The Formation of Group Norms in Computer-Mediated Communication

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The formation of group norms in computer-mediated communication (CMC) was examined among students who used e-mail as part of a course. A network analysis of group structures revealed that (a) content and form of communication is normative, group norms defining communication patterns within groups, (b) conformity to group norms increases over time, (c) communication outside the group is governed by different social norms. Results show that norms prescribing a particular use of technology are socially constructed over time at the level of locally defined groups and also show that the influence of these norms is limited to the boundaries of the group. It is concluded that the process of social construction is restrained by social identities that become salient over the course of interaction via CMC. These findings complement experimental evidence that stresses the importance of normative influence in CMC.

The once popular idea that communication technology has certain fixed effects on human interaction (technological determinism) increasingly is being challenged by research showing the diverse effects of these media. Many theories now emphasize the reciprocal influence of technology and the social context in shaping the ways in which

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the medium is used. A familiar example is that, when the telephone was introduced, designers believed it was fit only for brief business-to-business communication. To use telephones for personal conversation was an "invention" of the users themselves and only gradually became normative (Fischer, 1992). This process whereby users collectively establish norms is sometimes referred to as *social construction*.

Social constructs (used here as an umbrella term for social constructs and related terms such as shared systems of meaning) are major determinants of the use of computer-mediated communication (CMC) systems (Fulk, 1993). To discern relevant influences in the process of social construction, sociological approaches emphasize economic, political, and power relationships between groups in society (Feenberg, 1992; Marvin, 1988). Other perspectives focus on communicative and social-psychological influences. For example, adaptive structuration theory stresses the reciprocal influence of social and technological context on the structuration of technology (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990). An alternative social information processing model proposes three proximity mechanisms of social influence: relational, positional, and spatial (Rice, 1992; Rice & Aydin, 1991).

That technologies are socially constructed implies that their properties emerge and that the interaction between users is one likely place to find this process, especially with regard to CMC technology. This is explicit in adaptive structuration theory, which stresses that appropriation, whereby technology's structures are produced and reproduced, is reflected in social interaction: "Appropriation processes may be subtle and difficult to observe, but they are evidenced in the interaction that makes up group . . . processes" (DeSanctis & Poole, 1994, p. 130; also, Contractor & Seibold, 1993).

Despite the theoretical sophistication of these theories, the process of social construction is somewhat indeterminate and vague. Rice (1992) has noted that models of social influence and social construction "in general fail to provide adequate guidance as to how to identify relevant source others, operationalize different mechanisms of social influence, or specify the sources of influence at different levels of analysis" (p. 32). In other words, there is a need to specify better who or what exerts influence and to explain more precisely by which processes influence is exerted. For example, with regard to adaptive structuration theory, researchers have lamented that "the scholar . . . is left without precise pointers about where to look or what to look for in search of appropriation" (Baym, 1995, p. 150). A related issue is that there is a tendency to study social construction empirically as a static effect. But, social construction, almost by definition, is a dynamic reciprocal process occurring over time in which users continue to adapt their conventions to their (social) practice (DeSanctis & Poole, 1994). Moreover, the way in which social influence is

operationalized in empirical studies suggests that it exerts a constant influence on the behavior and actions of users, and contextual fluctuations are generally ignored. But, as we will show, it is likely that social influence is highly context specific.

To explore these issues, we report a study that examines the impact of one specific source of influence. The aim is to examine if the use of a CMC system is socially structured by emergent group norms in line with social constructionist principles. Moreover, the limits of these norms and temporal changes in their application are examined. Our predictions for the observed communication behavior are derived from a social identity approach, to which we now turn.

A Social Identity Approach

Social identity theory and its extension, self-categorization theory, argue that individuals have multiple possible selves. The self not only encompasses one's individual identity, but also comprises social identities associated with valued group memberships. Tajfel (1978, p. 63) defines social identity as "that part of an individual's self-concept which derives from . . . knowledge of . . . membership of a social group together with the value and emotional significance attached to that membership." The self-concept may change from context to context when the situation makes different social identities salient (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). For example, in the interaction with proximate colleagues in an organization, a social identity associated with one's team may be salient (i.e., the self is defined at the group level). In interaction with others within the same organization, a completely different social identity may become salient that is based on the overarching organization and what it stands for. Likewise, in interaction with one's boss, individual identity, or one's identity as a female or as a minority group member, may become slaient, depending on the nature of the interaction (Turner et al., 1987).

Social identity is closely wedded to norms that define how group members should think, feel, or behave.[1] Through a process called referent informational influence, the norms of the group are inferred from prototypical properties of the group. The prototype informs a group member what behaviors are typical and, hence, appropriate, desirable, or expected in the group (Turner, 1982). In a context in which group membership is salient, members will assign these norms to themselves, employing the attributes of their social identity to define appropriate conduct for themselves in the social context.

Although self-categorization theory has emphasized the central importance of group prototypes in influencing group behavior, it has paid

less attention to dynamic constructive processes involved in identifying or generating prototypical positions. In communication contexts, the role of language accommodation to prototypes has been related to the maintenance and expression of social identity (Gallois & Callan, 1988; also, Giles, Coupland, & Coupland, 1991; Giles & Powesland, 1975). Recent research by Reicher has focused on the construction of social identity in contexts in which norms of conduct are less clearly defined a priori (1987, 1994; also, Reicher, Spears, & Postmes, 1995). In his view, the prototype and norms of a group emerge because group members induce them from behavior they observe. However, the way in which norms are formed is not just the result of a passive perceptual process, but one of active negotiation and contestation within the group, limited by the group's historical and ideological continuity (Reicher, 1994, 1996). Combining these ideas regarding the expression and construction of social identity, we posit that group norms may emerge through interaction as a function of within-group accommodation to a prototype that is inferred from ingroup communications (any communicative act, therefore, simultaneously defining and reflecting group norms). We propose that such processes are especially likely to occur in computer-mediated groups, in which certain features of the group may reinforce the normative pull of the group (Postmes, Spears, & Lea, 1998).

In computer-mediated groups, social identity may sometimes exert a strong influence on behavior according to the social identity model of deindividuation effects (SIDE; Postmes, Spears, & Lea, 1998; Spears & Lea, 1992, 1994). Research has shown that mediated groups can develop a meaningful and strong sense of identity through interaction (e.g., Bouas & Arrow, 1996; Finholt & Sproull, 1990; Lea, Spears, & de Groot, 1998; Postmes, Spears, & Lea, 1999), despite the fact that many of the factors traditionally associated with social and interpersonal attraction and with normative influence are absent in such contexts. In order to explain the impact of social identity in CMC, the SIDE model argues that mediated groups can be very real to their members psychologically, despite the lack of direct physical contact. The model is supported by a range of studies showing that visual anonymity does not preclude normative behavior or attraction. A recent meta-analysis of the deindividuation literature, for example, shows that the SIDE model accounts best for effects of anonymity in groups (Postmes & Spears, 1998). Other research shows that social influence and attraction can actually be stronger in anonymous groups than in settings in which members are visually identifiable, because anonymity may accentuate the interchangeability of group members—provided that group members share a common identity, of course (e.g., Lea & Spears, 1991; Lea et al., 1998; Postmes, 1997; Postmes, Spears, Sakhel, & de Groot, 1998; Postmes & Spears, 1999; Spears, Lea, & Lee, 1990; Walther,

1997; see Postmes, Spears, & Lea, 1998, for a review).

One study in particular demonstrates how norms regulate interaction styles in computer-mediated groups even when no visible social cues are available (Postmes et al., 1998). In this study, a style of social interaction (either prosocial or efficiency oriented) was activated with a priming method. Although the style was activated successfully, over time only anonymous groups converged on the primed group norm; in groups made identifiable by means of portrait pictures, no norm formation was observed. A subsequent study replicated this effect and demonstrated that only in anonymous groups did the norm generalize to nonprimed group members, confirming that social influence is responsible for this behavioral pattern. These results show that social influence does not require physical presence or visible social cues, but stems from the psychological power of the group qua common identity (Turner, 1982).

In sum, the SIDE model, and social identity and self-categorization theory on which it is based, has implications for the impact of social norms on CMC. We refer to these joint implications as the *social identity approach*. This approach emphasizes the influence of social identity and the social norms particular to it in CMC. Although experimental research has validated this approach, it is much less clear how groups develop a sense of identity or community via CMC (see also Baym, 1995; McLaughlin, Osborne, & Smith, 1995). This constructive aspect of "mediated identity" is the focus of the present research, and in this regard social identity and social constructionist perspectives may mutually inform each other.

