The Effects of Electronic Interactions on Group and Individual Communication Processes

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ABSTRACT

This research is an investigation of computer-mediated communication (CMC) systems, in particular the way that task characteristics and e-mail structure affect inter-personal communication processes. Previous research has implicated the concept of de-individuation to explain some of the phenomena observed when e-mail is used, for example uninhibited and anti-normative behaviour. The study reported here extends these findings by considering the impact of technology on the communication process over time. Measures of communication activity were taken at intervals during an e-mail discussion period which allowed analysis of changes in interpersonal communication, particularly flaming and self-disclosure. The data showed a number of significant effects on the level of communication and the content of communications dependent on how identifiable the discussants were. The data is discussed in terms of the sequences of group development identified in traditional face-to-face group communications.

INTRODUCTION

Electronic-mail (E-mail) is one of the earliest, most widely implemented and used of Computer-Mediated Communication (CMC) systems. This technology has brought new opportunities for communication between individuals and groups which allows interaction on both social and work-related issues. This raises the social-psychological question as to how similar electronic communication is to traditional forms of interaction. The aim of this study is to investigate how CMC systems affect groups and individuals using e-mail for discussion. In particular the aim is to investigate the way that task instructions and e-mail structure affect inter-personal communication. A second consideration is to consider what changes occur in these processes during the discussion period, i.e. the development of the group. Some previous research indicates that in computer-mediated discussion groups the early interactions differ from later interactions (McGrath 1991; Walther 1992), but to date there has been

little research on what these changes might be and their importance. Identification of the similarities and differences between electronic communication and traditional face-to-face communication will provide useful information for the designers and implementers of CMC systems in order to help them fit naturally into formal and informal group structures. The research thus contributes to the theoretical advances on the impact of technology on interaction and has practical implications for the design and utilisation of systems to support co-operative work.

A number of studies have compared face-to-face communication with the use of CMC systems and found that in electronic interaction there is more equal participation between group members (McGuire et al, 1987); more task oriented discussion (Hiltz et al, 1986); less social pressure to conform to the group (Smilowitz et al, 1988) and less group polarisation (McGuire et al, 1987). The general explanation for these effects is that in the computer-mediated conditions there are fewer social cues available to the participants such that the nature of the communication and the style of message sent becomes more impersonal. This depersonalising of the medium is also used to account for another phenomenon observed in CMC systems, that of 'flaming' — the use of uninhibited language, swearing etc. (Sproull and Kiesler, 1986). Similarly Valacich et al (1992) found that anonymity, which is another form of depersonalising, increased the number of critical remarks in a group discussion and decision task conducted electronically. Spears et al (1990) suggest that these effects are a result of 'deindividuation' which is a psychological state where a person focuses on the group rather than themselves and there is a heightened sense of social identity and a corresponding decrease in personal identity. Previous research (Prentice-Dunn and Rogers, 1989) has shown that situations and contexts that encourage deindividuation are associated with less inhibited behaviour and less accord with social norms and values.

However, most of this research activity has been concerned with the outcome of the discussion that has taken place in the groups. Very little research has taken place that has considered the processes within the group. Some recent research suggests that significant changes take place

during the course of discussions using CMC systems. For example Taylor and MacDonald (1992) found evidence that group polarisation of attitude changed during the period of the electronic-mail discussion. This relative lack of concern with the process of development within electronic groups stands in sharp contrast to the rich body of research that has been conducted with face to face groups.

The importance of considering the time course of a group's activities and identity is highlighted by the research that demonstrates that groups show characteristic phases of development. For example, Bales and Strodtbeck (1951) identified three separate phases of group development: orientation, evaluation and control. Furthermore they found that groups exhibited a balance of interaction between task activity and socio-emotional activity which changed over the life of the group. Later Tuckman (1965) proposed a four phase theory of group development. He identified the stages as: Forming, Storming, Norming and Performing and like Bales and Strodtbeck (1951) distinguished between socio-emotional and task behaviour. Each developmental stage is divided into two dimensions: a) group structure — which deals with patterns of interpersonal relations and b) task behaviour that deals with the actual work being done by the group. The initial stages of the group interaction tend to be heavily task oriented, followed by conflict, then solidarity with an increasing amount of social-oriented activity in the later stages. No research on these developmental phases has been conducted with electronic groups.

