Ceci n'est pas un Objet? Talking About Objects in E-mail

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ABSTRACT

E-mail, far from being a poor, technically limited substitute for face-to-face communication, has some unique and compelling properties that make it ideally suited for talking about objects. In this article we show how e-mail users have evolved new forms of electronic deictic references to refer to work objects and have taken full advantage of the fluid boundaries between the different roles that e-mail can assume. We also illustrate how e-mail users draw on the persistence of the medium to make sense of the objects being talked about and sometimes even transform the conversation itself into an object of conversation. We conclude with several design suggestions for future electronic mail software based on these findings.

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1. INTRODUCTION

E-mail, as a growing number of studies suggest, is rapidly becoming the principal means of distance communication for today's computer-literate professional, surpassing the telephone in terms of the number of communications made each day (Bellotti & Smith, 2000; Markus, 1994). E-mail lowers the cost of coordination (Sproull & Kiesler, 1991), and many professionals spend a greater part of their day communicating over e-mail than even face-to-face. Although this may not be surprising for those who collaborate over distance, we have observed that even colleagues having offices next to each other, or sitting in plain sight of each other, still use e-mail as a principal communication medium.

It has long been clear that e-mail is more than just a simple communication system (Mackay, 1988; Whittaker & Sidner, 1996). It has played a critical role in personal information management and task management and delegation from its earliest incarnations up to the present moment. However, in recent years this medium has evolved drastically both in terms of its features and capabilities (e.g., it is now tightly integrated with personal information management and business processes on many platforms) and in terms of what it is used for. Most notably:

- E-mail has, in the past 5 years, begun to be capable of supporting the *transfer of attachments* and the *embedding of links* in the text by nonsophisticated users. Thus, it strongly affords the possibility of exchanging work objects involved in individual contributions within a collaborative context. As a consequence, e-mail appears to have become the primary document delivery mechanism for office workers using PCs (Bellotti & Smith, 2000).
- E-mail is *persistent* (for more on this topic, see Erickson, 1999) and so are the links and references to objects that it affords. Thus, along with improving the timeliness and convenience of access to object-related communication, e-mail can also leverage information management resources. Users are able to capitalize on storage, reminding, search, and retrieval capabilities of their online workspace for managing work objects that are organized within personal and shared file hierarchies (Barreau & Nardi, 1995). Work objects are easily accessible during e-mail communication in a way that they cannot be in most face-to-face encounters.
- E-mail is now a *habitat*, the place where office workers spend much if not most of their workdays. The application is always on and is often the focus of attention. It is increasingly used as a coordination center, as a storage site for shared digital resources, and as a central site for work conversations (Bellotti & Smith, 2000; Ducheneaut & Bellotti, 2001).

Even the user population has evolved from largely computer sophisticates and those who support them in technologically advanced organizations to everyday professions such as media production, marketing and sales, customer support, consulting, and so on. Therefore, these changes in the nature, use, and users of e-mail deserve continued attention, notwithstanding the large body of existing literature on the subject of e-mail. As Holmes (1995) put it, e-mail remains "a moving target."

In this article we take a fresh look at current practices among people who are using e-mail as a mundane technology to support everyday work. In particular, we are interested in an area that has so far received little attention in the literature: how e-mail users talk about the work objects that they and their colleagues are concerned with. By analyzing the particular communicative practices that e-mail users exploit, we show in particular how e-mail exhibits powerful characteristics in the following two ways:

- As a *preferred medium for talking about work*: exhibiting a variety of means to refer to work objects and coordinate activity around them.
- As a valuable *product of communication*: e-mail conversations, often standing as or evolving into work objects themselves.

Indeed, rather than being constrained by this medium's technical limitations, e-mail users have developed new ways of talking about things that would have been impossible to envision by taking a narrowly focused perspective on either the social or the technological side of the equation alone. We therefore illustrate with this article how e-mail can stand as a product of, as well as a medium for, human interactions (DeSanctis & Poole, 1994; Orlikowski, 1992; Orlikowski & Robey, 1991). And because e-mail users' innovative practices can be very enlightening for designers of electronic communication tools, we conclude with some design suggestions that arise from this research.

We begin with an overview of our research methodology and of the data we collected.

2. STUDY OF E-MAIL WORK CONVERSATIONS

2.1. Method and Participants

To analyze how office workers collaborate around work objects in e-mail, we used a methodology closely related to contextual inquiry (Beyer & Holtzblatt, 1997). We picked three organizations that we believed were advanced e-mail adopters with employees who were likely to provide a good account of the near future of mass e-mail use. We interviewed 28 professionals in these organizations:[1]

- PARC, the large, established research center with which we are affiliated. PARC has about 400 staff members located in a single building on a small campus in Palo Alto, California. Most employees belong to an approximately 5- to 10-person group in one of six labs. Researchers conduct both within- and cross-lab projects, which may be more or less commercially oriented. Each employee has a private office, generally located near the rest of his or her group. Ten interviews.
- MediaWorld, a 150-person, rapidly expanding multimedia production company that produces animated content for Web sites and TV. The employees in MediaWorld are divided into a number of different types of group including writers, artists, animators, engineering, Web design, quality control, and marketing. At the time of our study, the offices were open-plan and spread over two buildings on the same block in San Francisco with people located close to members of the same role grouping. Twelve interviews.

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1. To preserve our interviewees' privacy, the names of two of the organizations have been replaced with fictitious ones.

