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The Co-Evolution of Computer-Mediated Communication and Computer-Mediated Discourse Analysis

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2.1 Introduction

Computer-mediated communication (CMC) was originally produced and read as typed text and accessed through stand-alone clients. Increasingly, however, textual CMC has been supplemented by graphical, audio, and/or video channels of communication, and multiple modes[1] of CMC are available on Web 2.0 platforms and smart phones. As the technological affordances of CMC systems have evolved over time, so, too, have the efforts of scholars to analyze the discourse produced using those systems. One approach is computer-mediated discourse analysis (CMDA), a specialization within the broader interdisciplinary study of CMC distinguished by its focus on language and language use and by its use of methods of discourse analysis to address that focus (Herring, 2004a). However, CMDA was developed for the analysis of textual CMC; it has had little to say regarding, for example, the visual aspects of online discourse. It also tends to assume that online communication takes place primarily through one semiotic mode (i.e., text).

In this chapter, I describe efforts to develop and extend CMDA over time in order to address non-textual communication and the trend towards convergence of multiple modes of CMC in a single platform. The exposition is structured in relation to three historical phases of CMC: pre-Web (stand-alone textual clients), Web 1.0, and Web 2.0. For each phase, developments in CMC technologies are juxtaposed with developments in research on computer-mediated discourse (CMD) and the CMDA paradigm itself, with a focus on attempts to address multimodality within the paradigm, none of which have been entirely satisfactory to date. As an alternative, I propose a theory of multimodal CMC that suggests a new direction for CMDA going forward. This theory allows for the inclusion, under the umbrella of "CMC", of communication mediated by graphical phenomena such as emoji, image memes, and avatars in virtual worlds, as well by certain kinds of robots; in so doing, it extends the definition of CMC itself. Each of these phenomena can mediate human-to-human communication, support social interaction, and co-occur with other semiotic modes of communication, and thus their use constitutes fertile ground for computer-mediated discourse analysis.

I conclude by challenging linguists who study computer-mediated discourse to move beyond the confines of familiar methods and approaches, including traditional CMDA, and to follow computer-mediated discourse where it leads, including beyond linguistics, in order to analyze emergent and unprecedented discourse phenomena in all their manifestations.

2.2 Computer-Mediated Discourse Analysis

CMDA was first conceptualized in 1994[2] and developed by the author as a paradigm over the subsequent decade (Herring, Ed., 1997; Herring, 2001, 2004a, b). By 2004 it had evolved into a "methodological toolkit" organized around four linguistic levels: structure, meaning, interaction management, and social behavior, reflecting a progressive broadening of focus from the micro (structure) to the macro (social) level.[3] Associated with each level is a set of issues, language phenomena, and methods adapted, for the most part, from linguistics, as summarized in the following table (adapted from Herring, 2004a).

Table 2.1. The computer-mediated discourse analysis (CMDA) "toolkit"

Levels	Issues	Phenomena	Methods
Structure	Orality; formality; efficiency; expressivity; complexity; genre characteristics, etc.	Typography, orthography, morphology, syntax, discourse schemata, formatting conventions, etc.	Structural/Descriptive Linguistics, Text Analysis, Corpus Linguistics, Stylistics
Meaning	What is intended What is communicated What is accomplished	Meaning of words, utterances (speech acts), exchanges, etc.	Semantics, Pragmatics
Interaction management	Interactivity; timing; coherence; repair; interaction as co-constructed, etc.	Turns, sequences, exchanges, threads, etc.	Conversation Analysis, Ethnomethodology
Social phenomena	Social dynamics; power; influence; identity; community; cultural differences, etc.	Linguistic expressions of status, conflict, negotiation, face-management, play, discourse styles/lects, etc.	Interactional Sociolinguistics, Critical Discourse Analysis, Ethnography of Communication

Because CMD in the 1990s was overwhelmingly textual, the CMDA toolkit includes methods originally developed for textual analysis, such as text analysis and corpus linguistics; but because much CMD is dynamically interactive and includes "oral" features, the toolkit also includes methods traditionally applied to spoken discourse, such as conversation analysis and interactional sociolinguistics. Regardless of the methods used to analyze them, however, CMD data were originally produced and read as typed text on a computer screen, and most CMDA still focuses on interactive textual communication.

Over the years, modifications have been proposed to specific CMDA methods (e.g., Stromer-Galley & Martinson, 2009). Moreover, the CMDA paradigm as a whole was the subject of a special issue of *Language@Internet* (Androutsopoulos & Beißwenger, 2008), in which contributors proposed ways to expand the paradigm. These included incorporating perspectives from outside linguistics, such as ethnography (Androutsopoulos, 2008) from anthropology and 'communities of practice' (Stommel, 2008) from education. "Multimodal" enhancements to CMDA were also proposed by Beißwenger (2008) and Marcoccia, Atifi, and Gauducheau (2008), who analyzed videorecordings of gaze direction and body movements in individuals communicating via instant messaging and (text) chat, an approach reminiscent of user studies in the field of human-computer interaction (e.g., McKinlay et al., 1994). However, the focus of their approach was on the behind-the-scenes production of textual computer-mediated discourse (CMD), rather than on multimodal CMD as a joint enterprise manifest to all participants in an interaction.

More recently, jointly-produced multimodal CMD has begun to receive attention from language scholars. Conversation analysis (e.g., Jenks & Firth, 2013; Licoppe & Morel, 2012) and social semiotics (Sindoni, 2014) have been applied to audio- and videoconferencing, for example, and pragmatic and content analysis approaches have been adapted to analyze emerging forms of graphical communication (e.g., Herring & Dainas, 2017). However, these studies draw on different methodological paradigms and, with the exception of Herring and Dainas (2017), do not self-identify as CMDA.

Thus, new methods for analyzing online discourse have emerged over time in response to changes in CMC technology. This raises the question of whether CMDA is still relevant in the age of multimodal CMC. If CMDA is expanded to include approaches such as those mentioned in the preceding paragraphs, is it still meaningful to call it CMDA? Or is a new overarching paradigm needed, one that draws its assumptions and methods from "native" multimodal approaches, rather than from linguistic discourse analysis?

