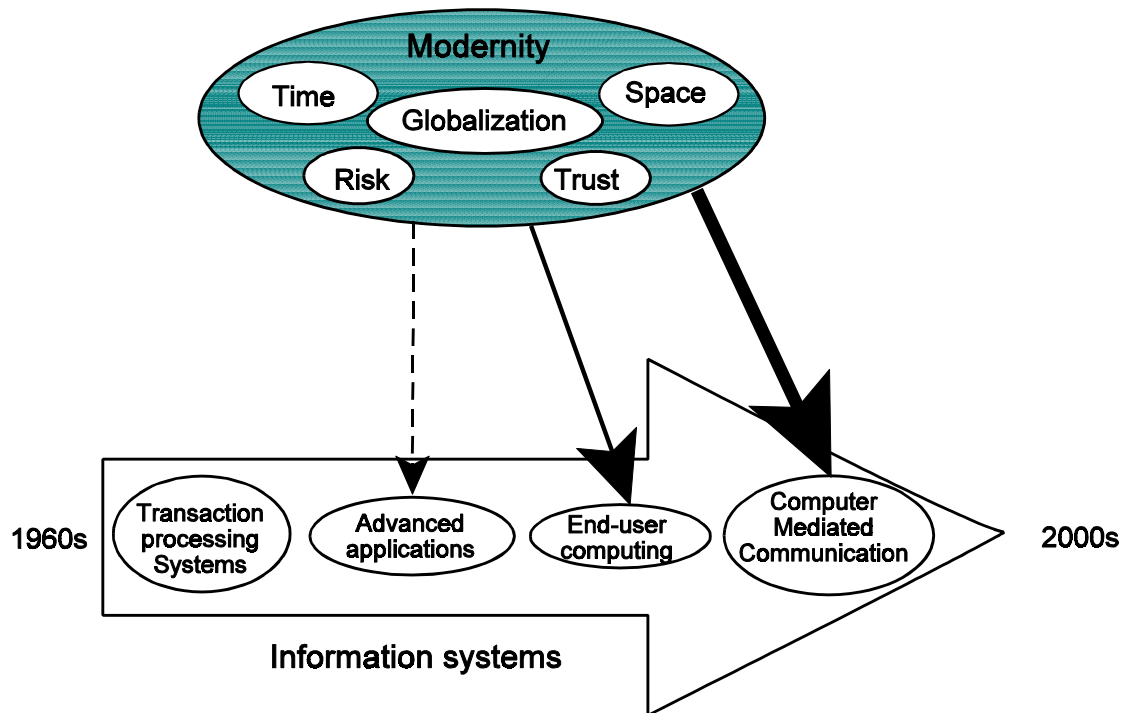
Figure 4.1: The influence of Modernity on Information Systems

4.1   Introduction

This is the last chapter in which the theoretical basis for the thesis is developed. Both Giddens and Habermas discuss the influence of the society in which we live on technology and the influence of technology on society. In this chapter these social philosophers will be referred to in order to obtain a critical perspective of technology, seeing it not only in the light of the advantages that it brings materially to some segments of society but also the less obvious disadvantages. The role of Information Technology in reducing the limitations of time and space on the way people interact is particularly interesting and Giddens' ideas on the impact of modernity on time and space and the related ideas of risk and trust will be studied. Habermas' critique of modernity in relation to communications media and the World Wide Web is also studied in accordance with the stated intention to view technology critically.

Different kinds of information systems have been developed at different times. This depended not only on the powerfulness of the existing technology but also on an emerging understanding of the different roles that information plays in an organisation and the relative importance of these. The first computer systems were centralised, batch processing systems that were limited to transaction processing and were bureaucratic. These systems were limited in scope in terms of time, space, usefulness and usability. These systems automated activities and used highly-structured, simple data types and data. The systems created over the last fifteen years are much more accommodating and have a far wider sphere of influence, either because they are tools developed in one place but used universally, or because they run on global networks. Therefore they reach across space and simultaneously almost eliminate time differences. These systems frequently use data such as text documents, which are not structured in the same way that data files used to be.

One sector of these advanced technologies, computer-mediated communication, and the Internet in particular is particularly relevant to this thesis and hence will be studied in this chapter and in greater depth in Chapter 5. This contributes directly to the research topic of this thesis, namely how effectively meaning can be shared by virtual teams who are communicating complex and equivocal information via e-mail.

4.2   The Information Age

It has become popular to divide the history of the world into a sequence of ages and each key note speaker seems to have a new and enlightening division. Often these are based on they way information is communicated. Hence, the eras are demarcated by the development of a written language, the printing press, electronic communication (morse code, telephone, radio and television) and "The Information Age" in which computer technology plays a large part. The society in which we live in the later part of the 20th century and now in the 21st century is, therefore, commonly characterised by the importance of information in it. We expect news to be relayed instantly and most people prefer means of communication that allow fast response (such as telephone, e-mail and using online ordering systems), to traditional, paper-based, means (such as letters, memos, reports and mail order). These recent forms of information systems underpin the whole phenomenon of globalization and as a result, have shaped our modern world.

> "*Globalization can be defined as the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa.*" [Giddens, 1990: 64]

The previous chapter was devoted to a detailed discussion as to what data, information and meaning are. Despite the depth of the discussion, it was restricted to fairly traditional points of view. In particular, the role of technology in adding value to information was limited. In this chapter, attempts which have been made to extend that role will be examined, but first some aspects of modernity and post-modern society (also referred to as radicalised modernity or late modernity) and the structural duality which involves the influence of technology on modern society and modern society on technology will be discussed. In doing so, I will refer particularly to issues that Giddens and Habermas have highlighted. This chapter will focus on the role that both time and place play in modern information systems.

More advanced Management Information Systems and entirely new forms of technological support for all levels of employees, are discussed very briefly in Section 4.4 of this chapter. This is done in order to illustrate why the definition of basic terms in Information Systems is undergoing subtle, and frequently unacknowledged change. The changes in how the terms are defined reflect a change in emphasis in the role of information systems.

4.3   Giddens' view of Modernity

4.3.1   Introduction

The history of social organisation can be divided into eras according to how the majority of the people earned their living at that time. Hunters and gatherers were followed by crop growers and pastoral communities. Most recently society has been industrialised and dominated by capitalism. The modern era (or modernity) began in 16th century Europe and introduced this industrialised society. Modernity is characterised by a fundamental change in popular beliefs. Pre-modern society was dominated by tradition, religion, and superstition, and hence, virtually everyone believed that outside forces (religious, magic, and human authority) controlled their destiny. Members of modern society, on the other hand, began to believe that there are identifiable, scientific reasons for phenomena that had previously been ascribed to the will of the gods. Thus, they began to believe that the individual could influence, if not control, his own destiny, and began to question existing customs and traditions. This gave rise to a reflexive society, one which recognised that the actions of individuals and groups have consequences, some of which may be unintended. In a reflexive society people monitor the results of their own actions, try to analyse why these have had previously unforeseen consequences and deliberately try to affect the future. As a result, modern society is far more future oriented than traditional society was, as we try to predict consequences and foresee the future. Modern man lives in the future rather than the past.

> "*... social reflexivity refers to a world increasingly constituted by information rather than pre-given modes of conduct. It is how we live after the retreat of tradition and nature, because of having to take so many forward-oriented decisions.*" [Giddens & Pierson, 1998: 115]:

Giddens identifies the following characteristics of modern societies:
- Attitude: open to transformation by human intervention
- Economics: market economy and industrialisation
- Political institutions: nation-state mass democracy [Giddens & Pierson, 1998: 94]

Pre-modern society tended to be quite static, changing slowly, but modern society is changing all the time and the pace of change seems to accelerate and the effects increase in scope. The rapid progress in science and technology is a result of the enquiring nature of modernity and also feeds the cycle of change. There are, however, other causes as well.

Giddens says that authors influenced by Marx consider capitalism to have been the sole factor determining modernity, "*The restless, mobile character of modernity is explained as the outcome of the investment-profit-investment cycle which, combined with the overall tendency of the rate of profit to decline, brings about a constant disposition for the system to expand*" [Giddens, 1990: 11]. He believes that, although this has been important, other elements have also contributed.

> "*The dynamic forces of modernity* [are]*... the expansion of capitalism, the transformative effects of science and technology, the expansion of mass democracy.*" [Giddens & Pierson, 1998: 117]

It seems that capitalism could be a basic cause which continues to feed the cycle; science and technology enable the dynamic nature of society but also perpetuate it (the duality of structure) and mass democracy allows more people to participate and hence, intensifies it. Rationalised organisations tend to be more dynamic than more traditional ones because the management is reflexive. The organisations incorporate formal systems that are designed to provide constant and rapid feedback and hence allow them to be monitored. This results in more adjustments which affect the functioning of the organisation and encourage innovation.

Giddens notes four forces or basic dimensions which are reflected in various aspects of modernity, namely,
- The economic order - capital accumulation in the context of competitive labour and product markets;
- An industrial-technological base resulting in the development of the "created environment";

- Military power - control of the means of violence in the context of the industrialisation of war;
- Administrative power - control of information and social supervision.

4.3.2   The relationship between modernity and information

Information plays several roles in modern society which can be linked to Giddens' model of modernity. Firstly, it is a resource contributing to administrative power.

> "*But modern society also involves the formation of a distinctive kind of state and, more generally, distinctive kinds of organization. These depend essentially upon the structuring of information. That is why I use the idea of 'surveillance' ... as the way in which information systems are constructed to form new systems of administrative power.*"
> [Giddens, 1990: 96]

But, secondly, it is also essential to the increasingly reflexive nature of society as noted above. Here it is in the form of feedback, as we use the results of previous actions in deciding what our future actions should be. A third role is that which information systems have played in the industrial and scientific mastery of nature, or humanly engineered progress, in commercial and industrial systems and in the military. This is where there has been immense growth in the formal body of knowledge that we attempt to transfer to the next generation of experts in any field. As noted in Section 4.1, global information systems form the basis of globalization. In Table 4.1 the characteristics which Giddens identified as applying to modernity, factors determining the dynamic nature of modernity and the institutional dimensions which he associated with modernity, are linked to information requirements.

Science and technology have become an inseparable part of modern society but have also had an enormous and potentially catastrophic impact on the natural world. It is the pace of change and the recognition that much of that change may ultimately be disastrous that has given rise to post-modern philosophies and what Giddens refers to as reflexive modernity and as radicalised modernity. He explains this as follows,

> "*...we have moved through modernity from a 'simple' to a more 'reflexive' mode... Reflexive modernization says something about late modernity, reflecting on the limitations and difficulties of modernity itself.*" [Giddens, 1990: 116]

Table 4.1: Relationship between modernity and information

Modernity		Role of Information
Character-istics	*Attitude: open to transformation by human intervention*	Active participation which intends to bring about change requires accurate, reliable information.
	economics: market economy and industrialisation	Market oriented economies need feedback from the market. Industrialised society needs to be efficient. Thus, information, at least at operating level, is required for industrialisation.
	political institutions: nation-state mass democracy	Democratic societies should make information freely available to all.
	future oriented	Predictions and forecasts need to be based on information about the present.
	reflexive	Feedback is essential in order to monitor current performance and detect unexpected consequences (error detection and correction).
	Risk taking	Modern institutions (military, industrial, economic) recognise the need to take risks but need to evaluate the extent of the risk ("risk management systems"). Manufactured risk needs to be monitored continually. Individuals should be informed about personal risk - health warning on cigarettes, lists of constituent ingredients on processed foods.
Factors determining the dynamic nature of modernity	*the expansion of capitalism*	Financial information. Investment decisions rely on almost instantaneous information.
	the transformative effects of science and technology	Science and technology create new information leading to new knowledge but are also founded on new input data and feedback from existing systems.
	the expansion of mass democracy	Democratic societies should make information freely available to all.

Modernity		Role of Information
Dimensions of modernity	*the economic order - capital accumulation in the context of competitive labour and product markets;*	Market oriented economies need feedback from the market. Competition feeds the need for information about competitors and about new products and services (opportunities) and about existing costs.
	an industrial-technological base resulting in the development of the "created environment";	Information allows the efficient operation of this sector but also information regarding "manufactured risk" is needed.
	military power - control of the means of violence in the context of the industrialisation of war;	Military intelligence is particularly important in modern warfare.
	administrative power - control of information and social supervision	By definition this is based on information.
Time	fast	Fast reaction depends on continual input of information.
Space	global	Globalization requires global information systems.
Personal relationships	open, honest, voluntary, temporary, materialistic	New intimacy expects an open exchange of personal information.

Modern technology and industrialisation has resulted in

> *" ... the increasing erosion of tradition and nature. The radicalization of modernity means being forced to live in a more reflexive way, facing a more open and problematic future. "*
> [Giddens, 1990: 116]

The so-called Information Age corresponds with radicalised modernity. The need for information is caused by the reflexivity of this society. The globally integrated character together with the reaction to that globalization, sometimes in the form of backlash, reinforces the need for ways of

exchanging information in an effective way. Radicalised modernity requires information but is also encouraged and extended by the information technology.

4.3.3   Time and space

Giddens interweaves concepts of time and space in much of his writing and these seem to play at least two roles. Firstly, there is the concept of the emptying of time and space. This refers to formalising measurement and the scientific character that the measurement of time and space has acquired [Giddens, 1990: 20]. In pre-modern times both time and space had a very personal and quite imprecise character. For example, a working day's duration depended on the season, distance was measured by the length of time it took to walk from one place to the other and the size of a piece of ground might be estimated by how many people (or cattle or trees) there were on it. Once clocks, and particularly portable clocks, were developed the concept of time was fundamentally altered. The universal reference to a standard time, and the separation of time from an exact relationship of the location to the sun have been relatively recent changes. (Now it is 8:00 at all locations in South Africa at precisely the same time, although the country is both wide and long and hence, according to the clock the sun rises at noticeably different times in Pretoria and Cape Town, and in Uppington and Durban, but this has not always been the case.)

Why is this relevant? Firstly, it has affected the control that individuals have over themselves and nature, as it has allowed mankind to see things from a more objective perspective. This has permitted complex organisation and co-ordination of events to the level of split second timing, and this is used to measure the efficiency of our organisations and production. Our society is extremely aware of time and very impatient. Hence, fast response time has become a significant competitive advantage. This rate of response has become both an advantage and disadvantage (instant gratification versus "the rat race"). The scientific control over time and space has resulted (and been the result of) a stretching of human horizons quite literally as it allows exploration, leading to routine travel and ultimately the exploration of outer space.

Secondly, people who are separated both by distance and time, have a profound influence on each other at a personal level but also at the level of the organisation and national economy. This has influenced how we communicate, the kinds of relationships that we consider normal, the kinds of organisations that we accept and the ways in which we manage them. The "distanciation of time and space" might sound as though it means that time and space are divorced from one another, or are independent, but it actually means that people separated by distance may still be in synchronous communication or may have a very real influence over each other. Giddens defines the concept as, "... *time-space distanciation - the conditions under which time and space are organised so as to connect presence and absence*" [Giddens, 1990: 14]. This is explained further as resulting in "...*complex relations between local involvement*

(circumstances of co-presence) and interaction across distance (the connections of presence and absence)" [Giddens, 1990: 14].

4.3.4 The relationship between time, space and information technology

One aspect of time-space distanciation is referred to by Giddens as the embedding and disembedding of expert systems. (Note that this use of the term "expert system" differs substantially from, and is much broader than, the term referring to a computer system that has a knowledge-base and substitutes for a human expert.) Technology allows essentially human activities to be captured in the form of procedures, bureaucratic systems, and computer systems and to be replicated and introduced in standard forms in otherwise dissimilar environments. Systems, labour and culture can be transferred by this process of disembedding. Labour located at the original site will be used during the creation of the expert system and the culture of that origin will permeate the system. But labour, culture and existing systems at the points where the system is embedded will be made redundant. This is one of the most noticeable effects of globalization. Standard, embedded systems have replaced the unique systems which were saturated with their local cultural influences. Automated production lines have replaced handcrafts.

> "*... locales are thoroughly penetrated by and shaped in terms of social influences quite distanced from them. What structures a locale is not simply that which is present on the scene; the 'visible form' of the locale conceals the distanciated relations which determine its nature.*" [Giddens, 1990: 19]

The organisation and coordination of systems, and embedded and disembedded expert systems, both influence and are influenced by our modern attitudes towards time and space. The most dramatic changes in lifestyles over the last decade are associated with technologies that bridge time and space, such as mobile telephones and the Internet. These are, however, simply the most recent and most extreme examples of the way in which common social behaviour has been affected, with respect to time and space, by technology. Many businessmen now travel long distances by air as part of a weekly routine. The goal of many online, embedded systems (not always realised) has been to significantly reduce the amount of time the average person spends standing in queues at shops and banks. Delays of a week or more that would previously have been accepted as normal, such as in acknowledgement of the receipt of a job application, are now reduced to seconds via e-mail. A significant number of people work from home and are rarely in the same place as either co-workers or clients. Software throughout a globalized organisation can be updated simultaneously. Computerised information systems are essential to, and integrated with, most of these events.

> "*The dynamism of modernity derives from the separation of time and space and their recombination in forms which permit the precise time-space 'zoning' of social life; the disembedding of social systems (a phenomenon which connects closely with the factors involved in time-space separation); and the reflexive ordering and reordering of social relations in the light of continued inputs of knowledge affecting the actions of individuals and groups.*" [Giddens, 1990: 17]

4.3.5 Trust and risk

> "*Trust and risk again concern the topic of time and space - they are both ways of organizing future time*" [Giddens & Pierson, 1998: 100]

> "*Trust ... can be a means of coping with risk, while acceptance of risk can be a means of generating trust.*" [Giddens & Pierson, 1998: 102]

Trust and risk are closely associated with each other and are relevant to situations where outcomes are not totally predictable and it is impossible to control the situation entirely. The more we move away from the stable, well-known, security of tradition, opting instead for the uncertainty of modern society, where we are required to make decisions based on our own judgement, the more we are forced to embrace risk and trust others.

4.3.5.1 Trust

One of the main ways of building trust is by providing information. Hence, the length of time that people have known each other will help to determine the degree of trust. The more open people are, the more they can identify with one another, and hence, learn to trust one another. This would imply that an information-rich society would be a trusting society. This unfortunately is not the case and must say something about the type or quality of the information. People are increasingly required to place their trust in technology and disembedded systems, rather than trusting people or their own senses, as they would when working directly with the machinery that has traditionally been used to do the work. Zuboff [1984] in her case studies in "In the Age of the Smart Machine" discusses the problems that people who previously worked directly with the product and machinery have when they now work with new technology:

> "*They haven't learned to trust the machine to tell them what to do. This trust does not come naturally. It will only come when they really understand how it works.*" [Zuboff, 1984: 80]

Classically, computer systems have been used to try to improve predictions and increase control. This is not the intention of more recent systems which span space and time, such as those used in computer-mediated communication, as they involve end-users and other participants who are not only separated physically but may be in different time zones and are never in the same office at the same time. Such systems embrace risk and accept that prediction and control over the system environment are not entirely feasible. The system is more open and subject to unforeseen and to uncontrollable influences than before. Hence, a large degree of trust is needed.

Dahlbom and Mathiassen [1995: 14-20] discriminate between computer systems that are bureaucratic (where decisions are made strictly according to rules - for example, production control systems), and those that are capable of coping with change. Bureaucratic systems are almost completely closed and unaffected by elements outside their boundaries. The second type, the organic systems, are useful where organisations must change rapidly in response to the changes in a dynamic society. The information requirements of the end-users, be they customers or managers, are not fixed, and computer systems must be designed to be flexible enough to be able to provide this information. The faster the pace of change, the higher the level of uncertainty within the organisation. There is always a risk that the organic system will not provide the right information to the right person at the right time. Such systems are more difficult to create and to monitor than bureaucratic systems but might have more impact. Hence, more institutional trust (or trust in systems and organisations) is required. An example is decision support systems that are meant to allow change to be managed more effectively, as the new circumstances can be evaluated quickly, actions can be suggested, and their effects can be predicted using the model. However, the accuracy of the model is difficult to evaluate and the predictions may be inaccurate. The impact of the decision can be far reaching. Thus, there is an important and quite complex link with respect to modernity between the issues of risk and trust and information systems.

There are other reasons why trust is difficult to establish in modern society. One is because we are less likely to have personal relationships with many of the people we are required to trust. Another is our mobility and the temporary nature of our intimate relationships. We need to interact with so many complex environments (not necessarily information systems) that even the most highly educated person is unlikely to have sufficient knowledge to be able to make informed decisions on every issue, and hence, has to be guided by other experts. Since there is frequently disagreement between experts, we are also required to decide which expert to follow - but the overload of information and the conflicting opinions make this very difficult. More information does not mean more useful information. On the other hand the typical person is partially informed about many topics and is able to question the opinion of the experts. We are often, therefore, in the uncomfortable position of knowing enough to know we want to participate

in making important decisions but we need assistance in making them and have to decide who to trust. Hence, the link between information and trust becomes complex even when technology is not directly involved.

Those who are supposed to look after the good of the general population (such as health authorities) are also faced with quandaries. They must decide how much information they should make available to the public. If they tell too much, panic might result which might severely harm the economy. If the feared event does not in fact occur, (even if it does not occur because, by fully informing the public, it is prevented) the authority will probably be accused of being unnecessarily alarmist. If they underplay the risk and limit the amount of information provided to the public, they might make it more difficult to take preventative steps and if the feared event does occur, the population will say that they were not properly warned. This means that gaining and maintaining trust is difficult.

This discussion has focussed on trust in systems and institutions. Aspects of interpersonal trust will be discussed in Chapter 6 in the context of teams.

4.3.5.2 Risk

Risk is "... *a marker of the attempt to break away from the past and confront an open future*." It is also an "... *active assessment of future hazards .... the more a society seeks to live in the future and shape it actively*." [Giddens & Pierson, 1998: 101]

Society has accepted that high risk can offer the chance of better returns and that being too cautious will mean that opportunities will be lost. Dreyfus [1999] explains Kierkegaard's second level or sphere of existence, the ethical level, as one where the degree of commitment means taking risks and progressing from a totally anonymous, uninvolved spectator (at the first, aesthetic level) to one where outcomes matter. Hence, the concept of positive risk has become important in our society. "*... [A]ctive acceptance of risk, and risk management, are at the core of the modern market economy*." [Giddens & Pierson, 1998: 102] Indeed more risky, organic information systems are seen as a positive advance over bureaucratic systems.

Information plays an essential role in reducing risk. In fact, one definition of the amount of information in a message is to what extent it increases the chance of correctly predicting what will happen. It is also true that the more information a person has, the more they believe that they can control events and the less fatalistic they are the more they are inclined to exercise personal choice. Complications can also occur. For example, if we know that everyone has the same information and that information determines the market, we get back to guessing how the competition will use the information.

Giddens [Giddens & Pierson, 1998] identifies two classes of risk. External risk is calculable and based on previous experience. An example is the risk of any natural disaster. This type of risk has always existed. Manufactured risk, on the other hand, results from human intervention in nature. The likelihood, and also the extent of this risk, is more difficult to judge than that of external risk. Manufactured risk has arisen only since mankind has started manipulating nature. Fluctuation in the economies of nations, caused by the ease and speed with which information and communication technologies allow users to interact with financial markets, has become one of the most worrying instabilities in modern times.

4.4   Habermas' Critique of modernity

Habermas has paid critical attention to modern society and in doing so has identified the role of science, technology and industry in the formation of a new ideology that assumes many social problems to be technical problems [Held, 1980: 251]. As a result, inappropriate technological solutions are sought to solve problems that may have root causes entirely unrelated to the proposed solution. This is an issue that is of fundamental importance to information systems developers and researchers. A system is inevitably going to be unsuccessful if it is intended to "cure" a problem that is incorrectly diagnosed. This "technocratic consciousness" is exacerbated by superficial knowledge and hence, misleading impressions, presented by the new breed of technology journalists. (Numerous columns and programmes now appear as regular features in the popular press and are devoted to technology and particularly the Internet). For example, these imply that the only way to keep up with competitors is to use the most recent technology almost exclusively and as visibly as possible. This is particularly evident in media comments relating to e-commerce. Habermas refers to the "colonisation of the lifeworld" to explain the skewing, imbalance or conflict caused when "the system", which handles the administrative and economic functions of society using functional rationality, starts to encroach on the lifeworld, which can only successfully function if communicative rationality prevails.

Information technology has a significant impact on previously separate disciplines (for example, education, business management, communications and media studies). This carries with it the possibility of the colonisation of the lifeworld of the non-IT discipline. It is also becoming so closely associated with other technologies, such as communications technologies, that many people now refer to Information and Communication Technology as a single discipline [Spaul, 1997: 78].

There are various effects of applying inappropriate forms of rationality to the subjective and intersubjective worlds. The value system of the lifeworld may be affected. For example, educational values could be adversely affected if the use of the Internet in education caused

educators to over-emphasise retrieval of information from numerous sources, rather than the role of synthesis, analysis and evaluation of information and the role of discussion in education. The participation of members of society in developing the culture and norms of their environment is affected in much the same way that Marx recognised that labour was alienated by capitalist production. For example, the encroachment of television in family life leads to passive, uninvolved citizens who live vicariously.

> "*The lack of public discourse and participation by all concerned often emerges in Habermas' work as a deeper problem in the modern era than ideologically distorted thinking or false consciousness.*" [Braaten,1991: 37]

This can be related even more closely to the Information Systems discipline by looking at examples of automated information systems. These encourage workers to be uncritical and to take little responsibility for whether decisions made and actions taken are actually correct or just "according to rule". Habermas considers the ultimately unacceptable solution to be one where decision making is completely delegated to computers [Held, 1980: 265].

4.4.1 As Critical Theory

Information technology is frequently used as a means of obtaining or retaining power. Dahlbom and Mathiassen [1995: 254] have adopted Habermas' ideas in their discussion concerning issues of interest and power in relation to systems development. The group involved in the design of a system will have considerable influence over the type and extent of information which the system will ultimately make available and will probably determine who the recipients of the information will be. Hence, various competing interests will be served or be ignored. Even outside formal information systems, technology is common in affluent homes and in environments to which more privileged members of society have access but is far less accessible by others. Access to technology gives educational opportunities, marketable skills and other advantages that means that technology perpetuates the status quo. The "digital divide" is a matter of concern within societies and between more developed and less developed countries [Bleach, 1998].

Most organisations demand that the end-users play a significant role in designing systems that will bring about organisational and social change. Differences exist regarding who should be included as end-users or role players in this process. There is often a considerable difference in the type of system that will be developed if the management and shareholders are the only people whose interests are considered. If, during the design process, the customer's needs are considered to be of paramount importance, better service, and ultimately a competitive advantage, might result. Alternatively, the well-being of the workers may be considered to be of

prime importance. This is taken particularly seriously in the development of information systems in Scandinavian countries [Lyytinen 1992; Jönsson, 1991; Hirschheim & Klein, 1989]. Critical Social Theory can be very useful as a theoretical basis for action research in order to achieve emancipatory goals, as the researcher can deliberately include the views of those people in the organisation who have least authority and power.

The concept of communicative rationality contributes to the development of information systems as a critical social theory. It emphasises the active role of all participants in any exchange of information. Each person receiving new information will evaluate it with respect to the truth claims implied in it. Hence, people will intuitively judge the reliability and accuracy of information (truth claims), its completeness, comprehensibility and possible bias (validity with respect to sincerity) as well as the authority behind it (and hence, its legitimacy) [Ngwenyama & Lee, 1997]. The end-user may accept the information, may have to reconcile it with conflicting prior held information, or might need to discuss it with others in order to reach a true understanding. This counters the idea that people are passive recipients of information, or the "conduit" theory of information where the processing is done in the computer system and transferred to the end-user. The end-user plays no role in the construction of meaning but simply acquires a copy of the information which will not differ from that of any other recipient of the information. Systems design that is aligned with critical theory and the concept of communicative rationality will recognise the need to address the needs of more role players, including those who are not in positions of authority. It also recognises that it is advisable to build in features that allow end-users to interact with, or have some discourse with the system, in order to query verify and amend information.

One way in which systems can play an emancipatory role is described by Jones [1997: 105]. Here the introduction of technology acts positively by allowing previously hidden work practices, to be revealed, instead of negatively as a threat of loss of power as is often the case. This is the case where previously unacknowledged policies have to be formally documented and specified in order to incorporate them into computerised systems.

4.4.2   Habermas, communications media and the WWW

Comparisons can be made between the print media (and subsequently television) and computer-mediated communication (CMC), in particularly the Internet. The print media was largely diverted from its independent role as a public forum to become the tool of powerful interests in both political and business arenas [Introna & Nissenbaum, 2000; Held,1980: 261]. Daniel Hallin uses Habermas' concepts of rational communication in an analysis of the cultural and political roles of the mass media in the United States [Braaten, 1991: 144]. His premise is that public debate has all but faded out in the 20th century.

Held [1980: 260] says,

> "*From his earliest writings Habermas has been concerned with the development and disintegration of the 'public sphere' and with the principle of 'discursive will-formation' (constraint free discussion) on which it was founded. By public sphere Habermas refers to 'a realm of social life in which something approaching public opinion can be formed'. It is a sphere in which citizens can 'confer in an unrestricted fashion - that is, with the guarantee of freedom of assembly' ...*"

The Internet is similarly being colonised. Initially, the totally independent World Wide Web (WWW) was the predominant user of the Internet. The availability of uncensored newsgroups and on-line chat makes the WWW a unique example of the "public sphere" [Spaul, 1997: 78] coming close to the ideal speech condition that Habermas considers to be important for the development of societal rationality. Whereas this function remains, the Internet has now also become the backbone for e-commerce with security issues being a big consideration. Search engines can introduce a bias favouring commercial interests [Introna & Nissenbaum, 2000]. It will be interesting to see whether the system and lifeworlds will be able to co-exist on the Internet in the long run without one-sided rationality coming into play.

Concerns regarding e-mail and privacy [Weisband and Reinig, 1995] and the use of e-mail as a form of surveillance address conflicts between traditional authority and the individual worker and between the system and lifeworld.

4.5   Modern Information Systems

The evolution of information systems has been from those that automate systems to those that informate. Zuboff originated the term informate to differentiate between two types of computerised systems [Zuboff, 1984]. Automated systems simply replicate a manual system and possibly do work more accurately and efficiently but provide no additional information beyond that which was available before. In fact they may give less information, as was the complaint of the operators of the pulp mill who said that they needed to smell and touch the pulp in order to determine its quality [Zuboff, 1984: 66]. The second type of system is the one which provides information that would otherwise not have existed. This comes from the computer's ability to compare sets of data and identify significant differences, detect trends and patterns and process very large quantities of data. Automated systems can result in the loss of expertise as the operators are no longer required to understand why certain things happen or why certain decisions are appropriate. They are no longer required to exercise any judgement. Informating systems on the other hand can increase expertise by making more useful information available

to decision makers and hence make them aware of significant factors that might previously have gone unnoticed. It also encourages them to think of previously unidentified relationships, which they can investigate with the further help of the system. Hence, it gives the manager the ability to explore possibilities. The differentiation between bureaucratic information systems and organic systems used by Dahlbom and Mathiassen does not conflict with the idea of automating and informating although there is not a simple correspondence between the two classifications.

Various new types of information system have been developed with the aim of informating rather than simply automating. Management Information Systems were developed in order to use output from Transaction Processing Systems (Information[1]) in order to produce richer information, closer to that described as Information[2]. Expert systems of the kind that are made up of a knowledge-base, inference engine and a system assisting in the creation of these knowledge bases (knowledge acquisition facility) were developed to permit complex expertise to be "captured" and emulated and taught. Intelligent tutoring systems were proposed which could understand the topic being taught, use the teaching strategy that best suited the student and topic and recognise what the student already knew, what misconceptions he had, and hence, what should be taught and how it should be taught. Artificial Intelligence systems include Expert Systems, Intelligent Tutoring Systems, robotics, vision systems, language recognition, natural language processing, neural networks and even learning systems which could improve their own performance over time and hence, learn. These systems have both been influenced by, and have accelerated the increase of work that is knowledge based, processing information instead of physical product [Skyrme, 1997].

A different approach exists with the same goal of providing rich information rather than just automating systems. Here managers and other end-users are provided with powerful tools and fourth generation programming languages which are easy to use and which allow the user to interact with a database or spreadsheet by formulating questions and doing "what if" analyses. Decision Support Systems, Strategic Planning tools, Executive Support Systems (which allow the input of data from sources external to the organisation), and Knowledge Management Systems follow this philosophy.[*] The intention is that instead of the systems analyst deciding which information will be meaningful for the end-user (or even requiring that user to predict what information will be useful in future) that decision is delayed until there is actually a need for information. Provided that the means exist for retrieving the information easily, accurately and timeously, the chance of this information being appropriated and being used in making good

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[*]Evidence of this change in general thinking is obtained by comparing surveys where the value of groupware was identified in 1996 as being "lowering travel costs" and in 1998 as sharing of knowledge [Coleman & Schiller, 1999]. The focus on less direct effects indicates a shift in attitude or a growing awareness of the importance of sharing Information[3] and not just Information[1]

decisions is definitely increased. These systems aim to produce information that is at least rich enough to qualify as Information[1] and not just as mere processed data. They attempt to address the needs of complex and uncertain environments. Thus, these systems are more like the organic systems of Dahlbom and Mathiassen and use an evolutionary approach to systems development and support the organisation structures which have arisen. Flexible, networked organisational structures can be innovative and can react quickly to new challenges and market conditions but need the support of similarly responsive information systems.

The different types of advanced information systems have had varying degrees of success and different people assess their potential differently. Where one person or school of thought assesses it as being "pie-in-the-sky" another will judge a particular idea to be enormously exciting with tremendous potential and to be definitely feasible. There is a clear trend towards developing systems that either produce rich information or provide tools that enable individuals to access information which will be meaningful to them. In many cases this information is in large chunks such as text documents instead of isolated numeric fields, or even limited database text. It might be in the form of a document or be of another data type such as sound, video or graphics. This trend is due to the fact that tasks and interrelationship between tasks is becoming more complex and hence more complex data must be communicated.

Some innovations need no selling and little justification. They are immediately adopted by vast numbers of users in a wide variety of environments and are used in ways that were originally never envisaged. Mobile phones are one obvious example and some aspects of the Internet another. These both use technology to exchange text or audio information (a characteristic of Information[2]) over a distance. In cases where it seems that the technology is being used enthusiastically, but possibly sometimes inappropriately, it is particularly important to do in-depth research to find out what the end-user is trying to do, how satisfied he is with his attempts, what changes can be made to the technology and how the process of using it can be adapted to improve results. It is necessary to see whether the advice derived from earlier research is applicable, is available and is followed.

The research undertaken here has aimed at using critical social theory and the concept of communicative rationality to determine how e-mail can be used effectively in reconstructing meaning specifically in collaborative teamwork. Lee [1994] points out that e-mail can be considered to be not only *"an instance of a telecommunication system, but also as an information system that offers decision support capabilities."*

4.6   Computer-Mediated Communication

4.6.1   The Internet (and World Wide Web)

The Internet has become a real and unstoppable force which is reshaping society in an unpremeditated way. It is used extensively in business to business applications, as part of virtual organisations, in private homes for consumer e-commerce, as a new form of socialising in e-communities, as a source of information, as a form of entertainment and increasingly as a means of achieving the goals of lifelong education. It is seen as one of the very few human inspired agencies other than war and the writing of constitutions that has had a rapid (traumatic or non-evolutionary) effect on the very fabric of society [Turoff, 1997]. Unlike war and constitutions, the Internet is affecting virtually every country simultaneously. We used to define the generations of computer hardware as being determined by the introduction of new technology (vacuum tubes, transistors, integrated circuits, large-scale integrated circuits) with the definition of the fifth generation not universally agreed upon. I propose that the de facto fifth generation is networked computers with the Internet being the global network of networks and hence, the universal hardware.

> *"Various sources have described the Internet alternatively as a vast mail system, a library system, a publication system, an economic system, and a social system. It is not any one of these things, but a new combination of them very different from a sum of their representations." [Turoff, 1997]*

The various uses of the Internet in the economy (all aspects of e-commerce including electronic data interchange, on-line auctions, on-line ordering and payment) and in organisations where "virtual teams" act within "virtual organisations", are having a dramatic effect on the balance of economic power worldwide. Serious reversals in the so-called, "dot com" sector of the economy have significantly and negatively influenced the global economy. What is more, if the developing economies win too small a share of e-commerce compared with that of the highly industrialised economies, the present economic imbalance will be exacerbated.

The goal of lifelong education in conjunction with the goal of affordable, accessible, equal opportunity education is increasingly being recognised as relevant, and probably essential, to all societies. The large number of people who are semi-literate and others whose training is inappropriate for the modern working environment has resulted in a situation where even highly industrialised countries such as Germany simultaneously have unemployment (unemployable

citizens) and a severe shortage of manpower in areas that are vital to the well being of the economy [Graff, 2000; Handy, 1995]. Traditional classroom-based education is considered to be ineffective in many cases and too expensive in others. The fact that the Internet is being assumed to be an obvious "solution" in providing distance education and that education is rapidly becoming big business are important issues here.

The suggestion that the Internet can be used to virtually replace all aspects of university education has been considered extremely worrying by many highly respected thinkers and this would be an extreme version of the system colonising the lifeworld. Dreyfus [1999] points out that the Internet allows all information to be published indiscriminately without indication of bias, relevance, significance or even accuracy and without any accountability. He equates this level of use of information with Kierkegaard's aesthetic level characterised by curiosity but no commitment. Further aspects of telematic education are discussed in Chapter 5.

Seely Brown and Duguid [1996] emphasise the role of the university in introducing students to communities of practice rather than abstract theory. These two authors believe that the Internet can play a role in this process but also warn that, "*the Net can provide a powerful impression of interactivity and exchange while in practice denying both*."

Thus, studies concerning the way in which the Internet is used cover a field that is very wide in its scope, is extremely important and is complex, as it is not only a matter of technology but also affects social systems. The particular problem being addressed in this thesis concerns the use of the Internet as a communication channel. This is relevant to virtual organisations and telematic, or web-based, education as the same basic issues apply in all cases where groups of people use digital, telecommunication systems in co-operative work. In both, information exchange is an essential part of the activity. And in both there is a, possibly less obvious, need to communicate meaning not just text. Equally important, however, is the need to form interpersonal relationships which are essential catalysts and contexts without which this richer communication cannot take place.

4.7 Conclusion

In this chapter, the relationship of technology and the lifeworld in the late 20th Century and first years of the 21st Century was examined. The argument is centred on the increasing extent to which we are becoming dislocated in terms of time and space - in the sense that people who are not situated together spatially and are not reacting to each other in real time or individually have a significant influence on each other. Technology plays an essential role in this distanciation and the newest forms of technology are exacerbating it.

Hence technology, particularly information technology and information systems, form an essential part of late modern society. The development of information technology has been influenced by the change in the way we understand time and space, as well as by other characteristics of the modern era, but the technology has also played a large part in altering our perception of time and space. Information is essential to society but an increasing reliance on information and the association of information with power can also encourage extreme forms of modernity resulting in the colonisation of the lifeworld. Both trust and risk, which are fundamental in our lifeworlds, are affected by the information available. It is, however, too simple to say that more information increases trust and decreases risk. This argument will be continued in the next chapter where the specific effect of telecommunications on communication and hence, on distance education and telematic education will be examined.

Advanced information systems strive to:
•   produce relevant and rich information,
•   to assist people in exchanging information effectively,
•   to provide people with enabling tools,
•   and allows a process of searching in real time for relevant information.

The information must meet their individual needs at the time it is required. Information systems and tools which are used to communicate unstructured, textual information (Information[2]) are popular but may not always be used effectively or appropriately. In the next chapter I will examine this question in detail.

Chapter 5

Computer-mediated communication

"Societies have always been shaped more by the nature of the media by which men communicate than by the content of the communication."

Marshall McLuhan and Quentin Fiore,

The Medium is the Message, Random House (1967)

5.1   Introduction

Chapter 5 and Chapter 6 are grouped together in the road map of this thesis (Figure 1.1 in Chapter 1) as they focus on organisations and technology. The technology is computer-mediated communication (CMC) and, in particular e-mail. The organisational unit is the dispersed collaborative team or virtual team. The aim of the two chapters is to explore how e-mail is used in these teams and whether this can be improved.

In this chapter an investigation into the way in which computer-mediated communication (CMC) is used is undertaken and some suggestions are made regarding general ways in which we can improve its usefulness. The discussion begins by looking at various theories concerning the effectiveness of e-mail as a medium for discourse, that is, whether e-mail can be used in cases where people with different frames of reference and different opinions need to reach a common understanding. These theories suggest that the effectiveness with which e-mail messages convey equivocal information is not solely dependent on the medium but can be improved as the users of e-mail learn ways of compensating for the intrinsic leanness of the medium. Thereafter, some basic guidelines, collected from a variety of sources, are presented. This is followed by a study of various research findings concerning the use of computer- mediated communication in collaborative work in tertiary education.

5.2   Information richness

5.2.1   The Medium

Information Richness Theory (IRT) was devised by Daft and Lengel [1986] and proposed that the medium used to communicate a message solely determines the level of communication. Hence, despite its name, it refers to the medium and not the richness of the information. According to IRT, media can be ranked according to their ability to carry information and hence change understanding within a time interval. Face-to-face meetings are considered richest, that is, they will be able to change the understanding of a participant in the conversation most quickly, most particularly when the topic of conversation is equivocal or the participants do not have the same frame of reference. Telephone, personal documents (such as memos or letters which are

addressed to a specific person or small group), impersonal written documents (whose target audience is unspecified), and numeric documents are considered to be increasingly less rich media. This has the interesting implication that academic writings, which presumably carry complex messages, are published in the second leanest medium. The justification could be that the arguments included are stated explicitly and unambiguously and the readers share a frame of reference. However, the theory was intended to advise business organisations as to the medium that should be used to communicate information and further research has concentrated largely on the choice of communications media by managers, so possibly academic publications fall outside the scope of the theory.

The four characteristics which influence a medium's richness are: how quickly feedback is provided; the number of additional cues it holds, such as tone and body language; the type of language it allows (basically this falls into two categories, spoken or written); and how personal the medium is (this tends to depend on how many people the medium addresses and the symbolic use of language, although this is not actually recognised by the original IRT).

This theory was initially considered to be prescriptive [Markus, 1994] in that it was intended to advise communicators as to which medium they should use for a given purpose. The theory stated that the more closely the medium matches the information processing requirement, the more efficient the organisation will be. This is consistent with contingency theory which says that the degree of fit between any form of technology and the task for which it is used will determine how effective and how efficient the technology will prove to be [Martinsons & Chong, 1999; Lewis, 1998]. Thus, the communicator should analyse how ambiguous the message is and then use the appropriate medium for communicating it. Subsequently, the theory was considered to be more descriptive than prescriptive and was used to explain why individuals and categories of workers choose to use a particular medium.

IRT quite specifically assumes that the individual alone, uninfluenced by social pressures, decides on the appropriate medium and does so using purely rational arguments. Hence IRT is an individual-level, rational choice theory [Markus, 1994]. In addition, the characteristics of the medium were supposed to be the only factors determining the richness of the message that could be communicated. The theory has been extended with time as researchers recognised that situational factors also play a role, such as, whether the recipient of the message was nearby, the number of people to whom the message should be sent, the current form of the message (is it already in print or electronic form) and time factors (urgency and whether the group can feasiblely be assembled at the same time). These situational factors are, however, still rational.

The original theory of information richness has lost credibility, as a number of researchers have reported that the medium does not appear to be the sole factor determining how well a message

is communicated. The work done by several of these researchers and their contributions to communications richness theory is described in the sections which follow. Webster and Travino, [1995] believe that there is no reason why IRT cannot be extended to include social influences and that the original factors concerning the medium itself remain valid. Markus [1994], on the other hand, differentiates clearly between individual-level theories, such as IRT, and social theories.

5.2.2   The correspondents

In contrast with the previous section, this section considers the role that the recipient of the message plays in determining what kind of information a message carries, rather than how appropriate the medium is for communicating messages. This point of view is, therefore, significantly different from the original IRT.

5.2.2.1   The hermeneutic, interpretive approach

The hermeneutic, interpretive approach to information (or communication) richness stresses the fact that the researcher must be aware that he is interpreting human subjects in the study and that the subjects themselves are interpreting themselves and the world around them. Hence, there is a double hermeneutic. Lee [1994] cites Ricoeur [1981] and Boland [1991] in his discussion of hermeneutics. He associates the concepts of *distanciation, autonomization***,** *appropriation,* and *enactment* with the use of e-mail. He says that a message is separated in time and distance from its author (distanciation). This is certainly true of e-mail once it is sent. The message then becomes an independent object (Autonomization). In Chapter 3 we refer to this as Information[2]. This is also easy to relate to the e-mail message as an electronic file being transmitted over a network. During this phase changes resulting only from the technology can occur, such as loss of body language cues and the signal being distorted by noise. Appropriation is very similar to Introna's [1992] use of the word. Enactment is the next phase where the actor acts either alone or with others in response to the appropriated meaning of the message.

The argument put forward by Lee [1994] stresses several things. Firstly, the recipient of the message is an active participant in the process, as he gives a meaning to the message that is not identical to that of the originator or of anyone else who receives it. A message which is stated in an ambiguous way and communicated via a lean medium can nevertheless result in a rich interpretation, as the person interpreting it will contribute richness to it by associating other information and knowledge with it. Secondly, the interpretation of the message is not purely subjective. It is also shaped by the shared meanings of the organisation or society. Thirdly, the message emerges as part of a process and over time.

Relating this school of hermeneutic thought to the definitions of information provided in Chapter 3: during distanciation Information[1] or Information[2] is produced either by a computerised information system or by a person. During autonomization the message could be considered to be data as it is unrelated to a person and is meaningless. During appropriation the information becomes Information[3].

5.2.2.2   The Critical Social Theory perspective

Ngwenyama and Lee [1997] add to the concept of communication richness by applying a Critical Social Theory perspective. The communication process is analysed in terms of Habermas' communicative actions. The very relevant point is made that communication richness depends not only on achieving mutual understanding (that is, the recipient of the message reconstructing the meaning intended by the sender), but that the recipient also critically judges the message to extract meaning. Hence, in the case of a message which is *instrumental*, the recipient will instinctively consider whether the order is valid by deciding whether the person giving the order is entitled, in the given social context, to do so. The message would also only be valid if the recipient thought that the originator could effectively and efficiently enforce the order. In the case of a *communicative message*, where the intention is that the participants mutually agree on future action, the message is valid if it is clear, complete and truthful and it may be necessary for it to be appropriate in the context. Where the two people communicating do not agree but are debating an issue (*discursive action*), the recipient of a message would evaluate it in terms of how clear and appropriate (relevant) the argument is. The recipient would also in many cases consider whether the argument is logical (truthful) and whether the opponent really believed (was sincere) what he was saying. Finally, a message sent as part of a *strategic action* would be judged by the recipient according to appropriateness and possibly sincerity, efficiency and effectiveness.

Hence, this further aspect of communication richness is concerned with the additional processing that the recipient of the message carries out beyond simply understanding what the sender of the message intended. This process does not depend very much on the channel of communication. By creating a personal opinion about what has been communicated and rejecting, if necessary, messages that are judged to be invalid, the recipient is an intelligent actor who is empowered to direct his own interpretation of the world. This is, therefore, an emancipatory view.

The fact that there is more assumed equality in status between correspondents on e-mail, since social context cues are not generally provided, means that there is greater inclination to question viewpoints [Tolmie & Boyle, 2000; Warf et al, 1999]. E-mail, therefore, encourages critical thinking. The process of critical thinking is recognised to be an essential part of learning and hence, e-mail can be seen to be particularly suited to learning and collaboration. Disagreements that occur will promote growth in understanding but these disagreements must be limited

(moderate) and occur within a shared broad framework of socially constructed reality [Tolmie & Boyle, 2000].

5.2.3 Social influences

The original IRT was entirely positivist and hence is associated with an objective view of the world, as it ascribed the intelligibility of a message entirely to the communication medium. The interpretivist approach used by Lee [1994] in part emphasises the role of the individual recipient and tends towards a subjective world view. Critical theory as it was used by Ngwenyama and Lee [1997] focusses on the emerging understanding of the individual and might also be seen as subjective. There is, however, a considerable body of work which is intersubjective in approach and looks at how the organisation influences the choice and effectiveness of use of a medium.

Lee [1994], despite the fact that he uses a hermeneutic interpretation in his analysis, also pays considerable attention to the concepts of the social construction of reality. These refer to the context within which a text is interpreted but the social structure, existing terminology and shared meanings that exist in the organisation are seen as having an existence or presence that is independent of the individuals who have contributed to their creation. There is a strong resonance between the idea of the social construction of reality and that of a social structure as defined in Giddens' Structuration Theory, as an instance of social reality is created by and altered by the actors and in turn shapes their understanding [Orlikowski & Robey, 1991]. The reality which is socially constructed is abstract but is nevertheless independent of any one person and is therefore, not subjective. It is persistent and hence real in a significant way. As a result of the ongoing process of interaction between actors and structures, a particular socially constructed reality can change. Any organisation is an example of a socially constructed reality. The organisation is not made up simply of buildings, employees, procedures or a bank account but of all of these. It will continue to exist even if quite drastic changes are made. Examples of other socially constructed reality are constitutions and bodies of knowledge such as Euclidean Geometry.

Different studies look at different aspects of the influence of society on the choice of communications medium. These will be considered separately in the subsections that follow.

5.2.3.1 Organisation's policy

The environments and organisations in which people work and socialise have an immense influence on the way in which they use technology [DeSanctis & Poole, 1994; Orlikowski, 1992; Orlikowski & Gash, 1994; Sole & Applegate, 2000]. The research of Markus [1994] investigates how a policy adopted by an organisation can ensure that a supposedly lean medium can be used

effectively to communicate rich information. Socialisation is the deliberate introduction and enforcement of policies by means of formal procedures and the social control of deviants. Such a policy would be introduced because one or more key members of the organisation has made this choice [Okamura et al, 1995]. "*One might also expect social definitions and technology usage practices to converge with the technology's material characteristics over time, ...*" [Markus, 1994] as these choices are based on the experience of the key member and this will tend to become more rational as that experience increases and other people influence it. The policies will differ between organisations as they are not necessarily simply rational choices. The externally imposed use of a medium means that there has been a conscious choice of a tool and there will be a conscious process during which the individuals will discover effective methods for using it and will deliberately teach others how to use it effectively. This results in socially defined behaviour, rather than objective choice or individuals being allowed to make a subjective choice.

In the case where an organisation's policy stipulates that e-mail is to be used to the maximum extent there is evidence of learned behaviour, which compensates for the inherent limitations of the medium. The loss of conversational coherence as a result of time delays can be compensated for by allowing incoming e-mail to take priority over face-to-face meetings. Hence, participants may interrupt meetings to read and reply to e-mail and a response time that approaches that of real time conversations will be achieved. The use of mosaic messages, where previous e-mails are included with the most recent reply, will also compensate for a loss of conversational coherence.

The justification for such a policy is that the reasons for using the medium are not as obvious as is assumed by IRT. The finding that "*... managers' high levels of email use did not match their low perceptions of email's richness*" [Markus, 1994] indicates that advantages are not always recognised consciously.

Advantages tend to be formally acknowledged only after users have learned to use the medium effectively. Examples of rational advantages which IRT does not acknowledge are:
• Flexibility regarding time. In the case of urgent problems e-mail can be used after hours, from home;
• More efficient uses of time as telephone calls tend to be longer and less structured than e-mail and not to be self documenting;
• E-mail can allow tasks to be completed and hence closure can be reached even when the co-worker cannot be reached by telephone; Similarly, in a teaching environment, being able to ask a question when it arises is useful [Leidner & Jarvenpaa, 1995].
• If necessary, e-mail can precede a telephone conversation and be used to provide all the basic information. Final agreements are confirmed and ratified during a brief telephone

call. Presumably this indicates a trust issue where the more personalised medium is used to confirm commitment.

The need for more personalised media to build trust is reflected in the perception that telephones should be used for relationship building or bonding rather than for debating. Thus, the type of information used in a work environment that e-mail can handle effectively, is seen to be different from the type of rich information which needs personal communication. This second form of information more often needs to be communicated in real time and as audio. This highlights the difference between different types of rich information along the lines differentiating between Information[1], Information[2], Information[3] and Information[4].

5.2.3.2   Emergent information richness

Although the hermeneutic interpretation by Lee [1994] was included as a discussion of the role of the individual in determining how rich a message is, Lee really sees richness as an emergent property of the interaction between the recipient, the communication medium and its organisational context.

> "*Instead, the best medium or an appropriate medium for a particular communication transaction would also depend on, if not the manager's familiarity and existing skills with the different media, then the manager's willingness, opportunities, resources, and support for learning the capabilities of the medium, exploring the possibilities that it opens up, innovating uses for it, and otherwise interacting with it.*" [Lee, 1994]

The medium will become more and more useful and suitable over time as the users find ways of adapting it or altering their own way of using it [Lee, 1994].

Hence, the choice of medium and the perceptions as to whether a particular medium is rich or lean, is not a static, rational choice but tends to evolve over time depending on the context. It does not depend solely on the individual but is situated in an organisation.

If managers encourage the use of a particular medium, or if early adopters are considered to be leaders worth following, or if those who do not use the medium get the impression that they will be missing out on important information and may become marginalised, that medium is likely to be adopted. In fact, social factors are relevant to the adoption of any technology. Social influences may be more important in new media than for more entrenched media. The study by Webster and Travino [1995] found evidence of this for all media. These two authors believe that theories concerning choice of media should not generalise about a whole group, such as managers, but

determine where it is most productively used, that is, investigate use for specific tasks. When new media are used, choices are made more consciously. In time, habit plays a greater role.

5.2.3.3　　　Channel expansion theory

Channel expansion theory [Zmud & Carlson, 1999] suggests that the way in which a particular communications medium is used will be determined by experiential factors such as the extent to which this person has used the medium effectively in the past, his knowledge of the topic or task that he will be discussing, the strength of the relationship between the people who will be involved and the knowledge of the working environment. A simple measure of the number of messages sent, or time during which the medium was used in an organisation, is not sufficient to determine the extent of experience using the medium. The quality of the knowledge is important. Hence, the theory states that people can learn to use e-mail to communicate rich information but it is essential that experience is gained that extends rather than repeats previous experience.

The two factors, which have the most influence on how rich a channel is perceived to be, are channel experience (experience using the technology) and communications partner experience (how well the correspondents know each other). Over time, channel experience ceases to be relevant as the other factors become more important. In contrast, the importance of the relationship with co-workers increases with time. The effect of insight into the topic being discussed is difficult to determine as a more knowledgeable person will discuss the topic in more depth and hence require more complex information to be exchanged and place greater demands on the medium, than a novice whose discussion is quite superficial. It can also be argued that less knowledge causes greater vagueness and uncertainty and hence makes successful use of the medium less likely. These issues remain unresolved but cannot be isolated from the skill of the communicator in making his knowledge explicit and the community of practice in which the communication is taking place. In the case where a frame of reference is shared the argument can be more complex than in one where the participants use different terminology and have different terms of reference.

Social influence is likely to be greatest where the organisation's staff have most and closest contact with one another and the least other outside or competing social influence. Social influence may increase as relationships become established and trust grows. Therefore, the duration of the relationship is important.

> *"Effectively communicating through computer-mediated channels may be a unique skill that takes more than simply time to develop. Inexperienced e-mail users will generally not be able to immediately engage in rich communication over the channel;"* [Zmud & Carlson, 1999]

Tolmie and Boyle [2000] concur with channel expansion theory. They include in their factors contributing to successful CMC the knowledge of other participants, experience communicating under the task conditions involved (this corresponds largely with experience of the organisation), and prior experience of CMC. These two authors explain the experience with the task in terms of ownership of the task (influence in determining what the task will involve) and clarity about the task.

5.2.4   Symbolic factors

Up to this point, we have discussed the more explicit content of the message and the way in which it is understood. The motive of the person wanting to communicate also plays a role in the choice of medium and how the message is interpreted. The choice of e-mail as a communication channel is often linked to the psychological advantages it is perceived to allow, or to the symbolic message implied by its use. Use of e-mail may be perceived to indicate informality rather than formality, convey authority and legitimacy, urgency or personal concern. It may be intended to encourage team building. These subliminal messages add significantly to the richness of the message in much the same way as body language does and in a sense compensate for the loss of these nonverbal cues. Thus, there are social effects of e-mail, where e-mail affects the society in which it is used (in contrast to the social effects of society influencing the use of e-mail, as discussed in Section 5.2.3).

5.2.5   Discussion

Communication richness has been extended to include not only its ability "...*to change understanding within a time interval*... " [Daft & Lengel, 1986] but also to be the way the message is interpreted and possibly enhanced by the inclusion of the lifeworld of and critical evaluation by the recipient. There is evidence that this communication richness can be retained even when a message is transmitted via a supposedly lean medium such as e-mail [Ngwenyama & Lee, 1997; Lee, 1994; Markus, 1994] and that people do not choose a medium solely for rational reasons [Webster & Travino, 1995].

Information Richness Theory has been extended further to recognise the following factors:
*   The physical characteristics of the medium determine what kinds of information it can carry. People recognise this fact and rationally decide which medium to use.
*   People interpret information using their own existing knowledge in the process. Hence, lean information can become much more meaningful despite the medium.
*   People judge the information or critically evaluate it. They do not take it at face value. Once again this increases its meaningfulness.

- Reality is socially constructed. It has some meaning independent of the individual and hence meaning can be shared.
- Social influences, in particular company policies, can require the use of e-mail and as a result employees will learn ways of compensating for the leanness of the medium.
- Combinations of media may be used (multiple channels).
- A combination of the depth of experience a user has with the medium, the topic being discussed, the co-workers and the organisation will also affect the way in which he uses the medium.

There is a fair amount of consensus in more recent studies that a number of factors influence people in deciding what medium to use in order to communicate equivocal information. Issues that affect the adoption of a computer-mediated communication medium in any organisation are now generally considered to include the material characteristics of the medium, situational issues, symbolic meaning that the participants believe the medium portrays and social factors. Other situational issues are concerned with convenience rather than meaning and some symbolic issues are more strategic, in that they are more interested in having information accepted than allowing genuine discourse. The social factors can be an imposed policy or more subtle factors where the norms of key figures in the organisation are imitated by new employees [Romm & Pliskin, 1999: 285]. These are not entirely independent of one another, as an organisation's policy, resulting in social pressure to use the medium, might be founded on rational or symbolic arguments. The depersonalisation of e-mail affects social behaviour. Issues of social behaviour are not so much concerned with trying to make the best use of the medium but studying involuntary responses to the nature of the medium. The way that we can compensate for these changes in social norms, in order to make better use of the medium, makes this relevant to the discussion on communication richness.

