LEARNING FROM NOTES:
Organizational Issues in Groupware Implementation

Wanda J. Orlikowski

CCS TR # 134, Sloan School WP # 3428-92
(revised version)

August, 1992

Acknowledgments
This research was sponsored by the Center for Coordination Science at the Massachusetts Institute of Technology. This support is gratefully acknowledged. Thanks are due to Jolene Galegher, Robert Halperin, Tom Malone and Judith Quillard who provided helpful comments on an earlier version of this paper. Thanks are also due to the men and women of Alpha Corporation who participated in this research.

LEARNING FROM NOTES: Organizational Issues in Groupware Implementation

Wanda J. Orlikowski

Sloan School of Management
Massachusetts Institute of Technology
50 Memorial Drive (E53-329)
Cambridge, MA 02139
(617) 253-0443 wanda@eagle.mit.edu

ABSTRACT
This paper explores the introduction of groupware into an organization to understand the changes in work practices and social interaction facilitated by the technology. The results suggest that people's mental models and organizations' structure and culture significantly influence how groupware is implemented and used. Specifically, in the absence of mental models that stressed its collaborative nature, groupware was intepreted in terms of familiar personal, stand-alone technologies such as spreadsheets. Further, the culture and structure provided few incentives or norms for cooperating or sharing expertise, hence the groupware on its own was unlikely to engender collaboration. Recognizing the central influence of these cognitive and organizational elements is critical to developers, researchers, and practitioners of groupware.

KEYWORDS
Groupware, Implementation, Lotus Notes, Organizational Factors, Technological Frames

INTRODUCTION

Computer-supported cooperative work, collaborative computing, and groupware have become common labels in our contemporary technological vocabulary. While some have discussed the potential for such technologies to enhance organizational effectiveness [3, 8, 9, 15], others have suggested that the implementation of such technologies is more difficult and yields more unintended consequences than is typically acknowledged [2, 10, 11, 12, 16]. Empirical studies of groupware usage in organizations are clearly needed to shed light on these diverse expectations. While there have been many field studies of electronic mail usage [1, 4, 5, 6, 13, 14, 17], groupware (that includes more collaborative features than electronic mail) has been studied less frequently.

In this paper I describe the findings of an exploratory field study which examined the implementation of the groupware product *Notes®* (from Lotus Development Corporation)[1] into one office of a large organization. My interest in studying the implementation and use of this product was to investigate whether and how the use of a collaborative tool changes the nature of work and the pattern of social interactions in the office, and with what intended and unintended consequences. The findings suggest that two organizational elements seem especially relevant in influencing the effective utilization of groupware: people's *cognitions* or mental models about technology and their work, and the *structural properties* of the organization such as policies, norms, and reward systems. The findings suggest that where people's mental models do not understand or appreciate the collaborative nature of groupware, such technologies will be intepreted and used as if they were more familiar technologies, such as personal, stand-alone software (e.g., a spreadsheet or word processing program). The findings further suggest, that where the premises underlying the groupware technology (shared effort, cooperation, collaboration) are counter-cultural to an organization's structural properties (competitive and individualistic culture, rigid hierarchy, etc.), the technology will be unlikely to facilitate collective use and value. That is, where there are few incentives or norms for cooperating or sharing expertise, goupware technology alone cannot engender these. Conversely, where the structural properties do support shared effort, cooperation, and collaboration, it is likely that the technology will be used collaboratively, that is, it will be another medium within which those values and norms are expressed. Recognizing the significant influence of these organizational elements appears critical to groupware developers, users, and researchers.

[1] Notes is an application development environment that can support communication, coordination, and collaboration within groups or organizations. While some features such as electronic mail are built-in, others need to be built by the adopting organization, e.g. discussion forums and customized views of shared databases. See Marshak (1990) for more details.

RESEARCH SITE AND METHODS

Field work was conducted within a large services firm, Alpha Corporation (a pseudonym), which provides consulting services to clients around the world. The career structure within Alpha is hierarchical with four primary milestones--staff consultant, senior consultant, manager, and principal. In contrast to the pyramidal career structure, the firm operates through a matrix form, with client work being executed and managed in a decentralized fashion out of local offices, while being coordinated through consulting practice management centralized in the headquarters office.

