Making Sense of the Unkown: Knowledge Dissemination in Organizations

Sven Laqua and **Angela M. Sasse**
University College London
London, UK
s.laqua@cs.ucl.ac.uk
a.sasse@cs.ucl.ac.uk

Carrie Gates and **Steve Greenspan**
CA Labs, CA Inc.
New York, USA
carrie.gates@ca.com
steven.greenspan@ca.com

ABSTRACT
Within corporations, opportunities are missed and efforts can be duplicated due to the relevant information not being known by the appropriate individuals. Often, an employee does not even know that relevant information might be uncovered by searching the corporate intranet. In this paper we present a context-sensitive aid to sensemaking by providing relevant information to an individual in an unobtrusive form, allowing the user to maintain focus on their current task, but to still be aware of related documents. We gather the relevant information based on keywords extracted from the user's currently-displayed email message and filter the results using the user's history and profile information. The information is displayed in the periphery of the user interface.

Author Keywords
Contextualization, Sensemaking, Focus + Context Interfaces, Contextual User Interfaces.

ACM Classification Keywords
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces - *Graphical user interfaces.*

INTRODUCTION
Traditional discussions of sensemaking focus on how an individual processes information, interprets and acts on that information and ultimately acquires new knowledge.

This framework of thinking might be augmented by the environment the individual acts in and interacts with. From an HCI perspective, such interaction would involve technology and some type of user interface that facilitates human-information interaction (HII). With the World Wide Web, the focus of HII has shifted towards information foraging [Pirolli 2007] and collaborative aspects of a "Social Web". Weick's [1995] argument that sensemaking is a social process cannot be supported any better than in the millions of discussions that people engage in every day on the Web.

Nevertheless, that interpretation of sensemaking is still one focused on an individual, who makes sense of information through interaction with technology and other individuals.

Without any doubt, this perspective is crucial. But for a better understanding of sensemaking in organizations, we would like to shift the focus towards a high-level analysis of information dissemination processes.

From an organizational point of view, corporate knowledge consists of information assets that are being communicated and thus shared between individuals. Knowledge that does not "move" between individuals does not exist for the organization. For the success of an organization, it is crucial that the people working in that organization communicate and collaborate effectively.

Although the value of communication is generally well acknowledged, the increasing problem of information overload illustrates a lack of satisfying solutions. People are flooded with email and other interruptions that distract their attention from important tasks. A survey conducted in 2005, estimated that interruptions consume about 28% of a knowledge worker's time. Spira and Goldes [2007] estimate, that in 2005, the total cost to business of unnecessary interruptions was $588 billion per year.

Current corporate solutions focus on unified knowledge repositories that can be queried on demand, usually through search engine interfaces. However, foraging through search engine results is still far from a convenient and effective process. More importantly, this approach requires people to formulate up-front, what they are looking for. One other aspect that traditional models of "active information seekers" ignore, but that needs to be considered, is that people are often not aware of their information needs. Serendipity is an important, albeit unpredictable, means of discovering useful knowledge. Many people have stumbled upon useful information that they were not looking for or didn't know existed – on the Web, in a meeting, or "at the water cooler". Although serendipity can be delightful,

discovering the information after it was needed, when it is too late, can be frustrating.

For organizations, the challenge lies in getting the relevant bits of its corporate knowledge to the right people at the right time. This cannot be guaranteed by a generic and manual information retrieval system. The best search engine is ineffective, if people don't use it.

RELATED WORK

In this section we present work that is related to our problem and proposed solution. In particular, we focus on research that has been performed on sensemaking in a corporate context, as well as presenting industry solutions that are related in design or function to our research.

Sensemaking in a Corporate Context

In large organizations, the majority of information work consists of trivial, yet extremely diverse activities. As Russell [2008] points out, complex and very specialized tools do not help, or even "hinder the process of sensemaking" in these everyday activities. What is needed, are simple and unobtrusive tools which seamlessly integrate into the general workflow of most users. The typical workflow interleaves multiple tasks [Bannon et al. 1983], and sensemaking often requires moving from one application to another. Minimizing the impact of these interruptions is important for user interface designers [McFarlance & Latorell 2002]. However, in some cases, one task is undertaken to make sense of another task, as when a knowledge worker searches among an archive of prior emails or a knowledge base in order to make sense of a current email. As noted by Stasko et al. [2008] "… sensemaking in our context is the process of connecting a series of individual bits of evidence to construct a larger, broader story or narrative. Sensemaking is about understanding how the individual events and entities referred to in the documents relate to each other and, when composed together, reveal a larger plot."

