# Group Information Management

WAYNE G. LUTTERS[1], MARK S. ACKERMAN[2], AND XIAOMU ZHOU[3]

## 1.1. Introduction

Activities of PIM are often embedded in group or organizational contexts. To work effectively within a group, an individual must manage information not only for his or her personal use but also to share with other members of the group. Obviously, one would like to leverage the activities of others around. Being able to obtain telephone numbers, schedule group meetings, determine the availability of one's peers, and obtain important collaborative information is invaluable. What are the issues, if any, in leveraging the work of others, in order to incorporate their calendar, contacts, and other information into one's own PIM system? And what would be involved in sharing one's own data for use by others?

This chapter reviews the host of issues involved in the collaborative use of personal information. Topics covered include motivation, adoption patterns, interaction styles, control over personal information, privacy, and trust. The goal is to facilitate sharing personal information by considering these issues; fully considered, they can enable the cooperative adoption and use of tools to support group information management (GIM). GIM refers to the practice and the study of the individual actions performed to support group activity. The support of this information management behavior includes the ability to acquire, organize, maintain, retrieve and use artifacts such as documents (paper-based and digital), web pages, and email messages. Groups can be small (e.g., a team of 6 or 7) or large (e.g., an organization with thousands of members). They can be ephemeral (e.g., chance encounters at a social event) or ongoing (e.g., a software project team). Groups can also be work-related (e.g., a business department) or not (e.g., a parent-teacher's organization). They may be engineered social units (e.g., a training class) or emergent assemblages of individuals (e.g., an affinity group of hobbyists).

Collaboration and information sharing have been widely studied in many literatures. To explore the issues impacting GIM support, this chapter draws heavily on the Computer-Supported Cooperative Work (CSCW) literature. CSCW is part of Human-Computer Interaction, and it broadly studies how people use computer systems and applications in group, organizational, or even Internet-scale contexts. (See Ackerman, 2000 and Olson & Olson, 1997 for brief surveys of this literature.) Where appropriate, however, we will also draw on a range of other literatures including information science, organizational studies, and sociology. The list of issues is long, and we somewhat arbitrarily break that list into three sections. We will first consider a work context, examining the social issues in sharing and then the more technical and cognitive issues

[1] Information Systems Department, University of Maryland Baltimore County, lutters@umbc.edu.
[2] School of Information and Department of Electrical Engineering and Computer Science, University of Michigan, ackerm@umich.edu
[3] School of Information, University of Michigan, xmzhou@umich.edu

in sharing information. We then note some of the issues in group information systems overall that may impinge on the successful and adoption of GIM tools, again in a work setting. Next, we examine GIM in a different setting, the home and family. Finally, the chapter ends with a brief examination of interesting research possibilities for GIM.

## 1.2. Scenario

Brooke Monroe manages her own information for the many projects in her life and for her various roles and responsibilities. She shares a considerable amount of her time, her emotional energy – and her information – with her colleagues at a high-tech start-up. For example, co-workers are able to review and make meeting requests in each others' digital calendars – which has proven very useful when a meeting must be arranged quickly. People in the startup discovered that they like to socialize with each other as well. They share a great love of new music and routinely exchange information about upcoming concerts and details about ones that they have recently attended. They like to stay aware of concerts one another are attending.

At his securities firm, Alex Monroe also shares information with his colleagues. However, in his situation people are much more circumspect about releasing calendar, task, or free-text information, as it can lead to security law violations. In addition, his co-workers jealously guard their rolodexs, as this can provide a leg up in the competitive securities business.

Brooke and Alex, when they are at home, like to mesh their calendars. They also share their contact information. Brooke is a bit secretive though, and likes to protect her private journal entries. While she's willing to share general calendar information (busy-free periods) with her mother, Connie, Brooke has been unwilling to provide detailed calendar, contact, or free-text information. Of course, since Connie needs help with her medical regime, Brooke and Alex both have to schedule items on their mother's paper desk calendar while synchronizing it with their own digital calendars.

This simple scenario illustrates some of the challenges of group information management at work and at home that will be unpacked in the following three sections.