- LeadDesign, a small (six-person) design consulting firm working on (typically) shorter projects. The employees are not all full-time, with two spending a considerable amount of time on private projects for other clients. Their backgrounds range from graphic to Web programming skills targeted toward corporate image and Web design. Although they have a shared office space, they often work remotely from it and do a great deal of collaboration with their clients remotely. Six interviews.

The interviews were conducted by two researchers and situated in the offices of the interviewees, where they could show us the contents of their e-mail. In the first part of the interview, we asked respondents a series of specific questions for background information and then about e-mail use. These questions drew upon findings in previous, more open-ended research we had conducted on personal information management and the role of e-mail (Bellotti & Smith, 2000). Our goal was to get a better understanding of our user population and how the demographics of our e-mail users and the kind of companies they work for affected personal information management in e-mail. The complete results of this first part of the study are reported elsewhere (see Ducheneaut & Bellotti, 2001).

From these orienting questions, we know that the individuals in our sample are fairly experienced in their profession on average (8 years) with extensive e-mail experience (11 years on average), but it is interesting to note that they are relatively recent users of their current application (3 years). Eudora™ (48%) and Microsoft Outlook™ (34%) are the two main e-mail clients used, followed by Outlook Express™ (10%). A marginal number of individuals use Mh on Unix or Netscape Messenger. The range of either incoming or outgoing communication volume is extremely wide, from 3 to 100 messages per day (incoming mean = 42, median = 40; outgoing mean = 17, median = 12). Twenty of our interviewees (71%) have nonmanagerial jobs; the remaining 8 (29%) are middle or upper level managers.

The latter half of the interview consisted of the interviewees being asked to pick the 10 most recent, nonprivate e-mail messages they had received and explain the conversation they were part of, while drawing that conversation on a sheet of paper, using any representational style. The diagrams, although informative in their own right, were only a support for our information gathering: We encouraged the subjects to talk aloud as they reconstructed the conversation. We asked our interviewees to talk about their 10 most recent messages because we assumed their memory would still be fresh and, therefore, that they would be able to provide us with the richest possible account of the exchanges these messages were a part of. Interviews were video recorded to capture as many relevant details as possible including e-mail sender, recipient, and contents.

It is important to point out that the conversations we collected are different from threads. Whereas an email thread is often defined as messages related via their subject lines, our definition of a conversation is a series of related messages as defined by the sketches and accounts of our interviewees. It is not always the same as a thread, since it may be composed of messages for which the topic has changed over time (for more on the relationship between computer-mediated threads and face-to-face conversations, see McDaniel, Olson, & Mage, 1996). This way we have been able to identify messages that are related to each other according to the understandings of a recipient but that automatic logging techniques would not have identified as such. Erickson and Kellogg (2000) offered a very compelling explanation of the power of conversations and why they should be the focus of our attention rather than threads or messages.

As well as showing us the messages, the interviewees explained the rationale for each of the messages that was sent or received, as they drew. In this way their diagram supported their talk. Sometimes a phone call or other event would also be represented as a key part of the process outside of e-mail. Figure 1 shows an example of one of the conversations that were drawn by our interviewees.

We did not always manage to get 10 conversations from our interviewees: One refused to draw sketches and instead simply talked about his messages, and three others stopped at the fifth or sixth conversation, because their descriptions had been so rich that we were running over the time allotted for the interview. The outcome of this study is therefore a collection of 261 examples of e-mail conversations, from the very short and simple (see, e.g., Figure 2), to the extremely long and complex (e.g., Figure 1), the majority of which contain examples of ways in which people talk about the things they are working on together. Most of our examples are work related, although some are more personal, and most contain what could be described as talk about things or objects. Thus, they provide an interesting snapshot of current practices in three distinct organizations, which leads to some interesting insights about the practices developed over time when e-mail is used as a medium for talking about objects.

2.2. Definitions and Issues Concerning E-mail Communication About Objects

Before we begin our discussion of e-mail communication about objects, we need to define some terminology to avoid a number of potential confusions that could arise from our arguments. E-mail is a digital medium and the objects discussed over e-mail may also be digital (such as a Web site), but they may also be actual things in the physical world (such as a pet), or they may be

