

Designing to Support *Adversarial Collaboration*

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ABSTRACT

We investigate the phenomenon of *adversarial collaboration*, through field studies of a legal firm. Adversarial collaboration requires that people with opposing goals come to agreement, usually producing a shared product that reflects the interests of the adversarial parties. Adversarial collaboration is characterized by secrecy, advocacy and discovery. To support this activity, software should provide flexible, selective sharing of awareness and access. These requirements contrast with conventional shared resource and awareness systems, which tend to assume *cooperative collaboration*, characterized by open processes and static membership lists. We illustrate these ideas in a redesign of our PeopleFlow research prototype.

Keywords

Design, adversarial collaboration, cooperative collaboration, collaborative writing, collaborative editing, documents, lawyers, privacy, secrecy.

INTRODUCTION

Early research into collaborative document construction explored individual cognitive processes in writing, specifically the relationship between the planning process and the composing process [13], and the differences between expert and novice writers [23]. Subsequent investigations described how co-authors subdivide the document construction process [2,3,22,29] and bring independently created sections of a long document together.

More recently, ethnographic studies have investigated a variety of writing, editing and document coding processes. For example, Blomberg, Suchman, and Trigg, [4] described the “practice of document retrieval and re-use in corporate law and database production activity in litigation.” Finally, technologies have been developed to support collaborations about the writing process, such as awareness of a collaborator’s activities and roles [12, 21], monitoring the states of documents [14], and co-authoring documents [1,16,25].

In our research, we have focused on the ways that people interact with one another, with tools, and with the different stages of the document -- its emerging representation -- as they work together, [6,7,8]. We studied the opportunistic and largely ad hoc planning process that domain experts often use to plan the immediate next steps of a shared project – but not the entire course of the project. We also uncovered needs for several distinct styles of collaborative document creation, with important implications for flexibility in the design of collaborative writing environments.

The result of our efforts was the design of a new tool set to help people write and edit a document collaboratively, while their awareness of each other and their access to other documents was simultaneously supported at the periphery of the workspace. The tool set, PeopleFlow, is described in more detail later in this paper.

There is a bias in the research summarized above, including our own. The bias is the assumption that collaborators want to share information with each other as broadly as possible, and that they are generally working together to achieve a common goal. More broadly, the previous work has assumed that the collaboration is *cooperative* [2,3,22,29]. Other research described the effects of power relations on the editing process and on the final form of the document, and explored how stakeholders acted as advocates for a broader constituency [11,20,24]. While other researchers have discussed adversaries working together (e.g. [17]), we pursue the notion of *adversarial collaboration*: that is, situations in which the co-authors of a document have widely divergent goals yet must collaborate in order to co-author a document. Opening this research area has caused us to make substantial revisions to our PeopleFlow design.

This paper explores commonalities and differences between cooperative collaboration and adversarial collaboration. We summarize our previous research on cooperative collaboration, including our earlier designs for PeopleFlow software. We then present new research on adversarial collaboration, culminating in a new design for PeopleFlow.

COOPERATIVE COLLABORATION CASE STUDY

When we began our own empirical investigations into collaborative writing, much of our data echoed that of our predecessors. We had selected a legal group as our subjects, feeling that the legal domain would be a particularly rich setting for studying the complexity of document creation and editing. Legal practice involves winning lawsuits and settling cases. Generally the practice

revolves around gaining the best possible outcome for one's client. The document is the major tangible product of the knowledge work of legal professionals (and paraprofessionals). In this setting, documents are not merely instrumental in supporting or guiding some other behavior. Documents are, instead, a lawyer's ultimate "deliverables."

Analysts and developers of collaborative writing software have approached the collaborative construction of documents focusing on work *done on the document itself*. They postulate actions such as editing, accepting and rejecting changes, annotating, passing the document among collaborators, and version control. These are the actions that are typically supported by standard word-processing, document management and groupware applications. We observed most of these behaviors in the course of our study, and asked questions about issues such as how this set of professionals handled changes to the document's content, structure or organization, how new participants were added to the process as reviewers or content experts, and so on.

Activities around Documents

However, following a sequence of behaviors – from an initial document draft through the harmonizing of ideas and contributions of different collaborators during the editing process through the final official "signing off" on a final legal brief – we noticed a number of intriguing and previously neglected phenomena:

Ad hoc Planning

First, the team of people working on a document, the constellation of tools at their disposal, and the information they brought together from different sorts of texts, (such as templates and newly drafted materials), conversations and references were all *emergent*. There was no way to specify everyone who would be involved in a document-construction process at the beginning of the project. In fact, the membership of the team often changed over the course of lengthy legal battle.