Recent research generally indicates that the leanness of the medium can be overcome by learning appropriate compensating behaviours and techniques.

> *"The effectiveness of knowledge sharing seems to depend less on the features or characteristics of the particular technology medium chosen, and more substantially on the extent to which sharing practices, exercised through particular technology use, are well-established and represent habitual action within the team."* [Sole & Applegate, 2000]

Zmud and Carlson [1999] note that it is not sufficient to learn only about the features of the software or even communication techniques. Other factors such as the relationship or bond between correspondents, the knowledge of, and interest in the task and a shared knowledge of the organisation are important determinants of successful communication.

It would be a mistake to assume that members of new virtual teams expect to do much more than co-ordinate activities and exchange documents via e-mail, or that they would immediately be able to work together successfully in the sense of constructing knowledge by means of CMC. However, the body of literature discussed here does indicate that it is possible to change these perceptions and to actually teach people how to use e-mail, either on its own or in conjunction with other media, to reach a common understanding of complex or sensitive issues. Leidner and Jarvenpaa [1995] report that e-mail is preferred to face-to-face communication once a work group has become familiar with it as a means of communicating. The literature discussed up to this point does not explain exactly how to go about doing this other than to advise that policies, particularly concerning issues, such as privacy, should be published. Swigger et al [1997] specifically have developed special software interfaces designed to teach cooperative problem solving skills to students located in different geographical areas but collaborating synchronously. Beyond this, it seems to be a matter of teaching by example. In the section that follows some quite simple guidelines are provided.

5.3   E-mail

The loss of the social context cues present in face-to-face conversation results in depersonalisation. The speaker does not entirely recognise that a person is being addressed, as the immediate nonverbal reaction is not visible. A result that is reported frequently is uncharacteristic aggression. This may involve "flaming" (deliberate rudeness) or simply insensitivity [Chester & Gwynne, 1998]. The lack of "micro-feedback loop providing social constraints" may make this more likely and intensify it by allowing it to go on longer [Ishaya & Macaulay, 1999].

On the other hand, this depersonalisation can make it easier for people to reveal personal details about themselves, as there is a low cost, both financial and psychological, in self-disclosure via e-mail. This openness could result in a feeling of personal intimacy and quicker bonding. Introverted people might, therefore, participate to a greater extent in e-mail conversation than they would in a face-to-face situation [Tolmie & Boyle, 2000; Lind, 1996]. (Extroverts are still more likely to participate in online discussions than introverts, but introverts participate more than they would, for example, in a classroom [Hara et al, 2000; Chester & Gwynne, 1998].) All participants find it relatively easy to introduce themselves in an e-mail group [Hammond, 2000]. As a result people believe that they can get to know each other through the medium [Hiltz & Wellman, 1997]. This has significant implications regarding building trust and hence the viability of virtual teams. The introduction of e-mail may create an illusion of a smaller and more friendly environment, as it reduces people's feelings of being isolated or excluded [Romm & Pliskin, 1999]. This point of view is, however, not consistently accepted. Tolmie and Boyle [2000] refer to a number of reports

recommending that groups meet in person in order to get to know each other before embarking on online interaction.

The research of Pratt and his coworkers [1999] is particularly relevant to virtual teams (which are discussed in Chapter 6) as it looks at how personal relationships can be formed using e-mail. The authors indicate that individuals who use a new communication medium can develop new social strategies and techniques, which will compensate for the limitations that the medium itself may have. An example of such compensatory behaviours is being more explicit and hence reducing the need for additional information. They expected that, in order to build up relationships, there would be a tendency to ask many questions early in the e-mail exchange in order to compensate for the loss of information which would otherwise be obtained via nonverbal cues. However, the research does not provide evidence of this,. "... *[I]it appears that people ask roughly the same kinds of questions in the same kinds of distributions whether the context is CMC or FtF*" [Pratt et al, 1999] but not necessarily the same number, at the same times, or in quite the same way. The lack of nonverbal cues and resulting depersonalisation means that inhibitions, which prevent us from asking new acquaintances personal questions, fall away.

New behaviours can be observed which differ from the social norms of face-to-face communication. These are not necessarily adopted in order to compensate for the medium but may be feasible or attractive because of the nature of the medium. For example, it is normal to immediately answer a question posed during a face-to-face conversation. In an exchange of e-mail some questions might not be answered. This is probably because physical presence demands attention and a response but absence results in a loss of that influence [Piccoli & Ives, 2000]. Hence e-mail respondents tend to focus on their own concerns and neglect those of the other participants. It may be that the delay between reading the question and answering it, and the fact that several questions may be asked together, permits (gives a plausible excuse for, rather than this being cause and effect) it to be forgotten. A new medium allows new norms to be invented and adopted as people are unsure what the norms are and do not have established well-entrenched habits. New norms result from observation and imitation of the way others behave.

The distance in time and space also has advantages. It is useful to be able to complete your argument without interruption. In situations with a high risk of conflict, being able to take care how you phrase or state your point is valuable. Hence, impression management is an important advantage of e-mail. An associated advantage in writing e-mail is having the opportunity to construct an argument or rebut a previous point after careful thought. Having the opportunity to read the other point-of-view carefully and repeatedly, link different points and generally consider the argument, is beneficial when a complex or controversial e-mail message has been received [Hammond, 2000; Hara et al, 2000; Tolmie & Boyle, 2000; Benbunan-Fich & Hiltz, 1999; Lewis, 1998]. This can be done while constructing an argument but the discussion can also be reviewed

and consciously be analysed providing an opportunity for reflexivity. Thus, having the opportunity to reflect on e-mail is an important feature which enhanced it as a potentially rich medium. Seale and Cann [2000] say that, "*There is a growing acceptance that a reflective dialogue could be supported using computer mediated communication*." Communicating via e-mail can reduce conflict as the distance in time and space permits "cooling off" and e-mail might be deliberately chosen as the medium for communication specifically in order to address highly inflammatory issues in an impersonalised way [Leidner & Jarvenpaa, 1995].

Hammond [2000] points out that each of these advantages can be linked to a disadvantage. The negative factor corresponding to not being interrupted is receiving no immediate feedback, and as noted earlier, you may never get feedback. The permanent nature of e-mail allows you to reread and reflect on messages (both those received and prior to sending a message) but also makes it impossible to retract or explain away a message that has been sent before harm is done. The ability to edit a message is balanced by the time, discipline and skill required to write rather than speak. Anyone who finds it difficult to express himself in writing would be at a serious disadvantage [Chester & Gwynne, 1998].

The loss of cues indicating status and the fact that the reaction of the person being addressed is not seen results in both boldness ("dis-inhibition") and a democratisation process (perceived equalising of status). In other words, it alters the balance of power in relationships [Warf et al, 1999; Hiltz & Wellman, 1997]. This can be emancipating but can also cause offence to people who expect to be treated with greater respect. In collaborative work it can have the effect that team members are more likely to contribute equally and domination by one member is less likely. The fact that there is proof in the form of a permanent record as to who did contribute can increase accountability and have the resulting improvement in reliability and responsibility.

Pratt et al [1999] refer to an experimental study by Walther and Burgoon [1992] which demonstrated that the relational qualities of an e-mail group can be expected to develop to be much like those of a face-to-face group but it takes longer for these to become established. This holds important connotations for virtual teams as the "depersonalising effects" of e-mail may only really be relevant initially.

5.3.1   Power structure

A number of studies [Romm & Pliskin, 1999; 1997a; 1997b] indicate how e-mail can be used as a political tool in organisations. This is due to the wide reach of the medium, its easy access and the bravado ("dis-inhibition") that results from the depersonalising aspects. In the case of conflict between an individual or a group and management, the ability to state one's case to a wide audience in an organisation, without management being able to control or censor the message, is

enormously empowering to less senior members of staff. This can mean that wide publicity and potentially wide support can be obtained very quickly in conflicts between individuals, individuals and management or conflicting groups. This can be interpreted as extremely damaging to the organisation or alternatively to the ability of management to control the organisation. Similarly, levels of management can simply be bypassed if members of staff can communicate directly with more senior management.

> "*E-mail enables people who are at the periphery of organizations to become more visible and facilitates communication between people at the bottom of the organizational hierarchy and those at the top.*" [Romm & Pliskin, 1999]

On the other hand, management can use the tool equally effectively to respond rapidly to information that is published unexpectedly and to give balancing versions of reports.

Management have, at least in theory, ultimate control over access to the e-mail system. They can set up policies and enforce them [Romm & Pliskin, 1999: 283]. These can include the right to read all e-mail, limit access and refuse to allow social e-mail. They can penalise use of e-mail that they consider inappropriate. Weisband and Reinig [1995] concentrate on practical advice, particularly concerning legal issues associated with e-mail privacy. These authors stress the need to educate employees about these matters by implementing a formal and visibly enforced company policy. This point of view is supported by various other authors [Ruggeri Stevens & McElhill, 2000]. Attention can be drawn to the existence of a policy by using intrusive interface design. A company's privacy policy reflects the culture and the level of trust within that organisation.

E-mail can be used in other ways to manipulate co-workers (by sending copies of e-mails to third parties either openly or as blind copies), or as ways of safeguarding yourself (by using e-mail to get evidence of instructions given) [Ruggeri Stevens & McElhill, 2000].

5.3.2   E-mail etiquette

E-mail has rapidly become the way in which busy people communicate [Berghel, 1997]. It has the advantage of being unintrusive (unlike a telephone) and avoids telephone tag, the problem of not reaching the required person by telephone, leaving a message and then not being in when the required person returns the call. A whole body of conventions, called e-mail etiquette, or nettiquet, has evolved regarding the polite and appropriate use of e-mail [O'Blenes, 1999; Journal of Accountancy, 1998; McCune, 1997]. A collection of these is given in Table 5.1. The fact that it is seen to be necessary to develop such a list and deliberately bring it to the attention of new users, says something about the medium. Its advantages of ease of use and immediacy can result in impulsive, ill-considered, messages being fired-off in the heat of the moment. The lack of a

present recipient removes the normal inhibiting factors usually present in face-to-face conversation. That is, in conversation on the telephone, or face-to-face conversations, a reaction to the message can be detected by interpreting facial expression, other body language, or audio clues. The simple presence of the other person serves as a reminder that this is a real person, with discernable status, to whom the existing social norms apply. Without this presence e-mail messages can be sent that are grossly insensitive [Sipior & Ward, 1999; Romm & Pliskin, 1999; Hiltz & Wellman, 1997]. A bitter exchange of five remarks by each of two protagonists takes only a few minutes if they are in each others presence. The fact that the same words exchanged via e-mail may continue over days entrenches the ill feeling. They can be read, reread and be used as evidence. Hence, although we associate e-mail with face-to-face and telephone conversation because it can be spontaneous, it is in some respects very different and far more problematic [Berghel, 1997]. The idea persists that e-mails are personal and temporary, ephemeral, or volatile, as once they are sent they seem to disappear. In fact they are recorded as electronic data which can be read by unintended people and can remain on record for a period which cannot be controlled by the sender. This perception of privacy needs to be actively countered. An e-mail message should be compared to a postcard rather than a letter. The right of other people to use e-mails as evidence in court cases has become entrenched in law. Even once the e-mail message has been deleted, it may still exist on a server or in an archive or be retrieved in some way.

Other issues, such as information overload and wasting the time of others with unsolicited mail and the even more antisocial phenomenon of viruses spread via e-mail [Schneier, 1999], result from the wide reach of the medium.

Some learned, protective, behaviour can be adopted and may be specifically taught [Skyrme, 1998]. For example, people providing services, such as lecturers and public figures, have learned to respond deliberately in a lean (impersonal and short) way to potentially explosive e-mail in order to avoid arguments. In fact the medium is very useful in this context, as the equivalent personal confrontation or telephone call is difficult to handle and end. This is an example of strategic communicative action. Whether the outcome is satisfactory to all parties is a separate issue. Unfortunately e-mail wars are still too easy to start and too difficult to end and e-mail abuses, including sexual harassment, are very common and can result in costly legal action [Sipior & Ward, 1999; Berghel, 1997]. Activating a spelling checker, which will always ask for confirmation as to whether the message must now be sent, goes some way towards changing the e-mail procedure from ready-at-hand to present-at-hand and giving the sender the opportunity to review and reconsider the message. Sipior and Ward [1999] report that some organisations have reminders that are displayed when staff log on to remind them of company policy regarding e-mail.

News groups and list serves are similar to e-mail, except that the messages are sent to a group whose composition was not controlled by the person sending the e-mail. These Internet-based groups are usually devoted to discussions on clearly defined topics of interest. It is interesting to note that in the wake of the destruction of the twin towers of the World Trade Centre and the Pentagon on 11 September, 2001, many such groups were involved in quite heated discussions concerning this act of terrorism. The "managers" of ITForum, ISWorld, and even the Quest user group, had eventually to intervene. ISWorld closed down for a short, cooling-off period.

Many other examples of the use of e-mail for sending messages that are controversial, have serious repercussions legally, are about interpersonal relationships or that are very personal, exist. This is evidence that the users of a particular medium are not particularly aware of, or possibly not in agreement with, research findings concerning whether a particular medium is suited for the message they want to broadcast. Issues such as the extent of the reach of the medium, how easy it is to use, its immediacy, its low cost, its anonymity and the lack of external control or censorship (authorisation is not required), make it very attractive.

These social factors are potent but a lean medium is a hindrance in sending messages where subtlety and sensitivity are preferable [McCune, 1997]. Therefore, it is necessary to develop new conventions which allow the most convenient medium to be used most effectively. Corporate policies can be drawn up but they need to be widely, and repeatedly, communicated [Sipior & Ward, 1999; Weisband & Reinig, 1995]. An example of a reasonably complete company policy document is provided by Parker [1999].

5.3.3   Guidelines for use of e-mail

Table 5.1: Guidelines for use of e-mail

1	Symbolic
1	Do not type in capital letters. This is an old convention but is still considered to be "shouting".
1	Typing errors are acceptable if you are sending an e-mail to a friend but not if it is to a superior or a member of the public.
1	Avoid "in crowd" acronyms and humour unless you are sure that your recipient will understand and appreciate them. This includes smiley faces ("emoticons") and other emotive symbols.
2	Equivocality
2	Consider carefully whether you have stated your case clearly if the matter is complex or contentious.
2	In the case of sensitive matters consider carefully whether e-mail is an appropriate medium [McCune, 1997]. Often once a dispute has started via e-mail it can be ended more easily by a phone call or personal meeting.

3	Relationships
3	Think twice before pressing send, particularly if replying to a message that has angered you.
3	Be cautious. E-mails you have sent may get into the hands of unintended others [O'Blenes, 1999].
3	Read an e-mail that has angered you again a bit later, carefully. Maybe the insult was unintentional, maybe you have mis-read or mis-interpreted something when quickly reading it. Try to find out if the sender has misunderstood a previous e-mail. A cycle of misunderstanding can easily occur [Sipior & Ward, 1999].
3	Include a brief greeting (salutation) and appropriate end.
4	Do not forward spam no matter how close the cause is to your heart.
4	Access to information
5	Always enter a meaningful subject heading [Hara et al, 2000; Skyrme, 1998].
4	Be aware of privacy issues. You should not publish (forward) private e-mails from others unless you have their specific permission.
4	Attachments, and layers of e-mails included within other e-mails, can be relatively slow to get to. If there is a simple announcement retrieve it directly into the body of the main e-mail. Only long documents or big files, such as graphics, should be attached.
4	Ensure that you are sending the message to the intended person. Do not send messages intended for one person to a group. This wastes other peoples' time and can be extraordinarily embarrassing.
4	Do not send e-mail until you know that the person concerned actually does read their mail, or else check that it has been read. Assuming that an important message has been received is unwise.
5	Include alternative ways of contacting you, as a standard part of the e-mail, such as phone numbers, fax and physical address. This can include an indication as to who you are, which is useful to strangers.
5	Ensure that you are not casually making company confidential information available, be aware of intellectual property rights [O'Blenes, 1999].
5	Ways of compensating for intrinsic features of e-mail
5	Reply immediately (within 24 hours), even if only to say the matter is receiving attention.
5	Messages should be kept short and only one issue should be addressed in an e-mail, so that quick responses are facilitated and important points are not overlooked or ignored [Skyrme, 1998].
5	Have a regular office routine for reading your e-mail. The policy of being alerted by the mail system when incoming mail arrives is useful so that important matters can be handled at once.
5	The history of previous comments in an ongoing discussion can easily be included by selecting the appropriate e-mail option. This is useful in reminding people in a discussion what it is all about.
6	Social
6	Alert employees to e-mail policy concerning privacy.
6	Educate users regarding these guidelines.

5.3.4   Discussion

Contentious issues concerning e-mail are whether it *can* be used effectively for sending equivocal information and hence whether it can be an effective medium of communication for teams of people who need to work together [Introna, 2001; 1998]. The original Information Richness Theory (IRT) differentiated between personal documents, such as letters or memos, impersonal written documents and numeric documents and stated that letters and memos held more rich information than impersonal documents (reports, fliers and bulletins) [Markus, 1994]. It seems strange that the content rather than the medium is used to differentiate between these cases. This implies that text (and hence this includes e-mail), **can** convey a broad spectrum of information types - a point of view which is borne out by general experience, as text can definitely arouse emotion, be used to argue (discursive information) and can be strategic (surely many contracts are examples of this, even though they are presented as being impersonal documents). IRT postulates that the bandwidth of the **medium** determines the richness of the information which is communicated and hence face-to-face conversation is richer than telephone which is in turn richer than text. The ability to communicate effectively, regardless of the medium, is learned. It is my contention that this is true of the effective use of e-mail. What needs to be taught is conventions, the need for careful composition of a message, and awareness of ethical issues such as privacy issues [O'Blenes, 1999; Weisband & Reinig, 1995].

E-mail is a special case of text, as it is more immediate (relayed more quickly) and hence some degree of spontaneity is preserved. It is generally informal and the text is unstructured. The use of e-mail by management and in education has been the focus of some research, most notably that of Markus [1994], Lee [1994], Ngwenyama and Lee [1997] and Jarvenpaa and fellow researchers [Jarvenpaa et al, 1998; Jarvenpaa & Shaw,1998].

> *"Even sophisticated users of groupware maintain that it is email that has totally revolutionized the way they work, is still the daily workhorse, and has stimulated a change of behaviour and culture."* Skyrme [1998]

5.4   Telematic education

The use of the Internet, Intranet and specific software for web-based curriculum management has been adopted in education with quite amazing speed. In fact, the availability of the related technology seems to have brought about significant changes in educational policy, which will have far reaching didactic, financial and infrastructural consequences. Academic e-commerce, where services are advertised, ordered, paid for and delivered via the Internet, such as online student

registration, is just another example of e-commerce. It follows the pattern of the new economic model in attempting to respond quickly to demand, be flexible, expand reach to new groups of customers and improve efficiency. The implications regarding competitive advantage are, therefore, judged to be important [Hosie & Mazzarol, 1999; Leidner & Jarvenpaa, 1995]. However, there is also the possibility that distance education can make use of the Internet for teaching and learning. The delivery of tutorial material can be achieved relatively cheaply and it is hoped that more students will be attracted as they will be able to study at times which they find convenient. There does seem to be a danger, however, that the real potential of telematics as an educational tool might be overlooked as a result of superficial application. Lessons learned from research in other fields, in particular information systems adoption theory, are not often applied in research into educational technology [Jost & Schneberger, 1994] although the "*... increasing overlap among educational institutions' and business organizations' approaches to organizational improvement is widely acknowledged*" [Alstete, 2001]. There are lessons that can be learned from Knowledge Management as well [Rowley, 2000]. In fact web-based curriculum management systems such as WebCT can be considered to be a form of Knowledge Management tool.

Often a new educational policy concerning the inclusion of a telematic or web-based component into the existing teaching model is stated simply as requiring that the number of contact lectures presented by a particular department should be reduced and the Internet should be used in some way or other. The actual strategy and **how** this type of tuition and learning will be used may be left up to the academic department or the individual lecturers. This is in accordance with the culture of education that Jost and Schneberger [1994] classify as professional bureaucracies, where the role of management is small and is confined to providing resources, resolving conflicts and liaising with the external environment. Thus, " *... a successful decision to adopt an innovation will not be made by the administration alone, it will be made and carried out by individual professional educators*" [Jost & Schneberger, 1994: 226]. Hopefully, when making these decisions the lecturers will be guided not only by considerations as to whether it will be more work, less work, or advantageous to their academic reputations, but also whether there is evidence that indicates that there will be useful academic outcomes. There are in fact a number of different ways of using the Internet in teaching. An excellent article discussing every possible use of technology in teaching is the one by Leidner and Jarvenpaa [1995]. Which of these teaching strategies is used, and where, depends on the course content, the learners, as well as on the model of learning embedded in the instructional method favoured by the lecturer who is responsible for the course.

Although it is possible to have virtual courses where all learning is done entirely through distance-learning, such as the Masters in Electrical engineering offered by Stanford University, the courses offered by the coalition of universities making up the Western Governors' University and the 1600 courses were offered by 95 schools together making up the California Virtual University [Beller & Or, 1998] prior to its demise in 1999 [Downes, 1999], it has been suggested that the ideal is to

use a mixed mode of teaching and learning, telematic enhanced learning, where students do some studying via telematics and also have some contact sessions. This is an appealing option but one that will also require careful thought. This model would make it necessary to keep all the students synchronised regarding progress in their studies which defeats the purpose of self study to some extent. A crucial element is the format and content of discussions during contact sessions. Lecturers and students need guidance and experience in effective discussion group strategies.

It is difficult to achieve a realistic level of enthusiasm in discussing telematic or technology enhanced learning. The enthusiasts tend to come across as naive optimists and those who are cautious are easily labelled as foot dragging, security hugging conservatives. The stakes are high. Careful planning and analysis are essential at all levels and the maximum amount of technical and administrative support, training, discussion and ongoing monitoring must be provided.

5.4.1 Web-based Management tools

The decision by the management of a university to use telematic teaching is often accompanied by the adoption of a web-based curriculum management tool. Examples are WebCT, FirstClass, Blackboard, NovaNet and others. This type of tool is intended to make it very easy for the lecturer to present the course material on a web site, link associated material, create attractive layouts and highlight important material. It also makes it easy for the student to access and use the material.

An important additional function of such tools is that they allow the academic activity and progress of individual students to be monitored, as well as the effectiveness of the study material. Thus, it provides a mechanism for Informating up by providing more information to the lecturer concerning the student [Leidner & Jarvenpaa, 1995]. This data can be derived from on-line quizzes which the student is required to do, producing marks that are automatically recorded. These are not only useful for monitoring the performance of the student, but also the effectiveness of both the study material and the testing procedure, as the data can be analysed to identify concepts that are frequently misunderstood and questions that are ambiguous [Partow-Navid & Slusky, 1999]. It can maintain a simple count as to how many times a specific student has visited the site or how many messages the student has submitted to a discussion group. (Unfortunately there is evidence that in those cases where marks are awarded for visiting a site or sending messages, students very quickly discover that no actually meaningful academic participation is required and they log numerous entries which represent minimal activity.) Not only is this type of monitoring intended to provide the lecturer with information concerning the student's progress but it can, if used properly, give the student fast feedback from the quizzes and a convenient and complete, picture of what he has worked on. The software is usually also intended to be used as a communication channel

between the lecturer and students and between students and, to a lesser extent, between administration and student. Both synchronous chat rooms and asynchronous news groups are generally available. The intention is to increase the amount of active discussion on topics related to the curriculum. Ideally, the lecturer is no longer seen as the primary source of information (the fountain of knowledge) but simply a partner in the educational experience, albeit a particularly wise and knowledgeable one. This facility is one of the features which permits the collaborative work to be done, on-line, by virtual teams. Another is the provision of tools allowing multiple authors of assignments.

A disadvantage can be that the student is compelled to spend a large amount of study time on-line. Students are always short of time and hence are highly resistant to any perceived additional demands on their time [Warf et al, 1999]. Reported cases [Morss, 1999; Papaspyrou et al, 1999] show that more than 80% of students participating in projects requiring them to collaborate on-line, spent less than three hours per week on this activity but a significant percentage of the students considered this to be excessive. This depends of course on the extent to which the use of the web-based system is compulsory and whether it replaces other more traditional study options. In some cases, it is considered ideal for all the required student activities to be very closely integrated with the study material on-line (for example, students and lecturers link comments made during the on-line discussions to specific points in the on-line prescribed text). This means that, in order to use the system optimally, all the study material (including the full prescribed text of books and guides) must be shared, on-line and accessible at all times. This places a considerable burden on those maintaining the system, not only from the point of view of hardware and software but also in creating and maintaining content. It also limits learners' options as they **must** study on-line a lot of the time.

In reality, lecturers are unaccustomed to following the progress of each student, monitoring all comments by students to ensure that misconceptions are not widely propagated and providing the encouragement and remedial help that would make a noticeable difference to results. Lecturers are understandably reluctant to adopt a role that can be seen as regressing to that of "nursemaid" or "policeman". At the opposite extreme, there is the possibility that the lecturers will use the system too superficially, placing very limited summaries on the system. Thereafter, the lecturer might pay less attention to the students and there might be less contact between student and lecturer than before. The immature student may lack the self discipline to pace or schedule academic activities and, having invested little in a course, drop out.

5.4.2   Summary of features offered by web-based curriculum management systems

A summary of features commonly found in web-based curriculum management systems or any software system intending to support education administration, teaching and learning processes is provided in Table 5.2.

Table 5.2: Summary of features

Web facility	Student view	Lecturer's view
Course administration		
General information concerning the course, lecturer's contact details, et cetera	Useful	Easy, short, needs only limited updating
Information regarding time schedules (about lectures, assignments, and tests)	Useful	Easy, short, needs only limited updating
University administration and student records		
On-line registration	Popular	Once off, university-wide development
Student access to his own academic and administrative records	Popular	Once off, university-wide development
Lecturer access to all student academic records	Popular	Needs to include all marks, not just those on-line activities
Lecture contents		
Lecture summaries - better performance in the short but not long run [Karuppan, 2001], length of summary is important, it should not be too long [Smith et al, 1999]	Students tend to think they need to study nothing else. Assists students who have difficulty taking good lecture notes. Students tend to print these out.	Time consuming unless provided with the prescribed book
Full transcripts of lectures	Too long. Students would rather read a prescribed book [Papaspyrou et al, 1999].	Time consuming [Partow-Navid & Slusky, 1999].

Simulations - demonstrations of processes - and videos. Popular business simulation games [Doyle & Brown, 2000; Maki et al, 2000] or laboratory simulations	May over-load the network, needs big bandwidth [Rowe & Gregor, 1999]	Needs expert development, not often available
Provision of links to relevant articles and other resources, such as databases and public domain software, on the Web	Students need to be convinced that they will need this information [Karuppan, 2001]. More useful to post-graduate students. Time consuming [Warf et al, 1999]. Can interrupt flow of text [Partow-Navid & Slusky, 1999]	Quite easy
Student activities		
On-line quizzes	Quite popular.	Depends on the quality of the MCQs. These are often provided with text books but need to be checked which can be time consuming. A large bank is needed to ensure that parrot fashion learning will not result. Partow-Navid and Slusky consider these to be very effective [1999].
Collaborative assignments plus on-line facilities such as discussion groups and CSCW tools	Students find it difficult to maintain non-trivial, on-line discourse. Issues of equal participation, trust, reliability. Time consuming [Warf et al, 1999]. Seale and Cann [2000] report time related excuses for not participating in an online discussion as predominating.	Difficult to teach how to discuss on-line. [Lind, 1996]. Coordinating the activities is difficult [Orsak & Etter, 1999]. Training, monitoring, seeding, facilitating are all very time consuming [Kochtanek & Hein, 2000; Ryan et al, 1999; Lind, 1996].
Virtual labs and synchronous broadcast of lectures	Bandwidth	Need to be created by experts and communication costs are high [Tsichritzis, 1999].

Web versions of computer-assisted instruction and interactive tutorials	More suitable for subjects in which drill and practice is required.	Need to be created by experts
Delivery mechanisms		
Submission of assignments via e-mail or other on-line delivery mechanisms	Very popular	Needs good administrative procedures. Standard format required.
Lecturers mark electronic copy and return marked assignments via e-mail et cetera	Popular	Not difficult but needs some practice.
Students publish their work on the Web	Can be time consuming. Do all students need these skills?	
Interpersonal communication		
General on-line discussion (not prescribed and not part of formal group work) in open news groups	Students tend to limit themselves to administrative details, coordination rather than collaboration.	
Private e-mail between students, lecturer and student, or administration and student	Very useful	Easy but can result in information overload [Kochtanek & Hein, 2000; Ryan et al, 1999; Lind, 1996].
On-line chat can be used for interactive tutorial type sessions. The lecturer can participate in various chat sessions at the same time [Partow-Navid & Slusky, 1999].		
Video conferencing		Expensive, requires additional hardware and bandwidth. Usually only available in corporate training of senior staff [Coleman & Schiller, 1999].

5.4.3 Discussion

An overview of web-based curriculum management systems features has been presented In this section. The issues relating to the use of the web-based curriculum management system's tools used for computer supported collaborative work will be discussed further in Chapter 6. In Chapter 9, Section 9.6 some results obtained by researchers undertaking similar research will be discussed in relation to the findings in this research.

5.5 Conclusion

In this chapter two main issues were addressed. Firstly, whether e-mail allows complex, equivocal and rich information to be communicated and the meaning embodied in it to be shared. This determines the feasibility of using e-mail in collaborative work in order to develop new designs or concepts and hence construct new meaning or simply to share meaning. Secondly, this issue can be investigated within the context of computer supported collaborative learning. The use of web-based curriculum management software in education was discussed in order to see how it can be used to assist students in constructing new meaning or reconstructing (understanding) concepts that are being taught.

It seems that many researchers believe that e-mail can be used in order to communicate complex and equivocal messages but that this is not a skill that is immediately available to correspondents and needs to be learned. Social factors have a significant impact on the use of e-mail both from the point of view of the circumstances where it is used and the way in which it is used. This is consistent with a sociocultural model of learning, as people using the technology together as a group will develop methods of using it which are appropriate for their purposes, even though these may not have been foreseen by the original developers. E-mail may be used inappropriately, unskillfully and with disastrous results. On the other hand, it may be used very successfully in circumstances where it would seem to be inappropriate. Thus there are social forces that make it important to find ways of using e-mail more effectively since the reasons for using it are so compelling that its limitations must be overcome.

The suggestions made in this chapter regarding the use of e-mail apply to most circumstances and users. In Chapter 6 we will explore the way that virtual teams (or dispersed collaborative teams) work and their need to develop the skills discussed in this chapter. Virtual teams need to communicate more complex information under circumstances of greater stress than is the case with users in general.

Chapter 6

Virtuality, teams and trust

'"Men work together,'I told him from the heart,

'Whether they work together or apart.'"

Robert Frost, The Tuft of Flowers

The Poetry of Robert Frost. Edward Connery Lathem, ed. (1979) Henry Holt.

THEORIES   APPLICATIONS
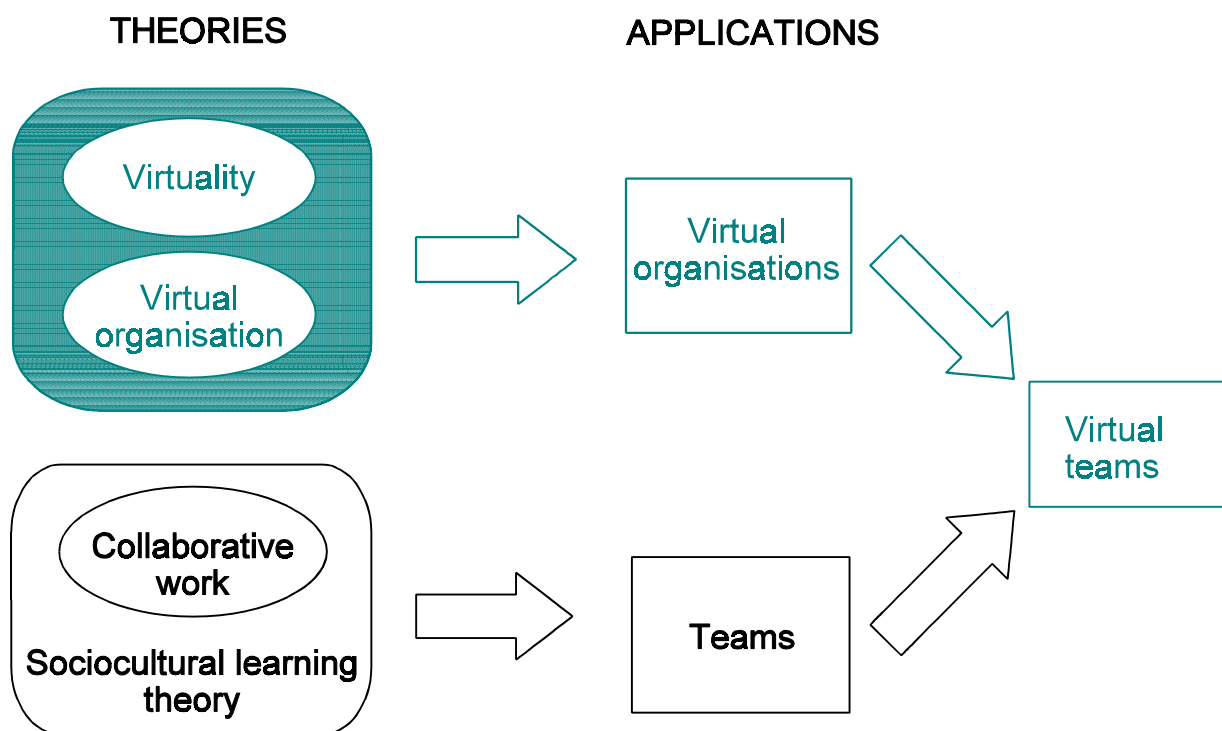
Figure 6.1: The contribution of theories of virtuality and collaborative learning to virtual teams

6.1 Introduction

There are numerous benefits resulting from collaborative work within a virtual team. However, there are also a variety of difficulties associated with this type of group work. If virtual teamwork is to be successful and take advantage of all the benefits, while avoiding the pitfalls, it is necessary to understand how virtual teams work, what affects them and what strategies can be employed to make optimum use of them. Issues such as the management of the team contribute to the teams' effectiveness but this thesis focusses on only one aspect, how teams share meaning and get involved in discourse with one another. In Chapter 5, communication using e-mail was discussed in terms of the type or richness of the information that can be communicated and suggestions were made regarding how the general use of e-mail could be improved. In this chapter, the subject is explored from the point of view of how dispersed teams

work together and what factors affect them and the role of computer-mediated communication in this teamwork.

Where group work takes place in a virtual environment, it is important to understand the impact of virtuality on the lifeworld and the processes involved in virtual organisation. It is similarly important to understand the development of virtual organisation as a form of metamanagement and the impact such organisation can have on society, as well as the challenges it poses and the opportunities it presents. The concepts of virtuality and virtual organisation are explored in Section 6.3 and in Section 6.4. This provides a theoretical basis for the "virtual" aspect of virtual teams.

It is also important to understand group work generally, both in its co-operative and collaborative forms. The discussion in Chapter 3 around sociocultural learning theories is important in this regard, as it adds to an understanding of how groups work and how people can learn behaviours that will impact on their ability to work in a team. This theory is applied in Computer Supported Cooperative Work (CSCW) and Computer Supported Cooperative Learning (CSCL). These areas of application not discussed in detail of this chapter as the value of collaborative team work is generally accepted and the research undertaken did not rely on Decision Support Systems or more sophisticated groupware.

The way in which the theories of virtuality and sociocultural learning interact and the application areas affected are illustrated in Figure 6.1. As is indicated in that diagram virtual organisations are associated both with the theories of virtuality and with virtual teams. Nevertheless, virtual organisations as a business model are discussed only briefly here, as the unit of analysis of the research undertaken for this thesis is at the level of the team and not the organisation. The emphasis in this chapter is, therefore, on virtual teams and the factors which influence their effectiveness. Questions of culture and diversity impact on how groups work together and it is necessary to appreciate how this is emphasised in the virtual environment.

Finally, trust is an important element in the effectiveness of any joint work and particularly so in the virtual context. It is therefore necessary to understand how trust impacts on group work and how trust can be developed. Trust was discussed in the context of modernity in Chapter 4. It is discussed again in detail here, from the perspective of building trust in teams in a working environment, that is, from a more pragmatic point of view.

Understanding these elements of virtual team work are important in any context where dispersed teams work together. However, they are especially important in the learning context, as students need to be prepared for a work environment in which virtual teamwork is becoming increasingly common. Students not only need to be introduced to the technology which supports such work,

they also need to be made consciously aware of the various factors which influence the effectiveness of virtual teams and need to be taught strategies which will permit them to make optimal use of this environment. This can be taught in various courses and in different degree programmes. For example, in a description of a postgraduate management course it is included as one of the three MBA treasures. These were given as, " ... *an intellectual curiosity, and* **ability to work in teams** (my emphasis) *and resilience to handle sustained pressure ...*" [UCT News, 2001: 40]. Chapter 5 addressed this question in part by indicating what students should be taught about communicating using electronic media but the discussion given in this chapter focusses more on the social issues than the communication and media issues.

6.2   Co-operative work

De Villiers [1995] says,

> "... *there is general agreement that co-operative methods which incorporate group goals and individual accountability accelerate learning considerably. These methods also have a positive effect on a wide array of effective outcomes such as intergroup relations, acceptance of mainstream learners and self-esteem.*"

Co-operative work is a more general term referring to any type of group work. It includes collaborative work, where students interact and work together on a single or integrated task, and co-ordinated work, where the students divide up the work, each complete a section and then combine the parts in some fairly loose way.

Learning theories, and in particular sociocognitive and sociocultural learning theories, were discussed in Chapter 3, Section 3.6. As was pointed out in that discussion, both of these theories propose that learning is primarily a social process that takes place when the learner is interacting with others. A key principle of constructivist learning theories, of which the aforementioned are both examples, is active learning. The learner must actively participate in the learning process. Associated with this is situated cognition, which says that the learner will build up a mental model using elements obtained from the social environment in which he is located, as well as elements from the knowledge and experience he already has.

Collaborative work requires students to work together in small groups or teams to achieve a clearly defined goal. Each team member will contribute unique insights, skills and personal attributes and will gain from those of fellow team members. Thus the team will achieve more than the separate individuals can. Learning occurs as an interactive and social process while the team members work together as individuals, construct meaning during the process of questioning each other's understanding and elaborate on ideas being shared in the group.

> "*Groups solving case studies are likely to experience process gains such as stimulation, synergy, more information and learning.*" [Nunamaker et al., 1991]

For the collaboration to be successful, each learner must:
• clearly understand the team goal,
• communicate effectively both with respect to ideas and feelings,
• actively and effectively participate in the team's work,
• contribute to the group's decision making process,
• handle conflict constructively,
• bond with the other team members,
• solve problems, and
• share power, influence and leadership.
 [De Villiers, 1995]

The advantages observed in collaborative work in an educational environment have been seen to be equally useful and evident in certain work environments. The original purpose of using a project team to complete a task that was too much work for one person or that needed the specialist skills of several different people has been extended. The team stimulates, motivates and vitalises the individual team members, that is, it generates synergies. Knowledge is one of the resources or assets of any organisation and learning and problem solving must occur within organisations. The similarities between the activities in the classroom and those in the office are important. Collaborative work within an organisation can be seen as a form of collaborative learning and hence the activities given above for learners are equally necessary for members of collaborative work teams.

Teams consisting of members from different organisations are also becoming more common, particularly within virtual organisations. Issues concerning teams that do not share space or place are discussed in Section 6.7.

Advantages and disadvantages of computer-mediated communication were discussed in Chapter 5. Just as collaborative learning and collaborative work are similar in many respects, Computer Supported Co-operative Work and Computer Supported Co-operative Learning have common roots and can use much of the same software (Groupware, Group Decision Support tools), technology (videoconferencing, online chat, et cetera) and methods.
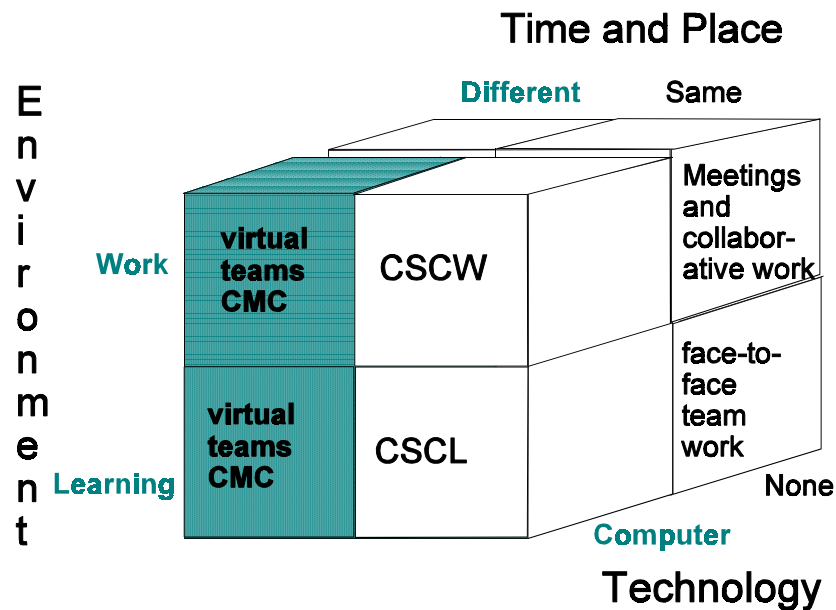
Figure 6.2: The systems used by teams

Figure 6.2 highlights the conceptual position of virtual teams using computer-mediated communication in the familiar time/place communication framework [Turban & Aronson, 1998] but adds a technology dimension. Hence, virtual teams are appropriate in both work and learning environments where they occupy different space, communicate asynchronously (different time) and use computer technology to do so.

Since the value of collaborative work is generally accepted, a detailed account of the theory and research in the field is not given in this thesis.

6.3   Virtuality

Virtuality, or the defining characteristic of virtual organisations, virtual communities and virtual teams has been described by a number of authors to encompass a number of related ideas. These will be used in Sections 6.5 and 6.6 of this chapter to explain what is meant by the terms 'virtual organisation' and 'a virtual team'.

One interpretation of the concept of virtuality is that a virtual entity seems to be the actual entity but is not [Shao, Liao & Wang, 1998]. For example, virtual memory appears to be, or acts as though it is, a large amount of main memory, but is in fact the manifestation of the use of a technique where the operating system uses secondary storage to supplement main memory.

Anyone interacting with virtual reality would experience it as though it was the real world, but it is, of course, only a limited and quite crude copy. There is, therefore, an association of virtuality with simulation.

A different interpretation is discernable in the case of virtual social structures, such as virtual communities, virtual organisations and virtual teams. Here it is not so much that the people do not really work together but that they do so in an unusual way. The end result is supposed to be the same, as though the participants made up a traditional team, organisation or community. The idea that virtuality allows the same ends to be achieved as before, but by means that are not traditional, has evolved, and now implies the use of technology, and in particular telecommunications, in attaining those ends. Definitions of the various types of virtual organisation refer to the use of Information Technology and this is usually intended to mean communication by means of networks, usually the Internet.

Associated with these definitions is a perception that a virtual organisation, virtual factory, virtual community or virtual team is ephemeral, as its parts are not all located in anyone physical place and the social group does not exist in a tangible way. The physical presence is substituted with virtual presence [Skyrme, 1998]. This, in turn, implies that the composition of these structures is dynamic and therefore they have the ability to respond to the requirements of the moment and can reallocate resources as requirements change. They can also be dissolved when they have served their purpose. This temporary or unstable structure can affect the degree of commitment that people feel towards the virtual entity.

Another aspect of virtuality is that the virtual entity has more capabilities and power than it inherently possesses [Christie & Levary, 1998]. This may be a result of the synergy inherited from collaboration [Holland, 1998] or may arise from the optimal use of resources. For example, virtual memory allows the computer to function as though it had a larger main memory than is actually the case and is, therefore, more powerful. A virtual team can derive the benefits of collaborative work without having to travel to meetings or all being available at the same time. Partners in a virtual organisation can share resources.

Virtuality, when applied to social structures, implies that the organisation is dispersed. Virtuality, therefore, crosses the barriers of space and in so doing causes a change in the way that the organisation functions in terms of time [Introna, 1998]. Virtual teams, for example, will communicate asynchronously much of the time, as they are not all working in the same time zone and, therefore, are generally not all working at the same time. This means that different groups may be active through the full 24 hours of the day, resulting in maximum productivity. Virtuality, therefore, implies a restructuring of the way people work with respect to fundamental dimensions (when, where and how).

Turoff [1997] considers the concept of virtuality from a rather different angle. He defines virtuality as the property of a computer system which allows it to influence the real world by making it

"... behave according to the template dictated by the virtual systems [operating inside the computer]." This argument is consistent with that of Giddens' structuration theory [Giddens, 1984] in terms of the duality of structure (the system affects the lifeworld and the lifeworld affects the system) and also recognises and warns of the possibility of the system colonising the lifeworld which is one of the concerns raised by Habermas.

Turoff stresses that the representation of reality within a computer system is not the "real thing" but a new reality that differs in important ways from the original. Our understanding of processes, be they physical or social, depends largely on any mental model we have adopted. The model has an overriding influence over how we interact with the system. Virtual reality systems are experimental simulations that resemble the real world only superficially. A simplified representation may assist us by making the actual situation easier to understand. A model acts as a filter allowing us to concentrate on the elements that are considered important while ignoring other aspects. This is acceptable when virtual reality systems are used as games or models of the physical world, as long as we remain aware of their limitations, but an oversimplified or incorrect model can mean that all interaction with the system is inappropriate. This is serious when parts of social systems are automated or when computer systems interact closely with social systems. For example, an entirely computerised state pension system can cause severe hardship if the realities of the difficulties that the elderly and disabled may face in accessing the system are not recognised and catered for. If reality is interpreted in terms of the model created by the system, instead of the system reflecting 'real life' as much as possible, the system colonises the lifeworld. Not only does technology have a direct impact on the lifeworld, it tends to influence the human perspective so strongly that only those objectives that are considered to be technologically achievable are every considered [Sotto, 1997].

> *"Today we are consciously or unconsciously designing social systems."* Turoff [1997]

Participants in a distributed virtual environment are in fact "negotiating reality" as they have the option of simply accepting what they are told or of challenging it by asking for supporting evidence. They do not have the normal supporting social structures or additional information, such as involuntary body language cues that we interpret subconsciously, that reduce risk in a traditional organisation. They must, therefore, be more conscious of the need to challenge statements and confirm that there is shared meaning rather than assume that information is correct. The feasibility of challenging truth claims and reaching consensus in an electronic or virtual environment is central to this thesis.

Turoff [1997] also points out that computers not only enable users to create "*models of reality but [give us] the ability to make any model appear real*." This pseudo reality is inclined to persuade us that the computerised system is valid and really does reflect reality.

Turoff's view of virtuality, and the warnings that it holds, acts as a counterbalance to the very optimistic, more instrumental views of virtuality that were given earlier in this section. The goals of Critical Social Theory require that these concerns be considered when research is carried out that involves social structures.

6.4   Virtual Organisation Theory

Mowshowitz defines virtual organisation as metamanagement, which results in the appropriate assignment or reassignment of concrete satisfiers to the abstract requirements of a task [Mowshowitz, 1999]. This is explained as follows: Virtual organisation is a switching process used to match suppliers (the satisfier) with a clearly specified requirement. It is necessary to make goals explicit and, as this is possible only for goal-oriented tasks, virtual organisation is limited to tasks of this sort. This switching process is typical of a search using a search engine on the Internet where the search criterion is the requirement and the list of sites retrieved represent the satisfiers. However, this process need not occur in an automated or computerised environment. A further step of selecting one from the list of potential satisfier is also required,that is, the actual connection or linking of the customer to the supplier must occur. Querying a database is another example of virtual organisation according to this definition. It is essential that a clear specification of the demand or requirement is made separately from descriptions of all the suppliers.

The process has two additional stages, one which specifies, maintains and occasionally alters the procedures or algorithms used when satisfiers are identified and a particular satisfier is chosen. The process of developing new search algorithms that will speed up a search of the Internet is an example of this stage. The second is at a higher level, where the goals are reviewed that were used to decide on these switch linking procedures. For example, Introna and Nissenbaum [2000] discuss the politics of search engines and gives examples of the criteria used to determine the comparative relevance of sites identified in a search and other criteria which are commonly used to determine whether sites that are less relevant will be displayed within the first references listed.

Using an Internet search engine as an example, the alternative criteria evaluated during the last stage of metamanagement (that is, review satisficing criteria by reflection on goals) could be to:
• 　　　Allow owners of sites to pay for a top position.
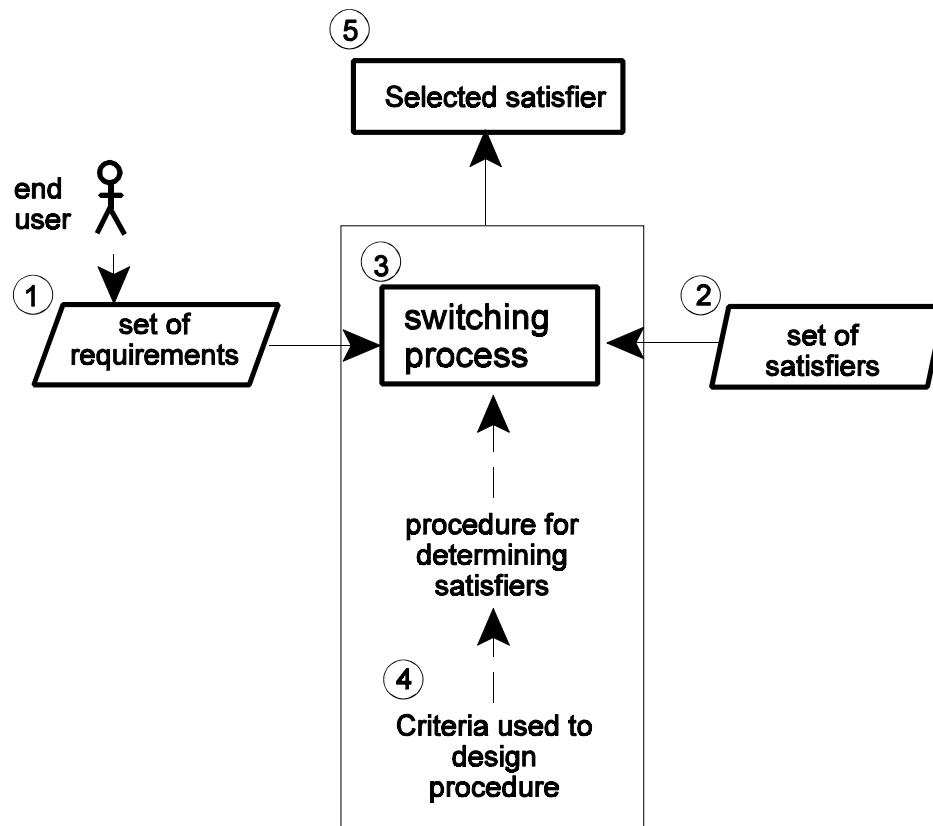
**Figure 6.3: Five major responsibilities in managing a virtual task
(derived from Mowshowitz, 1998])**

- Use the number of links from other sites to this one to determine its relevance and hence position in the list.
- Analyse the choices made by other users of the Internet who seem similar to this user in order to try to provide a selection of sites which will be of interest to this particular user.

The five major responsibilities of metamanagement, or the management of a virtually organised task, [Mowshowitz, 1999] are illustrated in Figure 6.3. Central to this concept of virtual organisation is the fact that sets of requirements, suppliers or satisfiers, procedures and criteria (shown as 1, 2, 3 and 4 in Figure 6.3) change continuously. These categories of information must be maintained and altered separately. The switching occurs as an isolated event (shown as 5 in Figure 6.3). This allows better service, as appropriate new solutions can be obtained at any time.

Although switching need not be according to formal, quantitative or algorithmic system, [Mowshowitz, 1997] it is more difficult to accomplish in an environment where computers are not

used. It is difficult to allow for a subjective point of view and is much easier if relationships can be based on explicit agreements. This view of virtual organisation does not cater well for ripple effects, or interdependent functions. It sees transaction cost simply in instrumental or mechanistic terms of matching requirements with satisfiers but has no concept of relationships or trust or the cost of creating relationships.

6.5   Virtual organisations

6.5.1   Introduction

There are four factors that have given rise to virtual organisations. These are
•   globalization,
•   the spread of information technology,
•   the birth of the information economy, and
•   the dismantling of hierarchy.

All these forces cause and affect each other [Introna, 1998; Skryme,1998].

Globalization has had at least two influences on organisations. The customers and the contributors may be anywhere in the world. The need to reach global markets and utilise global resources in order to be competitive is one of the challenges facing any organisation that has even moderate ambitions. Contributors may belong to the same organisation (as is the case with regional offices or divisions producing part of the produce), they may be suppliers, they may be outside organisations who are partners in producing the product or they may be individuals who have specialised knowledge and contribute as team members.

The development and spread of information technology have made it possible for organisations to become more responsive to customers by allowing easier access to information about their products and services, providing faster access to and delivery of services and by offering products and services which more closely match the customer's needs. The development of new technologies has, however, resulted in a need for the individual producers to keep abreast of new developments and to keep informed as to what the competition is doing. The world economy is so aggressive that even those organisations who do not seek international markets must defend their national markets from other global players.

The birth of the information economy means that much of the trade which now takes place is not an exchange of physical goods but of information and services. These are the ideal products to

trade over the Internet and hence this form of economy has both encouraged the development of networked markets and been stimulated by their growth.

The virtual organisation ideally consists of autonomous participants and democratic relationships should balance power between the individuals participating in virtual teams or partner organisations. These teams are self-managed and hence the number of levels of management can be reduced. In addition, individuals can communicate with more senior managers directly via e-mail. The empowerment of the individual worker, the reduction of bureaucracy in favour of more flexible and democratic management and a view of employees as committed, accountable and trustworthy, are ideals which are closely allied with concepts such as the virtual office and virtual teams. The more liberal politics and social mores of the second half of the twentieth century support these goals and naturally encourage this type of management structure. The evolution of the technology should not lock in partners nor should others be locked out [Steinfield et al, 1995]. However, this ideal of trust and egalitarianism is not always borne out in practice [Wilson, 1999; Chesbrough & Teece, 1996; Handy, 1995].

6.5.2 Definition of "a Virtual Organisation"

Virtual organisations use virtual organisation. The working group 4 of Project ACHIEVE [ACHIEVE, 1998] define a virtual organisation as one which strongly exhibits any *one* of the following characteristics:
- Geographic dispersion
- Empowerment, a move away from hierarchic management structures
- A dynamic nature, responds to change
- Interdependence

The definition by Travica [1997], given below, is concise and covers most of the characteristics commonly considered to be relevant. However, not all researchers or teachers in this field would agree that the partnership must be involved in a production process. Some speak more broadly of a partial mission overlap or achieving a collective goal.

> *"VO refers to a temporary or permanent collection of geographically dispersed individuals, groups, organisational units - which do not belong to the same organisation- or entire organisations that depend on electronic linking in order to complete the production process."* [Travica, 1997]

Combining these two definitions, a virtual organisation can be defined as follows:

A virtual organisation is a temporary or permanent collection of interdependent, geographically dispersed, individuals or groups, from within the same organisation or from different organisations, that depend on electronic linking in order to achieve a collective goal.

The correspondence between an organisation which is said to be virtual and virtual organisation theory arises, therefore from the following significant characteristics.

- The use of a switching process to select a satisfier from a set of satisfiers at the time that a service is required although those satisfiers may be geographically separate. Electronic linking enables the communication of the set of requirements and the delivery of service by the selected satisfier.
- The set of satisfiers may change as the composition of the virtual organisation is not fixed.
- The two previous characteristics enhance the dynamic nature of the virtual organisation.
- The interdependence is indicated by the need to obtain services from different groups using this switching process.
- The hierarchical management structure is replaced to some extent by the meta-management offered by the virtual form of organisation.

6.5.3 Success factors

The most successful virtual organisations are those where the different groups or organisations can work fairly independently on complementary tasks and communicate with each other through clearly identified channels [Chesbrough & Teece, 1996]. In other words, these organisations are more co-ordinating than collaborative. Another factor increasing the chance of success is having a stable and small set of partners in the organisation [Magretta, 1998].

Further success factors associated with virtual organisations are
- an organisation culture that accepts technology,
- a highly decentralised organisation, and
- a change-oriented organisation [Burn & Barnett, 1999].

Some authors measure the degree of virtuality of a virtual organisation according to how successfully the organisation breaks the barriers of time and space by delivering products and services at any time and anywhere [Sieber, 1998]. As the wealth of other factors involved has indicated, this is too simplistic.

6.6 Virtual teams

6.6.1   Introduction

> " *The basic building block of virtual organizations is a virtual team.*" [Jarvenpaa & Shaw, 1998]

> *"A virtual organization thrives only in the environment of teamwork."* [Christie & Levary, 1998]

A virtual team is a temporary or permanent collection of a small number of interdependent, geographically dispersed, individuals that have a common goal and depend on electronic linking in order to collaborate and achieve it. Thus the same four characteristics as were recognised for virtual organisations apply to virtual teams, namely,

- Geographic dispersion,
- Empowerment, a move away from hierarchic management structures,
- A dynamic nature, responds to change,
- Interdependence.

Therefore, the concepts of virtual organisation apply as much to virtual teams as to virtual organisations.

> " *...communication and collaboration will become activities integrated with, and natural components of, all aspects of daily, electronically-mediated, work"* [Manheim & Watson-Manheim, 1999]

A virtual team is usually involved at the strategic level (for example, with planning for non-routine work, such as analysis or design and with work that requires decisions to be made). Virtual teams should be involved in close, collaborative work rather than loosely co-ordinated work. It is important that team members communicate well with one another and can reach consensus. Thus, it is important that team members have interpersonal skills and personal cyberskills including e-mail techniques [Skyrme, 1998]. As was explained in Chapter 5, these can be learned to some extent and it is necessary that staff are given an opportunity to gain them and practice before they are needed in a stressful, "real life" situation [Coleman & Schiller, 1999].

> "... *simply supporting communication and collaboration with these basic technologies [e-mail, realtime chats, other types of groupware, workflow management systems etc] is NOT by itself sufficient ... additional software and training and education are required*."
> [Manheim & Watson-Manheim, 1999]

As is the case with virtual organisations, there is no formal management structure or organogram for a virtual team, although different members may play particular roles in the team because of their specialist knowledge (relating to the core competences of partners in virtual organisations). One member of the virtual team may assume the role of team leader or this role may be taken by different members at different times but a leader is seldom formally appointed. Virtual teams, because of their democratic and flexible nature, rely very little on rules and regulations [Majchrzak et al., 2000]. Thus there is lack of structure of all types and this needs to be balanced with trust. Trust limits the need for structure but exclusive reliance on trust is dangerous [Sabherwal, 1999]. Forms of trust will be discussed in detail in Section 6.8.