The remainder of this chapter is divided into two broad parts. In the first part, I conduct a retrospective review of three broad stages of technological evolution that have shaped CMC from 1985 to the present: pre-Web, Web 1.0, and Web 2.0. For each phase, I identify what new CMC modes were available at the time, what (new) aspects of CMD researchers focused on most, and the status of CMDA as a methodological paradigm.

The second part of the chapter is forward looking. In order to address the increasing multimodality and convergence of CMC, I propose a reconceptualization of CMC itself as fundamentally multimodal. From this vantage point, I argue that CMDA remains relevant, not just because textual CMC continues to be important, but because the principles at the core of the paradigm apply equally to interaction in non-textual modes.

2.3   A Historical Retrospective

2.3.1   Some Preliminary Remarks

My historical overview highlights connections between CMDA research and the technological properties of CMC.[4] However, I do not assume that technology has been the only, or even necessarily the most important, factor shaping CMC, nor that CMDA research has been driven exclusively by changes in CMC technology. Rather, CMC modes are socio-technical constructs (Herring, 2002). Social and cultural practices, as well as shifts in intellectual fashion in, e.g., discourse analysis and sociolinguistics over the last several decades (see, e.g., Androutsopoulos, 2006), have also played shaping roles. Nonetheless, it seems indisputable that the available technology sets limits on what is possible in CMC and influences – if not strongly shapes – it, and that CMC is the medium in which computer-mediated discourse takes place. I assume as much in what follows.

Moreover, I assume that the influence of CMC on CMD research and the CMDA paradigm has been primarily unidirectional. CMDA researchers, like researchers of CMC in general, have tended to follow current developments, choosing to study newer modes more often than older ones (Herring, 2004c). This makes sense when one considers the rapid rate at which the Internet has evolved and at which new CMC modes have emerged over a relatively short time span, as well as the heightened interest that tends to surround the latest developments. Thus, there has been a general directionality of influence from CMC technology, to communication via CMC, to research that addresses that communication. As a consequence, there is often a time lag between when a CMD phenomenon emerges and when it becomes the subject of published research, not least because of delays caused by the publishing process. For this reason, I sometimes include research with a later publishing date as part of an earlier evolutionary stage.

Finally, the following overview is selective and necessarily subjective, although I have tried to make it broad. In developing it, I drew on my extensive personal knowledge of CMDA as the originator of the paradigm, as well as my first-hand experience as a user and observer of CMC since 1985. The works I cite are focused on language and language use in CMC and written in English, excluding works that primarily concern applied domains. In addition to my own work, I consulted a list of 220 "top articles" on computer-mediated language that I had previously compiled with input from 20 leading CMD scholars from 10 countries; this was supplemented by focused Google Scholar searches. It is impossible in this chapter to credit all the sources I considered, and I

apologize in advance to scholars whose important work there was not enough space to mention.

2.3.2 Phase I: Pre-Web (1983-1993)

I begin my history around 1983, when the Internet *per se* emerged from its precursor, the Arpanet, which had been created in the late 1960s by the United States Defense Advanced Research Projects Agency (DARPA) (Hafner & Lyon, 1996). By 1983, the term 'computer-mediated communication' had been in use for several years (e.g., Arnold, 1978), and a number of modes of CMC were already in existence – email, group conferencing, Usenet newsgroups, game MUDs (Multi-User Dimensions or Dungeons), and an early form of synchronous one-to-one chat, Unix 'talk.' The end of Phase I would see the further introduction of the first public group chat platform, Internet Relay Chat (IRC); the internet service provider AOL; and social MUDs and MOOs (MUDs, Object Oriented).

These early modes of CMC were text-only – that is, users typed characters on a keyboard that appeared as words and symbols on their and their readers' screens. Even users of MUDs and MOOs created and navigated virtual spaces – rooms in houses, entire geographies – entirely in typed text. Another notable feature of early CMC is that the different modes were accessed through separate stand-alone clients – email at first through telnetting to a server using a line-by-line interface and later through specialized email clients, and IRC and MUDs through telnetting to different dedicated servers, while newsgroups required specialized 'reader' software, and AOL required proprietary software as well as a monthly subscription fee. These clients were not interoperable; perhaps for this reason, few internet users in the 1980s and early 1990s regularly used multiple modes of CMC (if they even knew about them). Moreover, accessing the internet during this period required a dial-up modem and was often painfully slow.

A small number of pioneering scholars first began addressing language use in CMC in the mid-1980s. Their studies focused on disparate phenomena ranging from abbreviated spelling and grammar to dialog structure, in limited-access CMC systems such as the Swedish COM system (Severinson-Ekhlund, 1986), an IBM intranet (Murray, 1985, 1988), and a 'wizard of oz' chat system designed to test a travel service prototype (Ferrara, Brunner, & Whittemore, 1991). In a forward-looking early essay, Baron (1984) speculated on the effects of CMC on the future of the English language.

A second wave of study began around 1993, as internet access spread and CMC started to come into more popular use; this wave continued through the rest of the decade. This period saw the emergence of threads of research focused around themes such as *orality, creativity,* and *play* in typography, orthography, and morpho-syntax (Cherny, 1999(1994); Danet, Ed., 1995; Werry, 1996); the influence of CMC systems on *message sequences and turn-taking* (Cherny, 1999(1994); Condon & Čech, 1996; Harrison, 1998; Herring, 1996b); and the *classification of CMC* in relation to speech

and writing (Collot & Belmore, 1996; Ko, 1996; Yates, 1996). Additionally, *gender styles and gender power dynamics* (e.g., Hall, 1996; Herring, 1993, 1994, 1996a; Kramarae & Taylor, 1993; Yates, 1993) emerged as a theme in response, in part, to the male-dominated culture of the internet at the time. (Early CMC adopters were mostly white, middle-class males). With a few exceptions, the data for most of these studies came from public internet forums such as newsgroups, discussion lists, IRC, and MOOs. Although a number of second-wave studies were published after 1993, they are included with this set either because their data were collected by 1993 or because the communication they analyzed involved earlier modes of CMC which remained popular through the mid-1990s.