## 1.3. Group information management at work

As most CSCW research has focused on office environments, this review of the social issues impacting GIM will be presented within this setting and later contrasted with the home. First, we will describe the social and collaborative issues underlying the motivations for GIM, including reward structures, control, privacy, trust, and adoption patterns. Next, the situated nature of information exchange will be examined, highlighting the contextual elements of GIM and information sharing.

### 1.3.1. Incentives and social issues in groups

As might be expected when people try to work together, there are a large range of personal and social issues. Before examining the specifics in the use of tools to support GIM, however, several basic social-theoretic findings need to be noted. These findings detail some important ways people operate within groups, and they frame any discussion of groups and their information use.

- First, Goffman (1961) argued that people are very concerned about how they present themselves to others. People wish to govern how others view them, and so, they tailor how they present themselves accordingly. For example, Alex may be a cut-throat security trader to one group of people and a caring son-in-law to another. Not all of the information passed on to others might be the same: Brooke may share ribald concert stories with her co-workers, but not with her mother. These identities, with their concomitant informational facets, were called “faces” by Goffman. He also argued that people want to control their impression management, or how they try to have others view them, and losing this control can be very disconcerting.

- As people control their information release, they often do it in a very flexible and nuanced manner (Goffman, 1961). For example, Alex might tell one colleague about a new job possibility but not another. Brooke might give her home phone number to one co-worker but not another. We often release information in a very highly contextualized manner as well. One doesn't consider only the people to whom the information will be given, a decision also weighs many aspects of the specific situation and circumstances.

  People also control their information in a very flexible manner. One does not weigh or deliberate about his information within an overarching personal policy of control, except under the most unusual circumstances. For example, Brooke could not uniformly say that she wants to share her social schedule with her mother; yet, she will freely reveal information if a particular social event conflicts with Connie’s need to be driven to a medical appointment. This is most often a fluid and natural exchange. It is rare that one’s social interaction is disrupted to consider whether to share. As well, one normally assumes an ambiguity in social interaction —one doesn’t necessarily know why someone else shares or withholds information, and it is seldom considered socially appropriate to ask. Conflict and goal incompatibilities are often masked by this social ambiguity.

- Finally, within groups and especially within organizations, not everyone has the same goals and understandings (Orlikowski, 1992). Members may share some goals and not others. For example, Brooke might share the goals of working together and delivering a product. At the same time, she might have the goal to stay current technically so as to maximize her employability. This, and other differences, can lead to breakdowns between people, and these breakdowns must be repaired.

Accordingly any consideration of GIM support must include the often conflicting and always varying incentives and motivations in interpersonal use. The above social theoretic considerations suggest that it is normal to have many incompatibilities in incentives and motivations among the people providing their information as well as the people receiving that

information. This is an extremely important issue in group information management. As Grudin (1989) observed, there is often a mismatch between the incentives of various players in a group system. In a group calendar system, for example, it may be in the interests of the managers to have their employees keep their calendars so they can be seen. For the employees, it may be in their interests to keep their calendars private so they can control their time (and safeguard their face to the managers).

These differences in incentives vary among roles and among groups. Often within organizations, groups can have differing goals and reward systems. Orlikowski (1992) studied Lotus Notes' adoption at a consulting firm. She found that varied groups and roles operated under differing organizational incentive structures, resulting in divergent motivations to share or not to share. The partners at the consulting firm wanted everyone to share their expertise and knowledge, and therefore became strong proponents of the system. The staff consultants needed billable hours and a recognized area of expertise in order to advance in the firm; thus, they had little incentive to contribute to the system. The computing people were highly motivated to learn and master Lotus Notes, since at the time, it was the hot, new technology. Simply, each group had a different incentive structure which resulted in different patterns of adoption.

Later work has suggested that reward systems can be realigned within organizations and groups. Palen (1999) found that shared calendar systems are used, if employees' schedules are not abused. Similarly, work by Orlikowski 2000) and others (Davenport & Prusak, 1998) found that the rewards for sharing can be realigned appropriately, leading to more use and reuse. Moreover, even in Orlikowski's early study, agreement (e.g., in individuals' mental models about the world, organization, work and technology) could be facilitated by common educational and professional backgrounds, work experience, training, and regular interaction.