The lawyers we observed continually refined their model of who needed to be involved in ongoing projects. These models depended on the stage of the document, the particular kind of argument they were making, and timing as deadlines neared. We found that authors who were co-located knew with whom they needed to collaborate, how to stay in contact with these people, and how to keep track of who had seen which version of an emerging document. These are representations about both the relationships among the people who need to be involved and the shape of the final document.

Multiple Roles for Cover Letters

The tools we use shape the way we act, but also "reflect the experience of other people who tried to solve similar problems before and invented/modified the tools to make them more efficient and useful" [13] Lawyers learn to use simple artifacts, such as cover letters for their memos, to monitor their own and their group's progress on the

construction of documents. In general, cover letters are used to inform receiver of the contents of a package. In this case, however, the lawyers used the cover letter as a tracking mechanism to determine the status of the last version of a document, when it was sent out, and who had received it.

Open Sharing

Finally, we found that colleagues working on one side of a case shared documents openly. It was assumed that any lawyer on the case had access to any document. Further, when the lawyers were working in the same office (which was a considerable portion of time), it was acceptable and appropriate for one lawyer to be aware of what his or her colleague was doing; and they regularly wandered into one another's offices to pose questions. Strategically concealing one's awareness or access to documents was not observed.

The PeopleFlow Project

As part of our inquiry into document-based collaboration, we developed PeopleFlow, a research prototype to test our ideas about enhanced support for collaboration [6,7,8].

Co-located collaborators already make use of informal awareness, planning, history monitoring, and synchronous and asynchronous collaboration, but do not have adequate integrated software to support these activities. Distributed collaborators have trouble with simple issues like getting access to a document and knowing who is available to consult at any given time, let alone being able to collaborate flexibly while co-constructing documents.

Day explains the importance of awareness of others as follows: "In a network, people and systems may be available or unavailable, and may want to expose a variety of descriptive information or contact addresses (telephone number(s); mood; quote of the day; email address; and the like). We refer to this information as *presence information*." [9]. In PeopleFlow, we expand this concept to include both information about persons and information about documents or document access. Here we mean shared access to a common set of documents plus additional information about the state of those documents.

Our goal in the Peopleflow project has been to understand how to enhance co-located collaborations and to extend collaboration on documents to distributed teams. Our findings suggested a significant departure from traditional groupware: Software support should enable an author to focus on the document itself, working within that application, while collaborating with others through awareness tools that are easily accessible at the periphery.

PEOPLEFLOW SCENARIO

In what follows we present a few slides from a design scenario created as a result of our observations. The scenario was created to mirror as closely as possible the processes observed, and facilitate the design of interactive tools to support remote collaboration on documents.

For reasons of confidentiality, many facts of this case have been disguised or omitted.

Peopleflow Scenario: The Setting

The story is about a law firm that uses PeopleFlow. The firm is representing Western Foods, a restaurant company that is being sued by Ronald Blake. Blake claims that he slipped and fell in the parking lot outside one of the company's restaurants at night because the lighting in the parking lot was inadequate.

People

- Brian Sanders, an attorney in the firm. Brian is our main protagonist; we see his screen throughout the scenario.
- Rachel Morrow, a senior partner in the firm.
- Liz Kendra, a research associate.
- Ron Curtis, another attorney at the firm, not represented in this version of the scenario.

These four people comprise the team working on the "Blake Matter"

The Scenario

Brian returns to his office and checks the PeopleFlow projects panel on his screen (see figure 1). This panel shows the status of the three main projects on which he is currently working. He clicks on the Blake Matter bar to open that project (See figure 2). Two panels appear. One panel shows the documents involved in the project, including (right to left) the initial lawsuit, some research into precedents, a settlement offer document, and the firm's response to the court which includes a request for summary judgment. In this panel, he can see text below two of the documents indicating Liz Kendra is currently working on the precedents, and that the settlement offer has been modified since he last saw it. The other panel lists the four people involved in the "Blake Matter" team. The filled boxes show that three of them are currently online, though only Liz is currently working on this project. Text near Liz Kendra's name indicates that she is currently reading the precedents document.