Much of the language-focused research in Phase I can retroactively be considered computer-mediated discourse analysis, even though CMDA as such did not yet exist. Indeed, it was the blossoming of such research that generated the perceived need for a language-focused paradigm such as CMDA. The earliest pre-CMDA collection of language-focused CMC research was a panel I co-organized with Brenda Danet for the 1993 International Pragmatics Conference in Kobe, Japan. The papers presented in that panel later formed the core of a book (Herring, Ed., 1996). The CMDA paradigm itself was emergent during this phase; it was conceived in 1994 for a 1995 workshop. That workshop would seek to bring together researchers with different CMC language-related interests under a single umbrella in order to assess what was known about online language and language use, set future agendas, and start to establish a presence in the broader area of CMC studies.

2.3.3   Phase II: Web 1.0 (1994-2004)

The World Wide Web was proposed by British physicist Tim Berners-Lee in 1989 and first implemented publicly in 1991; at that time, it was accessible only through a line-by-line browser. It quickly attracted general notice, however, after a browser that integrated text and graphics, Mosaic, was introduced in 1993 (Wikipedia, 2016). By 1994, the Web was being hailed as a dramatic advancement in internet technology, both for its graphical capabilities and its ability to link documents in different formats through 'hyperlinks' (Mitra, 1999).

Initially, web content was not considered to be CMC by most CMC researchers, in that it tended to be static. Moreover, the web was used more as a display (or advertising) medium than as a platform for reciprocally interactive communication. But gradually that changed, as previously stand-alone CMC modes such as chat and discussion forums were integrated into web platforms, and new modes of CMC emerged that were native to the web, such as wikis and weblogs. A second development followed an increase in the bandwidth, or throughput, capacity of the internet in the mid-1990s. Non-textual modes of CMC were introduced that did not reside on the web, but rather on the internet itself; these included 2D and 3D graphical virtual worlds, audio chat (Voice-over-IP), and videochat. Phase II also saw the rise and fall of ICQ and the popularization of Instant Messaging (IM) and SMS, or text messaging on mobile

phones, which can be considered a mode of CMC due to its similarities with IM. With the exception of virtual worlds and audio- and videochat, these new modes remained predominantly textual.

During this period the demographics of internet users diversified as a result of wider access, and the number of female users increased, reaching parity with – and even slightly surpassing – the number of male users in 2000, according to self-reported web use (Pastore, 2000). In this same period, starting in the mid-1990s, the internet – and with it, CMC – began spreading rapidly from the U.S. and the U.K. to other countries in the world. These demographic developments had implications for discourse and language use that were taken up in Phase II CMC research.

Notably, many researchers focused on *identity* issues relating to race, gender, age, and/or sexuality (e.g., Greenfield & Subrahmanyam, 2003; Herring & Martinson, 2004; Nakamura, 1995; Shaw, 1997; Tynes, Reynolds, & Greenfield, 2004). With regard to gender, postmodern-influenced analyses were proposed (e.g., Bucholtz, 1996; Danet, 1998; Rodino, 1997) to address phenomena such as gender switching and identity play, which were claimed to break down traditional gender binaries. On the (supposedly) anonymous internet, nobody would know even if you were a dog.[5] Another set of themes emerged in response to the growing number of people engaging in CMC in languages other than English: *language choice/code-switching* and *internet multilingualism,* drawing on principles and methods from sociolinguistics (e.g., Androutsopoulos & Ziegler, 2004; Danet & Herring (Eds.), 2003; Georgakopoulou, 1997; Paolillo, 1996; Warschauer, El Said, & Zohry, 2002).

Online community also emerged as a popular theme during Phase II, both in CMD and in CMC research more generally. From a discourse perspective, CMD researchers addressed issues such as criteria for community-hood, norms, and insider/outsider language (e.g., Baym, 1995; Cherny, 1999; Herring, 2004a; Paolillo, 1999). Other themes emerged from the direct application of language-focused paradigms to CMD. *Interaction management* is among the phenomena most directly affected by the technological properties of CMC. Adapting methods from conversation analysis, discourse-focused scholars started addressing issues such as openings and closings, turn-taking, topic development, disrupted adjacency, and repair (e.g., Anderson, Beard, & Walther, 2010 (written in 1996); Condon & Čech, 2001; Garcia & Jacobs, 1998, 1999; Herring, 1999; Gruber, 1998; Rintel, Mulholland, & Pittam, 2001; Rintel & Pittam, 1997; Schonfeldt & Golato, 2003). Finally, several works addressed *intertextuality*, considering as intertextual both hyperlinks on the web and forms of reference more generally (Gruber, 2000; Hodsdon-Champeon, 2010 (written in 1996); Jucker, 2002; Mitra, 1999). With few exceptions, the data for these studies came from traditional textual modes of CMC, both public and private, which flourished during this period.

Discourse analysts did not immediately embrace web-based or multimodal CMD. The first modes of web-based CMC to be analyzed as CMD were webchat and web forums,

but these were initially treated like IRC and mailing lists or newsgroups, respectively (e.g., Mauntner, 2005). Weblogs, when their communication was first studied empirically, were addressed using methods of content analysis rather than discourse analysis (e.g., Herring, Scheidt, Bonus, & Wright, 2004). Research on the discourse of the new non-textual modes (graphical virtual worlds and audio- and videochat) would also await a later period.

The CMDA paradigm was actively under development in Phase II. I organized a panel at the 1996 International Pragmatics Association conference on 'Computer-Mediated Conversation,' guest edited a special issue of the *Electronic Journal of Communication* on 'Computer-Mediated Discourse Analysis' in 1997, and together with Tom Erickson of IBM Research, co-organized the 'Persistent Conversation' minitrack at the Hawai'i International Conference on System Sciences (HICSS) in 1999, which would run for 11 years. But while I had been using some form of CMDA in my own research since the early 1990s and teaching it to students since 1998, there was no published guide for others outside my immediate sphere on how to do CMDA. Phase II saw the publication of two chapters intended to address that gap: 'Computer-Mediated Discourse' in the *Handbook of Discourse Analysis* (2001) described a range of discourse phenomena and what was known about them from existing research through approximately 1999, and I laid out the CMDA approach systematically, including the methodological toolkit, in a chapter for a collection on *Designing for Virtual Communities in the Service of Learning* (2004a). One of my goals in constructing the toolkit was to provide an overview of discourse phenomena that might be studied using CMDA, in the hopes of inspiring research on thus-far-neglected phenomena. In that sense, the 2004 chapter set a broad agenda for CMD research going forward.