Norm Formation and Social Identity in CMC

As indicated above, research on social identity has hitherto been limited by its neglect of the socially constructed nature of group identity (e.g., Reicher, 1994). Not surprisingly, then, the research on impacts of social identity in CMC suffers a similar problem: Social identity is usually treated as determined prior to the computer-mediated interaction (Postmes, 1997; Postmes et al., 1998; Spears et al., 1990; Walther, 1997), as predefined by the group labels (Finholt & Sproull, 1990), or in terms of social attraction between group members (Bouas & Arrow, 1996). However, it appears that for many groups extraneous and historical cues to identity are absent or uninformative. For group members, then, the properties of the group and behavior within it (the formation of social norms of conduct and of social identity itself) need to be inferred from others' and one's own actions and the responses to them. The present study sets out to examine this dynamic process whereby norms emerge through interaction. The research of Postmes et al. suggests a way in which this may

work. In that study, group members induced norms and conventions for electronic interaction from consistencies in the interaction itself. The present study aims to extend that experimental research. We also examine norm formation over time and the social and relational limits to normative behavior.

A challenge in the constructive aspect of norm formation in CMC is that interaction is naturally confounded: It is both the source of norms and the place to observe them at work. Although this limits the strength of the analysis, the contradiction may be less problematic than it at first seems. Owen (1985) has argued that consistency of communication alone can be sufficient to infer a group identity. In his analysis he showed how cohesiveness emerged in the language used in these groups in the form of shared meaning structures. Thus, consistencies in interaction may be sufficient to infer the emergence of identity and thereby norms. Such consistencies initially define the social identity that regulates group behavior and increasingly come to reflect this identity. In other words, the interaction serves as the dependent variable, and the emergent consistencies are the result of normative influence in the group.

A longitudinal analysis in particular would seem necessary to enable the inference of norm formation in CMC. The emergence of norms should result in convergence over time. Walther (1992) has emphasized the importance of temporal changes in social influence processes in mediated interaction (see also Chidambaram, 1996; Hollingshead, McGrath, & Connor, 1993); adaptive structuration theory posits that groups redefine their idiosyncratic uses of technology and that this is subject to perpetual change (DeSanctis & Poole, 1994). The social identity approach adds further insight concerning the direction of change. From a social identity point of view it can be predicted that the typical style of interaction in a group will become amplified or accentuated over time rather than shifting in unpredictable ways (see also Giles et al., 1991).

Although social constructivist theories are not specific about this, the social identity approach specifies certain limits to social and normative influence. Because the operation of norms of interaction relates to specific social identities, it follows that the norms of interaction that structure behavior inside the group do not apply to relations or interactions beyond the bounds of the group. In other words, when a person acquires norms for interacting within the ingroup, it is very unlikely that these norms generalize in any mechanical fashion to interaction with an outgroup.[2]

To summarize, we seek to test a number of hypotheses concerning normative behavior in CMC groups derived from a combination of social identity and social constructionist approaches. As a starting point, we analyze the frequency of computer communication within an e-mail com-

munity in order to differentiate interacting groups. Groups are operationalized here as nodes in communication networks, as in the classical sociometry tradition (Contractor & Eisenberg, 1990; Williams, Rice, & Rogers, 1988). Although this approach ostensibly defines a group structurally rather than as a psychological entity, we assume that the social networks under study will have sufficient social psychological reality for the participants involved to define a collective identity. Previous research confirms that accommodation with regard to the form and frequency of communication is indicative of social identity influences (Giles et al., 1991; Owen, 1985; Postmes, Spears, Sakel, & de Groot, 1998). The implication is that each group will have its own distinctive consistencies, which may be the consequence of the development of group norms (Postmes et al.), structuration (e.g., Poole & DeSanctis, 1990), and the active construction of the technology (e.g., Fulk, 1993).

H1: Consistencies exist in groups interacting via a CMC system, such that variations of content and form of interaction styles will be larger between groups than within groups.

Temporal developments in style should be discernible, because the group norms develop and emerge over time (Postmes, Spears, Sakel, & de Groot, 1998; Sherif, 1935; Walther, Anderson, & Park, 1994). According to the social identity approach, the prototypical characteristics of a group's communication should become accentuated over time. Prototypical characteristics are those aspects of communication that are typical of the group because they differentiate it from other groups (Turner, 1991). Such temporal developments in communication consistencies would provide evidence of social influence that is consistent with the social identity approach. Other theories, such as adaptive structuration theory and constructionist approaches, are somewhat less consistent with directional findings, because they emphasize how changeable and unpredictable developments in the use of technology are.

H2: Group norms will emerge over time such that interactions within the group will conform more and more to that which is typical of the group's style and content of interaction.

With a change of social context (in the case of e-mail, a change of audience), different norms should apply. This is because the social context makes certain social identities salient. On the whole, it will be the case that in interaction with one's own group, the social identity specific to that group will be salient. The norms of that group should regulate the interaction with fellow group members. In interaction with others out-

side of the group, however, these norms should not have a strong impact, because other social identities may become salient or because group norms prescribe different behavior with outgroups (also, Giles & Powesland, 1975).

H3: A group's norms will influence communication within the group, but not communication with people outside of the group. Other norms may apply in communication with people from other groups.

METHOD

The data for this study were collected during a computerized statistics course called "Dr. Stat." This was a nongraded voluntary course, supplementing the regular statistics course. The course was taught completely by means of computer, and no fixed course format was offered as in regular courses. Students participated at their own pace and time. In all, 268 students signed up, only 87 of whom covered the whole program. The high dropout was characteristic of the course's voluntary and informal character. These students used the system 32.7 hours on average. The majority of students were female (75%), and mean age was 21 years. Participants could follow the course on 1 of 24 terminals that were separated by means of booths in a computer lab.

A feature of the Dr. Stat software was a "mail" button, which the programmers thought might be useful for students to mail the staff for help at some point. Although the staff decided not to document it, the students discovered this facility and the possibility it provided to send mail to other students (the recipient could be specified). Over a 4-month period, 140 participants sent 2,017 messages, of which 548 (27%) were addressed to the staff. As part of the regular logging of students' performance, messages were logged by the system.[3] Staff removed all personal identifications such as names and student numbers from the messages and replaced them by a personal identification number before handing the messages over to the first author for analyses. The messages had a maximum length of 245 characters because of restrictions in the system. Field identifiers indicated who sent the message and who received it; the date and time of sending were also registered.

Content Analysis of Messages

The content of messages was analyzed with an integration of two existing coding schemes for electronic communication (Lea & Spears, 1992; Kiesler, Zubrow, Moses, & Geller, 1985). Following Lea and Spears, some

message characteristics were counted from the texts with the use of a computer program. Counts were made of the number of words and number of characters in each message. Also, the number of self-references was assessed (i.e., "I," "me," "mine"), as a measure of self-awareness (see also Davis & Brock, 1975; Sherblom, 1990). Finally, messages were counted for the number of paralinguistic markers in the text. Specifically, counts were made of ellipses, inverted commas, quotation marks, and exclamation marks. Sequences of question marks, exclamation marks, periods, or other symbols were double weighted.

Message Content

The content of messages was coded with the coding scheme developed by Kiesler and colleagues (1985; with the adaptations suggested by Lea & Spears, 1992). One rater (unfamiliar with group membership of messages and with hypotheses) coded all messages. Reliability was assessed by having a second independent rater score a random sample of 10% of the data. This resulted in good reliability (average Cohen's $\kappa = .74$, with reliabilities ranging from .52, "fair" according to Orwin, 1994, to an "excellent" .95).

The nine categories used were not mutually exclusive (more than one category could be applied to each message), but alternatives within a category were exclusive. Each message was coded individually, and because of the restricted length of messages they usually covered one topic. The first category assessed *topic*: whether messages were sociopersonal in content, whether they related to the study of psychology in general, or were task related (concerned with statistics or the computer course). A fourth option was used for other messages. Four other categories assessed whether a *request* was made, whether the message contained a *complaint*, whether it was a *reaction* to earlier conversation, and whether the message contained *humor*. Messages were also coded for the display of *emotion* (e.g., "I feel good"), and for affection displayed to a person. A seventh category indicated the *time-perspective* of messages: Some messages were intended to be read immediately (e.g., "coffee now!!!"), and some were for future reading (e.g., "You didn't show up. We'll meet on Thursday"). An alternative option for unclear time perspectives was also included. One category coded *personal revelations*: personal advice, flirtation or intimate requests. A final category assessed *uninhibited behavior*, or "flaming." In the CMC research literature, no consensus has emerged as to the best operationalization (Lea, O'Shea, Fung, & Spears, 1992), but generally it is assumed that flames are designed to be hurtful or insulting. The coding scheme distinguished between impolite statements and swearing as indices of harmful intent (Kiesler et al., 1985).