In building tool support for GIM, it is important to preserve the control that individual members have over the exchange of their information with other members of group. Without this control, group members may not make full use of GIM tools or, in the worst case, may actually work against initiatives to promote information exchange in the group. Other work in this book addresses this issue directly (Karat and Karat, this volume), but in general privacy has been found to a central concern by those adding information to group information systems (Dourish et al., 1993). It is critical that users be given control over the dissemination of their personal data, including whether it is shared at all. Furthermore, this must be done in a non-invasive manner, as users expect their control to be nearly seamless.

It is important to note that privacy in tool support for GIM is more problematic than in tools direct towards PIM alone. Group information systems often serve a multiplicity of purposes. Not only may users share calendar, address book, and other PIM information, the organization may use the GIM data to provide group and organizational level data and reports. For example, GIM data could be used to generate time-on-task reports. As mentioned, management and staff may have different incentives and goals, and these may also vary among groups. Group information can have mixed governance, and be owned by multiple groups or multiple levels of the organization (Ackerman & Halverson, 2004). This can also reduce the motivation to share. Privacy in these situations is critical, but one must also consider aggregated and even

anonymized data and its uses. For many GIM activities it may not be necessary to share all aspects of personal information.

Privacy and mixed governance of data raise the issue of trust. Bannon and Bødker (1997) argued that "trust or accountability is more in the role," which implied that the person who produces the information should have the responsibility for it. Yet, not all information is personal; it may be produced or owned by several parties. To resolve these tensions one must consciously choose which source to rely on. There are many criteria typically used in establishing these different levels of trust, such as which source is more authoritative, which is temporal, or which has been settled and definite (Ackerman and Halverson, 2004, Dourish et al., 1993). Berlin et al. (Berlin et al., 1993) reported that even in the earliest evaluation of their GIM system, issues of trust were already apparent. They quickly evolved a curator role to deal with this problem. For them, the curator's responsibility was to alert and fix classification problems. The resolution of trust remained a distributed responsibility. Given the importance of trust in successful GIM support, these notions of individual and collective curatorial activity warrant further research.

In examining these issues of user control, privacy, and trust in GIM, there is one particularly problematic aspect of support tools that must be addressed – user reliance on system defaults. Ascertaining the optimal pre-set configuration of what is to be shared and with whom is critical in GIM tools, because, simply, people do not customize their software. Mackay (Mackay, 1990) found that relatively few people varied from their default settings (about 10%) and even fewer actually programmed customizations (about 1%). This finding has held across a wide range of systems, and it is likely that it holds for GIMs as well. Indeed, Palen (Palen, 1999) found similar patterns for shared calendar systems which led to very different patterns of use. In her study 81% of users maintained the defaults for their access settings, which implies that default settings are fundamental design decisions that can affect the model of collaboration. This is an overlooked but important issue. Software developers must make it possible for companies to modify deployment default settings to suit conditions. Further, Palen found that users with shared calendar systems that defaulted to open access shared information (although they had workarounds to protect their private appointments). It is quite possible that with the proper defaults, users could be protected from privacy issues at the same time they are encouraged to share their information.

While the default settings of the initial tool installation are critical, recall from earlier in this chapter that all group information sharing decisions are situated. The contextual nature of these exchanges may make establishing a general policy difficult.

In concluding this discussion of the motivations for using GIM support tools, it is useful to abstract to a higher level and examine common patterns of adoption. Our collective understanding of group adoption patterns is still nascent. While general principles have been outlined (e.g., Grudin, 1989), most CSCW research provides conflicting and inconclusive evidence. For instance, Markus and Connolly (1990) claimed that mandated use (i.e., top-down managerial decision) is necessary to reach critical mass. Orlikowski (1992a) reported a mixed pattern of adoption and use of Lotus Notes at Alpha company – while the technical support staff successfully adopted Notes without managerial pressure, the staff consultants did experience top-down pressure. Palen and Grudin's (1999) study of electronic calendar use in two large

organizations, Sun and Microsoft, found that no single adoption pattern could fit every group. However, their interview and survey results primarily supported a bottom-up adoption trajectory: respondents felt more peer pressure to use their electronic calendars than from management.