Many tools for sensemaking target the structuring and representation of familiar information. Documents and other organizational artifacts represent a form of group memory [Weldon, 2000]. The difficulty for many knowledge workers is that they often do not know that relevant information exists within the organization, and if they do suspect its existence, they often do not know where to find it. As a result, knowledge workers spend inordinate time searching and sensemaking. In Millen & Fontaine [2003], users reported spending approximately 15% of their work day on accessing or acquiring information. Other surveys report higher figures. According to one market research survey, in 2005 over 25% of a knowledge worker's time was involved in searching for relevant information, up from approximately 16% in 2001 [Outsell, 2006]. A recent informal study conducted by one of the authors in 2007, revealed that staff members in a technical services organization of a large enterprise spent about 28% of their time searching for information in documents, emails and other sources. As cited in Dubie [2006], the Butler Group reports employees are both overwhelmed by the overload and lack of information; as much as 10% of staffing costs are lost "because employees can't find the right information to do their jobs".

One of the major means of organizational communication and sensemaking is email. Emails are exchanged on various topics creating many overlapping threads, which the user interface tends to separate. Connections between one email thread and another often go unnoticed (see below for discussion on Xobni). But as noted above, group memory is manifested in many other sources of information, e.g. documents, wikis and blogs.

Sensemaking is not just a matter of understanding a single document or email, event or social interaction. It requires situating that experience in the context of what else is happening within a social group or larger context. However, knowledge workers may often be unaware of what they do not know. Considering Weick's [1995] argument that organizational sensemaking is continuously challenged by the requirement for "interchangeability of people", not knowing what knowledge resides in the organization daunts every new employee, and re-appears with every new project.

Related Products

Google AdSense (https://www.google.com/adsense/) is an advertising product produced by Google that is related to providing context-sensitive advertising in an unobtrusive fashion. In Google AdSense for search, contextual advertising is provided to a user based on the keywords they are using for their search and other relevant aspects. In Google search, the advertising given is directly related to the user's search query. Google has extended this advertising strategy beyond search and, for example, provides targeted advertising in Gmail/Google Mail a pane to the right of the email that a user is reading. The advertisements presented in Gmail are directly related to the email a user is currently reading.

Xobni (http://www.xobni.com) is a product that integrates into Outlook and provides an additional pane of information related to a user's email. Like adverts in Gmail, in Xobni information is provided on the right side of the Outlook UI in an unobtrusive manner. However the content of the information is related solely to the user's email and not to any advertising. Xobni provides the ability to search through a user's emails, including all folders, and also provides threaded conversations to quickly gain context for the current email.

Additional analytic features are available, such as statistics on the email habits of contacts (e.g. times when they are most likely to respond to an email). Xobni is also capable of extracting phone numbers from emails, and can use this information to populate contact information. Thus if a user receives an email and wants to call the sender back, they can glance to the pane on the right and get the user's phone

number. Finally, Xobni also provides some social networking functionality, providing an analysis of email contacts based solely on the email received by the user.

OUR RESEARCH

Our research investigates methods for personalised and dynamic knowledge dissemination in organizations.

we propose a knowledge dissemination system (KnowDis) that provides users with information that they might find useful, without necessarily even being aware that they should be searching for such information. Such a need is particularly observable in the corporate context. For example, a wealth of information about corporate projects is typically available on web pages, wikis and other internal sites. However, employees often are unaware of the useful information residing within the corporate network or cannot take the time to find it. The result is that time-sensitive opportunities are missed, and that different units within the same organization might duplicate effort simply because there is no coordination between the units.