Message Form

The form of messages was coded by means of six categories assessing whether *abbreviations* were used, whether the message contained *formalisms* (socially-approved expressions of politeness such as "thank you"). The use of *slang* was included: nonconventional expressions and spelling, apparently deliberately distorted spelling, and use of foreign language. *Pronouns of address* were coded as formal, informal, or absent (in Dutch one can differentiate between formal "u" and informal "je"). The use of *superlatives* ("absolutely fabulous!!!") was registered, and a final category assessed whether the message contained *shouting* (use of capital letters for whole words or sentences).

RESULTS AND DISCUSSION

Cluster Formation

An unambiguous division of the course participants into groups is a prerequisite for further analyses. It was first examined whether communication was centered around social clusters or randomly dispersed. Messages between participants were entered into a distance matrix of participants. The distance estimate was given by the reciprocal of the number of messages between two participants plus one, resulting in a number ranging from 1, for *maximal distance*, to 0, for *small distances*.[4] Only those participants who sent or received more than two messages were included, in order to exclude the incidental users from the database. In total, 100 users were left in the clustering procedure.

The solution of the agglomerative hierarchical SPSS cluster analysis indicated a 25-cluster solution fit the data best. The criterion used for this decision was the increase in squared Euclidean distance (Δ) at each step of the analysis when two clusters are combined (Norusis, 1988). The distance between these clusters is small for the first combination, but increases at each step as the clusters combined differ more. A criterion for choosing the optimal solution is the first unusually large increase in Δ: an indication that two relatively distinct clusters are being forced together. Such an unusually large Δ was found between steps 75 and 76 of the analysis. This increase ($\Delta = 0.37$) was 5.75 standard deviations larger than the average increase to that point ($M_{\Delta} = 0.04$, second largest $\Delta = 0.25$). Twenty-five clusters were identified on the basis of the frequency of interpersonal communication within the population.

Of these 25 clusters, 21 were groups of sizes two to nine, and 4 were individual participants who did not fit into any one specific cluster. Of

the 1,341 messages sent by the groups (excluding communication to the staff), only 5% were sent to people outside the group. This indicates clusters were relatively self-contained and did not maintain much contact with participants outside the cluster. Because our hypotheses deal with the within-group effects, the four individual participants who formed one cluster were removed from the analyses. In addition, the analyses only examine the groups with four or more members because there were too few exchanges in groups of two and three for statistically acceptable comparisons across groups. The average size of the 11 groups remaining in the analyses was 6.4 members; they sent 1,188 messages within their group, 311 messages to staff, and only 72 messages to other groups (an average total of 22.4 messages per participant).

Two measures confirmed that the solution successfully identified self-contained groups. Both measures deal with the time at which messages were sent. As can be seen in Table 1, some groups used the mailing system early on in the course and some later on, $F(10, 1176) = 49.91$, $p < .001$. In addition, groups differed in the time of day when they sent messages, $F(10, 1176) = 165.54$, $p < .001$.[5] Thus, groups were not only identified in the spatial proximity implied in the frequency of their contact, but were also temporally distinct from each other: Group 2, for instance, was an early afternoon group and communicated most in the early weeks of the course. In contrast, Group 5 communicated late at night and later in the course. This confirms that communication frequency allows identification of distinct groups.

Messaging Within Groups

Our first hypothesis refers to differences between groups in terms of the content and form of messages. In confirmation of the hypothesis, there were significant differences on most of the dependent variables. Some variables were counted from the data (Table 1). No marked deviation from normal distributions were found, and violations of assumptions (homoscedasticity and normality of residuals) were within boundaries of the acceptable (see Glass, Peckham, & Sanders, 1972). Significant differences were found for the length of messages, the use of paralanguage, and the number of references to oneself (self-awareness). With regard to the form of messages, there were significant differences between groups on all variables except in their use of pronouns of address (unsurprisingly, given that this is only intragroup communication). Groups differed in their use of abbreviations, formalisms, slang, superlatives, and shouting (see Table 2).

Variations in message content across groups were also considerable. Groups differed in the number of requests, reactions, humor, emotion

TABLE 1
Averages of Message Characteristics and Counts of Message Content Within Groups, and ANOVA's for Differences Between Groups

Group	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*Mean*	*F*[a]	*N differences*[b]
n of Messages	462	50	79	176	33	28	133	74	25	88	40	108		
Time of day[c]	0.67	0.57	0.64	0.42	0.86	0.81	0.69	0.78	0.69	0.81	0.59	0.66	165.54***	43
Day[d]	27	15	29	32	62	59	48	23	36	32	33	32	49.98***	37
n of Characters	146	129	84	93	123	85	104	127	95	129	132	123	17.58***	14
n of Words	26	22	14	17	21	15	20	23	17	21	22	22	16.46***	12
Paralanguage[e]	1.16	1.76	0.99	0.55	1.03	0.76	1.25	0.53	1.31	1.58	2.09	1.10	2.78**	9
References to self[d]	1.53	1.18	0.73	0.85	0.61	0.75	1.37	0.72	1.00	0.74	0.85	1.16	4.97***	8

NOTE: All cells with underlined values deviate significantly from the grand mean of other cells by weighted deviance contrasts.
a. Analysis of variance with $F(10, 1176)$ degrees of freedom.
b. Number of cells significantly different from each other by Student-Newman Keuls post hoc comparisons (maximum number is 55 when all cells differ from each other).
c. Recoded to fall between zero (0.00 hr) and one (24.00 hr).
d. Recoded such that 1 is the first day of the course that was logged, and 70 the last.
e. The tests of these measures were corrected for the number of words in each message. Uncorrected averages are reported for ease of interpretation, however.
* $p < .05$, ** $p < .01$, *** $p < .001$.

and affection, and personal revelations they deployed. Also, there were differences in time perspective and the number of flames. Moreover, there is no relationship between flaming and self-awareness, the construct supposedly underlying deindividuation (Postmes & Spears, 1998). It is frequently suggested that lowered awareness of the self could be responsible for flaming (e.g., Kiesler, Siegel, & McGuire, 1984), but in fact the correlation between number of self-references (normalized for the number of words) and flaming (two alternatives taken together) was nonsignificant, $r(1187) = .009$, *ns*. It was also nonsignificant using the narrower definition of flaming as swearing, $r(1187) = .032$, *ns*. The suggestion that lowered self-awareness in CMC is responsible for antisocial activity was not supported.

The extent to which groups differed was demonstrated in the large number of group means that deviated from the average and the number of differences between groups (Tables 1 and 2). There was no pattern to suggest that the differences could be attributed to one or two particularly deviant groups: All groups deviated on at least four dimensions (average = 7.5).

In sum, the heterogeneity of CMC styles can to some extent be accounted for by differences between groups. Yet, with regard to the general topics discussed, no differences existed between groups. Groups generally discuss sociopersonal topics (74%). Messages related to the study of psychology were still quite common (23%), but there were virtually no messages about the task at hand (0.76%, not reported in Table 2 because of small numbers). This finding is comparable to McCormick and McCormick's (1992) results and probably reflects that the students were not concerned with the task in the interactions among each other.

At the level of the population it is apparent that affect is abundant in the messages (Rice & Love, 1987, for similar findings). As we have seen above, the main function of messages was social and personal. Social functions are also apparent in the custom of reacting to earlier contributions (28%) and the number of humorous contributions (35%). Emotion and affect are explicit in 39% of messages; 10% of messages signal affection to the receiver; and 11% of messages were intimate in nature (i.e., self-revealing, flirtatious, etc.). An example might illustrate how e-mail can be affectionate and self-revealing:

> I thought it was very sweet of you to help me back then filling in that form of the drama school, because I was very nervous, and you were nice and patient etc. love.

