

Summary

In summary, our approach attempts to untangle the technological determinism limitation by examining the broad and complex interconnecting effects of social behavior in virtual communities. We try to take the broadest possible view by incorporating views of the effects of group structure, and the nature of both the task and communication process and modality. As the Net is still in its infancy, I believe these constructs can point the direction for quite a few research programs yet to evolve.

Bridging back to the real world turbulence with which I opened: reminisce on communication diets during the "first" (?) Gulf War, and contrast with today. That war was dubbed "the first cable TV" war. CNN was the novel medium of choice. Audience research as we knew it in the late 20th century may have been the appropriate mode of thought and inquiry for that era. During that same war, some of us tuned old shortwave radios to pull in news from afar. And, at the other end of technology/history spectrum, that war already had its first online "bloggers" (though not called that yet, e.g., Werman, 1993). The events of early 2003 are already termed by some to be the first "Internet war." What I have proposed here is that we think about and critique the new communication realities and opportunities through these unique communication and Net-appropriate lenses of senses addressed, time and synchronicity, linearity in reporting and discussing, interaction, logs, simulation, and value of information.

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ONLINE COMMUNICATION: THROUGH THE LENS OF DISCOURSE

Data in Search of a Method



Online communication is easy (almost too easy) to collect, be it postings to international newsgroups, e-mail exchanges, chat logs or blog entries. Such data are a potentially rich source of insight into human behavior. Yet, for all their ready availability, the cognitive, cultural, expressive, political, and social meanings of online data are not transparent; structured methods and theoretical frameworks are necessary in order to analyze them. What methods and theories are most appropriate to extract patterns and insights from computer-mediated text?

When I first became interested in researching computer-mediated communication (CMC) some 13 years ago, I turned to discourse analysis for methodological inspiration. As a linguist, I knew that the study of discourse—or what Rice and Gattiker (2000) call the "microprocesses of human communication"—offered tried and true methods for analyzing spoken and written communication. It seemed only natural to extend this approach to discourse on the Internet. Yet, as I soon learned, the academic fields with which discourse analysis has been most closely associated—linguistics, psychology, and sociology—tend not to theorize about technologically mediated communication, and their purists discourage the study of "popular" cultural phenomena (as the Internet is sometimes considered) as less interesting or worthwhile than traditional problems in each field. As a result, relatively little methodological guidance can be found in mainstream discourse analysis literatures for researchers seeking to analyze CMC.

In an effort to bridge this gap, in the mid-1990s I began adapting discourse analysis methods to the study of computer-mediated interaction.¹ The resulting paradigm, computer-mediated discourse analysis (CMDA), is a language-focused specialization within the broader interdisciplinary study of computer-mediated

communication (Herring, 1996, 2001, in press). CMDA differs from other forms of discourse analysis in that its descriptive and interpretive apparatus crucially takes into account the technological affordances of CMC systems. Moreover, its methodological "toolkit" is customized to address common phenomena in CMC, and its analyses are socially, culturally, and historically situated in the larger Internet context. At the same time, CMDA shares with other forms of discourse analysis the theoretical premise that choice of word and expression is potentially significant, beyond the requirements of lexicon and grammar. It seeks to identify patterns in language structure and use that may have been produced unconsciously, yet shed light on broader phenomena such as decision making (Condon & Cech, 1996), gender ideology (Herring, 1999), cultural identity (Paolillo, 1996), and the social construction of knowledge (Paulus, 2003).

This essay provides an overview of CMDA.² After describing the methodological underpinnings of the approach, it illustrates how computer-mediated text appears when viewed through the lens of discourse analysis. It does this by advancing observations about a sample e-mail message that I received in June 2000, in preparation for the first conference of the Association of Internet Researchers, at which I delivered a version of this essay as a keynote presentation. I conclude by discussing a challenge currently faced by the CMDA research paradigm: the analysis of multimedia messages.