Figure 1. **Example of an e-mail work conversation sketched by one interviewee.**
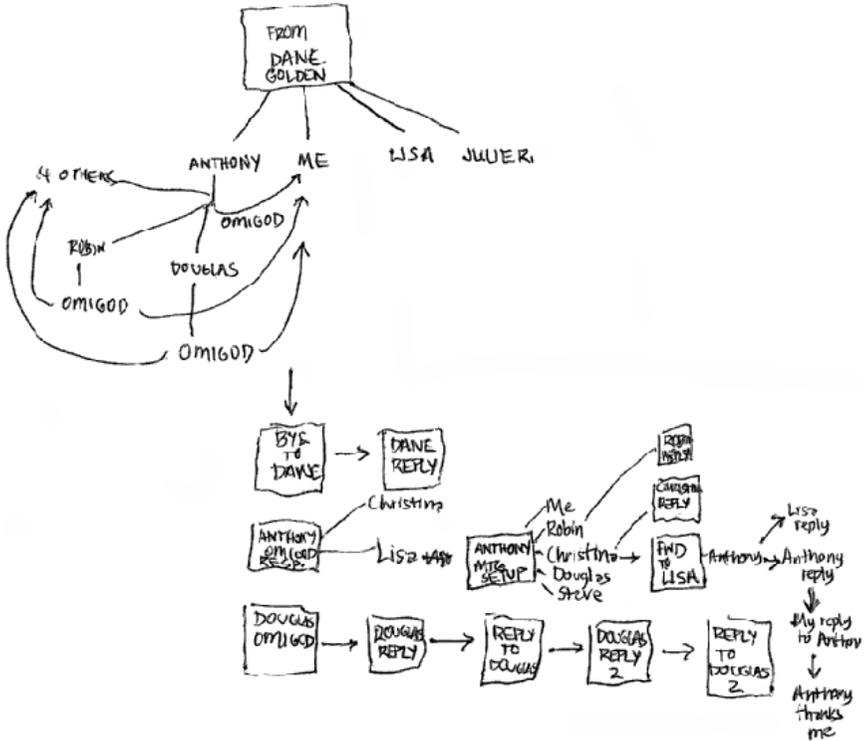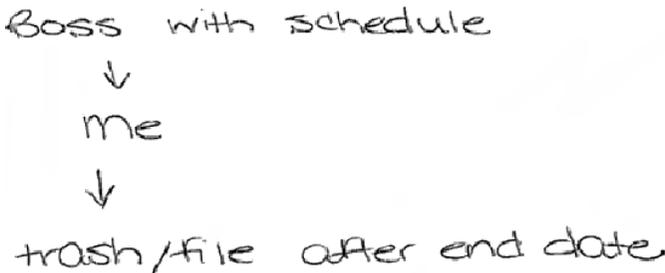

Figure 2. **A simpler conversation sketch.**

representations of things in the real world (such as a photograph). This can get confusing. In fact, a number of important constructs need to be understood in considering how people use this medium to talk about things:

- *Attachment.* We use this term[2] as it is commonly used in the field of computing to refer to any file that is transferred along with an e-mail message. Thirty-nine conversations in our data set (approximately 15%) included at least one attachment. Attachments were easy to identify reliably, because all the e-mail programs used by our participants highlight the presence of an attached file with an icon or text marker that we captured on tape.
- *Object.* We use this term to refer to the thing that is being talked about (e.g., a Web site, a pet, or a photograph). Virtually all of the e-mail conversations we were shown included talk about objects of one sort or another. It is worth pointing out that, in most cases, the object talked about was work-related. It was not necessarily digital, however: People can talk about a Microsoft Word™ document (*digital work object*) or a new sofa for the office (*nondigital work object*).
- *Proxy.* We use this term to refer to any depiction of, or symbolic reference to, an object (e.g., a photograph of a pet is a proxy for that pet; a floor plan is a proxy for a house). Thirty-three conversations (13%) contained at least one proxy.
- *Link.* This refers to a computationally enabled pointer to an object or a proxy for this object, usually in the form of a URL or a shortcut (e.g., "To access your account click on **http://www.bank.com/login**"). Sixty-five (25%) of our conversations contain links.
- *Reference.* This term is used to denote a *noncomputationally enabled pointer* to an object, such as its name, it's location in a file hierarchy, or some description that disambiguates it for those with the appropriate shared grounding. Seventy-eight (30%) of the conversations we collected used references. Some of these references are precise, in that one can access the object referred to by following the reference verbatim (e.g., "the bullet.gif file in the /var/www/html/project/pictures directory of our Web server"); others are imprecise, in that someone not familiar with this work environment would not be able to retrieve the object referred to (e.g., "The files can be downloaded from the usual place").

Having defined some terminology, we now explore this data in more detail, describing how objects are introduced and referred to inside electronic conversations and how electronic conversations can themselves become work objects that are referred to and manipulated.

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2. After we agreed on the meaning of each term by looking at a few examples, we coded the conversations independently. The rate of disagreement in assigned codes was negligible.

3. TALKING ABOUT THINGS IN E-MAIL-MEDIATED WORK CONVERSATIONS

3.1. Referring to Objects in E-mail: A Variety of Mechanisms

References and Common Grounding

Many messages in our data set contain quite imprecise references to objects (26 conversations, or about 10% of our sample, fit this definition). Consider this typical example received by a consultant at LeadDesign:

> From: colleague@LeadDesign.com
> To: consultant@LeadDesign.com
> Subject: Re: ShiningTeeth
>
> Could you get the files on the server?
>
> —colleague[3]

E-mail users do not seem to have trouble interpreting vague references such as this. If we want to understand how they talk about things, it seems important to analyze this phenomenon in more detail. Therefore, we now consider how shared interpretations can evolve and be transmitted over e-mail.

In face-to-face communication, the setting and the objects therein provide a context for the activity of talking. Furthermore, in such settings, gesture and deictic reference are simple resources that provide a way to reference the conversation directly to the objects with which it is concerned (e.g., Tang, 1991). In e-mail, things can be seen as somewhat reversed; the persistent talk provides the context for the solitary activity of viewing the content to which it relates. Compared with face-to-face references to objects, referential text in e-mail might reasonably be expected to have to be more explicit because it is not currently possible to link, by gesture or some technically mediated substitute, the talk to different parts of the object that is being talked about. However, during our interviews, we in fact saw many more examples of imprecise references that were immediately understood than long, drawn-out, explicit, and literal descriptions or references.