This message illustrates how everyday users are not thwarted by the medium in communicating feelings. Indeed, the expression of emotions

TABLE 2
Fractions of Messages Within Groups Falling in Each Content Category, With Chi-Square Tests for Differences Between Groups

Group	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*M*	*df*	χ^2	*N differences*[a]
Topic:															
Socio-personal	.73	.74	.84	.70	.94	.75	.71	.70	.92	.80	.80	.74	20	30.22 *ns*	
Study	.26	.24	.14	.24	.3	.21	.26	.23	.08	.18	.17	.23			
Other	.02	.02	.03	.05	.03	.04	.03	.07	.00	.02	.03	.03			
Request	.38	.54	.44	.38	.36	.25	.48	.49	.56	.50	.43	.42	10	18.60*	0
Reaction	.22	.40	.27	.41	.42	.36	.45	.20	.16	.06	.28	.28	10	76.47***	13
Humor	.38	.24	.29	.34	.61	.29	.26	.53	.24	.38	.35	.35	10	32.26***	10
Emotion	.47	.56	.29	.32	.36	.36	.29	.35	.28	.36	.43	.39	10	31.15***	4
Affection	.14	.12	.24	.03	.03	.04	.01	.09	.00	.11	.00	.10	10	61.35***	11
Time-perspective:															
Now	.66	.76	.75	.87	.88	.82	.83	.81	1.0	.64	.77	.75	10	66.40***	9
Future	.33	.21	.23	.10	.09	.18	.16	.15	.00	.33	.23	.23			
Personal revelations	.18	.16	.11	.04	.00	.04	.02	.08	.00	.09	.03	.11	10	58.99***	4
Flaming:															
Impolite	.08	.14	.09	.07	.30	.00	.05	.05	.04	.13	.00	.08	20	75.25***	10
Swearing	.10	.10	.20	.02	.15	.11	.07	.03	.04	.07	.22	.09			
None	.82	.76	.71	.91	.55	.89	.88	.92	.92	.80	.78	.83			

Table 2 Continued
Fractions of Messages Within Groups Falling in Each Content Category, With Chi-Square Tests for Differences Between Groups

Group	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*M*	*df*	χ^2	*N differences*[a]
Abbreviations	.20	.14	.06	.07	.06	.11	.09	.09	.16	.05	.12	.13	10	39.21***	4
Formalisms	.06	.12	.03	.07	.18	.07	.03	.18	.12	.06	.25	.07	10	43.79***	9
Slang	.42	.32	.27	.30	.58	.29	.33	.34	.68	.49	.68	.39	10	49.15***	16
Pronouns of address[b]:															
Informal	.46	.68	.38	.44	.52	.46	.53	.57	.48	.50	.38	.48	10	17.89 ns	
None	.53	.32	.59	.56	.48	.54	.47	.41	.52	.49	.62	.51			
Superlatives	.27	.24	.10	.16	.24	.7	.11	.16	.36	.26	.20	.21	10	36.93***	3
Shouting	.14	.04	.04	.03	.03	.11	.18	.09	.00	.26	.13	.12	10	53.06***	10

NOTE: Chi-square tests are preferable for categorical data, but results are similar with MANOVAs to compare within-group to between-group variance: Multivariate effects are significant for content and form and univariate effects are equally reliable as the chi-square tests reported above. All cells with underlined values deviate significantly from the grand mean of other cells by weighted deviance contrasts.

a. Number of cells significantly different from each other by Student-Newman Keuls post hoc comparisons (maximum number is 55 when all cells differ from each other).

b. Formal pronouns of address were hardly used within groups (0.7%) and are not reported.

* $p < .05$, ** $p < .01$, *** $p < .001$.

is not limited to sociopersonal messages or to positive affect as the following message illustrates. This example was coded as revealing a negative affect related to the computing task—complaining about the course and the system—and indicates how frustration can spill over:

> are you bored or what! i just sat messing for half an hour with one exercise, I hate this stupid computer and statistics drive me mad.COFFEE??????????????????????????????????????!!

However, these emotional and affective indices are unevenly distributed over groups, suggesting they might be typical for specific groups rather than a universal phenomenon. Some groups are socioemotionally lively and supportive, others are relatively impersonal and cold (for example, in Group 9, business-like interaction dominated). Together these messages are illustrative of the wide range of feelings, emotions, and affective reactions encountered. In this sense, findings confirm that CMC offers the opportunity for impersonal, personal, and sometimes "hyperpersonal" communication (Walther, 1996; also Lea & Spears, 1995), and that the particulars of style and content are differentiating characteristics of user groups.

As the last example indicates, there appears to be a substantial body of swearing and impoliteness in these e-mails. Flaming occurred in 17% of messages, but here again the variation in flaming indicates it would be mistaken to believe flaming is inherent in either the population or the medium. Moreover, for some, impoliteness and flame exchanging appear to be entertainment rather than an offensive activity. Sometimes flames are even invited:

> Hey L. [name deleted], get well distracted and write something funny back. You're bored anyway, and don't understand anything anyway. Mail me, otherwise I'll terrorize you with more mailings.

This e-mail from Group 5 preceded a "flame war" and was followed by an exchange of insults for a number of days. These insults were accompanied by signs that they were meant to be humorous and reflective of social friendships rather than undermining of them. During one exchange that continued over 28 messages in Group 1, a female participant "A" said:

> gee, you are really in an aggressive mood. doesn't it work out with dr statt? if you want to talk about it you can always come to me, I am all ears for your problems (heh heh)

and received the reply from (the also female) "B":

> i am NOT in an aggressive mood. If you start that again I'll smack you in the face, yes! Tssss, problems! Look at yourself, stupid bitch!

Upon which the rejoinder came from A:

> isn't it nice how time flies by, with all these messages…

In this exchange the insults were cushioned with laughs ("heh heh") or were deliberately humorous or ironic ("don't call me aggressive or I'll hit you"). Also, it appears that being called a bitch did not offend A, because the person referred to the exchange as a pleasant pastime. Yet, to the outsider, the word "bitch" would definitely qualify as rude and as swearing. Although a message might seem rude to an outsider examining it out of context, it is not certain that rudeness was either intended by the sender or perceived by the receiver. This underlines the importance of looking at the context and meaning of messages (e.g., as illocutionary and perlocutionary acts).

This then raises the question of whether one can characterize these exchanges in terms of antinormative behavior. Flaming is usually defined as "an e-mail message intended to insult and provoke" (*The Jargon File*, 1995). However, in the same dictionary the restriction is added that flames are "used in humorously overblown expressions of hostility." If it is true that insults were often not intended or perceived as insulting but humorous, one might rather conclude this to be accepted social behavior. Indeed, it has been questioned whether one should call flaming antinormative at all (e.g., Lea et al., 1992; Reicher et al., 1995). One can add that if flaming is normative to interactants themselves, then an exchange of insults could create a bond rather than a conflict. Flaming could thus be a defining aspect of group identity or a characteristic of the group that its members rally around (cf. Owen, 1985). Certainly this appeared to be the case for A and B, who exchanged many more messages after their "dispute."

Developments In Communication Within Groups Over Time

If it is the case that communication consistencies within groups reflect the emergence of group norms, according to the social identity approach one would expect a development in those aspects that are prototypical for the group over time (H2, predicting amplification of those characteristics the group has more or less of in comparison to other groups). Group 5, for example, could be characterized as a humorous environment

and as high in flaming. If our hypothesis were correct, Group 5 would show an increase in its typical behavior (humor and flaming) over time. To test this hypothesis, we developed a prototype measure for each group in order to compute for each message to what extent it contained the elements that were typical for the group's communication (cf. Berthold, Sudweeks, Newton, & Coyne, 1995). The prototypicality measure consisted of a weighted summation of content codings. The weights were the effect sizes of the differences between the group and the rest of the participants in the population: The effect size provides a measure of the extent to which one group differs from all the others in, say, its use of humor. A positive effect size indicates the group uses more of this category, a negative effect size indicates the opposite.

Two prototypes were calculated for each group. One prototype for the content of messages included the categories, requests, complaints, reaction, humor, emotion, affection, time-perspective, personal revelations, and flaming, and the counts for number of words. A category could only be included if the group differed significantly from the population. A second prototype of message form contained coding of abbreviations, formalisms, slang, superlatives and shouting, and the counts of paralanguage, the last recoded to fall between 0 and 1. Pronouns of address were not significantly different between groups, so this category was not included. Because this prototype consisted of only five categories we decided to use all of these in the calculation regardless of whether the difference was significant or not to ensure prototypes could be computed for all groups.

An example might clarify the procedure. With regard to message content, Group 3 characterized by the number of flames and the amount of affection. Effect sizes Z_{Fisher} were 0.359 and 0.538, respectively (that these are positive indicates Group 3 showed more flaming and affection than other groups). The content prototype for messages then becomes the formula p = (0.359 x flaming + 0.538 x affection). If a message is coded as a flame and as a display of affect, it receives the score (0.359 x 1 + 0.583 x 1), or 0.942. If a message contains neither flaming nor affect, the score is (0.359 x 0 + 0.583 x 0), or 0.