The CMDA Paradigm

In the most general sense, any analysis of computer-mediated text can be considered computer-mediated discourse analysis. In this broad sense, CMDA is employed by researchers in a range of disciplines including anthropology, communication, education, library and information science, linguistics, management, rhetoric, sociology, and women's studies, although they may not call what they do CMDA. The linguistic approach described here is further characterized by an empirical methodological orientation and a focus on language-related behaviors.

Methodological Orientation

CMDA, like other forms of discourse analysis, can be considered a subtype of content analysis (Bauer, 2000) that seeks to extract patterned regularities from text, and in which the units of analysis are elements of computer-mediated language (letters, words, sentences, messages, turns, exchanges, threads, archives, Web pages, etc.). Beyond this, CMDA approaches vary: they can be qualitative or quantitative; case studies or corpus-based; and the data can be naturalistic or produced in experimental settings. The linguistic variant of CMDA tends to draw its coding categories and research questions from linguistic discourse analysis, for example, Conversation Analysis, Text Linguistics, Critical Discourse Analysis, Interactional Sociolinguistics, and Pragmatics (see Herring, in press, for a fuller discus-

sion), although it is also common for researchers to allow the phenomena of interest to emerge from the data themselves, in what is sometimes called the grounded theory approach (Glaser & Strauss, 1967). CMDA may be supplemented with surveys, interviews, ethnographic observation, historical/comparative analysis, sociopolitical criticism, and the like. However, such methods do not in and of themselves constitute CMDA, unless of course they involve the analysis of computer-mediated text.

In my own research, I have found it useful to specify two types of interpretive apparatus, which can be considered part of the methodology of CMDA. The first is a classification scheme for contextual variables that potentially account for variation in CMC (Herring, under review). These variables are of two broad types: technological and situational.

Technological Variables

- synchronicity
- message-by-message versus keystroke-by-keystroke transmission
- size of message buffer
- persistence of transcript
- channels of communication (text, audio, video, graphics)
- anonymous messaging
- automatic filtering
- etc.

Situational Variables

- participation structure (number of participants; public or private, etc.)
- participant characteristics (demographics; experience, etc.)
- setting
- purpose
- topic
- tone
- norms (of participation, behavior, language use)
- linguistic code (language; writing system, etc.)
- etc.

The second interpretive apparatus is the operationalization of the concepts of interest in terms of specific discourse features (Herring, in press). Suppose a researcher is interested in determining whether an online communication environment is "empowering" to participants—what kinds of discourse behavior should

she look for as evidence of "empowerment"? As in other forms of content analysis—particularly if the goal is to quantify the results—it is essential to define precisely (and argue for, in case it is not obvious) what "counts" as empowering behavior.

Language-related Behaviors

Language, even written language, is very rich. Text producers make numerous choices (mostly unconscious) regarding word selection and grammatical expression, depending on their purpose, their audience, and their linguistic and rhetorical skills. When confronted with computer-mediated text, the researcher must decide which features to analyze. Language communicates at multiple levels: structural (form), semantic (meaning), interactional (conversation management), and social (activities and functions). Some specific phenomena associated with each level are listed below.³

Structure

typography, spelling, word choice, sentence structure, message organization, etc.

Meaning

of symbols, words, utterances, exchanges, etc.

Interaction

turn-taking, topic development, back-channels, repairs, etc.

Social Function

identity markers, humor and play, face management, conflict, use and abuse of power, norm articulation and enforcement, etc.

The following section illustrates how linguistic features at each level can potentially reveal information of a nonlinguistic nature.

An Example of CMDA

Consider the following e-mail message sent to me by one of the conference organizers regarding the scheduling of a keynote presentation and a workshop I had agreed to give at the first Association of Internet Researchers Conference. (The message is used with the permission of the author.)