No sooner was the paradigm formally articulated, however, when it faced a challenge. By the end of Phase II the web had become increasingly multimodal, and I began thinking about how to extend CMDA to analyze interactive multimodal online discourse (e.g., Herring, 2004b, p. 73), especially still and moving images, since speech presents no problems for linguistic approaches, in principle. Initially, I thought of extracting parameters of graphical communication that would be analogous to principles of grammar in verbal language, but I abandoned that idea when it led to conceptualizations that were overly abstract. Instead, I turned to developing a set of methods for analyzing web content, including graphical elements, based on content analysis (Herring, 2010). However, I would return to the CMDA challenge several years later, taking a different approach.

2.3.4   Phase III: Web 2.0 (2004-2017)[6]

In 2004, Web entrepreneur Tim O'Reilly used the term Web 2.0 as the name of a conference for "leaders of the Internet Economy [to] gather to debate and determine business strategy" (O'Reilly, 2005). The term has come to refer, on the one hand, to changing trends in, and new uses of, web technology and web design, such as participatory information sharing, user-generated content, an ethic of collaboration, and

use of the web as a social platform; and on the other hand, to the kinds of websites where such activity takes place: blogs, microblogs, wikis, social network sites, media-sharing sites, and so forth.

Two other important characteristics of the web during this phase are greatly increased bandwidth, which increases transmission speed and supports video, audio, and graphics to a much greater extent than in Phase II, and a tendency for different modes of CMC – including textual modes – to converge on a single platform. As part of this trend, most previously stand-alone CMC applications – email, chat, and forums, as well as the various Web 2.0 platforms – became accessible through a standard web browser.

Web communication now being pervasive and fully interactive, there is no longer any question as to whether or not it qualifies as CMD. Language-focused CMD research in Phase III has become more popular,[7] and it has diversified into new areas. Some are natural areas for inclusion in CMDA that for whatever reason were late to be taken up, such as *pragmatics* (e.g., Atifi, Mandelcwaijg, & Marcoccia, 2011; Herring, Stein, & Virtanen, Eds., 2013; Nastri, Penã, & Hancock, 2006; Yus, 2010) and *variationist sociolinguistics* (e.g., Bamman, Eisenstein, & Schnoebelen, 2014; Hinrichs & White-Sustaíta, 2011; van Compernolle, 2008; but cf. earlier studies by Androutsopoulos & Ziegler, 2004; Paolillo, 1999; Siebenhaar, 2003). Other areas from traditional (offline) discourse analysis that have been taken up are *critical linguistics* and *language ideology* (Chun & Walters, 2011; Mauntner, 2005; Thurlow & Mroczek, Eds., 2011; Walton & Jaffe, 2011) and *accommodation*, including style shifting and alignment (de Siqueira & Herring, 2009; Georgakopoulou, 2011; Niederhoffer & Pennebaker, 2002; Riordan, Markman, & Stewart, 2013).

New thematic foci of research have also emerged in response to the particular characteristics of internet communication. These include *deception, hoaxes, and spam* (e.g., Barron, 2006; Blommaert & Omoniyi, 2006; Hancock et al., 2008; Heyd, 2013), *online social support* (e.g., Danby, Butler, & Emmison, 2013; Harris et al., 2012; Locher, 2006; Stommel, 2007), and *special discourse communities* (e.g., Androutsopoulos, 2007; Hinrichs & White-Sustaíta, 2011; Sebba, 2003; Vaisman, 2013) such as online fan communities, rappers, and trolls. Focal areas have also sprung up around language use in individual CMC modes, such as *blogs and wikis* (e.g., Emigh & Herring, 2005; Herring et al., 2004; Herring & Paolillo, 2006; Myers, 2010; Peterson, 2011; Puschmann, 2010); *Twitter and Facebook* (e.g., boyd, Golder, & Lotan, 2010; Honeycutt & Herring, 2009; Lee, 2011; Lenihan, 2011; Page, 2012; Zappavigna, 2012); *YouTube* (e.g., Bou-Franch, Lorenzo-Dus, & Blitvich, 2012; Chun & Walters, 2011; Lange, 2007; Pihlaja, 2011); and *IM and text messaging* (e.g., Anis, 2007; Baron, 2010; Bieswanger, 2007; Deumert & Masinyana, 2008; Lee, 2007; Ling, 2005; Ling & Baron, 2007; Shortis, 2007; Spilioti, 2009; Tagg, 2012).

In Phase III, multimodality began to be addressed. Pioneering studies have focused on *non-textual modes* such as audiochat (e.g., Jenks & Firth, 2013; Jepson, 2005), videochat (Licoppe & Morel, 2012; Sindoni, 2014), and graphical communication

strategies (e.g., Dresner & Herring, 2010; McDonald, 2007). *Convergent media CMC* – CMC in which text co-occurs with other channels of communication on the same platform – has been studied (e.g., Jucker, 2010; Zelenkauskaite & Herring, 2008). Related to multimodality, researchers are also starting to address the methodologically challenging topic of *online and offline communication,* including how CMC is integrated with offline activities (e.g., Aarsand, 2008; Danby et al., 2013; Jones, 2011; Leppännen et al., 2011).

Finally, CMDA itself is being challenged to expand and adapt in various ways. *Automated corpus analysis* challenges the definition of discourse analysis, which has traditionally been done manually by human researchers, rather than by machines, although automated techniques are increasingly being used to address questions of interest to discourse analysts (e.g., Danescu-Niculescu-Mizil et al., 2013; Dürscheid & Stark, 2011; Huffaker & Calvert, 2005). From the opposite direction, researchers of *social and cultural context* (e.g., Androutsopoulos, 2011; Jones, 2004; Thurlow & Mroczek, Eds., 2011) challenge CMDA researchers to adopt broader qualitative and critical perspectives. *Methodological expansions of CMDA* have been proposed (e.g., Androutsopoulos, 2008; Beißwenger, 2008; Garcia et al., 2009; Marcoccia et al., 2008), as have competing theories of online communication (e.g., Weininger & Shield, 2004; Yus, 2010). These are healthy developments that indicate that computer-mediated discourse analysis is an active area of scholarship.