The members of the team usually represent the different partners in a virtual organisation **but virtual teams may also exist outside virtual organisations**. Members of any community of practice, for example, medical practioners in family practices or history professors, might create virtual teams. If the team members have joined the team as individuals, without the involvement of the organisations to which they belong, there is no corresponding virtual organisation.

Virtual teams are often used in software development. This may be out-sourced with the developers at one location and the end users elsewhere, or developers may work from their own homes, or different team members may be located at different branches of the same organisation, possibly in different countries [Boland & Citurs, 2001; Kimble et al, 2000; Sabherwal, 1999; Tellioglu & Wagner, 1999]. Virtual teams are, however, found in all sectors including law firms, insurance companies, medical services, computer hardware manufacturers and advertising agencies [Kimble et al., 2000; Ogilvie, 1994].

A grey area exists in the case where staff members are allowed to work from home. This telecommuting does not mean that the staff member is necessarily a member of a virtual team. The level of communication between the staff member and others, the sense of working together on a common project, whether the team has a recognised membership (even though the composition of the team may change) and the media used for communication, all determine whether this is a virtual team or not. Similarly, virtual organisations do not have to have virtual teams. Communication between the different organisations might be routine and formal, such as by means of EDI, online orders and progress reports that are generated entirely by an information system. All strategic planning and decision making that requires the participation of representatives from all the organisations might take place face to face. All product design might

take place within individual organisations, by collocated teams. Thus, the key words in the definition given at the start of this section are "common goal", "collaboration", "dispersed" and "electronic linking".

6.6.2   Effectiveness of virtual teams

Kimble et al. [2000] believe that, "*Today only a small proportion of virtual teams reach a level of performance that goes beyond what the individuals concerned could achieve independently.*"

But other authors have different opinions. For example, in discussing the use of virtual teams in software development Tellioglu and Wagner [1999] say,

> "... *much of this work is done by multiple, often distributed, groups ... There also may be much geographical as well as cultural space between those groups. Although they may not be connected in ways that help create a shared understanding, they manage to develop a reasonably coherent and stable product...*" [Tellioglu & Wagner, 1999]

The factors contributing to the success of the team can be classified as those to do with the environment, the organisations, the interpersonal issues and the individuals.

6.6.2.1   Environmental factors

The environmental issues are general factors linked to time and space, such as the difficulties which the medium intrinsically presents with respect to carrying rich information across space and time. This was discussed in Chapter 5.

> "*Many of the barriers ... derive from the lack of understanding of the new geography of information systems.*" [Kimble et al., 2000]

Differences in culture are related to geographic separation. Thus place difference, rather than space difference, is relevant. That is, the differences to do with cultural norms, infrastructure, and other local circumstances, remain significant although the number of kilometres separating the participants is of ever decreasing importance. The geography of information systems is made more complex by the fact that there are two spaces within which information systems operate, the physical space and the electronic space, and the rules governing the two are fundamentally different. For example, if you share a physical space you are likely to share at least some aspects of culture, you will probably have a language that you both understand, you will have access to much the same infrastructure and people and you are likely to communicate synchronously. On the other hand, if you share an electronic space none of these assumptions

can be made. There are also electronic places within the electronic space, such as chat rooms, in which a person can invent any number of different personal identities [Kimble et al., 2000; Chester & Gwynne, 1998].

6.6.2.2   Organisational factors

The general issues identified as being environmental often have local or organisational manifestations. At the local level, the fact that different localities have different infrastructure is a problem that is related to geographic separation. In an office environment, we are accustomed to having certain equipment like photocopiers, fax machines, powerful computers on which the required version of the required software is loaded, the services of a secretary, even possibly assistance in translation. All members of a collocated team would have access to these and would know that other team members also have these facilities. If a virtual team member is working from a home office, some of these may not be available. Just as confusing will be situations where the different team members use incompatible technology. Something as trivial as a printer setup that differs at various sites can result in carefully formatted reports printing incorrectly, resulting in wasted time, irritation and even friction between the team members.

All the members of a virtual team need to have equal access to reliable communications technology in order to exchange information quickly. Whereas we will wait patiently for a physical facility to open at the start of business in the morning or after a weekend, we are very impatient if an online service, which is meant to be available 24 hours a day, is not immediately accessible for any reason. Since this technology is both complex and dependent on other layers of technology, such as servers and ISPs that are not entirely controlled by the individual, team, or virtual organisation, reliability becomes a key issue and frustration levels can be high.

> *"Effective virtual working requires seamless interoperability and knowledge flows*
> *between people, processes and information repositories, wherever they are located ..."*
> [Skyrme, 1998]

Differences in culture are noticeable between nations but there are also differences between the cultures of organisations. These different norms can be the root of serious misunderstandings. Simple issues such as the appropriate form of address for more senior staff or how strict an organisation is regarding use of equipment for private purposes, can become significant areas of conflict.

> *"... actual practice depends on context (of people, knowledge, and the nature of the task)*
> *and is cultured (in the sense of being shaped by beliefs, commitments, styles, and power*
> *relations)."* [Tellioglu & Wagner, 1999]

Management of virtual teams requires an entirely new philosophy and approach. The self-managed nature of the team is a consequence of the distance between participants and the character of the media used for communication. For example, if e-mail is used as the primary means of communicating, the individual has control over when he will read messages, when he will reply and what issues he will address. Direct supervision is impossible. Handy [1995] addresses the issue directly and says "... *we will have to rediscover how to run organizations based more on trust than on control. Virtuality requires trust to make it work. Technology on its own is not enough.*" [Handy, 1995] Trust must be developed at all levels (manager-manager, manager-worker, worker-worker, customer-organisation) and hence it is necessary for managers and employees to have new skills and changed expectations [Christie & Levary, 1998].

Wilson [1999] addresses issues of surveillance and control over staff in virtual organisations which can arise when this trust is not present or where these issues are distorted.

> "*Personal relationships become a legitimate target for manipulative action by the promoters of corporate culturism and 'organisational change' where the concepts of mutual trust between individuals and commitment to a work group are used to influence the behaviour of individual [sic]. This is done by providing strong and systematic incentives to obey company rules, to develop work habits of predictability and dependability, and to internalise the enterprise's goals and values.*" [Wilson, 1999]

There are two contrasting philosophical points of view concerning the way in which advanced computer systems affect the organisation with respect to issues of trust and risk. The first is that advanced computer systems will be used to control virtual organisations as they will regulate reality. This was discussed in Section 6.3. This can, in extreme case, lead to loss of individual choice. Another aspect is that rigid systems will favour hierarchical virtual organisations where participants are locked into the relationship and the organisation is dominated by the most powerful partner. More flexible systems will favour market-based virtual organisations allowing the much more democratic model of equitable, mutually beneficial partnerships that may change continually. A third aspect was discussed in Chapter 4, Section 4.3.5.1, regarding embedded systems. Here, the system may be trusted by the clients and end users, rather than only, or even primarily, the individuals involved in designing, developing, operating or maintaining it. Hence the people behind the system become faceless servants, and personalise commitment and responsibility may decrease. These different ways in which the computerised system can restrict the individual are all versions of the system colonising the lifeworld.

The more optimistic scenario is that information systems allow much greater variety of informed choice and permit people and organisations to react quickly and appropriately in a very dynamic world. The type of information system used will determine the type of virtual organisation.

6.6.2.3   Interpersonal issues

In Section 6.2, collaboration was identified as one of the key issues concerning teams. Collaboration requires mutual understanding, reciprocity and trust [Skyrme, 1998]. It is a cornerstone of the sociocultural model of learning and is equally important for knowledge sharing in organisations [Coleman & Schiller, 1999]. However, it is unlikely to be popular in a virtual environment unless an effort is made to ensure that it does not entail excessive extra work. It needs to be part of the accepted routine and benefits should be immediately visible [Coleman & Schiller, 1999].

Trust between team members is a very important factor and this will be discussed in Section 6.8.

6.6.2.4   Individual factors

The individual's commitment to the virtual team and the "cyber skills" and interpersonal skills he has will be critical factors regarding the success of the virtual team. In virtual teams there is a reduced sense of reality, identity [Kimble et al., 2000], permanence and cohesion. This is in part due to the fact that team members do not see each other face to face, partly because interaction is often delayed, partly because of the dynamic nature of the team and partly because of the democratic management philosophy that is an essential part of virtual teams. The first two aspects were discussed in Chapter 5, Section 5.4. The dynamic nature of the team affects the composition of the team with respect to team members. During the life of the team, members may leave and new members may join. During the working time of an individual he may belong to various virtual teams, each having different team members. In addition, the team's tasks and the information upon which they make decisions may alter continuously. This variability in team structure and in task is an essential part of the virtual team concept and is intended to enable the organisations to respond quickly to changing customer requirements. However, as Kimble et al. [2000] point out, structural changes create an environment of instability for employees.

It is essential to obtain the support and commitment of individuals. Lewis [1998] says that, " *... membership of a team depends fundamentally on individuals' desire to participate whatever their personal motivations may be*. " This can be achieved in part by ensuring that the team's missions and goals are compatible with the individuals' aspirations [Skyrme, 1997]. This is consistent with the need for a common goal that was identified in Section 6.6.1 as one of the defining characteristics of a virtual team. One way of achieving this is by allowing team members to participate in identifying the goals. This is done by offering the individual membership in the organisation, that is, a share in the governance of the team and the right to participate in making major decisions about the policies, strategies and operation of the organisation as they affect the

team and task. This contributes to providing virtual team members with a sense of belonging, even if that community were largely a virtual one [Handy, 1995].

The cliché "Nothing succeeds like success" is true. Research has shown that initial failures undermine the team spirit and are difficult to counter. Training, provision of support and infrastructure and providing alternative ways for communicating are obvious requirements for minimising early problems. Most researchers recommend that virtual teams meet in person at least once a month to renew personal bonds.

6.6.3 Virtual teams in education

All the usual benefits of asynchronous communication apply as much at a residential university as in distance education, such as,

- It is non-invasive, and hence it is not necessary to disturb a teacher or coworker when he is busy.
- It is available outside normal hours, so a problem or idea can be explained when it is current and a degree of closure is reached, and the learner can go on with something else.
- A record is created automatically.
- Reflexivity and new knowledge creation are possible.
- It is an aid to learning by apprentices. [Lewis, 1998]

There are four main reasons for introducing virtual teamwork at a residential university, each of which is discussed separately below.

6.6.3.1 To provide students with skills that will be relevant in their careers

Virtual teams are becoming increasingly common in a work environment so this experience is good preparation for a future career. This is why students, when given a choice, often decide to work in virtual teams. Although the following two quotations refer to teamwork and not to virtual teamwork, they remain relevant in this context.

> "*.... the global workplace is calling for collaboration, teamwork, and a multidisciplinary perspective ...*" [Hitch, 2000]

> "*Therefore techniques that create and build team working and decision-making attributes in academic situations are essential in providing students with relevant career-based skills. (Morgan and Ramirez, 1983, p.8)*" [Doyle & Brown, 2000]

The difficulty in communicating effectively using a less rich medium, combined with the need to become familiar with the technology, makes it even more appropriate to assist students in obtaining the necessary skills for doing collaborative work.

6.6.3.2   In order to enhance collaborative learning

As mentioned in Chapter 5, particularly Section 5.2.5, there are a number of advantages that can be gained from using computer-mediated communication. These are as relevant in collaborative learning as in any other teamwork. All teamwork is intended to achieve improved performance, that is, achieve group process gains [Nunamaker et al., 1991]. Examples of these are synergy, pooling information, objectively evaluating each other's ideas and stimulation of new and relevant ideas. Common problems encountered in face-to-face teamwork are: interrupting one another (this can result in ideas not being completed, or being followed through), dominating the conversation, lack of participation out of shyness or fear of ridicule, ideas are not recorded (group process losses) [Nunamaker et al., 1991]. Thus, any supporting software and methodologies should attempt to assist in increasing group process gains and minimise group process losses.

Benbunan-Fich and Hiltz [1999] note the advantages and disadvantages of asynchronous learning networks (ALN) shown in Table 6.1.

Table 6.1: Advantages and disadvantages of asynchronous learning networks
[Adapted from Benbunan-Fich & Hiltz, 1999]

Advantages	Disadvantages
Enhances teamwork.	Procrastination
Minimises common problems encountered in teamwork.	Frustration due to delays waiting for others to communicate
Allows in-depth reflection on topics.	Pressure to meet deadlines
Assists in arriving at higher quality decisions.	Impersonal medium
Permits integration of external expertise.	Lack of incentives for participation

The research results support the claim that the benefits are in fact realised, since ALN-supported participants (individuals and groups) were found to have submitted better work than the face-to-face groups [Benbunan-Fich & Hiltz, 1999]. Online participants submitted longer reports, with virtual teams submitting considerably longer reports than any of the other groups. However, they found that virtual teams reported the lowest level of process satisfaction. Students can get assistance and support from classmates and from their teachers without necessarily being in a virtual team [Clifton, 1999].

6.6.3.3   In order to facilitate team logistics

Major reasons for group work being unsatisfactory in tertiary education are the difficulties
students have in finding a suitable time and place to meet, even though these students are on
the same campus for a large part of every day. Universities do not usually have meeting rooms
available for students to use for teamwork. If a scheduled lecture period is set aside for this
work, since all the students are supposed to be available at this time, the presence of several
teams in one venue at the same time makes it difficult to communicate effectively over the noise
and makes for many distractions. The use of virtual teams is ideal for eliminating these
problems.

6.6.3.4   Class size provides yet another incentive

All classes should be relatively small especially for first year students [Clifton, 1999] but this is
an unobtainable ideal and, as a result, the opportunities that the student has to participate
actively in the class are considerably reduced. Hence, the option of teamwork becomes
attractive.

A major disadvantage of the use of virtual teams at a residential university is that alternative
ways of communicating exist and are quite easy to access. Learning to use the medium
effectively, technological barriers and other frustrations may seem to make CMC a difficult
option. Clifton [1999] recommends that as a general educational principle the teacher should
" ... *insist on the desired changes as conditions for approval, when students are anxious and
angry they should be neither rewarded nor punished.*" Thus, it may be necessary to make this
option compulsory and to insist on evidence that meaningful use has been made of the medium
for discourse.

6.7   Culture

> "*Hanna (1998) claims that neither language nor distance are barriers to access when
> using new technologies, but cultural norms and patterns represent formidable obstacles
> to learning across political and cultural boundaries.*" [Beller & Or, 1998]

Hofstede [1997] proposed four dimensions according to which the cultures of different countries
could be assessed. These are the power distance index (PDI), individual to collectivist (IDV),
masculine to feminine (MAS) and uncertainty avoidance index (UAI). His research, using these
indices, showed that different societies "see" social issues differently. He takes care to stress

that individuals do not necessarily share the prejudices (in Gadamer's sense) of their societies and are not totally predetermined or "stuck" in those mind sets.

This is relevant to South African society: It is commonly accepted that different groups were quite deliberately kept apart socially and originate from totally different cultures and hence, if Hofstede's findings are accepted, they can be expected to score differently on the four scales. This is significant as this might affect learning styles and specifically the preferences and effectiveness of different team members. Issues regarding diversity were addressed specifically by Thomas [2000]. The quantitative research portion of the research undertaken for this thesis made particular reference to the home languages of the students as an indicator of diverse cultures. This part of the research is discussed in Chapter 7.

Social culture is only one aspect of the cultures that affect team work. Communities of practice have a culture of their own, in which terminology, other aspects of communication and mutual recognition all play a role [Seely Brown & Duguid, 1996]. This did not affect the research as the team members were all junior students studying similar subjects. They could, therefore, be considered to be from the same community of practice.

Organisational culture also affects dispersed teams. In the case of this research, the students were all members of the same organisation (the university) although many had only become members recently.

6.8 Trust

6.8.1 Introduction

Trust is defined by Mayer, Davis and Schoorman [1995: 712], quoted by Jarvenpaa and Shaw [1998], as the "*willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action, important to the trustor, irrespective of the ability to monitor or control that other party.*"

Trust is essential in all teams but will be discussed particularly from the point of view of teams who do not meet regularly in person, that is, virtual teams. Much of what is said applies equally to face-to-face teams.

> "*Although trust is important in any team, it is more essential in a virtual team.*" [Ishaya & Macaulay, 1999]

Trust is based on rational evaluations (cognitive), more subjective influences (affective) and evidence obtained by observation (behaviour). These coincide to some extent with the objective, subjective and inter-subjective worldviews discussed in Chapter 2. Any member of the team may act in a way that benefits his own interests or may choose to put the interests of the team, and therefore in most cases the organisation, first. There are two aspects of trust based on individual autonomy. Firstly, the individual working in a team must make decisions, explicitly or implicitly, concerning his own behaviour and how opportunistic that will be. In other words how trustworthy he will be and whether he will seek to gain personal advantage or attempt to promote the common good. Secondly, the individual must decide how trustworthy the other members of the team are. Hence, both expectations and goodwill are essential elements of trust [Ishaya & Macaulay, 1999]. These decisions are adjusted over time and affect each other. If the individual decides at some point that the other team members are untrustworthy, he will be less inclined to strive for common advantage and may decide to put his own interests first.

6.8.2   Forms of trust

The following forms of trust have been identified [Jarvenpaa & Shaw, 1998] :
•   Deterrence-based trust or calculus-based trust - here the individuals do what they say they will do because they recognise that the consequences of defaulting will be more severe than they consider to be worthwhile.
•   Knowledge-based trust - the individuals trust each other as they know each other sufficiently well to be able to predict each other's behaviour and have shared experience.
•   Identification-based trust - the individuals are convinced that they have similar intentions and goals.
•   Swift trust - the amount of time available does not allow for trust to be built up in the normal way and it must be assumed.

Initial behaviour is often influenced by calculative processes [Jarvenpaa & Shaw, 1998] which are associated with deterrence-based trust. The participant will weigh up the benefits of working towards the common goals of the group against his individual needs. He includes a consideration of the penalties for not co-operating, such as damaged reputation, or more concrete considerations such as lost marks. The likelihood of opportunistic behaviour diminishes with time, particularly because the longer anyone is involved in a work group the more he has invested and hence the more it is worthwhile to continue. In addition, with time there is a greater likelihood that the individual will have become familiar with the other participants and will possibly identify with them in terms of empathy and common values. Hence their good opinion becomes more important. Deterrence-based trust is, therefore, involved with the decision as to whether you will be trustworthy.

The second form of trust, knowledge-based trust, has two processes associated with it. Predictability ensures that uncertainty is reduced, as the participants have a reasonable idea of the patterns of behaviour, such as work habits, that they can expect from one another. The second facet, capability, or performance-based or action-based trust, refers to the perception as to whether the person can in fact fulfill promises and tends to depend on the past actions of that person. Both of these can best be ascertained with time. A curriculum vitae is not always detailed or reliable enough to elicit trust. This type of trust can be encouraged by drawing attention to successes by celebrating them [Sabherwal, 1999]. This form of trust is primarily based on a assessment of the trustworthiness of the other participants.

Similarly, identification-based trust takes time to be confirmed as people exchange information about themselves but the knowledge that a team member comes from a similar background or publically endorses similar values can help bridge this. Social dialogue tends to confirm identification-based trust. Once again, this is related to the trustworthiness of team mates.

Swift trust refers to the type of trust that is assumed in work groups that have very little time to develop the normal forms of trust. Swift trust implies no knowledge of team members' individual identities or norms [Ishaya & Macaulay, 1999]. The participants tend to assume that team members are similar to others with whom they have worked. Trust will depend on the task-related behaviour of the team members (that is, performance-based trust). The more responsive and active a team member is, the greater the trust that is placed in him. The perceptions of the personal characteristics of team members and an individual's feeling of identification and closeness to the other team members might become exaggerated, as in fact the team avoids discussing things that separate them and focus only on what they have in common. Swift trust develops very quickly while the team are working together. Since this form of trust is based on assumptions about coworkers rather than real information it is more closely concerned with decisions about your own behaviour (whether to be trustworthy) than that of others.

Another way in which swift trust is established is by a transference of trust from a trusted third party. Not only do the members of work groups depend on each another in a personal way to ensure that a task can be accomplished, they also rely on the institution(s) within whose patronage the group functions for support. The members draw on their conceptions of the ethics and value systems (collective norms) of the institution. Thus, trust in work groups is based not only on interpersonal trust but on the degree to which it is believed that the institution can control the group and the reputation of the institution or its representative who controls the group. Transferred trust is assumed before the team members start working together. It can be modified by swift trust or by the other forms of trust.
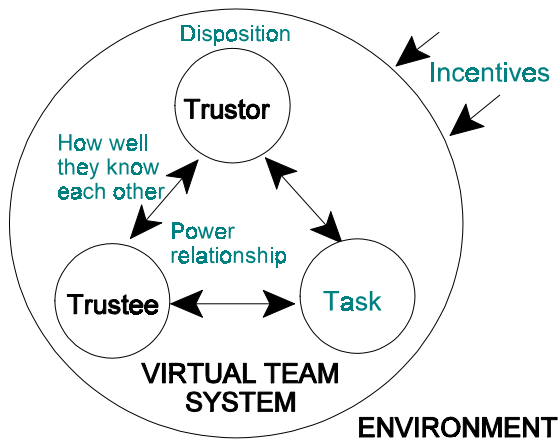
Figure 6.4: Virtual team system

Holland [1998] gives the following as antecedents of trust which influence not only how you will behave in a team but how you will interpret the behaviour of other team members.

- The disposition of the individual,
- How well the team members know each other,
- The power relationships between the trustor and trustee,
- The task being undertaken, and
- The incentives that are provided.

The relationships between these are illustrated in Figure 6.4. Factors from all three worldviews are included in the antecedents of trust. The disposition of the trustor depends only on him and is, therefore, entirely subjective. The relationship between the trustor and trustee, including how well they know each other and the power relationship between them, is intersubjective. The factors to do with the particular task and influences in the form of incentives are largely external or objective.

Figure 6.5: Factors affecting trust

Holland [1998] includes two further factors that are related to the task, namely the perceived risks and how important the outcome is. These depend to some extent on the individual, as each individual has personal circumstances that might make it particularly important that the project succeeds and similarly may have risk factors that apply specifically to him. These two factors also depend on the outside world. The project may be funded by sponsors external to the organisation, might be dependent on input which is totally outside the control of the team, may be located in a very complex and risky environment, or might be very important to someone in a position of authority. Figure 6.5 depicts these factors.

6.8.3   How trustworthy you will be

As with all issues relating to trust, the decision as to how to behave within a team depends on subjective, intersubjective and objective factors. Personal disposition, beliefs and background are, as pointed out above, important subjective factors. An example of personality or disposition is how highly the individual values the good opinion of others. Personal beliefs also determine the individual's attitude towards moral duty. For example, the individual's belief as to whether he should put the organisations' interests above his own will determine the amount of time he would spend on the task and how persistent and conscientious he would be. Not only moral perspectives are involved, accepted social norms and an understanding of what society and the organisation expect, will strongly influence behaviour [Ishaya & Macaulay, 1999]. The IDV measure of how individualistic the culture is [Hofstede, 1997], is relevant here. Thus these subjective decisions may be value-based or norm-based.

An intersubjective factor would be an assessment of whether team members share common values. An initial judgement as to the trustworthiness of the other team members will influence the decision as to how trustworthy the individual should be [Sabherwal, 1999].

Social norms are often not strong enough to entirely control social actors' behaviour [Ishaya & Macaulay, 1999]. Rational perspectives play an important part in these decisions. Calculus-based trust involves an assessment of the benefits that can be gained by acting in a trustworthy manner compared with those that would be gained by acting in an untrustworthy way. This is influenced by, amongst other things, the expected duration of the relationship. It cannot be calculated precisely, as there is always insufficient information. All these factors together will determine whether self-interest should be suspended in favour of a collective orientation.

6.8.4   How trustworthy you consider others to be

As work on the task progresses, the degree of success and the behaviour of the coworkers will influence perceptions as to their trustworthiness and modify the original antecedents of trust. Action-based trust is determined by performance, response time and hence, perceived ability [Kimble et al., 2000]. Action-based trust may be objective but the perception of success can be coloured by previous views as to the competence and trustworthiness of coworkers.

The factors to do with social attributes, namely, who you are (disposition), how well the trustee is known and the power relationships between the trustor and trustee, are social-based trust [Kimble et al., 2000]. Social-based trust depends largely on subjective and intersubjective factors which will be observed rather than measured.

6.8.5 Time, trust, and information
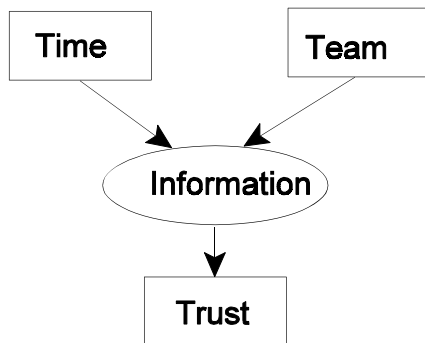
Figure 6.6: Time, trust, teams and information

All forms of trust, except swift trust and transferred trust, require information about the other team members in order to become established. This takes time. The information must also be refreshed regularly, that is, contact must be maintained or the trust will erode. The trust development process may be speeded up by the use of shared information systems because they enable detailed knowledge of team members' operational performances to be gained [Holland, 1998]. Hence, action-based trust is promoted and it is possible that this form of trust may be relied upon more than in the past where information was less complete, timeous and was perceived as being less accurate. This is one area where the system might be influencing the lifeworld.

The relationship between information and trust is also evident in both knowledge-based trust and identification-based trust as these depend on more personal information about team members. The time taken to obtain information affects both the performance of and the trust developed by virtual teams. Communication delays are unavoidable in a dispersed environment. This is particularly significant because the virtual team usually works to deadlines which makes rapid response still more critical. Thus, there is a three-way relationship between virtual teams, time and trust. Information is a linking factor as it plays a role in building trust and in the functioning in the team from the point of view of performance, which in turn affects action-based trust. The relationships between time, trust, virtual teams and information are illustrated in Figure 6.6.

Table 6.2 lists ways in which time, trust and information affect the team's functioning. All three of these factors are not always involved and hence those that are considered to be relevant are indicated in each case.

Table 6.2: Virtual teams relationship to time, trust and information

Ways in which some or all of the factors affect virtual teams' functioning	Factors		
	Time	Trust	Inform-ation
The team must be able to respond quickly to information concerning changing requirements and hence needs to be flexible.	U		U
The length of the prior relationship between team members and the amount of information they have about each other affects knowledge-based trust.	U	U	U

Ways in which some or all of the factors affect virtual teams' functioning	Factors		
	Time	**Trust**	**Inform-ation**
The duration of the team may be shorter than normal, and may be unpredictable. Thus short term gains are valued above long term ones which may not be realised. Opportunistic behaviour results from placing short term gains above long term ones.	U	U	
Calculus-based trust (or deterrence-based trust) takes into account the amount of time already invested in building trust and the expected length of the future relationships in order to decide whether it is important to protect reputation and relationships or not.	U	U	
Swift trust is motivated entirely by the shortage of time and a lack of information.	U	U	U
In a virtual team trust tends to degrade over time. Face-to-face meetings are needed to reinstate it by increasing accessibility of information.	U	U	U
Transferred trust also erodes over time and needs to be replaced by personalised forms of trust.	U	U	
In projects where there is time pressure, opportunities to socialise are reduced, reducing opportunities to learn more about each other at a personal level. Hence identity-based trust is more difficult to develop.	U	U	U
Action-based trust is promoted by fast and frequent feedback.	U	U	U
Delays in communication mean it will take longer to reach decisions, develop norms, et cetera.	U		U
Since it is easier to lose trust than to gain it, it is important to start immediately to build trust.	U	U	
"*over time the teams were adversely impacted by the diversity in their membership*" [Jarvenpaa & Shaw, 1998]	U	U	

> "*Regardless of how committed and well-meaning people are initially, they tend to lose their commitment, suffer from role overload and role ambiguity over time which in turn increases free loading, absenteeism, and other negative behaviours, all of which translates into lower project performance.*" [Jarvenpaa & Shaw, 1998]

6.8.6 Ways of improving trust

Broken trust forms a cycle of distrust and this in turn undermines future performance. Teams

> "... *start with an initial level of trust, this may strengthen, but all the time it is being compared with actual performance evidence. If the evidence indicates misplaced trust it typically takes time (the prevailing paradigm is preserved) until a break point (gestalt switch). Trust is a social capital. It is difficult to regain trust.*" Introna [1998]

The cycle can change from virtuous to vicious and vice versa. Reasons for the changes include complacency, adding or reducing structure, the additional or reduced attention of key people, changes in leadership such as a new project manager and incorporating identity-enhancing activities (celebrating the achievement of goals, and private confrontations) [Sabherwal, 1999]. Ishaya and Macaulay [1999] say that not only does trust emerge but it can be deliberately fostered. The process of developing trust in a face-to-face environment differs from that in a virtual environment. These authors suggest that there are five stages in the process and that at each stage there are structural ways of promoting trust. All of the actions involve providing team members with relevant information. These are shown in Table 6.3.

Table 6.3: Stages in the developments of trust (adapted from Ishaya & Macaulay [1999])

Stage	Type of trust	Roots	Actions
1 Transparent	Swift trust (deferred trust)	Task oriented, based on stereotyping, based on assumptions	Provide information regarding the task.
2 Calculus	Deterrence	Rewards and punishment	Establish monitoring structures such as role assignments and reporting mechanisms.
3 Predictive	Knowledge-based	Information about previous experience and qualifications of team members	Can be built by having a preliminary test of abilities.
4 Competence	Action-based	Performance, response time	Allow for the joint celebration of milestones and successes, demonstrating sections completed, soliciting feedback and open discussion regarding process and procedures.
5 Intensive	Identification-based	Identification with common goals and values	Express commitment and appreciation.

Characteristics of virtual teams in which trust seemed to be high are described by Jarvenpaa, Knoll and Leidner [1998]. These include a high level of participation by team members. In their research, this was found in teams where team members volunteered for tasks, took initiative and met commitments. Team members took care to keep each other informed about progress. Successful teams limited the amount of time spent on socializing with each other via e-mail but they were very careful how they worded subjective or potentially divisive e-mails. They were very positive about each other's work and generally supportive. They maintained an upbeat, enthusiastic tone in messages. They spent little time on negotiating procedures and formal structures. Leadership roles rotated, indicating that they considered one another to be equals. Free loaders were handled openly and quickly. Communication with the project leader was

equally uninhibited, so if there was uncertainty about anything the matter was addressed immediately. Overall these team members were very task-oriented and confident. Obviously these characteristics are associated with high achievers in general, so the abilities of team members, as well as their attitudes towards work, are of primary importance in success. Performance-based trust (or action-based trust) derives from these success-oriented factors.

Two key common elements which can be recognised in the characteristics identified by Jarvenpaa et al [1998] are exchanging sufficient information and being aware of time. Having identified these characteristics as contributing towards success, potential team members can be trained to work in this way. This agrees with the relationships emphasised in Figure 6.6 and Table 6.2.

Sabherwal [1999] emphasises that there has to be a balance between structure, in the form of monitoring performance, and social aspects of trust. He suggests that there needs to be "... *a direct (written) contract and a psychological contract based on trus*t." Excessive structural controls can hurt performance as they eat up time. They can also undermine trust as the team member interprets them as an expression of distrust.

Ishaya and Macaulay, [1999] have more practical advice which virtual team members can be given. They have classified these into activities which indicate integrity, ability, openness, benevolence and expectations. These are given in Table 6.4.

Table 6.4: Constructive behaviours for members of virtual teams
(Adapted from Ishaya and Macaulay [1999])

Dimensions	Behaviours
Integrity	Being honest, being straightforward, keeping promises, being faithful and true, timely response, being reliable
Ability	Demonstrating personal knowledge and competence, demonstrating individual and group skills, sharing individual experiences
Openness	Informing members, sharing ideas freely, giving feedback, apologising publicly
Benevolence	Being helpful, being supportive, being friendly, being humble, praising others
Expectations	Expressing one's expectations, compromising on individual expectations, being fair in one's expectations, being consistent

Certain bad strategies will destroy trust, for example, flaming or expressing criticism in a personalised way, making unreasonable demands, ignoring requests, failure to meet commitments. The influence of the medium on communications behaviour was discussed in Chapter 5, particularly in Section 5.4.

"... high tech has to be balanced by high touch to built high trust organizations." [Handy, 1995].

As mentioned in Chapter 5, Tolmie and Boyle [2000] recommend that groups meet in person in order to get to know each other, and hence initiate knowledge-based trust and ideally identification-based trust before embarking on online interaction. This can assist a sense of belonging to a community instead of to a place. *"Without a sense of belonging, virtuality looks like a very precarious state... ."* [Handy, 1995].

6.9 Conclusion

The main purpose of this chapter was to explore the nature of virtual teams and the factors which impact on their success. Virtual teams are considered to be important work units within virtual organisations. However, there is an extremely high risk that these teams will not be successful because they engage work at a high cognitive level which requires collaboration rather than co-ordination. Not only is the type of work innovative (non-routine) but the team is composed of people who might have different social cultures and communities of practice and no previous relationships with each other.

It is very important to develop bonds and create a sense of commitment within the team. Trust is the most important element in creating those bonds. Whether trust can be established and maintained within a virtual team will depend on the individuals involved and the amount of time the team will be working together and the amount of information shared between team members.

The factors impacting on the success of virtual teams are relevant in both a business and learning environment. However, in the business environment, there is not a great deal of time available to learn the skills necessary to maintain a successful virtual team. It is therefore important that, in addition to learning how best to communicate via electronic media, students learn the skills required to participate successfully in a virtual team.

The action research undertaken for this thesis is described in the next three chapters. In this research the e-mail messages of students working together in virtual teams are examined and compared with the audio recordings of the discussions of the face-to-face teams. This extensive qualitative analysis (Chapter 9) includes the factors affecting trust (depicted in Figure 6.4 and Figure 6.5 of this chapter) and the stages of trust summarised in Table 6.3 of this chapter.

Chapter 7

The research design

"It is a good morning exercise for a research scientist to discard a pet hypothesis every day before breakfast. It keeps him young."

Konrad Lorenz, "On Agression" ch. 2 (1963, trans. 1966)

7.1 Introduction

This chapter is the first of three in which the research which was undertaken is described. In the road map of the thesis (Figure 1.1) these are grouped together as the case study. In this chapter, the intentions and planning of the research is described. Chapter 8 gives a summary of the findings from the quantitative data and Chapter 9 gives a detailed analysis of the team discussions during which the team members attempted to construct or reconstruct meaning.

As explained in Chapter 2, Section 2.9 and Section 2.10, when the research framework was used to identify the nature of the research and to decide on appropriate strategies and methodologies, this thesis reports on an anti-positivist research project consisting of a field study during which both qualitative and quantitative data was collected. Methodological pluralism was considered to be necessary considering the multidisciplinary nature of the research. The research is clearly intersubjective in terms of the assumptions and beliefs about the nature of social science and this view affects both the way in which the research was planned and the way in which the data obtained was analysed. The research was both empirical and non-empirical (refer to Chapter 2, Section 2.9.1) and took the form of action research using questionnaires, recordings of the task-oriented discussions of the student teams, interviews and documentation to capture the data which is both text and recorded speech. The researcher was predominantly involved in participant observation. The type of methodology used relied on cooperation and understanding of the research was expected to emerge. This perspective can clearly not be value free.

The anti-positivist nature of the research is evident in the fact that there were no control groups of students. Students were allowed to decide for themselves which study option they wished to follow so that their studies were in no way compromised (this is discussed in more detail in subsection 7.6.9.2). Therefore, although the research is described as being empirical in part it was not in the form of a controlled experiment.

This chapter sets out the research design, looking specifically at what the research proposed to investigate, where the research took place, the relationship between the learning theory and the research, who participated in the research and why the research was undertaken as is necessary when case studies are done [Walsham, 1995]. The chapter also looks at proposals that were developed as to how the research question could be answered and how the research was actually carried out.

7.2   Research Question

This research involved action research, during which a critical, interpretive investigation was undertaken in order to determine whether e-mail can be used successfully by university students working together within culturally homogeneous teams, on tasks and projects which require them to share meaning groups. During the process, not only is there a need to understand what the other team members mean (reconstructing meaning), but also to build on and advance meaning further (constructing meaning).

7.3   The South African educational environment

The environment in which this study is being undertaken is an university in South Africa in the 21st century. South African society consists of many different cultures which are coming together for the first time as equals and this is equally true within the "traditionally white" universities in South Africa. Our multicultural society is unique, quite optimistic and in some respects growing in confidence. Trust between the various groups is generally stronger than most predicted it would be. The South African economy is, however, fragile and business confidence is no longer what it was in 1994. This society is indeed eager to get beyond its first tentative steps and stride out into the developed world but it is still a mixture of first and third world infrastructures, education and economy. There are immense gaps between the "haves" and "have nots" in terms of income, education and hence opportunities. The state and the private sector are attempting to redress inequalities but are meeting with mixed success. An enormous backlog exists in job creation and all aspects of providing acceptable standards of infrastructure to everyone.

Students at South African universities, from various backgrounds with respect to education, language, culture, politics and household composition are presently all being taught in much the same way, although there are student support programmes at some universities. Once the students join the main stream classes, however, the academic culture which is taken for granted in the discipline of Informatics (and Information Systems) is Western with an inheritance derived largely from the British and North American university cultures (and, to a lesser extent, German and other European cultures). Our degree structure parallels the British more closely than any other. These cultures, along with most others, are male dominated. The majority of text books used are written by citizens of the USA from an American point of view, and hence use examples from American business and assume familiarity with an American way of life. We have

a conflict, therefore, in that we have students from many different cultures but we adopt a predominantly American, male point of view. In addition, many, if not most South African students come from a distinctly authoritarian educational background, where not only is critical thinking never permitted, but in fact rote learning is frequently encouraged. Many students have very little confidence in their ability to form their own opinion let alone to defend it. We are faced, therefore, with the problem that students are not accustomed to relating what they learn to their own lifeworlds or using their own experience to judge the validity or applicability of what they learn. As explained in Chapter 3, Section 3.5.2.4, constructivist learning theory stresses that learners need to be actively involved in constructing meaning.

7.4   Adoption of the Sociocultural model

The research question stated in Section 7.2 explains that this research involves teamwork and hence collaborative learning. Collaborative learning was discussed in Chapter 6 and, as was pointed out there, it is an example of constructivist learning. The research was carried out at a South African university where students have a wide variety of backgrounds. The sociocultural model of learning, as explained in Section 3.5.3 of Chapter 3, highlights two pertinent issues. Firstly, learning is a social activity that takes place when people interact and communicate with one another. Secondly learning takes place in a context and each student will have his own individual context reflecting his culture, history and environment. As pointed out in Chapter 6, there are fundamental differences between the ways in which different cultures see the world and these are likely to affect the ways in which the student will learn. Since this research was undertaken within the multicultural context of South African universities, a sociocultural model of learning seems appropriate and issues of culture will, therefore, be recognised as being significant.

> "*Socio-cultural theories of mediated learning suggest that what is learned will emerge from the relationship between human action and the social, cultural, institutional and historical contexts in which action occurs. This makes it essential for us to understand these contexts and activities before we begin to investigate issues of learning.*"
> [Sutherland et al, 2000]

Chapter 8 is devoted to an analysis of the quantitative data obtained. This analysis will help us to understand some aspects of the contexts within which the students who were involved in this research learn. In order to analyse it, the data is grouped according to home language (which is used as an indicator of cultural diversity).

Sociocultural learning "... *[c]onceives pedagogy as a partnership between learners and tutors with emphasis placed on tools which can stimulate and mediate thinking and the development of cognitive skills from within a 'social' context. These interactions via networking, might take place at a distance, leading to a virtual learning environment.*" [Hartley, 1998]

Leidner and Jarvenpaa [1995] say that asynchronous communication, using networked computers and possibly groupware will support cognitive, constructivist, collaborative, and sociocultural learning models. The topic of this research is the use of e-mail by virtual teams and thus it coincides exactly with that described by Hartley, and Leidner and Jarvenpaa. Therefore, a sociocultural learning model seems to support the research.

A constructivist learning model requires learner-centred instruction and this implies that it the learner should be encouraged to use a learning strategy that suits his own learning style. This research required students to think about how they learn most effectively. They were encouraged to do so by being required to choose between the study options offered. The research accommodated different learning styles by providing three different study options,. After the collaborative teamwork was complete, the students were encouraged to reflect on the experience, the good and bad aspects of the study choice they had selected and whether that particular option did in fact suit their style of learning. Hence, students had to identify their preferred learning style, use it and then reflect on the choice and subsequent learning experience.

The proposed research contributes to the research challenges proposed by Leidner and Jarvenpaa [1995] namely, "*Research is needed on technology applications to promote sociocultural learning* " which is elaborated as research that aims "*... to immerse students in the content of the material, yet enabling them to communicate and contribute their own ideas and values based upon their own culture.*"; "*Research is needed on the added value of technology to the learning models*"; and also "*Research is needed on the influence of moderating variables on the learning models and their technological enhancements.*"

The study options proposed for this research, and explained in Section 7.6.2, were appropriate in a sociocultural model of learning, particularly as the various teams were encouraged to select one of the eleven official languages of South Africa, or any other language that they were all fluent in, as their language for communication within the group. It was hoped that a conscious effort to avoid cultural and social biases would result in more interesting outcomes.

7.5 What type of course is suited to virtual teams?

This research focusses on only one of the Internet teaching strategies, namely the use of computer-supported collaborative work in the form of virtual teams. Many examples of the use of online discussion groups, or virtual teams, quoted in articles, are at post-graduate level. One common reason for this is simply logistical convenience but this is not the only reason. Leidner and Jarvenpaa [1995] refer to studies by Hiltz and Singer, both of which were published in 1988, that "collaborative learning in a virtual space " is more effective than classroom learning for "mature, motivated learners" but less effective where the learners are less mature or less motivated. As will be seen from the summary of research reviewed during this study, given in Table 7.1, virtual teams have been studied for relatively small, post-graduate groups of students on a number of occasions. South African examples have also been noted, such as, the M Ed at the University of Pretoria (see Section 9.7); the use of Learning Space for groupwork by students studying towards a Masters in Business Leadership though distance education at The University of South Africa's Graduate School of Business Leadership [Hoosen, 2002]; and the PDIM offered as a postgraduate diploma by the Rand Afrikaans University [Van Brakel, 1999]. The research completed for this thesis differs in a very important way from all the other reports in that it was used to determine the viability of collaborative teamwork via e-mail for a much larger group (one thousand six hundred students) at a much more junior level and hence involving considerably less mature students.

There does not seem to be any research which focussed specifically on which educational level can use virtual teamwork most effectively. As noted above, reports of the research done in 1988 by Hiltz and Singer advise using this type of activity for more senior students. A more recent paper by Hiltz and Wellman [1997], indicates that the New Jersey Institute of Technology uses various online learning activities for all courses. Seely Brown and Duguid [1996], however, emphasise the importance of the way education socialises students and makes them familiar with the community of practice of the discipline they are studying. They refer to the experiences of Dan Huttenlocher, professor of Computer Science at Cornell University of using online news groups in undergraduate teaching as evidence that the Net is not useful for forming communities. They conclude that such discussions would be more useful at postgraduate level as older students are already very familiar with the patterns of university work and behaviour.

In the research being reported on here, a decision was made to experiment with virtual teamwork in a course where lecturing seemed to be rather unproductive, where the students were perceived to be particularly passive and where the lecturer had to work really hard not to fall into the "fork-lift" or objectivist mode of instruction, in which there is simply a transfer of

knowledge from the expert to the learner. Introductory Information Systems courses are not the only ones to exhibit these characteristics. They are frequently encountered in most other disciplines and are not limited to first year courses. Passerini and Granger [1999] use extensive multimedia in a technology-enabled classroom to present an equivalent course at The George Washington University and the justification for this investment in resources is likely to be very similar the concerns offered above.

The reason for proposing to use more collaborative work in this type of course, rather than to try to enhance the teaching as Passerini and Granger have done, is that in these classes the information is in fact available in the prescribed book. Lecturing, even that incorporating multimedia, adds very little beyond this. The lecturer can discuss or show videos of examples from more familiar, local organisations and this can help to address the problem identified earlier concerning the students' inability to relate to the subject but the volume of work to be covered usually reduces the opportunity to do this to a very superficial form of name dropping. It is easier and cheaper to set team assignments that make the student think about the course content and relate it to his own environment using examples which he and his team have devised.

We cannot get away from the need to be realistic and class size is certainly an issue. First year Information Systems classes are amongst the largest in our universities. Well over a thousand students may be registered. This is far larger than the class sizes reported in the research reviewed in Table 7.1 which averaged 62 students. (Hiltz and Wellman [1997] imply that they have used virtual teams for large classes but do not specify what they consider a large class to be.) There are practical considerations regarding teamwork in such large classes. It might be difficult for a lecturer, or lecturers, to cope with a hundred (or more) teams, each having four to seven members. Very careful administrative procedures need to be set up, with a careful choice of project topics and evaluation criteria.

The warnings of other authorities need to be heeded.

> "*Only students who are highly motivated, emotionally mature, and possessing a spirit of intellectual adventure are able to benefit to the full extent from such an independent, unstructured form of learning.*" [Warf et al, 1999]

There is a benefit which makes it worth trying to overcome the recognised obstacles. Large classes offer the most attractive possibilities of saving scarce resources, by moving at least partially towards a telematic option. Currently there is an enormous waste of resources as the largest lecture halls are reserved for these very large numbers of students, classes are repeated because the lecture rooms cannot accommodate them all in one class and within a month or two the lecture halls are only half full. This experience is supported by Maki and colleagues [2000]

who note a big drop out rate amongst first years and Papaspyrou and colleagues [1999] who state that attendance figures for a Software Engineering course at their university in Greece decrease steadily to less than 50%, as lectures are not compulsory. There are important advantages to keeping class sizes small, particularly for first year students [Clifton, 1999]. These include developing bonds between the student and lecturer which will ensure greater commitment from both parties and facilitate an exchange of knowledge. This goal (small class size) is almost impossible to achieve in courses such as Informatics 1 and the use of teamwork exercises compensates to some extent for this.

The review of research into the use of e-mail for online collaboration in tertiary education institutions, reported over the last five years, provided in Table 7.1, is by no means complete and cannot be considered to be unbiased. It would be nearly impossible to collect and analyse all relevant research. This collection can only be seen as a sample, which was collected because it was considered potentially interesting and relevant. The academic subject areas selected as the context within which these reported projects occurred cannot be said to be indicative of how appropriate or common they are. No research was found that attempted to determine where this teaching strategy was most appropriate but Rada [1998] reports that, " *A content analysis across many universities and disciplines of what they are doing on the Web (Rada, 1996), found that the only discernable pattern was that high technology disciplines were more inclined to use the Web in education than less technological disciplines."* One highly regarded researcher can influence others to build on research in the same subject domain.

Hence, we would not be justified in drawing a conclusion about the suitability of Psychology or Geography above Mathematics or English for this type of collaborative work, even though the collection of research referred to below might include noticeably more projects in one subject area than another. As can be seen from Table 7.1, however, Information Systems and related subjects are represented quite well in the reported research.

Table 7.1 Summary of research reports on Distance Collaborative Learning

Course	Number of students	Level	Tool	Activity	Ref
Various MBA courses, M Sc courses, B A (Information Management) Business Engineering	7 projects each with two universities, max in a project 125 students (varied from 18 to 28 for Masters level courses, 25 to 39 for Business Engineering and 104 for the BA course)	Mostly post-graduate but at least one BA course	eRoom and Group-Systems	Global teams, electronic brainstorming, voting, categorising ideas, shared report writing.	Vogel, et al, 2001
Cognitive Psychology	20	post-graduate	FirstClass	Asynchronous, discussion on assigned readings.	Hara et al, 2000
Educational Psychology	12 (2x6)	M Sc	FirstClass	Collaboration to conduct a literature review and write a paper.	Tolmie and Boyle, 2000
Nursing	96 in 7 courses	graduate students	WWW, COW plus others	Conferencing on the Web (COW)	Ryan et al, 1999
MBA (MIS)	120	post-graduate (average age 28.1)	desktop video conferencing, ISDN link	Synchronous, collaborative telelearning with local and distant groups.	Alavi M, 1995
MBA (MIS)	127	post-graduate (average age 28.1)	VisionQuest	GDSS collaborative decision making	Alavi M, 1994

Introductory Psychology	large (max 25 x 4 - actual between 59 and 93; max 50 x 2 - actual 82)	introductory	WWW	Mastery quizzes, individual, interactive, exercises, weekly laboratory meetings.	Maki et al, 2000
Geography	5 faculty, 16 students	mixed	www, e-mail (Caucus) and Lotus Notes	International groupwork, find information on web, assess and share information, critical evaluation.	Warf et al, 1999
Psycho-social Science module	124 but only 47 (38%) completed questionnaires	1st year	discussion list	Required to discuss material presented in class, self-chosen small groups.	Seale and Cann, 2000
Fundamentals of Computing	110 logged on (class size not given)	post foundation	FirstClass	Unstructured discussion.	Wilson and Whitelock, 1998
Business schools	30 (5 x6)	under-graduate	Business Strategy game	Global, but the members of each teams are together at one place.	Doyle and Brown, 2000
Various	small groups 4 - 8 or medium 20-30, 7 masters students	from unaccredited to Masters	First Class, Lotus Notes, WebCT	Asynchronous online discussion, does not seem to have been task based.	Hammond, 2000
Library Information Systems	60 (5-7 in a group)		FirstClass	Guest lecturers. General discussion of course content, project work with students active in determining the type of project and its work plan. Collaborative projects	Kochtanek and Hein, 2000

Personal Identity and Community in Cyber space	20	undergraduate		weekly journals, discussed key themes, group project.	Chester and Gwynne, 1998
Computer Science	140	undergraduate	Virtual Classroom	Case studies done by groups or individuals and face-to-face or as distributed collaborative work.	Benbunan-Fich and Hiltz, 1999
MIS	34	under-graduate	e-mail	Distributed teams, division of labour and transferring files using ftp.	Lind, 1996
Different courses			WebCT	Various	Morss D A, 1999
Digital Signal Processing		senior-level under-graduate	students publish on web	Distributed teaming, various institutions, projects.	Orsak, 1999
Introductory course in Software Engineering	61	ninth semester	web-based discussion forum and web-based courseware	Project plus enhanced course material.	Papaspyrou et al, 1999
Nursing	10 of the 30 in the class did the collaborative work	post-registration nursing degree programme, distance education	e-mail and a form of computer conferencing (news group)	Posted nursing logs and commented on each others logs.	Naidu and Oliver, 1999

Software Engineering course	95	3rd year	e-mail	Team project, software development.	E Vance Wilson, 2000
Information Systems (CSCW and Software Engineering course)	48	M Sc and third year	BSCW (asynchronous)	Online threaded discussion on guided topics throughout the course, two hour long synchronous discussion for a collaborative SE task which required brainstorming, prioritising and diagramming.	Ishaya and Macaulay, 1999
Geography	about 24		e-mail, web, video-conferencing and telephone	Distributed teams, create web based research report	Hurley, Proctor and Ford, 1999
Average	62				

7.6 Research plan

7.6.1 Introduction

The research compares the way in which students undertake teamwork in different contexts and use different communications media to work on assigned activities. The research subjects were first year Information Systems students who were studying a course whose content is given in full in the prescribed book. The course has, over many years and a variety of different lecturers, been poorly attended by students, indicating that the students themselves believe that self study is a feasible option. Nevertheless, the results obtained in examinations have been disappointing, indicating that the students do not succeed in learning (appropriating) the material which the lecturers expect them to understand. The course has a very high student enrollment (approximately one thousand six hundred students) placing a burden on the resources of the university, but, since lectures are so poorly attended, the resources committed are wasted. Teamwork was introduced as an integral part of the course just prior to, and independent of, this research. It worked very well. This research built on that option and also made use of the existing infrastructure provided for the"telematic courses" offered by the university.

At the time this research was done, the university concerned had already made a large investment in web-based education by providing hardware (servers), software (WebCT) and technical assistance to teaching departments in order to allow them to place course content on the university's web site. The teaching department within which this research was conducted had already decided to replace after-hours lectures for the part-time students with telematic teaching. The repetition of the course during the second semester, which was largely but not exclusively taken by students who had previously failed the course, was also only available as a telematic option. Abbreviated lecture notes, quizzes and administrative instructions were already available on the web as study material for these students.

This research, therefore, explored the viability of using a telematic, computer-supported collaborative work model for assigned collaborative work (required class assignments) being done by first year, Informatics students. It also compared the effectiveness of this option with one where the same assignments were done as face-to-face collaborative teamwork.

7.6.2 Description of study options

The research offered students a choice between three different study scenarios/ environments.

a.   Students could choose to attend **lectures** during which the content of the course would be covered and the class would be expected to: Participate in discussions; Work on assignments in teams during scheduled lecture periods; Take class tests. (Note: Lectures cannot be made obligatory and the university does not exclude anyone from examinations.) In the discussion that follows, this group will be called the class teams.

b.   Alternatively, students could choose to study from a prescribed book which covers the course material completely, work on assignments in a **face-to-face** group, attend a contact session once every three weeks and take one or more class test. The activity of the face-to-face group was monitored. These students were free to attend normal lectures as well if they chose to as no one can be excluded from lectures. In the discussion that follows, this group will be called the face-to-face teams.

c.   Finally, students could choose to study from a prescribed book which covers the course material completely work on assignments in a **virtual** group, which were suppose to communicate only via e-mai, attend a contact session once every three weeks and take one or more class test. The activity of the virtual group was monitored. These students were free to attend normal lectures as well if they chose to, as no one can be excluded from lectures. In the discussion that follows, this group will be called the virtual teams.

Options b and c involve **independent** teamwork, as it took place at a place and time controlled by the team, and hence, when speaking of these two groups together they will be referred to as the independent teams.

7.6.3 Incentives to participate in the Virtual Team option

There should be a clear need to use the technology (one of the principles of success proposed by Tolmie and Boyle [2000]) or the already familiar status quo will be too attractive. Students and staff are reported by many researchers to be conservative [Dewhurst et al, 2000; Kochtanek & Hein, 2000; Leidner & Jarvenpaa, 1995]. A lack of incentive has been the reason identified by various writers for disappointing use of web-based material [Karuppan, 2001; Wilson & Whitelock, 1998]. Incentives have been provided in various ways by different educators. Marks may be awarded for work that has to be done online [Ishaya & Macaulay, 1999]. Hara et al [2000] allocated slightly over 10% of the final grade to the online activity and, as all the students participated in this project, they were all expected to do this work. In the case reported by Maki et al [2000], the use of the online study material was not compulsory, but the students were

rewarded if they did use it, as questions were embedded in online study material and marks were awarded if these were answered correctly. These students could add to their course credits by completing further on-line activities, such as quizzes and often needed to obtain only very few additional points in the final examination [Maki et al, 2000].

It is clear that students do not in general do optional work. On the other hand, making participation in online conferencing compulsory may be counter productive. It may not suit the student's learning style (perceived or actual) and this teacher-centred approach is in conflict with the learner-centred philosophy already judged appropriate for virtual teamwork. Being forced to participate could cause resistance to the idea and hence have consequences entirely opposite to those intended. Seale and Cann [2000] say that it is important for the students and tutors to negotiate the use of technology and clarify expectations and that making it compulsory to work online contradicts this spirit of cooperation.

It was for these reasons, along with those indicated in Section 7.6.9 on ethical considerations, that the decision was made not to have additional rules or artificial incentives to make the virtual team option appealing, but rather to allow students to decide on a study option purely on the grounds of their own learning style and convenience. This turned out to have major consequences as far as the research was concerned as will be seen in the discussion in Section 7.7.3.

7.6.4 Assignments

The assignments set as teamwork should:
•   provide sufficient scope for a group effort to be meaningful but be within the capabilities of the average student and even below average students in the class;
•   be relevant to the subject matter prescribed for the period for which the project runs;
•   allow for individual views of the topic;
•   require serious thought.

It is important that there is clarity about the task [Tolmie & Boyle, 2000]. The description provided to the students in writing was considered to be sufficiently detailed. The assignment was, however, only provided in English. This decision was made after consultation with the lecturers, who believed that this was appropriate. All previous assignments had been in the form of references to exercises in the prescribed book which is only available in English and hence the problem statement had also only been in English. Some students subsequently said that they had struggled to understand the questions (refer to Table 7.2).

Hiltz and Wellman [1997] propose collaborative tasks in which students are asked to prepare written summaries of the prescribed material, identify key concepts, construct exam questions (presumably including model answers) and answer each others' questions.

The two tasks which were set as teamwork for the first year Informatics course are given in the exact form in which they were given to the students in Appendix C. Assignment 01 was an application of a concept and technique, which were given in the text book, to an environment which all students were familiar with. Assignment 02 required the students to design an unusual new application of a Management Information System, a Decision Support System or an Expert System for an imaginary scenario characteristic of their own environment. This would illustrate aspects of the subject being studied. The projects were expected to be original and require creativity while also requiring the student to devise concrete examples which would illustrate concepts. The researcher also expected that they would offer students the opportunity to relate the concepts to their own lifeworlds.

7.6.5 Evaluation of the students' assignments

Constructivism requires the process to be evaluated as well as the product [Hurley et al, 1999]. Therefore, ideally students should be evaluated on how well they worked together. The team members can assess each other's contributions to the task and these marks can be combined with those of the lecturer. (Orsak & Etter [1999] note that these evaluations tended to be biassed. It is indeed difficult to obtain reliable assessments of participation.) In the case being discussed here, a single copy of the assignment was handed in by the team as hard (printed) copy and all assignments were marked by a single teaching assistant using a model solution and a marking schedule provided by the researcher. This teaching assistant did not know which study option a particular team had selected. This ensured that no possible bias could exist. The mark awarded was the final mark for the assignment and every member of the team received the same mark. Marking was checked by the researcher on a random basis and appeared to be reliable.

Students who did assignments in class were all required to be present whenever the group met. This meant they all had to be present when the assignment was handed in and this was strictly enforced.