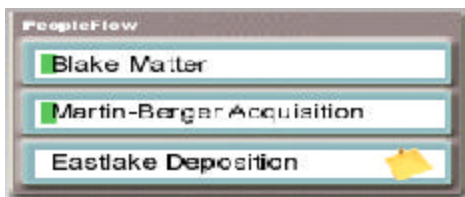


Figure 1: PeopleFlow project, document and people bars



Figure 2: PeopleFlow project, document and people bars

Brian wants to work on the summary judgment request, so he clicks on the document marked "Response" to open it. The document appears. (See figure 3). Note that Brian's name now appears under the document's icon, and that the text near Brian's name has changed to "Editing Response doc."



Figure 3: Brian reviewing the response document

While Brian is working on the summary judgement request, Liz Kendra calls him and asks him to look at the precedent document. He reads through it and sees that the facts in this case are almost identical to those in the Blake Matter, and this case was thrown out on appeal. This is very good news. The precedent Liz found strengthens the case Brian is making. Brian needs to let Rachel Morrow, who is handling the settlement talks, about the precedent that Liz found. He wants to do this fast, before they go back with another offer. He sees that she is online (see filled square next to her name in figure 2), so he clicks on Rachel Morrow's name to chat with her (for brevity, figure not shown). A chat window appears. The chat ensues about the precedent.

Brian has to leave for court in a few minutes. He wants Liz Kendra to add the precedent she just found into the document on which he is working. He sees that Liz is still online, probably in her office. Knowing she likes to use the phone rather than chat, he calls her. While they are talking, he wants to show her exactly where to add the precedent. He clicks on Liz Kendra's name in the people list and shares the document so that he can lead her through it. (See figure 4)

A share bar appears at the bottom of the document. A special cursor appears, showing Brian's cursor position as he leads Liz. Liz sees everything we see as Brian clicks on the scroll-down arrow to show Liz where the new precedent should go. Liz promises to add the precedent at this point.



Figure 4: Brian, seeing Liz is online, calls, shares and edits the document with her.

Implementation

Most of these features have been implemented in our Peopleflow prototype and currently being field-tested in our research group.

Summary: Cooperative Collaboration

This scenario presents the details of the Peopleflow software in the context of a group of in-house lawyers. These coworkers make no explicit attempt to conceal information or hide awareness of each other's behaviors and availability as to pertained to the case they had in common.

However, as our study progressed, it became clear that we needed to expand our purview from lawyers and paralegals on one side of a complaint to include the adversarial relationship between opposing counsel. We had identified *adversarial collaboration*: peers who are adversaries having opposing goals, but who nonetheless have to collaborate to complete legal settlements or contractual agreements.

COLLEAGUES, STAKEHOLDERS & ADVERSARIES From Colleagues to Stakeholders

There has been little discussion about adversarial collaboration in the literature. Clement and Wagner provided theoretical arguments in favor of separate and discontinuous information spaces [5]; one of us pursued this concept as a potentially valuable research topic in HCI [19]. Matusov [17] discussed lawyers as adversaries, but in the context of the rhetoric between a public defender and prosecutor involved in a trial, not writing a settlement agreement. Some researchers have taken a step beyond the cooperative model, to models in which collaborators are

seen as stakeholders and in some cases, competitors [11,18,20,24]. Informed by organizational development theory, this trend has helped to refine notion of how people work together on developing documents collaboratively, in terms of the division of labor associated with document creation and revision (such as the distinctions between primary authors and reviewers), power relations that address how each stakeholder represents and advocates for a broader constituency, and how the document becomes an arena for articulating, challenging and balancing divergent or competing claims, viewpoints or representations.

R. and J. Newman addressed some of the effects these power relations may have on the final form of the document when they described situations in which there was “pressure for the concealment of early drafts so that the text would not become available to other departments until political issues [were] settled” [20]. They went on to note that “where decisions are prepared through extensive sifting and reporting of information, the writing process may to a large extent determine the eventual decision by what it makes available and by what it conceals.”

This is a key point and reflects Susan Leigh Starr’s concept that a draft in process acts as a boundary object [26] — in this case a “resting ground” for ideas in a negotiation — and instantiates the different *stages of the development* of the document. By looking back over a series of drafts, one can map the progress — or lack of progress — towards closure. More importantly, each stage constrains the next stage of revision and creates a new context in which a conversation about the contents and form of the document can take place.

