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Implied information adds richness to 'lean' media

ABSTRACT

E-mail has become an accepted means of communication in working environments, and virtual teams who infrequently meet face to face tend to use e-mail extensively even when they are involved in complex and sensitive discussions. This paper reports on an analysis of the e-mails of university students working in virtual teams. It was found that the timing of e-mail messages provides implied information and compensates to some extent for the loss of non-verbal cues that are present in face-to-face communication. This implied information contributes to the richness of the information and assists the reader in interpreting not only the message but also the context. As a result, trust can be established or undermined. Actual examples are provided to illustrate some of the issues.

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1. INTRODUCTION

The globalized economy could not have developed without the rapid and widespread adoption of new communications technologies, and virtual organizations and virtual teams, two new organizational structures that have arisen from globalization, also rely heavily on electronic forms of communication. Virtual organizations are made up of independent partner organizations who work closely together and share parts of their information systems in order to provide a seamless customer service or production process. Virtual teams have members who are not within close proximity of one another, either because they work at different companies within virtual organizations or because they work for a single traditional organization but at different branches. Both of these new structures, as well as some less formal social structures have become significant contributors to the economy. For example, virtual teams are used where non-core competencies of companies are outsourced and open-source software development depends on a form of virtual team with open membership.

Virtual teams communicate largely by using lean media that have a limited ability to carry additional non-verbal cues, such as e-mail, although video conferencing and telephones are also used to some extent and traditional face-to-face meetings may also occur occasionally. (A full discussion on rich and lean media is given later in the paper.) Virtual teams may work on short- or long-term projects and the team membership may be stable or change continually. However, as in any team, in order to be productive the members need to establish a working relationship based on trust (Sabherwal, 1999) and there is a close relationship between good communication and trust (Ishaya and Macaulay, 1999; Jarvenpaa & Shaw, 1998, Jarvenpaa, Knoll & Leidner, 1998). Hence, although the new communications technologies have made such teams possible in theory, it is necessary to examine how they work in practice.

This research explores the relationship between time, trust and information communicated via email. An important facet is how effectively virtual teams communicate by using information technology, what types of information they share, and how this affects the level of trust within the team. This paper will identify subtle ways in which time contributes to, or reduces information richness from, e-mail messages. In doing so, the paper will contribute to information richness theory (or media richness theory as it is has come to be known more recently) by extending the concept of a rich message. Research problem and objectives

2. RESEARCH PROBLEM AND OBJECTIVES

The overall purpose of the research is to investigate ways in which the limited capacity of e-mail constrains virtual teams in their ability to work effectively on tasks where they

need to collaborate and share meaning while jointly developing concepts rather than simply coordinating tasks. In this paper, various forms of implied information are identified and the role played by the timing of e-mail messages in implied information is also studied. Actual series of e-mails are used to illustrate how the timing of messages and the various forms of implied information can affect the development of trust. The research adds to an understanding of how rich information is communicated via a lean medium by examining the non-verbal information that is in fact communicated.

3. UNDERLYING THEORY

3.1 Introduction

Research into computer-mediated communication (CMC) has its roots in Information Richness Theory (IRT) (Daft & Lengel, 1986) and it is appropriate to begin the discussion with it as it explains why e-mail is considered to be a lean medium. However, despite its name, IRT refers to the medium and not the richness of the information. A number of extensions to the theory have been devised since it was first proposed, all of which refer to how the richness of the information is enhanced by non-verbal means. Short subsections follow on some of these aspects including types of information content, underlying reasons for the choice of medium, the social presence model, social identity theory and de-individualization – SIDE and the way in which the subjective understanding and existing knowledge of the individual contributes to the richness of the information. This is done in order to place the proposed new element of implied information, introduced later in the paper, in context.

3.2 Information richness

According to IRT, media can be ranked according to their ability to carry information and change the recipient's understanding of a complex or equivocal matter in a given period when the two parties initially had different frames of reference. It proposed that the medium used determines the level of communication. Face-to-face communication is considered the richest, followed by the telephone, personal documents (considered to be both letters and memoranda), impersonal text documents and numeric documents (Daft & Lengel, 1986). IRT implies that rich information is needed to share subtle, equivocal meaning effectively and efficiently, and that only media with high a bandwidth can carry this type of information.