However, identification of temporally related changes in group processes highlights the question of the life-span of the group. Applbaum (1992) draws attention to the different time frames that have been used in the study of group processes. In CMC system research this has varied from laboratory studies lasting matters of minutes (Lea and Spears, 1991) through to studies of real e-mail users over a four month time span (Hiltz, 1988). It would be unrealistic to expect similar results from a simple comparison of the differences between variables measured at the beginning and ends of such studies.

Further, since one of the major reasons for the use of e-mail is that it allows communication in an asynchronous manner, and that groups typically take longer to communicate when using e-mail, then it may be the case that the lack of socio-emotional development in electronic groups is simply due to the naturally extended and disrupted time-frame. Electronic groups may be qualitatively different to face-to-face groups since the communication of interpersonal and task-related activities are likely to be different and therefore their developmental course may also be different.

Thus more research is necessary to answer the questions, what are the effects of technological changes on: a) the transmission of information in groups and b) the sequence of stages by which groups work. This can only be done if we move away from research that produces a snapshot of the situation at a particular moment in time (usually at the end of the study). Instead it is necessary to track changes across time. The study reported here is an initial consideration of this developmental process, through the study of electronic group discussion over an extended period.

To conclude, the two aims of this study are to:

(i) independently manipulate factors known to affect relative emphasis on social or personal identity. These are priming the subject to view themselves as an individual participant or as a member of the group, and the provision of different amounts of personal information about other members of the group. A 'group' instruction and minimal personal information should lead to a deindividuated or depersonalised state, with increased likelihood of uninhibited behaviour.

(ii) analyse levels of flaming and participation at different stages of the discussion to identify whether they change significantly during the discussion period. Group development theory would predict that flaming etc. would be reduced as the group engages in more socio-emotional discussion and becomes less deindividuated.

METHOD

Subjects

Forty eight subjects (37 males and 11 females) were recruited from a population of e-mail users who responded to a request to participate in a study of communication mediated by e-mail. This request was posted on a number of different e-mail networks within the U.K. Participants were geographically dispersed which minimised the possibility of other communication modes such as face-to-face meetings occurring during the observation period. All subjects were regular users of established electronic networks or conferencing systems (e.g. JANET, HICOM). Subjects were randomly assigned to groups of six with the constraint that to ensure equivalent gender balance between conditions each group contained at least one female subject. Care was taken to ensure that volunteers from the same electronic network were not placed in the same groups. All participants were asked whether they knew anyone in their group. No one had met or spoken to another member of their group.

All participants provided information about themselves via a brief biographical questionnaire which requested information about education, employment, e-mail use, hobbies and activities and a personal description. The sample consisted mainly of University researchers and lecturers. The most common discipline was Computing and I.T. Level of education was high, with nearly 70% of the sample at post-graduate level. E-mail use, was high, with 70% using e-mail more than once per day and 65% using an e-mail system for more than 3 hours per day.

Experimental design

A 2 x 2 factorial design was employed, with Identifiability (Low or High) and Group Immersion (Individual or Group Salience) as the independent variables. Two discussion groups were assigned to each condition.

Identifiability was manipulated by providing those in the High Identifiability condition with an electronic biographic database containing details of each group member. Subjects in the Low Identifiability condition were given only the e-mail usernames of other group members.

Group Immersion was manipulated by varying the emphasis of instructions given to subjects. In the Group Salience condition group identity was emphasised by describing the objectives of the study as: '...to observe communications between group members...and to see if there are any differences between various groups in the way that they communicate.' Subjects were told that they were participating as members of this group and not as individuals. The remainder of the instructions referred to the subject as a 'group member' and the other subjects as 'the rest of the group'. In the Individual Salience condition the briefing focused the aims of the study upon individual factors. For example, the objectives of the study were described as: '...to observe communications between individuals...and to examine personal styles in the way individuals communicate.' Subjects were told that they were participating as an individual within this group. The remainder of the instructions referred to the subject as a 'participant' and the other subjects as 'the other participants'.

Apparatus and Materials

Each subject used their normal e-mail terminal. Although these varied across the sample in terms of power, speed and functionality it was felt to be more important that subjects should use familiar technology rather than try to standardise the systems being used. Subjects using unfamiliar systems would have to learn to use them, which could have had an inhibiting effect on their willingness to engage in discussion. Network communication was controlled by a Digital Equipment Corporation VMS listserver facility based at Loughborough University, UK. Subjects communicated by sending a message to the distribution list set up at the address for their group (e.g. uk.ac.lut.hicom::jtl). The message was then automatically distributed to other group members and the experimenter.

Each message was time and date stamped for future identification.