A few years ago, Alpha purchased and distributed Notes to all their consultants and support staff as part of a strategy, described by a senior principal as an attempt to "leverage the expertise of our firm." My research study examined the implementation of Notes in one large office of Alpha over a period of five months.[2] Detailed data collection was conducted through unstructured interviews, review of office documents, and observation of meetings, work sessions, and training classes. Over ninety interviews were conducted, each about an hour in length, with some participants being interviewed more than once over the period of study. In addition to the office where the study was conducted, I interviewed key players from Alpha's headquarters and technology group. Participants spanned various hierarchical levels and were either consultants in active practice, administrators supporting practice activities, or members of the centralized technology support function (see Table 1).

	Practice	Technology	Total
Principals	13	4	17
Managers	26	15	41
Seniors	12	13	25
Admin.	8	--	8
Total	**59**	**32**	**91**

Table 1: Number and Type of Interviews in Alpha

The research study was designed to examine how the groupware technology is adopted and used by individuals, and how work and social relations change as a consequence. The research study began in February 1991 before the Notes system was due to be installed within the office and continued through the implementation and early use of the Notes system (June 1991). The findings reflect participants' anticipations of as well as their early exposure to the Notes system.[3] These findings need to be interpreted cautiously as they only reflect the adoption and early use experiences of a sample of individuals within a specific office in what is a larger implementation process continuing over time in Alpha. While early, the findings to date are interesting as they reflect people's initial experiences and assessments of Notes in light of their current work practices and assumptions about technology. The initial period following the implementation of a technology is typically a brief and rare opportunity for users to examine and think about the technology as a discrete artifact, before it is assimilated into cognitive habits and work practices, and disappears from view [18]. It is possible that with time, greater use, and appropriate circumstances, these early experiences will change.

RESEARCH RESULTS

Background to the Notes Acquisition

In the late eighties, a few senior principals realized that Alpha, relative to its competitors and clients' expectations, was not utilizing information technology as effectively as they could. In response, they commissioned an internal study of the firm's technological capabilities, weaknesses, and requirements. On the basis of this study's recommendations, a new and powerful position--akin to that of a Chief Information Officer (CIO)--was created within Alpha with responsibility for the firm's internal use of information technology. One of the first tasks the new CIO took on was the creation of firm-wide standards for the personal computing environments utilized in Alpha offices. It was while reviewing communication software that the CIO was introduced to the Notes groupware system. As he remarked later, after a few days of "playing with Notes," he quickly realized that it was "a breakthrough technology," with the potential to create "a revolution" in how members of Alpha communicated and coordinated their activities. Shortly thereafter the CIO acquired a site license to install Notes throughout the firm, and announced that the product would be Alpha's communications standard.

The CIO began to market Notes energetically within various arenas of the firm. He gave numerous talks to principals and managers, both at national meetings and in local offices, during which he promoted his vision of how Notes "can help us manage our expertise and transform our practice." Through interest and persuasion, demand for Notes grew, and the physical deployment of the technology proceeded rapidly throughout the firm. The actual use of Notes within the office I studied, however, appeared to be advancing more slowly. While electronic mail usage had been adopted widely and enthusiastically, the use of Notes to share expertise, and the integration of Notes into work practices and policies had not yet been accomplished. The data I collected and analyzed during my field study of one office suggests that at least two organizational elements--cognitive and structural--influenced the participants' adoption, understanding, and early use of Notes.

---

[2] henceforth referred to simply as "the office."

[3] This research study represents the first of a series of studies that are being conducted within Alpha over time. Further analyses and observations are thus anticipated.

Cognitive Elements

Cognitive elements are the mental models or frames of references that individuals have about the world, their organization, work, technology, and so on. While these frames are held by individuals, many assumptions and values constituting the frames tend to be shared with others. Such sharing of cognitions is facilitated by common educational and professional backgrounds, work experiences, and regular interaction. In the context of groupware, those cognitive elements that have to do with information technology become particularly salient. Elsewhere, I have termed these *technological frames*, and described how they shape the way information technology is designed and used in organizations [7].