Rich media have additional channels that supplement the main message-carrying channel and carry auxiliary, that is, non-verbal information. For example, face-to-face conversation, which is the richest medium, includes the spoken words carried by the

main channel, but more subtle audio cues such as emphasis and tone, visual cues provided by the facial expression and other body language, and timing are all auxiliary and add to the information being communicated. In contrast, the limited bandwidth and asynchronous nature of e-mail precludes all of this supplementary information and hence e-mail is said to be a lean medium. This is largely why e-mail was originally considered inappropriate for rich information.

3.3 The type of content

The presence or absence of non-verbal cues is not the only factor determining how well people share meaning. The type of message or content is also an important aspect. Information can be classified as follows according to its purpose (Chidambaram & Jones, 1993).

- *Uncertainty* results from incomplete information.
- *Equivocality* means that the information is ambiguous and different people may interpret it in different ways as they have unique views of the world.
- *Complexity* can be associated with uncertainty as the number of components of the information and the relationships between those components determine whether it is complex. Uncertainty results if the participants in a conversation do not have all the components or cannot relate them.
- *Sensitivity* refers to the fact that information may have emotional implications and may need to be conveyed in a way that achieves the required ends.

These categories correspond closely to the five primary task-related factors identified by Daft and Lengel, namely, equivocality, uncertainty, routineness, complexity and emotional content (Daft & Lengel as quoted by Dennis & Kinney, 1998). The more uncertain, equivocal or sensitive information is the more difficult it is to share meaning and hence the more you need to find ways of adding supporting information.

3.4 Reasons for the choice of medium

According to IRT, a lean medium should be used when explicit information needs to be communicated and hence to address uncertainty but not to carry ambiguous or sensitive information. Although this is a prescriptive theory, much of the empirical research done has tried to test the theory by studying media choice. A number of important papers have extended IRT (Chidambaram & Jones, 1993; Lee, 1994; Markus, 1994; Webster & Travino, 1995; Yates & Orlikowski, 1992) by recognizing situational factors and symbolic motives that affect the choice of medium and proposing social influence theories. These papers focus on the conditions (technological, social, organizational or psychological) that influence media choice and stress that media choice cannot always be ascribed to

individual, rational decisions. A medium might be selected because it is convenient even though it is not ideal in terms of the match between medium and information. Thus, these theories do not necessarily indicate how effective these choices would prove to be with respect to sharing meaning.

3.5 Effect of the medium on communication dynamics

Other groups of researchers explain the behaviour of people using e-mail, such as the social presence model (developed by Short (Chidambaram, 1996; Rice, 1992)) and social information processing theory (Chidambaram, 1996) and de-individualization – SIDE (developed by Lea & Spears (Chester & Gwynne, 1998)). The effect of e-mail in allowing direct communication between people of lower status with the management (democratization), the way in which e-mail can be used to strategic advantage both by workers with lower status and by management, and the effect of depersonalization are discussed. These papers focus on a change in the social dynamics of communication, particularly in organizations, resulting from the use of specific media and are hence social impact studies.

3.6 Interpretation and appropriation of the message

In addition research shows that rich information that is equivocal, non-routine, complex or sensitive information required to change understanding can be communicated successfully by using lean media and various reasons have been proposed. These include the development of compensatory communication techniques, and the natural ability of the participants to use their own knowledge of the topic and context to assist them in interpreting the new information (Lee, 1994; Ngwenyama & Lee, 1997). Some auxiliary information is derived from an understanding of symbolic and social norms. For example, the recipient might conclude that the communicator's choice to communicate via e-mail signals a wish for informality (Webster & Trevino, 1995) or alternatively that it indicates that the sender is an efficient worker. Similarly, sending a copy ("cc") of an e-mail to a supervisor may be interpreted as signaling the intention to use formal record keeping to hold someone accountable (Romm & Pliskin, 1998). Rich information may, therefore, be obtained from content and non-verbal cues, shared context (including a constructed social reality) and the ability of the recipient to interpret the message together with symbolic cues that indicate intentions.