Even though e-mail might at first seem to be a poor medium for discussing content, due to its lack of the subtle cues that are available in face-to-face set-

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3. The names in this example, and all others in this article, have been replaced with placeholders to preserve our interviewees' privacy. Also, and unless otherwise specified, the examples included in this article reproduce each message's body in its entirety.

tings (e.g., Daft & Lengel, 1984; Trevino, Lengel, Bodenstein, Gerloff, & Muir, 1990), there is usually enough shared context among collaborators to make overly explicit and heavyweight textual reference unnecessary. In other words, e-mail conversations are grounded in sufficient mutual knowledge (Clark, 1992) to allow very brief, sketchy, and implicit references to succeed without posing significant problems in interpretation.

Indeed, when selecting recent e-mails from their inboxes, our interviewees very rapidly remembered what the conversation they were a part of was about. The following is an e-mail received by a quality engineer at MediaWorld:

> From: designer@MediaWorld.com
> To: quality_engineer@MediaWorld.com
> Subject: T24
>
> Check the T24 logo.
>
> —designer

The quality engineer was immediately able to supply the following missing information:

- What this logo was (the object referred to was not attached).
- Where it was stored (on a shared server).
- Which project it was concerned with.
- What to do after checking the object.

A single, four-word sentence was enough to elicit all of this information from his memory. This is a clear illustration of how shared understanding allows sketchy references to be understood and acted upon.

Clark (1992) noted that mutual knowledge can be classified in a number of ways such as lasting or temporary, generic or particular, and can be deduced by various situational constructions such as membership in a community or co-presence. For the cases that we describe in this article, we note that people are often talking about objects inside the context of their organization or as representatives of their organization to other representatives of other organizations. We see institutions as one of the situational constructions Clark talks about, providing a powerful mechanism through which to establish common understanding. In particular, through policies and job descriptions, institutions limit uncertainty and distribute responsibilities (e.g., March & Simon, 1958; Simon, 1977). This explains why, when people are talking about work objects, sparse references can often be enough and a text-only medium such as e-mail can be appropriate. From

the known role of the message sender (a designer), the quality engineer already knows that he will probably have to deal with a design problem: Roles influence message interpretation (Williams, 1999). Moreover, from company policies (all graphic files for a given project are stored in a "graphics" folder inside a directory named after the project, stored at the root of the main hard disk on a particular server), he knows where to find the file without an explicit pointer to it. In short, talking about things is not done in a vacuum, and common understanding often need not be painfully (re)established over time: It can be prepackaged institutionally.

Beyond institutionally grounded common understanding, shared understanding mutually constituted through discourse over prior encounters can also be found (Clark, 1992). Later in the same conversation described in the previous example, another message was sent by an engineer to the quality engineer:

> From: engineer@MediaWorld.com
> To: quality_engineer@MediaWorld.com
> Subject: Re: T24
>
> Oh my God, they updated!
>
> —engineer
>
> [Note: Quotes from previous messages regarding graphics design omitted.]

Here, an understanding of the object talked about cannot be obtained simply through institutional mechanisms. Through their regular interactions over phone, e-mail, or face-to-face, these two colleagues had developed a specific image of the client company for which they were developing the T24 project. In particular, they knew that their contacts at this company were notoriously slow at taking into account the design changes that were suggested to them. Therefore, they shared a comic perspective on the events when the client responded to new content, hence the humorous "Oh my God, they updated" body. But the anaphoric "they" and the utterly implicit thing talked about (a collection of HTML pages), and their significance for the parties involved (further work on the project can now be accomplished), would only be understood in this specific terse (and humorous) format by someone having participated in previous interactions with these two colleagues.

Consider this other example received by the IT manager at MediaWorld:

> From: employee@MediaWorld.com
> To: it_manager@MediaWorld.com

Subject: Re: around tomorrow?

The file is ready for you to edit.

—employee

[Note: Quotes from previous messages about a management meeting omitted.]

Again, the recipient was able to understand immediately this apparently decontextualized definite reference and knew which work object was being talked about (a list of leased equipment). This reconstruction of missing information is all the more impressive because the subject line does not seem to elucidate the topic of conversation. In the recipient's own words:

> There is a reference to a document, but no link. But it is a document this colleague and I have been working on for a while, and I know exactly where it is. It is the list of leased equipment we are constantly updating.

Here a history of prior interactions provides the necessary grounding to interpret this imprecise reference. Knowing the identity of the sender and the timing of the message is enough to remind the recipient of the different collaborations in progress with this individual, along with their associated work objects and their location.

Of course, it should be obvious that the senders in our examples so far were able to correctly anticipate the amount (or lack) of disambiguation required to make references to objects and processes concerning them clear to recipients. This is part and parcel of the reciprocal nature of mutual knowledge (Clark, 1992).

To summarize, even if e-mail is a text-only medium, this does not seem to force its users to write in a literal, explicit form when they talk about work objects, much to the contrary. This is likely to be due to three reasons:

- In the case of our study, e-mail conversations take place inside an organizational context, and a great deal of the information required to interpret a message is packaged institutionally.
- E-mail is part of a larger ecology of communication media (Nardi & Whittaker, 2001): As such, it can draw on shared understanding developed outside the electronic channel. The e-mail recipient is not a passive receiver of electronic text but an active producer of meaning (Lee, 1994) who combines electronic messages with other sources of information within the organization.
- E-mail is used over time: Consequently, users can draw on a history of past interactions to interpret terse references.

But many previous studies that critiqued the lack of contextualized and redundant information (such as gesture, expression, and shared workspaces) in e-mail and other text-based communication channels (e.g., McCarthy, Miles, & Monk, 1991) failed to take these points into account. Indeed, as Wellman and Gulia (1999) put it, computer-mediated communication (CMC) research is often Manichean, presentist, and parochial, assuming that individuals use the electronic medium exclusively, that this is done in a social or organizational vacuum, and without consideration of one's history of past interactions.