7.6.6 Infrastructure

The students who decided to use the virtual teams option had unlimited access to the facilities provided by WebCT in the university's computer laboratories ("the Informatorium"). They had to be registered on WebCT and needed to have a password allowing access. Information

regarding this research, but also general course information, was available on the WebCT site for the course. This included the research information brochure, schedule of activities for the course, the requirements (problem statements) of the assignments, a brief outline of each chapter of the prescribed book which was to be covered in the course and a self test in the form of multiple choice questions for each chapter. The most important resource, as far as the research was concerned, was the facility for discussion groups on WebCT. A private discussion group was set up for each team. The researcher was a member of each of these. A public discussion group, which all the "virtual" students could access, was also available. Many students had their own private e-mail accounts as well and, as will be reported in Chapter 9, many preferred not to use WebCT's discussion facility but to use e-mail per se.

The researcher had privileged access to the WebCT module site. This meant that she could access statistics regarding how often each student had accessed the site and when. Marks were not held on WebCT but the department held a complete record of all of the marks separately in a database to which the researcher had access.

Students who had not elected to be in virtual teams were not given access to WebCT but had access to the separate module home page. Students had to get the rather complex password that allowed access to this home page from a lecturer. This site only contained copies of the transparencies used during lectures and announcements such as dates and venues of tests.

Students who did the teamwork as face-to-face teams, outside lecture times, had to book and collect a digital audio recorder from the researcher in order to record the discussion.

Prior to students submitting their Informed Consent forms, where they indicated which of the study options they favoured, the researcher had very little idea as to how many students would choose any option. She made arrangements to cope with ten percent of the students choosing the virtual option and ten percent the independent face-to-face option. As it happened far fewer students made use of these options.

7.6.7 Social structures and team structure

The optimal size of teams in a collaborative work group is generally accepted to be between four and seven or eight [Skyrme, 1998; 1997]. Online news groups, however, may include thousands of members. The use of e-mail in education may follow either the news group approach or the team approach. Hammond [2000] has found that the more structured the forum, the deeper the discussion. This indicates that teams focussing on a specific task are more likely to get into a meaningful discussion than those in news groups where the subject of discussion is ill-defined.

There are a number of factors which should be taken into account when making a choice between smaller or larger teams. Work load is reduced if team size is reduced as there are fewer messages to read and probably fewer separate arguments to keep track of [Hara et al, 2000]. Smaller groups heighten the personal profile (or personal recognition) of the individual and, as a result, have a positive effect on student behaviour and commitment [Hiltz & Wellman, 1997]. This is equally true in classroom lecturing. In very large classes there is less chance that disruptive or sleeping individuals will be identified. Large class sizes (defined as more than thirty students) may discourage student participation, as some students are shy to ask or answer questions in front of a large audience [Leidner & Jarvenpaa, 1995]. Alternatively, it can be argued that introverts are more likely to participate in a discussion where they consider themselves to be unknown [Leidner & Jarvenpaa, 1995]. On the other hand, as was explained in Chapter 6, team members need to trust one another when they undertake a joint task. Hence, the individual must make contributions to the task that can be attributed to him and the feeling of belonging (and being recognised) encourages commitment and further contributions. In addition, smaller teams can encourage more active involvement and more commitment, partly because absence or non-participation becomes more obvious. In this research, students were required to work in teams consisting of between four and seven members.

The composition of the team is the next important issue. Individuals are often allocated to teams so that there is a balance of skills and each team member plays a specific role in the team. The achievement levels of students can also be used to decide which team they should be in. Teams with members of mixed ability are often recommended, as the higher achievers can assist fellow students who find the subject difficult and an improvement in standard overall can result. Sometimes the composition of the team is not one of the factors in the research, or cannot easily be controlled and students are randomly placed in teams as was the case with those used by Lind [1996] and Vance Wilson [2000]. Teams may be allowed to select their own members because this is simplest, or this might be done deliberately as already established familiarity and friendships between team members has been identified as a success factor [Seale & Cann, 2000; Tolmie & Boyle, 2000]. Team composition might require each member to come from a geographically distinct site to ensure offline communication was minimised [Warf et al, 1999].

Thomas [2000: 84] (referring to O'Malley [1995]) says that Piaget advises that team members should be at an equivalent level of understanding but differ in their specific understanding or approaches to a problem so as to be able to learn from this difference. As is the case with Habermas' concept of ideal speech, it is necessary for the learners to recognise the need to use rational argument in order to justify their own points of view intend to reach consensus and allow each team member to put forward his view and to pay the same amount of attention to the different views.

In this research, teams were allowed to select their own members. This was done for several reasons.

1.   The intention was to encourage the formation of culturally homogeneous teams.
2.   The need for trust within a team was recognised as a success factor [Tolmie & Boyle, 2000] and, as trust develops over time, it was believed that team members who already knew each other would work together best.
3.   The large number of students made it extremely difficult to evaluate individuals in any way in order to allocate roles or balance team membership.
4.   The learner-centred philosophy suggests allowing students to decide who they would like to work with. Giving students this responsibility also removes the ethical dilemma of possibly forcing a student into a team to his disadvantage.

The team construction supports the belief that this teaching intervention was sociocultural in nature (see Table 7.2).

Table 7.2: Team construction according to the sociocultural approach [Kaptelinin, 1999]

How is the team constructed	
1. Size	Four to seven members
2. Composition. • Will team members have a homogeneous culture? • Are team members of similar status? • Do team members have special complementary qualifications? • Who selects team members? • Do team members already know each other?	This is the intention. Yes, all undergraduates, mostly first years. No The team themselves Ideally yes, in practice not necessarily.

7.6.8 Procedures and rules

The procedures and rules were spelled out in the research information brochure and again during an introductory lecture, so that students had the opportunity to ask questions. The overall philosophy was to have as few rules as possible but nevertheless to have procedures in place that would improve the chances of success in a project that was recognised to be complex (a very large number of immature students, three lecturers and a variety of study options) and hence risky. This is appropriate for action research. Contradictions and areas of conflict or differences of opinion are actively sought and hence there is a certain amount of risk in bringing

previously unacknowledged grievances and power struggles into the open. This type of research is, therefore, low on control.

In Questionnaire 4 (question 4.1.1), slightly more than 80% of the students said that they had understood the purpose of the research and slightly more than 85% said they understood the study options (question 4.1.2) that they were offered. However, only 63% of students completed the first questionnaire in which they had to select a study option, and a small percentage did not seem to understand them well (as their answers to other questions in the questionnaire indicated confusion).

There were three lecturers whom the students could approach during the day for answers to any questions. The researcher had an office on campus for the entire period that the research was being conducted and was accessible from 8:00 to 16:00 five days a week, although students were encouraged to contact her only in the afternoons.

7.6.9 Cooperative research methodology

In the research framework (Figure 2.7) it was noted that the appropriate methodology for this research was cooperative. Several groups were recognised as being role players and their interests had to be balanced (see Figure 7.1). This is in line with the critical and emancipatory aspects of the research. This is also characteristic of action research during which the researcher and role players from within the organisation collaborate (refer to Chapter 2, Section 2.6.2).
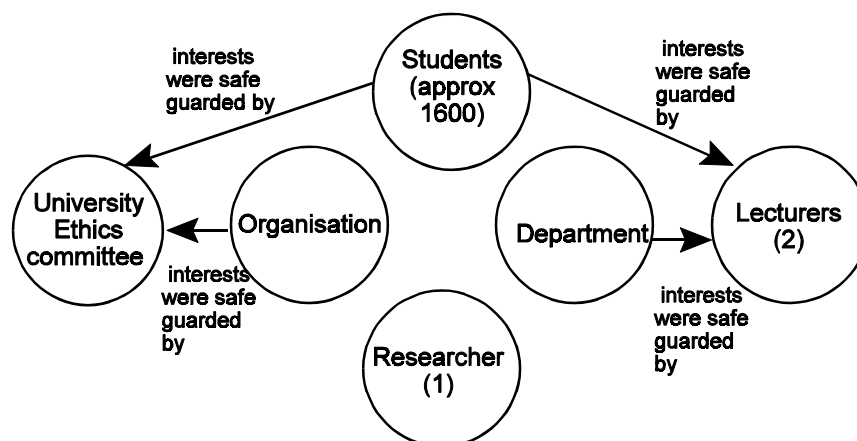
Figure 7.1: Role players in the research

7.6.9.1 The Department of Informatics

The impact of the research on the resources of the department, the relationship of members of the department to one another and the relationships of lecturers and students had to be considered. This was addressed by consulting those staff members who would be affected. The original proposals were adjusted in the light of input from the head of the department and lecturers for the course. This had a significant impact on the research but was considered to be necessary. Details of the changes made and how these affected the research are given in Section 7.7.3. In fact the initial response to the proposed research was one of serious concern when the researcher described her intentions to the module head and the second lecturer and compromises were necessary to obtain their cooperation. Thereafter they were unreserved in their support. This is an example of the choice of a compromise rather than an unadulterated emancipatory or critical approach to action research. After the research was completed, further interviews were held with the head of department and head of the course. These will be discussed in Chapter 9.

7.6.9.2 The students

It was very important to consider whether the research was likely to disadvantage specific groups of students. The most important way of ensuring that the student's academic outcomes were in no way compromised was by giving them the option as to whether to continue studying exactly as usual, or to make use of one of the other two options. They were offered a choice between participating in a virtual team or in a co-present team (meeting face to face). In all other respects all teams operated according to the same rules. The option of attending conventional lectures according to the existing lecture schedule or studying from the text book was also offered, although presenting all the scheduled lectures meant that there would be no reduction in work for the lecturers. (One of the long term goals was to reduce the number of duplicated lectures given, should a significant number of students indicate that they did not want to attend lectures.) In order to ensure that students were not disadvantaged by factors beyond their control, they were allowed to change from one study option to another at specific points in the course. The student response regarding the effect of the research obtained immediately after it was completed (question 4.2.3 in Questionnaire 4) was as follows: 21.11% said the research helped them, 29.62% were uncertain whether it had affected them in any way, 30.77% said it had not affected them at all, and 9.9% said it was disruptive. Comments that were considered to be similar were classified as belonging to the same group and a representative comment was used to identify the group. Personal judgement is used here and this is an example of the fact that the research is not value free. The groups of comments concerning the effect of the

research are given in Table 7.3 [2]. The rank assigned is an indication as to how frequently comments of this sort were encountered but there is no claim that it is a completely accurate count as this data collection was not verified by an independent person.

Table 7.3: Comments from students regarding the effect of the research
(Comment part of Question 2.3 in Questionnaire 4)

Good points	Rank	Bad points	Rank
Assignment improved understanding of concepts	110	Assignments were too time consuming	52
forced me to study	15	Timing of the research was inopportune (coincided with test week)	17
Challenging assignment	9	Confusing	15
Stimulating	9	Did not enjoy teamwork	10
Good assignment	8	Bad assignment	7
Made class smaller	4	Assignments not translated	6
Introduced other study options	2		
Introduced problem solving in the course	2		
Expanded general knowledge	2		
Provided an opportunity to be creative	1		
Allowed students to make an input to teaching	1		

7.6.9.3   The university

The researcher was required to get the permission of the university's ethics committee before students could be asked to participate in the research. This was duly done. The committee was agreeable to the research provided that the students were informed in person and given the opportunity to ask questions. They did query the arrangement that students would get marks for submitting the final questionnaire but, since this in fact contributed a very small amount to the year mark and it had been approved by the head of the department, agreement was obtained.

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[2] a) Dennis and Valacich [2001] say at least two separate individuals, whose inter-rate reliability has been assessed, must be used to do this type of coding. In this research this was not feasible.

b) These comments were optional and unsolicited in that the question simply allowed any comment to be appended

c) Only a small percentage of students made any comment

7.6.10   Lecturer involvement with the independent teams

Reports of various virtual team exercises [Wilson & Whitelock, 1998] indicate that a facilitator is required to sort out technical questions. Research reports indicate that problems with technology are common and often result in a number of students having delayed or inadequate access. This has a significant effect on their attitude and confuses research outcomes to a serious extent. Active involvement of a lecturer with each team, mediating in the case of discord and participating in content creation can also be considered. On the other hand this can inhibit the team members who are more likely to participate freely if they are not noticeably under a spotlight. (This issue of high or low student profile was discussed in Section 7.6.7.) Seale and Cann [2000] advise that the lecturer should take a more active role and lead by example but do so very sensitively so as not to dominate or inhibit the students.

Various strategies or policies are possible. One is to make it clear that teams can ask for feedback and help by addressing a request to the lecturer but the lecturer will not snoop, nor will he intervene unless the majority of team members request help. A second policy is to allow individual team members to ask for help. Since occasional contact lectures are arranged, open discussion and feedback between the lecturers and the entire class could also be used to provide the encouragement, feedback and discipline that is needed. Another possibility is to require progress reports in the form of standard checklists to be submitted at set times. In order for there to be a basis for comparison between virtual teams and co-present teams, co-present teams may be required to make complete tape recordings of their sessions and make these available to the researcher.

In their research, Hara et al [2000] say that the lecturer limited his input to the virtual discussions to providing encouragement only and did not actively participate in the debate, as he did not want to influence the direction the discussion took. This research required students to discuss assigned readings and one of the students was assigned the role of starter who initiated the discussion. The research was one of few that have analysed the actual content of online discussions and it determined that the questions posed by the starter are one of the main factors in influencing how much interactivity will occur. They also note that encouraging informal communication does not seem to improve interaction. This implies that a task-oriented online discussion ceases to focus on personal relationships. The ability to edit and reflect on a written message rather than a verbal one becomes valuable. The richness of the discussion is now in terms of cognitive content rather than emotional content.

A role similar to that of a starter could be taken by a lecturer or discussion moderator [Kochtanek & Hein, 2000; Seale & Cann, 2000] but, where an assignment is set, the assignment questions can substitute for those of the starter.

Noticeable activity attracts more activity, so, by seeding the discussion with encouraging, stimulating or helpful messages, particularly when there seems to be insufficient activity, the lecturer may be able to help it to achieve critical momentum [Kochtanek & Hein, 2000; Tolmie & Boyle, 2000; Wilson & Whitelock, 1998]. Conferencing leaders must entice others to participate, negotiate the construction of meaning by encouraging discourse (rather than allowing disagreements simply to be dropped), suggest ways of reaching consensus, help maintain focus and manage the discussion by providing summaries. The leader needs to try to overcome shyness and feelings of inadequacy among team members. This is difficult and time-consuming. Frequent faculty input is needed to keep focus [Warf et al, 1999]. Ideally the role evolves into that of facilitator.

Where large numbers of teams are involved, the need to monitor all the communication, let alone participate in it, can place a heavy burden on the lecturing staff. (This was noted in Table 5.2 in Chapter 5 and will also be discussed further in Chapter 9.)

In this research, teams were allowed to nominate the language that would be used for all internal, team communication. Therefore, it was possible that the lecturer would not be able to follow these discussions. In addition, there were a number of independent face-to-face teams who might be meeting off campus or at the same time as other teams. The lecturer did not participate personally in the discussions of these face-to-face teams, but they were recorded on digital or analogue audio media.

In order to minimise the differences between the virtual and face-to-face teams, the researcher planned to play a minimal role in the discussions of the teams. There was no intention to assist in content creation or to participate in the actual discussions. This position was maintained. Each virtual team was welcomed in one message and asked for a progress report in a second message. The researcher tried to encourage the virtual teams to get going and, as they did almost no online discussion, tried to reiterate that this had been the intention. She was also involved in negotiations concerning membership of some of the virtual teams. This was not foreseen, but became necessary as the number of potential member was very small and they were unable to persuade their friends to join them in virtual teams or else did not know their classmates. Other semi-administrative functions concerning access to WebCT, the submission of the assignments electronically and an exchange with one team regarding nettiquette, were handled by e-mail. Further details will be discussed in Chapter 9.

7.6.11   Contact sessions

Students who choose to study independently were required to attend occasional lectures or contact sessions (See Section 7.6.2). The intention was that these students would not attend the regular, scheduled lectures. One of the subsidiary goals of the research was to identify meaningful activities for these sessions. Originally the students were told that these sessions would be held after normal lectures, that is after 17:30 but this was found to be too inconvenient for the students. The way in which contact sessions were used during the research is described in Section 7.8.3.

Maki and colleagues [2000] suggested that all students should submit two questions concerning course material, via e-mail, to be discussed during a contact session. Onay [1999] says that these sessions should be used for discussion of assignments and case studies or that guest lecturers could be invited to give presentations. He stressed that the lectures should not duplicate material covered online. This is in line with the recommendation that there has to be a real reason to use the technology.

The sessions were primarily expected to be used to:
•   Set up teams.
•   Give instructions how to use WebCT. (In hindsight these should have been arranged to take place in the computer laboratory for a practical demonstration.)
•   Explain that the virtual teams were expected to work on the assignments together and construct meaning jointly. (This process might have been understood better if a simulation or prototype discussion was demonstrated.)
•   Discuss techniques for working in teams and nettiquette. (Additional material regarding teamwork should form an essential part of the course and should be examined, as students pay little attention to topics that are optional.)

7.6.12   Conclusion

The proposed instructional model was designed to be used in courses with very large numbers of students (at least one hundred) where the content of the course is largely factual and lectures are poorly attended. An Introductory course for Information Systems was identified as a typical example of such a course. Teamwork had already been introduced into the course prior to this research as a means of improving student participation and this worked well. In this research the context for the collaborative work was extended by offering three different possibilities, one of which included computer support in the form of WebCT discussion groups. The students were permitted to choose between working in a virtual team, a co-present (independent face-to-face)

team or doing teamwork during class. This was an entirely free choice with absolutely no attempt being made to influence it in any way whatsoever. The virtual teams were encouraged to nominate a language of communication and the intention was to encourage the students to seek input from their own cultures. Students participating in the teams were instructed on simple strategies for enhancing trust within the team and achieving results as a team. Teams selected their own team members but were restricted in size to between four and seven members. A simple assessment policy was developed which involved an independent person marking assignments.

Role players who would be affected by the research were identified as in action research more than one opinion or point of view is sought, partly to uncover problems and partly to validate conclusions. The interests of the different groups were not always compatible and channels were created which would ensure that these various groups always had a voice and could prevent their own interests from being seriously affected in a negative way. This was done by collecting information using questionnaires, conducting interviews and being present and available for the period during which the research was conducted.

7.7   Preparation for the research

7.7.1 Questionnaires

The four questionnaires were compiled in English and translated into Afrikaans so that both languages in which tuition is offered at this university were catered for. Copies of the questionnaires are provided in Appendix B.

7.7.2 Cross reference to research questions

A series of research questions was drawn up at the start of the research. Some of these were not in fact genuine research questions as they could be answered during the literature survey. A complete list as it was originally created, together with the expected source of information, is included in Appendix D. The questionnaires were validated by cross referencing the questions in the various questionnaires with the research questions. This ensured that information was collected regarding all the questions and also that data was relevant to the proposed research. The number of questions in the questionnaires that could be linked to a research question was calculated. Some questions could be linked to more than one research question as will be seen. The cross references table indicating the associations between questions in the questionnaires

and research questions is included in Appendix D. Dennis and Valacich [2001] say that if questionnaires are used to collect data, there should be at least three questions which contribute to measuring each dependent variable. Although no formal method, such as Cronbach Alpha, was used to do this, the idea here is along the same lines. It seemed that all the research questions were covered sufficiently.

7.7.3 Modifications made as a result of input from the department

The initial research proposal was modified as a result of concerns raised by the two lecturers who were in charge of the first year course on Informatics. The major changes are as follows.

- Only the second section of the course would be affected by the research. This was done in order to limit the scope of the research, permit first year students to become familiar with the university, lectures and lecturing staff and to make contact with other students before the research began. The only negative effect was that there was less time for the team members to get to know each other as a team.

- All students could attend any of the lectures, although virtual teams and those doing teamwork face-to-face, but not in class (independent teams), were told that they did not *have* to attend class. This was always the intention but it was now emphasised more. It was expected that most students who did independent teamwork would not attend normal lectures and that those who did teamwork in class would be required to attend all classes. In other words, originally there was a link between independent study and independent organisation of teamwork. The independent teams were expected to study according to a learning model that was much closer to the telematic model offered to after-hours and repeating students. As, according to the university rules, attendance of lectures is not compulsory, it was considered inappropriate to try to coerce the class-based teams to attend lectures and eventually there was absolutely no link between attendance of lectures and the option a student chose for teamwork. This considerably reduced the incentive to work as an independent team and resulted in one of the basic dimensions of the original research being weakened to an extent that the options became difficult to differentiate.

- All students were required to do the assignments in teams. Initially it was the intention that students attending class would do assignments as individuals. This would have increased the marking and was vetoed by the module head. This also resulted in the incentives to work independently being reduced considerably, removed one of the discernable differences between learning style options and reduced the options available to the students. A number of students complained about this (See Table 7.2 option 'Did not enjoy teamwork') as they wanted to do assignments as individuals and not in a team. In response to question 1.13 of Questionnaire 1, as to whether they enjoy doing teamwork, 253 students said that they sometimes enjoy it, 40 indicated no preference,

but 40 said they did not like teamwork and hence would choose not to do it. This group makes up only 7.7% of all the students who answered the question and, had this option been allowed as a sub-option within class-based study, it would not have increased marking too much. It does, however, mean that these students would not have the opportunity to learn how to work well in teams. In response to question 1.14 of Questionnaire 1, as to whether their results had been satisfactory when they had done teamwork previously, only 26 students said no (yes - 274, sometimes - 244).

Only one minor change was made after consulting the Ethics committee, namely, the student was asked to sign the Informed Consent form himself and not, as originally envisaged, a parent or guardian.

7.8   Research process

7.8.1 Introduction

In action research it is difficult to separate the process and outcomes completely as the process is fluid and needs to be adapted in response to interim results. It is for this reason that some aspects of the research process, particularly those that evolved during the research, will be discussed in Chapter 9 when the interpretation of the team discourse is done. However, in many respects the research process proceeded according to the plans explained in Section 7.6 and nothing further needs to be said about these aspects. This section explains those activities that need further explanation and can be described separately from the analysis of outcomes. In some cases, such as the actual mechanisms for collecting data, these processes were clearly research- oriented and not closely intertwined with the normal collaborative learning processes.

7.8.2 Selection of study options

The reasons for undertaking this research and the implications for students of choosing any one of the teamwork options were explained to the students who would be affected in detail, during an obligatory lecture before the research began. All students registering for the course received a pamphlet which repeated this information (this is reproduced in Appendix A). The ways in which teams would be required to operate, how they would be monitored, how marks would be allocated and how potential grievances would be handled were also discussed in this lecture. A lecture on cooperative work and specific ways of working effectively in a virtual team was also given prior to the teamwork.

Students were given one week in which to decide which option they wanted to use. All students were required to fill in a questionnaire (Questionnaire 1 is given in Appendix B) in which the reasons for making a choice were identified. The study option could be changed but this was supposed to be done only immediately after an assignment had been submitted and before work on the next one started. Students were asked to ensure that the researcher was properly informed in writing of such a decision. Students who elected to work in teams were required to register the names of their team members so that arrangements for monitoring the team activities could be made.

7.8.3 Contact sessions

In this research contact sessions were difficult to arrange. Students were reluctant to attend classes later than the usual lecture times but additional venues were difficult to obtain during the normal lecturing day. In addition, those students who did not want to attend lectures and hence opted for the independent study options were the ones who were supposed to attend these contact lectures. However, they were the ones who had indicated by their choice of study option that this was something they did not find convenient. Attendance at these sessions was therefore understandably very poor. Contact sessions were arranged to take place during scheduled lecture times for the course and occasionally had to "time share" with the activities of the class so that the independent student group did not have the undivided attention of the researcher.

7.8.4 Data collection

There were a number of forms of data that were collected.
- Questionnaires,
- Recordings of discussions between team members of face-to-face teams,
- E-mails exchanged between members of virtual teams,
- Recordings of interviews with the lecturers involved with the course,
- Recordings of interviews with other lecturers in this department and the head of department,
- Recordings of interviews with lecturers with an interest in Telematic education in other departments, some of whom were at another university,
- Recordings of interviews with students who had taken the course, and
- Students' marks for all assignments, tests and examinations.

7.8.4.1 Questionnaires

The first set of information was obtained from the Informed Consent form which was attached to the Information Brochure. Questionnaire 1 was handed out to the students before the research began and Questionnaire 4 was handed out after it was completed. There were three versions of Questionnaire 4. The first applied to students who elected to study by attending lectures and doing teamwork during class. The second was for the independent face-to-face teams and the third was for virtual teams. Questionnaire 2 was required in order to register who was in a particular team for the virtual and independent face-to-face teams. Questionnaire 3 was supposed to be completed if a student decided to change from one study option to another. The majority of questions in the questionnaires were structured and hence the responses could be collected as quantitative data. This was entered into Excel spreadsheets. The responses to the various open questions were classified, as explained in Subsection 7.6.9.2. The counts made of the responses in each of these categories is not entirely accurate[3]. Most of this data is reported on in Chapter 8. Occasionally references to the findings have been included elsewhere as considered appropriate. For example, the responses as to the students' perceptions as to the effect of this research is referred to in Section 7.6.9.2.

7.8.4.2 Recordings of team discussions

Two digital recorders were acquired and independent face-to-face teams were asked to book them and record their discussions. Some students simply recorded their discussions on analogue audio cassette recorders. This data was all converted to WAV format and stored on a number of CDROMs. The digital recorders were ideal for the purpose as the data could be downloaded to a computer hard disk in a matter of seconds even though the files were large. The compression of the audio files was very good in comparison with WAV format (exactly one quarter as large). Up to four hours of voice recordings could be held on the flash memory of the recorder. Unfortunately this format was not MP3 as the researcher had understood it would be from the marketing information for the equipment and hence these files could not be played other than on the Creative Nomad equipment. This was why they were converted to WAV. As

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[3]This data collection process cannot be considered to be accurate as new categories of responses were added as they were encountered and also because allocating remarks to a category is a subjective exercise. Had it been considered very important it would have been necessary to repeat the exercise once the set of categories had been finalised and it might even have been necessary to have the entire data collection process duplicated by a second data capturer. As there were so many questionnaires, and since this data was not considered to be of such great significance, this was not done. Therefore, this data provides only an impression of the responses. This is an example of research data that it either neither quantitative nor qualitative or is both.

the analogue recordings were captured as WAV files by the audio software used, all recordings were eventually in the same format, which was good.

The decision to allow these groups to record their discussions without the researcher being present was made after some thought. It meant that the role of the researcher as a participant observer was eliminated. It also meant that the research is dependent on recordings where it was sometimes difficult to hear what was said, are extremely difficult to transcribe and which might be edited by the research subjects by erasing sections. Walsham [1995] discusses all of these issues. The decision made here was based on the fact that if a much older lecturer was present at the team discussions, it might have had an inhibiting effect and the lecturer might take over the role of teacher within the discussions. In addition there were logistical difficulties, as more than one team might wish to meet at a time. In this research, no problems of confidentiality were encountered [Walsham, 1995].

7.8.4.3   E-mails and WebCT discussions

These are self-documenting and permanent so they need no additional data capturing.

7.8.4.4   Interviews

The digital recorders were used to record all the different interviews.

7.8.4.5   Marks obtained from student records

These were obtained as Excel files and could be merged with the Excel spreadsheets containing the quantitative questionnaire data.

7.9   Additional interviews

Additional interviews were conducted with lecturers and students after the research was completed. This was considered to be necessary because so few students elected to take the virtual teams option and because those who did work using e-mail communication did not exhibit any interaction that could be considered to be discourse. Two different sets of interviews were carried out with lecturing staff. The first was with lecturing staff in the Department of Informatics after the main research effort was completed and the quantitative data was analysed, in order to discuss the findings and get their opinions as to the validity of these results, as well as to give the feedback regarding a process that had also affected them. These interviews are referred to in Chapter 8. A second set of interviews was undertaken with a larger and less closely involved

group of lecturers and students as it was felt that not all of the research objectives had been achieved. These interviews were intended to get information concerning their own experience with virtual teamwork and computer-mediated communication as a means of sharing meaning. These interviews will be discussed in more detail in Chapter 9.

7.10   The theoretical elements used

Chapters 2 to 6 discussed a wide range of theory. The choice of research paradigm for the empirical work was discussed in Section 2.9 and was derived from the research frameworks presented in that chapter (particularly Tables 2.4, 2.5 and 2.6). The theory of communicative action [Habermas, 1984] will be used extensively in analysing the type of communicative action demonstrated by the team members in the virtual teams and this will be used to show evidence of one-side rationality. Concepts of information richness and communicative coherence with respect to e-mail, which were covered in Chapter 5, will be extended by investigating the levels of information carried in the e-mail messages. In doing so reference will also be made back to the classification of types of information derived in Chapter 3. Chapter 4 was devoted to studying aspects of modernity and radicalised modernity in accordance with Giddens' work. Globalisation is not referred to directly in the analysis, but the co-presence of the face-to-face teams is contrasted with the dispersed nature of the virtual teams, also the synchronised nature of the communication of the face-to-face teams is compared with the delayed communication by virtual teams, and finally the role that the length of the prior relationship and how this affects trust (discussed initially in Chapter 6) are all essential elements of the empirical work.

7.11   Conclusion

The goal of this research is to provide a genuine example of constructivist learning, within a sociocultural model and provide sufficient flexibility so as to accommodate a number of different learning styles. It is believed that this research design achieves these objectives.

A set structure for the research was prepared according to the guidelines identified in Chapter 2 as appropriate for an intersubjective or social view of the nature of social science This structure *inter alia* attempted to see the issues within context and to identify all the role players and address their needs, as well as to find ways to address conflicts arising between them.

However, action research is a learning process in which theory and action are combined. It is common for the original research plan to be adjusted during the period in which it is carried out

as action research requires a combination of generating change and generating knowledge. In action research, the researcher, together with participants from the host organisation, proposes changes and tries them out. It is a learning process in which theory and action are combined. Complexity and uncertainty are inevitable and acceptable.

The actual research thus differed in some respects from the research design particularly with regard to the duration of the research and the number of students who participated in the virtual groups. With regards to most other aspects of the research, such as the data collection and analysis, the research did not deviate significantly from the original research design.

Chapter 8

Problems of diversity:
Summary of the quantitative results

"'T is education forms the common mind:

Just as the twig is bent the tree 's inclined."

Alexander Pope, Moral Essays. Epistle i. Line 149.

8.1 Introduction

The main research project was concerned with exploring the viability of incorporating technology in doing group work (referred to as teamwork in this chapter). Both qualitative and quantitative data were collected during this research as explained in Chapter 7. The quantitative data, obtained using questionnaires, provided a means of providing a rich description of the educational environment and hence allowing understanding the context so that the qualitative data could subsequently be interpreted (in Chapter 9) and it is the purpose of this chapter to briefly discuss the main findings regarding context.

The quantitative data gave insights into how the students experienced one particular course and, in particular, the teamwork done. As the students had to complete the questionnaires, they had to consciously reassess their own learning process and their choice of study methods. At the same time, they were given the opportunity to comment on the teaching and hence influence decisions concerning the way in which the course is presented in future. The results, in the form of the percentages of students selecting each option, together with interpretations as to the meaning of, and possible reasons for, the differences between the different language groups, are summarised in this chapter. The complete, detailed analysis will be submitted for publication separately. It was not included, as the thesis is long and these detailed results were considered to be less important than the rest of the thesis.

8.2 Method
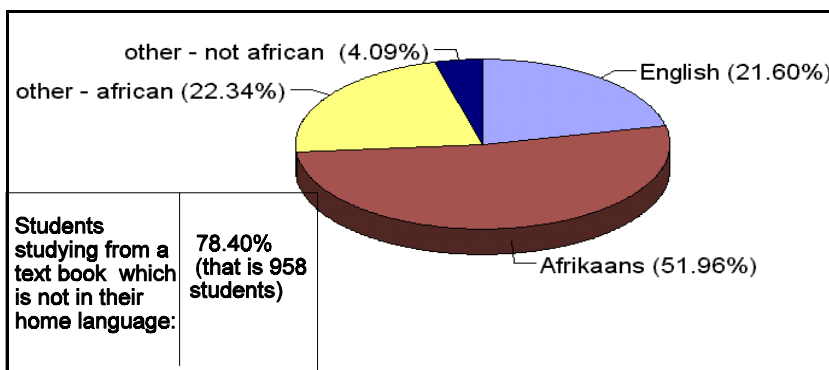
8.2.1 Introduction

The quantitative data was analysed according to the home languages, spoken by the students in order to highlight diversity with respect to culture and possibly educational background.

Figure 8.1: Home language

Patterns emerged that seemed to indicate that the different groups of students had significantly different attitudes towards the course. Since an attempt was made to interpret the data, this part of the research was not simply a descriptive, positivist study [Orlikowski & Baroudi, 1991]. The intention of this part of the research is to increase understanding within a cultural context and hence there are aspects of an interpretive approach.

8.2.2 Sample

Various different questionnaires were given to the students. The data which is to be discussed here comes from the fourth questionnaire entitled "Evaluation of the study option". As can be seen from Table 8.1, a high percentage of questionnaires were completed and returned and there was a large sample.

Figure 8.1 indicates the languages which, according to the questionnaires, the students use predominantly at home. The languages shown as "other - African" were almost exclusively the nine official languages of South Africa other than English and Afrikaans, whereas the "other - not African" were those of Europe and Asia.

Table 8.1: Research sample

Responses	1222	78.28%
Not returned	339	21.72%
Total number of students in the course	1561	

The data was analysed according to the home language of the student, which is given as: Afrikaans, English and 2nd-language students. The analysis compared the percentage of students in each language group who selected a particular option for a particular question. The questionnaire asked for additional comments at various points. As it is difficult to determine accurately how frequently related comments are made, reference is made in this chapter to comments but no attempt has been made to associate a particular comment with any group of students.

8.3   Results

8.3.1 Attitudes towards various aspects of the course

There was a noticeable difference regarding the attitude towards the prescribed book (Principles of Information Systems, edition 5, by Stair and Reynolds), the course itself and the assignments set between the Afrikaans-speaking students and the other students. In all three aspects, the Afrikaans-speaking students were less satisfied than the other students. For example, only 33.23% of the Afrikaans students chose to describe the book as easy, compared with 58.71% of

English students and 48.61% of 2nd-language students. The 2nd-language students were much more positive concerning how interesting the book was than the other groups. Three times as many Afrikaans students as either of the other groups believe the book is unnecessary. The economic pressures on the 2nd-language students are evident and contribute to the fact that nearly 10% do not have the book.

The responses to questions regarding the course itself also indicate that the Afrikaans-speaking students seem to be the least happy. They are significantly less inclined to say that the course is interesting and considerably more Afrikaans-speaking students said it was difficult. Since the prescribed book is an important part of the material aiding the students, this response might be associated with the responses concerning the book.

The same pattern was evident in response to questions regarding the first of the two assignments which had to be submitted for the second half of the course. Exactly 60% of the Afrikaans-speaking students said the first assignment was difficult or very difficult compared with 46.21% and 47.37% in the other two groups. The results were more uniform in the second assignment which almost all the students found challenging.

It is noticeable that the English-speaking students are least likely to attend lectures. This seems to be because they find the book to be an easy and informative alternative and they do not find the subject very difficult. The 2nd-language students are the most conscientious as regards attending lectures. Since most of these students also attend lectures presented in English we can assume that the standard of lecturing was not the predominant factor influenced class attendance. The good attendance by the 2nd-language students might be ascribed to a generally positive attitude towards their studies.

8.3.2 Attitudes towards teamwork

8.3.2.1   Introduction

Three answers to the question "How did you decide who you wanted to be in a team with?" predominated. Most students explained their choice as:
- People they knew socially - these were often school friends, or people who were in the same residence.
- People whose work habits and standard of work were likely to result in good marks.
- Coincidental choice, such as people who happened to sit nearby in class when the teams were created.

The way in which the team members relate to one another is a significant issue. The following question types were used to measure this:

- How the individual student communicates personally - six questions
- Outcomes and processes in teamwork - ten questions
- Team dynamics - how well team members got on and team communication - eight questions

The answers selected by the English group were consistently positive, scoring most positive compared to the other two groups in sixteen out of twenty-four questions and within one percent of the most positive score on a further five questions.

8.3.2.2 Attitude of 2nd-language students

The question regarding whether the student was satisfied with the standard of the assignment that his team submitted was identified as the key question and the other questions are then used in an attempt to determine reasons for this result. The marks obtained for assignments are important to the students and significantly influence their attitudes to future teamwork. The group of 2nd-language students were noticeably less satisfied with their results than other students (71.83% were satisfied compared with 80.16% and 89.02% for the other two language groups). In fact, this group's assignment results were similar to other groups.

A combination of shyness and lack of confidence (and domination by some of the team members who do not allow others to contribute because they do not consider their input to be valuable) was indicated by the data. This phenomenon did not seem to assume serious proportions but is also identified in the findings reported by Theda Thomas [Thomas, 2000].

One frequent problem identified by all the groups was the unequal contribution made by team members. A number of questions explored aspects of how teams work together and the answers shed light on this problem. Reliability is significant in teamwork and the 2nd-language students did seem to be noticeably less happy with the reliability of the team members than the other students were. The question regarding whether team members contributed satisfactorily is even more directly associated with the issue. The data values for this question for all three groups were quite close and the value for the 2nd-language students was in the middle.

Comments made regarding the best aspects of teamwork often focussed on the interaction between individuals in the team. They frequently included comments about making new friends and how well the team communicated and reached consensus. An important question reflecting team dynamics was whether the team ever had to address a problem concerning the way people worked together. 23.22% of the 2nd-language students answered "Yes" compared with slightly more than 11% in both the other cases. This finding was confirmed, although not to such a

pronounced degree, by the question "On the whole did team members get on well with each other?" - 85.14% of the 2nd-language students said "yes" compared to 87.56% and 92.05%. Students were asked to explain what they had done to address the problem if they answered "Yes" to the first of these questions but few explained. This result is cause for concern. An interpretation of it follows in the discussion section.

A markedly different number of students from the different language groups (Afrikaans - 62.36%; English - 71.97%; 2nd-language - 55.11%) said of their team "Everyone usually took part in discussions". Compared with the other two language groups, 2nd-language students were less inclined (74.92% compared with 80.31% and 85.75%) to say that team members were mostly or always friendly and polite. The reason may be given by the fact that far fewer of these team members knew each other well before they formed the team.

b.   Interpretation

The historical context in which this research took place, must be taken into account when these results are interpreted. Although almost all the students concerned were in their first year at university and would have started secondary school after 1994, it is still reasonable to assume that the English and Afrikaans students come from an established catchment area, either in the city where the university is located or from schools elsewhere with a tradition of sending students to this university. Therefore, there is a much greater possibility that these students will join up with already established teams of friends. This puts them at an advantage when doing teamwork. The 2nd-language students are less likely to have been to the same schools. The data shows that the students in the 2nd -language group have a variety of different home languages and this means that the majority may not have been to school locally. This would explain the low number who knew all their fellow team members previously. Their estimation as to how reliable, friendly and polite team members were, and also how trustworthy they were, would influence how successful the team was. It is recognised that how long team members have known each other affects their perceived and actual trustworthiness [Jarvenpaa & Shaw, 1998]. A positive point is that when asked to state what the best feature of teamwork was, many students mentioned that it provided ways of getting to know fellow students. These comments were not captured in a way that permits analysis according to language group but can be confirmed by fact that 73.77% of the 2nd-language students say that the team members can now be considered to be friends that they will continue to see (compared with 82.55% English and 72.03% Afrikaans). This represents a big growth in friendship when compared to the number of pre-existing friendships. Thus, future teamwork will benefit from this team building.

Thomas [2000] makes some suggestions regarding how to improve the participation of a diverse group of students in teamwork. These include setting aside time during which the students are taught how be assertive in an effective and nonthreatening way. Team building exercises are

done during this period as well. One of the main findings in Thomas' research is that black students, when they are in the minority, as was the case in the current report, tend to be reticent and do not participate sufficiently in teamwork. It was hoped, in the research being reported here, that this acknowledged problem could be avoided by allowing students to choose their own groups and by encouraging them to choose team members with whom they were at ease. It seems, however, that this was ineffective. The findings being reported here highlight the fact that time is needed to establish trust. This is extremely difficult to schedule. The absentee rate at lectures is already high and attendance would probably be extremely low at any workshop or team building exercise unless it was going to contribute significantly to final marks for the course.

8.3.2.3 Attitude of Afrikaans students

a. Analysis

The slightly lower rating for enjoyment of teamwork compared with the other students is in agreement with the scores discussed earlier regarding how interesting the prescribed book is and how interesting the course is. The lower rating by this group regarding whether other team members understood what they were trying to say might reflect the fact that new terminology is used in the course and these terms are given in English in the prescribed book and Afrikaans in class. Communicating about the course material may easily be affected by this. The lower perception of team members' enthusiasm seems to point to the same rather unenthusiastic attitude towards the course in general. The Afrikaans-speaking students selected the always or mostly option regarding whether team members had prepared in advance of team meetings considerably less often than the others.

Responses to three out of the four questions intended to shed light on just how much of the teamwork was done together and how much was done by individuals and simply put together later, indicated that the Afrikaans students were most likely to work separately at least to some extent. It is not surprising, therefore, that the question which largely covers all team activities, namely "Team members contribute satisfactorily", shows an unsatisfactory pattern similar to all the others discussed in this section.

b.   Interpretation

Taking results from an earlier questionnaire, which was completed before the students started the course, it seems possible that this group of students have not enjoyed teamwork in the past quite as much as either of the other groups and have possibly been exposed to less teamwork than the English-speaking students.

The results were discussed in detail with three members of the academic staff in the departments concerned. They were chosen because they taught the first year Information Systems courses and all three have considerable experience teaching Afrikaans-speaking students. None of them were surprised at the results. They all believe that the Afrikaans-speaking students tend to play a passive role in their studies and expect to be given a great deal of structure and support. These students have had little experience of being creative in the way expected in this course and tend to want to follow a recipe for a solution. The lecturers believe that this attitude is established during the students' school years but is perpetuated at the university by other departments. These other departments, which most of the students consider to be their home departments as they will be majoring in subjects offered there, lecture in a very structured way and generally use text books that are available in Afrikaans. Since these students used only Afrikaans text books at school, this means that an English textbook is a difficult new element. The lecturers believe that this group of students resent being expected to show initiative, are reluctant to prepare work and do not take responsibility for their own results. The lecturers reported a low attendance at lectures, considerably lower than that indicated by these students in the questionnaire.

Another more senior member of staff suggested that little teamwork was done at Afrikaans high schools in the past but that the advent of outcomes-based education was changing this. Another factor identified was that many Afrikaans students take additional subjects for Matric. Hence many of these students have already studied material which overlaps with that in this course and are bored. This staff member also noted that she had the impression that, of those students who requested permission to change their degrees in order to major in Information Systems, few were Afrikaans speaking.

8.3.3 Assessment of results as a whole

Although the difference in the average marks obtained by the groups of students for different activities is not large, a reasonably consistent pattern can be identified for all the student assessments done for the course. The 2nd-language students scored lowest on three tests containing mainly multiple choice questions but had marks close to those of the Afrikaans-speaking students for teamwork assignments and did well (average mark above the class

average) in the examination . This might indicate a language skills problem amongst those students.

The results of the research for this thesis all portray the students' perceptions and not actual fact. There is a 5.6% drop out rate and a 11.24% failure rate for this course. (Some of these students will subsequently pass the supplementary exam.) Almost all of the students who wrote the examination (1432 students) also wrote all the tests (1408, 1393, 1424 students for the three tests) although **all** students are permitted to write examinations regardless of whether they did any other work.

The research results reported above have come largely from quantitative data obtained from questionnaires. The sample was large and aspects concerning the participation in teamwork by the 2nd-language students are consistent with the findings of other researchers, namely Thomas [2000] and Goduka [1996a; 1996b; 1998].

The findings concerning the attitudes of the Afrikaans-speaking students towards teamwork and the course cannot be explained with certainty. As this university is one with an Afrikaans tradition, one might expect these students to be the most advantaged and that they would out-perform the other students. In addition, the Afrikaans students have been fortunate in that they have had to cope with few disruptions to their school education. Nevertheless the data seem to indicate that these students are relatively negative towards their university studies. Questions that need to be followed up in further research are: Are the problems local to the course in the sense that they are related entirely to issues such as the language of the textbook, or do they partly stem from earlier education as was suggested by the lecturers consulted?

On the other hand, factors to do with the change in the South African society might play a role. The rapid changes in the political dispensation have resulted in a completely new distribution of power. This, together with the major change in the composition of the student body at this university, could be put forward as reasons for some students feeling that they were losing status, whereas others might perceive themselves as gaining. This perception would particularly come to the fore in the first experiences of students outside the more protected and unchanged environments of their schools. Unfortunately the data can shed no light on these issues.

South African society is multi-cultural and it would be naive not to expect differences in the way in which different groups view teamwork. English-speaking and Afrikaans-speaking students could be expected to be more individualist than collectivist [Hofstede, 1997] and hence less enthusiastic about working in teams than the 2nd-language students. This was found to be true for the Afrikaans-speaking students but not for the English-speaking students. The different attitudes towards teamwork cannot, therefore, be interpreted as being in line with Hofstede's findings.

This is, therefore, an example of quantitative research telling only part of a story. It certainly appears to point to differences in attitudes that might be important but it says little or nothing directly about the causes. Further research could be undertaken.

8.4 Conclusion

In this part of the research it has been necessary to consider the cultural and historical context in which the research took place. This is appropriate for intersubjective social research as was noted in Chapter 2. Some of the data was analysed in a quantitative way using a spreadsheet and calculating percentages but it was also interpreted and occasionally suggestions were offered as to why things might have occurred. These interpretations are not value free but nor are the opinions that were collected in the questionnaires. The outcomes from this part of the research are descriptive and contribute to the research goals identified in the research framework, (refer to Table 2.8 in Chapter 2) namely a greater understanding of the context.

Three sets of attitudes that are a cause for concern were identified using a combination of quantitative data from the questionnaires and the comments that were included. The first is to do with the way the choice of a textbook affects the non-English-speaking students. The second, is the general attitude of the Afrikaans-speaking students to this course, including the teamwork. The third, is difficulties that the students whose home language is neither English nor Afrikaans have with teamwork.

The issue of English text books is a universal one and has been confronted repeatedly. From the results of this research, it is clear that the English-speaking students are at a distinct advantage and this is reflected in all types of assessment, their final results and their attitudes to all aspects of their studies. However, the difference of 4.5% in the average final mark cannot with certainty be ascribed solely to one factor. The difficulty of translating a textbook in a subject where new editions are published regularly and the fact that it is not only Afrikaans-speaking students but all non-English-speaking students that are affected, means that it is simply not feasible to provide a suitable book in multiple languages. We must accept that the students are going to have to improve their reading skills in English.

The issue of the overall attitude of the Afrikaans students to this course needs further investigation in order to determine whether this is true of specific courses and faculties or is a phenomenon which can be detected throughout all tertiary education. Once the extent of the problem is identified, its cause and, thereafter, the solution can be worked on. Possibly a multi-pronged approach is required with longitudinal studies monitoring progress.

The problems of diversity, and particularly those problems that the black students and other minorities experience in doing teamwork, has also been identified before. It seems, as is the case with language, that the best way to solve the problem is to confront the students with it but also to try to give them specific guidance by making all of them, not just the minorities, aware that there are problems and that there are recognised techniques for ameliorating them. Time needs to be allowed for this. Orientation courses for first year students might be one opportunity but it is possibly necessary to repeat these within courses to reinforce them in the context of actual problem solving.

Chapter 9

Evidence of reconstruction of meaning

"*Written words differ from spoken words in being material structures. A spoken word is a process in the physical world, having an essential time-order; a written word is a series of pieces of matter, having an essential space-order.*"

Bertrand Russell. An outline of Philosophy, Allen & Unwin (1951)

9.1   Introduction

This chapter will describe the research from the point of view of the response of the students to the study options offered and their interaction. The research planning was explained in Chapter 7 and this gave a complete view of the overall intentions of the research. In Chapter 8 a summary was given of the analysis of a large part of the data obtained from the questionnaires. This was done to interpret the context within which the research took place, provide a rich description of it and to answer several of the research questions. In this chapter, an attempt will be made to interpret the team discourses which were recorded in order to understand how students reconstruct meaning during collaborative work and how this is affected by the communications medium used. Thus a comparison will be made between the discourse of students who met face to face and those who were working as a virtual team. From this a greater understanding of the interaction of different social and technological elements in the process of reconstruction of meaning during collaborative work emerges and a depiction of this will be presented. This is used to arrive at suggestions as to how virtual teams can be assisted in collaboration.

As was stated in the first chapter, the purpose of this thesis is not discourse analysis and no study was made of Speech Act Theory other than in the very limited way of reading and understanding sections which refer to it in *The theory of communicative action (Vol. 1) Reason and the rationalization of society* [Habermas, 1984]. Hence, the discussions between students, be these via e-mail or in person, are studied in a less structured way than is customarily done in discourse analysis or text analysis. Reference will be made to statements and collections of statements that were made during the discussions and there will be an attempt to see these in context and to determine how they contributed to sharing meaning or, on occasions, how they created obstacles to this. No attempt is made at quantitative analysis of these discussions. Instead the analysis is done by interpreting the statements according to what type of intentions they imply and how they contribute to trust. In doing this use is made of concepts derived from the discussion of the Theory of Communicative action in Chapter 2. The method of analysis is described in Section 9.3.2.

The chapter starts with a factual description of the students' responses to the study options offered. The next section, Section 9.3, discusses the actual functioning of the virtual groups and the way they went about doing their assignments. The recorded communication of those groups will be discussed. Section 9.4 discusses the independent face-to-face groups, how they

functioned and how they did their assignments. Those teams that met during class are not discussed separately as their discussions were not recorded. The way in which the two types of independent teams (the face-to-face teams and the virtual teams) worked will be compared in Section 9.5. In Section 9.6 these findings are compared with findings reported in comparable research. After the main research effort was complete, the findings were supplemented by conducting interviews with lecturers at two universities and with students at the university where the main part of the research was done. These are discussed in Section 9.7 to see whether they do shed any further light on the situation. In Section 9.8 a diagram is provided that depicts different elements that affect the construction and reconstruction of meaning during collaborative teamwork. This links the different aspects of the material discussed in the thesis. The final section reviews the research questions that were set up initially and evaluates the research findings in terms of those questions.

9.2 The students' choices

9.2.1 The study options

The research offered students a choice between three different study options that affected the way they did the assigned teamwork.

a.   The class teams: Attend lectures and work on assignments in teams during scheduled lecture periods.
b.   The face-to-face teams: Study from a prescribed book, which covers the course material completely, and work on assignments in a face-to-face group.
c.   The virtual teams: Study from a prescribed book, which covers the course material completely, and work on assignments in a virtual group.

Students were given two opportunities to indicate their choices, first they completed the Informed Consent form and then Questionnaire 1 in which they confirmed their choice. The Informed Consent form explained the options in detail and required students to give a preliminary indication of their choice. In both cases they were asked to rank the options as first, second and third choice. Questionnaire 1 was intended to commit the student to a final, binding choice. 64.06% of the class completed this questionnaire.

As can be seen from Table 9.1, the overwhelming majority of students elected to continue with the option that they were accustomed to (option a). Of those who indicated that they were going to work as independent teams (either virtual or face-to-face) not all ever got around to

registering a team and then some of those did not do any work. This will be discussed in more detail below. Registered team sizes varied from three to six.

Table 9.1: Choice of study option

	Class team		Independent Face-to-face team		Virtual team					
					Own computer		University		Total	
Initial choice (Informed consent form)[*]	638	77.3%[**]	153	18.5%[**]	15	1.8%[**]	19	2.3%[**]	34	4.1%[**]
Final choice (Q-naire 1) — 1st choice	801	51.4%[***]	164	10.5%[***]	18	1.2%[***]	15	1.0%[***]	33	2.1%[***]
Final choice (Q-naire 1) — 2nd choice	46		396		28		71		99	
Registered teams			77						25	
Worked as teams			69						17	

9.2.2 Which students seem to be more likely to choose any option?

Although the year of first registration did not clearly influence the original choice, as shown in Questionnaire 1, of the students (Table 9.2), it became clear when the students did their teamwork that virtual teams were more popular amongst students who had not registered for the first time that year (Table 9.3).

Table 9.2: Initial choice classified according to the year registered

(percentages indicate the percentage of students *in that study option group* who were first registered during the year indicated)

	Class		Virtual		Face-to-face	
1998 or earlier	10	1.6%	1	2.9%	0	0.0%
1999	16	2.5%	1	2.9%	2	1.3%
2000	45	7.1%	4	11.8%	18	11.8%
2001	567	88.9%	28	82.4%	133	86.9%
Total in group	638	100%	34	100%	153	100%

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[*]Response to Informed Consent was 52.95% and to Questionnaire 1 was 64.06%

[**]As a percentage of those who responded

[***]As a percentage of the total class

As can be seen in Table 9.4, the less recent the registration the less likely the student was to complete Questionnaire 1, which is why the preference of the more mature students did not show up in the analysis of that questionnaire. Presumably students who chose to be in virtual teams were those who did not attend lectures and hence did not get, or did not return, the questionnaire.

Table 9.3: Actual Teams registering classified according to the year registered
(percentages indicate the percentage of students *in that study option group* who were first registered during the year indicated)

	Total class		Virtual		Face-to-face	
1998 or earlier	56	3.59%	1	4.00%	3	3.90%
1999	54	3.46%	2	8.00%	2	2.60%
2000	206	13.21%	14	56.00%	7	9.09%
2001	1243	79.73%	8	32.00%	65	84.42%
Total in group	1559	100%	25	100%	77	100%

Table 9.4: Students who returned Questionnaire 1 according to the year registered

	Answered Questionnaire 1		Did not answer
		Percentage of students registered during the year indicated that answered the questionnaire	
1998 or earlier	28	34.57%	53
1999	33	42.31%	45
2000	96	46.15%	112
2001	841	70.55%	351
Total	998	64.02%	561

9.2.3 Assessment of marks

Figure 9.1 shows the way in which the year mark and examination mark contribute to the final mark of students depending on the year of first registration. The year marks contributed positively and noticeably to the final marks of students registered for the first time in 2001, that is, students who were taking the course in the same year as they were registered for the first time. This is not the case for students first registered prior to 2001 and by the time that students have already been registered for more than three years (and hence could already have graduated) the year mark is a negative factor that is fortunately compensated for by an improved examination mark. This would indicate that there is a need to assist these "older" students with other class work options.

9.3   The virtual teams

The students, as mentioned in Section 9.2, were reluctant to choose the virtual team option and only 34 students, (4.12% of students who filled in the form and 2.18% of the actual class - see Table 9.1), indicated this as their first (most preferred) choice on Questionnaire 1.
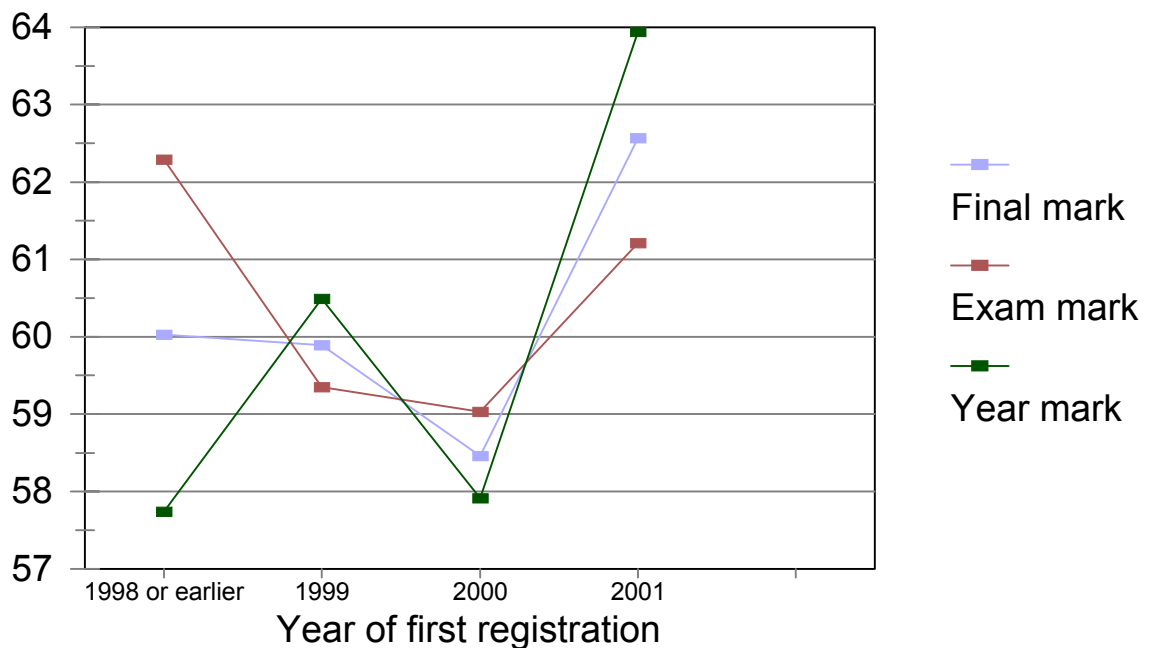
Figure 9.1: Graph of marks obtained versus year of registration

It was also not particularly popular as a second most preferred choice. Of those whose first choice this was, slightly more than half indicated that they would access WebCT from computers off campus, but of those who indicated this as their second choice more than 70% said they would use computers on campus. This could indicate that many who were interested in the option might eventually not have selected it because they did not have access to a computer at home.

Of the twenty-five students who eventually registered as part of a virtual team, fourteen had not indicated a preference (had not completed Questionnaire 1 to indicate a final choice) and three others had indicated other preferences. (Only 64% of the students did sign these forms.) So only eight had indicated that they did want to be in virtual teams. This means that, of thirty-three students who committed in writing to being in virtual teams, only eight registered as members of such teams. This indicates a high degree of uncertainty, or disorganisation, or inability to find team members that were acceptable.

Reasons given for joining virtual teams fell largely into two categories, convenience and interest in the technology.

Once students had chosen an option, it became clear that many of those who had said they wanted to work in virtual teams were having difficulty in setting up a team. A contact lecture had been arranged during which team members were asked to finalise teams but very few of the virtual team candidates attended this lecture. In general, arranging meetings of independent teams, whether these were virtual or independent face-to-face teams, was problematic. A single time slot during normal lecturing times never suited everyone and students did not want to attend contact sessions after hours. As a result several students contacted the researcher for help and she attempted to assist. One strategy was accessing the student records of students who had indicated this option and retrieving telephone numbers. The lecturer then made this information available to students who needed a team. Two teams were set up in this way and the team members all initially seemed to be motivated to work together and to have access to the Internet. There were eventually six virtual teams, known as Virtual Team One, Virtual Team Three, Virtual Team Four, Virtual Team Five, Virtual Team Six and Virtual Team Seven. The stories of each of these will be told separately. (There was no Virtual Team Two as this number was erroneously allocated to one of the face-to-face teams.)