Interpretation depends largely on how information is appropriated. The information and personal context that the recipient already possesses contribute to a rich understanding of the message (Lee, 1994). The ability of the recipient to evaluate new material critically and hence to act as an information processor is equally essential to communication

(Ngwenyama & Lee, 1997). Explicit content and the supplementary information transmitted or omitted during transmission is only part of the communication process. This view of information richness focuses on an individual, subjective understanding in addition to shared meaning.

4. DISCUSSION OF CONTRIBUTING CONCEPTS

4.1 Introduction

As mentioned earlier, this research project explored the relationship between time, trust and information communicated via e-mail. These need to be studied separately and together in order to understand the research problem. As will be seen in the discussion of the findings, the concept of trust was used directly in the analysis of the data. The concept of implied information is introduced in this section, before the discussion of the empirical research, as part of the development of the relationship between concepts. As this is actually a research result, it could be given later but an understanding of the elements, particularly trust, is required before the empirical analysis is presented and the relationship between them is, therefore, presented in this section as well. The linking of the concepts takes place in the subsection on e-mail.

4.2 Trust

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

Trust is based on rational evaluations, subjective assessments and evidence obtained by observation but the need for frequent interaction and communication is the basis (Ishaya & Macaulay, 1999; Jarvenpaa & Shaw, 1998, Jarvenpaa, Knoll & Leidner, 1998). There are two aspects of trust. Firstly, the individual must decide how trustworthy he will be and whether he will behave opportunistically or promote the common good. Secondly, the individual must decide how trustworthy others are. Both expectations and goodwill are essential elements (Ishaya & Macaulay, 1999). These decisions are adjusted over time and affect each other. If the individual decides at some point that others are untrustworthy, he may decide to put his own interests first.

There are several forms of trust

- Deterrence-based trust is calculative. The benefits of working towards the common goals of the group and the penalties for not co-operating are weighed up against

individual needs (Jarvenpaa & Shaw, 1998). Both the expected duration of the relationship and the length of existing relationships are factors.

- Knowledge-based trust (including action-based or performance-based trust) reflects knowledge of the behaviour, work habits and the ability of the trustee. These can best be ascertained with time. A written account, such as a curriculum vitae, is not always detailed or reliable enough to elicit performance-based trust.
- Identification-based trust depends on whether you believe that the person to whom you are talking comes from a similar background and has similar values.
- Swift trust is assumed in work groups that have very little time to develop the normal forms of trust. Since the members have no knowledge of the individual identities or norms of the other members, they assume they are similar to previous colleagues or the person or institution that introduced them (Ishaya & Macaulay, 1999). Feelings of identification and closeness might become exaggerated, as the team members avoid discussing things that separate them and focus only on what they have in common. Swift trust develops very quickly.

Ishaya and Macaulay (1999) indicate the importance of communication in all five stages of the process for building trust in virtual teams. The five stages are: the transparent process, which is early in the relationship and is based on assumptions, the calculus process where punishments and penalties that might be imposed are used in deciding whether to be trustworthy, the predictive process, which depends on an established relationship where team members can foresee how others will behave, the competence process where the team members assess the capabilities of others and finally the intensive process where they identify with each other and share goals.

4.3 Time

Time is fundamental to e-mail as it is asynchronous by nature in two respects. Not only is there a variable and voluntary difference in time between when the message is sent and when it is read but there is a short but significant delay between the composition of the message and the sending thereof. These two features, combined with the speed of transmission, are unique and valuable. On the other hand, e-mail exchanges can never be as rapid as face-to-face conversations and hence issues regarding spontaneity and conversational coherence also need to be considered.