Before concluding this retrospective survey, three additional perspectives on CMD that have been researched intermittently over time should be mentioned. These are *participation* in CMC (e.g., Herring, 1993; Herring, Johnson, & DiBenedetto, 1995; Joyce & Kraut, 2006; Marcoccia, 2004), *humor* (e.g., Danet, Ruedenberg-Wright, & Rosenbaum-Tamari, 1997; Hubler & Bell, 2003; Nishimura, 2012; Su, 2003), and *language change* (e.g., Baron, 1984; Berdicevskis, 2013; Danescu-Niculescu-Mizil et al., 2013; Gao, 2006; Herring, 1998; Rowe, 2011). Moreover, a fourth theme, *(im)politeness*, deserves special mention in that it has been a research focus – and an issue of concern – since Kiesler et al. (1984) reported finding disinhibitory effects, including "flaming," in experimental studies involving mediated communication in the 1980s. Numerous studies have addressed online politeness over the years (e.g., Darics, 2010; Graham, 2007; Herring, 1994; Locher, 2010; Pihlaja, 2011; Morand & Ocker, 2003; Rice & Love, 1987), and recent concerns about worsening incivility on the internet in the era of trolling, political polarization, and "fake news" have led to a further uptick in research on this topic (e.g., Hardaker, 2010; Phillips, 2015; Phillips & Milner, 2017; Rowe, 2015; Santana, 2014).

With the exception of the above-mentioned themes, which are not associated predominantly with a single phase, Table 2 summarizes the CMC technology, the CMD research, and developments in the CMDA paradigm that were new in each of the three phases surveyed in this and the previous two sections.

Table 2. Three phases in the co-evolution of CMC and CMDA

Phase	CMC Characteristics	CMD Research Themes	CMDA Paradigm
I: Pre-Web (1983-1993)	• Email; mailing lists; Usenet newsgroups; IRC; AOL chat; MUDs/MOOs; etc. • Stand-alone clients; not interoperable • Text only (+ emoticons) • Users mostly white males in the US and UK	• typography and orthography ("oral" features) • message exchange/turn-taking • gender styles and gender and power dynamics • word frequency/registers • (morpho)syntax • message/sequence structure	• Pre-CMDA: 1993 IPrA panel w/ Brenda Danet, led to published volume (Herring, Ed., 1996) • Name first used in 1994 Call for Abstracts for a 1995 GURT workshop
II: Web 1.0 (1994-2003)	• E.g., webchat; web forums; blogs; wikis; graphical virtual worlds; IM; ICQ; SMS; graphical worlds, VoIP, video chat • Convergence of CMC modes on the web • Spread of Internet to other countries • Increase in female users	• interaction management • online community • identity • language choice/code-switching • internet multilingualism • intertextuality • postmodern-influenced gender research	• First CMDA collection: Herring, Ed. (1997). • CMD and CMDA approach formally laid out (Herring, 2001, 2004a) as a broad agenda for CMD research • Contents of static websites not considered CMD
III: Web 2.0 (2004-2017)	• E.g., media-sharing sites; social network sites; microblogs • More bandwidth means more use of video, audio, and graphics • Convergent Media CMC – textual CMC included in multimodal platforms (e.g., Zelenkauskaite & Herring, 2008) • Web communication is fully interactive (distinction between Web and non-Web virtually disappears)	• pragmatics • sociolinguistic variation • critical language ideology • accommodation • discourse communities • deception, hoaxes, & spam • online social support • multilingualism; language choice/code-switching • identity; race, ethnicity; age • language use in individual modes (e.g., IM, text messaging; blogs, wikis; Twitter, Facebook; YouTube) • non-textual modes • Convergent Media CMC • online and offline communication • automated corpus analysis • social and cultural context • methodological expansions of CMDA • other theoretical approaches	• Faceted clasification scheme (Herring, 2007) • Growing recognition and use of CMDA, including identification of its limits • Critiques by Androutsopoulos & Beißwenger (2008) • Applied to an expanding range of linguistic domains • Web communication is considered CMD • Attempts to expand to multimodal CMD somewhat unsatisfactory • Identification of new challenges, e.g., how to deal with changing nature of links (and 'likes') in social media

Phase III has seen increasing recognition for, and use of, the CMDA paradigm (e.g., Androutsopoulos & Beißwenger, 2008; Darics, 2010; Koteyko, Jaspal, & Nerlich, 2013; Kushin & Kitchener, 2009). For my part, I followed my programmatic 2004 chapter (Herring, 2004a) with a 2007 article laying out a classification scheme for CMD according to two dimensions, or sets of facets: medium and situation variables. However, CMD has evolved in the era of Web 2.0; it now features previously unattested phenomena such as 'likes' and graphical 'reactions' on social network sites, dynamically collaborative-authored content on wikis, and asynchronous conversational exchanges via videos and images. The CMDA paradigm is confronted not only with the challenge of developing methods to analyze these new 'medium' phenomena, but also with accounting for them within its overall conceptual framework. I made another attempt to integrate methods and issues for multimodal analysis into CMDA in Herring (2013), which involved proposing the addition of a fifth, multimodal, level to the CMDA toolkit. However, 'multimodality' is not analogous to 'structure', 'meaning', etc., in that it refers to the channel of communication rather than a linguistic level of analysis, so the proposal was conceptually problematic. In fact, all the other levels in the toolkit can be studied for (fit within) multimodal CMD. It also lumps all multimodal CMD into a single category, without differentiating among audio, video, graphics, and so forth, and thus is descriptively inadequate. An alternative, and I believe more satisfactory, solution to the problem of multimodality and CMDA is laid out in the remainder of this chapter.