The students were given the same assignments and due dates on which the assignments were to be submitted as all the other students. The instructions that were included with the assignments said that the work should be subdivided into tasks that individuals could do independently. These should be allocated to the team members; they should agree on a work schedule; the team should review each other's work; make suggestions for improvement; and,

once consensus had been reached, make the changes and submit the assignment. They were asked to communicate as a team via e-mail or WebCT group discussions and were informed that the researcher needed access to their messages.

9.3.1   Response to the final questionnaire

9.3.1.1   General questions

Only thirteen students, coming from four of the six virtual teams (teams One, Four, Five and Seven), completed questionnaires after the teamwork was finished. The responses indicate that the students were less certain of the purpose of the research (61.54% said they understood it compared with 81.2% of the students in general) and how the option that they selected would work (58.33% compared with 85.17%). This was not surprising as these students were confronting the option that was least familiar. This group found the module less interesting (38.46% of the students selected this option compared with 63.96%) and more difficult (38.46% compared with 22.41%). Nevertheless they considered Assignment 01 to have been easier (69.23% compared with 39.33% of the general student body selected "easy"; 30.77% compared with 49.59% believed that it was difficult). However, of the students who completed this questionnaire, six did the first assignment as a member of a face-to-face team not as a virtual team so this response is not meaningful. The assessment of Assignment 02, which all these students did as virtual team members, was very close to that of the general student body.

9.3.1.2   Questions regarding e-mail or WebCT

Students accessed the Internet almost equally often from home and from the university laboratories. They generally believed that they had sufficient contact with the rest of the team via e-mail (nine students said Yes, three said No). Most team members did participate (all members of two of the teams said everyone in the team participated and members of two of the teams said that one or more than one team member did not participate.) Almost all of the team members admitted that they had discussed the assignments using other means than online (eleven of the twelve students). E-mail messages were generally answered immediately, seven students said within a day and two more said within two days. A wide variety of problems were encountered with WebCT access. Virtual Team Seven apparently could not access it at all (this team is discussed in Subsection 9.3.5). Half of the students believed that they needed more and better instructions on accessing it. This is discussed in Subsection 9.3.9.

9.3.1.3   Questions regarding the team

Although six of the thirteen participants who answered the final questionnaire did not know their fellow team members at all, ten thought they would remain friends. Only one person thought that team members were not friendly. This student felt that her team, who were all strangers, had not communicated successfully in any way. She said that the best feature of the teamwork was "Experimenting with something new that I have never done before and realising that sometimes things are not as easy as we thought." The worst feature was, "The fact that some of us never really got the chance to understand what was going on with the virtual teamwork and its importance." She did, however, say that she would do it again provided that changes were made. "... changes like training students for a week or so to get used to it other than just setting them to go and do it for the first time pretending to know what they have to do whereas they don't cause any way students are students." However she did not attend contact sessions that were arranged, as she "was busy".

Most students felt that they were able to communicate freely and easily (ten of the students) although there was evidence that no real discussion occurred. Four students said that there was little discussion, as e-mail was largely used to transfer documents, four said they were inhibited by knowing the discussions were monitored, five said they read the messages but did not contribute much and three said they were reluctant to defend their point of view. (Note that students were asked to select three options.)

Only one student was not happy with the quality of the assignment submitted. Most students said that both individuals and the group worked on the second assignment and nine of the students believed they had done their fair share of the work.

9.3.1.4   Contact lectures

Eight of the students attended the contact sessions and of those only three considered that they were useful. This was discussed from the lecturer's point of view earlier in Section 9.3. It will be referred to again in Section 9.7.

9.3.1.5   Worth incorporating in other courses

This option got a definite thumbs down with five students saying No, only one saying Yes, five unsure and one, already noted above saying Yes but with much more student preparation.
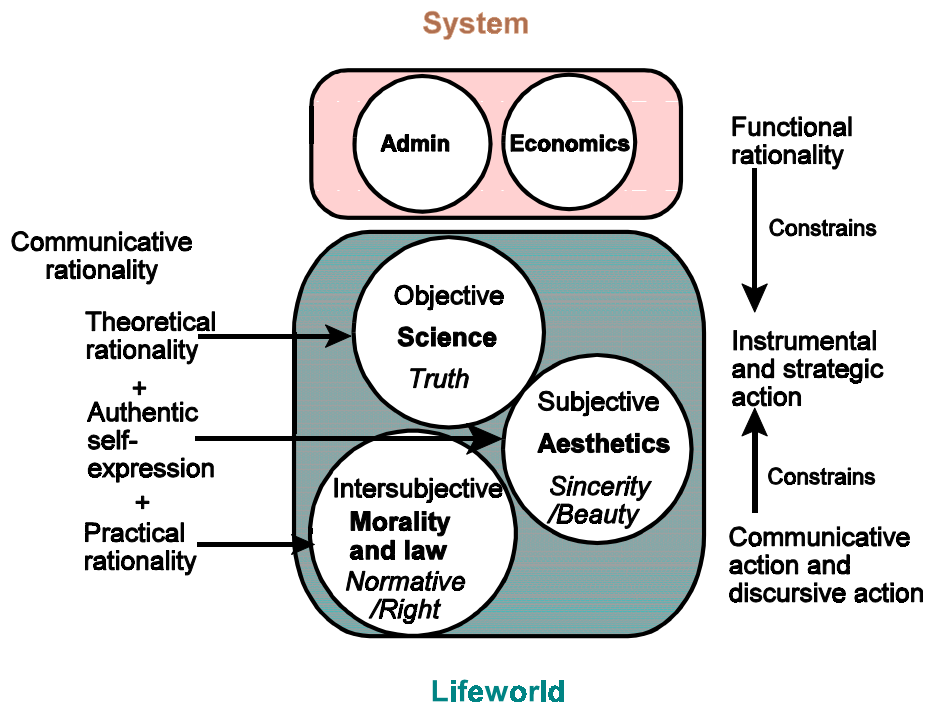
Figure 9.2: Relationship between forms of rationality and the 'worlds' to which they apply (given as Figure 2.1 in Chapter 2)

9.3.2 Method of text analysis

The following method of analysis emerged as the e-mail messages were analysed. Figure 2.1 of Chapter 2 showed the relationships between forms of communicative rationality, (that is, the forms of social action or intentional behaviour [Ngwenyama & Lee, 1997:154]) and the 'worlds'. This figure is repeated as Figure 9.2. Communicative rationality (comprising theoretical rationality, practical rationality and authentic self-expression) is expressed by means of two of the forms of social action, namely, communicative action and discourse. Communicative rationality and functional rationality constrain the other two forms of social action, instrumental and strategic action. In other words the two forms of rationality (functional rationality and communicative rationality) limit the manifestations of less rational behaviour (instrumental and strategic action).

The e-mail messages are analysed in five main ways, focussing on communicative actions, communicative coherence, trust, implicit meaning and outcome in the form of reconstructed meaning.

- **Communicative actions**
  The actual e-mail messages are examples of social action and are classified according to the four forms of behaviour, namely instrumental, strategic, communicative and discursive action. These groups of messages indicate the levels of communicative rationality.

- **Communicative coherence**

  Communicative coherence (discussed in Section 5.2.3.1 of Chapter 5) provides a context in which the exchange of messages can be interpreted by the participants. Evidence of coherence is noted, as is evidence of symbolic use of e-mail (this was discussed in Section 5.2.4 of Chapter 5).

- **Trust**

  Trust may exist prior to the exchange of messages and may build or deteriorate over the period during which the messages are exchanged. The factors affecting trust (shown in Figures 6.7 and 6.8 in Chapter 6) and the stages of trust (given in Table 6.3 in Chapter 6) are used in this part of the analysis.

- **Implicit meaning**

  The messages are textual and hence Information[2]. When they were analysed, they were seen to contain not only explicit information, but that implicit information can also be embedded in e-mail. This was not foreseen in Chapter 3, where the classification of information types was devised, but is in line with the idea of rich information as mentioned in Chapter 5, regarding the hermeneutic and interpretive approach to communication richness and the CST approach. It is necessary to differentiate between the nuances which can be included intentionally by the sender and information which is unintentional and possibly peripheral to the discussion.

  Implicit information will be defined here as entirely non-textual (nonverbal or nonlingual). Most implicit information is *unintentional* and *oblique* and depends on personal interpretation by the person reading the message. The decision to use e-mail instead of another medium is one example of symbolic information being implicit, but there are examples where symbolic communication is more overt and hence *not* implicit. For example, the use of either a first name, or a first name plus last name, or a title together with initials and last name implies a decision regarding the degree of formality that is appropriate and the perceived relationship between sender and recipient. This is, however, textual and is, therefore, strategic action. Examples of truly implicit information will be pointed out when the text is analysed. Implicit meaning, because it is non-textual, depends on, and contributes to the context of the message and is often only recognised when more than one message is reviewed and the content of the messages is related. Thus a hermeneutic process occurs during which new text is understood in context and the interpretation of the sense of the complete text is adjusted in light of the meaning contributed by the new message and the implicit information. This type of information is related to tacit information (Information[4]) in one sense because of its nonverbal

characteristics. However, this is not tacit information. The emergence of this element within e-mail messages was not previously recognised.

Giddens [1984] identifies unacknowledged conditions of actions, unconscious motivation and unintended consequences of action as an inevitable part of the human agent's interaction with social structures. The implicit information included within e-mail messages has a link with these concepts, but is not any one of them *per se*. Implicit information will, for example, have unintended consequences.

Information which is not stated overtly but is nevertheless deduced from the text itself is not considered here to be implicit information. For example, the emphasis and subtle implications that the person wished to include are conveyed by means of the choice of words. These messages are usually intended to be understood and may be easily decoded. This type of communication will generally be classified as strategic action.

- **Reconstructed meaning**
  The learning, reconstruction of meaning and construction of meaning, are outcomes that are involved with the appropriation of information, that is, creating Information[3]. In this process the learner or active participant is involved not only with understanding information received, but also consciously and unconsciously, refers to his own activities and previous understanding. Evidence of this reflexive behaviour, or the reflexive project of the self [Giddens, 1984] is included in the analysis. Reflexive, self-conscious, behaviour is particularly common in modern society. Evidence of learning was sought from the exchange as a whole. This combination of activities is included as a form of communicative action.

9.3.3 Virtual Team One

This team consisted of five students whose home language was Mandarin and hence formed a culturally homogeneous team who were from a minority group. This team were all students registering for the first time. They never contacted the researcher after their team was registered and never posted any messages on WebCT. Attempts to contact them using the private e-mail addresses they had provided were also in vain with a number of these e-mails being returned as undeliverable. Only when Assignment 02 was due in did they suddenly reappear. At this point a spokesman e-mailed the researcher and said that they had been working independently via personal e-mail. They then forwarded copies of e-mail but this turned out to be unreadable. This team's marks were satisfactory with all members passing and two doing well (refer to Table 9.5). One did not write the examination and no supplementary mark was recorded so he may well have dropped out. His year mark was very low adding credence to this possibility. From the

marks it seems clear that this team did not all work together for Assignment 01, as they were given different marks.

Table 9.5: Marks for Virtual Team One

Assignment 01 (out of 20)	Assignment 02 (out of 30)	Year %	Exam %	Final%
15	15	65	58	62
16	15	63	76	70
16	15	57	54	56
16	15	77	66	72
15	15	20	987[*]	987[*]

9.3.4 Virtual Team Six

Three students formed this team initially and a fourth, who was looking for a team, joined them later. Two of the original three were registered the previous year (2000) for the first time and the third first registered in 1995, the member who joined as a stranger registered in 2001 for the first time. No communication of any sort was ever received from this group. They did not respond to any personal e-mails or messages on WebCT. They cannot be considered to have worked as a virtual team. No one in this team submitted a final questionnaire as a virtual team member, but they did get marks for assignments and did submit questionnaires indicating that they ultimately selected a different study option. The marks of this team were borderline (refer to Table 9.6). Only one student achieved a respectable year mark without which his final mark would have been less than 50%. The lack of success as a team cannot be attributed to their work as a virtual team, as they do not appear to have worked together in this mode.

Table 9.6: Marks for Virtual Team Six

Assignment 01 (out of 20)	Assignment 02 (out of 30)	Year %	Exam %	Final%
16	16	46	42	44
16	16	60	46	53
16	16	44	56	50
16	16	46	58	52

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[*]The code 987 indicates that the student did not write the examination but might have been given a supplementary examination, in this case no supplementary mark was recorded.

9.3.5 Virtual Team Seven

This team consisted of five students, all of whom were second years (registered in 2000 for the first time). The team registered late, too late for Assignment 01, but were welcomed onto WebCT on May 16, (the others were up by April 26). The team did not respond to any personal e-mails or messages on WebCT but eventually submitted an assignment and said they had been unable to access WebCT (there is no explanation as to what the exact problem was as they did not contact the researcher with any queries or problems in this regard). They said that they had communicated with one another via e-mail. They must, in fact, have had access to WebCT, as one did eventually post a message to it saying that they had completed the assignment and handed it in. They said they had not realised that the researcher also needed to get the e-mails but they would provide copies on disk. When these "e-mails" were read they simply consisted of sections of the final document submitted as Assignment 02 and no accompanying messages. Thus, this team cannot be considered to have worked as a virtual team. The marks of this team were reasonable with their assignment marks (64%) rather better than their below average examination marks (Refer to Table 9.7). This team did all submit final questionnaires, all very uniform in the comments made.

Table 9.7: Marks for Virtual Team Seven

Assignment 01 (out of 20)	Assignment 02 (out of 30)	Year %	Exam %	Final%
17	18	68	50	59
14	18	56	50	53
14	18	66	52	59
14	18	55	54	54
14	18	59	42	50

9.3.6 Virtual Team Three

9.3.6.1   Introduction

This was an interesting team. It started off with four team members; all were Afrikaans speaking males who had registered for the first time in 2000. Two of the four were cousins, both named for the same ancestor and hence both having the same name. This group did access WebCT. One of the four gave as his reason for selecting this option the fact that he had used an Internet option for a previous course and it had worked well.

9.3.6.2   WebCT Messages

Table 9.8 contains all the WebCT Messages of this team together with an interpretation of the significance and meaning of the messages. The messages have been translated from Afrikaans and where considered to be appropriate, censored, with these censored changes indicated by asterisks. Annotations within the text are indicated by means of square brackets.

Table 9.8: WebCT Messages from Virtual Team Three

	E-mail message	Research comment
1	Thurs Apr 26, 2001 11:19 from the researcher Subject: Group 3 Congratulations, you have succeeded in accessing the WebCT discussion group for Virtual group 3 for course X. I am the lecturer and in general will not be participating in your discussion unless specifically requested to do so. I hope you will find this an easy way of working. Regards YYY	All the groups received this message sent separately to each group. Here the researcher closed the message with her first name and surname. This is probably communicative action with the communicator and recipient in a social context. It should be clear, complete, in context and truthful (See Chapter 3, Subsection 3.5.2). As will be seen from messages that follow, the clarity (shared meaning) is in dispute, as the students thought that the lecturer would not be able to read their messages.
2	Wed, May 02, 2001 09:46 from cousin B Subject: ***** 1st **** Hello you guys !!!!!!!!!! My cousin and I have done the 1st assignment so C you and D [the other two team members] must please do Assignment 2. The assignment must be handed in on 21 May !!!!!	The subject heading of this message is startling. The asterisks have been put in place of very crude language. It would seem that this message was sent in a less than positive spirit, as the subject heading indicates a lack of appreciation for the first assignment and is very emotive. It would seem that these two are not aware that this message will be read by the lecturer /researcher. Presumably this message was fired off in haste and without due consideration. The format is informal, the content deliberately naive. The fact that they were meant to do this assignment together, as a team, online, seems to have entirely escaped these two. The assignment that they say they have done was not attached so that their team members could validate its existence or content so

	E-mail message	Research comment
		there is an implicit claim for unilateral trust. There is no truth claim in the form of practical discourse and the sincerity of the message would be questioned. The easier of the two tasks, which was worth fewer marks, is unilaterally appropriated and the expectation is expressed that the other two should shoulder the burden of the more difficult task. This message appears on the surface to be simple, clear and understandable. The "logic" of the argument - that since they have done some of the work the other two should do the rest - is superficially legitimate. This is an equivocal message and has been interpreted as being strategic action.
3	Wed May 02, 2001 10:55 from cousin A Subject:[Name of the researcher] Is it at all possible that we could get the questions in Afrikaans, as the assignments are rather unclear and we are not always sure what you want us to do? Thank you, A	This message indicates that the assignment might not in fact have been done yet despite the claim in message 2. The context of the message is therefore illuminating. The claim here is once again a communicative action that should be judged as to whether it is clear, complete, in context and truthful. It seems likely that these students have not understood how the discussion groups work and do not realise that the entire group can see all the messages.
4	Wed May 02, 2001 11:19 from cousin A Subject: Assignment 1 group 3 Our assignment. It is the attached file. 80% please From group 3 PS we are "related" (cousins) [the word related is for some reason provided in English]	The two did not wait for the answer their previous message. The joking note (80% please) and reference to their relationship seems to be an attempt to create a bond or a form of intimacy to build trust. It seems as though this message is intended for the lecturer, which is inconsistent with message 2 where they seem to think that the lecturer will not see the message. Possibly the choice of a subject heading is how they expect to route a message or attract the attention of the researcher. The last two sentences seem to be strategic action. The context created by this message casts doubt on the previous one (message 3). Are these two actually interested in getting a translation of Assignment 02? Are they planning on doing it despite what they said in their

	E-mail message	Research comment
		earlier e-mail (message 2)? The short intervals between messages make the context easier to interpret but make the inconsistencies more puzzling.
5	Wed May 02, 2001 13:37 from the researcher Subject: Subject heading I am amazed and upset that [ref to the name of the university] students dare to send a message with such a heading to a lecturer. ..... To come to academic matters. A team effort means that the full team MUST contribute, this was clearly stated as part of this assignment's instructions.	This was a fairly lengthy message of between 150 and 200 words. It was in response to message 2. The loss of message sequence is clear in that two further messages have been sent out since. The first paragraph might be discursive, trying to reason, albeit in a rather authoritarian way, concerning nettiquette. It also addresses the issue of the relationship between the members of the team and the researcher. It is definitely referring to the traditional university power structure countering the emancipatory nature of e-mail very explicitly. There are certainly some strategic action features. The second paragraph tends once again to be instrumental action.
6	Wed May 02, 2001 14:11 from the researcher Subject heading: re: [The researcher's name] Sorry the questions are only available in English. Mrs YYY	This is a rather terse message concluded using a more formal version of the researcher's name. This message does not invite any discussion. It implies justified authority. Hence, although this is a reply to a request (message 3) it is almost instrumental action. It is in the form of giving instructions or orders. The implied reference to rank by using the title reinforces authority. Thus a symbolic factor is behind this (see Subsection 5.2.4 of Chapter 5).
7	Wed May 02, 2001 14:16 from the researcher Subject: re: Assignment Group 3 I cannot open the file that you attached to the previous message. You must in any case print it and hand it in at the box ..... A B YYYY	As in message 5, this is instrumental action. Intimacy is again discouraged by the use of initials and surname.

8	Wed May 02, 2001 22:31 [from the third member of this team referred to as C in message 2] Subject: Administrative notice Hi. I did not have access to the WebCT system until virtually the due date for handing in the first assignment, and then converted back to the normal lecture groups. I had already cleared this with [the lecturer] and was under the impression that my return to the group would be conveyed. I actually did indicate that I would consider rejoining the virtual group from the second assignment. After considering the last few messages that have been exchanged I have decided that it would be in my best interests not to do so. I am rather surprised that I still have access to the WebCT system. This should be the last time that I post a message here, so goodbye. C CCCC	This seems to be a strategic message with some discursive aspects. It seems that the writer is partially trying to distance himself from the preceding contretemps. He also seems to be obliquely trying to justify why he did not participate in the teamwork. He certainly seems to feel that there has been a breakdown of trust (between him and the group or between the group and lecturer) and that this would negatively affect his results. This message was carefully worded and typed (no spelling mistakes, impeccable punctuation and capitalisation) and this illustrates the feature of e-mail to allow for reflexivity. The last sentence has a distinctly strategic note. Formal close with initial and surname.
9	Thur May 03, 2001 11:29 from the researcher Subject: Administrative notice I understand. I will withdraw your access to WebCT. Y Y YYYY	The brevity of this message is symbolic and also indicates learned behaviour. It limits the discussion to an instrumental level.
10	Wed May 09, 2001 18:59 from cousin A Subject: [A suitably respectful greeting does not exist in English, Dear is not a really appropriate translation] Mrs YYYY We are very sorry about the bad mannered and in appropriate message! We were under the impression that only we could read it and in addition were upset because we had arranged to get together at that particular time to work and only half the guys pitched up!!! But we received a SMS from C at about 12 o'clock that he was still in vvv and whether we had done the assignment already. ..... We	Discourse is evident, as the author tries to explain the context and intentions. This message is strong with respect to sincerity claims and includes a negotiation with respect to marks. A complex situation is addressed via e-mail. Care is taken in the way it is explained, indicating the usefulness of the medium in allowing reflexivity. The message has clearly been edited. This message also illustrates e-mail's advantage in allowing awkward situations to be addressed and resolved

	would understand if the first assignment was not marked. We would understand if we got 10% less if that was possible. .... Group 3	remotely. This message tries to reestablish trust. A respectful tone is adopted. No claims for emancipation are evident here.
11	Thu May 10, 2001 10:43 from the researcher Subject: Re: [A suitably respectful greeting....] Thank you for the message. I know that these things happen. ...	Reply to message 12 accepting the apology and hence the sincerity claim. Meaning has thus been successfully shared after a period in which two groups were in disagreement.
12	Thu May 17, 2001 09:37 from cousin A Subject: Assignment 2 Listen here group 3 we must begin with this assignment, it is jolly long, we must meet each other some time tomorrow here in the lab. I think probably at about 10 o'clock. SMS me if it does not suit you. [From] A	Fairly straightforward. As in message 10 a reference is made to an alternative, convenient form of technology, SMS. This alternative cannot be used to send longer messages and hence cannot replace e-mail but is portable and therefore it has a unique role. Unfortunately the group has still not understood that the team is not supposed to meet despite this having been restated explicitly in message 11.
13	Thu May 17, 2001 09:58 from cousin B Subject: Fine I will read up the stuff a bit and I'll bring it along tomorrow so we can begin to tame this assignment. See you 10 o'clock. Have a nice day. B	The two cousins seem to have a well-established relationship with trust being no problem.
14	Thu May 17, 2001 12:27 from team member D Subject: Re : Assignment 2 That's fine with me. My assignment is already partly complete. D	Team member D has not been evident on this virtual group until now. The reference to work already done is an attempt to build trust by showing an intention to contribute to the team effort.
15	Fri May 18, 2001 15:52 from team member D Subject: Re : Assignment 2 Please remember. The idea is that you do not get togther but always work via e-mail. Mrs Y	Probably sent too late, that is, after the team got together.

16	Separate e-mail message, not on WebCT Fri May 18, 2001 11:45 from team member D Subject: Virtual group 3 This is in connection with Assignment 2. As a result of various tests and activities I have not contributed to Group 3s team work at all and have decided at this stage to move back to my face-to-face group of the earlier part of the course. ... I ask that you accept my decision for academic reasons.	In actual fact it seems that the other two evicted this member from their group. The strong and well-established trust between the cousins seems almost to have been an obstacle for the integration of other team members. This is, however, simply a supposition.

9.3.6.3   Text analysis for Virtual Team Three

The e-mail messages are analysed in five main ways, focussing on communicative actions, context, trust, implicit meaning and outcome in the form of reconstructed meaning.

- **Communicative actions**

In Table 9.9 the e-mail messages are grouped according to the type of social action.

Table 9.9: Analysis of communicative action for Virtual Team Three

Social action	Efficacy	Information
Instrumental action	Succeeded	Messages 5 (2nd paragraph), 6, 7. These messages were all generally administrative.
Strategic action	Attempted	Messages 2, 4, 8, 14
Communicative action	Succeeded	Messages 1, 3, 12, 13, 15, 16
Discursive action	Succeeded occasionally	Message 5 contains a truth claim regarding the appropriate way to address people.

The communicative and discursive action messages contain claims using practical rationality and NOT truth claims in the sphere of theoretical rationality. There were claims of sincerity and self expression, but these seemed to be examples of strategic action and not authentic self-expression. Communicative rationality was limited, therefore, to normative validity claims only (practical rationality).

In the case of Virtual Team Three, functional rationality was not strong as there were no economic incentives and students could find alternative ways (by joining other groups) of
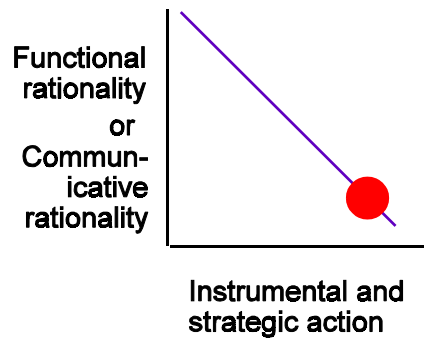
Figure 9.3: Relationship between different forms of social action - Virtual Team Three

acquiring the marks for assignments. (Marks are the equivalent of economic incentives at a university.) There were no stringent administrative controls in place preventing this and students did in fact opt to join other, class-based teams.

As a result of the low functional and communicative rationality, instrumental and strategic action were not constrained and many examples of these are evident in the messages from the team. Figure 9.3 illustrates the way in which the low communicative rationality allows a high degree of strategic action.

•   **Communicative coherence**

The authors of these messages seem to assume that communicative coherence will be lost but in fact the thread of messages 4, 3 and 2 provide a context and hence, causes some of the insincere strategic action to fail. These were sent out with relatively little intervening time (9:46, 10:55 and 11:19). Context *was* lost when answers were not received fast enough and a second message was sent out before the answer to the first one was received.

•   **Trust**

The factors affecting trust in and the stages of trust Chapter 6 are used in this part of the analysis. The analysis is presented in Table 9.10.

Table 9.10: Factors affecting trust for Virtual Team Three

Factor affecting trust	Comment
Disposition of team members	It is not possible to judge the personal characteristics of these team members with any degree of justification using this limited evidence.
How well do they know each other?	A and B knew each other extremely well. C and D did not appear to know the rest of the team very well but they were all in the same academic year.
Power relationship	The four team members all had equal status but the combination of two forming a power block may have played a role. The lecturer has a privileged and more powerful position as indicated in the comment on message 5. Messages 6 and 7 are examples where the form of name used in the message can imply authority. This is directly linked to text and is deliberate and hence is explicit, not implicit, according to the definition given in 9.3.2.

Incentives	Team member C had already established that it was possible to work in another team which was not virtual. Team members A and B believed that they had to negotiate with the lecturer if their work was to be marked.
Task	All the teams had the same task.
Risk	The risk was minimised for team members A and B as they were in contact regularly by other means.
Perceived importance	The fact that all four team members contacted the lecturer with respect to their positions indicates that the outcome was important.
Stage: 1. Transparent 2. Calculus 3. Predictive 4. Competence 5. Intensive	There were a number of separate trust relationships. Between An and B the trust was extremely strong, that is, intensive. Between the students and lecturer stage 2, calculus, was definitely the prime form. The relationships between C and the team, and between D and the team were fragile, either at stage 1 or at best stage 3.
Messages involved	This communication medium served as a vehicle for the breakdown of trust (messages 2, 3, 4, 5) but is also used to attempt to build trust (message 4) and is partially successful (messages 10 and 11, 13).

- **Implicit meaning**

The timing of, and time difference between messages 2, 3 and 4 carries unintentional information, which allows a reader to interpret the intentions of the senders as being insincere. Message 2 was regarded as an implicit truth claim for unilateral trust regarding the work supposedly done by team members A and B. The brevity of message 9 was regarded as deliberately symbolic.

- **Outcomes**

The inconsistencies regarding excuses were not referred to explicitly when the lecturer responded to the students and it is not known whether the students themselves were ever aware that they contradicted themselves and each other. At least A and B should have learned lessons regarding the use of e-mail in collaborative learning from this experience. The comment in Table 9.8 regarding message 9 referred to brevity being a learned response to contentious issues. This lesson was not, however, learned during this exchange of messages. The comment regarding message 11 refers to shared meaning resulting from the attempt by A and B to explain their behaviour and the lecturer's acceptance of the explanation. In terms of the tasks set, rather than the lessons learned regarding the use of e-mail in collaborative learning, this group avoided ever constructing knowledge as a virtual team. Self awareness or the reflexive

project of the self was evident in the contrast between the uninhibited message 2 and the carefully worded message 10 sent by the same people. Although not mentioned before, it was also evident in the fact that the lecturer consulted with another staff member before sending message 5.

9.3.6.4   Discussion

What can be deduced from this long history? This team did not do collaborative work online, but did inadvertently get involved in an equivocal online e-mail correspondence with the lecturer. The discussion provides examples of various forms of discourse, issues of power and features of the use of e-mail for social and symbolic purposes. The fact that this group could, and did use WebCT, but made no attempt to use it to work on the assignment despite frequent attempts to push them into doing so, illustrates the very significant barrier that students perceive there to be regarding the suitability of the medium for collaborative work. From the marks provided in Table 9.11, it seems that student C, despite his rather aggrieved self-justification, never did do any work after Assignment 01 and did not write the examination or any supplementary examination, whereas the other three managed to keep up.

Table 9.11: Marks for Virtual Team Three

Team member	Assignment 01 (out of 20)	Assignment 02 (out of 30)	Year %	Exam %	Final%
A	15	23	61	56	58
B	15	23	55	58	56
C	13	0	6	987[*]	987[*]
D	0	22	58	56	57

Issues of trust were very evident, with notable attempts at manipulation and strange inconsistencies such as asking for a translation and then, twenty-four minutes later, without waiting for a reply, submitting an assignment that needed some thought. Despite the fact that a fifty-minute lecture on nettiquette had been given, this group seemed to have no e-mail skills and this highlights the extent of this type of problem.

In the context of achieving the goals set in the assignment, the system cannot be considered to have colonised the lifeworld. This is true even though the conditions of ideal speech were limited (as the medium, e-mail, inhibits the natural means for achieving communicative rationality). This is because this team did not attempt to use e-mail to construct meaning related directly to the task being performed and therefore, it cannot be blamed for the fact that they failed to communicate effectively. Social factors played a more significant role. Apparently student C did

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[*]As before this indicates that the student did not write the examination.

not intend to do the first assignment as a member of a virtual team (see message 8). He then withdrew after "... considering the last few messages ...". Team member D gave " ... various tests and activities ..." as his reasons for not working (message 16). Team members A and B were in constant personal contact and had no reason to work with each other via e-mail.

The technology definitely did play a role in the relationship of the lecturer/researcher and this team. The breakdown in the trust between them would not have occurred had this technology not been used, but an understanding of the context, specifically that e-mail is known to cause dis-inhibition and inappropriate language, made this breakdown easier to overcome. The opportunity provided to "mend fences" without being exposed directly and the feature allowing the statements to be carefully prepared is not natural but is useful.

9.3.7 Virtual Team Four

9.3.7.1   Introduction

In contrast with the teams described so far, this team was made up of students who did not know each other. The team arose from the activities of the researcher, who contacted people who had indicated that they wanted to be in virtual teams but did not register as part of such a team. These students said that they had been unable to find a team to join and then agreed to work together. The team was mixed regarding culture, home language, sex, age and full-time versus part-time study. As such, it is in direct contrast with the very uniform Virtual Team One.

9.3.7.2   E-mail and WebCT messages for Virtual Team Four

The e-mail messages are given in Table 9.12 exactly as they were sent.

Table 9.12: E-mail and WebCT messages for Virtual Team Four

	E-mail message	Research comment
1	Thu, 26 Apr 2001 11:05:21 From: Researcher To: M You have choosen to be in a virtual team for INF152 but I do not seem to have a team registered with you as a member. Would you like me to give you names and e-mail addresses and/or telephone numbers of other students who are looking for a virtual team to join? Time is limited and the first assignment is supposed to be in by 2 May. I need to register the teams on WebCT before you can start working. Please let me know what you a planning to do. Regards [researcher]	Messages 1 to 7 are concerned with the process of setting up the team. Although these messages are about creating teams, they are impersonal and seem to give priority to practical concerns (functional rationality).
2	Date: Thu, 26 Apr 2001 12:19:58 +0200 From: M To: [researcher] My first choose was to be part of a virtual email team, but my final option was to attend classes normally. If there are still students that want to be part of a team, I'm willing to join them, but as on today I wasn't able to find anyone that wished to participate in this option. M	
3	Date: Thu, 26 Apr 2001 13:41:17 +0200 From: [researcher] To: N Hi, Have you succeeded in getting a virtual group together yet? Mr M is also trying to establish a group. [email address]. ... Good luck, please let me know if I can assist in any way. As I said, I am particularly keen to get some WebCT teams working. Regards [researcher]	Detailed instructions as to how to access WebCT were included here, but N never did use WebCT.
4	Date: Tue, 1 May 2001 23:13:51 -0700 (PDT) From: N To: [researcher] I am having a great deal of problems establishing a virtual team. The only reply that I have received is that of M. He also seems to be having problems finding others to form a group. Then, the other concern of mine	There was an initial problem with access but this was sorted out. The system seems to colonise the lifeworld to some extent as a result of this early problem. This student has no difficulty

	is that I cannot access WebCT. I can log on to the "Registered courses" on th UP home page, but as soon as I try to go to the disscusion group site for INF 152 it tells me access denied. I realise that the assignment is due today, so M and I will be comming to see you this afternoon. I apologise for the inconvienience that we have caused. Kind regards, N	expressing herself clearly, in context and completely, and hence ordinary communicative action is easily achieved.
5	Date: Wed, 2 May 2001 08:36:23 From: researcher To: N I have two more suggestions. K is likely to e-mail you. He is urgently looking for a team. His e-mail address is .... In addition on the WebCT messages a L has left a message that he is looking for a team to join. I have sorted out the reason that you could not access WebCT. Please try again. You may have an extension to Friday for this assignment.	It seems that no further contact was made with L. This might have been because N did not succeed in using WebCT immediately and hence could not link up with L.
6	Date: Wed, 02 May 2001 12:06:23 From: M To: [researcher] Can you please arrange a meeting for ALL the students that wish to participate in this. Miss N phoned me yesterday and neither of us can get a team together. I think it should be the best to get all the students together and then form the groups. When is the due date for Assignment 1? I've attend normal class today, and Mr X didn't say anything about this. My assignment is almost finished, but I need group members to check & join. Thanks M	M clearly does understand the purpose of virtual teams. He seems to doubt that e-mail can be used to create strong enough bonds between the team at the start.
7	Date: Wed, 02 May 2001 14:51:19 +0200 From: [researcher] To: M Hi, It is really difficult to arrange to get all the students together for any reason. Half of them simply do not	Typographical errors are an unfortunate feature of e-mail. Here the researcher referred to April when it should have been May. Hopefully the context made this error

	pitch up. For example at the first contact session only three of the forty students who said they wanted to be in virtual teams pitched up which was unfortunate as that was when I was hoping they would set up the teams. The next contact session is scheduled for this week Friday (4 April). I'll let you know the time and place first thing tomorrow. I have sent a separate e-mail to N nd to you regarding additional team members and extension of the due date for this first assignment. Regards [researcher]	obvious. Some discursive communication takes place as the researcher tries to argue for the creation of teams by virtual means. This is more practical rationality in the sphere of morality and law than theoretical rationality. It is a truth claim, referring to the "just" life (not to the "good" life or theoretical world).
8	Thu, 03 May 2001 08:33:48 From: N To: M Hi, M. I went to talk to [the researcher] yesterday afternoon, and we have been given till tomorrow to complete the assignment. I have also emailed another person who may be a potential member, but he has as yet not replied. ([K plus email address]) I will start working on the questions as soon as I am home again, and send what I have done via email directly thereafter. If we don't haer anything frrom K, then [the researcher] said that it would be alright for the first assignment if just the two of us complete it. Regards N	This team ultimately ended up with only two members, both of whom were older than the typical student and were working, although one had first registered in 1999 and the other in 2001.
9	Thu, 03 May 2001 10:15:29 From: M To: N Hi, I've almost complete my assignment as well ... (In Afrikaans, but I'll translate and forward my version to you. Is the due date Today or tomorrow? Must we submit our assignment via email to [the researcher]/ via the WebCT system? I'll send you my try within the next 2 hours ... M	It is not quite clear why M said, "...I've almost complete my assignment **as well** ... ". In message 8 N said that she had not yet started with the work. M seemed to be confused as to the meaning of "tomorrow" in message 8, this might be due to the asynchronous nature of e-mail which may make reference to time ambiguous.

10	Subject: Reply Date: Thu, 03 May 2001 10:41:08 From: K To: N Hi! Am K . I read your massage.Take me as one of the team.Contact me as soon as you get this massage so that we can work out assignment.	It seems that this student is not able to express himself easily (clearly) in writing. This would be a barrier to good online communication.
11	Subject: Re: INF152, assignment 02 and contact lecture Date: Thu, 03 May 2001 11:35:22 +0200 From: [researcher] To: [all virtual team members] INF152 Assignment 02 1. This assignment is as much about working as a team as it is about designing a system. Hence we require evidence that you have worked as a team. 2. Marks will only be awarded to: D Face-to-face teams if they have registered a group and recorded their discussions on a tape or digital recorder. Assignment 2 will be handed out when the team is registered. D Virtual teams if they are registered and actually do use e-mail or WebCT discussions to reach a consensus on their final answers. Assignment 2 will be on WebCT 10 May. D Normal teams if all team members are present during both of the case study lectures 10 or11, and 17 or 18 May. Assignment 2 will be handed out in class on10 and 11 May. It must me handed in during class on 17 and 18 May. Virtual teams Contact session Friday 11 May South Hall 9:30 to 10:20 Face-to-face teams Contact session Friday 11 May Roos Hall 13:30 to 14:20	

12	Thu, 03 May 2001 12:13:39 From: M To: N Hi, My first try is as follows. Please check and make corrections and let me know if I'm in the correct diorection / completely lost ... Please correct some language errors - I'm actually Afrikaans speaking Assignment 1 Question 1 - ..... Question 2a ..... Question 2b I'll mail you this later - have completed this question in my text book. Haven't got the book on my right now! Cheers	Student M indicated that he had virtually completed the first assignment (message 9) before joining the team. The discussion concerning Assignment 01 consisted of five messages (9, 12, 14, 15 and 16) and lasted from the morning of 03 May to Friday 04 May 10:25. These two students maintained close contact but did not comment on each other's efforts.
13	Date: Thu, 03 May 2001 12:22:24 -0700 (PDT) From: N To: K Hi there. welcome to the team! the assignment is due tommorow (4 may)... do what you can, and mail it to me/ M [e-mail address follows] asap. Thank you!	Possibly this was too vague as far as instructions for a contribution are concerned. It may have been interpreted as not genuinely inclusive.
14	Fri, 04 May 2001 09:58:34 From: M To: N Hi, Here are some notes on Question 1 & 2b. 1. .... Must we mention something about ... Tests are marked immediately & results are displayed 2. K.	It seems as though copies of this and other e-mail regarding the assignment were not sent to K. This might have been because M felt it was already too late for him to contribute. It did mean that trust was not built up at this crucial point.
15	Subject: INF assignment 1: Question 2b Date: Fri, 04 May 2001 10:04:28 +0200 From: N To: M CC: lecturer	M also made some suggestions regarding question 2b (see message 14). The chance to develop an answer combining ideas from both seems possible but

	Pls read through what I have typed, and change what you feel is necessary. I have received your answer, and I think we may need to incorporate the two into one. See what you can do. Thanks.	never actually occurs online. Thus, an opportunity for expressing theoretical rationality is missed. Word files were attached.
16	Fri, 04 May 2001 10:25:02 From: M To: N Pls check Now we have complete answers for Question 1, 2a, 2b Bye M	A Power Point file was attached.
17	Date: Fri, 04 May 2001 11:09:14 +0200 From: N To: [researcher]	The e-mail address used for this message was not the one usually used by N. Word files were attached and the system indicated the format (Encoding: base64) automatically.
18	Date: Fri, 04 May 2001 12:36:47 +0200 From: [researcher] To: N Hi, I tried to print your assignment but MSWord bombs repeatedly. Please either bring in a printout (with your names and student numbers on it as it will be marked by a student assistant and yet another person will enter the mark into the database) or amend it and resend. Regards [researcher]	This reply was sent directly to the address used in message 17 using the "reply" function of e-mail. The convenience of this feature was the root cause of miscommunication, as the address used was not one where the student reads e-mail.
19	Date: Fri, 04 May 2001 12:41:29 +0200 From: [researcher] To: N I am not sure that I have received all copies of all the e-mail you have exchanged. It is important for my research that I get them all, indiscretions will be ignored should there be any. I am only interested in the process not the people. Please could you forward any I might have missed.	Again, this was sent to the address used in Message 17. This incorrect address resulted in a breakdown of communication. Here the system definitely intruded on the lifeworld in a negative way.

20	Date: Fri, 04 May 2001 12:46:38 +0200 From: [researcher] To: N, M Hi, Has your team in fact only been the two of you? Please could you check whether you sent me copies of all your e-mails. It is very important from the point of view of my research that I get them all. Any non-related or non-academic remarks will be ignored. I am really only interested in the process not in who said what. Please resend the assignment that I could not print or else hand in a written copy. Please ensure that the names and student numbers of those who participated are on it. Thanks, [researcher]	Again sent to the address used in Message 17 but a copy was sent to M as well. Only M actually received the e-mail but the researcher was not aware of this.
21	Fri, 04 May 2001 15:01:22 From: M To: Lecturer Attached = all messages sent - Assignment 1	
22	Wed, 09 May 2001 14:23 From: M Please reply to this message to see if ALL group 4 users are using this WebCT facility. See you all on Friday M	Student M tried to establish contact with all members of the team via WebCT and to encourage them to attend the contact session on Friday 11 May. He assumed a leadership role. There was no response from the other team members. It seems that K (and L) had already decided not to participate by that stage.
23	Mon May 14, 2001 11:08 Hi Virtual Team 04, Very few of the virtual team students attended the contact lecture on Friday. As a result you have not received copies of the questionnaire - Questionnaire 4C - Virtual teams. 10 marks towards your module mark are allocated for completing this questionnaire. If you want it you wil now have to come to me to collect it. ..... Regards [researcher]	

24	Mon May 14, 2001 11:57 From: M Once completed with this questionnaire, can we submit it via WebCT / must we bring the hard copy to your office? M	This seems to be a deliberately subtle way of responding to message 23 and indicating that he does have the questionnaire and therefore must have been at the contact lecture.
25	Mon May 14, 2001 16:16 From: researcher Hi M, I'm not sure how you could submit the questionnaire via WebCT as you do not have it electronic form. I could find out if you could fax it. The assignment can be submitted electronically provided I am able to print it successfully. One of the first assignments could not be printed. Please make it very clear if something is being submitted for marking and the keep a look out for a response from me as to whether I could print it. I am now worried as to whether you submitted assignment 01 electronically as I did not understand that this was the case. Let me know immediately as I must ensure that your effort has been submitted to be marked,. Regards [researcher]	It is not clear what suddenly alerted the researcher to the fact that this team had submitted Assignment 01 electronically but unsuccessfully. It seems as though an almost subliminal message reminds her that this matter had not been resolved as the team did not reply to messages 18 and 19. Recollecting unfinished business by linking a comment to some previous event is common during face-to-face conversations. It is very interesting that it occurred here as well.
26	Wed May 16, 2001 10:13 N en I did Assignment 1 en submitted it electronically to you. (email) It was in normal Word format, and I'm sure that it was printable. M	This exchange reveals both strengths and weakness in e-mail from an administrative and technical point of view. The attachment could not be printed, even though it was considered to be in a standard format. The reply alerting the team to the problem (message 18) was not received, as N
27	Wed May 16, 2001 15:25 Hi, I have your message, I'll find it, try to print it, and come back to you. [researcher]	

28	Wed May 16, 2001 15:47 As you'll see from my e-mail to you non-WEbCT addresses, a message of mine apparently did not reach either of you as I replied to an address for xxx which was apparently bot a good address to use. The problem is that I could not print the assignment and then assumed that you had got my message and simply submitted a printed copy into the XXX assignment box. It doesn't matter much since we have discovered the problem. Please just drop off a printed copy to me personally or into my post box .... I'll see that it is marked. Regards [researcher]	had sent the assignment from an address where she did not receive e-mail. There was no compensatory habit expecting acknowledgement of e-mails so the fact that the message had not been received was not understood. Here we have a breakdown in sharing meaning even though the messages were not at all equivocal. In message 26 it is interesting how M, who is Afrikaans-speaking but communicates well in English and appears to type proficiently, often uses "en" instead of "and" showing that he uses email almost intuitively without being aware of himself.
29	Wed May 16, 2001 10:13 Hi there, sorry that I have been unable to reply sooner... things have been a mad house over here! I will email what I have done on the assign to you tomorrow evening, as I am having a lot of problems with my pc @ home. Everything seems to be alright now. :o) I am, however, having problems using WebCT, maybe you have a few tips for me? I think that we will also have to find 2 more members for our team. Again I am sorry for the delay, I hope to have something for you tomorrow evening. Thanx N	This message seems to be out of context. It seems likely that M contacted N prior to this message but a copy was not passed on to the researcher. N uses emoticons :o) to build trust with M. This is clearly symbolic and an aesthetic validity claim is made.
30	Thu May 17, 2001 11:21 From: M ALL GROUP 4 members Hi, there, First of all we must decide the application & classes we will use in Assignment 2. I think we should go for the Public Transport System - Expert system. This means that this entire system will be managed by computers - representing human brains. Example - if an	M seems to be trying to encourage the silent members by using capital letters to emphasise ALL GROUP 4. A more personal approach using the names of the other team members might have been more successful. The instructions on how to use WebCT (omitted here) are in response to the request by N in message 29. He seeded the

	accident	discussion with a suggestion regarding the choice of a topic for the assignment. He proposed a work schedule, explaining that he had other commitments, and suggested a way of subdividing the work. All in all he acted as an ideal collaborative team member. He also tried to find additional team members.
	WEBCT: Go to	
	I wish to complete this assignment before this weekend. Unfortunately I've got 5 tests en 3 assignments for next week and wish to finish this one as soon as possible. I'll send you ..... I'll appreciate it if you can have a look at .... so long. Then we can exchange work en make changes if needed.	
	-- [researcher] wants Assignment 1 - she cannot print it?!?! I think she is still using a old version of Word. Who will handle this? -- Heard of any new members is our team? -- Please send mail to .... -	The use of ?!?! is unusual for M. He obviously is someone who expects technology to work. The comment "Please send mail to ..." refers to a change of e-mail address.
31	Thu May 17, 2001 20:16 From N To M I have handed a printed version of our last assignment to [researcher] We can do the t-port system - Expert system, no problem. I have only just arrived home, so I haven't had a chance to get started. I will work on my part tonight, and hopefully have it for you 2morrow. We should be able to finish it tomorrow, or if I don't manage, I will email you my work by latest saterday evening (as I am working Friday night and Saterday during the day). But fear not!! It will be done ASAP! As it stands, I have no other members to join the team. Thanx for the tips for using WebCT ... I will try it out. Good luck for studying! :o)	M's oblique request in message 30 that someone else ensures that a printed copy of Assignment 01 is submitted, met with immediate success. N saw to this and within hours she agreed to the choice of a topic and undertook to do the section of work allocated to her. She has responded explicitly to the need for a rapid turnaround time expressed by M. Student N has a different style from M. She is more personal, refers to her own lifeworld more and actively builds trust by thanking M and wishing him luck but in general contributes far less in terms of concrete work within the online discussion.
32	Fri May 18, 2001 13:24 From M To N Thanks, Public transport system - expert system	M continues to try to develop the work collaboratively rather than just doing his section (message 32 and 33). He submits drafts and ideas

	Please check the following and made corrections ... Flowchart - think it must be similar to p495 - All components of an ES Ethical and Social issues - I couldn't find anything about this in Ch11. Think we should take this from Ch10 (DSS) ... Think we should sat something about the comparison to human and its + en - factors as weel as Solutions?	regularly each day and remained very focussed.
33	Mon May 21, 2001 13:48 From M To N Char. Of Expert Systems - We should discuss each & say where this feature plays a role in our specific Transport system. .... All components of an ES Ethical and social issues - I couldn't find anything about this in Ch11. Think we should take this from Ch10 (DSS) ... Think we should sat something about the comparison to human and its + en - factors as weel as Solutions?	N appears not to have responded or contributed the work she promised. (I cannot, however, be sure that I have copies of all the e-mail.) The repetition of the last two paragraphs from message 32 seems to act as a reminder that this is still outstanding. The ease with which text from elsewhere can be copied encourages this as a new e-mail convention.
34	Mon May 21, 2001 15:15 From M To N Pls check & add eth & soc issues. Not sure about flowchart. Thanks M -- Word 97 format.	M seems anxious to finish with this work and is signalling this by the short message and by encouraging N to add her section. The final comment indicates that the attachment is in Word 97 format and this seems to acknowledge the previous difficulties regarding printing out Assignment 01.
35	Mon May 21, 2001 20:068 From M To N Attached = Assignment 2	This message seems to be to the researcher and signals that M feels he has done his share and wants to end his commitment. It was not

	If N doesn't change anything to this, then this will be the final version M	evident what procedure would be used to determine whether this assignment was the final one and thus the version that should be marked.
36	Wed May 23, 2001 12:55 From M [researcher] Confirmation: 1. Did you receive my Questionnaire form .... I see that our (group 4) marks for Assignment 1 is not published yet. Can you please make sure that the marks are published as soon as it's marked? Thanks M	Subsequent messages were largely administrative and brief but two days after message 35 M asks for confirmation as to the receipt of assignments.
37	Wed May 23, 2001 13:28 Your assignment 01 was sent to the marker with the assignment 02 only on Tuesday this week so it is unlikely that a mark will be available before the end of the month. The reason it was sent to her late was because I was unable to print that assignment. ... [Researcher]	The convenience of e-mail is demonstrated by the speed with which the lecturer can respond to the query in Message 36.
38	Thu May 24, 2001 12:41 Will there be another assignment for XXX, or was assignment nr 2 the last one? M	
39	Thu May 24, 2001 12:47 Assignment 2 is the last one except that you also get 10 marks for completing the last questionnaire. [researcher]	

9.3.7.3 Text analysis for Virtual Team Four

The e-mail messages are analysed by discussing them with respect to social action (in Table 9.13), truth claims that indicate communicative rationality (in Table 9.14), context, symbolic features, trust, implicit meaning and outcomes.

• **Communicative actions**

Once again the e-mail messages are grouped according to the social action that they were judged to portray.

Table 9.13: Analysis of communicative action for Virtual Team Four

Social action	Efficacy	Information
Instrumental action	Succeeded Not successful	Messages 1 to 5 Message 3 regarding use of WebCT
Strategic action	Not evident	
Communicative action	Succeeded	Almost all the messages fall into this category. All except 10 succeed in being clear, in context and complete. These are classified in Table 9.14 according to the type of truth claim.
Discursive action	Succeeded to some extent	Messages 6 and 7

Table 9.14: Analysis of truth claims for Virtual Team Four

Truth claims	Effectiveness	Messages
Theoretical discourse	Attempted	Messages 12, 14, 15, 16, 30, 32, 33
Claims of sincerity, authentic self-expression	yes	Particularly messages 29, 31
Normative validity claims referring to ethical and social norms, practical discourse	yes	Messages 6 and 7

In this case, as far as Students M and N were concerned, functional rationality seemed to predominate. This is illustrated in Figure 9.4. The emphasis was on getting the work done. As a result instrumental and strategic action were not very evident (constrained by the functional rationality). This interaction between functional rationality and instrumental and strategic action are illustrated in Figure 9.4.
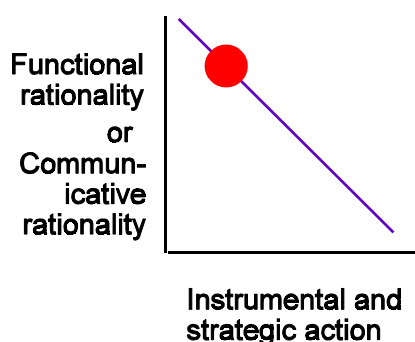
Figure 9.4: Relationship between different forms of social action - Virtual Team Four

Discursive construction of meaning was not completely successful at the theoretical level despite the fact that M invited this form of communication. Nevertheless, N and M communicated well at the lower level of communicative action as the messages were clear and complete and the quick response allowed context to be maintained. Thus, they shared meaning effectively. Communication broke down as far as K was concerned. This could have been circumstantial but there does seem to be a chance that he did not feel he was really welcomed into the team.

- **Communicative coherence**

Loss of context is most evident in the fact that the researcher was not aware that her messages (18, 19) were not received. This issue will be taken up under implicit meaning. The confusion in the meaning of 'today" and "tomorrow" in message 9 is evidence of the distanciation of time and place.

- **Richness of information**

There was some deliberate use of symbolic means to add richness to the information. In message 30 use was made of capital letters to give emphasis, and in messages 29 and 31 emoticons were used, presumably to create a friendly feeling and hence aim for identification-based trust. Short messages, such as message 34, give a message of limited time and urgency. Repetition, in message 33, acts as a formal reminder. Even though M was very clear in the way he expressed himself and seemed to think that e-mail has limitations as far as team building is concerned (message 6), he was also occasionally subtle and indirect in communicating via e-mail (messages 24 and 35 are examples).

- **Trust**

Once again the analysis is done according to the factors affecting trust and the stages of trust and the discussion is presented in Table 9.15.

Table 9.15: Factors affecting trust for Virtual Team Four

Factor affecting trust	Comment
Disposition of team members	As before, it would be presumptuous to try to determine the disposition of team members from the small amount of evidence. M and N were older students and both appeared to be focussed and confident. So little was heard of K and L that no statements can be made.
How well do they know each other?	Not at all.
Power relationship	M took a leadership role but not one of superior authority. The lecturer played very little part in this team's work.
Incentives	The incentives seemed to be high for the two part-time students M and N. There were no other convenient means for M and N to achieve their functional goals as they did not know each other prior to this project, were both studying only part-time and could not easily join other teams. K and L seem to have given up on the course already and hence had no incentives.

Task	The same task was set for all the teams.
Risk	The risk was reduced for M and N as they managed to stay constantly in touch via e-mail. They also made personal contact with the lecturer, reducing risk by sharing responsibility for the success of the team implicitly with the lecturer.
Perceived importance	M and N seemed to think that the project was important as can be seen from the effort they put into it.
Stage: 1. Transparent 2. Calculus 3. Predictive 4. Competence 5. Intensive	The transparent stage, in which swift trust predominates (as there was no time to build up a relationship), was the primary stage. There was some progress towards competence-based trust . M is very reliable and does what he says he will do.
Messages involved	N responds quickly when asked to do something (30 and 31).

- **Implicit meaning**

The fact that the researcher did eventually realise that messages had not been received, without this ever being explicitly said, also indicates that some of the features of face-to-face communications are carried as sub-text in e-mail.

This series of messages contained an example of a very different type of subliminal meaning (Information[4]), namely, that of becoming aware of something that was never said. This occurred when the lecturer realised that messages might not have been received (message 28). This is possibly connected to communicative coherence as there was no response when a problem printing the assignment was mentioned (message 18) and to the request in messages 19 and 20. This was not identified immediately (the expectation that you will get an answer within a particular time period is reduced) but was nevertheless eventually recognised. Refer also to the comment with message 25.

- **Reconstruction of meaning**

The literal breakdown in shared meaning resulting from messages not being received was discussed under implied meaning. Another example of breakdown occurred when software was incompatible (message 30). The response of one team member to an oblique request from the other (messages 30 and 31) was an example of shared meaning.

The way in which technology plays a moderating role in the duality of structure [DeSanctis & Poole, 1994] can be seen from the adoption of common strategies regarding e-mail. An example is message 33 where a section of text has been copied. But, as shown in the case of answering via "reply" (message 18), it can also be a problem. The constructed reality in terms of shared protocols and procedures does not necessarily assist in sharing meaning at the level of effective communication.

M's attempts to get the team working as a team, but using an understated way of doing so, was deliberate (refer to messages 30 and 32). This seemed to be the clearest evidence of a conscious effort to achieve the goals set by the lecturer as the ideal for a virtual team and hence of the reflexive project of the self.

9.3.7.4 Discussion

Trust seemed to be built up between M and N, and although participation might initially have been based on self-interest, there is evidence of unselfish, group-oriented behaviour. This agrees with findings by Ishaya and Macaulay [1999].

The system had a noticeable influence on the lifeworld with technological problems hindering teamwork. For example, the reason that K seemed to be excluded might have been because e-mail was used rather than WebCT, and this allowed team members to address messages to individuals instead of the whole group automatically receiving them. The use of e-mail instead of WebCT might also have excluded L.

As can be seen from the marks given in Table 9.16, the two inactive team members never succeeded in doing any teamwork at all and neither passed the course. Team member M did well and team member N was probably very lucky to have had him with her on the team, as this boosted her mark to pass despite the fact that she failed the examination and all tests.

Table 9.16: Marks for Virtual Team Four

Team member	Assignment 01 (out of 20)	Assignment 02 (out of 30)	Year %	Exam %	Final%
K	0	0	0	987	987
L	0	0	0	24	12
M	13	22	72	70	71
N	13	22	58	44	51

9.3.8 Virtual Team Five

9.3.8.1 Introduction

As in the case of Virtual Team Four, this team was made up of students who did not know each other. They were provided with a list of possible virtual students and contacted each other. They were all black students but of different years academically and both male and female. The team seemed to start off enthusiastically but eventually one member resigned. This student did not seem to have participated much but eventually got very good marks for the course. The team only submitted the first assignment, and only E seemed to do much work. He then resigned because of health problems and the team seemed to collapse as now two members had formally withdrawn and one did not seem to have ever contributed. Sadly, the one person left was the one who had indicated that she was excited about the project. In her questionnaire after the end of the research she was most negative, being one of the few who seemed to have felt most let down (see Subsection 9.3.1.3 questions regarding the team).

9.3.8.2 E-mail messages from Virtual Team Five

Virtual Team Five did not send as many e-mails as the two previously discussed teams. They did seem to use the telephone as well. The e-mails and commentary are given in Table 9.17.

Table 9.17: E-mail messages from Virtual Team Five

	E-mail message	Research comment
1	Thu, 26 Apr 2001 09:19:01 +0200 From: E Morning As discussed, this is my e-mail address as promised. Once you have read this message please e-mail, as confirmation, back to me and the rest of the group. Also send a carbon copy to YYY [researcher] on the cc address above. I still have to get one e-mail address from .... She'll respond at about 18h00 tonight. I just called the first four names on the list that Y [the researcher] sent me and that's you people. See attached. Let's try to have all the responses today still so that we may start communicating during this weekend if possible. Have a nice day and good-luck	The person who was expected to phone back apparently did not join the team. This student took the role of leader. He has a friendly and organised approach. The communicative action is one of sincerity and the message is clear, complete, and in context.