New Forms of Deictic References

The variety of objects that are talked about in the e-mail channel appears to be as broad as in face-to-face encounters. They include documents, Web sites, computers, houses, animals, restaurants, movie theaters, pieces of machinery—the list could go on for a long time. Providing an exhaustive listing of these objects is not the main focus of our article, but the diversity of this list is an interesting aspect of e-mail use. Even if many of the objects talked about are digital in nature, e-mail is still used to talk about things that are not purely digital artifacts.

The interesting point becomes, then, how these nondigital objects can be drawn into the electronic medium when necessary. One specific practice seems to have increased in importance: the systematic use of proxies as a bridge between the nondigital object talked about and the electronic conversation. Remember that we use the term *proxy* to refer to a digital depiction of an object (e.g., a jpeg picture may be a proxy for a pet; an online map pointing at a location may be a proxy for a house—see Section 2.2.). We now illustrate how proxies are used through several empirical examples.

For certain objects, the mechanism of linking gives rise to the possibility of making the object and the finger pointing to it transportable across time and space. Whenever the object talked about is described on the Web, participants in e-mail conversations have developed the practice of linking to these online proxies as a new form of deictic reference. Following is an example:

> From: senior_executive@LeadDesign.com
> To: consultant@LeadDesign.com
> Subject: Re: phones

> In our latest discussion about the new phone system for our office (http://www.pacbell.com/Products_Services/Business/), I mentioned that each of you should get back to me with a list of the features you prefer. Could you please send me your comments by tomorrow?

> —senior_executive

> [Note: Quotes from previous messages omitted.]

Consider also this second example, again from LeadDesign:

> From: friend@external_design_firm.com
> To: consultant@LeadDesign.com
> Subject: New machine
>
> Hey C,
> Last time I told you we were about to get new machines here. I am
> sure you know a lot about this stuff, could you tell me which of these two
> is best: the Apple G4 (http://www.apple.com/powermac/) or a Sun
> Workstation (http://www.sun.com/desktop/)?
>
> —friend

The important point is that, in a significant number of cases, these links do not point to the exact object that is talked about. Instead, online proxies now mediate the interaction between people and objects, and this new layer of abstraction forms the basis for new electronic deictic references (we counted 33 conversations that were analogous in this respect to the ones just described; that is, about 13% of our sample). Participants in e-mail conversations are not pointing at the object, only at one or several online surrogates (proxies and possibly changing versions) that now stand for the original object. In short, finger pointing has been adapted and transferred to the electronic medium. Admittedly, the kinds of precise gestures that disambiguate parts of objects that are talked about in the real world cannot yet be mimicked. But this does not appear to pose problems that outweigh the obvious benefits of being able to remotely talk about an object that cannot be digitally transferred without being next to it.

One well-known problem with linking to electronic objects including proxy objects is that, in certain cases, and increasingly over time, the object pointed to can be changed, without any participant in the conversation being aware of this change. Most readers will have had the experience of following a link in their e-mail, only to find that it is now broken or pointing at something different than intended. Indeed, URLs are symbolic, not hard links. When such a change happens, even if it is rare, the consequences can range from the amusing to the dramatic. However, we did not find any examples of this problem in the sample of 33 messages mentioned previously, suggesting that it is not a highly commonplace occurrence. It is worth mentioning, however, that this problem of a "broken proxy" may very well have been underrepresented in our study sample, due to the fact that the messages investigated were the 10 most recent ones. It could be that proxies decay as a function of time, but we were not able to measure this directly.

We did find an illuminating example of a related problem. A consultant from LeadDesign and one of his clients were working on last minute modifications to a Web site before its official launch. During the exchange, a typo modified the URL pointing to one of the objects the two were talking about. As a result, the link was broken and the two participants had to exchange extraneous e-mails to clarify the misunderstanding. But, as described by our interviewee:

> The big problem here … we usually keep older copies of the things we are working on, you know, just in case. So you would have older versions of stuff lying around in the same directory. And the way we do this, we simply add numbers after the file name. So if my typo had just changed a number for another, this guy [the client] would have been incorporating old, outdated stuff in his design without even knowing about it.

Over time, increasing misunderstandings would probably have made the error apparent, but precious time would have passed: As our interviewee illustrated, the innovative practice of digital finger pointing is not yet without flaws. It is interesting to note at this point that some have been quick to exploit this problem: For instance, **www.whitehouse.com** does not point to the President's residence but to a pornographic Web site (the real site is at **www.whitehouse.gov**). In electronic conversations, this gives rise to the possibility of new forms of misunderstandings when talking about objects.

Quoting and Historicity Around Work Objects

Another practice that users have developed alongside linking is the systematic use of quoting. Interestingly, this probably emerged over time because of the way e-mail clients are configured. Very few users take time to change the default parameters of their e-mail clients, and almost all of these clients now automatically insert a full copy of the initial message when a recipient replies. But users have learned to rely heavily on this historicity of e-mail, especially when they draw new participants into a conversation (for more on this, see Eklundh & MacDonald, 1994).