Time significantly affects whether and how meaning is shared and does so in many ways. Communicative coherence, that is, the ability to recall what has been said, relates statements to a context and maintaining emotional momentum means that synchronous communication is expected to be more effective than asynchronous communication. In the case of e-mail, a technological feature is used to compensate for the loss of

communicative coherence. "Mosaic messages" (Lee, 1994) are constructed where earlier messages are reproduced in each subsequent reply to recreate the context and assist with interpretation.

The time spent in the process of communicating (this might be described as the time in which one or more communicators are "on-line") as well as time spent reaching a decision or achieving consensus, some of which might be "off-line" or between communications, is important with respect to the efficiency and effectiveness of sharing meaning and decision-making processes. The use of leaner media has been found to cause slower performance overall and the difference is more pronounced with less equivocal tasks (Dennis & Kinney, 1998). This is understandable as simple tasks can be completed quickly if all the participants are present or communicating fast.

4.4 Explicit, tacit and implied information

In the context of knowledge management, in particular, information is described as being explicit or tacit. However, there is a third category that is not often mentioned: implicit information. Factual and unequivocal information can easily be put into words and hence be described explicitly. Tacit information is difficult to describe, is most often conveyed by showing and is learned by doing. Implied information could be expressed explicitly, but is not, and may include information to do with attitude, intentions or simply content, which the person sending the message may foresee, or even expect, the receiver to be able to deduce. Although logic in Computer Science recognizes how implied information can be extracted from formally represented statements, for example, in expert systems, very little seems to be written in information theory, as applied in CMC, with respect to this type of information. In a continuum of how easily the information is communicated in words, explicit is the easiest, the tacit most difficult and implicit falls between the two. As will be seen, implied information is not necessarily only deduced from non-verbal information.

4.5 E-mail

Due to its asynchronous character, both the timing of an e-mail message and the way in which content is expressed are under the control of the individual. Nevertheless, many e-mail messages are sent impulsively and a recognized feature of e-mail use is the reckless way in which it is often used. This is addressed in research on the social presence model, social identity theory and de-individualization mentioned above. Deliberately controlling timing and the presentation of information allows conscious impression management, which contributes to building or undermining trust between members of a virtual team. This awareness is a manifestation of "the reflexive project of the self",

a characteristic of late modernity where most people are aware of, question and revise their actions as well as social practices (Giddens, 1990). A virtual team member who decides when to read e-mail and when to respond can substantially affect how trustworthy he is considered to be. Similarly, when the individual creates and edits the message and pays attention to presentation (spelling, grammar and wording) he has time to construct a "public face". This is useful for people who lack confidence or are not able to express themselves well because they are not fluent in the language. Impression management can be taken to any lengths, including deliberately adopting a totally fictitious physical identity (Chester & Gwynne, 1998). (The adoption of a fictitious identity is, however, more likely in open forums and virtual communities than within a virtual team with a formal working relationship.)

The three aspects, content, time and presentation, make up the e-mail message. Timing and presentation partly replace the non-verbal cues that are recognizable in face-to-face conversation and add meaning in the same way that those cues enrich spoken information. This implied information provides clues, deliberately or unintentionally, on sincerity, trustworthiness and commitment. It can reveal the private face of the sender and hence contribute to identification-based trust. Alternatively, the lack of spontaneity that is the result of impression management can be evident to the reader of the e-mail and can undermine certain forms of trust.

5. RESEARCH DESIGN AND METHODS

CMC generally investigates social issues of the use of technology and hence a qualitative, interpretive research philosophy is appropriate. It is impossible to 'measure' either trust or shared meaning in any objective way. The interpretive approach used does not seek to quantify either of these but instead attempts to use specific, hopefully convincing, examples to illustrate the new concept that is derived. Although a large number of teams could not be studied, it is the contention that the e-mail messages quoted are typical examples and reflect an interesting and common feature of CMC. Habermas' Theory of Communicative Action was used in the analysis and this highlighted certain aspects and assisted in the interpretation of intentions and trust. The research was planned from the start to comply with the set of principles for conducting and evaluating interpretive field studies in Information Systems (Klein & Myers, 1999).