ADVERSARIAL COLLABORATION

In the corporate legal setting, the negotiating attorneys must maintain a professional working relationship with opposing counsel, their adversaries: in general, lawyers’ practice assumes that this process leads to the best possible settlement for the client. The lawyer-to-lawyer relationship has to be sustained over time, in the face of conflict. Moreover, it is the job of the attorneys to help the opposing side reach closure. This means the parties have a shared interest in the document even when the goals are strongly opposed. Such adversarial collaboration may partake of many of the document management behaviors that are found among congenial colleagues. However, we have found that adversaries overlay a new set of actions on the document creation process. These actions involve:

- **Secrecy** -- they do not want to reveal everything to the other side and everything they do reveal is intentional
- **Advocacy** -- they to push their own position as far as possible
- **Discovery** -- strategic revelation of partial information

In adversarial collaboration, both sides rely on the strategic manipulation of awareness of the existence and availability of information, including documents, people, and

processes. Their ability to control access to these resources by selection is one key to their success.

Adversaries, unlike colleagues, actively attempt to curtail the propagation of the complete representation to the other side. They may, in fact, have one representation instantiated in the document and withhold another, fuller story. Attorneys must make deliberate, strategic decisions about what to share with adversaries — and when to do so.

Understanding adversarial collaborations will have important implications for design. To show how this behavior is played out, we review a single legal case from beginning to end. We present a scenario of a redesigned version of Peopleflow based on the case. For the purposes of this paper, we have chosen a case where the goals of the principals are completely polarized.

ADVERSARIAL COLLABORATION CASE STUDY

For reasons of confidentiality, selected facts of this case have been disguised and omitted. However, the sequence around the exchange of documents and the level of awareness among the parties has been retained.

The setting

The case study occurs in the legal office of Masonic Outfitters, a firm that manufactures and provides specialized thermal instrumentation to a wide variety of manufacturers.

Masonic Outfitters has been threatened with litigation by Roberts Appliances. Roberts Appliances says that its business was irreparably harmed when it missed an important ship date with a valued customer. This happened because Masonic Outfitters did not provide it with the quantity of thermal components its contract specified. Roberts Appliances further alleges that when it finally did receive the late shipment, the original purchase order had been deliberately changed so that it would look like Masonic had actually provided Roberts Appliances with the correct quantity.

The formal initiation of the case is triggered when Cathy Simpson, one of Masonic Outfitters' senior attorneys, receives a letter from Martin Welton telling her that he has been retained by Roberts Appliances to look into the matter.

People:

The Masonic Outfitters team

- Cathy Simpson, Masonic Outfitters' senior staff attorney
- Marilyn Masarelli, a law student acting as Cathy's research assistant
- Jason Alter, a junior attorney in the firm who is also working in the case

These three people comprise the team working on the "Roberts Matter"

The Roberts Appliances team

- Tom Roberts, the CEO of Roberts Appliances, the client

- Martin Welton, an attorney retained by Roberts Appliances, which does not have in-house counsel
- Jane Eldona, Martin's office assistant

The Discovery Phase

To support their lawsuit, Martin asks Cathy to send him a copy of the original Roberts Appliances purchase order. He writes:

"As a courtesy, however, I have reconfirmed my understanding that certain purchase order files were apparently stored in both Masonic Outfitters' inventory and accounts receivable databases. The purchase orders are coded under RobApp.doc ...fortunately, Masonic Outfitters' practice was to routinely back up files and retain them for one year after ship dates."

Presumably, Martin has found out the name and location of these files from Roberts Appliances, which was using Masonic as a vendor for many years before this incident.

Martin's not-so-subtle pointer is apparently intended to head off any possibility that Cathy's team will argue that they cannot locate the document. In a post-hoc interview Marilyn, the law student who assisted Cathy on the case, explained

"It could be that we wouldn't maybe even know where it was, wouldn't even know it was out there, and he was saying go get it. That's another spin. But why would he say don't try to hide it? (laughter) Well, that's the two [options]. Directing us to it so we can get there ASAP [as soon as possible.]"

Cathy explains to the researchers that the selective sharing of documents is a common "game" played in the early stages of discovery in a threatened litigation. Before a suit has actually been filed, there is no legal requirement that all pertinent documents be disclosed.

"If it's a [threatened] lawsuit and there's discovery and you feel there's a valid discovery request and there's no viable exception that we can come up with [laughter]...and they [the adversaries] do the same thing [if there are] no viable exception that they can come up with [...] Actually it's a very good thing that there are exceptions but unfortunately, that's distorted by both sides. You should have exceptions...we share it if we feel we have to." [emphasis ours]

This is the first clue about the possibility that there will be strategic restriction of access to information. Martin knows that unless he can give a precise definition of what document his side is looking for and where it might be, the document may not be provided. It is possible that Cathy and Marilyn may know about the document they are looking for, have that document in their file system but specifically choose not to share it, or even let Martin know of its existence. While Cathy and Marilyn might freely share the information about the document among

themselves and members of their team, their goal is to not share it with Martin.