Another scenario that illustrates this problem is:
"The marketing division of a bank decides to analyse a user's accounts (e.g., how much debt, mortgages, credit cards, etc.) to determine products that should be targeted to the user. At the same time, the mortgage division of the bank decides to launch a campaign to ensure that people have the best mortgage types given their lifestyle, and therefore analyse the same underlying information. Thus two different divisions are creating very similar code."

The KnowDis Prototype

Our research focuses on providing users with external information that is relevant to the task that they are currently performing. We focus specifically on the task of reading email, and provide information related to the current email being read.

The prototype we develop will be integrated into MS Outlook as an add-on. The reasons for choosing to integrate the KnowDis system into MS Outlook are that email is a central communication and task management tool in many organizations [Bellotti et al, 2003; Millen & Fontaine, 2003], and that MS Outlook is a widely adopted email client in large organizations.

By offering a system that seamlessly integrates into the work flow of most users we expect significant benefits in terms of user adoption and user acceptance over a stand-alone solution. Another key benefit to this approach is speed, as users are able to quickly skim over a few contextual recommendations, while reading email.

The KnowDis Contextual Information Interface

Figure 1 shows an example user interface for the KnowDis system, where the standard MS Outlook email listing is provided, along with the preview pane showing the current email being read and with contextual snippets that link to related external articles in a side pane.

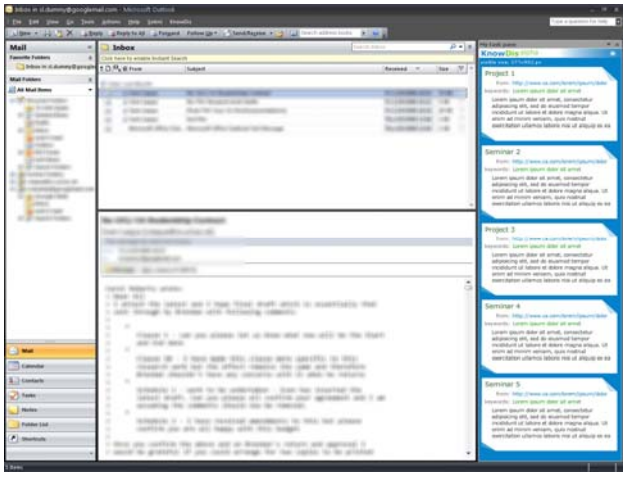

Figure 1. KnowDis System Outlook Integration (default mode)

This is similar in concept to, for example, Gmail, where paid advertisements relating to the current email being read are provided unobtrusively on the side. However, rather than providing paid advertisements, we are providing related information assets of the corporate intranet to the user. The idea of KnowDis as a "side bar" can be understood as an entry point for sensemaking activities evolving around Email. This approach focuses on increasing the awareness and grasp of corporate knowledge that might benefit users in their work contexts.

Easy access to relevant corporate information assets is the first step in facilitating sensemaking in organizations. In addition, we propose an advanced "exploration mode" for the KnowDis system, which will become part of the same add-on and thus be directly integrated into MS Outlook. Figure 2 shows a potential visualization for the "exploration mode" of the KnowDis system.

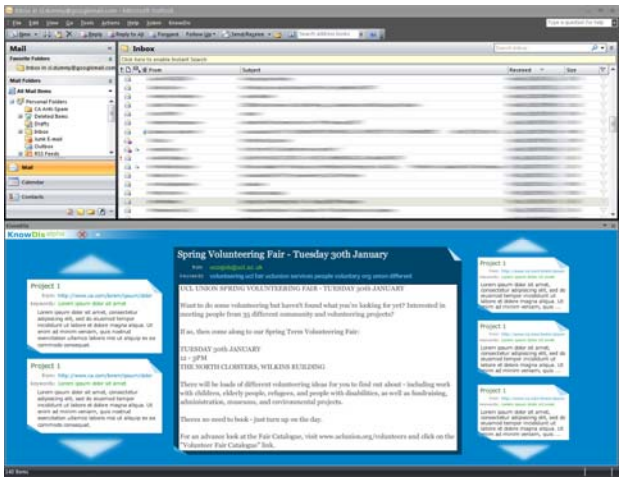

Figure 2: KnowDis System Outlook Integration (exploration mode)

In the exploration mode, the user interface enables a richer and more flexible contextual visualization of corporate information assets and a user's emails.