When confronted with a new technology, individuals try to understand it in terms of their existing technological frames, often augmenting these frames to accommodate special aspects of the technology. If the technology is sufficiently different, however, these existing frames may be inappropriate, and individuals will need to significantly modify their technological frames in order to understand or interact effectively with the new technology. How users change their technological frames in response to a new technology is influenced by (i) the kind and amount of product information communicated to them, and (ii) the nature and form of training they receive on the product.

(i) Communication about Notes

Employees in the office I studied received relatively little communication about Notes. Many of them first heard about the CIO's decision to standardize on Notes through the trade press. Others encountered it during Alpha's annual management seminars that form part of consultants' continuing education program. Most encountered it for the first time when it was installed on their computers. Without explicit information about what Notes is and why Alpha had purchased it, these individuals were left to make their own assumptions about the technology and why it was being distributed. This contributed to weakly developed technological frames around Notes in the office. Consider, for example, these remarks made by individuals a few weeks before Notes was to be installed on their computers:

I know absolutely nothing about Notes. I don't know what it is supposed to do.

All I know is the firm bought it, but I don't know why.

I first heard that the firm had bought Notes through the Wall Street Journal. Then your study was the next mention of it. That's all I know about it.

I heard about Notes at the [management seminars] about eight months ago. I still don't know what it is.

It has something to do with communications.

It's big email.

I've heard that it's hard copy of email ... but I am not very clear about what it is exactly.

Is it a new version of 1-2-3?

I believe Notes is putting word processing power into spreadsheets.

It's a network... I don't know how the network works. Where does all this information go after I switch my machine off?

It's a database housed somewhere in the center of the universe.

Weakly developed technological frames of a new and different technology are a significant problem in technology transfer because people act towards technology on the basis of the meaning it has for them. If people have a poor or inappropriate understanding of the unique and different features of a new technology they may resist using it, or may not integrate it appropriately into their work practices. In the office, one consequence of such poor understanding was a skepticism towards Notes and its capabilities. For example, principals and managers in the office commented:

I first heard about Notes when I read in the Wall Street Journal that Alpha had purchased a revolutionary new piece of software. My first thought was -- how much is this costing me personally? ... [T]his kind of implementation affects all of our pocketbooks. ... I have [heard that] there is no value in information technology -- so you can imagine how I feel!

When I first heard about it, I thought "Oh yeah? First hook me up to the network, and then I'll listen." Right now I still can't see the benefit.

I don't believe that Notes will help our business that much, unless all of our business is information transfer. It's not. Business is based on relationships. Ideas are created in non-work situations, socially, over lunch, etc.

Poor circulation of information about Notes was a consequence of the rapid installation of Notes that Alpha had pursued. The CIO had delegated responsibility for Notes deployment to the firm's technology group. Because demand for Notes was growing quickly, the technologists did not have an opportunity to plan the Notes rollout, and did not develop or pursue a formal implementation plan or information dissemination strategy. Two technology managers commented:

We tried to stay one step ahead of the firm's demand and [the CIO's] evangelism. We were swamped with requests. Every time [the CIO] gave a talk, we'd be deluged with requests for Notes. ... We had no time to do a formal plan or a grand strategy because [the CIO] had raised the level of enthusiasm in the firm, and there was no way we could say to the principals "wait while we get our act together."

[The CIO] set the tone for the deployment strategy by generating interest in the product at the top. He was pushing a top-down approach, getting to all the principals first. So our deployment was driven by a lot of user pull and a little push from us. ... We were constantly struggling to keep up with demand.

5

This rapid, demand-driven rollout was consistent with the CIO's assumption about how technologies such as Notes should be implemented. He commented that:

> *Our strategy was to blast Notes through our organization as quickly as possible, with no prototypes, no pilots, no lengthy technical evaluation. We want to transform the way we deliver service to clients.*

He believed that an "empowering" technology such as Notes should be put in the hands of as many people as possible, and that if the technology is compelling enough "they will drift into new ways of doing things." That is,

> *[I]f you believe that Notes is a competitive technology you have to deploy it quickly, and put it in the hands of the users as fast as possible. Critical mass is key.*

In particular, the CIO focused on convincing the key "opinion leaders" in the firm of the value of the technology, as he believed that these individuals would lead the charge in defining and spreading the uses of Notes throughout the firm.