2	Date: 26 Apr 2001 10:11:21 -0000 From: F THANX A LOT [researcher] I AM CONFIRMING THE MESSAGE I GOT MY GROUP NO. I'VE ALREADY RECEIVED A CALL FROM E. HOPE THE OTHERS WILL RESPOND AS EARLY AS POSSIBLE	This student never seemed to get involved. I received no further e-mail from him. This is strange in the light of his immediate confirmation of membership.
3	27 Apr 2001 16:37:25 MDT From: G hi mam i just want to tell you that anything is fine, with regard to the group members that you have found for me.so because i found this message late i 'll make sure that i come and see you first thing in the morning on Wednesday. so thanks a lot i am alredy excited ..	This enthusiastic response promises good results.
4	Tue, 1 May 2001 13:36 From: E Hi Guys I called most of you today about my state of health. Never-the-less, I managed to read through the cchapter, not all of it unfortunately and if you check your personal e-mails, you will find my answers for part of the assignment. I did the 1st two questions and hope that you will agree with my answers. If not please ammend and Notify me via e-mail. Y [researcher] I have sent you a copy too. . Hope to see you soon.. E	E still seems to be committed to the group and to be making a considerable effort to do his share.
5	Wed, 2 May 2001 13:36 From: E Hi Guys I have not heard anything from our fellow mate, Mr. H. If any you guys, X/V ever heard from him, please inform me. I think our lecturer would like to know to... Enjoya.. E	This seems to be strategic action; an oblique way of telling Mr. H that E has no intention of allowing free loading. The implication is that F and G have contributed although they did not

		include the researcher in their mailing.
6	Thu, 3 May 2001 09:40:32 -0700 From: H "It is with great pity that I have to inform you guys that I am no longer in the virtual group. That simple means you are going to have to do without me. The reason was i thought I performed wellenough in accounting to acctually relax a bit but i didn't. sogood luckguys."	Seen in the context of message 5, it is clear that the intended recipient interpreted the ambiguous message correctly. This indicates that messages are read even when the recipients have not contributed to the discussion.
7	Date: Wed, 02 May 2001 00:11:55 +0200 From: E Morning Please see attached as promised. Any amendment, please let me know via e-mail/ call. Enjoy E	Clearly E does not expect all communication to be via e-mail.
8	Date: 2 May 2001 04:12:48 MDT From: G hi there i have a problem with attaching the info about Q2b pls get back to me if u can .we decided that everything is fine with Q1 and Q2a so u did more or less of what i did .	Technological problems. It seems possible that G had not done the work.

9.3.8.3   Text analysis for Virtual Team Five

The e-mails have been grouped according to type of social (or communicative) action in Table 9.18 and according to type of truth claim in Table 9.19.

• **Communicative actions**

Table 9.18: Analysis of communicative action for Virtual Team Three

Social action	Efficacy	Information
Instrumental action		
Strategic action		5, 6
Communicative action		1, 2, 3, 4, 7, 8
Discursive action		

Table 9.19: Analysis of truth claims for Virtual Team Four

Truth claims	Effectiveness	Messages
Theoretical discourse		
Claims of sincerity, authentic self-expression		2, 3
Normative validity claims referring to ethical and social norms, practical discourse		4

The causes of problems that this team experienced are difficult to identify fully from the messages sent. The feedback obtained from G in the questionnaire proposes that insufficient instruction on the use of the technology and the use of virtual teams was the prime reason for these problems. She is the only person who might have an explanation as to why team members dropped out of other teams (K and L in Virtual Team Four particularly, but possibly C and D in Virtual Team Three as well). The fact that the team used e-mail and WebCT is not fully explained (see message 4), but since the attachment option of WebCT was not used, e-mail might have been used only for sending attachments. Explicit reference is made to using the telephone (messages 4 and 7). These all imply that the technology of WebCT and e-mail were unfamiliar and hence a hindrance. Miss G's comments should be taken seriously. The year marks (given in Table 9.20) show that G's marks for assignments were better than her other marks, so the technology cannot be held responsible for all her problems. This is confirmed by the fact that although she felt that more preparation should have been given, she did not attend the preparation sessions as she"was busy".
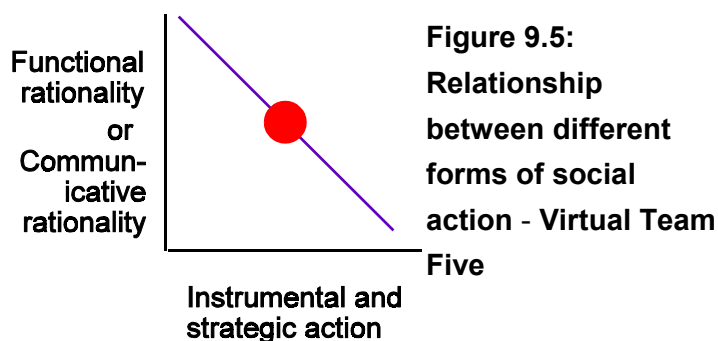
Figure 9.5: Relationship between different forms of social action - Virtual Team Five

Functional and communicative rationality, and instrumental and strategic action, are estimated as being moderate (refer to Tables 9.18 and

9.19) and hence, in this case, a balance is maintained as shown in Figure 9.5. The small quantity of functional and communicative communication is seen as a reducing factor. The strategic action was benevolent rather than malevolent (Table 9.19). This teams' messages were not analysed fully in the way that was done for virtual teams Three and Four as there is little evidence regarding the other aspects.

Table 9.20: Marks for Virtual Team Five

Team member	Assignment 01 (out of 20)	Assignment 02 (out of 30)	Year %	Exam %	Final%
E	15	0	52	58	55
F	15	0	67	36	40
G	15	15	50	44	47
H	19	19	82	70	76

9.3.9 Discussion

9.3.9.1 Technical issues

WebCT itself gave no problems. The technical assistant did make an error that initially prevented virtual teams from accessing WebCT, and since the researcher could never test the system from the point of view of the student (she was told this was impossible, as she had privileged access) she could not test this. The problem was solved quite easily once it was identified but this type of obstacle can demotivate students. There were more problems with attachments that could not be opened or could not be printed. A number of groups preferred to use their private e-mail to using WebCT. This could be because it allowed them control over whom they sent the mail to (and hence they could avoid being monitored) or it could be because they were more familiar with e-mail than WebCT.

The most serious problem concerning WebCT was the inadequate amount of instruction prior to using it. Any future use should ensure that it is demonstrated in detail. As Miss G, of Virtual Team Five says, students are reluctant to admit that they do not feel confident about technology. Hands-on practice would be the ideal way to address the problem.

9.3.9.2 Summary of findings

The results of this part of the research can be summarised as follows.
• Few students wanted to be in virtual teams, indicating the tendency of individuals to maintain the status quo. There was considerably greater interest among students who

were registered as students at least one year before the research. This might reflect timetable clashes or greater independence and self-confidence.

- Many students found it difficult to get teammates for virtual teams.
- Several members of the teams dropped out for reasons that were not provided. In general these team members never formed bonds or contributed at all beyond initial contacts.
- Several teams either did not use WebCT or did not include the researcher in e-mail giving rise to the suspicion that they did not work as a virtual team at all.
- Those teams that did communicate in an observable way via e-mail or WebCT did not discuss the work much. The construction of meaning was done offline and often as individuals.
- The well-known pitfalls regarding e-mail communication were encountered in the form of inappropriate subject headings and the uncertainty of intentions (was this a final version of the assignment or not).
- Some quite ambiguous messages were interpreted without difficulty.
- Evidence of reflexivity could be observed.
- Some evidence of learned behaviour and contrast between the e-mail of frequent users and relatively new users was noticeable.

9.3.9.3   Suggested improvements to the research design

The option of seeking team members on the general discussion list of WebCT would probably have been preferable to the method used of giving out a list of telephone numbers, as it would have introduced the students to WebCT. The fact that the researcher had to work through a staff member from another department in order to give students access to WebCT, and therefore thought that the teams should be set up first, coupled with inexperience using WebCT, meant that this option was not tried.

A hands-on session in the Informatorium for this group initially would also have been useful and there is a definite need to teach students how to use e-mail more effectively as these skills will also improve with use. There is also evidence that more senior students, particularly those studying part-time, see some potential in the use of Telematic education. However, the numbers of part-time students are very low compared with full-time students.

9.3.9.4   More far-reaching conclusions

The students participating in virtual teams perceived very little need to share meaning online as other channels were available. In addition, where they tried to do so, either in the context of discussing the task or in trying to influence team members, they found it difficult to achieve their

goals. In Virtual Team Three, strategic action was very transparent, and in Virtual Team Four, M's attempts to get a discursive process going online failed despite repeated attempts.

Team members who did not immediately join in inevitably fell by the wayside. The individual had to rely entirely on his own motivation and confidence, as the team were unable to help each other over the initial psychological barriers. The important feature of teams, mutual support, was limited to those team members who communicated immediately and appeared to identify with one another. The extent of any individual's contribution to the work was bounded by their ability to join the discussion, and hence technological barriers to access had the same effect as personal inhibitions and also prevented a team from bonding. When trust could not develop there was a high incidence of team members apparently being ejected from teams (D in Virtual Team Three, H in Virtual Team Five). This was based on action-based trust. Team members who did not even promise a contribution were placed in a position where they were forced to withdraw from the team. On the other hand rapid response, even if not accompanied by actual work, did serve to increase team loyalty and hence N benefited even though she did not contribute as much as M.

The messages contained evidence of a new form of information (implied information) and evidence of rich information despite the fact that there were relatively few messages. The fact that no joint construction of theoretical meaning evolved is an extremely important part of this research. However, the fact that it was not attempted indicates more that team members need to be introduced to this option and to be convinced that collaborative work is possible (assuming that it is, a point not yet proved or disproved). The evidence that an experienced user of e-mail (such as N) can communicate far more effectively than naive users such as G, reinforces the idea that these skills can be taught and improve with practise.

9.4 The independent face-to-face teams

Twenty-one independent face-to-face teams were registered, consisting of ninety-six students. Seventeen of those teams recorded at least one discussion. The length of time teams spent discussing an assignment varied from eight minutes to one hundred and seven minutes. Some met twice to continue working together. Others met only once. Here students seemed to have little or no difficulty in finding team members and the researcher was not involved in the process of setting up teams.

These discussions are not going to be analysed in great detail, as this is considered to be beyond the scope of this thesis and would require skills and resources beyond those available. The discussions have not been fully transcribed and they are not all equally audible.

The intention is not to verify whether collaborative learning is effective, it is accepted that this has already been proved. These recordings are reviewed in order to pinpoint differences between the ways in which the virtual teams and the independent face-to-face teams constructed meaning. This analysis would, for example, indicate whether the assignments set were appropriate for teamwork, whether students at this level of education can be expected to work together effectively on assignments of this sort, and whether the team structures were a problem. If it is found that the assignments were appropriate, the team structures were adequate and the students were sufficiently mature to work together in this way, then these can be excluded as explanations why virtual teams could not share meaning at the level of theoretical rationality.

9.4.1 Response to the final questionnaire

9.4.1.1 General questions

After the collaborative work was complete, eighty-seven students submitted a questionnaire regarding this study option. These students seemed to understand the purpose of the research (82.95% compared with 81.38% of the total student body) but they were less sure of what their study option entailed (78.41% compared with 85.85%). Despite having chosen this option, 12.5% did not use it for the first assignment and 9.1% did not use it for the second assignment. Virtually all of these students have the prescribed book, and their opinions of it coincided closely with those of the general student body, except that fewer thought it was expensive (only 26.14% compared with 37.66%). Their opinion of the course, and how difficult the assignments were, was also very close to that of the total student corps. Slightly more of these students were taking the course voluntarily (11.36% compared with 7.33%).

9.4.1.2 Questions regarding the team

Students selecting this option had team members that they were friendly with or had worked with before. Only 5.68% said they did not know any of their team members (compared with 11.37% overall). As in all other cases, the students made or retained friendships, and 77.27% predicted that they would continue to see most of the other team members, although only 55.68% knew them all quite well before. These students seemed very confident about their ability to communicate in a group and that the group had in fact discussed the work. Compared with the options selected by the total set of students, these seem more positive in all respects. Table 9.21 shows the percentage of students from each of the two groups who chose a particular option to describe their own participation in teamwork.

Table 9.21: Own participation in teamwork

		Face-to-face	General
Joined in discussions freely		86.36%	78.77%
Enjoyed discussions		73.86%	60.57%
No real discussions occurred		3.41%	13.82%
Listened mostly		6.82%	12.13%
I contributed a fair share of the work	more than	25.00%	21.65%
	about right	65.91%	61.75%
	less than	4.55%	5.64%

The comparisons between the responses of the face-to-face teams and the body of students as a whole regarding attitudes towards team members (Table 9.22) are close in almost all respects, but the face-to-face team members more often reported that they had not just swapped efforts and indicated more general participation by their team. On the negative side fewer said that they always prepared. These features were also evident in the tape recordings made, which will be discussed in Subsection 9.4.2. It is, however, not true that this would necessarily be the way independent teams would normally behave. The fact that team members had selected this option voluntarily, and that in most cases they were being recorded, would markedly increase the likelihood that they would remain focussed on the task on hand and would collaborate on the work.

Table 9.22: Assessment of attitudes of team members

	Enthu-siastic	Friendly	Reliable	Swap only	Social	Work	Prepare	Contri-bute	Pay attention
Face-to-face teams									
Always	11.36%	54.55%	23.86%	2.27%	4.55%	28.41%	10.23%	30.68%	38.64%
Mostly	44.32%	27.27%	42.05%	9.09%	5.68%	37.50%	35.23%	52.27%	39.77%
Usually	37.50%	12.50%	25.00%	14.77%	36.36%	26.14%	38.64%	9.09%	12.50%
Never	2.27%	1.14%	4.55%	69.32%	48.86%	1.14%	10.23%	2.27%	4.55%
Student body as a whole									
Always	13.65%	49.62%	27.21%	3.29%	5.31%	27.46%	15.08%	24.52%	32.52%
Mostly	36.56%	29.49%	34.29%	12.64%	10.61%	41.95%	30.58%	42.63%	36.73%
Usually	35.13%	11.20%	25.70%	25.78%	32.01%	19.97%	34.04%	21.90%	19.80%
Never	4.30%	0.67%	4.21%	49.79%	43.64%	2.36%	11.71%	2.44%	2.19%

9.4.2 Recorded discussions

Both the assignments set gave rise to rich discussions within the independent face-to-face teams but Assignment 02 was intended to be more far reaching and the average discussion time of nearly 45 minutes, compared with twenty minutes on average for Assignment 01 reflects this.

The examples in this section focus, therefore, on Assignment 02. Generally a very high percentage of the time was spent constructing meaning by means of discursive action and theoretical rationality.

9.4.2.1 Prescribed book

Throughout the discussions the students referred to the textbook for information. One use of the book was in obtaining definitions and longer explanations of terms. It was necessary for the students to know what Decision Support Systems and Expert Systems are before they could decide which of these they would include in their information systems. It was evident in the discussions that this meant that they had to consult the prescribed book, as they were not sure of these terms. A second use was to obtain examples. For example, at one stage group F11 allocated the issue of social and ethical issues to the boys in the group, and they went through the text book looking for examples of social and ethical issues and then tried to identify similar issues related to the system they were developing. Sometimes the students read aloud from the book. This was particularly the case with a group of young black men with a formal style of taking turns to speak who stuck to closely to the book and never really seemed to design a system of their own. This team, therefore, spent more time trying to understand the book, and hence reconstructing its meaning, than constructing their own meaning.

9.4.2.2 Related to own example

The students then related the definitions from the book to the applications they were designing to see if they thought they were applicable. The F11 team, for example, came to the conclusion that an Expert System could not ever be used with a public transport system and that the question was intended to see whether they recognised this. Sometimes a definition only partly helped in developing a concept. The students only partially understood the definition until they related it to a concrete example.

The students related the applications they were developing to their lifeworlds throughout. For example, the group who proposed a campus transport system referred to the problem of using the proposed ski lift on cold winter mornings to the distant medical campus, and the Afrikaans-speaking students mentioned they had not used the common South African "combi-taxi" system. A group of black students choose a transport system based on combi-taxies because "*I think it would be better because we understand it better, we use it most of the time, our parents use it.*"

9.4.2.3   Discursive action

Students often developed their understanding by presenting ideas, elaborating on each other's ideas, and questioning their own and each other's understanding. The use of examples was particularly helpful in trying to share meaning (reconstruct meaning) and develop new meaning (construct meaning).This was particularly evident in the attempts to identify differences between social issues and ethical issues. In fact the students often included, justifiably, security issues in with these. In this question that it was particularly evident that formulating their own examples was useful.

9.4.2.4   Difficulties with concepts

Generally the students had difficulty discriminating between the imagined application they were using, that is, the transport system or security system, and the technological component that included the Management Information System, Decision Support Systems and Expert Systems. Hence, in describing the purpose of the system, they would often give the purpose of their transport system rather than the purpose of the Information System. As a result they tended to spend the largest part of the time discussing aspects of the application environment (such as, when team V2 discussed whether they were going to have mini busses or large busses) and very little about how they would collect data or make information available. This confusion was also evident in the discussion of ethical and social issues. Some students (for example, group F7) spent most of the time talking about the safety and convenience of users of the overhead campus transport system they had described but they did quite explicitly say they must now talk about the "computer part". Other students (for example, team V2) never really made a clear distinction between the two, and although they incorporated aspects of technology, such as SMS messages to tell commuters if busses have been rerouted, and smart card bus tickets with voice recognition to prevent old ladies at bus stops from being mugged for their bus money, these were included in a general discussion of the transport system. This is evidence of the fact that students were more capable of examining concrete examples than more abstract issues, although, according to Piaget, they should already have developed to the point that they had little difficulty with abstract thinking. In future the difference needs to be stressed more during lectures and in the statement of the problem in this type of assignment.

9.4.2.5   Critical thinking

This mode of discussion encouraged students to contribute to, or criticise work presented by their team members. For example, when the two team members in team V2 who had prepared the brief purpose statement read it out, one of the others gave an abbreviated version "*Just two*

lines where you said it in ten". In this same group the other team members seemed eager to contribute to the ethical and social issues that were prepared before the meeting and were not prepared just to accept the work already done.

Students sometimes asked for additional explanations indicating once again that they were not prepared simply to accept concepts as self-evident. In the discussion of team F11 the person who often took the lead said, *"Has anyone read what a DSS is or am I the only one who does not know?"* This student's leadership style often took the form of questions. "*Is the fact that there are so many 'misaansyferings' (fraud) not also a special issue?*" Sometimes the style was quite formal. In a different team the discussion was began as follows, "*Okay Gents, we selected a Decision Support System and a public transport system. Let me just hear what you think about a public transport system? Maybe you can tell us about it Doctor? ..... Why a public transport system?*" The "chairman" continued to formally invite each member to add something and this recording was stopped after short intervals to allow them to discuss the topic off the record.

Several teams got off track as they had not discussed the intention of the question and therefore spent all their time on discussing the transport system or security system as an organisational system and ignored the fact that they were required to design an information system. This meant that they did not get to the MIS and DSS or Expert System. Team F11 is a good example of a more critical approach to the assignment. One student explicitly tried to analyse the questions that had been asked. As a result this team decided that the lecturer had given a choice of two applications (transport and security) and two types of systems (Decision Support and Expert) specifically in order to test insight, as an expert system was not applicable to a transport system. This type of discussion was completely omitted by the virtual groups and also by many face-to-face groups. Deciding on strategy in answering questions, which is part of this process of reasoning about the questions, must be done early. Few of the teams spent time reading or discussing the instructions given on the reverse side of the assignment sheet, and most did not discuss the way marks would be allocated. Hence, team F15 was unusual in that they remarked on the marks which would be awarded for originality.

9.4.2.6   Shared information

Occasionally students shared information beyond that found in the textbook. For example, when team F11 were discussing rail systems, one team member said that purely by chance she had heard on the radio that morning that unless decisive action was taken, South African railways would be out of business within fifteen years. As a result this team decided to name their system "Save the South African Rail and Commuter Service System". This information made what they were doing very relevant, particularly as they were designing a Decision Support System and could now identify the need for financial decisions to do with maintaining rolling stock, as this

had been noted as a reason why the current system was in trouble.

9.4.2.7 Productive use of time

The mood in different groups was vastly different. Group F11 laughed a lot, and hence took a while to settle down and make really productive use of their time. Other groups were very obviously aware of the recorder and were keen to make a good impression, as was the case already mentioned where team members were asked in turn for contributions to the discussion and the tape was switched off whenever informal discussion took place. Thus the communicative action with respect to clarity, completeness and context varied with some groups being quite frivolous, interrupting each other and speaking simultaneously and others being much more careful. The more spontaneous discussions appeared to be more fruitful even though they were not as efficient.

Some members of the teams did some independent work ahead of time, as they had been instructed to do, but this was not always the case. Team V2 explicitly say, "*I and Nickolai have prepared sections 1 to 4 - purpose, flowchart and ethical and social issues*". These two team members presented their work and this gave rise to an animated discussion. Team F14 also worked ahead, "*We have chosen these already*." "*We've got the flowchart, we've drawn it, you'll see* [to recorder]." But then got involved in a discussion on why they chose this. Most groups seem to have decided which of the systems they would develop before the recordings started. Teams would have had preliminary meetings when the question paper was obtained and when meeting times were agreed. Possibly the choice of system was made then.

It is not possible to judge the efficiency of the teams with respect to the amount of time they spent on the assignments, as the face-to-face discussions did not cover the work completely. Individuals did a certain amount of work before the meetings, time was taken arranging meetings and getting to them, and the work had to be written up after the meetings. In some cases it was clear that there was a scribe who was taking full notes during the discussions. In other cases it was not at all clear who was going to be responsible for the final copy or how faithfully it would represent the decisions made. The self-documenting nature of virtual teams is an advantage here.

9.4.2.8 Leadership

There was almost always one person who seemed to be able to help the team focus, directed the discussion, and tried to identify points where a decision had been made or could be made in order to ensure progress. This was not done in an overly dominating way and there was not much evidence of team members contradicting each other but even in cases where team

members seemed rather passive and disinterested initially and just accepted what the leader said, they tended to get involved eventually. For example, in team F15, there were three girls who seemed to find it difficult to get to grips with the project as is evident from the following exchange, " *I don't really understand what we must do*"; her friend reads out the assignment exactly as it is given; "*Oh ok, now its beginning to sort of make sense*." These girls have difficulty understanding how there can be ethical issues in a bus system, as they start off seeing it entirely from their own point of view: you get on, buy a ticket, drive and get off. But as they discuss further they begin to see additional points of view such as roadworthiness, management of busses and the staff and drivers, issues concerning how they drive, friendliness, and whether the bus is on time. This team did develop their understanding and at the same time, became more enthusiastic.

9.4.2.9 Instrumental action

There was no evidence of team members treating each other simply as resources unless the fact that a team member was clearly devoting her time to documenting the discussion could be seen in this light. Assigning topics to individuals or subgroups was also quite common.

9.4.2.10 Strategic action

There was not overt manipulation of team members. Awareness of the tape recorder would have influenced behaviour and hence the editing that occurred in switching off the recorder for off the record discussions was strategic but within the team itself no obvious strategic action was evident.

9.4.3 Conclusion

These discussions were reviewed in order to pinpoint differences between the ways in which the virtual teams and the independent face-to-face teams constructed meaning.

As pointed out in Subsection 9.4.2.4 there was evidence of far more discursive action in face-to-face teams than had been the case in virtual teams. In Subsections 9.4.2.9 and 9.4.2.10 it was noted that little instrumental or strategic action was encountered in face-to-face teams. Figure 9.6, therefore, depicts the balance between the forms of social action accordingly.
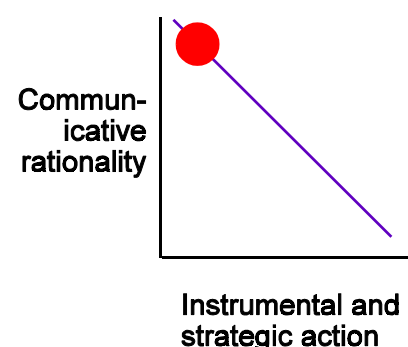
Figure 9.6: Face-to-face teams, high communicative rationality (theoretical rationality), low strategic and instrumental action

A number of questions were posed at the start of this section.

- Were the assignments that were set appropriate for teamwork? Since the face-to-face teams found them challenging and stimulating these assignments can be considered suitable. They revealed basic concepts, which the students had previously not explored fully, and hence areas where they had only a very superficial understanding. The way in which understanding was both shared and constructed during the discussions indicated that the students found the topics sufficiently substantial and relevant.

- Can students at this level of education can be expected to work together effectively on assignments of this sort? Although the students generally did not choose to do the teamwork independently, and those who did frequently remarked that the worst aspect was the difficulty of arranging times and places when they could meet, once the logistics were conquered the work set as collaborative tasks could be considered to be within the range of ability of average students. The students who were recorded were able to work together constructively. There was evidence, however, that in the teams that were not monitored there was a considerable amount of freeloading and that in all types of teamwork steps need to be taken to eradicate this.

- Did the free choice of teammates pose a problem? In this project no attempt was made to specify how a team should be composed or how work should be divided. Within the face-to-face teams there was no evidence that this was a problem although the task of writing the final document was not observable and might have created problems after the discussions were recorded. The fact that the recorders had to be returned immediately after the discussions eliminated them as a useful resource for the team.

9.5   Comparison between online and offline discussion

The type of discussion evident in the tape-recorded discussions is completely different from that of an e-mail discussion for various reasons. The team are physically together for a period of time and exchange literally hundreds of messages or comments during the period. They refer to the book, different subgroups or individuals are frequently busy in parallel, people often talk at the same time, and the process is not very orderly. There is a lot of joking and time is not all spent specifically saying relevant things. Thus social processes occur during which knowledge-based and identification-based trust is strengthened. There is a process during which people are literally exploring ideas, saying things spontaneously, and amending their points of view. The

process is not only more spontaneous but more fluid and dynamic.

The e-mail discussions involve far more work as an individual, and ideas are shared only once the originator has considered them and formulated them as text. The small number of students' e-mails makes it impossible to generalise from this research but there was no evidence of team members evaluating the work done by others or offering any suggestions as to how it could be improved. There was no evidence of any collaborative learning taking place whereas in the collocated groups it was clear that new ideas were developing and being shared within the group and that genuine consensus was reached. There was some evidence of relationships and trust being developed but the mechanisms and social processes were necessarily different.

Although, in the recordings of the face-to-face teams, it is impossible to identify all the team members present or always to positively identify a speaker in the recordings, the team members present did all seem to contribute satisfactorily even though there was usually an identifiable leader. The e-mail contributors can be easily identified but there was a definite high non-participation rate. The reason is not clear, as those who dropped out generally never did more than say they wanted to be members. They never contributed. Of the dropouts a significant number dropped out of the class completely. It seems, therefore, that already-at-risk students made a token gesture of joining these teams.

It would not be meaningful to compare the marks obtained for assignments by the groups choosing the three different study options, as none of them stuck religiously to one mode. The class groups had the opportunity to work on their assignments outside the scheduled lecture times and most did create word-processed final projects even though this had not been the intention. The virtual teams all communicated by other means as well, and the independent face-to-face team members had to do some work separately. In addition, as there was no attempt to match these groups according to ability, there could well be factors that biassed the marks that were totally independent of the study options. The complex scenario, compounded by the reasons given above, made it clear that this research was suitable for qualitative research and not for quantitative research.

9.6   Are these findings in line with other research?

As with much research into education, research reports on the use of online discussion groups and the use of online collaborative teams indicate that they generally do not perform significantly better or worse than face-to-face teams. The medium is not the only or even the most important factor . This is consistent with the "No Significant Difference Phenomenon" as reported in 355 research reports, summaries and papers - a comprehensive research bibliography on

technology for distance education accessible at
http://teleeducation.nb.ca/nosignificantdifference/. The corresponding site
http://teleeducation.nb.ca/significantdifference/ gives mixed results. Some are favourable and
others negative.

The general impression gained from a review of reports of a limited number of similar research
projects published over the past seven years is that students are hesitant to do teamwork online
[Leidner & Jarvenpaa, 1995]. Hence, although the students might achieve the same or even
better results they perceive the learning to have been unsatisfactory [Maki et al, 2000]. For
example, Ryan et al [1999] found in their research that classroom methods were rated
significantly higher than online learning regarding the degree of interaction, and this interaction
was considered important in understanding course content. This is supported by the findings of
Papaspyrou et al [1999].

> Similarly, Seale and Cann [2000] say, " *... only used by a small group but evidence for*
> *reflection is not overwhelming, there seems to be a distinct group of students who would*
> *prefer to take part in non-computer-based discussion, the most common reasons given*
> *for not finding the online discussions useful were that the discussion content was not*
> *useful and that they prefer f-t-f* ".

 Shaw and Marlow [1999] also say, " *The students prefer a more traditional learning*
environment, find online learning impersonal, derive little satisfaction ." Benbunan-Fich and Hiltz
[1999] call this 'process dissatisfaction', as the group have difficulties communicating online.
These last two researchers encountered this in their own research and report this finding as
being consistent with the research literature in general [Benbunan-Fich & Hiltz, 1999]. At a more
general level, Olesen and Myers [1999] report that there is evidence, both in their research and
other reports, that organisations resist change to their structures and this includes use of
groupware.

This is even the case where highly trained and experienced researchers are concerned. Lewis
[1998] says,
> "*Although many scientists find significant rewards through participation in collaborative*
> *research (encouragement, sharing problems and work, new ideas and intellectual*
> *stimulation), it is also a process fraught with difficulties and tensions. Indeed, it has not*
> *yet been proven that scientists even want to engage in more of it.*" [Lewis, 1998]

As was the case here, even those students who did think that virtual teams would meet their
needs, once they tried it decided against it for future use [Lind, 1996]. It seems clear that there is
insufficient reason for the vast majority of collocated students, at a residential university, to use

this form of teamwork [Alavi et al., 1995]. The need for a fit between the task and technology is fundamental in all adoption of technology.

A second common finding is that a number of students never get going [Tolmie & Boyle, 2000] and there is a significant dropout rate [Hammond, 2000; Maki et al, 2000; Warf et al, 1999; Wilson & Whitelock, 1998]. The results of the research done for this thesis support these findings.

The level of discussion also remains superficial [Seale & Cann, 2000; Tolmie & Boyle, 2000]. The initial email messages are crucial in assisting students to form bonds, and the response to these by other team members is equally important [Coutu, 1998; Leidner & Jarvenpaa, 1995]. Once again this research produced similar results.

9.6.1 Linking the findings to other success factors

Shao, Liao and Wang [1998] propose a model which can be used to predict the stability of a virtual organisation. This was discussed in Section 6.6.2.3 of Chapter 6. The four factors are purpose, boundary, technology, and connectivity. It seems probable that these can also be applied to the predictable success of a virtual team. The degree to which the team share a common purpose, the exclusivity of the team relationship (boundary), the fit between information and technology, and the communication options, may predict the degree to which a team will function well as a virtual team. In the research reported here the teams had a common purpose, team membership was not fixed (team members swapped teams despite instructions), it did not seem that novices could easily create a fit between the information they required and the technology, and the team members could communicate in other ways. The teams were, therefore, unstable, particularly where the team members were not experienced users of e-mail.

Skyrme is very optimistic about the potential of dispersed teams but does admit that failures occur.

> *" In my experience the biggest causes of failure are:*
> *   • not having a compelling shared vision*
> *   • not clearly identifying network participants and their respective roles*
> *   • having team missions and goals incompatible with indiviual's aspirations*
> *   • having dominant nodes (i.e. a competitive or pressure relationship rather than a truly collaborative one)*
> *   • not communicating sufficiently and clearly enough."* [Skyrme, 1997]

In the research reported on here it seems probable that the virtual teams were not convinced of the need to use e-mail, and hence did not share the vision presupposed by the project. The participants were not clearly identified before the project work began, and a solid commitment, backed by ensuring that it was difficult to join other teams, was not obtained. The size of the class concerned was the prime reason for these difficulties. Hence, individual's aspirations did not depend on the teamwork. Domination by individuals did not appear to be a problem here. In fact it was more evident in face-to-face teams. The quality and frequency of communication was not a problem once a team actually settled in to this way of working. This cannot be judged in any meaningful way as the weaker team members, who might not have communicated sufficiently even had they been integrated into the team, left early in the team's term or else were never integrated and did not participate.

Introna [1998] defines cooperation as that which "*... happens when people engage in the production of a work as if 'one mind or body.' Where there activities fuse together in a way that make the suggestion of separation seem incomprehensible.*" He argues that work requiring cooperation cannot be achieved at a distance, and hence that which is often referred to as telecooperation is in fact telecoordination [Introna, 1998].

9.7 Interviews

Since there were so few virtual teams that could be studied, the research was extended to include interviews with a number of lecturers and students. These interviews were semi-structured and the purpose was to collect informed opinions regarding the viability of using virtual teams in undergraduate collaborative work.

9.7.1 Interviews with lecturers

Seven university lecturers, all of whom had considerable teaching experience, and with the ranks of lecturer (one), senior lecturer (two), or professor (four) were interviewed. Of these three had mostly taught at a distance education university, one had taught almost exclusively at a residential university, and three had taught at both. All were involved with (or had until recently been involved with) Informatics, Information Systems, Information Science, or Computer Science teaching. The overall aim was to find out their opinions and learn from their first-hand experience with respect to online discussion groups and online collaborative work.

9.7.1.1   Participation in ListServes and Newsgroups

The first question that the people who were interviewed were asked was about their own participation in online discussions of any sort. This excluded the use of discussion groups in their own teaching. Although they all belonged to online newsgroups or ListServes, or had belonged at some stage, only two contributed to discussions at all regularly. All said that there is a very high percentage of "lurking" (people who read but do not contribute to the discussion) in open discussion groups. They also agreed that much of what is contributed is of only slight interest, and that a coherent series of comments on a topic is rare.

The reasons for not contributing, and in some cases for no longer even belonging to the group, were the volume of messages, the difficulty in evaluating, classifying and filing messages, and the proportion of useful material compared to the total volume. Thus, the cost in terms of time was too high in comparison with the gains in information.

Of the two who actively participate, one does so because he believes that well-known and highly-regarded people read the contributions and he wants them to recognise him as being active in the community of practioners. C sees this as, " *the only way of keeping in touch with the broader community*". The second, E, is involved with an online task group whose membership is by invitation only and active participation is the purpose of belonging to the group. She also described herself as "*I'm a pretty participative person. I will put an idea there even if I think its half good*."

In contrast the other interviewees admitted to being inhibited. D said she did not contribute as she did not have the time to formulate the material that she would submit in a sufficiently professional way. She said, however,
> "*They definitely do brainstorming on it [the newsgroup]. They sort of exchange ideas and frequently one would say 'I haven't thought about that, that may be a ggod idea to do when I do the next research project' or something like that*."

Others simply felt uncomfortable offering their opinions. This highlights the fact that there are significant psychological barriers to getting involved in online discussions, and that these even apply to mature and established academics. On the other hand the two people who do participate both said that young people (one spoke of ten and thirteen year olds, the other of sixteen to twenty year olds) do participate, particularly in synchronous online chat forums. Almost everyone agreed with the researchers' suggestion that online discussion was an accepted feature of the working world of people that are involved with technology. They also agreed that this meant that it would be sensible to introduce students to this activity at university

before they had professional reputations that they might be keen to protect. They also all agreed that there are skills that can be taught and learned regarding developing meaning through online discussions.

When asked about the type of discussion which occurs in the online groups accessed by these interviewees, most said that this tended to be factual, might consist of a section of code that would solve a problem or provision of links to relevant material.

B described them as,

> *"There has been very little ongoing discussion, someone has asked a question and the response has been a little authoritarian, either this is the answer or look at this link but there hasn't really been ongoing discussion now that I think of it."*

Three types of activity could be considered to be construction of meaning. Firstly, for example in ITforum, each month a paper is selected by one of the organisers and this is discussed. (My own observation of ITforum indicates that the vast majority of the contributions have nothing to do with the paper but are announcements of conferences and other less weighty matters). Secondly, as in the MingW C++ listserve, some open source programming is done.

H, who was an inactive observer in this list, said,

> *"No I think it, um for me it is incontrovertible that there is very serious work being done there and in fact in the whole sort of open source community it is sort of part of their culture is to be using newsgroups and it seems almost the primary means of communication. ... Their whole way they develop software is a big team approach and everyone contributing, everyone submitting bug reports, making comments, suggestions and it is very interactive, organic thing and its happening on the Internet on the newsgroups. So that undoubtably is working. I think there are a number of things that make it difficult to sort of break into that community. I don't think there's that much snobbishness but I think that in certain instances the culture is defined in terms of what things you can say and what things you can't say. Saying things in a certain way. I think that certain newsgroups are worse than others in this respect - they've got their own language and some are virtually impossible to follow what is being said because people are just talking their own language. But I actually think that the success very often of these type of groups is a build up of a type of a culture whether it is in language or something else and I think that the reason why I say part of the success of them it is replacing the face-to-face contact. I think groupwork in a face-to-face context has been proved to be a very good learning environment and there are definite disadvantages to doing this online you loose the personal contact. I think that there is a whole social aspect to face-to-face meeting that is missing there and very often this has to be*

replaced by a type of a cultural...

Another person believes that this works for a specific type of person who is deeply immersed in technology and who prefer socialising via technology. The third example was that of closed online task groups where there is a specific shared goal, funding, and deadlines.

9.7.1.2 Collaborative learning

There was a range of experience in using any form of group work as part of teaching and it varied from the use of formal methods, such as jigsaw, to totally informal groupware. The two most well-informed members of the group with respect to formal collaborative learning were at a residential university. D had incorporated it actively into her own research. She said that, although she believed it was useful, it was extremely time-consuming to plan and implement, and that as a result it was not longer used in her department although informal groupware was part of just about every course.

> E has used collaborative work in postgraduate honours courses but says, "*With the current ratio of students to lecturers in our environment they will either have to force me, or do a very good selling job on me, because I have done it and I know what the effect is on your time unless it is part of your research*."

Not only do the design and planning require extensive effort, but a lot of extra work is required to make it work and to manage the teams. In a small class of about sixty students she thinks it is rewarding and the team assignments are better and more stimulating to mark.

 C has a very different point of view. He has implemented a variety of different versions of online collaborative work and is very enthusiastic about this option, but he agrees that the most formal of these requires some preparation. His courses are at Masters level and have small numbers of students, but he also refers to successful use of online discussions in first year and second year courses. These seem to use open discussion forums which are not integrated with teamwork [Cronje, 2001].

Of the three lecturers who taught at a distance teaching university where the number of students registered for undergraduate courses is extremely high, only one was even vaguely interested in the idea of groupwork. H had set up his own discussion group for a second year course which had run for three or four years. It had been quite successful, although it was voluntary and not linked to teamwork per se. He had recent experience in using groupwork in a workshop for teachers changing from Pascal to Delphi and was *"really quite astonished at how well it worked"*, but he did think it would be difficult to incorporate into a distance education course. He believes

that it would be essential to convince students that it was in their interests to work in this way, and was doubtful that it would reduce the amount of marking. Another senior lecturer, F, had herself participated in online group work as a student in the M Ed class. She said she would exercise great caution and would use it only at postgraduate level. She sees it as being terribly inefficient. B has not used any teamwork in his teaching, but is convinced that it requires extensive management and would be out of the question in distance education. He says that this is the impression he has gained at conferences. Collaborative work is successful only where there is a low student to teacher ratio. His evaluation of teamwork in Delphi certificate courses was "*spectacularly un-useful*" in contrast with his colleague G. He believes that the idea that students would assist and support one another in teams is facile. A has no experience in collaborative teaching but would be interested in trying it out at undergraduate level with a limited number of students as part of a Telematics option at a residential university.

9.7.1.3 Virtual teamwork

Only C has used online or virtual teamwork in his teaching. Two of the other people, F and E have participated in virtual teams as students. C remains enthusiastic, but neither C nor F is keen to follow the same route. One explanation of this relates to the purpose of the course being offered. The M Ed course offered by C focusses particularly on the use of technology in education, hence this serves a dual role of permitting students to learn about the topic by using it and in fact gaining from collaboration on the assigned work.

> E adds this specifically in her remark, "... *it would depend on whether one of my objectives was to teach them how to work in groups*".

Various lecturers refer to the difficulty of convincing the students of the need to work this way. It seems, therefore, that Information Technology lecturers, which all the lecturers other than C are, are not convinced that this is a workplace skill or lifelong learning skill that they should be teaching their students, and see it more as a technique that should be convenient and efficient from the point of view of the teacher. B, for example believes that a lecturer can discuss roles and responsibilities in collaborative work with students. He, himself, works from home quite extensively, and hence has first-hand experience of using technology in order to facilitate working with others on projects. He believes that the nature of the work determines the usefulness or otherwise of technology.

9.7.1.4 Course level

Many of these teachers were generally sceptical of the use of collaborative work, let alone virtual or online teamwork, and so they did not consider it useful at any level. C, as the main exception,

sees online teamwork as a learned skill that can be taught at any level and that consists of conventions. He sees the use of the Internet as being part of "*... an organic growth of society*". Some of the others speculated on where it might be used despite having expressed reservations. F would only use it at postgraduate level with few in a group and she believes it is essential that the group get to know each other beforehand. She is strongly opposed to the idea at undergraduate level. G on the other hand believes that students should be encouraged to work in virtual teams, or to participate in newsgroups, from first year so that they can reap rewards by second and third year. D would like to use WebCT at all levels, and to make online discussion groups available as an alternative to face-to-face groups so that the excuse that the group could not meet can be eliminated. She believes that it will take time for the students to master working online. She believes that part-time, off-campus postgraduate students will benefit most, and already have many of the skills. However, paradoxically, these smaller groups are the responsibility of a single lecturer who will find it most difficult to organise online activities. E disagrees about the part-time students. She would also prefer to use this at postgraduate level, but only for full-time students as the part-time students are too difficult to organise into teams. (This is because these part-time students are very independent, and have tight schedules, and hence find it more difficult to co-ordinate their activities.)

9.7.1.5 Type of assignments

C sets a variety of assignments for online teamwork, but creativity and emulation of social activities play a large role in these. He is a strong supporter of constructivism. One of his previous students, F, says that the lack of structure of this type of assignment can make virtual teamwork more difficult.

> To balance this C says, "*... particularly with cooperative constructivist work, and Internet work, you have to be draconnic in setting the targets and the tasks and schedule*."

D suggests that assignments would need to be devised that introduced students to the idea of virtual teams gradually, with very few marks for the initial assignments as they acquired the skills and developed routines. G has a suggestion that is entirely the opposite and tries to address the problem of incentives. He suggests setting a project that is quite daunting in its scope, and particularly the number of concepts and depth of understanding required. He then suggests that students are told that they can choose whether they do it alone or as part of a team, but that the amount of work will make it very attractive to be in a team. This allows for the difference in learning styles.

E suggests unstructured assignments where answers are not immediately available.

9.7.1.6   Participation by lecturer

 C, who has considerable experience in running online discussions, said that students need to be aware of activity in the discussion group, and that it is counter productive to use FAQs and other devices to reduce this. This "background noise", or virtual presence, reminds them that the group exists and encourages them to use it. He also related that when he deliberately played a less obvious role (in response to being told that he had a very high presence in the discussion, which he interpreted as meaning that he was being prescriptive and instructive), students complained that they were being ignored and got insufficient feedback. He now believes that the lecturer must speak at least once every two days even if not actually adding anything. A personal message from the lecturer gets response from the students. G had similar, first-hand, experience with an open discussion group. He had participated in the discussions regularly for two or three years, and then, as a result of workload stopped contributing. He found that the discussion quickly degenerated into a "whinge session" with students complaining about the prescribed book, course, assignments and everything else.

The actual style and values that the lecturer portrays are considered to be very significant. F was generally in favour of a middle road between a constructivist and a controlling or behaviouralist approach. She suggests that interim versions of projects should be posted. B particularly believes that it takes skill to intervene successfully, and that this intervention carries information concerning the values that you have regarding group work. For this reason he does not believe that assistants can be used to monitor the discussions. D requires the open discussions for the Telematic courses to be read by the lecturer every day. A also thinks that personal involvement is necessary, and that this would only be feasible with one hundred students or fewer.

The participation by the lecturer is one of the elements that these lecturers thought would be most demanding. Ideally the lecturer is only a facilitator, but there are still administrative problems that need to be attended to, and the one example of consistently successful groups, that of C, seem to depend quite significantly on the personal energy of the lecturer.

9.7.2 Interviews with students

It was not possible to follow up the virtual team work with interviews with the students who had participated in the teams. Instead five interviews were carried out with students who were registered as Telematic students for the same course in the following semester. These students were not repeating the course, as is the case with the majority of the students registering in the second semester. The Telematics version of the course does not include any lecturers. The

students are given several assignments to do, and they write class tests, module tests, and eventually an examination similar to the one set for the first semester. There are online quizzes, very brief summaries of chapters in the prescribed book, and schedules of tests on the WebCT site, and the lecturer involved responds to messages on the discussion facility.

These interviews did not contribute greatly to the idea on teamwork online as this was not a feature of the Telematics courses that they were taking. These students were all working but did not necessarily have easy access to e-mail at work. One who was an articled clerk said that junior staff members were not allowed Internet access. All of these students had used e-mail, and two of them who had worked overseas for a time maintained friendships using e-mail predominantly as a channel of communication. Some of the students were registered for other university courses where e-mail (not WebCT) was used to communicate with off-campus students. This was apparently not as reliable a service as the "institutionalised" service offered for the Telematics versions of the Informatics course.

9.8　　　　　　　A depiction of the reconstruction and construction of meaning

9.8.1 Introduction

The graphical representation of the role of information in collaborative teamwork which is given in Figure 9.7 has emerged from the interpretation of the research in the light of the philosophies and theories reviewed in chapters 2, 3 and 4. The reflexive project of the self and communicative rationality are incorporated specifically. The organisational or social factors and technologies discussed in chapters 5 and 6 have also influenced the interpretation. Trust and communication richness were the two factors identified as significant.

The elements depicted contribute towards a team's ability to develop a product or construct reality. In the representation the team members A, B, C and D, start off with individual views of the world or individual understanding. Using one or more of the social actions which express communicative rationality, they exchange ideas and build up shared understanding or reconstruct meaning. In cases where a team is working together to develop a product, this shared understanding will be an important factor influencing the degree to which the team can collaborate. Shared understanding and the combined vision incorporated in the prototype or incomplete product are appropriated to form a new individual perspectives. The fact that there is
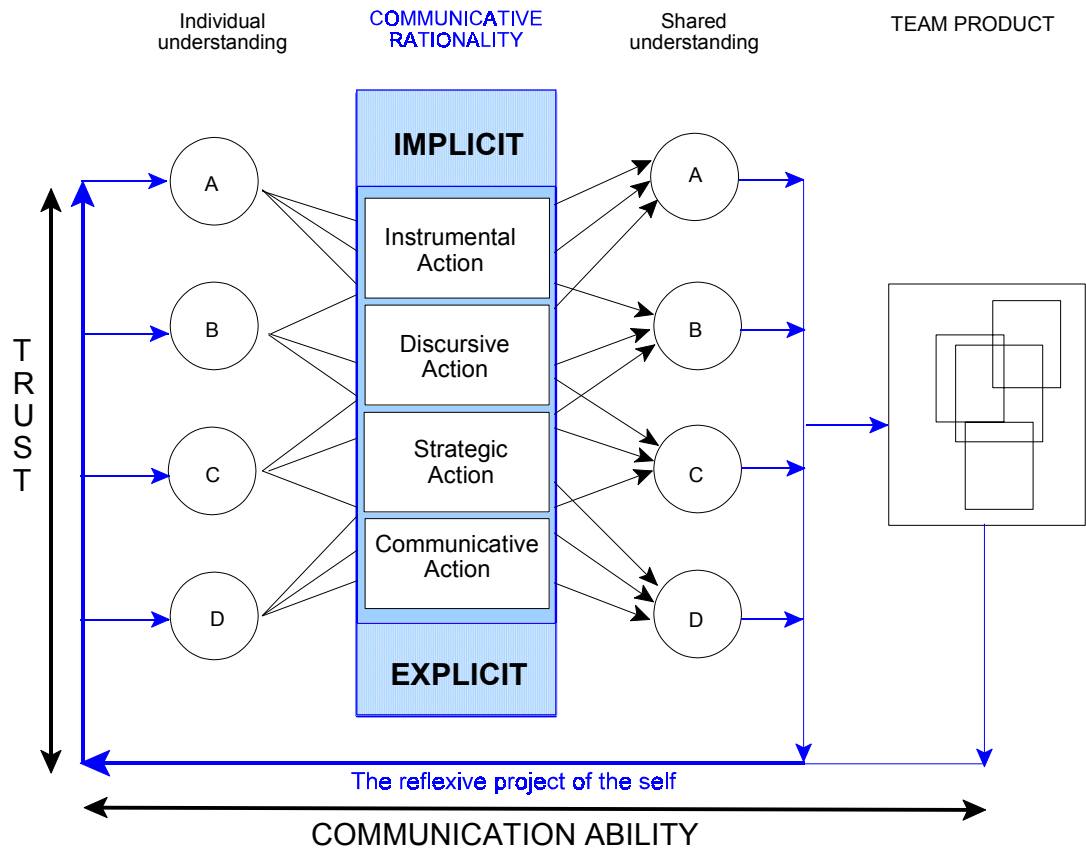
Figure 9.7: A depiction of the role of information in collaborative teamwork

a cycle of meaning corresponds with the cyclic nature of Mingers' Meaning System shown in Chapter 3, Figure 3.3 and the model of the teaching and learning process in Figure 3.2 (adapted from De Villiers). It this cycle the information becoming enhanced and increasingly rich. The cycle of meaning contributes to the reflexive project of the self as self-identity is modified as a result of input from day-to-day life social behaviour and discourse [Giddens, 1991: 70].

In the depiction the social actions are shown as having both an implicit and explicit side as discussed in Section 9.3.2. This indicates that messages can contain non-verbal, largely unintended information.

Two sets of factors that are of interest in this thesis are represented as two dimensions. These are factors affecting trust (refer to Section 6.8 of Chapter 6) and factors related to the intrinsic nature of, adoption and use of communications technology (refer to Chapter 5). The psychological distance between the team members, which is determined by the amount of trust (and is closely associated with time and information as was discussed in Chapter 6, particularly Section 6.8.5), will affect the processes of developing understanding, with increased separation

resulting in less information being shared. This may mean that parts of the product are developed separately consequently a more fragmented product.

The second dimension reflects the ability of the user and the medium *together* (called the communication ability) to communicate rich information. A lean communication ability will limit the amount of information that can be shared and will also contribute to a fragmented end product. Here a lean communication ability is considered to be not only due to a medium which has a narrow bandwidth, and cannot transmit all the subsidiary information and cues, but also a medium that requires skills, or access, which are not available to the person using it. The skills may be technical or social. Hence, one particular individual may only be able to communicate lean information using a given medium (for example, text to an illiterate person) and someone trained to use it optimally may be able to transmit very rich information using the same physical resources. Within a team, some members may experience the medium as more or less accommodating than others. Similarly, the receiver of the message has to be able to interpret the message within the context of the technology as well as other more traditional contexts, such as culture.

9.8.2 Application of the depiction to virtual teams

During the virtual team discussions reproduced in Section 9.3, strategic action, instrumental action and communicative action at the non-discursive level were all evident. Thus, in Figure 9.8 these forms of social action are highlighted. This was due to a combination of factors affecting trust and use of the technology.

The various members of virtual teams had varying levels of cyber skills and this limited their ability to use e-mail effectively. In Figure 9.8 this is represented by showing B as not contributing to the discussion at all, and C communicating with only some members of the team (A and D) as would be the case where individual e-mails are sent to only some members of a team instead of using WebCT discussion groups which ensure that everyone automatically receives the messages. Inhibition and poorly worded messages also reduce the quantity of information. This illustrates the fact that some team members can successfully use the communications medium, but that the same medium can be used to exclude others, force them to drop out, or limit the degree to which they participate. (Ideally the representation should show separate barometers of communication ability for each team member but, because this would complicate the representation, an "average" is shown.) The quality of the information depends on the communicative rationality. The undeveloped trust caused by the short length of the relationship, creates another barrier. Both of these factors reduce the amount and quality of information shared.
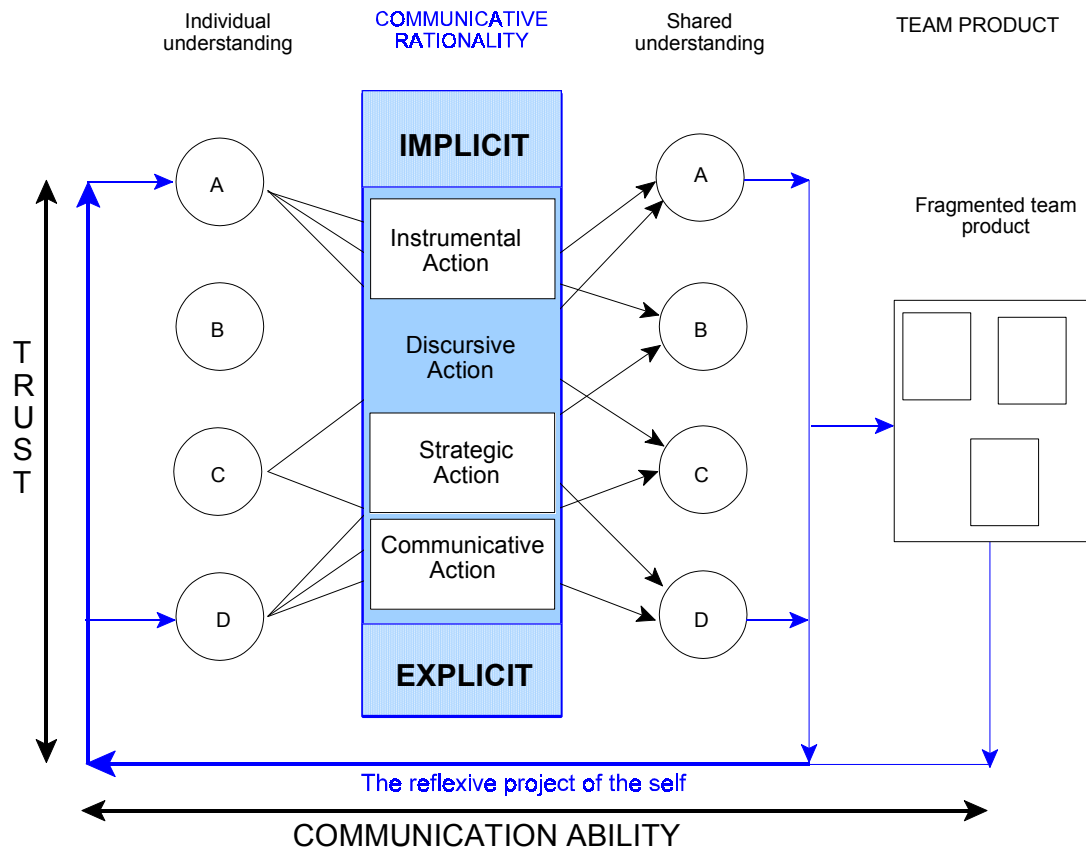
Figure 9.8: Depiction applied to virtual teams

The assignment ultimately produced was a collection of separate individual contributions which were not integrated. Some team members did not contribute to it at all. This is illustrated in Figure 9.8 by the fragmented task produced.

This representation indicates two distinct consequences of use of a medium such as e-mail, the degree of collaboration of individual team members and the quality (fragmented or integrated) of the product developed.

9.8.3 Application of the depiction to face-to-face teams

The representation introduced in Figure 9.7 is adjusted to represent the communicative rationality of face-to-face teams (Figure 9.9), and the way this contributes to the development of constructed reality. Here the communications ability available during face-to-face conversation allows rich information to be shared (communication richness is high) as the team are accustomed to expressing themselves in this way. How rich the transmission is will be influenced by cultural and technology skills factors such as whether the individuals are speaking their home
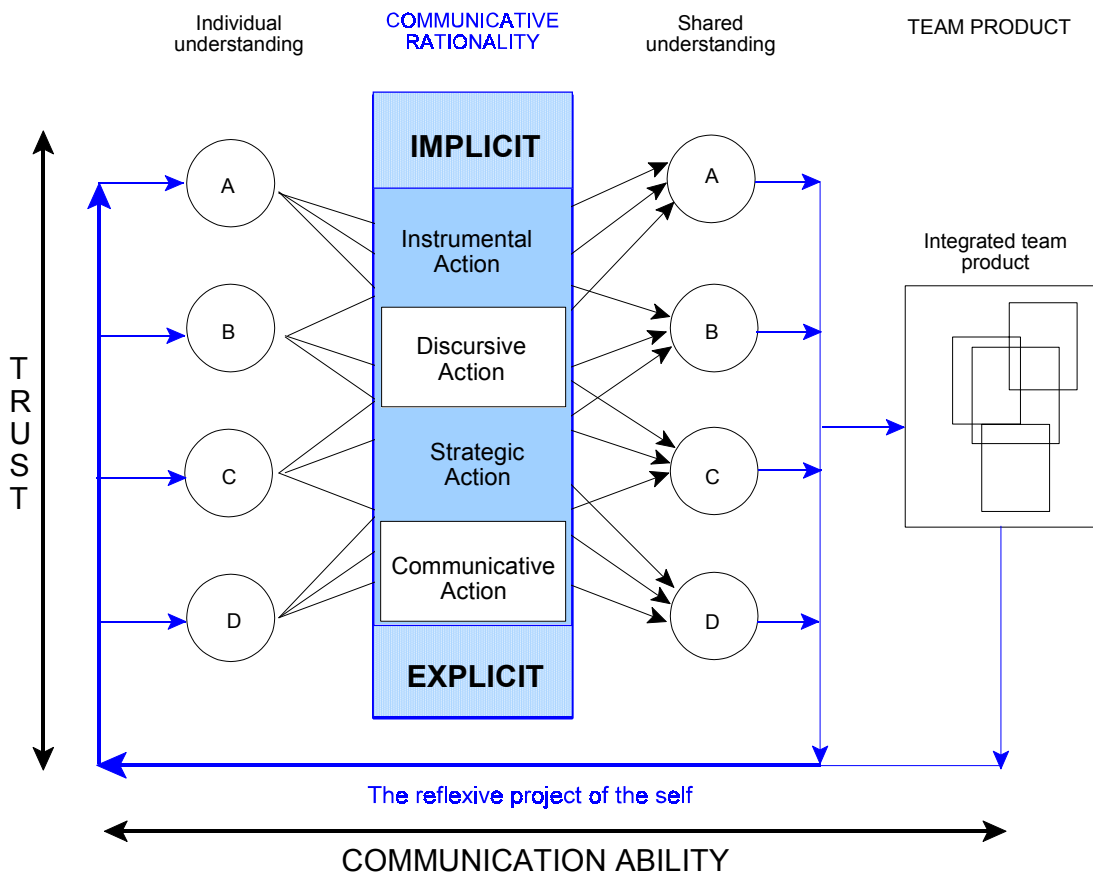
Figure 9.9: Depiction applied to face-to-face teams

language and how conscious they were of being recorded. The trust factors were less likely to be negative as the teams were allowed to select their own members and were in fact encouraged to choose participants with whom they felt comfortable. The teams were specifically told to use their home languages as far as possible. Considerably more discourse, and less instrumental action and strategic action, was evident in this type of collaboration, as reported in Section 9.4. Hence, communicative action and discursive action are highlighted in this version of the representation. All the team members participate to some extent and private, exclusive conversations were less common. Hence, the representation shows lines of communication between all team members. The team product is far more integrated in that it was produced as a genuinely collaborative effort.

