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%***
	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%

*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.

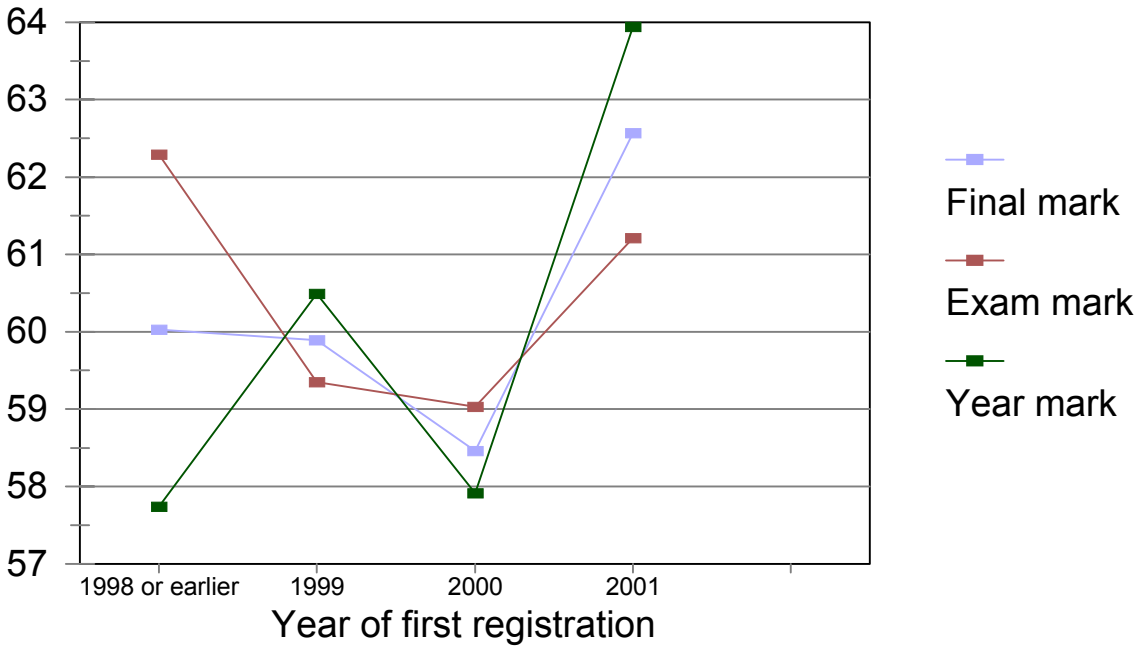

Figure 9.1: Graph of marks obtained versus year of registration

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.

