A Personal Knowledge Management Tool that Supports Organizational Knowledge Management

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Abstract. This paper describes the concept and design of PK-MAST (a Personal Knowledge Management And Sharing Tool), which is a novel knowledge management tool and framework that seeks to bridge the gap between personal knowledge management and organizational knowledge sharing. PK-MAST gives the user a strong 'personal' feel in capturing knowledge for his/her own purposes and is very easy to use, but it also supports selective knowledge sharing with minimal effort from the user.

Introduction

Knowledge management is a process of creating, capturing, distributing, and using knowledge effectively. Knowledge, information and data are distinguished as follows. Data are raw facts. Information is data with context and perspective. Knowledge is information with guidance for action based upon insight and experience. The appropriate use of knowledge is wisdom. It has become commonplace to distinguish between the management of knowledge on a personal level and on an organizational level. The transformation of data-to-information-to-knowledge and the reverse is the foundation of information retrieval, decision-making, data mining and the knowledge management (Spiegler 2000). Knowledge management turns raw data into information (finished product) and after that into knowledge (actionable finished goods). In organizations, this knowledge is not only stored in document and electronic repositories but also in organizational routines, processes, and norms (Davanport & Prusak, 1998). Knowledge is one of the most important assets of an organization, and knowledge is held by people. Many managers would readily admit that knowledge is difficult to manage. Organizations need to create an environment where people can explore, share and put to work the knowledge that they have. A critical tool to support this environment is a knowledge management system. Knowledge management systems are widely used to manage know-how solutions that are captured from daily business processes. The knowledge is normally structured and stored in a database. Because employees are generally inactive in updating databases, extra resources are necessary to keep the database up-to-date.

Knowledge is generally classified into two categories, i.e. explicit knowledge and tacit knowledge. According to Nonaka and Takeuchi (1995), tacit knowledge is something not easily visible and expressible. The tacit knowledge is regarded as the most valuable and actionable at the same time hard to formalize and highly personal. Explicit knowledge can be expressed as something formal and systematic (Nonaka & Takeuchi, 1995). The knowledge included in work manuals, procedures, codes, audio and video records, which have originally been created with the goal of communicating with another person, is described as the explicit knowledge. Knowledge assets of an organization are based on contributions from individual employees at various levels. An employee with solid personal knowledge is of little value to the organization unless the individual can convert his or her explicit or tacit knowledge to the organizational knowledge base that is sharable by the concerned employees. On the other hand, personal knowledge management (PKM) focuses on understanding how a knowledge worker's activities contribute to the worker's own performance. Users are relatively self-motivated in using PKM tools to manage their own information. An obvious limitation of current PKM tools is that they only provide knowledge management support at an individual level. Organization knowledge indeed comes from individuals and there is the potential to develop PKM tools that can be used to capture knowledge by individuals and share it with others without the overheads of organisation-wide knowledge management systems.

This paper describes the concept and design of PK-MAST (Personal Knowledge Management and Sharing Tool), which is a novel PKM tool and framework that supports both personal knowledge management and organizational knowledge sharing. PK-MAST deals with general knowledge management issues and so routine tasks such as managing an individual's diary are not considered in this paper. In what follows, an overview of current PKM tools is presented followed by the design of the PK-MAST system. Then a description is given of the way that PK-MAST can be used to manage knowledge at a personal level and share knowledge with others. Finally the advantages of PK-MAST over conventional approaches are discussed.

Personal Knowledge Management Tools

Personal knowledge management (PKM) is a set of problem-solving skills that have both a conceptual and physical, or hands-on, component (Dorsey, 2000). PKM Tools refer to computer systems that support PKM activities. They are used routinely in managing paper documents, electronic documents, web bookmarks or one's personal library so that they are accessible, meaningful and valuable to the individual (Jason & Hixon, 1999). A list of 36 tools grouped into six categories was published in KM magazine (KM 2000). Although they are called PKM tools a strict definition might categorise most of them as PIM (Personal Information Management) tools since they do not have any knowledge of the data they manage. PKM tools can be categorized into five types (Barth, 2004):

