Mapping the Semantic Desktop to a Personal Knowledge Management framework

Maryam Ramezani
Alan T. Burns
DePaul University
School of Computer Science
Chicago, IL
Mramezani, ABurns@cdm.depaul.edu

Abstract

Personal Knowledge Management helps users in retrieving, evaluating, organizing, collaborating, analyzing, presenting and securing information and ideas. Social Semantic Desktop seeks to be a comprehensive solution for helping knowledge workers in PKM. In this paper evaluate NEPOMUK, the social semantic desktop against features of a PKM framework. We critically examine its features to identify shortcomings and also recommend possible extensions for improvement.

1 Introduction

Personal knowledge management is an important area in need of research. The actions of enterprise knowledge workers are critical to firm performance; yet, the productivity of these workers is often lacking in this era of instantaneous digital information. The Information overload problems are not only managing the vast amount of email, web pages and so forth available, but also finding the right information to help make decisions and perform tasks.

Personal knowledge management is crucial in helping individuals organize, retrieve and reuse enterprise information, but also in creation of their own knowledge and integrating it into their own mental models.

The current desktop requires excessive effort and time to organize the information for later retrieval. A typical problem is a researcher who wants to organize all previous research papers in different folders. The traditional hierarchical folder structure does not permit the same document to reside in different folders nor can metadata or relations be added to them. In order to retrieve the documents, the user has to remember where the documents are stored or the name of the file to be able to search for it. There is no option to search for all documents related to a specific author or specific topic. Applications like Google Desktop help to index and retrieve the documents on the desktop; however, adding meta-data and relations and collaborating with other users are still not possible in a current desktop environment.

HayStack [17,18] is one of the early projects developed in MIT to create a semantic desktop which make it easier for people to collect, organize, find, visualize, and share their information. The social semantic desktop, NEPOMUK, is a more recent project that extends the personal desktop into a collaboration environment which supports both the personal information
management and the sharing and exchange across social and organizational relations. NEPOMUK seeks to be a comprehensive solution developed by a research community supported by industry leaders such as SAP and IBM. NEPOMUK intends to realize and deploy a comprehensive solution - methods, data structures, and a set of tools - for extending the personal computer into a collaborative environment, which improves the state of art in online collaboration and personal data management and augments the intellect of people by providing and organizing information created by single or group efforts. NEPOMUK is published as open-source software.

In this paper we evaluate this social semantic desktop against features of a PKM framework. We critically examine its features to identify shortcomings and also recommend possible extensions for improvement.

2. Personal Knowledge Management

Personal Knowledge Management (PKM) can be considered the next generation of Personal Information Management (PIM) systems. While the terms have been used interchangeably in literature, the distinction lies in the definition of “information” and “knowledge”. Tables 1 and 2 show some definitions for both terms.

Volkel in [14] distinguishes between PIM tools and PKM, where PIM tools manage email, calendar, and tasks, but do not support the authoring, reuse, collaboration, context management and interoperability required of PKM. Jarche describes PKM as helping individuals to organize (sort [triage], categorize, make explicit) and retrieve the information they need without extra effort. He identifies some practical problems and how PKM tools can help solve them in [8]:

1. Connect with others in a specific field in an inexpensive way (blog)
2. Mine some of the knowledge out there (feed reader)
3. Share findings, or have it available in a discussion (social bookmarks)

In our day-to-day learning, one often repeated task is making the link from “this is an interesting idea” to “this is what I know”. The Web now provides us with an array of cheap and free tools to collect and collate information.

Table 1. PIM definitions.

<table>
<thead>
<tr>
<th>Source</th>
<th>Personal Information Management Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3]</td>
<td>The acquisition, organization, and retrieval of information by an individual computer user</td>
</tr>
<tr>
<td>Wikipedia</td>
<td>The practice and the study of the activities people perform in order to acquire, organize, maintain, retrieve and use information items such as documents (paper-based and digital), web pages and email messages for everyday use to complete tasks (work-related or not) and fulfill a person’s various roles (as parent, employee, friend, member of community, etc.)</td>
</tr>
<tr>
<td>[6]</td>
<td>“the ordering of information through categorization, placement, or embellishment in a manner that makes it easier to retrieve when it is needed”.</td>
</tr>
<tr>
<td>[10]</td>
<td>“the methods and procedures by which we handle, categorize, and retrieve...”</td>
</tr>
</tbody>
</table>
information on a day-to-day basis”.