Adding complexity to our understanding of groupware adoption patterns is the realization that the relationship between users and technology continues to evolve over time. Orlikowski's (1992b) Duality of Technology presented a structurational model of technology that posited artifacts as potential modifiable throughout their existence in a technology's lifecycle. Throughout interaction with certain technology, users have the potential to change it both physically and socially in a process of co-evolution (Orlikowski 1992b, O'Day et al. 1996). Palen (Palen, 1999) labeled the same phenomenon as socio-technical evolution in her examination of group calendaring systems. Another helpful illustration of this effect is Star and Ruhleder's (1996) longitudinal study of the Worm Community System (WCS) which resulted in the emergence of locally-tailored applications and repositories that combined with local knowledge and expertise. This evolution was facilitated by the features of infrastructure that supported the redefinition of local roles and the emergence of a community of practice.

Given the overall complexity of groupware adoption, the research community is split on successful strategies. Some prefer to consider how users can more fully participant in the design process (e.g., Greenbaum and Kyng, 1991) while others reflect on how all participants come to slowly understand their needs and capabilities in a process of co-realization (e.g., Hartswood et al., 2007).

### 1.3.2. Information sharing in groups

The next set of issues involves information sharing as a technical and cognitive process. Again these issues are framed by a basic social theoretic finding:

- People's emphases on what details to consider or to act upon differ according to the situation (Suchman, 1987). This is as true in information sharing as any other activity: this directly follows from Goffman's observations. That is, people's information sharing is heavily contextualized and situated.

People are good at handling situated activity, and their activity is heavily contextualized around the particulars of the situation. People adding and retrieving information in a group information system must mesh their often idiosyncratic categories, indices, schema, and information routines. As well, even individuals change categories, indices, and routines, and often lose valuable information, but these issues become magnified in group and especially organizational use. As an indication of the magnitude of the problem, Furnas et al. (1987), found that when two people were asked to name commands there was less than a .20 probability of overlap in their terms. (While this study was performed in a command line environment, this scale of the problem in naming things most likely holds across domains.) This is especially true for unstructured data, such as free-form text. Unstructured items may not include enough description needed for findability by someone other than the person who had submitted the item (Berlin et al., 1993).

In a particularly insightful study, Berlin et al. pointed to the different styles in group storage and retrieval. As they pointed out "An inherent problem of a shared repository is that individual finding strategies do not work for a group" (Berlin et al., 1993, p. 25). They go on to state:

> Beneath our surface agreement on the categories lay crucial differences, exposed when we compared how we would classify a set of test messages based on project members' activities and recent e-mail. We differed along the following five dimensions:
>
> 1. purists and proliferators
> 2. semanticists and syntacticists
> 3. scruffies and neatniks
> 4. savers and deleters
> 5. the expected purpose for which the item is saved

In their view, these are filing habits and preferences developed over a long period of time by individuals. People in their study differed over the number of categories (purists had one, proliferators many), whether people categorized by the event or the topic (semantics by event and syntacticists by topic), the number of categories (scruffies had but five top-level categories, neatniks had hundreds), how much was saved, and a user's expected future roles and tasks. Each user had his or her individual style, and in combination, the differing styles made adoption difficult. In use, the differing styles meant that their users found browsing more useful, since users had an imprecise sense of when an item was created, may not know how it was indexed or keyworded, and may not know the words in an item for full-text retrieval.

Berlin et al. also noted that group systems carry with them questions of private versus group storage. Users need to trust the system will be there in the future, or they will store the information in their personal space of information instead. (This observation is further elaborated in Whittaker and Hirshberg, 2001.) As well, Berlin et al. found that users questioned whether information belonged to the group or to the individual. This suggests that GIM tools may need to consist of federated PIM tools, or at least this would be advantageous. Users will weigh whether to store truly private data in a group information repository.