(ii) Training on Notes

Training users on new technology is central to their understanding of its capabilities and appreciating how it differs from other technologies with which they are familiar. It also significantly influences the augmentation of existing technological frames or the development of new ones. Because the technologists were extremely busy deploying Notes and keeping it up and running, they did not have the resources to pay much attention to the education of users. Their first priority was to physically install hundreds of copies of Notes in multiple offices around the country and keep them operational. As one technology manager noted, it was a matter of priorities:

> *We made a conscious decision between whether we should throw it [Notes] to the users versus spending a lot of time training. We decided on the former.*

The under-emphasis on training was consistent with the CIO's general view that Notes does not require formal end-user training, and that it is through experimentation and use, not formal education programs that people begin to appreciate a technology's potential and learn to use it in different and interesting ways. This user-driven diffusion strategy, however, typically takes time, particularly in a busy services firm with considerable production pressures. Because this study did not detect any new user initiatives around the use of Notes in the office, it is possible that the timing of the research is simply too early in the implementation process. The following experiences thus represent the first encounters consultants had with Notes and how they initially appropriated it.

The training that was made available to users in the office I studied came in two forms, self-study and classroom training. The former provided users with a videotape and work-book, and covered Notes' basic functions and interfaces. The latter offered up to four hours of instruction and hands-on exercises by local computer support personnel. None of these training options emphasized its collaborative nature or possible business value. The training materials were relatively technical, individual-oriented, and non-specific in content. Trainees were exposed to the basic Notes functions such as electronic mail, editing, and database browsing. While facilitating the accessibility of the material to all individuals, from secretaries to principals, this "one size fits all" training strategy had the effect--at least initially--of not conveying the power of Notes to support specific consulting applications or group coordination.

This training on Notes resembled that of the training conducted on personal productivity tools. While useful for teaching the mechanics of Notes, it does not give users a new way of thinking differently about their work in terms of groupware. While Alpha was less concerned with collaborative or group work than with sharing expertise across the firm, the effect of the initial training was that participants in my study attempted to understand Notes through their existing frame of personal computing software. Such interpretations encouraged thinking about Notes as an individual productivity tool rather than as a collaborative technology or a forum for sharing ideas. For example, one manager noted:

> *I see Notes as a personal communication tool. That is, with a modem and fax applications I can do work at home or at a client site and use Notes to transfer work back and forth. In the office, instead of getting my secretary to make twenty copies of a memo she can just push a button.*

Further, the applications built for users by the technology group tended to automate existing information flows rather than creating new ones through the cooperative features of Notes. This reinforced the message that users received in their training, that Notes is an incremental rather than a transforming technology, and that new technological frames or new work practices around it are not required. Thus, in contrast to the technologists' vision of Notes as a technology that can "fundamentally change the way we do business," consultants in the office appeared to expect, at most, incremental improvements in operations. A manager noted:

> *The general perception of Notes is that it is an efficient tool, making what we do now better, but it is not viewed by the organization as a major change. Remember we're ... a management consulting firm and management consultants stick to management issues. We don't get into technology issues.*

Another said:

> *I think it will reduce the time of gathering information. I think it will cut down on frustration in transferring information. But it is not a radical change.*

As a result of the lack of resources that technologists had for communication and training, users of Notes in the office developed technological frames that either had weakly developed notions of Notes, or that interpreted Notes as a personal rather than a group or firm productivity tool. Because technological frames may change over time and with changing contexts, it is

possible that the frames developed by the office participants will change over time. For example, if individuals are exposed to other applications of Notes developed elsewhere in the firm or in other firms, or if their increased use of Notes helps them understand how they can change the way they work, new understandings and uses of Notes may result. Our ongoing study of this implementation will monitor such possible developments.