[4] “an information system developed by, or created for, an individual in a work environment”. The acquisition, organization, maintenance, retrieval, and presentation of items into the PIM system.

<table>
<thead>
<tr>
<th>Source</th>
<th>Personal Knowledge Management definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wikipedia</td>
<td>A label for the effort to integrate personal information management (PIM), focused on individual skills, with knowledge management (KM).</td>
</tr>
<tr>
<td>[7]</td>
<td>PKM attempts to utilize the computer to help the individual manage the information explosion in a meaningful way. It’s a system designed by individuals for their own personal use.</td>
</tr>
<tr>
<td>[12]</td>
<td>PKM is conceptual framework to organize and integrate information that we, as individuals, feel is important so that it becomes part of our personal knowledge base. It provides a strategy for transforming what might be random pieces of information into something that can be systematically applied and that expands our personal knowledge.</td>
</tr>
<tr>
<td>[14]</td>
<td>PKM is sketchpad to collect and elaborate personal ideas, addresses, dates, tasks, bookmarks, etc.</td>
</tr>
<tr>
<td>[9]</td>
<td>PKM is a set of processes, individually constructed, to help the flow of implicit to explicit knowledge. However, PKM is more about attitude than any particular tool set. It’s taking (or rediscovering) our innately curious nature and tapping into it so that we can continue to expand our horizons.</td>
</tr>
<tr>
<td>[1]</td>
<td>(1) retrieving information; (2) evaluating information; (3) organizing information; (4) collaborating around information (5) analyzing information; (6) presenting information; and (7) securing information.</td>
</tr>
</tbody>
</table>

3. Social Semantic Desktop

The term “Semantic Desktop” was introduced in 2003 and it is a driving paradigm for desktop computing in the area of the Semantic Web. The semantic desktop is defined in [15] as

“a device in which an individual stores all her digital information like documents, multimedia and messages. These are interpreted as Semantic Web resources, each is identified by a Uniform Resource Identifier (URI) and all data is accessible and queryable as RDF graph. Resources from the web can be stored and authored content can be shared with others. Ontologies allow the user to express personal mental models and form the semantic glue interconnecting information and systems. Applications respect this and store, read and communicate via ontologies and Semantic Web protocols. The Semantic Desktop is an enlarged supplement to the user’s memory.”

1 The Resource Description Framework (RDF) is a framework for representing information in the Web.
Decker and Frank in [16] present the Semantic Web, P2P Computing, and Online Social Networking as new technologies which can impact how people interact and collaborate and presents a vision of how the different thrusts will evolve to produce the Social Semantic Desktop, which enables people and communities to directly collaborate with their peers while dramatically reducing the amount of time they spend filtering and filing information. In a Semantic Desktop, where Semantic Web technologies are used, PIMO (Personal Information Model) is used for data integration.

PIMO is a formal representation of the structures and concepts an individual knowledge worker needs, according to her or his personal mental model. Users have a view of all of their documents, organizations, social events, projects, tasks, topics, people in a semantic network which they create for themselves. They can make relationships between each of the “Things” in their desktop. They can rate things and create annotations as well. Figure 1 shows a screenshot of a typical semantic desktop and the PIMO model.

![Figure 1: A screenshot of the semantic desktop (NEPOMUK)](image)

4. Mapping PKM framework to the Social Semantic Desktop

In this section we use the PKM framework presented in [2] and map the processes and tools of the PKM framework to the social semantic desktop. The Barth framework suggests there are seven PKM processes a tool must perform: Accessing, Evaluating, Organizing, Analyzing, Conveying, Collaborating, and Securing information and ideas.

Accessing Information and ideas: PIMO has a great structure for helping the user access the information and ideas. Different data sources such as e-mails, contacts, appointments, and files from the local file system are indexed and kept in the RDF Repository. The RDF\(^2\) structure of all resources help users to easily access information and ideas. Users can annotate resources and create relationships between different elements which can help them easily access what they are looking for. There is a class of “Things” in PIMO which includes all user’s documents, events,

\(^2\) Resource Description Framework
locations, organizations, collections, projects, etc. Users can access their information through search or browsing through the semantic network of their “Things”. The semantic desktop makes it easy for users to search for relations not only for keywords as it is in traditional search. For example, users can search for files linked to a person, city or event.