This was action research as it took place in a context similar to that where the researcher normally worked and hence a learning-action cycle of research activity took place. The researcher learned from the process as it occurred, and adapted the research as was necessary, as is customary in action research. In addition, the research had a valuable impact on the students and teaching at the university where the project was carried out. A field study was undertaken by using teams that were made up of university students

working together on tasks and projects that required them to share meaning. All the students signed Informed Consent forms where they were told that the research would be published but they were assured that they would not be identified. The students were first-year Informatics students who were allowed to choose whether they wanted to work in virtual teams or face-to-face and they were allowed to select their team members. This was done both for ethical reasons and in order to try to eliminate distrust being built into the research design by coercing students to participate. The researcher wanted all the teams to start with similar levels of trust based on existing relationships. The decision to allow purely voluntary participation resulted in important limitations that should be noted, namely, only a small percentage of the class chose to participate and the small number meant that contrary to the intended situation, students were unable to create teams of people that knew each other well. This had important consequences as will be seen in the discussion that follows.

The assignments set were fairly simple but required the students to work together to design a solution rather than allowing each to do part of the assignment and simply to collect the separate sections before submitting the work. Complete details of the research design are available online (Alexander, 2002).

The virtual teams participating in the field study had a limited period in which to complete the work. As said earlier, they were permitted to select their own team members but most teams found this impossible to do as only a very small percentage of the class chose to work as virtual teams. As a result, although the researcher expected that self-selected teams would be culturally homogeneous, this was not the case and the teams in general consisted of members who did not know each other. The teams were told that the researcher would have access to the messages of the discussion groups and monitor them, that virtual teams should develop their answers jointly and that all communication should include everyone in the team.

6. RESULTS

In the section that follows the specific e-mail messages obtained from those virtual teams are provided (in Tables 1 and 3) and will be discussed. The unit of analysis was the entire conversation or series of messages for one virtual team. During the team's discussions not only did the team members need to understand what the other team members meant but they were also expected to build on and advance the meaning further. The research as a whole used a form of discourse analysis during which Communicative Action (as described by Habermas (1984)) and factors affecting trust were interpreted in order to determine how meaning was shared. A summary of some aspects of the analysis is provided in Tables 2 and 4. These tables include material not

discussed further in this paper. Only one aspect of the findings - how information can be included inadvertently in e-mail – will be highlighted here. Two excerpts from two series of messages are used as examples as these indicate two types of implied information. They are presented exactly as they were received and hence include typing errors but those messages that were originally not in English have been translated. There is no intention here to make value judgments concerning the participants but rather to use authentic data to highlight how unintended information can be transmitted and the possible effects on trust.

6.1 Case 1

Only three messages from the complete series between the individual students and the lecturer are used in this discussion as an example of implied information. There were four team members, all males, who had registered for the first time in the same year and had the same home language. Two were close family members. One of the four gave as his reason for working in a virtual team that he had used an Internet option for a previous course and it had worked well. The team seem to be unusually disingenuous.

C	E-mail message
1	Thurs Apr 26, 2001 11:19 [First welcoming message from the researcher.]
2	Wed, May 02, 2001 09:46 from 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 !!!!!
3	Wed May 02, 2001 10:55 from A Subject:(Name of the researcher) Is it at all possible that we could get the questions in (our home language), as the assignments are rather unclear and we are not always sure what you want us to do? Thank you, A
4	Wed May 02, 2001 11:19 from 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)

Table 1: Case 1 - E-mail messages

Factors 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 the students were all in the same academic year.
Power relationship	The team members 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 (not included). The use of a more formal name, including title, in the message implies authority (examples not included). This symbolic information is directly linked to text, is deliberate, and hence explicit.
Incentives	C had already established that it was possible to work in another face-to-face team. A and B believed that they had to negotiate with the lecturer if their work was to be marked.
Risk	The risk was minimized for team members A and B as they were in contact regularly not only using e-mail.
Perceived importance	The fact that each of the team members contacted the lecturer with respect to their progress 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 A 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).