Structural Elements

Structural properties of organizations encompass the reward systems, policies, work practices, and norms that shape and are shaped by the everyday action of organizational members. In the office, three such structural properties significantly influenced individuals' perceptions and early use of Notes.

(i) Reward Systems

Within Alpha there is an expectation--shared by many services firms--that all or most employee hours should be "billable," that is, charged to clients. This is a major evaluation criterion on which employees are assessed, and employees studiously avoid "non-billable hours." Because most of the participants did not initially perceive using Notes as a client-related activity (and hence as "not chargeable"), they were disinclined to spend time on it. Further, given their lack of understanding and skepticism of Notes, they were unwilling to give up personal time to learn or use it. Consider these comments from senior consultants and managers:

One of the problems is time. Given my billing rate, it makes no sense for me to take the time to learn the technology. In Alpha we put so much emphasis on chargeable hours and that puts a lot of pressure on managers. ... And now we've made an enormous commitment to Notes and Hardware, and LANs, but we haven't given people the time and opportunity to learn it. For them to do classes they have to work extra on weekends to meet deadlines.

I think it is going to be a real issue to find time to use Notes. We don't have the time to read or enter information in Notes. What would I charge it to? We already complain that we can't charge our reading of our mail to anything. We end up having to charge it to ourselves [he reads his mail on the train going home].

I don't think that Notes will ever be used in Alpha as effectively as it could be. We're not going to make sure everyone in the office has fifteen hours over the next year to spend time learning it. And if they expect us to take it out of our own time I'm not going to invest that time. I have another life too.

The opportunity costs for me to take training in the office are very high. At my level, every week is a deadline, every week is a crisis. No accommodations are made in our schedules or workload to allow us to train on technology. So I won't learn it unless it's mandatory.

Thus, one significant inhibitor of learning and using Notes was the office's reward system with its accompanying incentive schemes and evaluation criteria. Because the reward system had not changed since the implementation of Notes, consultants in the office perceived time spent on Notes as less legitimate than client work. While many used Notes for electronic mail or database browsing, these activities amounted to a few minutes a day, and hence were easily subsumed into client or personal time. However, any more extensive use of Notes was seen as potentially disrupting the balance between billable hours and personal time, and hence to be avoided. These concerns, however, varied by position in the office. Not surprisingly, principals were willing to take a longer-term and firm-wide perspective on Notes, being less preoccupied than were managers and senior consultants with time constraints, "billable hours," personal performance, and their own careers.

(ii) Policies and Procedures

Along with the few resources dedicated to Notes training and communication, the office--at the time of my study--had not formulated new work procedures or set new policies around data quality, confidentiality, and access control. Many participants indicated that their use of Notes was inhibited by their lack of knowledge about these issues, particularly concerns about liability (their own and Alpha's). Principals for example, worried about data security:

Security is a concern for me. ... We need to worry about who is seeing the data. ... Managers should not be able to access all the information even if it is useful, [such as] financial information to clients, because they leave and may go and work for competitors. So there should be prohibitions on information access.

I am not sure how secure Notes is. Many times we have run into difficulties and things have got lost in never-never land.

I have concerns about what goes into the databases and who has access to them and what access they have. ... But we haven't thought that through yet.

Managers and senior consultants in the office were more anxious about personal liability or embarrassment:

I would be careful what I put out on Notes though. I like to retain personal control so that when people call me I can tell them not to use it for such and such. But there is no such control within Notes.

My other concern is that information changes a lot. So if I put out a memo saying X today and then have a new memo two weeks later, the person accessing the information may not know about the second memo which had canceled the first. Also if you had a personal discussion you could explain the caveats and the interpretations and how they should and shouldn't use the information.

I'd be more fearful that I'd put something out there and it was wrong and somebody would catch it.

I would be concerned in using Notes that I would come to the wrong conclusion and others would see it. What would make me worry is that it was public information and people were using it and what if it was wrong? I would not want to be cited by someone who hasn't talked to me first. I'm worried that my information would be misconstrued and it would end up in Wichita, Kansas "as per J. Brown in New York" being used and relied on. You should be able to limit what access people have to what information, particularly if is your information. I would definitely want to know who was looking at it.