Date: Thu, 1 Jun 2000 10:03:13 -0500
To: HERRING SUSAN <herring@uta.edu>
From: Nancy Baym <nbaym@ukans.edu>
Subject: Re: keynote scheduling

Hi Susan, the last day is Sunday and we're having no keynoters at all, so not to worry about that. Appreciate your flexibility, and expect we'll be able to work within such lax parameters! Plenary topic and title sound great, as does the workshop idea (you might want to call that one gender and the internet, just to hit the broader population a bit). Look forward to meeting you f2f and will stay in touch as things progress,
Nancy

A number of observations can be made about this message, which I selected as a typical example of my professional e-mail correspondence at the time. In an actual discourse analysis, we would probably not restrict ourselves to such a small sample of data, but for the purpose of illustration a single e-mail message will serve.

A first step is to apply the classification scheme presented above to the sample message. For the list of technological variables, this yields the following values:

Technological Variables

- asynchronous
- message-by-message transmission
- unlimited message buffer
- persistent (must be deleted or will remain)
- text only
- anonymous messaging not readily available from sender's university account
- filtering may or may not be available (depends on e-mail system)

These values would be the same for most messages sent from university e-mail accounts, however, and as such are not likely to explain much of interest about the message. More potentially explanatory in this case are the values for the situational variables:

Situational Variables

- One-to-one; private; real identities
- Sender and receiver are white, female, 35-45; native speakers of U.S. English; experienced e-mail users; professors and CMC researchers; S is senior to N; S and N have e-mailed before but never met face-to-face
- Setting is academic (messages are exchanged between university accounts)
- Purpose is communication re: upcoming conference to which S is an invited speaker
- Topics are scheduling S's presentation and title of workshop S has agreed to give before the conference
- Tone is professional yet friendly

- Norms (of academic e-mail in the United States) are semiformal, polite
- Code is written U.S. English; ASCII text

Of particular interest are the participant characteristics and the purpose/topic of the message, since these are specific to the exchange in question. We might expect these circumstances to be reflected in discourse choices that set this message apart from other e-mail messages.

Let us proceed by considering the *structural* properties of the message. The accurate spelling, grammatically well-formed sentences, and varied and sophisticated vocabulary (e.g., "lax parameters") reveal that N is an educated writer, and probably a native speaker, of English. Moreover, the message is well organized, following the basic e-mail message schema described in Herring (1996): Greeting-Message Body-Closing. At the same time, the style of the message is somewhat informal, as indicated by the casual greeting "HI," the abbreviation "fzf," and the repeated ellipsis of subject pronouns and articles (e.g., "Plenary topic and title sound great"), lending the message a "telegraphic" feel. This, taken together with the fact that the greeting and the message body are run together without a paragraph break and the fact that the word "HI" contains an uncorrected typo, suggests that the sender was in somewhat of a hurry or otherwise preoccupied.

As an example of analysis at the *meaning* level, let us consider what actions are performed by the propositions of the message. We borrow here from linguistic pragmatics the notion of "speech acts" (Austin, 1962) or what Herring (1996) calls "functional moves." In what follows, the message is broken into propositions in the left column, which are assigned speech act labels in the middle column. The right column labels the macrosegments (cf. Longacre, 1992), or larger functional units, of the message.

Functional Moves

1. HI Susan,	Greeting	OPENING
2a. the last day is Sunday. . .	Explanation	
2b. so not to worry about that.	Reassurance	ACCEPTANCE OF
3a. Appreciate your flexibility. . .	Thanks	S's PROPOSALS
3b. and expect we'll be able to. . .	Promise (mitigated)	
4a. Plenary topic and title sound great. . .	Evaluation	
4b. you might want to call that. . .	Suggestion	REQUEST FOR FUTURE ACTION
5a. Look forward to meeting you fzf	Assertion (formulaic)	
5b. and will stay in touch. . .	Promise (formulaic)	CLOSING
6. Nancy	Signature	

The macrosegmentation column suggests that the message is task focused and involves negotiation. The speech act column reveals the meaning of each utterance in context: for example, that proposition 3b functions as a promise, although it

does not superficially resemble one. It further suggests that the sender is somewhat indirect in communicating her meanings, in as much as the promise must be inferred (rather than being stated directly), and in that the sender uses conventionally indirect speech acts such as politeness formulas. Indeed, an indirect speech act in this message results in a misunderstanding on the part of the receiver, as will be noted below.