Consider the following example: A group of researchers at PARC were talking about the purchase of new equipment. Over the course of several conversational turns, they discussed the relative merits of different technological solutions, using links to proxies for the products on the Web (a mechanism we just described). Because the e-mail client predominantly used in the organization (Microsoft Outlook) automatically quotes the previous sender when replying to a message, old messages were progressively appended as the conversation progressed, and no one deleted them. The researchers then decided

to solicit the opinion of another colleague who was not initially included in
the discussion. This was accomplished with this simple message (partially ed-
ited to save space):

> From: researcher1@parc.xerox.com
> To: researcher2@parc.xerox.com, researcher3@parc.xerox.com
> Cc: colleague@parc.xerox.com
> Subject: Re: server
>
> Researcher3, what do you think of this?
>
> >——Original message———-
> >From: researcher2@parc.xerox.com
> >To: researcher1@parc.xerox.com, researcher3@parc.xerox.com
> >Subject: Re: server
>
> >Right, but I really think anything less than 1Ghz won't do.
>
> [several discussion steps omitted]
>
> >>——Original message———
> >>From: researcher1@parc.xerox.com
> >>To: researcher2@parc.xerox.com, researcher3@parc.xerox.com
> >>Subject: server
>
> >>We need a new server to which we could offload some of our com-
> putation-
> >>intensive jobs. I have been exploring several options:
> >>-an IBM (http://www-1.ibm.com/servers/eserver/pseries/640.html)
> >>-a DELL
> >>(Http://www.dell.com/us/en/biz/products/series_pedge_depts_
> servers.htm)
> […]

Here, certain attributes of e-mail make it particularly suited to talking
about objects collaboratively. The most important of them are probably the
historicity and transportability of electronic conversations, coupled with the
use of links. E-mail users have developed interesting practices making use of
these features: They can now provide any conversation participant with both
indirect access to the object talked about (via links to proxies substituting for
the object) and the context surrounding the talk. They can do all of this in a
single conversational move, that is, by forwarding one message or copying
someone. Seventy-five conversations in our sample (about 29%) used quoting
this way, providing newly drawn-in people with a history of past conversa-
tions instead of typing lengthy introductions. Therefore, when an object is be-

ing talked about, the part of the context surrounding it can be accessed and attached to it easily. In this way, e-mail conversations have a distinct advantage over ephemeral face-to-face conversations.

In another attempt at making use of e-mail historicity, some users at MediaWorld tried an interesting workaround: They shared some of their Eudora mailboxes on a public server (Outlook used in association with Exchange provides a public folder facility, which would also support this practice). This way, when someone needed access to information about a particular project, records of previous exchanges were publicly available. This mechanism is crude, however: Eudora mailboxes are monolithic text files, and this makes it hard to select precisely which messages to share, giving rise to potential privacy issues (although these were not mentioned by our interviewees).

We can identify a number of further potential problems for e-mail quoting, which our study shows to be of less practical significance than one might perhaps suspect. Most notably, providing a conversation participant with the history of previous exchanges is not a guarantee of a perfect interpretation. When trails of e-mails are forwarded, contextual information is passed on but, at the same time, new possibilities of misinterpretation arise: information "leaks." As scholars in linguistics, such as Derida (1988), have proposed, it might be that context is infinite, and the notion of a "literal meaning" is problematic. Still, the number of such problems in our interview sample is surprisingly small. Our interviewees never mentioned being quoted out of context or objects being mishandled because their accompanying context was unclear or reinterpreted in a different light (we did not, however, explicitly ask about these issues: further research would be needed to solidify these findings).

It used to be that there were no agreed conventions about whether to include the context or history of prior messages as the conversation proceeds (Whittaker & Sidner, 1996). Instead of getting complete conversational records, participants had to reconstruct past interactions from seemingly random and isolated messages or sometimes even pieces of messages. But with the default option in e-mail clients such as Outlook or Eudora being to systematically include copies of previous messages, this problem seems less prevalent nowadays. Other writers have also remarked that users selectively edit their quotes instead of copying the whole original message into the response (Eklundh & MacDonald, 1994). We saw only a very small number of similar behaviors in our sample.

If there were, in fact, any problems to do with inconsistent and confusing quoting (or omissions), they would surely be compounded by the phenomenon of "topic drift" that we observed. Indeed, e-mail users in this study frequently reused old messages to initiate a new conversation, instead of creating a new thread from scratch. As a consequence, the trail of embedded messages inside an e-mail may not relate at all to the current subject of conversation.

When an object is being talked about, it is therefore possible that the information surrounding it might be completely unrelated. In this case, historicity becomes a hindrance, and one could imagine that this might be the source of a potential loss of time spent deciphering this incoherent background. However, even this did not appear to be problematic for our interviewees.

To summarize, users have turned certain features of e-mail to their advantage, exploiting them to develop innovative ways of talking about objects. Thanks to a new form of electronic deictic reference and the systematic use of quoting, they have made the object talked about and its surrounding context transportable. Coupled with the ease with which people can be reached via e-mail, this ultimately gives rise to the possibility of dynamic, flexible conversations about work objects in which participants can join and leave with little difficulty. Rather than reproducing older genres of communication, e-mail users have progressively developed new forms of writing electronically about distant or digital objects (Yates & Orlikowski, 1992).

3.2. When the Conversation Becomes a Thing in Itself

To conclude this section, we analyze another interesting phenomenon: the evolutionary conversion of a conversation, or how e-mail talk can ultimately become a thing that is talked about. Indeed, some observations of our interviewees' practices indicate that, because of its electronic nature, e-mail can be progressively transformed from a conduit for interaction around objects to being the object of the interaction itself.