The prototypes were used for regression analyses with time as the independent variable (time here does not refer to time of day, as above, but was a number linearly increasing with the messages sent within the group such that the first message within a group was 0 and the last 1). The results, summarized in Table 3 and graphed in Figure 1, supported the hypothesis for the content prototypes. There was a small but consistent effect that messages within the group became more prototypical in content over time (r = .15 across groups, $p < .001$). The

TABLE 3
Temporal Development in Prototypicality: Regressions of Content and Form Prototypes on Time

		Content		*Form*	
Group	*n*	β	*t*	β	*t*
1	462	0.21	4.57***	0.11	2.33*
2	50	0.17	1.17	-0.09	-0.64
3	79	0.09	0.82	-0.21	-1.90
4	176	-0.02	-0.23	-0.04	-0.57
5	33	0.46	2.91**	-0.11	-0.54
6	28	-0.07	-0.34	-0.34	-1.83
7	133	0.28	3.35***	-0.16	-1.91
8	74	0.09	0.75	0.40	3.73***
9	25	-[a]	-	-0.19	-0.97
10	88	-0.04	-0.36	-0.07	-0.66
11	40	0.22	1.36	0.33	2.18
Average[b]:		0.15	3.63***	-0.01	-0.45

a. Regression for Group 9 was impossible because there was no variation over time: Prototypical categories were found in all messages.
b. The averages were computed through a meta-analytic aggregation of weighted Fisher *Z*'s for β's and weighted *Z*'s for *t*.
*$p < .05$, ** $p < .01$, *** $p < .001$.

prototypical *form* of messages, however, appears not to change over time ($r = -.01$, *ns*). An important point to note is that a prototype is only predictive of development within the group. When prototypes are used to predict time effects for other groups, we find that these are poor predictors on average for either content or form ($r = .04$ and $r = .02$, respectively; these aggregates control for intercorrelations).

These results confirm that there is a social determinant in changes of messaging over time. At the group level the typical characteristics of interaction emerge and develop over time. Thus, over time, that which is characteristic of the group is expressed more strongly, consistent with the social identity prediction. That this effect occurs for message content only might indicate that superficial characteristics of messages, such as the number of question marks, are not subject to social influence in the same way that content is. In support of this interpretation, there were a few incidental messages about the practice of mailing itself (metacommunication), and these dealt exclusively with the content but never with the form of messages. An example of such metacommunication is:

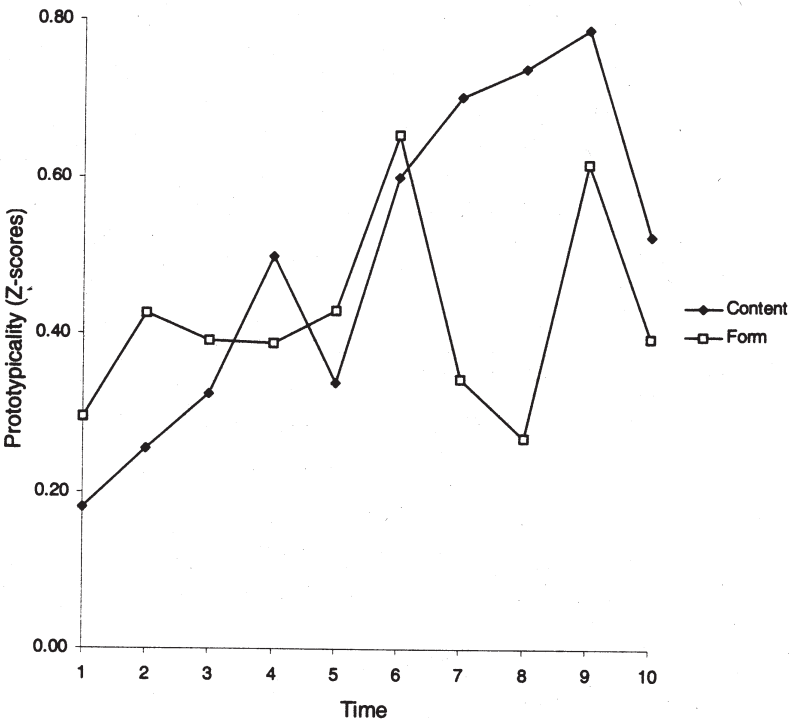

Figure 1: A Plot of Content and Form Prototype *Z*-scores by Time
NOTE: Positive *Z*'s indicate messages are more prototypical. Percentiles of *Z* averaged across groups are plotted.

> [M.], what in the name of God are you talking about? Every time I receive gibberish from you. Can you write something sensible and understandable in Dutch some time?

In this example, comments are made about the message received rather than its phrasing. In a similar vein, the reactions to messages, when given, were content related, but never mentioned the use of certain characters, expressions, or shouting for instance. This indicates that message form appeared not to be much of an issue in most groups, unlike content. In this respect it is not surprising the temporal development exists only for message content.

A second aspect of these data is that the size of the effect appears to be small. However, when one considers that we use a rather crude measure

of prototypicality and an equally crude coding procedure (both of which cause random error), it is likely that we are dealing with a fairly stable and reliable relationship (Prentice & Miller, 1992). Also, there is some indication that the relationship is not completely linear, as can be seen in Figure 1. There appears to be a drop in content prototypicality of messages toward the end of the interaction within a group, which may attenuate the size of the effect. If the last 15% of interaction is dropped, the correlation of the content prototype with time increases from .15 to .21. This finding is in line with research concerned with the developmental aspects of group dynamics that argues group members will individuate themselves from the group just before termination of the group's interaction (in this case, the end of the course), and, thus, behave less prototypically (Worchel, Coutant-Sassic, & Grossman, 1992).

The finding of increased prototypicality over time is indicative of normative influence. The predictable direction of developments supports the social identity approach. This finding also implies that conventions for the use of the medium were constructed socially: An implicit agreement emerged at a group level as to what was appropriate. However, it is still possible that the differences found arise through an *individual* process of differential habituation to the medium and imitation of others' behavior and are not restricted to particular social identities. To examine this and to investigate further whether limits exist to the influence of group norms, we move on to an examination of communication outside of group boundaries.

Communication Outside of the Group

One could argue that these group level differences arise out of individual habituation or social learning principles suggesting computer communication norms are fairly low-level learned responses reinforced by the environment (Bandura, 1977; Fulk, Schmitz, & Steinfield, 1990). The disadvantage of these explanations is that they fail to differentiate between aspects of the environment that control behavior. The social context is thus viewed as a factor extraneous to the individual, gradually socializing the individual's behavior (cf. Hogg, 1992). This explanation would predict that a generic response will be learned, which will then be applied regardless of the social relation between the actor and the source of influence. The implication is that typical characteristics of an individual's communications should therefore affect communication with any other group or individual.

In contrast, the social identity approach predicts that a change of social context leads to a discontinuity in behavior to the extent that a change of context activates different (social) identities and different norms. So-

cial context is thus not conceptualized as a force field gradually affecting the individual's actions from the outside. Rather, behavior is radically altered by the social context, because different norms are internalized for each specific group. Thus, in communication to others such as the staff, a course participant may act differently than he or she would toward fellow group members, and ingroup norms should *not* predict behavior toward an outgroup (H3).

Because there was, by definition, so little interaction outside of the social group, we relied on communication with the staff as outgroup.[6] A total of 312 messages were sent to the staff members from our 11 groups. As predicted, the messages toward the outgroup were in all but one group not prototypical by ingroup standards. On average, the prototypicality for communication content toward ingroup is $Z = 0.49$. With regard to the outgroup, the average prototypicality is negative, $Z = -.22$, and the difference between the two is significant, $t(1498) = 10.71$, $p < .001$.[7] Moreover, the prototypicality associated with the outgroup is reliably smaller than zero, $t(311) = 3.83$; $p < .001$. This result indicates that communication patterns are not prototypical outside of the group boundaries and shows that communication toward an outgroup is actually atypical by ingroup standards. Group members behave *less* typically when they communicate toward the outgroup. Thus, the typical aspects of the group's behavior within the confines of the group are atypical in communication outside of the group.