**Evaluating Information and ideas:** PIMO allows users to rate and tag their “Things”. Also, PIMO has a recommendation system that helps users through their navigation in the semantic network. The rating values are used for ranking of Things and filtering.

**Organizing Information and ideas:** Certain features of semantic desktop help users in organizing their information and ideas. Topic Hierarchies, tagging, associations and roles, Collections, and etc help users to organize their “things” and create necessary relationships to create the organization that they prefer. Users can label, name or tag things and make subclasses in order to organize their things. In figure 1, for example, Maryam Ramezani is related to DePaul, tagged with Data mining and is a member of ACM-w organization. When entering this information, the application with automatically create topic “data mining”, thing “DePaul” and Organization “ACM-w” and creates the relationships between them.

Another organizing feature of the semantic desktop is the “DropBox” in the NEPOMUK. DropBox helps user for files management. It is connected with folder “DropBox” in user’s home directory. All documents moved to this folder, can be easily annotated by you using DropBox dialog. When the user saves, copies or moves a file to DropBox’s dir, a DropBox window pops up presenting multiple folders for moving the file and tags to be added to the file. The basic idea of DropBox is to annotate files with Tags. The Tags should have assigned folder, in which the file will be stored. All files annotated by the same Tag will be stored in one directory. Users can annotate files with multiple Tags although the file can be stored only in one directory. The concept of annotating things is commonly used in the NEPOMUK semantic desktop and makes browsing through resources easy.

**Analyzing Information and ideas:** The analysis of information is fundamental to the process of converting information into knowledge. At the same time, this is the most discipline-specific information skill since the models, theories and frameworks that are central to analysis are frequently tied to the academic discipline [1]. Barth introduces summarizers, spreadsheets, and visualization tools as the main tools for analyzing information and ideas in [2]. Although NEPOMUK has an option for showing the semantic structure of all “things” and their relationships, it does not support analyzing information as much as it should do. Data mining and data analysis technique can be used to analyze the information from each individual user as well as group of users. Analyzing the information from different users, and aggregating them can help discover useful patterns which can be used in recommendations or can help in future decision making.

**Conveying Information and ideas:** The processes include answering, explaining, presenting, publishing, and teaching and the tools include office suits such as word processing, presentation, spreadsheets, databases, HTML editors, etc[2]. Adding specialty tools to help package
knowledge, such as enhancing charts and advance presentations to the semantic desktop can be helpful.

**Collaborating Information and ideas:** The Social semantic desktop utilizes collaborating through sharing, recommendations, querying, social integration, synchronization, and Networking. In particular, Sharing represents the targeted exchange of information with certain selected people, while Recommendations is the interaction which provides hints or recommends certain information resources based on some specified need. Querying is the part of a search process where systems are inspected in order to find what was requested (additionally, overcoming representation heterogeneity). Social Synchronization involves the process of locally preserving some content shared in social sites, and Networking is the action of getting in contact with other people which have similar goals or interest. [12]

**Securing Information and ideas:** Security is one of the biggest problems in social adaptive systems. Collaborating information and ideas is one of the most important points of designing a social semantic desktop to get the benefit of collaboration and sharing information. However, if there are security or privacy issues in the system, knowledge workers will not be willing to share their information or meta data which are all valuable part of information and can be transferred to knowledge in a collaborative environment.

The processes that can handle security of information are backup, inoculation, insulation, encryption and the related tools are access controls, password and encryption, virus filter and firewalls, and IP agreements [2]. NEPOMUK has a security prospective which is used for secure file sharing. The security function encrypts the file with one symmetric key and encrypts the symmetric key as many times as the number of receivers. We believe that security and privacy are still important issues that should be very carefully researched in a social semantic desktop.

5. **Conclusion**

In terms of the Barth framework for PKM, NEPOMUK is good at accessing, evaluating, organizing and collaborating information and ideas. However, it falls short as an everyday tool for managing and organizing their resources, since it needs to be more user-friendly. NEPOMUK would benefit from additional capabilities which help analyzing, conveying and securing information and ideas.

**References**