To analyze *interaction* we must situate this message in relation to other messages in the same exchange sequence, of which there are a total of four. We may then characterize the exchange structure (cf. Sinclair & Coulthard, 1975) as follows:

Exchange Structure

N (30 May 20:35)	Initiation	[Request time preferences]
S (1 Jun 2:19)	Response	[Suggest preferred times]
N (1 Jun 10:03)	Follow-up/ Initiation	[Approve times/Request modification to workshop title]
N (17 Jul 15:07)	Re-initiation	[Request workshop title + abstract]

This analysis reveals the function of the target message in a longer sequence of messages: as a follow-up to a previous response, and as an initiation of a new exchange. Furthermore, it exposes a breakdown in the expected exchange structure: S doesn't respond to N's 2nd initiation, so N reinitiates her request a month and a half later. Closer inspection reveals the probable reason for S's failure to respond: N's request for a modified workshop title was phrased indirectly, as a suggestion (see proposition 4.b). The problem becomes further apparent when we examine the use of cohesive elements (cf. Halliday & Hasan, 1976) that refer to previous and anticipated messages in the exchange sequence. The message contains several cohesive links to S's previous message ("that"; "your flexibility"; "such lax parameters"; "the workshop"), but only one link that (weakly) suggests a future response ("you might want . . ."). This minimal linkage, in combination with the indirectness of the speech act, does not clearly communicate that a response is expected. Fortunately, the misunderstanding had no adverse consequences beyond requiring N to send a follow-up message.

Finally, although the message is short, it is possible to identify features in it that perform *social functions*. The sender indexes her identity as an Internet-savvy communicator by her use of the abbreviation "fzf." By displaying knowledge of conference conventions, she shows that she is an academic professional, and her choice of topic and assumed authority to influence scheduling decisions reflect her conference organizer role. At the same time, she performs a female identity by attending repeatedly to her addressee's social face. In the terms of Brown and Levinson (1987), she employs both positive politeness ("appreciate," "sound great," "look forward to meeting you," "will stay in touch") and negative politeness ("not to worry"; "you might want"; "a bit"), consistent with research that finds that women (in CMC, as in face-to-face communication) tend to make greater use of

linguistic politeness than do men (Herring, 1994; cf. Tannen, 1990). Consistent with this interpretation, power relations are backgrounded: although S is senior to N ($S > N$) and N is a conference organizer ($N > S$), N addresses S in an informal, friendly style, as her equal, as has been described for face-to-face female-female interaction (Coates, 1993).

This simple example illustrates how an e-mail message might appear through the eyes of a discourse analyst, and suggests how broader concepts might be operationalized in terms of specific linguistic features. Education level, state of mind, purpose of communication, directness, and social identity can all be read off of computer-mediated text—even from a short message that does not strike one as particularly revealing at first glance.

Of course, an actual analysis would consider a larger sample of data and focus on developing a coherent analysis around a particular research question. The following table lists examples of actual CMDA research.

Table 1: Other CMDA Research

Structure	• Abbreviations as community markers in a social MUD	Cherny, 1999
	• Structural features of private e-mail compared with written memoranda in a workplace setting	Cho, in press
	• Schematic organization of e-mail messages posted to academic listservs	Herring, 1996
Meaning	• Content of Instant Messages exchanged among co-located students in a Swedish computer lab	Hård af Segerstad, 2002
	• Information exchanged in computer-mediated library reference interviews (analysis of questions and responses)	Ford, 2003
	• Collaboration and the social construction of knowledge in a distance education course (speech act analysis)	Paulus, 2003
Interaction	• Effects of medium, task complexity, and number of participants on turn-taking strategies	Condon & Cech, 1996, 2001
	• Topical coherence in recreational and pedagogical Internet Relay Chat (IRC)	Herring & Nix, 1997
	• Agreements and disagreements in a soap opera fan newsgroup	Baym, 1996
Social function	• Expressive use of emoticons in IRC play	Danet et al., 1997
	• Language choice as a marker of ethnic identity among diasporic South Asians on Usenet	Paolillo, 1996
	• Rhetorical mechanisms of online gender harassment	Herring, 1999