Given the status differential between staff and students, variation in message content are to be expected. Similar results were obtained, however, for the prototypes based on the form categories, $Z_{ingroup} = 0.42$; $Z_{outgroup} = 0.09$; $t(1498) = 4.83$; $p < .001$.[8] Thus, also in terms of message form, the typical ingroup communication characteristics were not found in communication to the outgroup (although the $Z_{outgroup}$ is not negative as for message content). Moreover, at the level of the individual there were no significant correlations between the typical characteristics in communication to the ingroup and to the outgroup. Correlations of prototypicality between ingroup with outgroup messages (aggregated averages at the level of individuals, weighted for the number of messages to the outgroup) indicate nonsignificant relationships for content and form prototypes, $r(95) = -.06$, *ns* and $r(95) = .06$, *ns*.[9]

Thus, also at the level of the individual were the message characteristics from one context (intragroup) unrelated to another context (intergroup). In other words, there was no relation between individuals' behavior inside the group and outside the group. This is an important finding demonstrating that group norms overcome the individualism of the participant. Together these results are supportive of the view that communication norms established within the group have an important influ-

ence on behavior and that they cease to have their effects beyond the boundary of the group, consistent with the social identity approach. In this respect, social influence may even overcome consistency in individual styles from context to context.

A more global comparison of communications of students among themselves with student to staff interaction showed a large difference in the level of formality. Unsurprisingly, categories related to formality and social etiquette were used more in interaction with staff than with other students. An index of formality was computed that combined pronouns of address, complaints, flames, slang, and shouting such that more formal categories were "positive" and informal categories "negative." Comparing exchanges within groups with exchanges with the staff, we find that students are more formal to staff, $M_{staff} = -.75$; $M_{students} = -1.34$; $F(1, 1498) = 73.79$; $p < .001$.[10]

When examining temporal development of informality, it appears that student-to-staff communication becomes less formal over time, $r(300) = -.30$, $p < .01$, but there is no such relationship within the student community, $r(1186) = -.02$, *ns*. Thus, there seems to be a norm of politeness in operation in communicating to the staff, just as might be expected in face-to-face communication.

GENERAL DISCUSSION

These results show that groups can be identified within a population when no a priori structures or social categories are imposed and when with regard to their position in the university hierarchy the participants cannot be differentiated on the basis of status or position. The grouping was demonstrated with a network analysis of interaction frequency and validated by the temporal separation of clusters. It is of course possible that prior groups could have existed among the students. Indeed, the messages convey that some participants knew each other beforehand; but, this does not appear to have been widespread. The impression during the course was that participants came into the lab individually when they started the course. Yet, during the subsequent weeks some relationships developed, partially via e-mail, partially otherwise, as is typical for e-mail use in organizational and other contexts. More generally, this implies that personal relationships may be well sustained or developed via CMC (Lea & Spears, 1995; Walther, 1996).

In one sense, the contact of participants outside of e-mail does not affect our conclusions; that this contact has an impact on media usage is part and parcel of our proposition that the social context affects media use. More problematic are pre-existing groups, because these could import their own norms into the new communication setting and thus limit

the conclusions to be drawn about normative processes within this communications technology. Yet, pre-existing groups, like newly formed ones, must learn to use a communication medium that they have no experience with and therefore develop their own way of interacting. What speaks to this point are not so much differences in style, but the fact that some groups used the e-mail facility as a "chatbox," others as a scheduling tool, still others to interact with nonpresent friends. These exemplify differences between groups that cannot easily be attributed to pre-existing group norms or to norms developing in face-to-face interaction, but that are the result of emergent normative influence in the use of technology.

Despite the absence of formal divides within the student population, there is nevertheless a clear difference in communication content and style between groups (H1). The differences between groups occur despite homogeneity with regard to the general topic of conversation. The observation of growing accommodation within groups does not mean that conversation was uniform across groups, however. Indeed, topics were highly variable (as is evidenced by the differences on other content categories), but they mostly fell within the broad range of socioemotional chat (e.g., McCormick & McCormick, 1992).

Normative influence can be inferred from a temporal development in prototypicality of group members' behavior: Group members conform more to communication norms over time (H2). As mentioned earlier, such norms are different from general social norms such as laws and custom, but can be conceived as emergent properties of the group that organize behavior (Sherif, 1935). Thus, at the behavioral level social influence shapes medium usage within groups, which corroborates results in an experimental context (Postmes et al., 1998). This development occurs primarily for message content and not for message form. This difference, although not anticipated, is interesting in that it signifies the relative importance of content in determining and reflecting social identity and social norms. It suggests that identity is grounded in characteristics that can be meaningful tools for categorization (i.e., the humorous group, or the rude group) rather than formal features that are less likely to identify the nature of a group (i.e., the group that uses many question marks).

These differences between groups and the temporal changes found are consistent with a number of perspectives within CMC, such as adaptive structuration theory (Poole & DeSanctis, 1994) and constructionist approaches more generally (Fulk, 1993). These approaches do not specify any direction to such temporal fluctuations, however, nor would they easily account for them. That the direction of developments over time could be specified directly supports the social identity approach (more specifically, for Reicher's [1987, 1994] ideas of norm formation in crowds, as applied to CMC). Moreover, this finding is entirely consistent with

communication accommodation theory insofar as it draws on the social identity approach to account for patterns of convergence and divergence in communication (Giles et al., 1991; Giles & Powesland, 1975; also, Gallois & Callan, 1988).

The finding of increased prototypicality of messages over time implies that individual variations in within-group action were limited as the consequence of the formation of social norms through interaction. Because of the centrality of group norms to social identity (Turner, 1982, 1991), this finding implies that social identities are not fixed prescriptions that exist as contextual givens, but that these may be subject to social construction and change in a similar fashion to the emergence of norms. As mentioned before, such an integration of constructionist ideas and the social identity approach may enrich our understanding of social identity (Reicher, 1994) while reminding us of certain structural limitations to social construction. Moreover, we argue that examining the interplay between individual and social influences on norm formation and the social definition of "the group" goes to the heart of a fundamental issue in social science: the mutual influence of the collective and the individual in shaping social behavior. In our view, each communicative act reflects on both levels simultaneously. In each interaction any utterance is simultaneously a product of the individual and the collective and has implications for how each should be defined. Moreover, an analysis of communication forces us to focus on messier yet meaningful properties of the relation of the individual to the social, most importantly its dynamic nature.

We therefore suggest that the results relate the developments over time to the formation of a group's social identity. This implies that temporal developments may be less likely to be found when unambiguous norms for interaction (or strong identities) exist from the outset. It is conceivable that, once a social identity is defined, fewer temporal developments will occur than when it is emergent. This might account for some of the inconsistencies in research findings of temporal changes in CMC, which sometimes occur (Hollingshead et al., 1993; Walther, 1992; Walther & Burgoon, 1992), but sometimes do not (Bouas & Arrow, 1996; Lebie, Rhoades, & McGrath, 1996; Postmes, 1997; Walther, 1994, 1997). Walther's (1997) findings neatly demonstrate that when clear norms and identities exist from the outset there is a lack of temporal developments.

No influence of ingroup norms was found on outgroup communication (H3). Whereas communication to an ingroup conforms to a certain prototype of message content, communication to an outgroup is atypical by ingroup standards. There is no relation of characteristics of messages sent to the ingroup with characteristics of messages to the outgroup. Interestingly, there was no relation between styles within and outside of the

group at the level of the individual either. Thus, changes in the social context (in this case, the audience) have a drastic impact on CMC use, and this implies that the norms for the use of CMC are specific to the group in which they emerge. This pattern of findings is different from theories that see communication norms as the result of individual habituation, which would have predicted consistencies at the individual level, particularly in the message form. Instead, the social influences observed were inconsistent and pluriform: They depended on the social context, in particular the audience. The fact that the formation of social norms of technology use was particular to a group and a social context suggests that there are important limits to (group based) social construction of CMC usage. The distinction of group memberships and concomitant change in social identity is one contextual factor that appears to be central to understanding the pluriform nature of social influence processes.

In sum, the findings are consistent with the social identity approach by showing that the social and normative context has a substantial impact on CMC use. Others have made a similar point mostly from constructionist perspectives (e.g., Fulk, 1993; Poole & DeSanctis, 1990; Rice, 1994). Our analysis is also constructionist, but we attempt to specify further the differentiated nature of the social context and show that an understanding of the intra- and intergroup context is central to explaining the patterned variability of computer-mediated interaction. This variation of media usage from intra- to intergroup contexts indicates the role of social groupings in the social influence process. Results corroborate experimental data by showing that behavioral convergence is found in CMC and that this convergence is limited by group boundaries and cannot be reduced to individual idiosyncrasies.