Table 2: Case 1 - Summary of discourse analysis

6.2 Trust

Factors affecting trust (Holland, 1998) and the stages of trust (Ishaya & Macaulay, 1999) are used in the analysis provided in Table 2. In this example the students undermined any existing transferred or swift trust within the team by manipulative behaviour that was easily recognized due to the information carried in implied form. Two members of the team formed a subgroup and tried to manipulate the rest of the team. They seemed confused as to who had access to the messages and sent out contradictory messages (messages 2, 3 and 4) within a short period as though only certain recipients would read them. For example, in message 2 (the very first message sent out by the team members) they said they had completed the work but in message 3 they asked for a translation of the question. They did not wait for answers to the questions posed in message 3 before sending the next contradictory message (in message 4 they submitted the work without waiting for the translation they had requested). The authors of the messages seemed to assume that communicative coherence would be lost but in fact the thread of messages provided a context and hence caused some of the insincere strategic action to fail. The messages were sent out with relatively little intervening time (9:46, 10:55 & 11:19) and this indicates a mismatch between the asynchronous medium and team members' time schedule, sense of urgency or lack of patience. 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.

6.3 Impression management

The senders of the message seemed aware of the impression that they made at one level but unable to recognize that their insincere behaviour was obvious to the recipients. Hence, both a public face and private face were displayed.

6.4 Implied meaning

The timing of, and time difference between, the messages 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.

6.5 Findings

Issues of trust were very evident throughout this exchange of e-mail, 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. This group seemed to have no e-mail skills despite having the opportunity to attend a fifty-minute lecture on netiquette. This sequence of messages highlights the extent of the problems that can arise from careless or naïve use of e-mail.

In the context of achieving the goals set for the virtual team, the system cannot be considered to have colonized the lifeworld even though the conditions of ideal speech were limited (as 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, the technology cannot be blamed for the fact that they failed to communicate effectively. Social factors played a more significant role.

6.6 Case 2

Table 3: Case 2 - E-mail messages

17	Date: Fri, 04 May 2001 11:09:14 +0200 From: N To: (researcher)
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)
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.
20	Date: Fri, 04 May 2001 12:46:38 +0200 From: (researcher) To: N, M Hi, (message not relevant here)

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 (message not relevant here)
23	Mon May 14, 2001 11:08 Hi (message not relevant here)
24	Mon May 14, 2001 11:57 From: (message not relevant here)
25	Mon May 14, 2001 16:16 From: researcher Hi M, (message not relevant here) 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 then 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)
26	Wed May 16, 2001 10:13 N and I did Assignment 1 and submitted it electronically to you. (email) It was in normal Word format, and I'm sure that it was printable. M
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 not 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)

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
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 accident …. WEBCT: Go to ….. I wish to complete this assignment before this weekend. Unfortunately I've got 5 tests and 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 and 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 in our team? -- Please send mail to …. -
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)

32	Fri May 18, 2001 13:24 From M To N Thanks, Public transport system - expert system 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 say something about the comparison to human and its + and - factors as well as Solutions?
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 say something about the comparison to human and its + and - factors as
	well as Solutions?
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.
35	Mon May 21, 2001 20:068 From M To N Attached = Assignment 2 If N doesn't change anything to this, then this will be the final version M

The team whose e-mail messages form the basis for this case did not know each other. The team was mixed regarding culture, home language, gender, age and full-time versus part-time studies. Only those messages reflecting the role of time in conveying implicit information are given in Table 3.

6.7 Richness of information and impression management

There was some deliberate use of symbolic techniques to add richness to the information. For example, in some messages (not included here), capital letters were used for emphasis and emotions were used to establish identification-based trust. Short messages give a sense of limited time and urgency. Repetition of earlier comments acts as a formal reminder. Even though M was very clear in the way he expressed himself and seemed to be aware that e-mail has limitations as far as team building is concerned (indicated in an earlier message), he was also occasionally subtle and indirect in communicating via e-mail.

6.8 Trust

As before, the analysis in Table 4 is done according to the factors affecting trust and the stages of trust.