This approach shall enable users to flexibly (re-)organize and filter information that is relevant to their current task focus. Users will be able to access email conversations and generally related email along-side the recommended corporate information assets. The ability to skim over potentially useful information or drill for details will facilitate users' understanding of the information presented.

In this context, we will also investigate the possibility of using a focus-metaphor visualization [Laqua & Brna, 2005]. The focus-metaphor combines contextual navigation and the actual display of information, which enables a dynamic and seamless interaction with the underlying information space.

Conceptual Diagram

A conceptual diagram explaining our prototype implementation is provided in Figure 3. The task that the user is performing is that of reading their email, which they do by using (for our prototype) MS Outlook. The user opens Outlook and begins reading their email as normal. In the background, our system listens to user interactions, and processes key terms for selected email messages. The key terms are then filtered based on the user's personal profile and the resulting set is sent to an intranet search engine running on a central server. The results returned by the search engine (where the search has been performed on the internal knowledge management sites, such as internal web pages, wikis, document management sites, etc.) are then filtered again based on (anonymized) usage statistics to identify more popular (and hopefully more useful) items. The returned set of links is ordered based on a combination of the applicability of the web site (determined by the key word matching) and the popularity of the site. This information is then filtered a third time based on the user's personal profile so that, for example, previously visited sites are removed and only the desired number of responses are shown. The results are then displayed to the user in conjunction with their current email message. The user's profile is updated by the display upon actions taken by the user, such as clicking on a link.

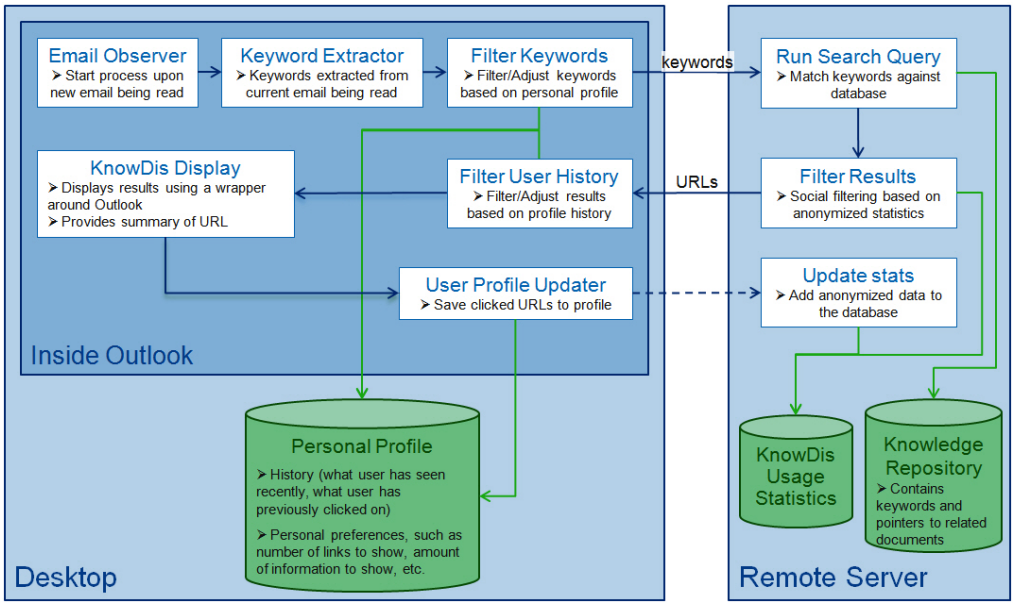

Figure 3. Conceptual Use Case of the KnowDis System

Evaluation Methodology

Upon completion of the prototype, we intend to perform the following user study with the following evaluation questions: Does the prototype facilitate sensemaking and lead to greater and more efficient use of intranet resources? Does the prototype reduce perceived information overload? And does it increase perceived social cohesion? We wish to know whether the system enables users to more easily discover useful knowledge within the enterprise and solve their problems, in a timely manner. In addition, we would like to understand whether or not the system helps users feel less overwhelmed by the volume of information residing in the intranet. Beyond its impact on knowledge sharing, we also wish to evaluate whether the system helps users feel more connected to the rest of the enterprise (from both a knowledge management and social network perspective), beyond their immediate project or department.