The results of this study complement predictions of social information processing models of social influence in communication technology. These models focus primarily on individuals as sources of social influence (e.g., leaders, key communicators, or "early adopters"). Our analysis focuses on the group as a source of social influence and shows that, although the normative influence of the group is strong, it is also limited in important ways. Results show that multiple influence structures coexist at the same time and that these evolve dynamically.

We are not of course claiming that these findings based on largely recreational CMC use will generalize in their particulars to other groups or organizational contexts. However, such is also partly our point. We argue that the content of communication within CMC will be contextually determined and influenced not only by the general norms of the subcultural milieu (e.g., McCormick & McCormick, 1992), but also the specific local norms and practices of the communicating group. This is not to say that organizational contexts are any less open to the influence of social

and group norms over and above social constraints in the form of supervisory, managerial, and organizational policies (cf. Johnson & Rice, 1987). In our data, normative influence shaped interaction with the higher status staff, for example. Thus, we believe social context factors could be important determinants of technology usage in more structured organizations as well.

Despite the interesting findings, a study such as this is limited in two ways. First, such an analysis is inevitably open to alternative explanations. The naturalistic approach decreases control and makes it difficult to challenge all possible accounts for the findings. Also, the absence of comparable control conditions (e.g., face to face communication) makes it difficult to evaluate properties of the medium. Second, field observation is ill suited for definite testing of theoretical assumptions. Yet, because these findings complement experimental data gathered under more rigorous conditions, this demonstration serves a valuable purpose and helps to establish the ecological validity of the social identity approach. Moreover, a field study such as this is illuminative and suggests alternative avenues for theoretical development; in particular, with respect to the constructive aspects of media, social norms, and social identities.

In conclusion, this study shows how social factors help account for variations in technology usage. Both content and form of messaging are variable, socially structured, and subject to emergent norms specific to one's social group. In this respect, experimental evidence is supported that interaction may convey the emergence of norms and even social identity in CMC. The influence of a group's communication norms is restricted to intragroup settings. In communication to an outgroup, other norms apply that are independent of the ingroup norms. This suggests multiple constructions of technology coexist and evolve simultaneously, but relatively independently. Communication is thus shaped socially, even in the apparent absence of clear social cues. The influence of social factors in CMC indicates that although the medium may alter "normal" interactions, it still provides a vehicle for normative social regulation.

NOTES

1. This conception of norms differs from traditional perspectives examining the force of societal norms in custom, law, and tradition. Rather, norms in this view (and in this article) are conceptualized similar to Sherif's (1935) analysis of situational norms. This refers to norms that are formed through interaction and that are the norms of one specific group or situation.

2. The words "ingroup" and "outgroup" are used liberally here to indicate communication within a network of students or outside of it. This terminology is not intended to convey higher identification with the ingroup, although that is usually the case.

3. Participants were informed that their activity on the course would be monitored and

recorded and consented to this, which makes it possible to analyze these messages.

4. Using a multidimensional scaling procedure, the distance matrix was converted into a six-dimensional equivalent, fit to use as input in the SPSS cluster analysis program. This transformation was necessary because of the many cells with maximum distances (represented by unity) that resulted when many participants did not have contact with each other during the course. SPSS cluster analysis needs a multidimensional matrix as its input to compute the Euclidean distances for such a relatively "empty" matrix. MDS transforms the two-dimensional matrix into a multidimensional equivalent by separating out clusters across multiple dimensions (doing in essence the same as a cluster analysis, without allowing the easy identification of groupings).

5. Although analyses are more unreliable for the 21 clusters of two or more members, the time differences are significant for these groupings, too: $F(20, 1238) = 30.88$, $p < .001$, for the time in the course, $F(20, 1238) = 86.28$, $p < .001$, for the time of day.

6. Social learning principles should apply to communication norms regardless of context—at least where the form and style of messages are concerned—as should social constructions of technology. Thus, these theories should predict consistency in ingroup and outgroup directed communication, even when this outgroup is differentiated in terms of status.

7. The analysis here is conducted at the level of individual messages, and this introduces a possible violation of the independence assumption: Although we are interested in the differences between messages of each type, these may be dependent on each other because they were composed by similar individuals or even within one group. However, the more conservative test of this effect at the group level is also reliable, $t(10) = 2.90$, $p < .05$.

8. The more conservative test of this effect at the group level is reliable as well, $t(10) = 2.19$, $p < .05$.

9. More conservative tests of these effects at the group level ($n = 11$) are nonreliable as well.

10. The more conservative test of this effect at the group level is reliable as well, $t(10) = 4.21$, $p < .01$.

REFERENCES

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Baym, N. (1995). The emergence of community in computer-mediated communication. In S. Jones (Ed.), *Cybersociety: Computer-mediated community and communication* (pp. 138-163). Thousand Oaks, CA: Sage.

Berthold, M., Sudweeks, F., Newton, S., & Coyne, R. (1995). "It makes sense": Using an autoassociative neural network to explore typicality in computer mediated discussions. In S. Rafaeli, F. Sudweeks, & M. McLaughlin (Eds.), *Networks and netplay: Virtual groups on the internet*. Cambridge, MA: AAAI/MIT Press.

Bouas, K. S., & Arrow, H. (1996). The development of group identity in computer and face-to-face groups with membership change. *Computer-Supported Cooperative Work, 4,* 127-152.

Chidambaram, L. (1996). Relational development in computer-supported groups. *MIS Quarterly, 20,* 142-163.

Contractor, N. S., & Eisenberg, E. (1990). Communication networks and new media in organizations. In J. Fulk & C. Steinfield (Eds.), *Organizations and communication technology.* (pp. 143-172.) Newbury Park, CA: Sage.

Contractor, N. S., & Seibold, D. R. (1993). Theoretical frameworks for the study of structuring processes in group decision support systems: Adaptive structuration theory and self-organizing systems theory. *Human Communication Research, 19,* 528-563.

Davis, D., & Brock, T. C. (1975). Use of first-person pronouns as a function of increased objective self-awareness and performance feedback. *Journal of Experimental Social Psychology, 11,* 381-388.

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science, 5,* 121-147.

Feenberg, A. (1992). From information to communication: The French experience with videotext. In M. Lea (Ed.), *Contexts of computer-mediated communication* (pp. 168-187). Hemel Hempstead, UK: Harvester Wheatsheaf.

Finholt, T., & Sproull, L. S. (1990). Electronic groups at work. *Organization Science, 1,* 41-64.

Fischer, C. S. (1992). *America calling: A social history of the telephone to 1940.* Berkeley: University of California Press.

Fulk, J. (1993). Social construction of communication technology. *Academy of Management Journal, 36,* 921-950.

Fulk, J., Schmitz, J., & Steinfield, C. W. (1990). A social influence model of technology use. In J. Fulk & C. Steinfield (Eds.), *Organizations and communication technology* (pp. 117-140). Newbury Park, CA: Sage.

Gallois, C., & Callan, V. J. (1988). Communication accommodation and the prototypical speaker: Predicting evaluations of status solidarity. *Language and Communication, 8,* 271-84.

Giles, H., Coupland, N., & Coupland, J. (1991). Accommodation theory: Communication, context, and consequence. In H. Giles & J. Coupland (Eds.), *Contexts of accommodation: Developments in applied sociolinguistics* (pp. 1-68). New York: Cambridge University Press.

Giles, H., & Powesland, P. F. (1975). *Speech style and social evaluation.* London: Academic Press.

Glass, G. V., Peckham, P. D., & Sanders, J. R. (1972). Consequences of failure to meet assumptions underlying the fixed effects analysis of variance and covariance. *Review of Educational Research, 42,* 237-288.

Hogg, M. A. (1992). *The social psychology of group cohesiveness: From attraction to social identity.* Hemel Hempstead, UK: Harvester Wheatsheaf.

Hollingshead, A. B., McGrath, J. E., & O'Connor, K. M. (1993). Group task performance and communication technology: A longitudinal study of computer-mediated versus face-to-face work groups. Special issue: Time, task, and technology in work groups. *Small Group Research, 24,* 307-333.

Johnson, B., & Rice, R. E. (1987). *Managing organizational innovation: The evolution from word processing to office information systems.* New York: Columbia University Press.

Kiesler, S. K., Zubrow, D., Moses, A. M., & Geller, V. (1985). Affect in computer-mediated communication: An experiment in synchronous terminal-to-terminal discussion. *Human-Computer Interaction, 1,* 77-104.