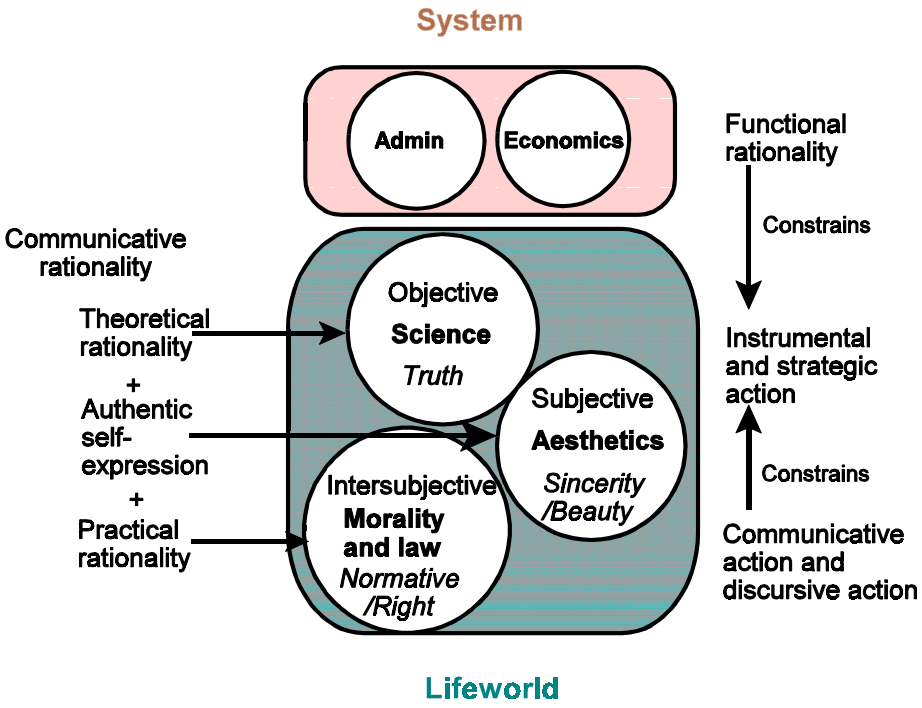

Figure 9.2: Relationship between forms of rationality and the 'worlds' to which they apply (given as Figure 2.1 in Chapter 2)

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

*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

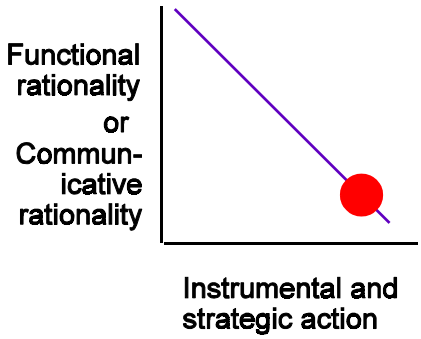

Figure 9.3: Relationship between different forms of social action - Virtual Team Three

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

*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 .... 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 .... -	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. 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.

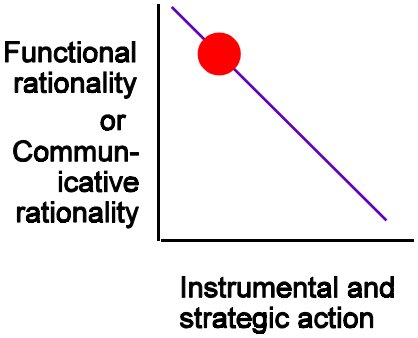

Figure 9.4: Relationship between different forms of social action - Virtual Team Four

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".

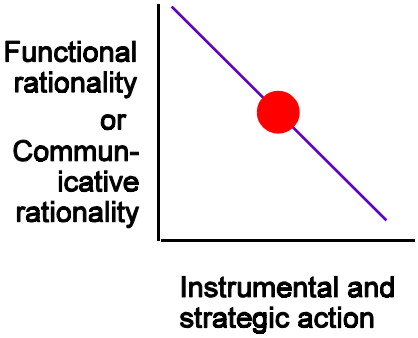

Figure 9.5: Relationship between different forms of social action - Virtual Team Five

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-siatic	**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.

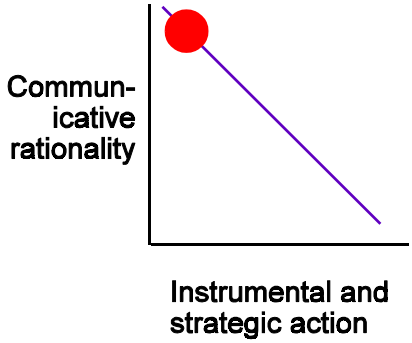

Figure 9.6: Face-to-face teams, high communicative rationality (theoretical rationality), low strategic and instrumental action