9.9 Answers to some of the research questions

9.9.1 How does cultural homogeneity affect trust in a virtual team?

The number of participants is too small to make any findings in this regard. Amongst the virtual teams only two members of Virtual Team Three, and one member of Virtual Team Five formally withdrew. These teams were both culturally homogeneous. In Virtual Team Four the two white students were active and the two black students were not. As reported in Subsection 9.3.7, one of these seemed to blame a lack of technical assistance for her inability to join in rather than being excluded by teammates. The fact that only Virtual Teams Three, Four and Five could be monitored at all means that the apparent cohesion of the other teams cannot be assumed to be real.

9.9.2 How does culture affect learning in a virtual team?

The data did not allow any investigation of this question. In face-to-face teams there was evidence of the frequent use of home language during discussions, even when the black students were very aware of the tape recorder and were meticulous about providing their responses in English as well. Teams who were not fluent in English often translated terms from the book for fellow students. Culture is a factor, as could be seen from the quantitative results of Chapter 7 in the way the textbook affected the students.

9.9.3 How feasible is this form of telematic education in the short term?

This research seems to provide a very clear answer to this question. Telematic teaching can be used in a variety of useful ways but is unlikely to provide a feasible alternative for collaborative learning unless there is an intensive programme of practice and guidance. It seems that its use is more likely to assist with administration of group work, setting dates for meetings, assigning tasks and resources, and transferring documents, rather than genuine group work.

9.9.4 How efficient does this form of telematic education appear to be (estimated cost/benefit)?

No effort was made to answer this question in that costs of the research were ultimately negligible and the initial concept of saving on presenting lectures fell away. The fact that those benefits that were investigated, that is, the online collaborative learning, seem to be so limited, the efficiency cannot be considered to be high. Thus low cost resulted in very low benefit. The cost of the intensive programme referred to in paragraph 9.9.3 will be much higher.

9.9.5 Why do first year Information Systems students decide to participate in virtual teams rather than co-present teams or lectures?

The students who are not academic first years (those that registered prior to the current year) are more likely to opt for Telematic forms of education, as they are less likely to attend lectures. These finding were discussed in Section 9.2.

9.9.6 Why do students change from one study environment to another?

This data was not obtainable as students were not prepared to comply with the instructions to report changes. There was, however, a considerable variation between the choices indicated by the students initially and what they finally did. This is reflected in Tables 9.1, 9.2 and 9.3.

9.9.7 Why do students select certain teammates?

Students choose friends or people they have previously been in teams with. Convenience is also rated highly and hence people living nearby, for example, in the same residence are often selected. A second major reason is more deliberately rational in that students try to identify other students with whom they think they will work well. Usually this is explained as: students who have similar study habits, are reliable and have high standards. Choosing teammates that the student expects to be able to communicate with easily is also given as a reason, but this is relatively rare. Occasionally, the student specifically joins a team who have marks that are considerably higher than his in order to benefit from them. A significant number of students do not know anybody in the class well enough to feel they can ask to join them. Thus, a number of students make up teams randomly. This was discussed in Chapter 8.

9.9.8 Why do the students enjoy and succeed in working in a virtual team?

There is no evidence that can be used to answer this question.

9.9.9 Why do students think they need contact sessions?

The students identified a need for more guidance in using the technology. Since the collaborative work could not be done effectively in virtual teams there is a clear indication that the teamwork should take place during contact sessions. They could possibly use the online discussion groups as a supporting and supplementary technology by means of which students could continue discussions and co-ordinate work. If, on the other hand it is considered to be essential for students to learn to collaborate online several contact sessions would be needed as for the intensive programme referred to in paragraph 9.9.3.

9.9.10 How should virtual teams be structured in a multicultural environment?

Since virtual teams have not been found satisfactory, this question cannot be answered in the form in which it is stated. There is, however, a need to address the position of minority students and more particularly those who find it more difficult to find compatible teammates. The advantages of teamwork are evident and are enhanced by having teammates that are trusted, reliable, focussed, and able. If teamwork is used as the basis of a large portion of the assigned year work, students should be afforded every opportunity to do this to the best of their ability. This research does not present an answer but does identify a problem in this regard. Building up a team and acquiring skills for team management is one skill that can be taught [Thomas, 2000], [De Villiers, 1995].

9.9.11 How should virtual team members be prepared for working in this way?

The preparation given prior to this research involved a lecture on e-mail etiquette and included warnings concerning depersonalisation and most of the elements listed in Table 5.1 in Chapter 5. This was clearly inadequate. Students need extensive instruction and practice in both the technology and social skills. This would require a series on contact lectures as well as graduated exercises where the students could build up their skills. Table 5.2 refers to research reports that confirm that this is difficult and time consuming.

9.9.12 How should the lecturer, facilitator or researcher interact with virtual teams?

The role of the lecturer as mentor, member of the team encouraging collaboration and pointing out how the medium can be used more effectively for rich communication was addressed during the interviews discussed in Section 9.7 (subsection 9.7.1.6). As noted there, this is time consuming but does appear to be successful. The skill of the lecturer in using the medium is clearly also important.

9.9.13 How should a university decide which courses it offers via telematic education?

This question depends enormously as to what is intended by 'telematic education". In this research the specific issue of large first year courses for which teamwork formed an essential part was explored regarding the viability of using virtual teams. From the findings it seems that t would be unwise to impose virtual teamwork on first year students in the hopes of reducing logistic problems such as provision of venues. The question is answered, therefore, in a limited way.

9.9.14 How should contact sessions in conjunction with telematic education be structured?

Once again this depends on what is meant by "telematic education". If virtual collaborative teamwork is required the answers given in paragraph 9.9.11 apply.

9.10 Conclusion

This chapter involved the interpreting the discussions of the virtual teams and a comparison of these with excerpts from the recordings of discussions by the face-to-face teams. It was obvious that there was very little similarity in the level of rational communication between the two groups. The virtual teams were involved with coordination whereas the face-to-face groups collaborated. In addition the research showed clearly that very few students who attend classes believe that virtual teamwork is either attractive or feasible. Thus very few students selected this option.

The research shows that efforts to include collaborative learning into an exclusively distance education model of learning (in which there are no contact sessions) would require an intensive programme to prepare the students. In mixed models, where students do some work online (telematically) and also have contact sessions, collaborative work is done more easily and successfully face-to-face despite the fact that web-based curriculum management tools provide discussion group facilities. In all cases where genuinely collaborative work is required it is important to explain to students exactly what the difference is between coordinated work (during which the work load is shared) and collaborative work (where the students jointly construct meaning). They also need to understand the benefits of collaborating.

Although this research was undertaken in an educational setting, the findings have consequences beyond education. Virtual teams, as noted in Chapter 6, are used increasingly often in virtual organisations. The importance of trust and communication ability is as relevant in that setting as in education. In addition this research shows that students cannot easily be equipped with communication ability as a side effect of their education even as part of an Informatics course.

Chapter 10

Conclusion

10.1 Introduction

Sharing complex information and reconstructing meaning lies at the core of education, particular at university level. The Internet was adopted with unprecedented speed and enthusiasm and the idea that it could also be incorporated into education quickly followed. The World Wide Web can be, and is, used widely in education as a form of electronic notice board, a medium easily accessible from anywhere at any time on which unambiguous information can be stored. The essence of education is not, however, the provision of lecture summaries, schedules, or even allowing individuals access to their own, private, information such as marks or account information. Educators now generally believe in the value of students being actively involved in constructing their own knowledge. The sociocultural model of learning recognises the importance of students working together in teams, and actively participating in collaborative learning, as this helps students to relate information obtained from outside sources to their own cultures and lifeworlds. This research explored the feasibility and efficacy of using e-mail as the main medium of communication in collaborative work. Its purpose was, therefore, to see whether the existing use of web-based or telematic education could be extended to include collaborative learning.

Collaborative work by dispersed teams is, however, not only of interest in distance education. Globalisation has meant that globally dispersed teams are becoming increasingly common in the work environment as well. Hence the research is relevant not only to distance education but also to virtual organisations.

The research involved action research, during which a interpretive, investigation was undertaken in order to determine whether e-mail can be used successfully, by university students working together within culturally homogeneous teams, on tasks and projects which require them to share meaning. During this type of process not only is there a need to understand what the other team members mean (reconstructing meaning), but also to build on and advance meaning further (constructing meaning).

This final chapter assumes two roles. In it a model of collaboration systems is presented which finally links the concepts discussed throughout the thesis. The research is also evaluated with respect to the research paradigm selected in Chapter 2.

10.2 Background

The environment in which this study was undertaken was a university in South Africa in the 21st century. South African society consists of many different cultures, which are coming together for the first time as equals, and within the "traditionally white" universities in South Africa there are now a healthy mixture of students from all language groups. Of the students who participated in the research being reported on here 52% were Afrikaans-speaking, 21.5% were English-speaking, 22.3% speak one of the other nine official languages of South Africa, and 4% speak some other language at home. Our multicultural society has proved to be more adaptable than many predicted, and there are few signs of racial tension in the lecture rooms. Students at South African universities, from various different backgrounds with respect to education, language, culture, politics and household composition are presently all being taught in much the same way, although, at some universities, there are student support programmes to assist students whose educational background is assessed as being inadequate.

In general, the norms, culture, and underlying values that are taken for granted in teaching Information Systems in South Africa are predominantly Western and the academic tradition is derived from the British and North American university cultures. Citizens of the USA write the majority of textbooks used, from an American point of view, and hence using examples from American business and assuming familiarity with an American way of life. Of course these are not really foreign to our students, and local examples would not differ in any fundamental way, but there is some distanciation in the sense that students are not personally familiar with the environment.

Many, if not most, South African students come from a distinctly authoritarian educational background, where not only is critical thinking never permitted, but in fact rote learning is frequently encouraged. Many students have very little confidence in their ability to form their own opinion let alone to defend it. We are faced, therefore, with the problem that students are not accustomed to relating what they learn to their own lifeworld, or using their own experience, to judge the validity or applicability of what they learn. This is compounded by the first two problems identified, namely that the personal experience of individual students differs widely in many respects and is also not reflected in the study material.

It is important to include collaborative learning into the tertiary education of these students in order to address the problem indicated. This encourages the students to actively participate, to relate the material presented in books and lectures to their own lifeworlds and to become more

critical in a constructive way. It also provides them with practice in communicating and expressing ideas in their own words in a non-threatening environment.

10.3 The virtual team collaboration system

A collaboration system is an information processing system within which reconstruction of meaning occurs between team members. The representation of the system given in Figure 10.1 is not a classic systems diagram with input, output, process and a feedback loop. Instead the reconstruction of meaning can be visualised as an organic process during which information of various types is communicated and appropriated to build shared meaning (constructed reality). In a collaboration system for a virtual team who communicate via e-mail, the information available can be classified as Information[1] (or lean information) that is produced as reports from computer programs, narrative text which is communicated electronically (Information[2]), individually appropriated information (Information[3]) and tacit information (Information[4]). (Pictures and sound files can be attached but this is rarely done and was not considered in this thesis.) Only Information[1] and Information[2] can be converted into digital form and be communicated electronically and only Information[3] and Information[4] is appropriated by the team members.
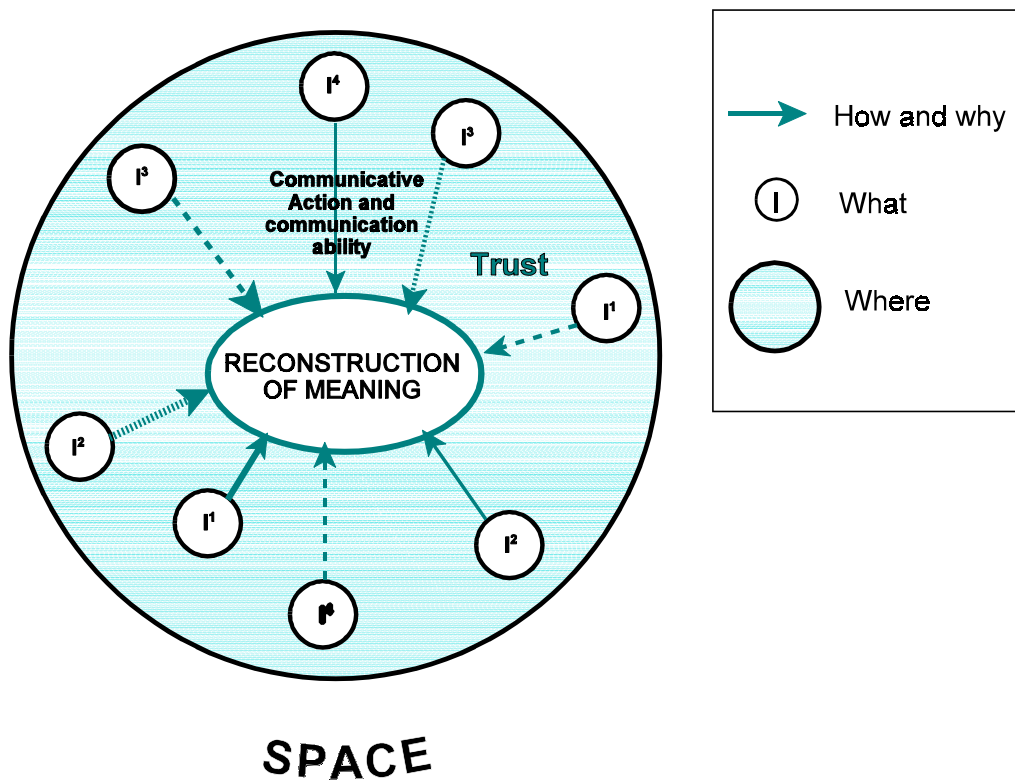
Figure 10.1: The collaboration system

Some additional, implicit information can be communicated by non-verbal and non-textual means. The concept of implicit information introduced in Section 9.3 of Chapter 9 completes the range of action types introduced in Chapter 3 as it is information which is unintentional. Although it is external, unappropriated information, it is related to tacit information in the sense that it is not explicit and is shown in the model as a form of Information^4. This classification is concerned with the form of the information but also with aspects of its content (*what*) and represented in Figure 10.1 by the small circles with I^1, I^2, I^3 and I^4.

The boundary of the collaboration system is seen in terms of proximity of space. The more closely bound the system is in terms of space, the more effectively the participants can communicate. The analogy is that the individual pieces of information can more easily contribute to the reconstruction of meaning if they are contained in a bounded system. This aspect of the system is involved with *where* communication occurs and is represented by the outer circle. Thus this model recognises that co-located teams have the least amount of trouble communicating.

Time is frequently associated with space but physical distance no longer implies a time delay and communicative cohesiveness is dictated only partly by time. It is difficult to compensate for lost spontaneity but forgotten facts can be retrieved if the medium allows them to be recorded and greater comprehension can be gained with more time. Hence the role of time in communication is multi-faceted and it is not included as a factor in the virtual team collaboration system.

Physical distance does mean that the communicators are dependent on telecommunication technologies to transmit the information. The intrinsic natures of these technologies limit the type of information that can be communicated and hence it is necessary for the user to learn techniques to compensate for a loss of information. These skills, together with different kinds of communicative action, promote communicative rationality. In Chapter 9, the term communication ability was proposed to embrace the idea that the ability to communicate rich information, including equivocal and implicit information, depends on the skill of the person as well as the intrinsic properties of the medium. The skills, both technical and social, of the team members using the communication medium contribute to the 'energy' propelling the information. This 'energy', made up of communicative action and communication ability (technology use skills), is depicted in the model as arrows. A solid arrow represents highly effective communication. The greater the 'energy' the richer the information and more likely it is to assist in the construction of new meaning and the building of shared understanding. The 'energy' is, therefore, concerned with *how* the information is communicated and is represented by the arrows.

The richness of the message when it is received will also depend on the interpreting ability of the receiver and this also has technology related aspects. The receiver, therefore, also needs to develop skills to allow him to make maximum use of the medium. The discursive form or form of communicative action is related to the intention of the speaker [Ngwenyama & Lee, 1997] and this means that this aspect of the model can also be labelled *why.* The arrows, therefore, represent both *how* and *why*.

Communicative rationality, and to a lesser extent functional rationality, are seen to thrive when trust is strong. Thus, the model shows trust as the permeating or surrounding atmosphere within the system. In Chapter 6 the relationships between teams, time, trust and information were discussed. Trust is seen to reduce psychological distance. Disembedded systems, including the communications systems required by virtual teams, will only be used if some form of trust exists even if it is only a form of transferred trust. These concepts are related to the relationships between those reconstructing meaning and hence, *to whom* the information is communicated.

This virtual team collaboration system model is consistent with the depiction of the role of information in collaborative teamwork (Figures 9.7, 9.8 and 9.9) but has a different emphasis as it includes the different types of information and includes space as a significant factor. The two representations together conclude the abstraction of the concepts considered in this thesis.

10.4　　　　　　Evaluation of the research outcomes

This research set out to investigate the reconstruction (or possibly a better term might be the co-construction or joint construction) of meaning between members of virtual teams. This goal was not ultimately obtained and the data ends up being more about the process of co-ordinating behaviour for completing the problem. The unexpected reluctance of the students who were the subjects of the research to work in virtual teams combined with the difficulty the teams had in embracing the concept of the joint construction of meaning via e-mail made the original goal impossible to achieve.

10.5 Evaluation of the research with respect to the research paradigm selected

10.5.1   Was this an interpretive study?

Klein and Myers [1999] have proposed a set of principles for conducting and evaluating interpretive field studies in Information Systems. This thesis can be evaluated against these.

The research carried out was intended to be pluralistic. This is in response to the need to include views of a complex and multi-faceted research area obtained from different sources and in various forms. These can be obtained by using a variety of methods to collect information [Banville & Landry, 1992; Kaplan & Duchon, 1988; Klein H K, Hirschheim R & Nissen H, 1991; Jarvenpaa S L, 1991; Trauth & Jessup, 2000]. Ben Agger [Agger, 1998: 19 and : 37] calls for "polyvocality", in other words a combination of qualitative and quantitative research.

The quantitative data was gathered using questionnaires, recording the numbers of students selecting the different options at different times, numbers of contributions to discussions, et cetera. The focus of the study was, however, on determining how well the virtual teams succeeded in working together and in particular, how successful they appropriated and personalised information regarding general Information Systems principles. Hence, the content of the discussions was studied in detail with the intent of seeing how rich these discussions were and whether they facilitated learning.

Interpretative research has been defined as follows:

> "*It does not define dependent and independent variables, but focuses on the complexity of human sense making as the situation emerges; it attempts to understand phenomena through the meanings that people assign to them*" [Klein & Myers, 1999]

> "*... aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context.*" [Walsham, 1993]

> "*The **interpretive understanding** is how an observing researcher (for instance, an anthropologist or an organisation scientist) understands these human subjects to understand themselves and the world around them.*" [Lee, 1994]

The research undertaken qualifies as interpretive research according to these definitions.

10.5.2   Was this a field study?

The study was carried out by investigating how students perform tasks in real life, that is, in their studies and not in laboratory experiments where tasks are being simulated. The study affected a significant part of the assigned work the students did for a university course. The researcher was closely involved with the students, the lecturers and the department for the duration of the course. This may, therefore, be described as being either an ethnographic or an in-depth case study. Klein and Myers [1999] say that the only difference is "*the length of time that the investigator is required to spend in the field and the extent to which the researcher immerses himself or herself in the life of the social group under study*". Detailed, observational evidence is a characteristic of ethnographic studies whereas case studies do not depend solely on participant-observer data [Yin, 1989]. In this case the researcher collected data as an observer as well as via questionnaires. It is debatable whether she was a genuine participant as she played only a limited role in the collaborative teamwork other than setting the assignments and arranging the recordings.

This is also an example of action research of the field study mode [Stowell et al, 1997: 174] as it was initiated by the researcher. The focus was, therefore, on exploring research ideas, but it is hoped that the students who participated in the field study also benefited and that the institutional memory of the host university will retain information obtained and will benefit from the insights obtained. The researcher and hosting organisation had no noticeable conflicting interests. However, complacency in this regard should be avoided. The researcher attempted to highlight issues where conflicting interests of any stakeholders may possibly have been overlooked in the past. The effect of language on the students' learning and the difficulties that some students have in finding suitable team members are examples of this. The research investigated ideas that were formulated as a result of critical evaluation of literature and practice.

The action was theory led. The sub-goal of guiding the host institution can be interpreted as making the findings available to the university, and in particular the department responsible for the adoption of telematic learning in the university. These groups might subsequently be able to build on the findings. The research qualifies as action research as it addresses a perceived real-world problem situation of considerable complexity. It also aimed to address the concern that

"*many academic IS methodologies ... have not been tested or evaluated by applying them in demanding cases*" [Stowell et al, 1997:164].

The research can be assessed with respect to. a number of further criteria identified by Stowell et al. [997].

- Obtain willing collaborators and plan for possible changes in participation and support individual collaborators during the research.

  The students were allowed to choose which study option they wanted to use and they were permitted to change their minds. In addition, as pointed out in Chapter 7, the opinions of the other lecturers were taken seriously and the research design was adapted in order to ensure that the students were not disadvantaged. As a result of the changes made to the research design (refer to Section 7.7.3 in Chapter 7) it was difficult to obtain clearly differentiated sets of results and large samples.

- Ensure that the domain is an appropriate one.

  An extensive literature study into web-based teaching, virtual teams and virtual organisations was carried out. The domain appeared to be appropriate but the eventual results showed that students at a residential university are not convinced of the usefulness of virtual team work.

- Plan by focussing on the approach used rather than predicting outcomes.

  Detailed planning was undertaken. The outcomes were not at all those that were expected. The significance of the underlying theory emerged only after the results were studied and interpreted.

- Plan how various research methodologies will be used and in particular, how data will be collected, rigorous documentation must be maintained and an awareness of the process of interaction and continuous reflection must be ensured.

  Chapter 2 and Chapter 7 explain in detail what was done, both from the point of view of deciding on an approach (Chapter 2) and deciding on practical issues (Chapter 7). The strategy of recording team interaction and interviews and storing these in electronic format on CDROM permitted repeated reflection.

- Avoid false expectations on the part of the organisation and individual students.

A concerted effort was made to inform students and lecturers of the intentions, procedures and progress of the research. No complaints were received regarding false expectations.

- Have a strategy for dealing with possible outcomes.

    Flexibility was built into the research design from the start. The paucity of virtual teams was compensated for by adding the interviews with lecturers and students.

- Balance research needs and host organisation's needs.

    This was taken very seriously.

- The initial aim depends on the initial theory but this may be amended in the light of subsequent events.

    As pointed out in Section 7.7.3, changes were made which had a significant impact on the research in order to achieve the mutual understanding, consensus and cooperation identified as necessary for intersubjective research methodologies.

As students were subjects participating in their real roles as students and not in artificial roles (such as emulating the activities of managers) Introna and Whitley's criticism [1999] of laboratory research in IS does not apply.

10.5.3   How was the fundamental principle of the hermeneutic circle applied?

The hermeneutic circle means that whenever text is interpreted both the parts and the whole must be considered. Each sentence is interpreted taking the meaning of the whole text into account and conversely, the meaning of each individual sentence influences how the entire text is interpreted. The principle of the hermeneutic circle can be applied more widely so that each individual text is interpreted in context and the context is re-interpreted in the light of that text. In terms of e-mail, each message is interpreted taking previous messages into account and also taking into account the wider context of the circumstances, culture, organisation and the task that is being worked on. Each message in turn affects how the broader context is interpreted. The hermeneutic principle was particularly relevant in identifying examples of strategic communicative action and implicit information.

The principle of the hermeneutic circle affected many aspects of the research, not only at the level of interpreting e-mail messages between the students in the telematic groups. These other aspects will be examined as part of the discussions on the principles which follow.

10.5.4 How was the principle of contextualisation applied?

This study is rooted in the recognition of the circumstances in which university education finds itself at this time. The fact that students with high potential, but very different previous educational backgrounds, are taught together is the first element of the context of this study. The second element is the affect of new technology on communication in general and the influence this is expected to have on education. Taking the local, cultural context and the global, technological context into account is, therefore, essential.

Seen in terms of the hermeneutic circle, the way that culture, pre-existing relationships (or the lack of these) and technology affected the content of individual e-mail messages was examined, as was the way that these messages allowed trust to be created or maintained within a team. The effect of these two factors (culture and technology) on the students' task outcomes cannot be measured in a positivist way as there are numerous other contributing factors.

10.5.5 How was the principle of interaction between researcher and subject applied?

The lecturer was largely an observer and facilitator. The role of the researcher was discussed in Section 9.9.12 in Chapter 9.

If we consider the hermeneutic circle again, the way in which the researcher interprets what the research subjects are saying and doing is the relevant focus. The results are "seen" in the light of her own preconceived ideas, in the light of the opinions of other lecturers in similar environments and in comparison with what published texts on related topics and research. These interpretations were used to identify and re-evaluate preconceived ideas concerning the viability of virtual teamwork at the university level involved in this research. The discussions with the lecturers used as consultants (Section 9.7 of Chapter 9) assisted in this process. This circle was traversed repeatedly during analysis of the research results in order to reach conclusions that seemed to be justified.

10.5.6   Was there potential for abstraction and generalisation?

Walsham [1995] discusses the problem of contributing to theory by generalising from case studies. In this case the intention was to obtain results that could not only be used as guidelines generally in telematic education, but that would apply to the global world of practice, that of virtual teams in virtual organisations. The concrete suggestions made are in fact uncontroversial and not very innovative. They tend to add weight to existing opinion rather than contribute entirely new insights.

Abstraction and generalisation were undertaken using Habermas' Theory of Communicative Action and Giddens' ideas concerning radicalised modernity. Gidden's concepts of the consequences of modernity emphasise the importance of time and space in the structuring of social relations and the use of e-mail was related to these concepts. The depiction of the reconstruction and construction of meaning presented in Section 9.8 of Chapter 9, and the virtual team collaboration system presented in Section 10.3 of this chapter showed that abstraction was possible.

According to Whetten [1989] a contribution to theory development should include factors that

> "*... logically should be considered as part of the explanation of the social or individual phenomena of interest...*" (*what*), identify how they are related (*how*) and "*... the underlying psychological, economic, or social dynamics that justify the selection of factors and the proposed causal relationships*" (*why*). [Whetten, 1989]

Contextual limits (*who, where and when*) must then be placed on the propositions generated. Whetten advises that few scholars will generate an entirely new theory but will attempt to refine an existing body of work. In this case the research has built on the communication richness theories in computer-mediated communication but has presented them in the light of the Theory Communicative Action (and in so doing extended the work of Ngwenyama and Lee [1997]) and radicalised modernity. Thus the *why* aspect of theory development has been focussed on.

> "*This is probably the most fruitful, but also the most difficult avenue of theory development. It commonly involves borrowing a perspective from other fields*" [Whetten, 1989]

10.5.7   Were multiple interpretations investigated?

Since three options were incorporated in the study, namely, lecturing, co-present work groups and telematic work groups, as well as the fact that different groups will intentionally reflect different cultures, there is no doubt that multiple interpretations were investigated at the level of the individual student and the teams.

The hermeneutic circle was considered by looking at interpretations of the discourse of individual groups and then combined interpretations of all the teams selecting a particular study option and finally comparing the discourses of the teams who chose different study options. As is appropriate in interpretive research conclusions were in terms of narrative descriptions rather than as hypotheses that could be proved or disproved.

10.5.8   How was the principle of suspicion applied?

One of the most important intentions of this research was to allow students to find their own ways of appropriating university level material in a fulfilling and effective way. The issues of communication, meaning, culture and learning are all difficult to look at objectively as every individual interpretation is heavily impregnated with prejudice and not without political slants. These issues are all about power and hence emancipation. It is possible that the students concerned viewed this study with scepticism and even suspicion. It is partly for this reason that the study was designed to allow the students to choose for themselves which study option to follow, and to allow them to select team members according to their own criteria.

10.6   Conclusion

10.6.1   General

The technology for communicating with distant co-workers, lecturers with students and vice versa exists, is widely available and is accepted as a convenient tool and this is the source of the problem. It is too easy to use. Insufficient reflection and research is being used to guide the rush towards using Information and Communications Technology in situations that may have significant and subtle side effects on every aspect of modern life.

Organisations, be they large multinationals or new, small companies dedicated to e-commerce, have adopted organisation structures with fewer levels of management and less formal reporting procedures. Faster turnaround in terms of product development, quicker response to market conditions and improvements both in terms of speed and other aspects of service are features of the new economic model. This promises greater profits but also increased risks.

Universities, which have guarded their reputations jealously and are aware that their reputations are an essential part of what they sell, (that is, a vital ingredient in competitive advantage [Seely Brown & Duguid, 1996]), appear to be rushing to embrace telematic education as a significant part of their core business. These organisations have recognised the challenge that the Internet has presented and seem to believe that if they delay in responding they might never be able to catch up with their competitors. This parallels the move to other forms of e-commerce many of which have proved less successful than was initially predicted.

Many students at South African universities are studying in surroundings that they find foreign and threatening from a social and an educational point of view. Immense financial sacrifices and psychological investments have often been made by these students and their families. They and their families have high expectations of the institutions to which they have at last succeeded in gaining entrance. If the education system fails them it would represent an enormous loss of youthful energy, trust, hope and goodwill as well as the future loss to the economy of the re-investment of knowledge and skill.

This research ultimately is intended to highlight what the key concerns in education should be (the construction and reconstruction of meaning) and to explore the potential of a commonly available technology in collaborative learning.

10.6.2   Contribution made

The contribution made by this thesis stems largely from insights derived from analysing the discussions of teams who were involved in collaboration from the perspective of the Theory of Communicative Action. The analysis also takes into account some of the important issues raised by Giddens regarding modernity, namely the importance of trust and the need for reflexivity. Since the number of virtual teams whose discussions could be examined was small the primary contribution made by this thesis is in proposing a method of interpretive analysis and demonstrating its application rather than presenting strongly supported research results. The five dimensions used in the analysis, namely, communicative actions, communicative coherence, trust, implicit meaning and reconstructed meaning focus attention on the collaborative process and hence the outcome rather than the technology.

The role that technology plays is important and the researcher highlights differences between the ways that similar teams, working on the same task but using different communications media, collaborate and the resulting differences in outcomes. It seems certain that modern society will use information technology to an increasing extent in communication in future and, although much of this communication is via technologies allowing audio and visual communication, the use of e-mail and the provision of more static text-based information on the Internet seems unlikely to decrease. An important point made in the research is that, if e-mail is already being used for collaboration and is likely to continue to be used extensively for this purpose, it is important to investigate in detail how it is used and how people can be taught to use it more effectively. The findings indicate that implicit information can be communicated in a variety of ways using e-mail. Some information that is non-verbal and frequently unintentional is significant. Information richness has been extended by a number of recognised researchers to reflect the fact that a number of factors beyond the intrinsic nature of the medium determine the richness of the information communicated. This research highlights an aspect of information that these researchers may indeed have intended but which was not emphasised or referred to explicitly in their work.

Associated with the finding regarding implicit information in e-mails is the theoretical discussion in Chapter 3 in which information was classified. This is considered to be a significant contribution made by the thesis.

The fact that the subjects used were teams of first year university students, studying Informatics and collaborating on assignments, and that these students were fairly naive with respect to using e-mail as a means of communicating was an important limiting factor in the research. It is difficult to generalise from this context to one where virtual teams are required to collaborate on a task in a distributed working environment. The incentives for collaborating via e-mail differ considerably in such groups as does the maturity of the people who would collaborate. Hence this research can contribute only in terms of fairly broad suggestions with respect to virtual teams in virtual organisations in general.

On the other hand the research results have very specific significance for residential universities which have already acquired the infrastructure for web-based teaching and incorporate some features already in the tuition of on-campus students. It seems clear from the findings that despite there being some genuine reasons for proposing the use of e-mail for collaborative learning it is not at all easy to achieve success. The students themselves would need to have incentives to work in this way and would need considerable preparation and practice before any real collaborative learning could be achieved.

10.6.3   Future research

A number of interesting possibilities exist for future work. Studying the discourse of teams working on design or other creative work in dispersed organisations would provide a rich research field. A particularly interesting option is to study the online discussions of dispersed end-users involved in the development of information systems using computer-mediated collaboration.

The research could also usefully be continued at a university presenting courses exclusively as distance education. One of the most serious limitations at South African distance universities where face to face tutoring at regional offices is very limited is the difficulty in doing any collaborative work. These students would probably see more reason for participating in virtual teams and are also more accustomed to using text as a means of communication.

Further work can also be done in extending the methodology developed for analysing collaborative discourse. It is hoped that opportunities will become available so that the interpretive research can continue in investigating virtual teamwork from the perspective of constructing meaning.

References

ACHIEVE, 1998. Exploiting the wired world - Best practice in managing virtual organizations. The report of Working Group 4 of project ACHIEVE. http://www.achieve.ch/, access date 7 March, 2002.

AGGER, B. 1998. *Critical social theories: An introduction*. Boulder, Colo: Westview Press (Perseus Books Group).

ALAVI, M. 1994. Computer-mediated collaborative learning: An empirical evaluation. *Management Information Systems Quarterly,* 18(2): 159-174.

ALAVI, M. & CARLSON, P. A. 1992. Review of MIS research and disciplinary development. *Journal of Management Information Systems*, 8(4): 45-62.

ALAVI, M. & WHEELER, B. C. & VALACICH, J. S. 1995. Using IT to re-engineer business education: An exploratory investigation of collaborative telelearning. *Management Information Systems Quarterly*, 19(3): 293-312.

ALSTETE, J. W. 2001. Alternative uses of electronic learning systems for enhancing team performance. *Team performance management: An international Journal*, 7(3/4): 48-52.

AVISON, D. 1997. The 'discipline' of Information Systems: Teaching, research, and practice. In Mingers, J. & Stowell, F. (eds), *Information Systems: An emerging discipline?* London: McGraw Hill: 113-136.

AVISON, D. E. & FITZGERALD, G. 1995. *Information Systems Development: Methodologies, Techniques and Tools.* 2nd ed. Maidenhead: McGraw-Hill.

BANVILLE, C. & LANDRY, M. 1989. Can the field of MIS be disciplined? *Communications of the ACM*, 32(1): 48-60.

BARRETT, M., SAHAY, S. & WALSHAM, G. 1996. Understanding IT and Social Transformation: Development and illustration of a conceptual scheme. *Proceedings of the 17th ICIS*, 1996:42-50.

BELLER, M. & OR, E. 1998. The crossroads between lifelong learning and Information Technology: A challenge facing leading universities. *Journal of Computer-Mediated Communication*, 4(2), Http://www.ascusc.org/jcmc/vol4/issue2, access date 7 March, 2002.

BENBUNAN-FICH, R. & HILTZ, S. R. 1999. Educational applications of CMCS: Solving case studies through asynchronous learning networks. *Journal of Computer-Mediated Communication*, 4(3), Http://www.ascusc.org/jcmc/vol4/issue3, access date 7 March, 2002.

BERGHEL, H. 1997. Email - the good, the bad, and the ugly. *Communications of the ACM*, 40(4): 11-16.

BLEACH, J. 1998. Disabling myth or writing for the world: The secondary schools language project in the Eastern Province, South Africa. *Campus-Wide Information Systems*, 15(2): 54-60.

BLOOM, B. S., ENGELHART, M. D. & Committee of College and University Examiners (Great Britain). 1956. *Taxonomy of educational objectives : the classification of educational goals. Handbook 1, Cognitive domain, APPENDIX condensed version of the taxonomy of educational objectives*. New York: Longmans.

BOLAND, R. J. 1985. Phenomenology: A preferred approach to research on IS. In Mumford, E. (ed) et al., *Research Methods in IS.* Amsterdam, New York: Elsevier Science Publ (North-Holland).

BOLAND, R. J. 1996. Why shared meanings have no place in Structuration Theory: A reply to Scapens and MacIntosh. *Accounting, Organizations and Society,* 21(7/8): 691-697.

BOLAND, R. J. & CITURS, A. 2001. Work as the making of time and space. *Sprouts: Working Papers on Information Environments, Systems and Organizations, 2, Winter.* Http://weatherhead.cwru.edu/sprouts/2002/020101.pdf, access date 22 April, 2002.

BRAATEN, J. 1991. *Habermas' Critical Theory of Society*. Albany: State University of New York Press.

BULTJE, R. & VAN WIJK, J. 1998. Taxonomy of virtual organisations based on definitions, characteristics and typology. In *VoNet: The newsletter*, http://www.virtual.organization.net, 2(3):9, access date 7 March, 2002.

BURN, J. & BARNETT, M. 1999. Communicating for advantage in the virtual organization. *IEEE Transactions on Profession Communication,* 42(4): 215-223.

BURRELL, G. & MORGAN, G. 1979. *Sociological paradigms & organizational analysis*. London: Heinemann.

BUSBY, J. S. & PAYNE, K. 1998. Computer-based instruction in qualitative research practices. *Journal of Computer Assisted Learning*, 14: 59-70.

CHECKLAND, P. & HOLWELL, S. 1998. *Information, systems and Information Systems: Making sense of the field*. Chichester: Wiley.

CHELLAPPA, R., BARUA, A. & WHINSTON, A. B. 1997. An Electronic infrastructure for a virtual university. *Communications of the ACM*, 40(9): 56-58.

CHESBROUGH, H. W. & TEECE, D. J. 1996. When is virtual virtuous? Organizing for innovation. *Harvard Business Review*, 74(1): 65-73.

CHESTER, A. & GWYNNE, G. 1998. Online teaching: Encouraging collaboration through anonymity. *Journal of Computer-Mediated Communication,* 4(2), Http://www.ascusc.org/jcmc /vol4/issue2, access date 7 March, 2002.

CHICKERING, A. W. & EHRMANN, S. C. 1996. Implementing the seven principles: Technology as lever. *AAHE Bulletin*, October:3-6.

CHICKERING, A. W. & GAMSON, Z. F. 1991. Applying the seven principles for good practice in undergraduate education. *New Directions for teaching and learning*, 47, Fall.

CHRISTIE, P. M. J. & LEVARY, R. R. 1998. Virtual corporations: Recipe for success. *Industrial Management*, 40(4): 7-11.

CLIFTON, R. A. 1999. The education of university students. *College Teaching*, 47(3): 114.

COLEMAN, D. & SCHILLER, G. 1999. Dataconferencing, distributed project management, collaborative e-commerce and other interactive trends. In Sieber, P. & Griese, J. (eds), *Organizational virtualness & electronic commerce, Proceedings of the 2nd International VoNet - workshop*, September 23-24, 1999. Bern: Simowa Verlag: 43-52.

COLLINS ENGLISH DICTIONARY. 1995. 3rd ed. Harper Collins Publishers.

COUTU, D. L. 1998. Briefings from the editors: Organization - trust in virtual teams. *Harvard Business Review*, 76(3): 20-22.

CRAIG SMITH, N. 1990. The case study: A useful research method for information management. *Journal of Information Technology*, 5:123-133.

CRONJE, J. C. 2001. Metaphors and models in Internet-based learning. *Computers & Education*, 37: 241-256.

DAFT, R. L. & LENGEL, R. H. 1986. Organizational information requirements, media richness and structural design. *Management Science*, 32(5): 554-571.

DAHLBOM, B. & MATHIASSEN, L. 1995. *Computers in context: The philosophy and practice of systems design*. Cambridge, Mass: Blackwell.

DAVIDOW, W. H. & MALONE, M. S. 1992. *The virtual corp*. New York: Harper Business.

DE VILLIERS, C. 1995. The integration of IT in a co-operative learning environment. D Com thesis, Univ. of Pretoria, Pretoria.

DE SANCTIS, G. & POOLE, M. S. 1994. Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science,* 5(2): 121-145.

DENNIS, A. R. & VALACICH, J. S. 2001. Conducting research in IS. *Communications of A I S,* 7(5): Http://www.cais.isworld.org/articles/7-5, access date 7 March, 2002.

DEWHURST, D. G., MACLEOD, H. A. & NORRIS, T. A. M. 2000. Independent student learning aided by computers: An acceptable alternative to lectures? *Computers & Education*, 35:223-241.

DOWNES, S. 1999. What happened at California Virtual University. Http://ww.atl.ualberta.ca/downes/threads/column041499.htm, access date 13 May, 2002.

DOYLE, D. & BROWN, F. W. 2000. Using a business simulation to teach applied skills - the benefits and challenges of using student teams from multiple countries. *Journal of European Industrial Training*, 24(6): 330-336.

DREYFUS, H. L. 1999. Anonymity vs commitment: The dangers of education on the Internet. Ethics and IT, 1(1): 15-21.

GALLIERS, R. 1992. Choosing appropriate IS research approaches. In Galliers, R. (ed), *Management Information Systems research: issues, methods & practical guidelines.* Boston: Blackwell Scientific Publications.

GALLIERS, R. 1997. Reflections on Information Systems research: Twelve points of debate. In Mingers, J. & Stowell, F. (eds), *Information Systems: An emerging discipline?* London: McGraw Hill : 141-157.

GALLIERS, R. & LAND, F. F. 1987. Choosing appropriate IS research. *Communications of the ACM*, 30(11): 900-902.

GIDDENS, A. 1984. *The constitution of society: Outline of the theory of structuration*. Cambridge: Polity Press.

GIDDENS, A. 1990. *The consequences of modernity*. Stanford: Stanford University Press.

GIDDENS, A. 2000. *Runaway world*. New York: Routledge.

GIDDENS, A. & PIERSON, C. 1998. *Conversations with Anthony Giddens : making sense of modernity*. Stanford: Stanford University Press.

GODUKA, I. N. 1996. Challenges to traditionally white universities: Affirming diversity in the curriculum. *South African Journal of Higher Education,* 10(1): 27-39.

GODUKA, I. N. 1996. Restructuring education to affirm unity and diversity. *South African Journal of Higher Education,* 10(2): 67-74.

GODUKA, I. N. 1998. Linguistic and cultural diversity: Implications for learning, educating and curricula transformation. *South African Journal of Higher Education,* 12(1): 34-43.

GRAFF, J. 2000. Europe's jobs challenge. *Time*, 155(18): 22-29.

HABERMAS, J. 1984. *The theory of communicative action (Vol. 1) Reason and the rationalization of society*, translated by T McCarthy. Boston: Beacon Press.

HABERMAS, J. 1987. *The theory of communicative action (Vol. 2) Lifeworld and System: A critique of functionalist reason*, translated by T McCarthy. Boston: Beacon Press.

HAMMOND, M. 2000. Communication within on-line forums: The opportunities, the constraints and the value of a communicative approach. *Computers & Education*, 35(4): 251-262.

HANDY, C. 1995. Trust and the virtual organization. *Harvard Business Review*, 73(1): 40-50.

HARA, N., BONK, C. J. & ANGELI, C. 2000. Content analysis of online discussion in an applied educational psychology course. *Instructional Science*, 28(2): 115-152.

HARTLEY, J. R. 1998. CAI and AI - a time for rapprochement? *Journal of Computer Assisted Learning*, 14: 249-250.

HELD, D. 1980. *Introduction to critical theory: Horkheimer to Habermas*. London: Hutchinson.

HILTZ, S. R. & WELLMAN, B. 1997. Asynchronous learning networks as a virtual classroom. *Communications of the ACM*, 40(9): 44-49.

HIRSCHHEIM, R. A. & KLEIN, H. K. 1989. Four paradigms of IS development. *Communications of the ACM*, 32(10): 1199-1216.

HIRSCHHEIM, R. A., KLEIN, H. K. & LYYTINEN, K. 1996. Exploring the intellectual structures of Information Systems development: A social action theoretic analysis. Accting., Mgmt. & Info. Tech., 6(1/2): 1-64.
HITCH, L. P. 2000. Aren't we judging virtual universities by outdated standards? *Journal of Academic Librarianship*, 26(1): 21-26.

HOFSTEDE, G. 1997. *Cultures and organizations: Software of the mind*. London: McGraw-Hill.

HOLLAND, C. P. 1998. The importance of trust and business relationships in the formation of virtual organizations. In Sieber, P. & Griese, J. (eds), *Organizational Virtualness Proceedings of the V O Net - Workshop*, April, 1998. Bern: Simowa Verlag.

HOSIE, P. & MAZZAROL, T. 1999. Using technology for the competitive delivery of education services. *Journal of Computer Assisted Learning*, 15:118-128.

HOOSEN, Z. R. 2002. Evaluating the instructional software used at the SBL to test its conformance to HCI usability principles. Honours project, University of South Africa, Pretoria.

HURLEY, J. M., PROCTOR, J. D. & FORD, R. E. 1999. Collaborative inquiry at a distance: Using the Internet in geography education. *Journal of Geography*, 98(3): 128-140.

INTRONA, L. D. 1992. Towards a theory of management information. D Com thesis, Univ. of Pretoria, Pretoria.

INTRONA, L. D. 1998. Telecooperation as working-together (or thinking about computer mediated cooperative work). *Proc of the 15th IFIP World computer congress*. Vienna/Budapest, Sept 1998: 89-102.

INTRONA, L. D. 2001. Cooperation, Coordination and interpretation in virtual environments: Some thoughts on working together. *Int J of Cognition Technology and Work*, 3(2): 101-110.

INTRONA, L. D. & NISSENBAUM, H. 2000. Limiting the Web: The politics of search engines. *IEEE Computer*, 33(1): 54-62.

INTRONA, L. D. & WHITLEY, E .A. 1999. About experiments and style: A critique of laboratory research in IS. *Information Technology and People,* 13(3): 161-173.

ISHAYA, T. & MACAULAY, L. 1999. The role of trust in virtual teams. In Sieber, P. & Griese, J. (eds), *Organizational Virtualness & Electronic Commerce, Proceedings of the 2nd International VoNet - Workshop*, September 23-24, 1999. Bern: Simowa Verlag: 135-152.

JABLONSKY, S. F. 1991. Alternative views of quality in IS research: Discussant's comments. In Nissen, Klein & Hirschheim (eds), *I S Research: Contemporary Approaches & Emergent Traditions*. Amsterdam: Elsevier Science Publ (North-Holland).

JACKSON, M. C. 1992. An integrated programme for critical thinking in Information Systems research. *Journal of Information Systems*, 2: 83-95.

JARVENPAA, S. L., KNOLL, K. & LEIDNER, D. E. 1998. Is anybody out there? Antecedents of trust in global virtual teams. *Journal of Management Information Systems*, 14(4): 29-64.

JARVENPAA, S. L. & SHAW, T. R. 1998. Global virtual teams: Integrating models of trust. In Sieber, P. & Griese, J. (eds), *Organizational Virtualness Proceedings of the V O Net - Workshop*, April, 1998. Bern: Simowa Verlag: 35-51.

JONES, M. 1997. It all depends what you mean by discipline. In Mingers, J. & Stowell, F. (eds), *Information Systems: An emerging discipline?* London: McGraw Hill: 97-112.

JONES, M. 1999. Structuration Theory. In Currie, W. L. & Galliers, R. *Rethinking Management Information Systems.* Oxford: Oxford University Press: 103-135.

JÖNSSON, S. 1991. Action research. In Nissen, Klein & Hirschheim (eds), *I S Research: Contemporary Approaches & Emergent Traditions*. Amsterdam: Elsevier Science Publ (North-Holland).

JOST, K. L. & SCHNEBERGER, S. L. 1994. Educational technology adoption and implementation: Learning from Information Systems research. *Canadian Journal of Educational Communication*, 23(3): 213-230.

JOURNAL OF ACCOUNTANCY. 1998. Golden rules of e-mail. *Journal of Accountancy,* 186(6):8-9.

KAPLAN, B. & DUCHON, D. 1988. Combining qualitative & quantitative methods in IS research: A Case Study. *Management Information Systems Quarterly*, Dec 1988:571-586.

KAPTELININ, V. 1999. Learning together: Educational benefits and prospects for computer support. *The Journal of the Learning Sciences,* 8(3-4): 499-508.

KARUPPAN, C. M. 2001. Web-based teaching materials: A user's profile. *Internet Research*: *Electronic Networking Applications and Policy,* 11(2): 138-148.

KIMBLE, C., LI, F. & BARLOW, A. 2000. Effective virtual teams through communities of practice. Research Paper No. 2000/9. Strathclyde Business School.

KLEIN, H. K., HIRSCHHEIM, R. & NISSEN, H. 1991. A pluralist perspective of the I S research arena. In Nissen, Klein & Hirschheim (eds), *I S Research: Contemporary Approaches & Emergent Traditions*. Amsterdam: Elsevier Science Publ (North-Holland).

KLEIN, H. K. & MYERS, M. D. 1999. A set of principles for conducting and evaluating interpretive field studies in IS. *Management Information Systems Quarterly,* 23(1):67-93.

KOCHTANEK, T. R. & HEIN, K. K. 2000. Creating and nurturing distributed asynchronous learning environments. *Online Information Review*, 24(4): 280-293.

LACITY, M. C. & JANSON, M. A. 1994. Understanding qualitative data: A framework of test analysis methods. *Journal of Management Information Systems*, 11(2): 137-155.

LANDRY, M. & BANVILLE, C. 1992. A disciplined methodological pluralism for MIS research. *Accting., Mgmt. & Info. Tech.*, 2(2): 77-97.

LATOUR, B. 1996. Social theory and the study of computerized work sites. In Orlikowski, W. J., Walsham, G., Jones, M. R. & deGross, J. I. (eds), *Information technology and changes in organizational work.* London: Chapman & Hall.

LAUDON, K. C. 1989. Design guidelines for choices involving time in qualitative research. In *Management Information Systems: Harvard Business School Research Colloquium*. Boston, MA: Harvard Business School: 7-10.

LAY, P. M. Q., ECCLES, M. G., JULYAN, F. W. & BOOT, G. 1993. *The principles of business computing*. 4th ed, Cape Town: Juta & Co, Ltd.

LEE, A. S. 1994. Electronic mail as a medium for rich communication: An empirical investigation using hermeneutic interpretation. *Management Information Systems Quarterly,* 18(2): 143-157.

LEIDNER, D. E. & JARVENPAA, S. L. 1995. The use of information technology to enhance management school education: A theoretical view. *Management Information Systems Quarterly*, 19(3): 265-292.

LEWIS, R. 1998. Membership and management of a 'virtual' team: The perspectives of a research manager. *R & D Management*, 28(1): 5-13.

LIND, M. R. 1996. Student case groups versus face-to-face groups. *Education and Training*, 38(6):10-13.

LYYTINEN, K. 1992. IS and critical theory research methodology. In Alvesson, M. & Willmott, H. (eds), *Critical Management Studies*. London: Sage.

LYYTINEN, K. & HIRSCHHEIM, R. 1988. Information Systems as rational discourse: An application of Habermas's theory of communicative action. *Scand. J. Mgmt*., 4(2): 19-30.

MAGRETTA, J. 1998. The power of virtual integration: An interview with Dell Computer's Michael Dell. *Harvard Business Review*, 76(2): 72-85.

MAJCHRZAK, A., RICE, R. E., MALHOTRA, A., KING, N. & BA, S. 2000. Technology adaptation: The case of a computer-supported inter-organizational virtual team. *MIS Quarterly*, 24(4): 569-600.

MAKI, R. H., MAKI, W. S., PATTERSON, M. & WHITTAKER, P. D. 2000. Evaluation of a web-based introductory psychology course: Learning and satisfaction in on-line versus lecture courses. *Behavior Research Methods Instruments & Computers*, 32(2): 230-239.

MANHEIM, M. L. & WATSON-MANHEIM, M. B. 1999. Managing virtual work: Integrating reflection and action through appropriate software support. In Sieber, P. & Griese, J. (eds),

Organizational Virtualness & Electronic Commerce, Proceedings of the 2nd International VoNet - Workshop, September 23-24, 1999. Bern: Simowa Verlag: 21-42.

MARKUS, M. L. 1994. Electronic mail as the medium of managerial choice. *Organization Science* 5(4): 502-527.

MARTINSONS, M. G. & CHONG, P. K. C. 1999. The influence of human factors and specialist involvement on information systems success. *Human relations*, 52(1): 123-126.

MATTHEE, M. 1998. Supporting the teaching of Mathematics by information technology in a cooperative learning environment. D Com thesis, Univ. of Pretoria, Pretoria.

MCCUNE, J. C. 1997. E-mail etiquette. *Management Review,* 86(4): 14-16.

MCNALLY, D. W. 1977. *Piaget, education and teaching*. Harvester Press.

MINGERS, J. 1995. Information and meaning: Foundations for an intersubjective account. *Information Systems Journal*, 5:285-306.

MINGERS, J. & BROCKLESBY, J. 1996. Multimethodology: towards a framework for critical pluralism. *Systemi*st,18(3):101-131.

MORSS, D. A. 1999. A study of student perspectives on web-based learning: WebCT in the classroom. *Internet Research: Electronic Networking Applications and Policy*, 9(5): 393-408.

MOWSHOWITZ, A. 1997. Virtual organization. *Communications of the ACM*, 40(9): 30-37.

MOWSHOWITZ, A. 1999. The switching principle in virtual organization. In Sieber, P. & Griese, J. (eds), *Organizational Virtualness & Electronic Commerce, Proceedings of the 2nd International VoNet - Workshop*, September 23-24, 1999. Bern: Simowa Verlag: 9-20.

MYERS, M. D. 1994. A disaster for everyone to see: An interpretive analysis of a failed IS project. *Accting., Mgmt. & Info. Tech*., 4(4): 185-201.

MYERS, M. 1997. Interpretive research in Information Systems. In Mingers, J. & Stowell, F. (eds), *Information Systems: An emerging discipline?* McGraw Hill.

MYERS, M. D. 1997. Critical ethnography in IS. In Lee, A. S., Liebenau, J. & DeGross, J. I. (eds), *I S and Qualitative research*. London: Chapman & Hall.

NGWENYAMA, O. 1991. The critical social theory approach to IS: Problems and challenges. In Nissen, Klein & Hirschheim (eds), *I S Research: Contemporary Approaches & Emergent Traditions*. Amsterdam: Elsevier Science Publ (North-Holland).

NGWENYAMA, O., DAVIS, G., LYYTINEN, K., TRUEX, D. & CULE, P. 1997. Panel - Assessing critical social theory research in IS. In Lee, A. S., Liebenau, J. & DeGross, J. I. (eds), *I S and Qualitative research*. London: Chapman & Hall.

NGWENYAMA, O. K. & LEE, A. S. 1997. Communication richness in electronic mail: Critical social theory and the contextuality of meaning. *Management Information Systems Quarterly*, 21(2):145-167.

NICOL, J. R., GUTFREUND, Y. S., PASCHETTO, J., RUSH, K. S. & MARTIN, C. 1999. How the Internet helps build collaborative multimedia applications. *Communications of the ACM,* 42(1):79-85.

NOUWENS, J. & BOUWMAN, H. 1995. Living apart together in electronic commerce: The use of information and communication technology to create network organizations. *Journal of Computer-Mediated Communication* 1(3): Http://www.ascusc.org/jcmc/vol1/issue3, access date 7 March, 2002.

NUNAMAKER, J. K., DENNIS, A. R., VALACICH, J. S., VOGEL, D. R. & GEORGE, J. F. 1991. Electronic meeting systems to support group work. *Communications of the ACM*, 34(7):40-62.

O'BLENES, C. 1999. Tangling with technology. *Management Review*, April, no vol or number, :52: www.proskauer.com/pubs/articles, access date 7 March, 2002.

O'DONOVAN, B. & ROODE, J. D. 2001. A framework for understanding the emerging discipline of Information Systems. *Information Technology and People*, forthcoming.

OGILVIE, H. 1994. This old office. *Journal of Business Strategy*, 15(5):26-34.

OKAMURA, K., FUJIMOTO, M., ORLIKOWSKI, W. J. & YATES, J. 1995. Helping CSCW applications succeed: the role of mediators in the context of use. *The information society*, 11(3): 157-172.

OLESEN, K. & MYERS, M. D. 1999. Trying to improve communication and collaboration with information technology: An action research project which failed. *Information Technology & People, 12(4): 317-332.*

ONAY, Z. 1999. Building an Internet-based learning environment in higher education: Learner informing systems and the life-cycle approach. *Informing Science*, 2(2): 45-52.

ORLIKOWSKI, W. J. 1991. Integrated information environment or matrix of control? The contradictory implications of Information Technology. *Accting., Mgmt. & Info. Tech.*, 1(1): 9-42.

ORLIKOWSKI, W. J. 1992. The duality of technology: Rethinking the concept of technology in organizations. *Organization Science, 3(3): 398-427.*

ORLIKOWSKI, W. J. 1992. Learning from Notes: Organisational issues in groupware implementation. *The information society*, 9(3): 237-250.

ORLIKOWSKI, W. J. 1993. CASE tools as organizational change: Investigating incremental and radical changes in systems development. *MIS Quarterly*, 17(3): 309-340.

ORLIKOWSKI, W. J. 1996. Improvising organizational transformation over time: A situated change perspective. *Information Systems Research*, 7(1): 63-92.

ORLIKOWSKI, W. J. & BAROUDI, J. J. 1991. Studying IT in organizations: Research approaches and assumptions. *I S Research*, 2(1): 1-28.

ORLIKOWSKI, W. J. & GASH D. C. 1994. Technological frames: Making sense of IT in organizations. *ACM transactions on IS,* 12(2): 174-207.

ORLIKOWSKI, W. J. & ROBEY, D. 1991. IT and the structuring of organizations. *Information Systems Research*, 2(2): 143-169.

ORSAK, G. C. & ETTER, D. M. 1999. Distributed learning: Using Internet technologies to expand educational resources. *IEEE Signal processing magazine*, 16(5): 56-62.