There is a hesitancy here because you don't want to put everything into public information as people may rely on that information and screw up, and it may reflect badly on you.

The lack of explicit procedures and policies around Notes highlights the difficulty of enforcing firm-wide policies in a decentralized firm. While the CIO has been able to institute standards around certain technology platforms--clearly a technical domain, instituting standard procedures and policies about data quality, control, and liability begins to encroach on the organizational domain--an arena where the CIO's authority is less established. As a result, the technologists have been careful about setting policies that would require organizational changes and that might invoke turf issues. Managers of local offices, however, had not devoted any attention to this issue, at least in the early adoption phase. As a result, there was some ambiguity about the locus and nature of responsibility and liability with respect to the intellectual content of Notes databases. This may have inhibited the application of Notes to a broader range of work practices in the early phase of implementation.

(iii) Firm Culture and Work Norms

Alpha shares with many other consulting firms a relatively competitive culture--at least at the levels below principal. The pyramidal structure and the hierarchical "up or out" career path promote and reinforce an individualistic culture among consultants, where those who have not yet attained principal status vie with each other to get the relatively few promotions handed out each year. In such a competitive culture, there are few norms around cooperating or sharing knowledge with peers. These comments by consultants in the office are illustrative:

This is definitely a competitive culture--it's an up or out atmosphere.

Usually managers work alone because of the competitiveness among the managers. There is a lot of one-upmanship against each other. Their life dream is to become a principal in Alpha, and they'll do anything to get there.

The atmosphere is competitive and cut-throat; all they want is to get ahead as individuals.

Interestingly, there was some evidence that there is much more collegiality at the highest levels of the firm, where principals--having attained tenure and the highest career rank--enact more of a "fraternal culture" than the competitive individualism evident at lower levels. This is also evident in service organizations with similar organizational structures, such as firms providing legal, accounting, or medical services. Below the principal level, however, managers and senior consultants in my study indicated that there was generally little precedent for sharing or cooperating with colleagues, and little incentive to do so as they needed to differentiate themselves from their peers. For example:

The corporate psychology makes the use of Notes difficult. Particularly the consultant career path which creates a back-stabbing and aggressive environment. People aren't backstabbing consciously, it's just that the environment makes people maximize opportunities for themselves.

I'm trying to develop an area of expertise that makes me stand out. If I shared that with you you'd get the credit not me.... It's really a cut-throat environment.

Power in this firm is your client base and technical ability. ... It is definitely a function of consulting firms. Now if you put all this information in a Notes database you lose power. There will be nothing that's privy to you, so you will lose power. It's important that I am selling something that no one else has. When I hear people talk about the importance of sharing expertise in the firm, I say "Reality is a nice construct."

The competitive individualism--which reinforces individual effort and ability, and does not support cooperation or sharing of expertise--is counter-cultural to the underlying premise of groupware technologies. It is thus not surprising that, at all but the highest career level, Notes is being used largely as an individual productivity tool in the office. Senior consultants and managers within this office feel little incentive to share their ideas for fear that they may lose status, power, and distinctive competence. Principals, on the other hand, do not share this fear and are more focused on the interests of the office and the firm than on their individual careers. An interesting contrast to this point, which further supports it, is that Notes is being used by Alpha technologists to exchange technical expertise. Not being subject to the competitive culture, individual-focused reward systems, "up-or-out" career pressures, and "chargeable hours" constraints of the consultants, the technologists appear to have been able to use the technology to conduct their work, that is, solving technical problems.

DISCUSSION

The results of this research suggest that the organizational introduction of groupware will interact with cognitive and structural elements, and that these elements will have significant implications for the adoption, understanding, and early use of the technology. Because people act towards technology on the basis of their understanding of it, people's technological frames often need to be changed to accommodate a new technology. Where people do not

appreciate the premises and purposes of a technology they may use it in less effective ways. A major premise underlying groupware is the coordination of activities and people across time and space. For many users, such a premise may represent a radically different understanding of technology than they have experienced before. This suggests that a particularly central aspect of implementing groupware is ensuring that prospective users have an appropriate understanding of the technology, that is, that their technological frames reflect a perception of the technology as a collective rather than a personal tool.