Each group discussed the same topic which was "Issues Concerning the Definition of Rape." This was chosen for topicality. At the time of the study there had been some discussion in the media concerning 'date-rape', the nature of consent and culpability on the part of the victim. This produced a lively discussion and differences of opinion among the participants.

Procedure

Immediately prior to the study, attitudes to seven different aspects of the discussion topic were collected by questionnaire. Participants also completed the biographical questionnaire. After subjects had been allocated to one of the groups, they were given background information to the study and instructions specific to the condition. This initiated the discussion period which lasted for two weeks. Subjects were free to send as many or as few messages as they wished, on as many days as they wished. At the end of the discussion period, subjects were asked to complete the attitude scales again and complete an extensive self and group perception questionnaire. These data are not considered in this paper.

Dependent Measures

The transcripts of the discussions were coded on a number of measures. In order to analyse *what* participants were discussing, a qualitative analysis of the transcripts was carried out. This noted the incidence of two behaviours: flaming and self-disclosure. Two types of flaming were differentiated. Type (a) consisted of abusive or impolite comments directed towards other participants. For example, "*L listen very carefully to me...So get your facts straight before coming out with naive statements, such as 'page 3 being a key societal factor making rape so rife in this country' and I HAVE got my facts straight.*". Type (b) consisted of general comments containing uninhibited language. For example, "*I'm still hurting after being locked in a f***ing cell...*"

Self-disclosure was defined as any comments that revealed something private about the person. For example *"I don't normally tell people, so please keep it within the confines of our discussion group...a man who I knew and trusted attempted to rape me...I didn't even know he was gay and I'm certainly not."*

A number of quantitative measures were extracted from the transcripts including the number and length of messages sent by each individual. These were used to compare participation rates and the amount of discussion that took place.

RESULTS

The analysis of the transcripts will be considered in two sections: communication activity and communication content.

Level of communication activity

Tables 1 and 2 show the means and standard deviations of the mean number of messages and the mean length of messages sent in each condition for each week of the study. A three factor (Group Immersion, Identifiability and Time) analysis of variance was carried out on each set of data. For both measures the Identifiability manipulation was statistically significant — number of messages ($F=9.96, d.f.=1,44, p<0.005$) and length of message ($F=22.08; d.f.=1,44; p<0.005$). Subjects in the High Identifiable groups sending more (High = 4.5 versus Low = 2.5 messages) and longer (High = 91.47 versus Low = 30.51 lines) messages than those in the Low Identifiability conditions.

Although Group Immersion was not significant on either measure, subjects in the Group Salience condition sent more messages per person and longer messages per person than those in the Individual Salience condition.

Time was statistically significant for both the number of messages sent ($F=19.7$; $d.f.=1,44$; $p<0.001$) and the length of messages sent ($F=14.51$; $d.f.=1,44$; $p<0.001$). In both cases message sending activity was less in Week 2 than in Week 1 — number of messages (Week 1 = 4.65 versus Week 2 = 2.40); length of messages (Week 1 = 78.74 versus Week 2 = 43.25). There was also less difference between the groups in Week 2 i.e. the message-sending activity across groups tended to equal out over time.

Table 1.

Mean number of messages sent in each condition for each week, standard deviations in parentheses.

Group Immersion	Identifiability			
	Low		High	
	Week 1	Week 2	Week 1	Week 2
Individual	1.80	1.40	5.60	4.10
	(1.20)	(3.80)	(3.80)	(3.60)
Group	4.70	2.20	6.50	1.90
	(3.90)	(2.10)	(3.70)	(0.80)

There was a marginally significant interaction between Identifiability and Group Immersion for the number of messages sent ($F=3.99$; $d.f.=1,44$; $p=0.052$). It can be seen that one condition differs from the others: subjects given Low Identifying information and Individual Salience send fewer messages than the other groups. A similar pattern is also seen in Table 2 where again those subjects given Low Identifying information and Individual Salience sent shorter messages than the subjects in the other three conditions, but again the effect was not significant.

There was a significant interaction between Group Immersion and

Time for the number of messages sent ($F=6.36$; $d.f.=1,44$; $p=0.01$). This was such that the message-sending activity for those given Individual instructions reduced only slightly (from 3.7 to 2.75) over the two weeks while those given the Group instructions halved the number of messages sent (from 5.55 to 2.05).

There was also a significant interaction between Identifiability and Time ($F=4.68$; $d.f.=1,44$; $p<0.05$) for the length of messages sent. Here there was a large drop in the High Identifiability condition over the two weeks (from 119.29 to 63.65), but only a small decrease in the Low Identifiability condition (from 38.18 to 22.84).