Table 4: Case 2 - Summary of discourse analysis

Factors affecting trust	Comment
Disposition of team members	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 focused 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 a very small part in this team's work.
Incentives	The incentives seemed to be strong for the two part-time students M and N. There was no other convenient way 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 seemed to have given up on the course already and hence had no incentives.
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.

Factors affecting trust	Comment
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.

6.9 Implied meaning

This series of messages contained an example of implied information that is very different from the example in Case 1. Loss of context occurred because the researcher's messages (18, 19) were not received and she did not initially realize that this had happened. She became aware of the problem (message 28) when there was no response to the request in messages 19 and 20. This problem was not identified immediately (as the expectation that you will get an answer within a particular period is reduced), but it was eventually recognized. This indicates that some implied information is carried in e-mail.

6.10 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. The response of one team member to an oblique request from the other (messages 30 and 31) was an example of shared meaning.

The role that technology plays can be seen from the adoption of common practices in compiling e-mail. In message 33 a section of text has been copied (cut and paste) in order to reinforce a message. On the other hand using "reply" resulted in an address being used that was not usually used by this team member (message 18). Thus, shared protocols and procedures do not necessarily assist in 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 impression management to achieve the goals set by the lecturer.

6.11 Findings

Trust seemed to be built up between M and N. Although participation might initially have been based on self-interest, there is evidence of unselfish, group-oriented behaviour. This agrees with one 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.

The two inactive team members never succeeded in doing any teamwork at all and did not pass the course either. 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 the tests.

6.12 Overview

In face-to-face communication, timing in the form of hesitation, fast, enthusiastic speech or urgency can express emotion. The impact of the timing of e-mail messages is entirely different from this and reveals different kinds of information. The two contrasting examples discussed in this paper demonstrate that an understanding of the medium results in impression management or reflexive behaviour. Nevertheless, non-verbal information, albeit of different types, can still be carried as part of the message. The first type of implied information, which could be deduced from contradictory statements indicated apparent insincerity and could as a result be expected to cause a loss of trust. In the second case, an almost intuitive deduction made from what was not said rather than verbal communication revealed that a message had not been received. This resulted in a building of trust or at least a rescue of trust since trust would have been undermined if this understanding had not been gained.

In interpretive research there is often a perceived problem regarding validity and reliability and this has received a great deal of attention in Information Systems research (Davenport & Markus, 1999; Lee, 1999; 2001; Markus & Lee, 2000a; 2000b). It is certainly true that subjective judgments are made in interpreting intentions. This is not really relevant. The research is not about whether A, B, M or N were communicating in good faith or judging them as individuals. It was using real e-mails to illustrate the concept of implied information.

> Interpretive researchers are not saying to the reader that they are reporting facts; instead, they are reporting their interpretations of other people's interpretations. It is thus vital, in order to establish some credibility to the reader, that they describe in some detail how they have arrived at their 'results.' (Walsham, 1995.)

The issue of generalizations from interpretative research is discussed in the same article and one of the four types of generalization proposed is "development of concepts". (Walsham, 1995) Klein and Myers (1999), in discussing interpretative field studies say, ".. . the inferences drawn from one or more cases does [sic] not depend on the representativeness of the cases in a statistical sense ..." These authors then cite (Walsham 1993:15) ' ... but on the plausibility and cogency of the logical reasoning used in describing the results from the cases, and in drawing conclusions from them'.

7. CONCLUSION

Fast feedback in spoken communication allows participants to repair misunderstandings that result when one or more participants interpret implied information in a way that the other party did not intend or would prefer to change. In the case of e-mail, other ways of compensating for the medium can be learned. This was revealed by the difference in impression management between the teams studied in the research. The more considered approach was more successful in maintaining the trusting relationships. By defining the concept of 'implied' information carried even in very lean media, this research indicates that virtual teams should be aware that implied information exists and can significantly affect the levels of trust in the team. Conscious impression management can be used to make implied information explicit, or to remove the unintended and harmful clues that allow negative messages to be deduced. A relationship between the richness of the information and the development or destruction of trust within a virtual team seems probable but further research is required to confirm this.

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