Cathy begins to do her own research. She gives the initiating letter to Marilyn, who contacts some people who may have information that will be valuable in constructing their case. Information that might be useful to Martin and Roberts Appliances' case is moved from a database that is accessible to a broad range of people to one that has more security and a more controlled readership.

In the meantime, Marilyn begins to interview the purchasing clerks, inventory specialists, quality managers and shipping people associated with the Roberts Appliances account. The memos she writes to Cathy are marked confidential. When she has some information to share, she stops by Cathy's office to discuss it. All of this information gathered during the discovery process is available to Cathy and Marilyn; if there were other attorneys or paralegals working on their side of the case, it would be shared openly with them as well.

Cathy does not share any of the information she is gathering to build her side's case with her adversary. As she explains,

"I want them to know less than nothing. Everything I share [with the other side] is intentional."

A few weeks later, Cathy's team receives a letter by fax from Martin. He notes that they have been playing "telephone tag" but wants to update her on his progress on the case.

Martin writes that one of the documents he wants to review was sent on March 23. He argues that this document confirms that facts do, indeed, support Roberts Appliances' contention that Masonic changed the quantity listed in the purchase order.

The Settlement

Another month goes by, during which Cathy and Martin have a number of conversations over the phone. They decide to settle the case. Martin drafts the first version of the settlement document, faxing it to Cathy. His cover letter refers to a telephone conversation that they have had. He notes that he has included certain clauses she specifically requested. Cathy marks up her own copy with changes she will require in the settlement document. She then faxes that version with her annotations to Martin's office so that his assistant, Jane, can generate a new version.

Over a three-day period, the drafts of the final settlement document are progressively edited -- new clauses are added, others deleted. Martin "helps" to clarify a number of issues and track changes being requested by referring to them specifically in the cover fax cover letters written by himself or by Jane. Cathy explains

"It's very asynchronous...towards the end in a settlement [the adversaries conduct] a lot of negotiation ... on the phone and have it crystallized and say is this okay. Then

you take the red pencils out and there's another round of fights."

The researchers ask:

Q: *How do you know someone's going to get back to you?*

A: *They usually call. They either say they'll send it back this afternoon, because they don't want [confidential legal information] sitting on the fax machine.*

At this stage, contact between the opposing attorneys increased in both frequency and intensity. The lawyers control their interactions by screening calls, using caller ID, or having their administrative assistants act as gatekeepers. Generally the choice to accept or refuse a call from opposing counsel is intentional. This is in direct contrast to our observations of the ways Cathy and Marilyn casually glanced or wandered into each other's offices.

Finally, a final version is drafted and reviewed. The agreed-upon documents are signed by Tom Roberts, the CEO of Roberts Appliances and by Cathy's boss, the head of the corporate legal department. These are sent to the attorneys' offices by fax, and soon after, official hardcopy "record copies" of the settlement are submitted to the adversaries on both sides and filed with the court.

This limited case study illustrates the ways lawyers control access to information and awareness of people and documents while engaged with their adversaries. Below, we present a design scenario based on our above observations. This scenario highlights the differences we observed between cooperative and adversarial collaboration, specifically: that cooperative collaborators *share* access and awareness and that adversaries strategically *limit* access and awareness. We introduce the interface associated with a potential redesign of the PeopleFlow software tools. We retell aspects of the case above as a scenario that shows how adversarial collaborators might work together if these software tools were at their disposal. PeopleFlow has a number of design and architectural dimensions (for a fuller discussion see [6,7,8]). Below, we demonstrate some of these design implications through a scenario that replays the interactions between the adversaries working on the "Roberts" case.

DESIGN SCENARIO

We will replay a section of the case discussed above from the point of view of the two adversaries. In the actual case study, the only technologies used to support communication with opposing counsel were phone, fax and express mail. (These two attorneys did not send email to each other, although the "Masonic Outfitters" team used email among themselves.) However, for the purposes of illustrating the design issues surrounding differential access and awareness we will retell the story as if all of the participants were using PeopleFlow during the discovery phase of the case and while they co-authored the settlement agreement.

We begin our scenario at the point where Marilyn, the law student working with Cathy, has completed her background interviews with the people associated with the Roberts Appliance case. Cathy and Martin, the opposing counsel, have decided to create a common PeopleFlow space to help them work more efficiently.