At the time I conducted my study, many of the participants in the office did not have a good conception of what Notes was and how they could use it. Their technological frames around Notes were weakly developed and relied heavily on their knowledge and experience of other individually-used technologies. Given such cognitions, it is not surprising that in their early use of the technology, these participants had not generated new patterns of social interaction, nor had they developed fundamentally different work practices around Notes. Instead, they had either chosen not to use Notes, or had subsumed it within prior technological frames and were using it primarily to enhance personal productivity through electronic mail, file transfer, or accessing news services. As indicated above, however, these findings reflect an early phase of the participants' experiences with Notes. It is possible that these experiences will change over time as they get more accustomed to using Notes, and these are expected to change over time depending on their ongoing experiences with the technology.

Where a new technological frame is desirable because the technology is sufficiently unprecedented to require new assumptions and meanings, communication and education are central in fostering the development of new technological frames. Such communication and education should stress the required shift in technological frame, as well as provide technical and logistic information on use. A training approach that resembles that used for personal computing software is unlikely to help individuals develop an appreciation of groupware. For individuals used to personal computing environments and individual applications, shared technology use and cooperative applications are difficult to grasp. In these cases, concrete demonstrations of group applications can help to provide insight. Further, learning groupware collectively may foster joint understanding and expectations. Where individuals learn a shared technology in isolation, they may form their own assumptions, expectations, and procedures which may differ from those of the people they will interact with through the technology.

In situations where the premises underlying groupware are incongruent with those of the organization's culture, policies, and reward systems, it is unlikely that effective cooperative computing will result without a change in structural properties. Such changes are difficult to accomplish, and usually meet with resistance. Without such changes, however, the existing structural elements of the firm will likely serve as significant barriers to the desired use of the technology. For example, in the study described above, the existing norms, policies, and rewards appear to be in conflict with the premises of Notes. Because incentive schemes and evaluation criteria in the office had not been modified to encourage or accommodate cooperation and expertise sharing through Notes, members feared loss of power, control, prestige, and promotion opportunities if they shared their ideas, or if their lack of knowledge or misinterpretations were made visible. Thus, in a relatively competitive culture where members are evaluated and rewarded as individuals, there will be few norms for sharing and cooperating. If groupware is to be used cooperatively in such cultures, these norms need to be changed--either inculcated top-down through training, communication, leadership, and structural legitimation, or bottom-up through support for local opportunities and experimentation around cooperation. Without some such grounding in shared norms, groupware will likely be used primarily for advancing individual productivity.

In addition to norms, resources are a further important facilitator of shared technology use. Whether formally earmarked from some firm-wide R&D budget, or provided informally through local slack resources, occasions for experimenting with shared applications are needed to generate interest and use around cooperative computing. In the office, for example, there had been no change in the allocation of resources following the implementation of Notes, and members had not been given time to use and experiment with Notes. There was thus a tension between the structural requirement that all work be production-oriented, and the adoption of an infrastructure technology such as Notes which was perceived to be only indirectly related to production work. Where individuals are not given resources to learn and experiment with the new technology, or not given specific applications that help them accomplish their production work within the technology, the immediate pressures of daily production tasks and deadlines will tend to dominate their decisions around how they allocate their time.

This research study suggests that in the early adoption of a technology, cognitive and structural elements play an important role in influencing how people think about and assess the value of the technology. And these significantly influence how they choose to use the technology. When an organization deploys a new technology with an intent to make substantial changes in business processes, people's technological frames and the organization's work practices will likely require substantial change. An interesting issue raised by this requirement is how to anticipate the required structural and cognitive changes when the technology is brand new. That is, how do you devise a game plan if you have never played the game before? This is particularly likely in the case of an unprecedented technology such as groupware. One strategy would be to deploy the technology widely in the belief that through experimentation and use over time, creative

ideas and innovations will flourish. Another strategy would prototype the technology in a representative group of the organization--on a pilot basis--and then deploy it to the rest of the organization once the technology's capabilities and implications are understood. This way the required structural and cognitive changes learned through the pilot can be transferred. Viewed in terms of these two strategies, aspects of Alpha's adoption activites now appear to resemble the former strategy. Our future studies should indicate how successful this strategy has been.