2.4 Reconceptualizing CMC

The current conceptualization of CMC, which has not been updated substantially since the term first started appearing in print nearly 40 years ago,[8] arguably retains connotations of textual, one-mode-at-a-time transmission. Thus as a first step, I propose reconceptualizing CMC as fundamentally multimodal. Indeed, if the proverbial Martian scholars were to come to Earth and encounter CMC for the first time in 2017, they would undoubtedly perceive its transmission via multiple semiotic modes to be inherent in its nature – as, I assume, do young people who have never known a world in which CMC involved only textual exchanges. A consequence of conceptualizing CMC as multimodal is that non-multimodal CMC ceases to exist, except historically. This reconceptualization does not exclude text-only CMC; rather, text is one of a number of possible modes of transmission that also include voice, audio, video, and – I suggest – graphics and certain kinds of robotic devices, as represented schematically in Figure 1.[9]
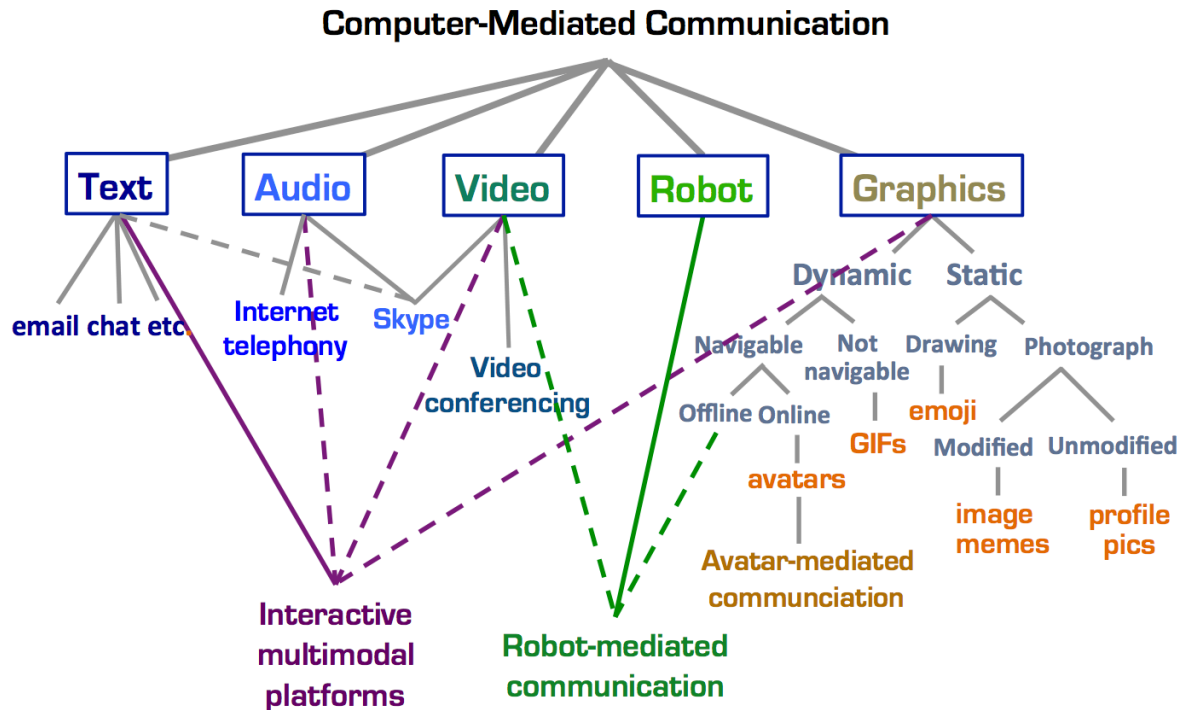
Figure 1. CMC reconceptualized as inherently multimodal

Text, audio, and video CMC have been around for decades and have been addressed often in the literatures on CMC and human-computer interaction (see, e.g., O'Connail, Whittaker, & Wilbur, 1993, for video conferencing). Therefore, in the following subsections I focus on three newer phenomena from Figure 1: communication on interactive multimodal platforms (IMPs); graphical communication, including avatar-mediated communication (AMC); and robot-mediated communication (RMC). Like other CMC modes, these emergent phenomena involve verbal language (as well as other semiotic systems); mediate human-to-human communication; and support social interaction, and thus the discourse that is produced through them constitutes CMD. I then consider the ramifications of these phenomena – and the multimodal model of CMC more generally – for computer-mediated discourse analysis.

2.4.1 Interactive Multimodal Platforms

Interactive multimodal platforms (IMPs) are digital platforms on which two or more semiotic modes – typically text plus audio, video, and/or graphics – are available to support interactive human-to-human communication (Herring, 2015). IMPs differ from multimedia platforms or convergent media CMC platforms in that IMPs support multiple forms of CMC, whereas the other platforms may have only text commenting or chatting on a site with other media, such as games, news stories, or products for sale, that serve primarily entertainment, informational, or commercial purposes. An early example of an IMP is YouTube, which supports both video exchanges and text comments. Other examples are multiplayer online games where players can communicate with each other via both text chat and voice – and in some games, player avatar movements – and videoconferencing systems that support synchronous video,

audio, and text-based communication (and sometimes collaborative drawing on a whiteboard). The list of IMPs now includes Skype, Google+, and Facebook. As social media sites continue to add CMC affordances such as videochat, IMPs are becoming increasingly common.

IMPs, like convergent media CMC, are characterized by media co-activity; that is, users engage in multiple activities involving different semiotic modes on the same platform (e.g., Herring, Kutz, Paolillo, & Zelenkauskaite, 2009). Especially when synchronous communication is involved, media co-activity raises issues such as competition for users' attention and the effects of such competition on message production and discourse processing. Moreover, both IMPs and convergent media CMC call for theories and methods of analysis that can address the interplay between text and other modes of mediated communication. IMPs differ, though, in that they provide contexts that allow for direct comparison of communication styles and strategies across different modes on the same platform. Studies that have focused on IMP discourse to date include Newon (2011, World of Warcraft), Sindoni (2014, videoconferencing), and Herring and Demarest (in press, VoiceThread).

2.4.2 Graphical Communication

Internet users have been chatting online via graphical avatars in virtual worlds since the mid-1990s, when 2D and 3D virtual worlds such as the Palace and AlphaWorlds were introduced. Second Life popularized this type of CMC in the mid-2000s, and it remains a common feature of virtual game worlds such as World of Warcraft. While avatar-mediated communication (AMC) usually involves verbal communication via text and/or voice chat, some studies have analyzed avatar movement, gaze direction, and other semiotic signals as part of the avatars' communicative repertoire, including how their physical behaviors interact with other modes such as text and speech (e.g., Garau et al., 2001; Newon, 2011; Yee, et al., 2007).