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

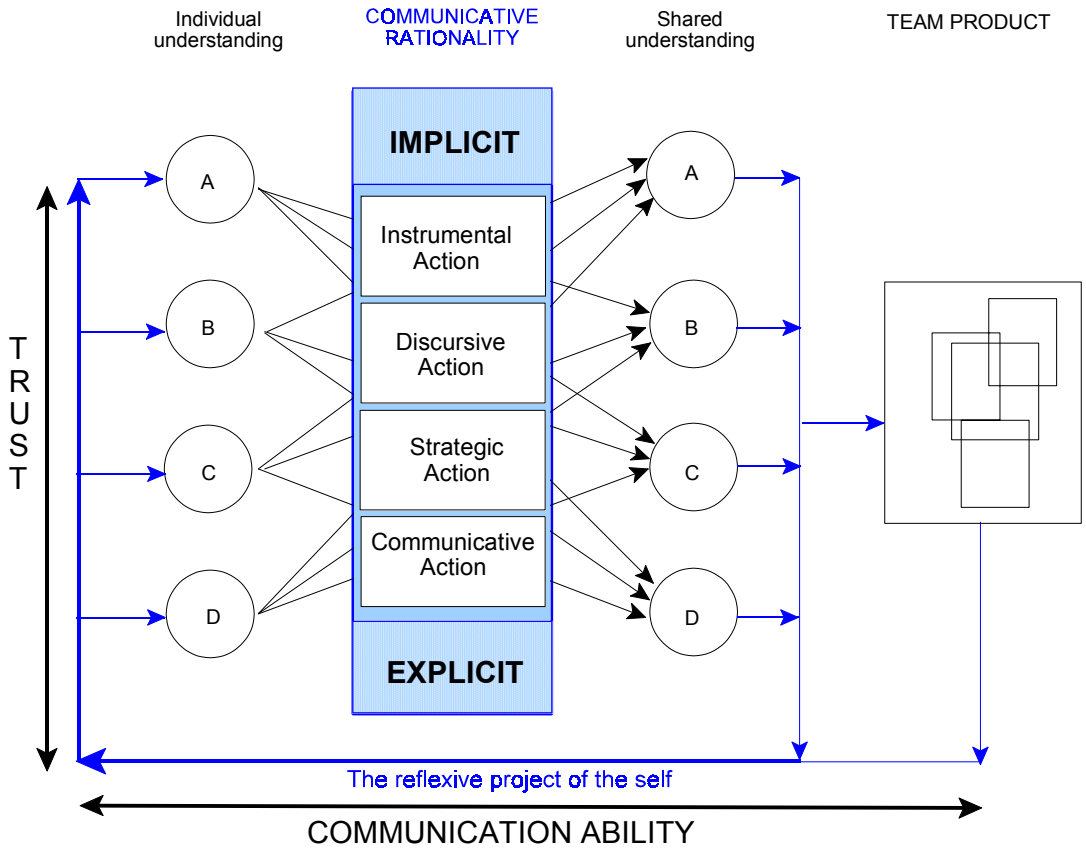

Figure 9.7: A depiction of the role of information in collaborative teamwork

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.