For example, at MediaWorld, one e-mail conversation started as a simple question sent to a technical distribution list. The manager of the Information Systems department, who was also on the list, sent a formal request to one of the technicians saying "you take care of it." The technician then contacted the initial sender and arranged a meeting with him. They decided the issue was important enough to warrant further discussion. A set of tentative requirements was therefore sent to the initial distribution list for comment, and it was progressively refined over time. After several iterations, and the progressive addition of a number of "outsiders" to the discussion, these requirements, raised as part of the e-mail talk, began to be talked about themselves as sufficiently important to be transformed into a policy document. Going even further in the transforming process, the technician then gathered all of the past messages exchanged on the list, formatted and edited them in his word processor, and posted the resulting document on the company's intranet.

This example is only an extreme case of an emergent phenomenon in e-mail (particularly with the common application default of comprehensive quoting observed previously) where, in certain circumstances, an electronic conversation can progressively crystallize into an object in itself. In this case,

the initial conversation evolved from a conduit to discuss an employee's request into an object that was talked about, eventually going so far as to be explicitly transformed into an entirely different genre of text. E-mail, like other information artifacts, can play more than one role. And it seems here that the boundaries between these two roles are fluid enough that electronic conversations can be easily transformed into artifacts.

This phenomenon had previously been noticed in the context of newsgroups, where moderators edit the posts of the participants to preserve a group memory in the form of FAQs (frequently asked questions; see, e.g., Whittaker, Terveen, Hill, & Cherny, 1998). Our study shows that a similar process occurs in organizations where e-mail is used and for conversations of a smaller scale than those typically seen in newsgroups. More importantly, it appears that this process is fairly transparent and that it requires neither a sophisticated technical infrastructure nor moderation, nor a large number of participants to be successful (for a discussion of the same issues in the context of Lotus Notes, an example of a more complex infrastructure for preserving organizational memory, see Whittaker, 1996).

4. CHANGING THE WAY WE TALK

Rene Magritte's painting "The Treachery of Images" (more commonly known as "Ceci n'est pas une pipe"; c. 1928–29) highlights the often unappreciated difference between the representation and the object. Our title for this article, "Ceci n'est pas un objet" (French for "This is not an object"), was intended as a pun on that painting, which represented a novel dialectical turn in the history of art and art criticism. Indeed, our article has examined some fascinating aspects of e-mail including the facts that conversations may appear to refer to objects when, in fact, they do not and that the objects being talked about are themselves sometimes simply persistent conversations that have changed their status somehow. Our analysis of e-mail practices has presented the argument that users are fluent e-mail communicators, adept at turning this medium to their evolving needs. The ways in which they do so today are surprisingly nonproblematic in the light of much of the early research literature (e.g., Daft & Lengel, 1984; Trevino et al., 1990), which tended to focus on the shortcomings of e-mail as a communication tool. In the final part of this article we suggest a number of potential design innovations that could capitalize on or better support these practices in relation to talking about objects.

4.1. Binding Conversations and Objects Together

As we have described, e-mail users have come to rely on the historicity of e-mail conversations. Herring (1999) recently argued that "persistent conver-

sation aids the user's cognitive processing.… Users are able to participate in simultaneous multiple interactions without getting hopelessly lost or confused, because there is a typed record to which they can refer to keep track of what is going on" (p. XX). This leads to a "general desiderata for system design. Logging/archiving capabilities should be enhanced, in light of the crucial role played by persistent text in facilitating cognitive processing" (p. XX).

The conversation examples we described in our previous section give further credit to this requirement. Persistence seems to be an attribute of electronic conversations that facilitates talking about objects. It is, however, only supported in limited ways by electronic mail applications. Most users rely on copies of previous messages being progressively appended, as we described earlier, but there could very well be other ways to support e-mail users' reliance on conversational history. As Erickson and Kellogg (2000) suggested, we want to move from today's state, where electronic conversations are of value primarily as they occur, to a situation in which the comments that make up a conversation can serve as a useful work product. Therefore, we propose the following possibilities for improvement.

Attaching Conversations to Objects

Given the importance of e-mail threads in providing useful contextual information about work and work objects, users need to have access to "conversations you can move around." As we explored earlier, e-mail conversations sometimes become objects in themselves. There is also an interesting reversible relation between e-mail conversations and their attachments: The attachment may provide background for the conversation, or the conversation may provide background to the enclosure. To build on this phenomenon, we could technically model e-mail exchanges as objects. This way, they (a) could be attached to other objects, thereby providing the context needed to make sense of them (in a similar vein to the "StickyChats" system described by Churchill, Trevor, Bly, Nelson, & Cubranic, 2000, or the TeleNotes system by Whittaker, Swanson, Kucan, & Sidner, 1997), and (b) could be used as a group resource for accountability and sense making.

In one's personal filing structure for help in retrieving and revisiting context. As we demonstrated in this article, e-mail conversations act as a sort of metadata. By capturing over time the discussions surrounding a work object, e-mail conversations progressively crystallize important contextual elements that, contrary to face-to-face interaction, can later be reused for sense making along the lines described in the literature on representing design argumentation (see Lee & Lai, 1991, for an overview of tools and techniques). But e-mail messages suffer from the same problem as the discursive contributions in ar-

gumentation tools in that they typically remain confined to the boundaries of their particular e-mail reader.

We would like to propose that groups of e-mail messages should be modeled as individual and independent entities. This way, copies of conversations could be stored by a participant with the objects to which they relate. Conversely, objects should also be linked to the conversations that surround them, so that this important contextual information could be accessed easily from anywhere in one's personal filing structure. This contextual information would have the added advantage of being dynamically updated as the conversations surrounding this particular object evolve, as opposed to the user consciously saving one message at a time in the same folder as an object.