Table 2.

Mean length of messages (number of lines) sent in each condition for each week, standard deviations in parentheses.

Group Immersion	Identifiability			
	Low		High	
	Week 1	Week 2	Week 1	Week 2
Individual	31.54	19.69	104.58	55.67
	(25.05)	(18.02)	(77.06)	(42.06)
Group	44.83	26.00	134.00	71.64
	(31.15)	(22.04)	(76.78)	(98.60)

When the standard deviations are examined it can be seen that there is more variability in the High Identifiability groups — especially for length of message. This can be interpreted as evidence that there is more equality of participation in those groups receiving Low Identifiability in terms of both frequency of messages sent and length of messages.

In summary, the more information there is available about the other

members of the group (High Identifiability) then the more and longer messages sent. Over the observation period the amount of communication decreases and this is primarily due to the high activity groups, i.e. the High Identifiability and Group Salience groups decreasing their communication by half.

Communication Content

There were relatively few instances of self-disclosure and flaming per condition. Therefore Tables 3, 4 and 5 show the *total* number of self-disclosure and flaming comments per condition.

Table 3.

Frequency of type (a) flaming in each condition for each week.

Group Immersion	Identifiability			
	Low		High	
	Week 1	Week 2	Week 1	Week 2
Individual	1	0	6	7
Group	2	2	8	0

Table 4.

Frequency of type (b) flaming in each condition for each week.

Group Immersion	Identifiability			
	Low		High	
	Week 1	Week 2	Week 1	Week 2
Individual	2	2	10	3
Group	1	1	11	0

It can be seen from Tables 3 and 4, that subjects given Low Identifiability produced very few incidence of either kind of flaming — with only 5 out of a total of 26 Type (a) flames and 6 out of a total of 30 Type (b) flames. The observed frequencies were compared against expected values of equal distribution. The observed values were not equally distributed for either type (a) flaming ($\text{Chi}^2=12.45; \text{df}=1; p=0.005$) or type (b) flames ($\text{Chi}^2=11.32; \text{df}=1; p=0.005$). Therefore flaming did not occur evenly across conditions and it can be seen that Identifiability was the significant factor in both types of flaming. Contrary to prediction and previous research it was the individuated conditions that resulted in most flaming not the impersonal, Low Identifiability conditions. Group Immersion had little effect, with those in the Group and Individual conditions producing a similar number of flames.

The incidence of self-disclosure, illustrated in Table 5, indicate that the more that is known about other members of the group (i.e. the High Identifiability conditions), the more a person will disclose about themselves. Again testing against an expected equal distribution, frequency of self-disclosure across conditions was significantly and strongly affected by the experimental manipulations ($\text{Chi}^2=42.62; \text{df}=1; p<0.005$).

Table 5.

Frequency of self-disclosure in each condition for each week.

Group Immersion	Identifiability			
	Low		High	
	Week 1	Week 2	Week 1	Week 2
Individual	3	1	11	6
Group	1	0	27	4

When the occurrences of flaming are examined across time, it can be seen that both types of flaming decrease in Week 2. However there does

seem to be an association between Group Immersion and Time. In Week 2 subjects in the Individual conditions produce more flames than expected and those in the group conditions less flames than would be expected. This effect is only significant when the frequency of both types of flame are combined ($\chi^2=5.03, df=1; p<0.05$). It can also be seen that subjects given High Identifiability produce more flames than those given Low Identifiability in both weeks, therefore, the pattern noted earlier for flaming appears to be consistent over time.

From Table 5, it can be seen that there is significantly more self-disclosure in Week 1 (42 incidence compared to only 11 in Week 2). The effect of Group Immersion was not independent of Time. In Week 2 subjects in the Individual Salience conditions self-disclose more than would be expected. However, again the effect is not quite significant ($\chi^2=3.346, df=1; p<0.1$).

It could be argued that the levels of flaming and self-disclosure were simply a function of message sending activity, i.e. there are more flames in some conditions simply because there were more or longer messages sent. To test this hypothesis a further series of tests were conducted. Here actual instances of flaming and self-disclosure were compared with the proportions that would be expected based on the amount of message sending activity in each group rather than an equiprobable distribution or the marginal values per condition as used in the previous analysis.