The prototype will be installed and accessible within the corporate network. Participants will be divided into two groups. One group will be given access to the system and the other will be the control group. Both groups will complete pre- and post-test online evaluations of their knowledge acquisition behaviors and knowledge sharing attitudes: how often do they search the intranet, how successful are they are retrieving information, how often do they miss an information source only to discover it after its value has diminished, do they feel isolated from the rest of the enterprise etc.? During the test phase, we will monitor system use, such as how often participants use the system, how frequently they click on the displayed links, and how their behavior changes over time.

At the end of the evaluation the two groups will be compared. The reason for having two groups is that knowledge management in most enterprises is dynamic and attitudes are often based on the changing organizational climates. To control for these changes we will compare the changes found in the test group with those found in the control group.

In addition, a sample taken from the test group will be observed and interviewed. These observations and interviews will evaluate the user interface and its impact on task focus and user attention, navigational decisions, intranet exploration and search efficiency.

CONCLUSION

The contribution of this paper centers on the concept of presenting information to users that is (1) relevant to their current task, but (2) which does not distract from their current task. We address the first issue by describing a prototype application where a user is presented with information from the corporate internet that is related to an email message that they are currently reading. This information is chosen based on keywords extracted from their email, and is filtered based on the user's history and profile. The second issue is addressed through the use of unobtrusive contextual visualizations, where the current task is the main focus of the application, but snippets of additional information are presented dynamically in the context of the main task. This allows the user to focus on the task at hand, but to also see related information at a glance.

REFERENCES

1. Bannon L., Cypher A., Greenspan S., and Monty M. Evaluation and Analysis of User's Activity Organization. In *Proceedings of CHI*, 1983 (Boston, December). ACM, New York, 1983. pp. 54-57.
2. Bellotti, V., Ducheneaut, N., Howard, M., and Smith, I. (2003). Taking Email to Task: The Design and Evaluation of a Task Management Centered Email Tool. In *Proceedings of CHI*, 2003 (Ft. Lauderdale, April) ACM. New York. pp. 345-352.
3. Dubie, D. (2006). Time spent searching cuts into company productivity. In *Network World*, 10/20/2006. [http://www.networkworld.com/news/2006/102006-search-cuts-productivity.html]
4. Laqua, S. and Brna, P. The Focus-Metaphor Approach: A Novel Concept for the Design of Adaptive and User-Centric Interfaces. In *Proc. Interact* 2005, Springer (2005), 295-308.
5. McFarlane, D.C. and Latorella, K. A. (2002): The Scope and Importance of Human Interruption in HCI Design. In *Human-Computer Interaction*, 17 (1) pp. 1-61.
6. Millen, D. R. Fontaine, M. A. (2003) Improving Individual and Organizational Performance through Communities of Practice. In *GROUP*, 2003, November 9–12, 2003, Sanibel Island, Florida, USA.
7. Outsell (2006). HotTopics: 2001 vs. 2005: Research Study Reveals Dramatic Changes Among Information Consumers. [http://www.outsellinc.com/store/products/219]
8. Pirolli, P. Information Foraging Theory: Adaptive Interaction with Information. *Oxford University Press*, 2007.
9. Russell, D. M., Jeffries, R. & Irani, L. Sensemaking for the rest of us. *Sensemaking Workshop at CHI*, 2008.
10. Spira, J.B. and Goldes, D.M. (2007). Information overload: We have met the enemy and he is us. *Basex Inc.* [http://www.cica.ca/download.cfm?ci_id=39403&la_id=1&re_id=0]
11. Stasko, J., Goerg, C. & Liu, Z. Sensemaking across Text Documents: Jigsaw. Sensemaking Workshop at CHI, 2008.
12. Weick, K. E. (1995). Sensemaking in Organizations. *Sage Publications*, Thousand Oaks, CA.
13. Weldon, M. S. (2000) Remembering as a social process. In D. L. Medin (Ed.). The psychology of learning and motivation. (pp. 67–120). New York: Academic Press.