More recently, graphics on social media sites have evolved from cute or funny images or videos that people share for their entertainment value to semiotic devices that are used to convey propositional content, in lieu of, or in conjunction with, text. As such, they can function as propositions within messages or as stand-alone turns in conversational exchanges. These devices include emoticons, emoji, stickers, GIFs, and text-in-image memes; video clips may also serve similar functions. Herring and Dainas (2017) refer to these devices as *graphicons*.

Emoji, especially, are attracting growing scholarly attention, as well as speculation that emoji are becoming a new 'language' (e.g., Stockton, 2015). Examples can be found on the web of text message exchanges and song lyrics written entirely or almost entirely in emoji; an emoji phrasebook also exists, as well as a "translation" of Herman Melville's classic novel, *Moby Dick*, titled 'Emoji Dick'. However, the intended meanings of emoji are not always clear (Miller et al., 2016), and their use raises issues of ambiguity, ambiguity resolution, miscommunication, and repair. Moreover, most

emoji depict concrete entities, including facial expressions, or physical actions, such as running. Emoji can express emotions (via facial expressions), but emoji for abstract concepts such as 'concept,' 'analysis,' and 'freedom' are largely missing, and symbols that express syntactic relations are also rare (the + sign, indicating coordination, is an exception). Furthermore, one cannot easily embed propositions or indicate events out of temporal sequence via emoji. These present limitations notwithstanding, there is anecdotal evidence that some users are adapting emoji whose literal referents are 'things' to express more abstract notions (e.g., a rightward-pointing finger for the English directional preposition 'to'; an eye-rolling face as a deictic pointing to content posted earlier ('above') in an exchange). In addition, emoji-only exchanges occur, typically as a form of playful commmunication, in which some users construct elaborate emoji sequences. These exchanges constitute intriguing data for analysis in terms of their emergent structure, intended (vs. understood) meanings, conversational dynamics, and social signification.

Thus far, there are relatively few discourse studies that analyze graphicons-in-use, although this is changing, as CMD scholarship catches up with contemporary CMC usage. Studies that have focused on graphical conversation to date include McDonald (2007, text-in-image exchanges on a community blog), Pihlaja (2011, video exchanges on YouTube), Dresner and Herring (2010, emoticons), Amaghlobeli (2012, emoticons in SMS), Bourlai and Herring (2014, Tumbler GIFs), Voida and Mynatt (2005, photographs), Katz and Crocker (2015, selfies), Herring and Dainas (2017, graphicons in Facebook comment threads), Nishimura (2015, emoticons and emoji in Japanese blogs), Dürscheid and Siever (2017, emoji), and Lim (2015, stickers).

2.4.3 Telepresence Robot-Mediated Communication

Telepresence robots are robotic devices controlled by remote users that can be navigated through physical environments and that include two-way audio and video conferencing capabilities. Sometimes characterized as "videoconferencing on wheels" (Desai et al., 2011), the telepresence robot is also an avatar or representation of the user that can be remotely manipulated, similar to a graphical avatar in a virtual world. The robot can also be thought of as a technology or channel that mediates communication directly, analogous to text, audio, video, and graphics, and whose properties potentially shape the nature of the communication that occurs through it. These three conceptual relationships are represented by separate lines connecting to 'robot-mediated communication' in Figure 1. Robot-mediated communication (RMC) is communication in which at least one party is telepresent via, and remotely controlling, such a robot (Herring, 2015).

RMC raises numerous issues as regards social interaction, many of which relate to the technological properties and limitations of the current generation of telepresence robots and are resulting in the emergence of new interactional norms. For example, the limited mobility and range of visibility of robot 'pilots' affect their ability to attract attention,

gain and hold the conversational floor, and time turn-taking appropriately. The pilot may misgauge social distance due to a lack of depth perception and position the robot too close or too far away from an interlocutor, may talk too loudly due to a lack of audio feedback, or may linger too long after a conversation due to missed social cues (Lee & Takayama, 2011). 'Locals' interacting with the robot must learn to understand that the robot's behaviors reflect technological issues, rather than social inappropriateness or intentional rudeness on the pilot's part.

As yet little research has addressed discourse in RMC, and non-linguistic studies of RMC tend to be experimental or interview-based in nature. As telepresence robots come into more common use, however, and corpora of naturally-occurring conversations between robot pilots and their local interlocutor(s) become available, discourse analysis methods can fruitfully be applied to such data. In Herring (2016) I propose a number of directions that such analysis could take.

2.5   Implications for CMDA

In the preceding subsections, I identified discourse and social interaction issues raised by communication through interactive multimodal platforms, graphics, and telepresence robots. To address these, methods and insights will be required that extend beyond linguistic discourse analysis. For example, the literatures of semiotics, ethnography, human-computer interaction, and human-robot interaction could be instructive to consult. To analyze the interplay of text and images, scholarship on comic books, or even ancient illuminated manuscripts, could potentially provide insight. To analyze videos, CMD analysts might need to (re)learn spoken discourse analysis techniques and (re)acquire the patience – or devise automated methods – to transcribe speech, which has been unnecessary with textual CMD.

More generally, the inclusion of these new phenomena in the definition of CMC challenges CMDA to evolve. First, it obliges the paradigm to fully embrace not just emergent forms of mediated discourse, but also audio- and videochat/conferencing, which until now have been included in principle, but less often in practice, as part of CMD (but cf. Jenks & Firth, 2013; Licoppe & Morel, 2012; Sindoni, 2014). Second, methods need to be identified, modified, or innovated for analyzing the discourse produced through each semiotic mode, as has been done for textual CMD (cf. Herring, 2004a). The expanded conceptualization also calls for cross-mode analysis methods, as both CMC modes (e.g., discussion forums, instant messaging, videochat) and semiotic modes (e.g., text, graphics, video) converge on a single platform and as social media users produce content, such as tweets, that is reposted and shared on other, including mass media, platforms (e.g., Squires, 2010). Finally, at the theoretical level, the inclusion of graphics as discursive devices broadens the definition of CMD beyond verbal language. Holistic understandings are required to understand what behaviors, characteristics, and/or assumptions unite these potentially disparate phenomena.[10]

Multimodal CMC, as reconceptualized in Figure 1, has several characteristics that are arguably shared by all modes of CMC. For example, although motivations for use vary by individual and according to context, all modes afford a facilitating social distance and an ability to be more selective in one's self-presentation than face-to-face communication. Norms of language and social interaction have evolved or can be expected to evolve in all modes of CMC with use over time. Communities of users also tend to form around CMC platforms. In these and other regards, earlier textual CMC modes and practices can shed light on current and future non-textual developments, as, for example, the evolution of ASCII emoticons suggests a trajectory for emoji use. More generally, the literatures on better-studied modes can guide the identification of research questions and the interpretation of results from investigations into newer modes. It appears, for example, that research on both video conferencing and avatar-mediated communication has relevance for robot-mediated communication (Herring, 2015).