Kiesler, S., Siegel, J., & McGuire, T. W. (1984). Social psychological aspects of computer-mediated communication. *American Psychologist, 39,* 1123-1134.

Lea, M., O'Shea, T., Fung, P., & Spears, R. (1992). "Flaming" in computer-mediated communication: Observations, explanations, implications. In M. Lea (Ed.), *Contexts of computer-mediated communication* (pp. 30-65). Hemel Hempstead, UK: Harvester Wheatsheaf.

Lea, M., & Spears, R. (1991). Computer-mediated communication, de-individuation and group decision-making. *International Journal of Man-Machine, 39,* 283-301.

Lea, M., & Spears, R. (1992). Paralanguage and social perception in computer-mediated communication. *Journal of Organizational Computing, 2,* 321-342.

Lea, M., & Spears, R. (1995). Love at first byte? Building personal relationships over computer networks. In J. T. Wood & S. Duck (Eds.), *Understudied relationships: Off the beaten track.* (pp. 197-233). Beverly Hills, CA: Sage.

Lea, M., Spears, R., & de Groot, D. (1998). *Knowing me, knowing you: Effects of visual anonymity on stereotyping and attraction in computer-mediated groups:* Manuscript submitted for publication.

Lebie, L., Rhoades, J. A., & McGrath, J. E. (1996). Interaction process in computer-mediated and face-to-face groups. *Computer-Supported Cooperative Work, 4,* 127-152.

Marvin, C. (1988). *When old technologies were new: Thinking about electric communication in the late nineteenth century.* New York: Oxford University Press.

McCormick, N. B., & McCormick, J. W. (1992). Computer friends and foes: Content of undergraduates' electronic mail. *Computers in Human Behavior, 8,* 379-405.

McLaughlin, M. L., Osborne, K. K., & Smith, C. B. (1995). Standards of conduct on usenet. In S. Jones (Ed.), *Cybersociety: Computer-mediated community and communication* (pp. 90-111). Thousand Oaks, CA: Sage.

Norusis, M. J. (1988). *SPSS/PC+ Advanced Statistics™ V2.0.* Chicago: SPSS Inc.

Orwin, R. G. (1994). Evaluating coding decisions. In H. Cooper & L. V. Hedges (Eds.), *Handbook of research synthesis* (pp. 139-162). New York: Russell Sage Foundation.

Owen, W. F. (1985). Metaphor analysis of cohesiveness in small discussion groups. *Small Group Behavior, 16,* 415-24.

Poole, M. S., & DeSanctis, G. (1990). Understanding the use of group decision support systems: The theory of adaptive structuration. In J. Fulk & C. Steinfield (Eds.), *Organizations and communication technology* (pp. 173-193). Newbury Park: Sage.

Postmes, T. (1997). *Social influence in computer-mediated groups.* Unpublished Ph.D. thesis, University of Amsterdam, The Netherlands.

Postmes, T., & Spears, R. (1998). Deindividuation and anti-normative behavior: A meta-analysis. *Psychological Bulletin, 123,* 238-259.

Postmes, T., & Spears, R. (1999). *Contextual moderators of gender differences and stereotyping in computer-mediated group discussions.* Manuscript submitted for publication.

Postmes, T., Spears, R., & Lea, M. (1998). Breaching or building social boundaries? SIDE-effects of computer-mediated communication. *Communication Research, 25,* 689-715.

Postmes, T., Spears, R., & Lea, M. (1999). Social identity, group norms, and "deindividuation": Lessons from computer-mediated communication for social influence in the group. In N. Ellemers, R. Spears, & B. Doosje (Eds.), *Social identity: Context, commitment, content* (pp. 164-183). Oxford, UK: Blackwell.

Postmes, T., Spears, R., Sakhel, K., & de Groot, D. (1998). *Social influence in computer-mediated groups: The effects of anonymity on group behavior.* Manuscript submitted for publication.

Prentice, D. A., & Miller, D. T. (1992). When small effects are impressive. *Psychological Bulletin, 112,* 160-164.

Reicher, S. D. (1987). Crowd behaviour as social action. In J. C. Turner, M. A. Hogg, P. J. Oakes, S. D. Reicher, & M. S. Wetherell (Eds.), *Rediscovering the social group: A self-categorization theory* (pp. 171-202). Oxford, UK: Basil Blackwell.

Reicher, S. D. (1994). Collective action and the (re)construction of the self. In A. Oosterwegel & R. Wicklund (Eds.), *The self in European and North American culture: Development and processes.* Amsterdam, The Netherlands: Kluwer.

Reicher, S. D. (1996). "The Battle of Westminster": Developing the social identity model of crowd behaviour in order to explain the initiation and development of collective conflict. *European Journal of Social Psychology, 26,* 115-134.

Reicher, S. D., Spears, R., & Postmes, T. (1995). A social identity model of deindividuation phenomena. In W. Stroebe & M. Hewstone (Eds.), *European Review of Social Psychology* (Vol. 6, pp. 161-198). Chichester, UK: Wiley.

Rice, R. E. (1992). Using network concepts to clarify sources and mechanisms of social influence. In G. Barnett & W. Richards, Jr. (Eds.), *Advances in communication network analysis.* Norwood, NJ: Ablex.

Rice, R. E. (1994). Network analysis and computer-mediated communication systems. In S. Wasserman & J. Galaskiewicz (Eds.), *Advances in social network analysis: Research in the social and behavioral sciences* (pp. 167-203). Newbury Park, CA: Sage.

Rice, R. E., & Aydin, C. (1991). Attitudes towards new organizational technology: Network proximity as a mechanism for social information processing. *Administrative Science Quarterly, 36,* 219-244.

Rice, R. E., & Love, G. (1987). Electronic emotion: Socioemotional content in a computer-mediated communication network. *Communication Research, 14,* 85-108.

Sherblom, J. C. (1990). Organizational involvement expressed through pronoun use in computer mediated communication. *Communication Research Reports, 7,* 45-50.

Sherif, M. (1935). A study of some social factors in perception. *Archives of Psychology, 187,* 1-60.

Spears, R., & Lea, M. (1992). Social influence and the influence of the "social" in computer-mediated communication. In M. Lea (Ed.), *Contexts of computer-mediated communication* (pp. 30-65). Hemel Hempstead, UK: Harvester Wheatsheaf.

Spears, R., & Lea, M. (1994). Panacea or panopticon? The hidden power in computer-mediated communication. *Communication Research, 21,* 427-459.

Spears, R., Lea, M., & Lee, S. (1990). De-individuation and group polarization in computer-mediated communication. *British Journal of Social Psychology, 29,* 121-134.

Tajfel, H. (1978). Interindividual behaviour and intergroup behaviour. In H. Tajfel (Ed.), *Differentiation between groups: Studies in the social psychology of intergroup relations* (pp. 27-60). London: Academic Press.

The Jargon File, Version 3.2.0. [on-line dictionary]. (1995). Available: http://www.cnam.fr/Jargon/.

Turner, J. C. (1982). Towards a cognitive redefinition of the group. In H. Tajfel (Ed.), *Social identity and intergroup relations* (pp. 15-40). Cambridge, UK: Cambridge University Press.

Turner, J. C. (1991). *Social influence.* Milton Keynes, UK: Open University Press.

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorisation theory.* Oxford, UK: Basil Blackwell.

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research, 19,* 52-90.

Walther, J. B. (1994). Anticipated ongoing interaction versus channel effects on relational communication in computer-mediated interaction. *Human Communication Research, 20,* 473-501.

Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal and hyperpersonal interaction. *Communication Research, 23,* 1-43.

Walther, J. B. (1997). Group and interpersonal effects in interpersonal computer-mediated communication. *Human Communication Research, 23,* 342-369.

Walther, J. B., & Burgoon, J. K. (1992). Relational communication in computer-mediated interaction. *Human Communication Research, 19,* 50-88.

Walther, J., Anderson, J. F., & Park, D. W. (1994). Interpersonal effects in computer-mediated interaction: A meta-analysis of social and anti-social communication. *Communication Research, 21,* 460-487.

Williams, F., Rice, R. E., & Rogers, E. M. (1988). *Research methods and the new media.* New York: Free Press.

Worchel, S., Coutant-Sassic, D., & Grossman, M. (1992). A developmental approach to group dynamics: A model and some illustrative research. In S. Worchel, W. Wood, & J. Simpson (Eds.), *Group process and productivity* (pp. 181-202). Newbury Park, CA: Sage.