As well, many of these group-level issues, such as group categorizations, indexing, and information styles, are not one-time problems. Categories will shift over time, as groups change their needs. Berlin et al. found this, and their group devised a curator role to alert the group to classification issues. As Suchman (1994) pointed out, these categorizations are political, in that they carry with them assumptions about the legitimacy of certain activities and work (also see Bowker & Star, 2000; Star & Strauss, 1999). This is especially true at the organization level. It may be difficult to find consensus around contested categorizations, or alternatively, some users may resist sharing or using data (Markus, 1983). As will be noted, an active area of research includes the tailorability of systems for both individual and group use.

Not only is the categorization more difficult in group settings, more care must be given to prepare the information for later use by others (Lin et al., 2004; Markus, 2001). The information must be decontextualized, stripped of its irrelevant or highly contextualized information and abstracted for later use (Ackerman & Halverson, 2004; Lutters & Ackerman, 2002). Later, when the information is reused by another person, the user must recontextualize the information, trying to understand the original context as well as the current context of use.

## 1.4. Group information management in the home

Another domain for GIM is home life. The use of personal information in the home is predominantly collaborative and thus forms a type of GIM. While many of the dimensions of domestic GIM already discussed in this chapter transfer appropriately from work life to home life, there are additional forces and considerations in this environment that warrant attention.

There is significant work required to maintain a well functioning household, some of it is explicit (e.g., housekeeping chores), but most of it invisible or articulation work (Strauss 1993). While the differences between home and office are pronounced (Crabtree & Rodden, 2004), many of the underlying collaborative mechanisms that support work in each domain are similar (O'Brien et al., 2000). Production in the home is of a significantly smaller scale, but of increased complexity from the office. With stronger individual interests, less defined organizational structure, and a web of intermeshed, often conflicting goals, collective action in the home is a continual compromise resulting from a dynamic, negotiated order (Strauss 1993). While home life necessitates its own activities, it is also the confluence of many external forces (e.g., work, school, community and avocation) (Brush et al., 2005).

As well, home life has its own work rhythms, in concert with the rhythms of the outside world (e.g., office, school) and the biological needs met in the home (e.g., meals, sleep). Time pressures drive much of the negotiation in the home. This trend is only increasing given the ongoing blurring of the boundaries between home and work (Frissen, 2000).

All households develop their own means of managing these many conflicting goals. These often emerge from an artful appropriation of resources in the home to form organizing systems – "in which heterogeneous collections of artifacts are enrolled to capture, integrate and arrange, and convey information" (Taylor & Swan, 2005, p. 647). Many of these appropriated resources become group information.

The most common forms of organizing systems in the home are paper-based household calendars (Crabtree et al., 2003) and lists (Taylor & Swan, 2004). The joint calendar is the most obvious melding of personal information resources into a shared, group resource (e.g., taping school activity flyers to relevant days on the calendar). Individual schedules are brought together in order to negotiate collaborative activity (e.g., who needs the car for what activity this week?). Publicly displayed lists also serve as points of negotiation, whether they are time dependent task lists or communal shopping lists. As the fieldwork for the Casablanca project (Hindus et al., 2001) revealed, managing the interpersonal relationships within and without the home is a primary work task in home life.

Given the diversity of skills, interests, involvement, and ownership, the most successful group information technologies in the home are those that are infinitely reconfigurable. Self-organization in GIM support is critical to supporting the "full complexity of social organization in home life; [sic] allowing users to establish their own sets of usage practices" (O'Brien et al., 2000, p. 297).

In the negotiated space of the home, the kitchen reigns supreme. As the most public, highly trafficked, and multi-purpose of all home spaces, it becomes the locus of collaborative action (Nagel et al., 2004). Enthroned in this public space is the refrigerator (Swan & Taylor, 2005). This highly configurable display space is often the focal point for both coordinating household activity (e.g., family calendar, chores rotation, shopping lists), and displaying critical information. In many homes it is the primary activity center for coordinated action (Crabtree et al., 2003).

While most of the artifacts and information employed in the daily operation of the home are ephemeral, the home is also the primary center for capturing and preserving memories of the household members. The content varies from functional reuse (e.g., list of items to pack when going on vacation) to sentimental value (e.g., child's drawings). The means are equally diverse, from scrapbooks to bulletin boards to inaccessible corners on the side of refrigerators (Swan & Taylor, 2005). This may be an additional role for domestic GIMs.