Cathy logs onto her computer and opens the PeopleFlow project bar and selects the Roberts case. She sees two toolbars, one for document access and the other for people awareness. (See figure 5)

She sees her three highest priority projects or cases, and the Roberts' case. She needs to review the letter Martin sent her initiating the Roberts case to determine if she needs to release any documents.

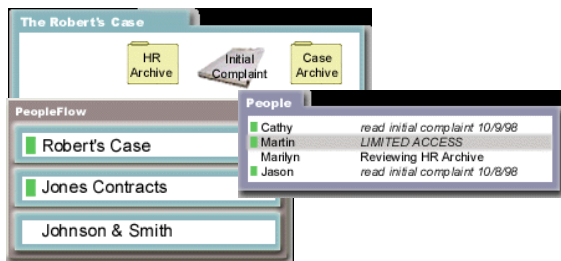


Figure 5: Cathy's Project, Document and People awareness bars

On her document bar Cathy can see, from right to left, some old but relevant cases from which she plans to pull out references and language to use as a template in her responses and/or settlement, should it get that far. She also sees Martin's initial complaint, and a group of accounts payable documents and inventory records, including some of the ones in question. On the people bar, notice that she has limited access only to Martin, opposing counsel

Cathy double clicks on Martin's initial letter (which goes into a shared file system and opens up the document) to review his client's claim (see figure 6).

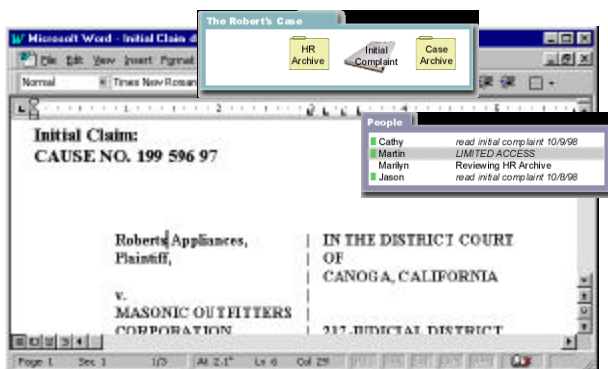


Figure 6: On Cathy's computer: Martin's initial letter along with the document and people bars

On her people awareness bar, Cathy can see four people: herself, Marilyn, Jason, and the opposing counsel, Martin. Cathy can see that Martin has "Limited Awareness and Document Access." This means that Cathy can see if

Martin is online, but cannot see what documents he is working on.

The next day, Martin logs onto his Peopleflow project bar, and sees three projects, including the Roberts case. He also wants to do some work on the case. He selects that project and his project-specific document and people bars appear (see figure 7). Even though he and Cathy are using a common system, he sees different documents and people than she does.

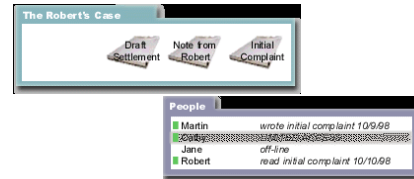


Figure 7, Martin's document and people bars.

Martin sees the same initial claim letter he sent to Cathy, but additionally, he sees the initial draft settlement based on a conversation he has had with Tom Roberts, Roberts Appliances' CEO. He has not yet shared this draft with Cathy or anyone else at Masonic Outfitters.

On his people bar, Martin can see himself, Cathy, Jane, his assistant, and Robert.

Martin wants to share his initial settlement with Cathy to "feel out" whether Masonic Outfitters might be willing to settle the claim. Looking at the People Bar, he sees that she is online. He calls her on the phone, and asks her if she is available to talk about the document. She is, but Cathy wants to see the actual wording of the draft document. She asks him to share the document with her. He agrees, but does not want to give her editing access, and he shares the document with her in a read-only format (see figure 9).

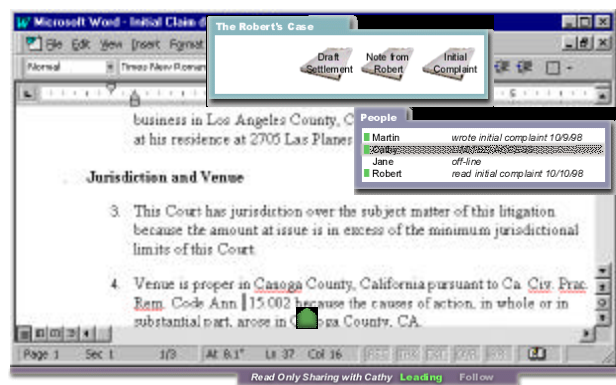


Figure 9: Martin sharing the document in read only format with Cathy – in read only mode editing control can not be passed off to Cathy.