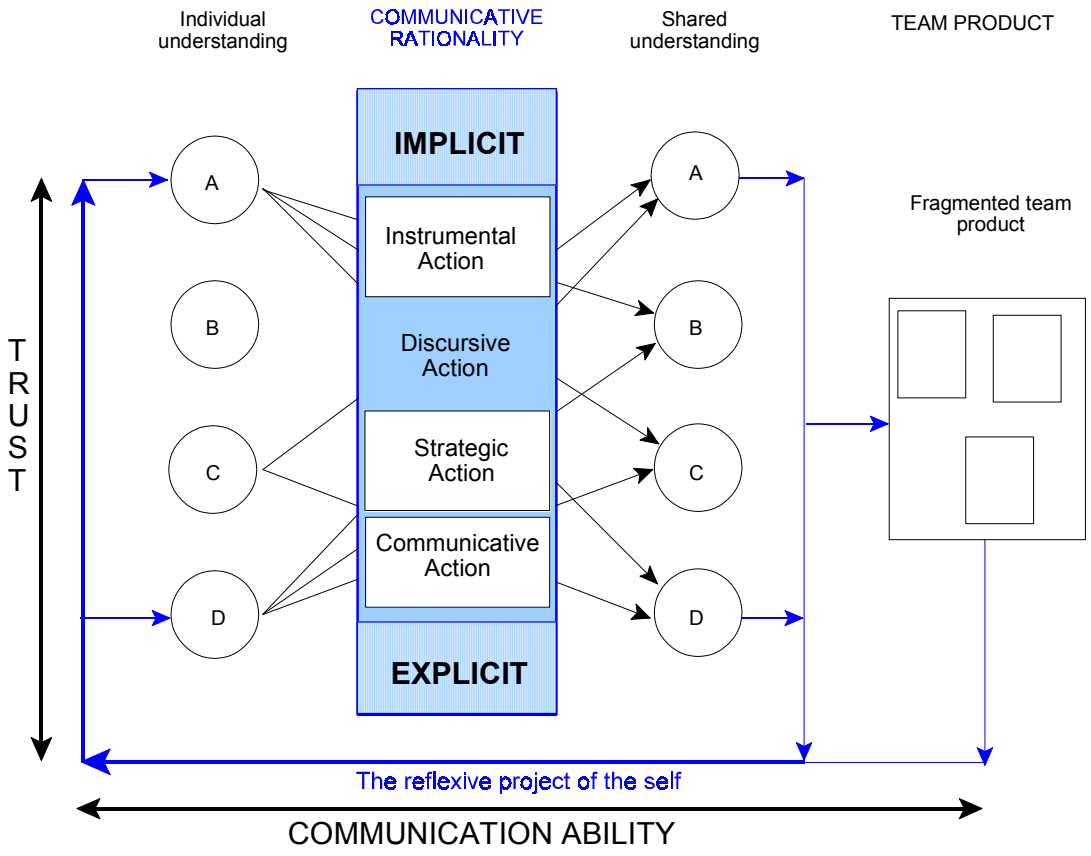

Figure 9.8: Depiction applied to virtual teams

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

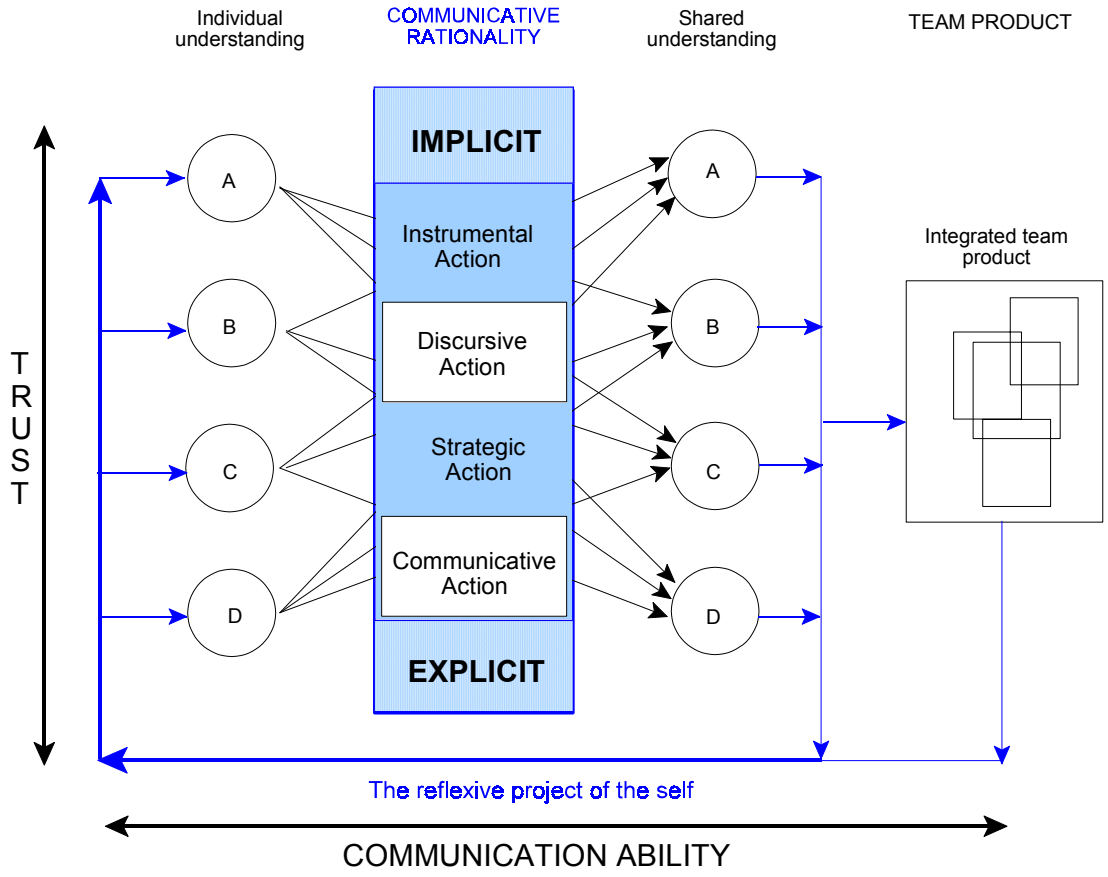

Figure 9.9: Depiction applied to face-to-face teams

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.