Traditionally the home has been technologically impoverished when compared to the workplace. This has fostered a reliance on non-digital GIM. However, this is shifting dramatically. Rapid diffusion of such technologies as cellular phones and broadband networking afford new possibility for domestic GIM. As the distinctions between homelife and worklife continue to blur (Nippert-Eng, 1996), their influence on the development of GIM support tools remains an open research question.

## 1.5. GIM tools

At the time of this writing, software support for GIM is quickly improving. The tools supporting the opening GIM scenario are in a state of constant change and evolution. How Brooke and her colleagues, for example, organize themselves and their information exchange is clearly a product of their time, as are the constraints the tools impose on their sharing.

Of course, GIM tools have been in existence since computing began, but mainframe and time-sharing applications (e.g., PROFS calendar) were limited. They had prescribed interaction styles, limited information types and collaboration support, and it was difficult to create ad-hoc networks of collaborating people, especially outside of organizational boundaries.

Since then several major changes made GIM substantially easier. Networks allowed greater sharing of information. The Internet brought email to society, evolving the possibilities for GIM. In the early 90s, networking also enabled the highly successful Lotus Notes system with organization-wide calendaring, email, information sharing, and collaborative information applications. Notes also added the fluidity to define your own GIM interactions. Other notable GIM systems in the research literature include Answer Garden (Ackerman, 1998) and BSCW (Bentley et al., 1997).

More recently, GIM tools have grown to include a large range of applications. These include Web-based applications such as group calendars (e.g., Google calendar) and information sharing and presentation (e.g., MySpace, Flickr). Now in the age of the so-called Web 2.0, there are

even more possibilities for collaborative use including collaborative filtering and recommendations (e.g., Amazon), collaborative tagging (e.g., Flickr, CiteSeer), social networking (e.g., Friendster, LinkedIn, Fanpop), and blogs (e.g., Blogspot). It should also be noted that there are also a number of alternative architectures to the Web for GIM including p2p (e.g., Napster, gnutella) and hybrid server/p2ps (e.g., Groove).

With the large amount of interest as well as the number of new systems, one can expect that GIM applications will only increase in utility.

## 1.6. Open research issues for GIMs

There are a number of open research topics in GIM. As mentioned, there are a variety of interesting opportunities for sharing personal data. For example, the Haystack project offers the opportunity to obtain recommendations for useful papers or monographs on a research topic. One Haystack system could ask another for a reference. Furthermore, since everything is clearly typed, it is relatively easy to ask for a specific phone number. The use of meta-data and automated reasoning is key to these types of projects (Karger, this volume; Berners-Lee et al., 2001). This remains an active research area, but one of great promise.

Another open research topic is the provision of privacy and awareness. Awareness of what others are doing is an intriguing possibility through GIM tools. Any awareness of others seemingly necessitates the loss of privacy of those other individuals. As mentioned above, many GIM design possibilities suggest the loss of personal privacy. Hudson and Smith (1996) signaled one mechanism for controlling the loss of privacy while providing awareness. In their work, one can blur the multimedia streams thus hiding the specific video image or audio words while letting the user know that someone is either present or talking. It may be possible to find similar mechanisms to ameliorate GIM privacy issues.

Another research frontier is that of collaborative visualizations and new representations. Begole et al. (2003) have used visualizations to see team patterns of activity and allow people to mesh more easily. (But see the comments on privacy.) As more and more data become digital, the opportunities for visualization and new representations will become even more important and interesting.

Finally, more needs to be determined about how GIM support will continue to evolve. It is likely that their use co-evolves: As users use a system, they begin to find new ways to use it. They push to add new features, which then adapts the system to their needs. However, little is known about this co-evolution. Furthermore, as mentioned, it is likely over time that users will need and want to evolve indexing schemes, storage conventions, and retrieval styles. What is not known is how much users will want to use old material and how that material, if any, must be maintained over extended use.

## 1.7. Acknowledgements

This work was funded, in part, by the National Science Foundation, grant IIS-0325347. We would like to thank Jaime Teevan and William Jones for their patience and encouragement for this work.

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