Looking to the Future: Interactive Multimedia

Discourse analysis has traditionally been applied to verbal language, whether it be spoken or written. So, too, CMDA has thus far focused primarily on communication of a verbal nature. However, as CMC becomes increasingly multimodal, there is a growing need for systematic methods of analysis to extract pattern and meaning from communication produced by means other than typed text. In particular, images (graphics, photographs, animation, and video) are playing an increasingly important role in interactive media ranging from the World Wide Web to group videoconferencing to 3-D virtual worlds. Discourse analysis can be used to analyze images produced alongside, or in place of, text.

I have recently initiated several research projects that involve the development of methods to analyze images in multimodal CMC. The first is concerned with gender representation in video clips on a professional development Web site; qualitative methods were devised to analyze gestures and movement in the videos (Herring, Martinson, & Scheckler, 2002). The second project concerns gender representation in pornographic Web sites. This study makes use of quantitative content analysis and link analysis methods for Web pages containing mostly photographic images (Herring & Martinson, 2002). Concurrently, research is being conducted into the nature of communication in 3-D virtual worlds that is leading to the development of methods to analyze animated graphics and navigation in three dimensions (Herring, Börner, & Swan, under review).

We draw inspiration in this work from the social semiotic approach to the analysis of images articulated by discourse analysts Gunther Kress and Theo van Leeuwen (1996). Although Kress and van Leeuwen have not yet taken this step, their approach suggests the possibility of integrating methods of visual analysis with methods of textual analysis as part of a unified paradigm. In a similar vein, the not-too-distant future could see the emergence of CMDA techniques to address multimedia CMC, in which a common set of social semiotic principles informs the analysis of computer-mediated text and images.

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Notes

1. Other researchers were doing this more or less unconsciously around the same time, as they struggled with similar issues and concerns; see, for example, Baym (1996), Cherny (1995), and Yates (1993, 1996). Ferrara et al. (1991), Murray (1985), and Severinson Eklundh (1986) were pioneers in this regard.

2. For more extensive descriptions of the CMDA approach, see Herring (2001, in press, under review).
3. The choice of which features to focus on depends on one's research interests. For example, Herring (in press) discusses what discourse features one might analyze to address the question of whether a given online group is a "community."

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CYBERSCIENCE, METHODOLOGY, AND RESEARCH SUBSTANCE

Introduction



This paper builds on an ongoing research project¹ exploring the impact of information and communication technologies (ICT) on academia. We coined the term "cyberscience" (Nentwich, 1999) to depict the gradual move from traditional science (in a wide sense, including the social sciences and the humanities) where computers and telecommunication played only a marginal role toward a new type where, in particular, the Internet seems to have changed the way academics produce knowledge. Inter alia, we put forward a number of initial hypotheses about the qualitative impact of the advent of the new technology on how academics work and what they produce (Nentwich, 2001) and then tested them in a series of interviews.² This paper presents both the hypotheses and the empirical evidence gathered from the interviews on how ICT may affect the substance of research. We define substance of research as the essence proper of the research results, devoid of the form or representation.

Conceptually, ICT-induced changes of scholarly communication do not directly influence the substance of research. Rather, there are three possible routes how these changes may impact, namely, first, via changes of the *methodology*, defined here as the sets of rules of "how to" and standardized ways in which researchers carry out research; second, via changes in the *representation* of scientific knowledge (e.g., hypertext); and third, via changes in *work modes*, that is the practical, day-to-day, carrying out of research (e.g., collaboration). In this paper, we focus on the first of these impact routes (methodology). We found the following methodology-related types of impact: outcomes, otherwise impossible; changing initial input side; choice of topic; creative potential; inter- and trans-disciplinarity. For reasons of space, we only discuss the first four types in the rest of this chapter.³