Last but not least, it is possible to analyze CMC in each semiotic mode – even graphics – on the levels of structure, meaning, interaction management, and social behavior. All have structural properties; all signify meanings in context; all can be used to hold conversational exchanges; and social behavior can be enacted through every mode. In other words, all the modes mediate human-human discourse, and thus discourse analysis as an approach and a set of methods is applicable to all.

2.6   Broader Implications and Conclusions

Over the course of its nearly 25-year history, CMDA has faced a number of challenges from technological advances in CMC, including increased bandwidth, increasing multimodality, and media convergence. In order to address these challenges, I have suggested here that it is necessary to reconceptualize CMC itself. I have proposed a unified view of multimodal CMC that includes graphics and robotic devices as mediating channels, along with text, audio, and video. This reconceptualization is a first, theoretical step toward equipping CMDA and CMD researchers with the tools they need to analyze multimodal, convergent CMC. The advantages of this view include that it enables emergent CMC modes to be understood, in part, in terms of familiar modes. It also highlights where new methods are needed for analyzing multimodal CMD, be it in individual modes, co-occurring modes (IMPs), or interaction among/across modes. An important next step will be to develop specific sets of methods appropriate for analyzing each nontextual mode, especially for less traditional phenomena.

One implication of this reconceptualization is that CMDA as a paradigm remains relevant. Regardless of the technology that mediates it, CMD can be analyzed in terms of its structure, its pragmatic meanings, its interactional properties, and the kinds of social behavior it supports. This is as true for robot-mediated communication and communication via emoji as it is for traditional email and chat.

Another implication is that linguistic methods alone are insufficient to address the range of phenomena that are currently attested in computer-mediated discourse (cf. Gee, 2014). This leads to a broader question. As CMC continues to evolve, linguists who study CMD have a choice: Do they remain within the borders of known linguistics methods and approaches, including traditional CMDA? Or do we (for I am included in this category) follow the technology where it leads, including beyond linguistics, to study CMD in all its forms? This is a question that we all must ask and answer for ourselves as CMC technologies become ever more rich, complex, and multimodal.

Notes

1. A 'mode' is a specific communication type within a medium such as the computer (Murray, 1998, p. 353). 'CMC modes' in this chapter are sociotechnical constructs that combine online messaging protocols with the social and cultural practices that have evolved around, or are emergent through, their use; examples include email, instant messaging, and virtual worlds (cf. Herring, 2002). I use the term 'semiotic mode', following Kress and van Leeuwen (2001), for the 'modes' implicit in the term 'multimodal', e.g., text, audio, video, graphics, music. When my focus is on the pathway or mediating technology that transmits multimodal communication, the term 'channel' may also be used. Thus, for example, instant messaging (CMC mode) is textual (semiotic mode), transmitted via typed text on a keyboard or mobile device (channel).

2. The name 'Computer-Mediated Discourse Analysis' was first used in a 1994 Call for Papers circulated by the author for a workshop by the same name at the 1995 Georgetown University Roundtable on Languages and Linguistics (GURT).

3. The toolkit also includes a non-linguistic level, Participation (see Herring, 2004a).

4. The history of the internet has been written about extensively; rather than go into detail about it here, I refer the reader to other sources (e.g., Hafner & Lyon, 1996). CMC modes have also been described in numerous works, some of which present, or at least allow for, comparison of the modes' chronological emergence (e.g., Herring, 2002).

5. A reference to a 1993 cartoon in the *New Yorker* (see, e.g., Herring, 2003).

6. Some argue that we are no longer in the era of Web 2.0 but rather in a new phase, Web 3.0, characterized by technological advances in the semantic web, artificial intelligence, machine learning, and natural language search – the so-called 'Intelligent Web' (Spivak, n.d.). It is possible that these technological developments are already affecting CMD, but research themes associated with them have yet to emerge clearly, it seems to me. Thus I have provisionally defined Phase III as continuing up to the time of this writing.

7. Many themes from earlier phases have continue to attract CMD scholarship, including *multilingualism* and *language choice/code-switching* (e.g., Androutsopoulos, 2013; Deumert & Masinyana, 2008; Fung & Carter, 2007; Hinrichs, 2006; Lee, 2016; Morel et al., 2012; Siebenhaar, 2006; Themistocleous, 2013); *identity* (e.g., Campbell, 2004; Marwick, 2013; Milani, 2013; Sargeant & Tagg, Eds., 2013); *race and ethnicity* (e.g., Byrne, 2008; Heyd, 2014; Hughey & Daniels, 2013) and *adolescence* (e.g., Buckingham, Ed., 2008; Kapidzic & Herring, 2011; Leppännen et al., 2011; Subrahmanyam, Smahel, & Greenfield, 2006; Tagliamonte & Denis, 2008; Tynes, Reynolds, & Greenfield, 2004).

8. In what is possibly one of the earliest uses, George Arnold used the term "computer-mediated communication" in his 1978 Columbia University doctoral dissertation, explaining that he preferred the "more general" term to others then in use, such as "computer conferencing", which he found "overly restrictive" (p. 5). Many of Arnold's observations on "The nature of computer-mediated communication" (pp. 5-13) seem familiar 39 years later.

9. This conceptualization is expandable. In theory, additional branches could be added to the top node in Figure 1 as new technologies that mediate human-human communication are introduced in the future.

10. See, e.g., Gee (2014) for a unified view of discourse that includes video games, among other phenomena.

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