1. Indexing and search tools. These tools index the content of local hard drive, making rapid and complex searches possible for the knowledge most likely to be immediately useful to the user. Examples include: *Enfish Professional* from *www.enfish.com* and *dtSearch Desktop* from *www.dtsearch.com*.
2. Associative links and search tools. These tools take the content of a document that the user is working on and deliver related information from the Internet. Examples include: *One-Click* from *www.gurunet.com* and *APR Smartlogik* from *www.aprsmartlogik.com*.
3. Online meta-search tools. These tools send simultaneous queries to many individual search engines at one time and deliver the results in a single list of hits. They can double the coverage of even the best search engine. Examples include: *Blogpulse* from *www.inelliseek.com* and *KnowAll* from *www.knowall.com*.
4. Web capturing tools. These tools simplify the clipping of Web pages from the Internet for offline reading, archiving and reuse. Examples include: *WebWhacker* from *www.bluesquirrel.com* and *HTTrack Website Copier* from *www.httrack.com*.
5. Organizing and mapping tools. These tools store, attach and annotate information in context by organizing it into networks, hierarchies, and reports for later reuse. Examples include *Knowledge Workshop* from *www.lmsweb.com* and *Personal Knowledge System* from *www.kwbsolutions.com*.

A key distinction of PKM tools is that they allow the user to select or shape the working environment to suit themselves. An obvious area to investigate within PKM system development is the integration of these features into a single tool. However, the current tools do not facilitate the sharing of information with others; they focus on fulfilling the needs of individuals. The themes of integration and sharing were central to the building of the Knowledge Browser (Case *et. al.*, 2003) which focussed on the personalisation needs of Web communities. To properly qualify for the title of PKM a tool should have some knowledge about the information it manages, for example via an ontology. The ultimate goal of these tools can possibly be summed up in the phrase "Semantic Desktop" coined by the Gnowsis project (Sauermann 2005) where the goal is that all information is able to be gathered and stored in a knowledgeable way. The central idea of PK-MAST is to try and retain the flexibility of PKM tools and also the typical motivation of a user to maintain their own personal knowledge base and to combine this with some organizational management features and to achieve this without destroying the feel of being a PKM tool.

PK-MAST (Personal Knowledge Management And Sharing Tool)

For PK-MAST to succeed in managing personal knowledge and selectively sharing knowledge with others there are four requirements that need to be met. First, the flexibility of PKM tools has to be retained. PK-MAST should allow users to search, capture and store knowledge in a way that is as convenient as in conventional PKM tools. In most PKM tools, knowledge is categorised hierarchically. The knowledge hierarchy represents the mental map of the individual who created it. Individuals may set up their knowledge hierarchy very differently from others because of their backgrounds, experiences, preferences, etc. Secondly, users should be able to define easily what knowledge can be shared and what is to remain private. Therefore, PK-MAST should provide both flexibility and rigorous security functions to protect private knowledge stored on the local side. Thirdly, data stored as personal knowledge and organizational knowledge must be consistent, even though the knowledge hierarchies may be different. PK-MAST should be able to perform mapping between two different

knowledge hierarchies. Transferring authorized personal knowledge to organizational knowledge and storing it in the appropriate part of the hierarchy should be performed automatically with no user intervention being necessary. In this way a corporate knowledge database is built behind the scenes with minimum resource needed. Finally, the personal feel of the tool should not be lost when being used to query organizational knowledge. Querying the organizational knowledge should be as easy as querying the personal knowledge.
Figure 1 illustrates the process of knowledge capturing, filtering, sharing and searching using PK-MAST. The system is designed based on the four requirements above.