Martin and Cathy continue their phone conversation while looking at the same document. Martin walks her through the settlement and its terms. Cathy says she would like to look over the document, and asks if Martin could give her

editing access to it. Martin agrees, they end the sharing session and a few seconds later, the document shows up in Cathy's Peopleflow document bar (see figure 10.)



Figure 10: Cathy's document and people awareness bar: She now has access to the draft settlement document.

Cathy also indicates that she is out of town tomorrow and that her assistant, Marilyn, is the person he should contact with questions about the Roberts case that day. She asks Martin if he would like to have access to Marilyn on his People bar so that he will know whether she is available. Martin says yes, and his PeopleFlow bar updates as Cathy gives Robert selective and limited time duration access to Marilyn for the following day (see figure 11).

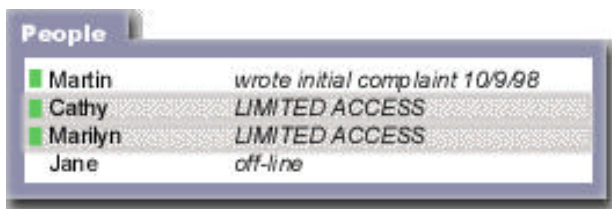


Figure 11: Martin now has awareness of Marilyn, Cathy's assistant.

SUMMARY

A number of software products offer web-based shared information spaces – for example, Lotus Development Corporation's Quickplace, Instinctive Technology Inc.'s eRoom and Involv Corp.'s Involv. It is possible to control access to documents in any of these products. However, the designs of these products are fundamentally static, and do not recognize that users may need to share documents selectively and on an ad hoc basis. Similarly, awareness products monitor the on-line availability of people and resources – for example, AOL's Instant messenger and Zephyrs. These products provide the capability to “not be available” to a particular group of people. However, the design reflects a static list. Availability settings are left in place over a long period of time. Creators of these software packages understand only part of the story. As anticipated five years ago in the critique by Clement and Wagner [5], product designers have foreseen the need for groups of people to come together and collaborate, but they have not foreseen the need to do so in a way that controls membership and visibility while maintaining flexibility.

PeopleFlow tools allow members of a particular group to know whether their colleagues are on-line, determine the status of those colleagues status (for example, indicating whether their connection is currently active or inactive),

alert them to personal messages, and initiate chats. We would like to distribute only as much information as is really needed, rather than requiring a “virtual meeting” of the entire organization simply to distribute awareness information. As a result of the study reported here, PeopleFlow has been redesigned to allow users to set up a shared file system within cooperative groups and across adversarial groups, where access to documents and awareness of people can be allowed on an ad hoc, selective basis. Taking into consideration these design considerations in PeopleFlow, it is possible for users to manipulate the settings strategically and on an ongoing basis.

Adversarial collaborations are the sine qua non of situations that call for the *selective dissemination of information*. However, tools for the selective dissemination of information are not limited to use by adversaries. They would be potentially valuable in sensitive contract negotiations, between editors and authors or whenever workers want to be available to some co-workers and not others.

The design exercise presented in this paper has allowed us to make changes to Peopleflow to better match the ways people work, specifically supporting the strategic control of access and awareness. In adversarial, and even less-overtly antagonistic relationships, access control lists and selective availability are not secondary tools, they are critically important. We suspect that the more and more we look at inter-organizational collaboration, the more important these dimensions will become.

REFERENCES

1. Baecker, R.M. Glass, G. Mitchell, A., and Posner, I.R. “SASSE: The Collaborative Editor” refereed videotape presented at the 1994 ACM Conference on Human Factors in Computing Systems, May 1994. Also published in the *SIGGRAPH Video Review*, 1994.
2. Beck, E.E. “A survey of experiences of collaborative writing” in M. Sharples (ed.) *Computer Supported Collaborative Writing*, Springer-Verlag, London 1993
3. Beck, E.E. “Changing documents, documenting changes” in S.L. Star (ed.) *The Cultures of Computing Blackwell Publishers*, Cambridge, MA USA 1995
4. Blomberg, J., Suchman L., Trigg, R. “Reflections on a work-oriented design project” *Proceedings of PDC'94* (Chapel Hill NC USA October 1994) Computer Professionals for Social Responsibility, www.cpsr.org.
5. Clement, A., and Wagner, I. Fragmented exchange: Disarticulation and the need for regionalized communication spaces. In *Proceedings of ECSCW'95*. Stockholm: Kluwer, 33-49, 1995.
6. Cohen, A.L., and Cash D., “The role of representation in cooperative writing: An ethnography of co-authoring in the legal profession” *LOTUS CODE #*