It was found that for flaming the observed frequencies were not significantly different from those that would be expected on the basis of the number of lines sent in the messages. Therefore the increased flaming behaviour by the subjects in the High Identifiability conditions can be explained by their increased level of communication activity. However this was not the case for self-disclosure. The observed frequencies were significantly different from those expected on both the number of messages ($\chi^2=26.78, df=1; p<0.001$) and the length of messages sent

($\chi^2=9.54; df=1; p<0.01$). Basically subjects in the High Identifiability/Group Salience condition self-disclose more than expected.

To summarise, it appears that Identifiability is a significant factor affecting flaming where the more that is known about other members of the group then the more that people are prepared to flame and self-disclose. Indeed there were *very* few flames and self-disclosure comments from those given Low information. The Group Immersion manipulation had little effect, although as the groups developed, those whose individuality was made salient flamed and self-disclosed *more* than those given group-salient instructions. However, it must be noted that there is some evidence to suggest that those in the High Identifiability conditions flamed more due to the fact that they sent more and longer messages. The increases in self-disclosure were not simply due to increased message sending activity.

DISCUSSION

This study had two main purposes. The first was to examine levels of communication activity in e-mail discussions groups where the contexts had been manipulated to provide more or less emphasis on a personal individual identity or an impersonal social identity. Previous research which has attempted to test the social cues explanation of the effects of CMC has either compared electronic communication with face to face (for example Siegel et al, 1986) and confounded structural differences between the two (synchronicity, speed of communicating etc.) or compared electronic groups under different conditions but generally in laboratory based experiments (for example, Lea and Spears, 1991), which are unlikely to generalise to everyday e-mail use. This study overcomes these problems by combining the power of experimental control and manipulation with real e-mail discussion groups. The second aim was to begin to consider the fact that groups are dynamic entities and develop. Much of the previous research have usually so truncated the discussion periods that no development could have been observed.

The first conclusion to be drawn from the data presented here is that there is no support for the view that impersonal or 'deindividuated' contexts encourage less inhibited communication either in quantity or in quality. The more anonymous conditions in this study showed the fewest messages sent and these messages were in general shorter. Both of these effects were strongly significant. Reducing individual awareness through increasing the salience of the group had no effect on the quantity of communication or its quality. In fact the evidence here directly contradicts that found by Kiesler et al (1984). It was the conditions in which subject could be personally identified and in which they had provided information about themselves that produced higher levels of flaming and uninhibited communication. Hence the rather 'technologically deterministic' arguments of Sproull and Kiesler (1986) are unfounded. More complex processes and factors are involved in influencing communication in electronic groups particularly as regards the extent to which people obey the social norms that govern communication and interaction in face-to-face contexts. Whatever leads to anti-normative behaviour in CMC systems anonymity does not appear to be the critical factor.

The second aspect of this study is the consideration of the changes in the processes over time. The provision of the Identifying information about individuals seems to have facilitated the communication process. These groups produced many more and longer messages in the early stages of the discussion than did the others. Although there was a falling off of discussion in Week 2 this was much less dramatic in the Low Identifiable groups. It appears as if they took longer to get going but sustained the level of discussion longer. The same effects can be observed in the levels of flaming and self-disclosure. If one takes the view that flaming and self-disclosure are more socio-emotional rather than task based discussion then the provision of personal information has encouraged and facilitated the groups to interact at that level. Whether this can be seen as a positive release of socio-emotional interaction or a negative release is difficult to

consider here. It was the case that none of the participants dropped out of the study or the discussions.

The critical aspect however is that the effects of the experimental manipulations, in particular the provision of the personal database of information about the other members of the group dissipated over time. The implications of this are important as regards the conclusions that can be drawn about the consequences of the use of CMC systems. The results of studies based on a particular time-frame will only be applicable to that time-frame.

In terms of the implications for the use of CSCW systems, it would appear that in circumstances where a high level of interactive discussion is desirable then this can be achieved by providing a means for the participants to obtain information about the other members of the group. However, if equality of participation is the critical goal then the anonymity of group members should be preserved. It is difficult to give guidelines on how to realise high level and equal participation. Obviously much further work needs to be conducted in this area. An aspect which has not been considered here is the nature of the tasks that groups are asked to carry out. The task used here was simply to discuss a particular topic and to present a view on that topic at the end of the discussion period. There was no requirement for a consensus view to be found or a decision to be made, whereas previous research has used structured tasks where a decision has been required within a short period of time. It may well be the case that these findings are partly a result of the rather open-ended task set to the group and may not apply more universally. How people approach the use of a communication medium will undoubtedly be affected by their conception of the nature of the activity required of them and their perception of how the medium will allow them to accomplish that requirement. The evidence bearing on this latter point is considered elsewhere (Taylor, 1994).

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