At the time of writing this article, it is possible (with Outlook, or Eudora to some extent) to drop proxies representing mail messages in any folder on one's hard drive. This is the next best thing to attaching conversations to objects themselves, but we did not see examples of use of this feature in our studies of e-mail practices. We think, however, that this is more likely due to its being a very little known property of these applications rather than because it is not useful. We predict that we will see more exploitation of capabilities such as this as they evolve with future operating systems and mail applications, as they are discovered, and as their use propagates among e-mail users.

As a shared resource for accountability and intelligibility. It seems to us that another property of e-mail conversations should be that parts or all of them can be shared with others. This desideratum is supported by our observations about the extensive use of quoting and some creative attempts at conversation sharing by copying entire Eudora folders on the network. It is worth noting that newsgroups have offered a similar resource for a long time, and that they can frequently be accessed from the same program one uses to read e-mail. Lotus Notes™ databases have also supported public and restricted access conversations for many years. None of our interviewees used Notes, however, and we did not see examples of people using newsgroups extensively. The latter can probably be easily explained by the fact that most of our study participants would use public conversations a posteriori, that is, for accountability when an activity is over, or "on the fly" during the course of an activity to share only parts of it with others. But newsgroups force all of the conversation to be public, which is not necessarily useful or even needed in many cases. Their low signal-to-noise ratio is also frequently cited as a problem—making conversations public should not result in an overwhelming influx of messages only remotely connected to what one is trying to accomplish in e-mail.

Privacy is another important issue if we were to implement such a facility within one's e-mail: The recipient should at all times be in control of which

conversations (or segments of conversations) are publicly available. But because e-mail conversations capture an important part of the context that makes work objects intelligible, it seems that encouraging the sharing of conversational histories "on the fly" or a posteriori would be helpful when collaboratively talking about things. And as we mentioned previously, conversations that are shared should be linked to the shared objects to which they relate. This would provide a resource for making shared content more intelligible to those who need to use it.

Reliably attaching objects to conversations.   We also described how e-mail users have systematized the use of new electronic deictic references by making an extensive use of links. These links, however, are only symbolic and may not be permanently attached to the resource they are supposedly pointing to. As we outlined, this could lead to problems and misunderstandings, an issue that is not limited to e-mail but also extends to the World Wide Web.

Therefore, it seems that our analysis further emphasizes the need for efforts such as the work the Internet Engineering Task Force (IETF) is conducting on the Uniform Resource Name (URN) scheme. URNs are persistent identifiers for information resources (IETF, 2001). Contrary to URLs, they are hard links, always pointing to the same object. This could help better support some of the practices that e-mail users have developed when talking about work objects.

4.2. Pointing Inside Objects

Although we did not observe any obvious signs of problems being experienced for want of the ability to make deictic references to subcomponents of objects, such as a particular paragraph in a document, it seems likely that such a feature could be a plus for collaborators over e-mail. The lack of mention of any problem with the granularity of pointing may simply have been due to the fact that our informants were not focusing on how things could be better in our interviews. Thus, an e-mail environment with features similar to HTML anchors could be useful, whereby entire e-mail conversations could be linked to points in work objects.

4.3. Version Control

As we illustrated, people exchange many digital work objects via e-mail. It has now become so easy to attach such resources to messages that, as a consequence, it is quite frequent for e-mail users to end up with duplicates

of these objects attached to their messages. Therefore, it seems that some form of version control would be a worthwhile addition to e-mail clients or servers. This way e-mail users would be sure that the object they access, no matter which message they use as their starting point, is really the most up-to-date version.

5. CONCLUSIONS

Despite a huge body of literature about e-mail use, our study shows that e-mail users are constantly developing innovative practices around this medium. So it is clear that we need to go "beyond being there" when thinking about computer-mediated communication (Hollan & Stornetta, 1992). Our observations suggest that e-mail has many powerful and unique properties for managing communication about work objects that are much more than just a poor simulation of what is possible in face-to-face communication. Furthermore, we have seen that e-mail is both the product of, as well as a powerful medium for, human action. This belief in the multidirectional nature of technology has become more prevalent in the past decade, as scholars such as Orlikowski (1992), Orlikowski and Robey (1991), and DeSanctis and Poole (1994) have started to construct a theoretical framework that builds on and extends the central tenets of Giddens' (1984) structuration thesis. Our own case study of the ways in which people talk about objects in the e-mail channel seems to reinforce the validity of such an approach.

Instead of being constrained by a set of technical limitations (e.g., e-mail is text-only and the participants in a discourse are not co-located), e-mail users have progressively evolved new forms of deictic references and taken full advantage of the fluid boundaries between the different roles that e-mail can assume. Instead of being painfully explicit and literal in their electronic conversations, e-mail users draw on the persistence of the medium to collaborate across time and space, allowing conversations into which people can be drawn very fluidly. Progressively transformed into a habitat, e-mail has also become a powerful way in which to organize one's work and rapidly access work objects rather than a poor textual envelope for things better discussed face-to-face.

Drawing on our observations of users' practices, we have suggested several ways in which we could better exploit certain properties of this electronic medium on which users have come to rely so heavily. Only by looking at users' practices, and trying to leave some of our a priori conceptions about human interaction at the door, will we be able to design tools that draw on and respect the always surprising richness with which computer users adapt technological tools to their own ends.

NOTES

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