- 1998.03. Available from the first author at alcohen@lotus.com.
7. Cohen, A.L., Cash, D., Muller, M.J. and Culbertson, C., "Writing apart and designing together" *CHI 99 Extended Abstracts* (Pittsburgh PA USA, March 1999) ACM Press.
 8. Cohen, A.L., Cash, D. and Muller, M. J. "Awareness, planning and joint attention in collaborative writing: From fieldwork to design" *LOTUS CODE # 1999.02*. Available from the first author at alcohen@lotus.com.
 9. Day, M. Scaling and selectivity: From NSTP to SGAP. *ACM SIGOPS European Workshop on Operating Systems*, 1998.
 10. C.A. DellaFera and M.W. Eichin. "The Zephyr notification service." *Proceedings of the USENIX Winter Conference*, Dallas TX USA: USENIX Association, 1988
 11. Doheny-Farina, S., "Writing in an emerging organization" *Written Communication* 3(2), April 1986
 12. Dourish, P., and Bellotti, V. "Awareness and coordination in shared workspaces" *Proceedings of CSCW 92* (Toronto, November 1992) ACM Press
 13. Flower, L. and Hayes, J.R., "A Cognitive Process Theory of Writing." In *College Composition and Communication*, 32, 1981
 14. Kaptelinin, V., Nardi, B. and Macaulay, C. The Activity Checklist: A Tool for Representing the "Space" of Context. *interactions* magazine, July, 1999.
 15. Kirby, A. and Rodden, T. "Contact: Support for distributed cooperative writing" in *Proceedings of ECSCW'95*. Stockholm: Kluwer.
 16. Leland, M., Fish, R., and Kraut, R. "Collaborative Document Production Using Quilt" *Proceedings of CSCW 88* (Portland, September 1988)
 17. Matusov, E. (1993). Intersubjectivity without agreement. *Mind, Culture, Activity: An International Journal*.
 18. McMaster, T., Jones, M.C., Wood-Harper, T., "Designing stakeholder expectations in the implementation of new technology: Can we ever learn our lesson?" In Kyng, M. and Mathiassen, L. *Computers and design in context*, MIT Press, Cambridge, 1997
 19. Muller, M.J., Wharton, C., Laux, L., and McIver, W. Jr. Toward an HCI research and practice agenda based on human needs and social responsibility. In *Proceedings of CHI 97*. Atlanta GA: ACM, 1997.
 20. Newman, R., and Newman, J., "Social writing: premises and practices in computerized contexts" in M. (Ed.) *Computer-Supported Collaborative Writing* Springer-Verlag 1993
 21. Palfreyman, K. and Rodden, T. "A protocol for user awareness on the World Wide Web" *Proceedings of CSCW 96*, Boston November 1996, ACM Press
 22. Posner, I.R. and Baecker, R.M. "How people write together" in *Proceedings of the Twenty-fifth Annual Hawaii International Conference on System Sciences*, 1992.
 23. Scardamalia, M. and Bereiter, C. "Research on written composition" in M.C. Wittrock (ed.) *Third handbook of research in teaching* MacMillan, New York 1986.
 24. Selfe, C.L., "Computer-based conversations and the changing nature of collaboration" in J. Forman (Ed.), *New visions of collaborative writing*, Boynton/Cook Publishers, Portsmouth, NH 1992
 25. Sharples and van der Geest *The new writing environment: Writers at work in a world of technology*. Springer Verlag London 1997
 26. Star, S.L., The politics of formal representations: wizards, gurus and organizational complexity. In Star, S. (Ed) *Ecologies of knowledge: Work and politics in science and technology*. SUNY Press, Albany NY USA 1995
 27. Stein, N.L., Bernas, R.S., Calicchiam D.J., & Wright, A. (1997). Understanding and resolving arguments: The dynamics of negotiation. In B. Britton & A.G. Graesser (Eds.), *Models of understanding*, Hillsdale, NJ USA: Erlbaum.
 28. Stein, N.L., & Miller, C. (1993). The development of memory and reasoning skill in argumentative contexts: Evaluating, explaining, and generating evidence. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 4). Hillsdale, NJ: Erlbaum.
 29. Winsor, D. "An engineer's writing and the corporate construction of knowledge" *Written Communication* 6(3), July 1989