It is worth noting that while the early use of Notes in the office has proved more valuable for facilitating individual productivity than for collective productivity, the implementation of Notes has resulted in the installation of an advanced and standardized technology infrastructure. As one technology manager put it: "A side-benefit of Notes is that it got people into a more sophisticated environment of computing than we could have done otherwise." Most of the office members--from principals to senior consultants--now have ready and easy access to a network of personal computers and laser printers. Thus, while the initial experiences with Notes in the office may not have significantly changed work practices or policies, the office appears to be relatively well-positioned to use this platform to take advantage of any future technological or work-related initiatives.

In general, the findings presented here provide insight for future research into the structural and cognitive organizational elements that interact with and shape the adoption and early use of groupware in organizations. They also have practical implications, indicating how and where such organizational elements might be managed to more effectively implement groupware in various organizational circumstances.

ACKNOWLEDGMENTS

Support from MIT's Center for Coordination Science is gratefully acknowledged. Jolene Galegher, Bob Halperin, Tom Malone, and Judith Quillard provided helpful comments on an earlier version of the paper. Thanks are also due to the participants from Alpha Corporation.

REFERENCES

1. Bair, J.H. and Gale, S. An Investigation of the COORDINATOR as an Example of CSCW, *Proc. CSCW* (Portland, September 1988).

2. Bullen, C. and Bennett, J. Groupware in Practice: An Interpretation of Work Experience, *Proc. CSCW* (Los Angeles, October 1990), 291-302.

3. Dyson, Esther Why Groupware is gaining Ground, *Datamation* (March 1, 1990), 52-56.

4. Eveland, J.D. and Bikson, T.K. "Evolving Electronic Communication Networks: An Empirical Assessment," *Proc. CSCW* (Austin, August 1986), 91-101.

5. Feldman, M.S. Electronic Mail and Weak Ties in Organizations, *Office: Technology and People*, 3 (1987), 83-101.

6. Finholt, T. and Sproull, L.S. Electronic Groups at Work, *Organization Science*, 1:1 (1990), 41-64.

7. Gash, D.C. and Orlikowski, W.J. Changing Frames: Towards an Understanding of Information Technology and Organizational Change, *Academy of Management Best Papers Proc.*, 51st Annual Meeting (Miami Beach, August 1991), 189-193.

8. Govani, Stephen J. License to Kill, *Information Week* (January 6, 1992), 22-28.

9. Groupware: The Teamwork Approach, Supplement to *PC Week*, 8, 41 (October 14, 1991).

10. Grudin, J. Why CSCW applications fail: Problems in design and evaluation of Organization Interfaces, *Proc. CSCW* (Portland, September 1990), 85-93.

11. Kiesler, S. The Hidden Messages in Computer Networks, *Harvard Business Review* (January-February 1986), 46-59.

12. Kling, R. Cooperation, Coordination, and Control in Computer-Supported Work, *Comm. of the ACM*, 34, 2 (1991), 83-88.

13. Mackay, W.E. Diversity in the Use of Electronic Mail, *ACM Transactions on Office Information Systems*, 6:4 (1988), 380-397.

14. Markus, M. L.. Toward a 'Critical Mass' Theory of Interactive Media, *Communication Research*, 14:5 (October 1987), 491-511.

15. Marshak, David S. Lotus Notes: A Platform for Developing Workgroup Applications, *Patricia Seybold's Office Computing Report*, (July 1990).

16. Perin, C. Electronic Social Fields in Bureaucracies *Comm. of the ACM*, 34, 2 (1991), 75-82.

17. Sproull, L.S. and Kiesler, S. Reducing Social Context Cues: Electronic Mail in Organizational Communication, *Management Science*, 32, 11 (1986), 1492-1512.

18. Tyre, M.J. and Orlikowski, W.J. Windows of Opportunity: Creating Occasions for Technological Adaptation in Organizations, Sloan School of Management #3309, MIT (Cambridge, July 1992).