PAPASPYROU, N., RETALIS, S., EFREMIDIS, S., BARLAS, G. & SKORDALAKIS, E. 1999. Web-based teaching in software engineering. *Advances in Engineering Software*, 30: 901-906.

PARKER, C. 1999. E-mail use and abuse. *Work Study*, 48(7): 257-260.

PARTOW-NAVID, P, & SLUSKY, L. 1999. Learning Java internationally using WebCT. *THE Journal Online: Technological Horizons in Education*. November, 1999 http://www.thejournal.com/magazine/vault/A2375.cfm, access date 7 March, 2002.

PASSERINI, K. & GRANGER, M. J. 1999. Integration of instructional approaches through media combination in an undergraduate information systems course? *Campus-Wide Information Systems*, 16(5): 162-170.

PICCOLI, G. & IVES, B. 2000. Virtual teams: Managerial behaviour control's impact on team effectiveness. In *Proceedings of the twenty first international conference on Information Systems*, Dec 2000. Atlanta, GA: A. I. S. : 575-580.

PRASAD, P. 1997. Systems of meaning: Ethnography as a methodology for the study of information technologies. In Lee, A. S., Liebenau, J. & DeGross, J. I. (eds), *I S and Qualitative research*. London: Chapman & Hall.

PRATT, L., WISEMAN, R. L., CODY, M. J., & WENDT, P. F. 1999. Interrogative strategies and information exchange in computer-mediated communication. *Communication Quarterly*, 47(1), access date 7 March, 2002.

RADA, R. 1998. Virtual educational organisations. *Journal of Computer Assisted Learning*, 14: 247-248.

RICHMOND, P. G. 1970. *Introduction to Piaget.* New York: Basic Books Inc.

ROMM, C. T. & PLISKIN, N. 1997. Playing politics with e-mail: A longitudinal conflict-based analysis. In Lee, A. S., Liebenau, J. & DeGross, J. I. (eds), *I S and Qualitative research*. London: Chapman & Hall: 362-388.

ROMM, C. T. & PLISKIN, N. 1997. Towards a virtual politicking model. *Communications of the ACM*, 40(11): 95-101.

ROMM, C. & PLISKIN, N. 1999. The role of charismatic leadership in diffusion and implementation of e-mail. *The Journal of Management Development*, 18(3): 273-290.

ROODE, J. D. 1993. Implications for Teaching of a Process-based Research Framework for IS. In Smith, L. (ed), *Proceedings from the Int Academy for Information Management Conference*, Orlando, Florida, Dec 1993.

ROWE, G. W. & GREGOR, P. 1999. A computer based learning system for teaching computing: Implementation and evaluation. *Computers & Education*, 33: 65-76.

ROWLEY, J. 2000. Is Higher education ready for knowledge management? *The Internet Journal of Educational Management*, 14(7): 325-333.

RUGGERI STEVENS, G. & MC ELHILL, J. 2000. A qualitative study and model of the use of e-mail in organisations. *Internet research: Electronic Networking Applications and Policy,* 10(4): 271-283.

RYAN, M., CARLTON, K. H. & ALI, N. S. 1999. Evaluation of traditional classroom teaching methods versus course delivery via the World Wide Web. *Journal Of Nursing Ed*, 38(6): 272-277.

SABHERWAL, R. 1999. The role of trust in outsourced IS development. *Communications of the ACM*, 42(2): 80-86.

SCHNEIER, B. 1999. The trojan horse race. *Communications of the ACM*, 42(9): 128.

SEALE, J. K. & CANN, A. J. 2000. Reflection on-line or off-line: the role of learning technologies in encouraging students to reflect. *Computers & Education*, 34(3-4): 309-320.

SEELY BROWN, J. & DUGUID, P. 1996. Universities in the digital age. *Change*, 28(4):10-20.

SHAO, Y. P., LIAO, S. Y. & WANG, H. Q. 1998. A model of virtual organization. *Journal of Information Science*, 24(5): 305-312.

SHAW, G. & MARLOW, N. 1999. The role of student learning styles, gender, attitudes and perceptions on information and communications technology assisted learning. *Computers & Education*, 33(4): 223-234.

SIEBER, P. 1998. Virtuelle Unternehmen in der IT-Branche, die Wechselwirkung zwischen Internet-Nutzung, Organisation und Strategie, Berner betriebswirtschafliche Schriften, Band 19, Bern, Stuttgart, Wien, Verlag Paul Haupt, :258. http://www.virtual-organization.net/, access date 7 March, 2002.

SIPIOR, J. C. & WARD, B. T. 1999. The dark side of employee email. *Communications of the ACM*, 42(7):88-95.

SKYRME, D. J. 1997. Virtual teaming and virtual organizations: 25 Principles of Proven Practice. http://www.skyrme.com/updates/u11.htm, access date 7 March, 2002.

SKYRME, D. J. 1998. The realities of virtuality. In Sieber, P. & Griese, J. (eds), *Organizational Virtualness Proceedings of the V O Net - Workshop*, April, 1998. Bern: Simowa Verlag.

SMITH, C. D., WHITELEY, H. E. & SMITH, S. 1999. Using email for teaching. *Computers & Education*, 33(1):15-25.

SMOLOWITZ, I. 1997. The future of American corporations. *Business Forum*, 22(2-3):73-74.

SOLE, D. & APPLEGATE, L. 2000. *Knowledge sharing practices and technology use norms in dispersed development teams.* Proceedings of the twenty first international conference on Information Systems, Dec 2000. Atlanta GA: A. I. S.: 581-587.

SOTTO, R. 1997. The virtual organization. *Accting, Mgmt & InfoTech*, 7(1): 37-51.

SPAUL, M. 1997. Discipline and critique: The case of Information Systems. In Mingers, J. & Stowell, F. (eds), *Information Systems: An emerging discipline?* London: McGraw Hill: 63-95.

STALLINGS, D. 2000. The virtual university: Legitimized at century's end: Future uncertain for the new millennium. *Journal of Academic Librarianship*, 26(1): 3-14.

STAIR, R. M. & REYNOLDS, G. W. 2001. *Principles of Information Systems*. Course Technology, Thompson Learning: Australia.

STEINFIELD, C., KRAUT, R. & PLUMMER, A. 1995. The impact of interorganizational networks on buyer-seller relationships? *Journal of Computer-Mediated Communication*, 1(3): Http://www.ascusc.org/jcmc/vol14/issue3, access date 7 March, 2002.

STOWELL, F., WEST, D. & STANSFIELD, M. 1997. Action research as a framework for IS research. In Mingers, J. & Stowell, F. (eds), *Information Systems: An emerging discipline?* London: McGraw Hill: 159-200.

SUTHERLAND, R., FACER, K., FURLONG, R. & FURLONG, J. 2000. A new environment for education? The computer in the home. *Computers & Education*, 34(3-4): 195-212.

SWIGGER, K. M., BRAZILE, R., LOPEZ, V. & LIVINGSTON, A . 1997. The virtual collaborative university. *Computers Educ.*, 29(2/3): 55-61.

TELLIOGLU, H. & WAGNER, I. 1999. Software cultures. *Communications of the ACM*, 42(12): 71-77.

THOMAS, T. A. 2000. A teaching environment for learning soft skills applicable to Information Systems development. D Com thesis, Univ. of Pretoria, Pretoria.

TOLMIE, A. & BOYLE, J. 2000. Factors influencing the success of computer-mediated communication (CMC) environments in university teaching: A review and case study. *Computers & Education*, 34(2): 119-140.

TRAUTH, E. M. & JESSUP, L. M. 2000. Understanding computer-mediated discussions: positivist and interpretative analyses of group support system use. *Management Information Systems Quarterly*, 24(1): 43-79.

TRAVICA, B. 1997. The Design of the virtual organization: A research model. In proceedings of the A. I. S. 1997 Americas conference, Indianapolis. bsb.baylor.edu/ramsower/ais.ac.97/papers/travica.htm, access date 7 March, 2002.

TRUEX, D. P. 2001. Three issues concerning relevance in IS research: epistemology, audience and method. *Communications of A I S*, 6(24): Http://www.cais.isworld.org/articles/6-24, access date 7 March, 2002.

TSICHRITZIS, D. 1999. Reengineering the university. *Communications of the ACM*, 42(6):93-100.

TURBAN, E. & ARONSON, J. E. 1998. *Decision Support Systems and Intelligent Systems.* London: Prentice-Hall: 311.

TUROFF, M. 1997. Virtuality. *Communications of the ACM*, 40(9): 38-43.

UCT NEWS. 2001. Media Watch. *University of Cape Town Alumni Magazine*, 28:40.

VAN BRAKEL, P. 1999. Teaching information management via a web-based course. *Electronic Library*, 17(6): 389-394.

VANCE WILSON, E. 2000. Student characteristics and computer-mediated communication. *Computers & Education*, 34(2): 67-76.

WALSHAM, G. 1995. Interpretive case studies in IS research: Nature and method. *European Journal of IS,* 4:74-81.

WALSHAM, G. & HAN, C-K. 1991. Structuration theory and Information Systems research. *J. of Applied Systems Analysis*, 17: 77-85.

WALSHAM, G. & SAHAY, S. 1999. GIS for district-level administration in India: Problems and opportunities. *MIS Quarterly,* 23(1): 39-66.

WALTHER, J. B. & BURGOON, J. K. 1992. Relational communication in computer-mediated interaction. *Human Communication Research*, 19: 50-88.

WARF, B., VINCENT, P. & PURCELL, D. 1999. International collaborative learning on the World Wide Web. *Journal of Geography*, 98(3): 141-148.

WEBSTER, J. & TRAVINO, L. K. 1995. Relational and social theories as complementary explanations of communication media choices: Two policy-capturing studies. *Academy of Management J*, 38(6): 1544-1572.

WEISBAND, S. P. & REINIG, B. A. 1995. Managing user perceptions of email privacy. *Communications of the ACM*, 38(12): 40-48.

WHETTEN, D. A. 1989. What constitutes a theoretical contribution. *Academy of Management Review*, 14(4): 490-495.

WILSON, F. 1999. Cultural control within the virtual organization. *The Sociological Review*, 47(4): 672-694.

WILSON, T. & WHITELOCK, D. 1998. Monitoring the on-line behaviour of distance learning students. *Journal of Computer Assisted Learning*, 14: 91-99.

WINOGRAD, T. & FLORES, F. 1987. *Understanding computers & cognition: A new foundation for design*. Reading, Mass: Addison-Wesley.

YIN, R. K. 1989. Research design issues in using the case study method to study. In *Management Information Systems Harvard Business School Research Colloquium*. Boston, MA: Harvard Business School: 1-6.

ZMUD, R. W. & CARLSON, J. R. 1999. Channel expansion theory and the experiential nature of media richness perception. *Academy of Management Journal*, 153(1).

ZUBOFF, S. 1984. *In the age of the smart machine*. New York: Basic Books Inc.

Appendices

Appendix A

Information Brochure

Information brochure and acknowledgement form for INF152

> It is important that you read this and then SIGN the Informed Consent form and HAND IT IN to the secretary in the Department of Informatics or the lecturer at your first INF152 lecture.

Dear student,

Thank you for taking the time to read this information brochure and complete the Informed Consent form. The research described here is intended to help me to evaluate one aspect of telematic teaching which also is relevant in modern virtual organizations, namely the functioning of virtual teams. You will benefit from the research in a number of ways. Firstly, by participating in it you will be encouraged to find out how you yourself prefer to learn. Secondly, students who choose to do assignments in teams will have greater control over when they study and how much time they spend on the module. And thirdly, you will discover first hand how technology can affect the working environment. It is hoped that the university as a whole will also benefit from the research and your contribution to it.

This research project allows you to choose from three different study options for INF152.
a)   You may:
   - EITHER take this module in the traditional form of lectures
   - OR only attend occasional lectures and work in groups via e-mail
   - OR only attend occasional lectures and work in groups meeting face to face.
b)   Participation in the research is voluntary, if you choose the option of attending normal lectures you will be unaffected by the research.
c)   The research will only involve module INF152 and takes places in the second half of the first semester.
d)   You will be allowed to change from one option to another if you find an option unsatisfactory. This will have to be done in an orderly way as explained later.
e)   All three options will be fully supervised by lecturers and assistants.
f)   Feedback and comments from students will be encouraged and this will include having student representatives in a monitoring committee set up for the project.
g)   All the INF152 students will write the same examination and their final marks will be calculated using the same formula (that is, it will be calculated in all cases with the examination mark and the module mark each contributing 50% to the final mark.)
h)   Please sign the form that you have been given to confirm that you have been informed about the research and to tell us whether you want to participate.
i)   As part of this research it will be necessary that the lecturer:
   - receives copies of all of the e-mail exchanged by members of the virtual teams as part of the project
   - and records working sessions of the face-to-face teams.

Please remember that both I and the university have committed ourselves to complete confidentiality and you can be assured that your answers to questionnaires and other information recorded as part of this research will never be communicated to any third party or be used in any way to evaluate you.

If you would like more details about the research project please read Appendix A. This information will in any case be explained in the introductory lecture which will be given at the start of this module.

Refer to the last page of this brochure to see what you have to do with respect to this module.

Please complete the Informed Consent form which will be handed out separately to you.

Thank you for your co-operation

Mrs P M Alexander
Room 5-61, Dept Informatics, University of Pretoria
(012) 420-3367 or (012) 807-0983

Details of this research

What will be investigated in the research?

1.   Telematic education

As many of you may know, the University of Pretoria uses Telematic education in some courses. Clearly it is necessary to investigate ways in which it can be used most effectively and this is one of the purposes of this research.

What is Telematic education? It is the use of the Internet in education for any of a variety of purposes and allows students to get information, send messages or even do certain tasks at any time and at a distance.

a.   It can be used for primarily *administrative purposes*, for example, to ensure that you can get information about lecture times and venues, the dates of tests and examinations, what work you need to study for a particular test, and the mark you got for a test or assignment.
b.   It can also be used in the *teaching* of courses. Summaries of lectures, full explanations of topics, or links to additional articles which you might find interesting or which may explain a topic in a different way can be provided as web pages.
c.   Another way in which telematic education can be used is to present *tests* that are taken online or to allow you to check how well you know a topic by means of *online exercises* which are marked immediately and which include helpful comments if you give a wrong answer.
d.   Telematic education also allows students to discuss their work with their lecturers and other students via e-mail. This improved *communication* means that you can submit electronic versions of assignments via e-mail and the marked assignment can be returned in the same way.

All of these options are possible, but not all of them are necessarily used in all courses.

This research will focus on one particular aspect of telematic education where students work in teams. A detailed description follows but briefly the virtual team members communicate with each other and a lecturer via the facility provided by WebCT which is similar to e-mail, and complete assignments as a team.

1.   Virtual organizations and virtual teams

The Internet is also used extensively outside education as a part of the globalization of our modern world. This is particularly noticeable in e-commerce and virtual organizations and it is becoming increasingly important to teach Informatics students about this new development in Information Systems.

This research is, therefore, also intended to:

- teach you how to work effectively in a virtual team in case you have to work in a such a team in the future.
- allow you to experience how technology can affect you and your work activities when they must be carried out using it. This will give you a very real understanding of issues involved in Informatics. It is important that designers of technology based systems recognise that people are affected by these systems in numerous ways that are often difficult to predict.

How will the research be carried out?

1. During the research students will be offered the choice between three different study options.

a) *Lectures*

You may choose to attend three, double-period (one hour twenty minutes) lectures per week in which the content of the module will be covered.

If you choose this option you will be expected to:
- participate in discussions in class;
- work on assignments alone;
- take class tests;

b) *Face-to-face teams*

You may choose to work on assignments as part of a face-to-face team.

If you choose this option you will be expected to:
- study the module on your own and as part of your team, using a prescribed book which covers the topic completely;
- attend a contact session (lectures with the rest of the teams and the lecturer) once every two weeks; (The contact sessions will be held after normal lecturing hours at 17:30).
- take class tests.

You are not expected to attend the regular lectures which are held three times a week although you may do so if you choose.

As part of the research we will monitor and record the activity of these teams.

c) *Virtual teams*

You may choose to work on assignments in a virtual team with team members who communicate with each other only via e-mail.

If you choose this option you will be expected to:
- study the module on your own and as part of your team, using a prescribed book which covers the topic completely;
- attend contact session (lectures with the rest of the teams and the lecturer) once every two weeks; (The contact sessions will be held after normal lecturing hours at 17:30).
- take class tests.

You are not expected to attend the regular lectures which are held three times a week although you may do so if you choose.

As part of the research we will monitor and record the activity of these teams.

2. Introductory lecture

All the INF152 students will be required to attend a lecture on cooperative work where we will discuss specific ways of working effectively in a virtual team. This lecture will be given at the usual lecture times and in the usual venues on Wednesday 28 March, Thursday 29 March and Friday 30 March. The ways in which the two different types of teams mentioned above must work together, how they will be monitored, how marks will be allocated for the assignments which are done by the teams, and how potential grievances will be handled, will also be discussed. It is important that you attend this lecture.

3. Selecting an option
    You will be given a limited amount of time after receiving this brochure in which to decide finally which of the study options you want to use (although we do ask you to give us a provisional indication of your choice in the Informed Consent form which you are to fill in on receiving this brochure). During the introductory lecture mentioned in point 2) above and you will be asked to fill in a questionnaire in which you finally decide and you explain why you made that choice. You may change your study option immediately after Assignment 1 has been submitted and before work on the Assignment 2 starts, provided that you complete the necessary request form and inform everyone concerned. Students who decide to work in teams must register the names of their team members and arrangements for monitoring the team activities will be made.

4. Recording team discussions
    As part of this research it will be necessary that the lecturer:
    •   receives copies of all of the e-mail exchanged by members of the virtual teams as part of the project
    •   and records working sessions of the face-to-face teams.
    The individuals whose comments are recorded will not be identified, and the records will be held solely for research purposes.

Virtual and face-to-face Teams

a. A team may consist of no more than six or fewer than four members.
b. Each team has its own personal character and culture and this is something that will be examined as part of the research.
c. Each team needs to communicate within the group in a language that all the team members are fluent in. This may be any one of the eleven official languages of South Africa (or even some other language).
d. You will choose your own team members (although we will try to help you to find a team to join if this is necessary). One of the important aspects of this research is that students are in teams where they feel comfortable, can communicate easily with each other, and trust fellow team members from the start.
e. All the members of a virtual team *as well as the researcher* must be sent all that team's e-mail.
f. All the members of a face-to-face team must be informed when and where the team is meeting. Two days advance notice must be given to the team members *and to the research office so that a research assistant can be present to record the meeting.*
g. Since we would like students to relate the information that they are learning about to their own life worlds and to the type of social structures that they are familiar with, it is

advisable for students in a team to have reasonably similar backgrounds. For example, in one of the assignments, one of the options is for you to design an information system for a public transport company. It would be useful if all the team members working together on this assignment had experience in using a particular type of public transport. Another option in this assignment is to design an information system for a crime prevention or security company. A team addressing the concerns of a particular type of community that all the team members are familiar with would work together better than one where some members had a different understanding of the issues.

Assignments

a.   Assignment 1

This assignment will be available on 18 April. You may collect a printed copy from your lecturer during the normal INF152 lectures on 18 and 19 April, or from Mrs Alexander when you submit your lists of team members. It will also be available on the Internet.

a)   Teams
- The first assignment will be a multiple choice assignment where each (every) team member will be required to answer different questions.
- The team members must check all the answers to the questions that they did not do, and if they do not agree with the answers give reasons and discuss the answers until consensus is reached.
- The members of each team will all get the same mark for the assignment (though different teams will probably get different marks) but the discussion entered into by the team will be noted by the lecturer and be taken into account in marking. Thus, if there is evidence that a team had a convincing argument for selecting an option, even if it was not the answer indicated as correct in the model answer, it would be given the mark.

b)   Students not working in teams
Those students who are not working in teams will simply answer all the questions on their own and hand in the answers. The mark awarded will be determined in the usual way, that is, according to how the answers compare with the set of correct answers.

2.   Assignment 2

This will be in the form of a mini-project in which aspects of systems analysis and design must be considered in the context of an imaginary system. It will be available in the first week of May (30 April to 4 May). You can collect a printed copy from your lecturer during the normal INF152 or from Mrs Alexander. It will also be available on the Internet.

a)   Teams

All the students in the team are expected to participate actively in an attempt to relate the material in the prescribed text to an information system which they will describe. Each team member will be allocated a role to be fulfilled in order for the task to be completed. There will be at least one contact session in the period when students are working on this assignment in which they will be able to discuss it with a lecturer.

b)   Students not working in teams

The students will have the opportunity to discuss the exercise in class but will complete it individually.

Resources provided by the university

Students who wish to participate in virtual teams will need to use e-mail. The university will make e-mail facilities available but reserve the right to limit the amount of e-mail that a student may send and to whom. Access to computers and the Internet will be provided for this purpose but bookings may have to be made ahead. Students who choose to use e-mail from home cannot claim any compensation for the cost.

Thank you for your co-operation

Mrs P M Alexander
Room 5-61, Dept Informatics, University of Pretoria
(012) 420-3367 or (012) 807-0983

What you, the student, need to do

Now (when you receive this pamphlet)
a)   Fill in the form given to you separately, which indicates that you have been informed about the project. It is essential that you do this as otherwise it will not be possible for you to participate in the project. The choice made now as to which option you want to take is not binding but we need some indication of numbers for initial planning. Please read this pamphlet carefully and decide on an option.
b)   If you want to work in a team, start thinking about who you would like to be in a team with.
c)   Buy the prescribed text book if you do not already have it.

March
d)   Make sure you write the dates of the compulsory information sessions into your diary (28, 29 and 30 March) and ensure that you attend one of these sessions.

During these information sessions you will be given further information regarding procedures, dates for the contact sessions in which all the teams and the lecturer(s) will meet, and we will discuss the use of e-mail as a management tool and the functioning of teams in virtual organizations (please note that this is not covered in the prescribed text).

During the information session (28, 29 and 30 March)
e)   Fill in the first questionnaire
f)   Help select representatives to be on the committee monitoring the research project.

April
g)   Submit a list of members in your team signed by each team member to the researcher, or place into Mrs Alexander's post box in the Dept of Informatics (no later than 19 April).
h)   Check that the list of members posted on the departmental notice board and web site corresponds with the list you signed. This will be posted on the notice board on 23 April. Changes must be in by 26 April.
i)   Ensure that you have a copy of the Assignment 01 questions for INF152.
j)   If you are working in a face-to-face team let the researcher know at least two days in advance when and where your team is meeting. The full team also need to be given the same advance notice.

May
a)   Submit Assignment 01.
b)   Ensure that you have a copy of the Assignment 02 questions for INF152.
c)   Submit Assignment 02.

Participation by
the University of Pretoria students who are registered for module INF152
in the Virtual Teams research project

. . . .
(Student's name)

. . . .
(Student number)

I voluntarily agree to participate in the project as explained in the Information Brochure for INF152. I understand of the nature and objectives of this research. I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purpose of publication.

Mark the option you would most like 1 ; the next most acceptable choice 2; and the choice you least prefer 3.)

☐   I would like to study the module during my own time using the prescribed book as study material and to do assignments as part of a virtual team that communicate via e-mail. I will use my own e-mail (from home or work). I will attend the contact sessions between students and lecturers which will be held once every two weeks at 17:30.

☐   I would like to study the module during my own time using the prescribed book as study material and to do assignments as part of a virtual team that communicate via e-mail. I will need the university to give me access to e-mail. I understand that I may not be accommodated in this option. I will attend the contact sessions between students and lecturers which will be held once every two weeks at 17:30.

☐   I do not wish to participate in the research but instead will attend full lectures and do assignments on my own.

☐   I would like to study the module during my own time using the prescribed book as study material and to do assignments as part of a team that meets for this purpose. I will attend the contact sessions between students and lecturers which will be held once every two weeks at 17:30.

This choice is NOT binding. A final choice will be made later.

Signed Name   Date

               Witness   Date ....

               Researcher   Date ....

You will be provided with a copy of this form once you have signed it.

Appendix B

Questionnaires

INF152   Questionnaire 1
Choice of study option
(To be completed prior to starting the module.)

Student number[*] . . . .

For each question, mark the one option that you choose.

1.1.1

When did you first register at the University of Pretoria?

1. before 1999   2. 2000   3. 2001

1.1.2

How many modules did you pass in the last year in which you registered (not this year)?

☐ not registered before this year   ☐ more than four   ☐ four

☐ three   ☐ two   ☐ fewer than two

1.1.3

In the last year in which you were registered (not this year), how many modules did you take? (If you officially cancelled a module do not count it.)

☐ not registered before this year   ☐ more than four   ☐ four

☐ three   ☐ two   ☐ one

1.1.4

Are you repeating this module (INF152) this year?

☐ Yes   ☐ No

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[*]Please remember our undertaking to respect confidentiality and not to communicate your responses to the university in any way.

1.1.5

Have you ever used e-mail or something similar such as the e-mail facilities on WebCT?

☐ Yes   ☐ No

1.1.6

Do you have access to e-mail or a similar electronic post outside the university?

☐ at home   ☐ at work   ☐ elsewhere

1.1.7

Do you attend many more lectures for some university modules than for other modules?

☐ Yes   ☐ No

Why . . . .

. . . .

1.1.8

Last year, approximately how many of the scheduled lectures for the modules you were registered for did you attend?

☐ I was not at this university   ☐ more than 75%   ☐ between 75% and 50
     in 2000

☐ between 50% and 25%   ☐ fewer than 25%

1.1.9

So far this year, approximately how many of the scheduled lectures for the modules you are registered for have you attended?

☐ more than 75%   ☐ between 75% and 50%   ☐ between 50% and 25%

☐ fewer than 25%

1.1.10

What is your home language?

. . . .

1.1.11

Which lecture group are you in for INF152?

☐ E1 ☐ MI ☐ OI

☐ E2 ☐ M2

1.1.12

What makes you decide to skip lectures for a particular module? *(Mark at most three options. Mark the most important 1; the next most important 2; and the third most important 3.)*

☐ the time when the lecture will be given

☐ clashes on the time table

☐ how busy you are with other module work (eg, assignments due, tests coming up)

☐ the quality of the lecturer

☐ how easy or difficult the module is

☐ how well the prescribed book covers the material

☐ whether a friend will be attending the class and will let you know if there was anything important

☐ the lecturer frequently indicates what is important in the prescribed book and this it useful to know this

☐ you know that you probably will not get round to study this work if you do not attend classes

Other . . . .

. . . .

1.1.13

Do you enjoy doing teamwork as part of your studies? *(Omit if you've never worked in a team or haven't worked in a team very often.)*

☐ Yes ☐ Sometimes ☐ I don't care one way or

☐ No the other

1.1.14

When you worked in a team before, have your results been satisfactory? *(Omit if you've never worked in a team or haven't worked in a team very often .)*

☐ Yes ☐ Sometimes ☐ No

1.1.15

Are you confident you'll pass the modules you registered for this year?

☐ all of them ☐ more than half ☐ fewer than half
☐ not certain of any

1.1.16

How good are you at getting your point across in a group of four or five people? *(Mark at most three options. Mark the most important 1; the next most important 2; and the third most important 3.)*

☐ I join in a discussion freely.
☐ I enjoy discussing quite serious topics such as the work I'm are studying.
☐ I join in as long as no teachers or lecturers are in the group.
☐ I mostly listen to what everyone else is saying and do not say much.
☐ People usually understand the point I am trying to make.
☐ The discussions are usually in a language that is not my home language and so I'm shy about joining in.
☐ I won't try to press my own point of view or explain it more fully even if I'm sure that I am right.
☐ I enjoy influencing my fellow students.

1.1.17

How good are you at communicating in writing (not essays but short, friendly notes to fellow students)? *(Mark at most three options. Mark the most important 1; the next most important 2; and the third most important 3.)*

☐ very good
☐ good
☐ fairly good
☐ bad
☐ I don't like communicating in this way because my spelling and grammar aren't good
☐ I don't like communicating in this way because my hand writing is not good
☐ I don't know as I do not do this often

1.1.18

How good are you at communicating by telephone?

☐ I enjoy talking on the phone and do so as often as I can.
☐ I enjoy talking on the phone but prefer talking to someone face to face.
☐ I only use the phone to give someone a message.
☐ I avoid the phone as much as possible.
☐ I do not have easy access to a phone most of the time.

1.1.19

Which way do you prefer to study? *(Mark only one.)*

☐ attending lectures

☐ alone from books

☐ doing practical work or exercises

☐ using other media such as the Internet or videos

INF152 Confirmation of the study choice

(To be signed by the student)

Student number: . . . .

Mark the option you would most like 1 ; the next most acceptable choice 2; and the choice you least prefer 3.

☐ I would like to study the module during my own time using the prescribed book as study material and to do assignments as part of a virtual team that communicate via e-mail[*]. I will access the e-mail facilities of WebCT via the Internet from home or work. I will attend the contact sessions between students and lecturers which will be held once every two weeks at 17:30.

☐ I would like to study the module during my own time using the prescribed book as study material and to do assignments as part of a virtual team that communicates via e-mail[*]. I will need the university to give me access to the e-mail facilities of WebCT. I will attend the contact sessions between students and lecturers which will be held once every two weeks at 17:30. I understand that I may not be accommodated in this option.

☐ I do not wish to participate in the research but instead want to attend all the usual lectures and do assignments on my own.

☐ I would like to study the module during my own time using the prescribed book as study material and do assignments as part of a team that meets for this purpose and attending occasional contact sessions between students and lecturers.

This is my own, informed decision, and I confirm that I have been given full explanations and an opportunity to discuss the implications of my choice. I accept responsibility for the choice that I have made.

Signature: . . . .

Give your reasons for deciding on this option.

. . . .

. . . .

---

[*]E-mail facilities in the universiy's WebCT system

. . . .

. . . .

What do you think you and your fellow students should do in order to make this option work well?

. . . .

. . . .

. . . .

. . . .

INF152 Questionnaire 2
Registering a virtual or face-to-face team
(To be completed prior to starting the module.)

- *Your signature indicates that you agree with the composition of your team. Sign only after the names of all members of the team have been put on the list.*
- *You are expected to check the lists of teams and members once these are displayed on the notice board in the Dept. of Informatics in order to confirm that your details are correct. The lists will also give you your very important team identification number. Please report any problems immediately.*
- *It is possible to change teams, but this can only be done:*
  - < *before Assignment 1 is handed out, that is, before 14 May, 2001*
  - < *OR after the first assignment has been handed in and before work starts on the second assignment (end of May).*

Name of student	Student number	Contact telephone number or e-mail address	Signature

INF152 Questionnaire 3
Changing your study option

(To be completed on changing from one option to another.)

Once you have committed yourself to one study option you may only change your mind before 14 May, 2001 OR after the first assignment has been handed in and before work starts on the second assignment (end of May)

Date:

Name: Student number

Option that you previously chose

☐ lectures   ☐ teams that meet face to face

☐ teams that work via e-mail[*]

Option that you now want to change to

☐ lectures   ☐ teams that meet face to face

☐ teams that work via e-mail[*]

Give the identification number of the team that you want to leave. . . . .

If you want to leave a team, you MUST attach a note signed by ALL the members of the team saying that you have personally informed them of your decision to leave the team.

Give the identification number of the team that you want to join.   . . . .

If you want to join a team, you MUST attach a note signed by ALL the members of the team saying that you are welcome to join and team members must give phone numbers or e-mail addresses where they can be contacted to confirm this.

Reason for the change *(This must be given no matter what your original choice was.)*

. . . .

. . . .

Signed:

---

[*]E-mail facilities in the universiy's WebCT system

INF152 Questionnaire 4

Evaluation of the study option you chose

Every student must please complete a copy of this questionnaire and hand it in together with the second assignment.

Student number^{**} . . . .

If you submit this questionnaire, you will be awarded bonus marks towards your module mark.

For each question, mark the one option that you choose.

Section A - General
*To be filled in by **all** students*

4.1.1

When you had to choose one study option (lectures, face-to-face teams or virtual teams) did you clearly understand the purpose of the research?

☐ Yes   ☐ No

4.1.2

Did you clearly understand how the study option(s) you chose would work?

☐ Yes   ☐ No

4.1.3

What is your home language? . . . .

---

^{**}Please remember our undertaking to respect confidentiality and not to communicate your responses to the university in any way.

^{***}E-mail facilities in the universiy's WebCT system

4.1.4

Which study option did you use for Assignment 1?

☐ lectures ☐ teams that meet face to face ☐ teams that work via e-mail***

4.1.5

Did you have access to a copy of the prescribed book for this module when you needed it?

☐ Yes ☐ No

4.1.6

Which study option did you use for Assignment 2?

☐ lectures ☐ teams that meet face to face ☐ teams that work via e-mail

4.1.7

Mark the following comments if you agree. (You may mark more than one statement.)

Was the prescribed book:

☐ easy to read ☐ interesting ☐ unnecessary if you went to lectures
☐ too long ☐ too expensive

4.1.8 Was the module:

☐ interesting ☐ difficult

Additional comments . . . .

. . . .

. . . .

4.1.9

Did you complete Assignment 1?

☐ Yes ☐ No

4.1.10

Was Assignment 1:

very difficult	difficult	easy	very easy

4.1.11

Did you complete Assignment 2?

☐ Yes   ☐ No

4.1.12

Was Assignment 2:

very difficult	difficult	easy	very easy

4.1.13

Did you choose to take this module or did you have to take it because it was a compulsory part of the degree you are taking?

☐ chosen   ☐ compulsory

Fill in one or more of the following sections.

Complete Section B if you attended normal lectures and did at least one assignment on your own.

Complete Section C if you studied the module during your own time using the prescribed book as study material and did at least one assignment as a member of a team that met for this purpose.

Complete Section D if you studied the module during your own time using the prescribed book as study material and did at least one assignment as a member of a virtual team.

IF YOU CHANGED OPTIONS DURING THE MODULE PLEASE COMPLETE THE SECTIONS CORRESPONDING WITH BOTH CHOICES.

Section B - Lectures
Complete if you attended lectures and did at least one assignment on your own.

4.2.1

What percentage of scheduled university lectures for this module did you attend?

☐ more than 75% ☐ between 75% and 50% ☐ between 50% and 25%

☐ fewer than 25%

4.2.2

Did you find the lectures useful?

☐ Yes ☐ No

. . . .

. . . .

4.2.3

Did the research project affect your studies?

☐ it helped me ☐ uncertain ☐ it was disruptive

☐ no

. . . .

. . . .

. . . .

4.2.4

Were there discussions during the lectures that the students participated in?

☐ useful discussions occurred during nearly every lecture and students participated well

☐ there were not many discussions

☐ only a few students took part in discussions and it was always pretty much the same students in every discussion

☐ discussions wasted time

. . . .

. . . .

. . . .

Section C - Face-to-face teams

Fill in this section if:

- *you participated in the research **for all or part of the module**,*
- *studied the module during your own time using the prescribed book as study material,*

- *AND did at least one assignment as part of a team that met for this purpose.*

4.3.1

Did your group meet often enough?

We met far more often than necessary.	We could have had fewer meetings.	We could have met slightly more often.	No, we should have met much more often.

4.3.2

Mark the description that describes your group best? Attendance at team meetings was:

Very good. All team members almost always attended.	Most members attended most of the time.	Certain team members hardly ever attended the meetings.	Attendance was generally very poor.

4.3.3

Mark the description that describes your group best?

Everyone usually took part in discussions.	The same people usually dominated and did not give others the chance to speak.	Some team members usually did not say much.	It was usually difficult getting any discussion going.

4.3.4

On the whole did team members get on well with each other?

☐ Yes ☐ No

4.3.5

Did you know the other team members before you worked together in the team?

☐ Yes, I knew them all quite well. ☐ I knew some but not everyone. ☐ No, I didn't know anyone at all.

4.3.6

Do you consider most of the people who were in your team to be friends you will try to spend more time with in future?

☐ Yes ☐ No

4.3.7

Where did your team usually meet?

☐ on campus but not in a lecture room ☐ at someone's home ☐ in a lecture room

☐ at different places ☐ none of these

4.3.8

When did your team usually meet?

☐ evenings ☐ weekends ☐ mornings or afternoons during the week

4.3.9

Were people in the group usually friendly and patient?

☐ Yes   ☐ No

4.3.10

How successful were you at communicating in the group? *(Mark at most three options. Mark the most important 1; the next most important 2; and the third most important 3.)*

☐ I joined in most discussions freely.

☐ I enjoyed the discussions.

☐ Having a researcher in the group put me off.

☐ I mostly listened to what everyone else was saying and didn't say much.

☐ People usually understood the point I was trying to make.

☐ The discussion was usually in a language that is not my home language and so I was shy about participating.

☐ I did not try to press my own point of view or explain it more even when I was sure I was right.

4.3.11

Was there a research observer at your team meetings?

☐ most times   ☐ about half of the meetings   ☐ rarely

☐ never

4.3.12

Were you satisfied with the standard of the assignments that your team submitted?

☐ Yes   ☐ No

4.3.13

Were you satisfied with getting information and studying for the examination from the textbook only?

☐ Yes   ☐ No

4.3.14

Did you attend contact sessions (the meetings with the lecturer and other teams)?

☐ Yes   ☐ No

4.3.15

Were the contact sessions between lecturer and student useful?

☐ Yes   ☐ No

4.3.16

What do you think the best feature of the teamwork was?

. . . .

. . . .

. . . .

4.3.17

What was the worst feature of the teamwork?

. . . .

. . . .

. . . .

4.3.18

What improvements can you suggest for contact sessions?

. . . .

. . . .

. . . .

4.3.19

Do you think you did your fair share of the work?

☐ more than your share   ☐ about the right amount   ☐ not enough

4.3.20

You should answer all of these questions.

Did most of the team members:	Always	Mostly	Usually	Never
do what they said they would do and when they said they would				
behave in a friendly way				
discuss work during the meetings rather than chat				
prepare for these meetings by studying the text book				
contribute to the team effort satisfactorily				
pay attention (listen carefully) to what other people were saying, particularly if they did not agree about an answer or how the assignment should be done				

4.3.21

When teams do not work together successfully how do you think the problem should be solved?

. . . .

. . . .

. . . .

4.3.22

Did your team ever need to address a problem concerning the way people worked together?

☐ Yes ☐ No

4.3.23

If the answer to the previous question was yes, how did the team attempt to solve the problem and how successful were they?

. . . .

. . . .

. . . .

. . . .

4.3.24
How did you decide who you wanted to be in a team with?

. . . .

. . . .

. . . .

4.3.25
If you decided to attend the normal lectures (not the contact sessions) for the module even
though you were working in a team, how many lectures did you attend?

☐ all   ☐ more than 50%   ☐ only a few

Please give reasons for this decision . . . .

. . . .

. . . .

Section D - Virtual teams

Fill in this section if:
*   *you participated in the research **for all or part of the module**,*
*   *studied the module during your own time using the prescribed book as study material,*

*   *AND did at least one assignment as part of a virtual team that only **communicated
    via** e-mail.*

4.4.1
What language did you use as a team for e-mail?

. . . .

4.4.2

Where did use email? *(You may mark more than one option for this question.)*

☐ home   ☐ university labs   ☐ work

☐ Internet café   ☐ friend or family assisted   ☐ somewhere other than these options

4.4.3

Did your group communicate with each other via e-mail sufficiently often?

☐ Yes   ☐ No

4.4.4

Did everyone in the group take part in discussions via e-mail?

☐ Yes   ☐ No

4.4.5

Did team members need to use means of communication other than e-mail (such as telephone or face to face meetings) in order to get the work finished?

☐ Yes, once   ☐ Yes, more than once   ☐ No

☐ the group stopped using e-mail completely and communicated in other ways

4.4.6

Did you know the other members of the team before the project?

☐ yes, knew them all quite well   ☐ knew some but not everyone   ☐ no, did not know anyone at all

4.4.7

Do you consider most of the people who were in the team to be friends you will try to stay in touch with in future?

☐ Yes   ☐ No

4.4.8

Did most of the other team members respond to e-mail which you sent out?

☐ within a day   ☐ within two days   ☐ they said they did not receive it

☐ they ignored it   ☐ within a week

4.4.9

Did you have difficulty with e-mail? *(Mark at most three options. Mark the most important 1; the next most important 2; and the third most important 3.)*

☐ I couldn't get permission to use a computer at the university for the amount of time that was necessary.

☐ I had problems with the network.

☐ It cost too much.

☐ The instructions explaining what I had to do were unclear or insufficient.

☐ I thought I would have access from home but this proved to be impossible.

☐ I didn't receive all the messages sent by the other team members.

Other . . . .

. . . .

4.4.10

Were people in the group usually friendly and patient?

☐ Yes   ☐ No

4.4.11

How successful were you at communicating in the group? *(Mark at most three options. Mark the most important 1; the next most important 2; and the third most important 3.)*

☐ I joined in most discussions freely.

☐ I enjoyed the discussions.

☐ Knowing that a lecturer was monitoring the group put me off.

☐ I mostly read what everyone else wrote and did not write much.

☐ People usually understood the point I was trying to make.

☐ I was shy about writing in a language that is not my home language.

☐ I didn't try to press my own point of view or explain it more fully even if I was sure I was right.

4.4.12

Were you satisfied with the standard of the assignments that your team submitted?

☐ Yes   ☐ No

4.4.13

Were you satisfied with getting information and studying for the examination from the textbook only?

☐ Yes   ☐ No

What do you think the best feature of the virtual teamwork was?

. . . .

. . . .

. . . .

. . . .

4.4.14
What was the worst feature of the virtual teamwork?

. . . .

. . . .

. . . .

. . . .

4.4.15
If you decided to attend the normal lectures (not the contact sessions) for the module even though you were working in a team, how many lectures did you attend?

☐ all ☐ more than 50% ☐ only a few

Please give reasons for this decision . . . .

. . . .

. . . .

4.4.16
Did you attend contact sessions (the meetings with the lecturer and other teams)?
☐ Yes ☐ No

4.4.17

Were the contact sessions between lecturer and student useful?

☐ Yes   ☐ No

4.4.18

What improvements can you suggest for contact sessions?

. . . .

. . . .

. . . .

. . . .

4.4.19

Do you think you did your fair share of the work?

☐ more than your share   ☐ about the right amount   ☐ not enough

4.4.20

How did you decide who you wanted to be in a team with?

. . . .

. . . .

. . . .

4.4.21

(You should answer all of these questions.)

Did most of the team members:	Always	Mostly	Usually	Never
do what they said they would do and when they said they would				
behave in a friendly way				
discuss work in their e-mail messages rather than chat				

seem to have prepared by studying the text book				
contribute to the team effort satisfactorily				
pay attention to what other people were saying, particularly if they did not agree about an answer or how the assignment should be done				

4.4.22

When virtual teams do not work together successfully how do you think the problem should be solved?

. . . .

. . . .

4.4.23

Did your team ever need to address a problem concerning the way people worked together?

☐ Yes   ☐ No

4.4.24

If the answer to the previous question was yes, how did the team attempt to solve the problem and how successful were they?

. . . .

. . . .

. . . .

4.4.25

Do you think that you would like to work in a virtual team for some other university modules (not necessarily all)?

☐ Yes   ☐ Not sure   ☐ No

☐ Yes provided certain essential changes are made (Explain below)

. . . .

. . . .

. . . .

Appendix C

Assignments

INF152 Assignment 1
Work to be covered: Chapter 8 of S&R
Due date: 2 May
Marks: 20

INSTRUCTIONS

a) Read through the assignment and try to ensure that you all have an overall idea what the questions are asking and how they should be tackled.

b) Allocate sections of the assignment to one or more team members.

c) Agree on a work schedule.

d) Each member of the team should then independently do the part of the work allocated to him or her and submit it to the rest of the team by the agreed time and date.

e) Each team member should now work through the complete set of answers and make notes as to how to improve them.

f) The team must now *jointly* discuss these suggestions for improvement and once consensus has been reached make the changes.

g) The final set of answers must be handed in by the due date.

Question 1

Apply the transaction processing cycle to the Computer-based Education/Training (CBT) tests that you have taken (for example, for INF151 in the University of Pretoria CBT labs). In other words, take each activity in the transaction processing cycle give by Stair and Reynolds and explain in no more than ten lines what processing is required in a CBT testing system. Some parts of this system you have first hand knowledge of and hence you will be expected to give fairly accurate and quite detailed accounts. Some aspects of the system are not completely obvious and so you will simply make assumptions and educated guesses in your answer.

[6]

Question 2

Although a university at first may not seem to require the same traditional transaction processing applications as those described in Chapter 8 of Stair and Reynolds, on thinking more carefully the similarities can be detected.

a) Adapt the description of the order processing system to be suitable for a university. Draw a data flow diagram for the "order entry system" suitable for a university similar to the one in figure 8.8 for this system and briefly explain (between five and ten lines each) what the four processes might involve.

[8]

b) An order processing system as depicted in Figure 8.7 includes seven subsystems (we have already considered the order entry system in a)). Would a university's order processing system include these as well? Describe subsystems for use at a university that are in some respect similar to those given (between five and ten lines). [6]

INF152 Assignment 2

Work to be covered: Chapters 9, 10 and 11 of S&R
Due date: 21 May
Marks: 30

Question 1
Choose one of the following applications
☐ A public transport system
☐ A security management system

Choose one of the following classes of information system
☐ Decision Support System
☐ Expert system

You are going to design a purely imaginary information system and are encouraged to include unusual ideas as well as those that might be expected in such a system.
In all cases you must:
• Indicate at the start which options you have chosen
• Briefly (no more than ten lines) give an overall description of the purpose of the system
• Draw an overall systems flowchart in the style used by S&R.
• Include a section of no less than one page on ethical and social issues that are reflected by the system you have designed
• Design an MIS:
   Identify the functional area. Identify *in detail* the input data obtained from the supporting TPS and other sources. Give *detailed* accounts with report or screen layouts of the output. For each report indicate when these will be produced (scheduled, key-indicator, etc), and what level of management it supports (operational, tactical etc)

In addition

• If you choose to design a DSS:
Explain in detail what type of decisions you are going to enable management to make and how. Give examples of the types of queries that the manager will require the DSS to provide answers for. The fields that need to be held in the underlying database must be described in detail including where the input data will be obtained from and how it will be verified.

• If you choose to design an expert system:
You need to give details of the knowledge based required. You must say exactly what kinds of expertise the system is covering and the scope of that expertise. You must give no fewer than

ten rules that will guide the user of the system. You must give detailed screen layouts showing the user interface.

INSTRUCTIONS

There are six possible options

	MIS	DSS	Expert system
Transport			
Security			

1. This assignment is as much about working as a team as it is about designing a system. Hence we require evidence that you have worked as a team.

2. Marks will only be awarded to:
*   Face-to-face teams if they have registered a group and recorded their discussions on a tape or digital recorder. Assignment 2 will be handed out when the team is registered.
*   Virtual teams if they are registered and actually do use e-mail or WebCT discussions to reach a consensus on their final answers. Assignment 2 will be on WebCT 10 May.
*   Normal teams if all team members are present during both of the case study lectures 10 or11, and 17 or 18 May. Assignment 2 will be handed out in class on10 and 11 May. It must me handed in during class on 17 and 18 May.

3.   What to do.
a. Read through the assignment together and try to ensure that you all have an overall idea what the questions are asking and how they should be tackled.
b. Allocate sections of the assignment to one or more team members for them to do initial preparation or come up with some ideas that the team can build on.
c. Agree on a work schedule.
d. Each member of the team should then independently do the part of the work allocated to him or her and submit it to the rest of the team by the agreed time and date.
e. Each team member should now work through all the work done so far and make notes as to how to improve it.
f. The team must now *jointly* discuss these suggestions for improvement and once consensus has been reached make the changes.
g. The final set of answers must be handed in by the due date.

4.	This assignment is more complex than the previous one because:

a.	You have to decide which scenario you want to tackle using the options given. Before you can decide on this you need to have devised a team strategy for making this decision.

b.	The project is larger, covers more work is and less well defined than that in assignment 1 and stretches over a longer period of time. You will need to meet at least twice to complete it. Virtual teams should work only via e-mail.

c.	You should NOT try to work independently as the sections rely largely on the decisions made in other sections. Your communication channels will have to be good.

5.	Your work will be evaluated using the following marking scheme

a.	Grasp of concepts and theory. Is this really the type of IS that it is intended to be? I.e. an MIS not a TPS, a DSS not a MIS, or an Expert System not anything else. This is indicated by the purpose and output (reports, queries et cetera)	[7]

b.	General presentation. This is visual, neatness, grammar and spelling.	[4]

c.	Originality	[4]

d.	Logic (can the output be obtained from the data available)	[4]

e.	Ethical issues	[3]

f.	Completeness, detail	[8]

Appendix D

Research questions and sources of data

	WHAT IS	
1.1	What is information?	Theory (Chapter 3)
1.2	What is information richness?	Literature study (Chapter 5)
1.3	What is a virtual team?	Literature study (Chapter 6)
1.4	What is telematic education?	Literature study (Chapter 5)
1.5	What cultural characteristics in South African society affect tertiary education?	Chapter 8[***]. There was evidence that the difference language groups did have different attitudes towards the course, the textbook and teamwork. It was not clear whether this could be attributed to cultural, schooling, or other differences in background.
1.6	What is a culturally homogeneous group?	Literature study (Chapter 6)
1.7	What is Computer Supported Cooperative Learning?	Literature study (Chapters 3 and 6)
	HOW DOES	
2.1	How does trust develop in virtual teams and how is it maintained?	The literature study (particularly Chapters 6) supported by data from questionnaire 4 (questions regarding trust/success/ in questionnaire) give preliminary data but the main evidence is obtained in recorded e-mail and audio recordings and be analysed in Chapter 9.
2.2	How does rich information get reconstructed in a virtual team? In other words, how does meaning get shared?	Literature study: Computer-mediated communication (Chapter 5) Habermas' Theory of Communicative Action (Chapters 2 nd 4), data, particularly analysis of e-mail and conversations (Chapter 9)

[***]and in the more detailed article which will be submitted for publication.

2.3	How does cultural homogeneity affect trust in a virtual team?	Data from questionnaire 4 (questions regarding trust/success/ in questionnaire) give preliminary data analysed in Chapter 8 but the main evidence is obtained in recorded e-mail and audio recordings and be analysed in Chapter 9.
2.4	How does culture affect learning in a virtual team?	
2.5	How feasible is this form of telematic education in the short term?	Questionnaire 4 provided some of these answers but Chapter 9 explores the issues more thoroughly.
2.6	How efficient is this form of telematic education appear to be (estimated cost/benefit)?	Analysis of the process is discussed in Chapter 9.
	WHY IS	
3.1	Why do first year Information Systems students decide to participate in virtual teams rather than co-present teams or lectures?	Quantitative analysis of Questionnaire 4 in Chapter 8 and in the more detailed article which will be submitted for publication.
3.2	Why do students change from one study environment to another?	
3.3	Why do students select certain team mates?	
3.4	Why do the students enjoy and succeed in working in a virtual team?	
3.5	Why do students think they need contact sessions?	Questionnaire 4 provided some of these answers but Chapter 9 explores the issues more thoroughly.
	HOW SHOULD	
4.1	How should virtual teams be structured in a multicultural environment?	Qualitative analysis in Chapter 9.
4.2	How should virtual team members be prepared for working in this way?	Literature study in Chapters 5 and 6 and qualitative analysis in Chapter 9.
4.3	How should the lecturer, facilitator or researcher interact with virtual teams?	Literature study in Chapter 7 and qualitative analysis in Chapter 9.

4.4	How should a university decide which courses it offers via telematic education?	
4.5	How should contact sessions in conjunction with telematic education be structured?	Questionnaire 4 provided some of these answers but Chapter 9 explores the issues more thoroughly.

Cross reference between questions in questionnaires and research questions

Collaborator's opinions . . . .

Date . . . .

Research questions / Questionnaire 1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5
When did you first register at the University or Pretoria?					1	1	1		1	1			1			1	1					1	
How many of your courses did you pass in the last year in which you registered?													1	1									
4.4.26 How many courses did you register for in the last year in which you registered? (If you officially cancelled a course do not count it.)													1	1									
Have you been registered for this course (INF....) before?													1	1									
Have you ever used e-mail?												1		1									
Have you access to e-mail from home?												1		1									
Last year, appro1imately how many of the scheduled university lectures for the courses you were registered for did you attend?														1									
So far this year, appro1imately how many of the scheduled university lectures for the courses you are registered for have you attended?														1								1	
Is there a big difference in the number of lectures you attend for some university courses compared with other courses?														1								1	
What is your home language?					1	1			1	1				1									
Which lecture group are you in for INF152?														1									

Questionnaire 1 — Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5
What factors influence whether you attend lectures or not? (You make mark more than one option for this question.)														1							1		
Do you enjoy doing team work as part of your studies?								1	1	1	1												
Have you obtained good results when you worked in a team before?								1	1	1	1												
Are you confident of your ability to pass the courses you have registered for this year?													1	1									
How good are you at communicating verbally in a group of four or five people? (You may mark more than one option for this question.)														1									
How good are you at communicating in writing (not essays but short friendly notes such as e-mail)?		1												1									
How good are you at communicating by telephone? (You may mark more than one option for this question.)		1												1									
Which way do you prefer to study?														1									
Choice of study option												1											
TOTALS	0	3	0	0	2	2	0	3	2	4	4	3	4	17	0	1	1	0	0	0	1	3	0

Questionnaire 4 — Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	Val
GENERAL																								
When you had to choose one study option (lectures, co-present teams or virtual teams) did you clearly understand the purpose of the research?																				1				1
Did you clearly understand how the study option(s) you chose would work?																				1				1
What is your home language?				1	1				1	1				1										
Which study option did you use for assignment ?														1										

Questionnaire 4 / Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	Val
Which study option did you use for assignment 2?														1										
Did you have access to a copy of the book prescribed for this course when you needed it?												1												
Was the prescribed book:												1												
Was the course:																						1		
Did you complete assignment ?													1											
Was assignment :													1											
Did you complete assignment 2?													1											
Was assignment 2:													1											
Did you choose to take this course (module) or was it a fi1ed and mandatory part of the degree you are taking?																								
motivation leads to success leads to effectiveness																								
TOTALS	0	0	0	0	1	1	0	0	0	1	1	2	4	3	0	0	0	0	0	2	0	1	0	2
Questionnaire 4 - LECTURES																								
Whatpercentageofscheduleduniversitylecturesforthiscoursedidyouattend?													1											
Didyoufindthelecturesuseful?													1	1										
Didtheresearchprojectaffectyourstudies?																								1
Weretherediscussionsduringthelecturesthatthestudents participatedin?													1				1							
TOTALS	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	0	0	0	0	0	0	1
Questionnaire 4 - CO-PRESENT																								
Did your group meet sufficiently often?							1	1																
Did everyone in the group take part in discussions?								1		1														

Questionnaire 4 / Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	Val
Did team members get on well with each other?								1		1														
Did you know the other team members before you worked together in the team?								1								1								
Do you consider people who were in your team to be friends who you will try to spend more time with in future?								1																
Where did your team meet?												1		1										
When did your team meet?												1		1										
How successful were you at communicating in the group?									1															
Was there a research observer at your team meetings?																					1			1
Were you satisfied with the standard of the assignments that your team submitted?								1	1		1	1	1											
Were you satisfied with obtaining information and studying for the e1amination from the te1t book only?												1												
Were the contact sessions between lecturer and student useful?																		1		1		1		
What do you think the best feature of the team work was?								1	1			1	1			1								
What was the worst feature of the team work?								1	1			1	1	1	1	1								
What improvements can you suggest for contact sessions?																		1		1		1		
Do you think you did your fair share of the work?								1								1								
Did most of the team members do what the said they would do and when they said they would								1																
behave in a friendly way								1																

Questionnaire 4 — Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	Val
discuss work during the meetings rather than chat								1																
prepare for these meetings by studying the tet book								1																
contribute to the team effort satisfactorily								1	1															
pay attention (listen carefully) to what other people were saying, particularly if they did not agree about an answer or how the assignment should be done									1															
When teams do not work together successfully how do you think the problem should be solved?								1	1	1	1									1				
Did your team ever need to address a problem concerning the way people worked together?								1	1	1	1									1				
If the answer to the previous question was yes, how did the team attempt to solve the problem and how successful were they?																	1			1				
How did you decide who you wanted to be in a team with?																1								
TOTALS	0	0	0	0	0	0	1	16	8	4	3	5	3	4	1	2	4	2	0	3	3	0	2	1
Questionnaire 4 - VIRTUAL																								
What language did you use as a team for e-mail?										1	1									1				
Where did use email?												1												
Did your group communicate with each other via e-mail sufficiently often?								1				1												
Did everyone in the group take part in discussions via e-mail?								1	1		1													

Questionnaire 4 / Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	Val
Did team members need to use means of communication other than e-mail (such as telephone or face to face meetings) in order to get the work finished?									1															
Did you know the other members of the team before the project?																1								
Do you consider people who were in the team to be friends who you will try to stay in touch with in future?								1																
Did the other team members respond to e-mail which was sent out?								1				1												
Did you have difficulty with e-mail?												1												
How successful were you at communicating in the group?									1															
Were you satisfied with the standard of the assignments that your team submitted?								1	1		1	1	1											
Were you satisfied with obtaining information and studying for the e1amination from the tet book only?												1												
What do you think the best feature of the virtual team work was?								1	1			1	1				1							
What was the worst feature of the virtual team work?								1	1			1	1	1	1		1							
Were the contact sessions between lecturer and student useful?																		1		1		1		
What improvements can you suggest for contact sessions?																		1		1		1		
Do you think you did your fair share of the work?								1									1							
How did you decide who you wanted to be in a team with?																1								

Questionnaire 4 \ Research questions	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	Val
Did most of the team members: a) Did most of the team members do what the said they would do and when they said they would?								1																
b) behave in a friendly way								1																
c) discuss work in their e-mail messages rather than chat								1																
d) seem to have prepared by studying the tet book								1																
e) contribute to the team effort satisfactorily								1	1															
f) pay attention to what other people were saying, particularly if they did not agree about an answer or how the assignment should be done									1															
When virtual teams do not work together successfully how do you think the problem should be solved?								1	1	1	1									1				
Did your team ever need to address a problem concerning the way people worked together?								1	1	1	1									1				
If the answer to the previous question was yes, how did the team attempt to solve the problem and how successful were they?																	1			1				
Do you think that you would like to work in a virtual team for some other university courses (not necessarily all)?													1											
TOTALS	0	0	0	0	0	0	0	15	10	3	5	7	4	2	1	2	4	2	1	3	2	0	2	0
TOTALS from previous table		3			2	2		3	2	4	4	3	4	17		1	1					1	3	
GRAND TOTAL	0	3	0	0	3	3	1	34	20	12	13	17	18	27	2	5	10	4	1	8	5	2	7	4