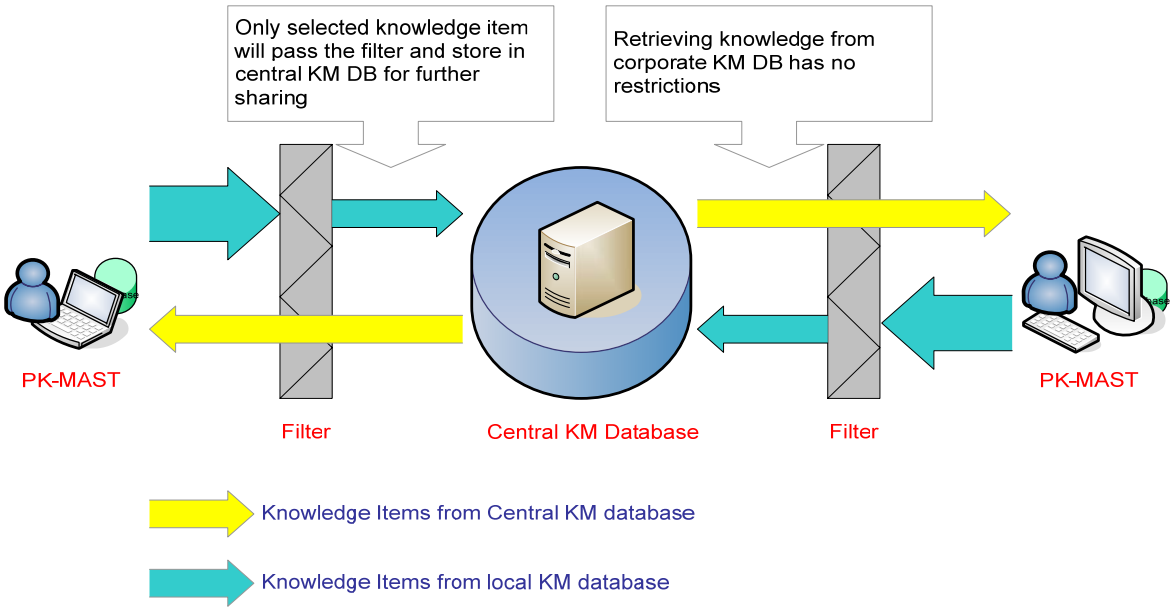

Figure 1: Knowledge capturing, filtering and searching using PK-MAST

Knowledge Capturing and Filtering

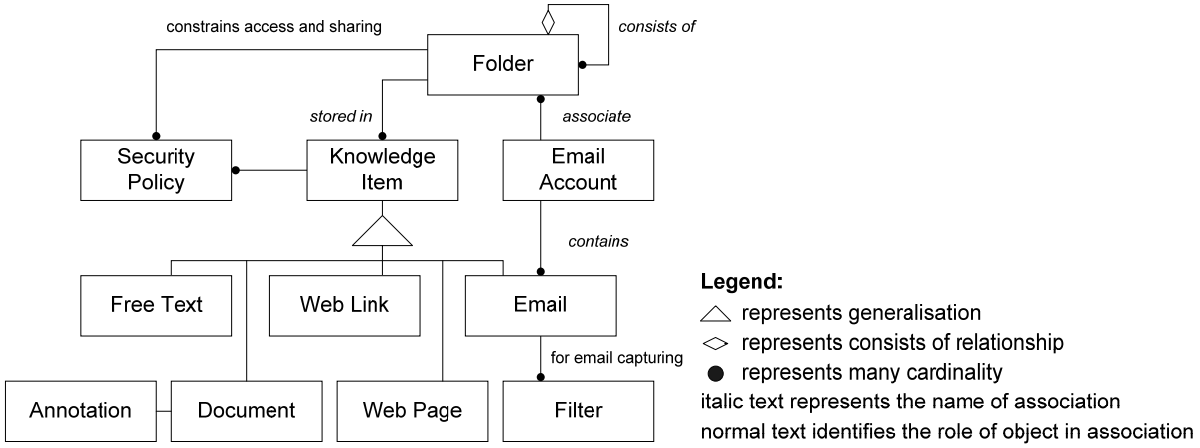

Figure 2: Meta-data model

PK-MAST can handle data in different forms and the meta-data model is shown in figure 2. The design of PK-MAST resembles Microsoft's File Explorer and, therefore, it is very easy to use. In the prototype the user interface consists of a left-hand-side panel which shows the knowledge folders organised hierarchically (see figure 3). The root folder is called the knowledge drive. The system allows multiple knowledge drives to exist at the same time. When a knowledge folder is selected the knowledge items contained in that folder will be displayed on the right hand panel. A knowledge item is any information that the user is interested in and would like to save for future use. It can be a web link, a web page or free text, or a combination of them. Information can be captured easily by copy and paste. If the source information cannot be copied, such as video or read-only

PDF files, files can be attached to the knowledge item and annotations can be added. Email is another popular medium for transferring knowledge and information. In PK-MAST, a knowledge folder can be associated with an email account. One email account may have multiple folders associated with it. An associated folder can also have filters specified. A filter is a constraint to decide whether an email should be copied to the folder or not. A filter can relate to any part of an email, such as sender, receiver, subject and content. More than one filter can be applied to a folder. The system will scan the email account regularly and if any new emails are found then they will be copied to the appropriate folder, based on the pre-defined filters.

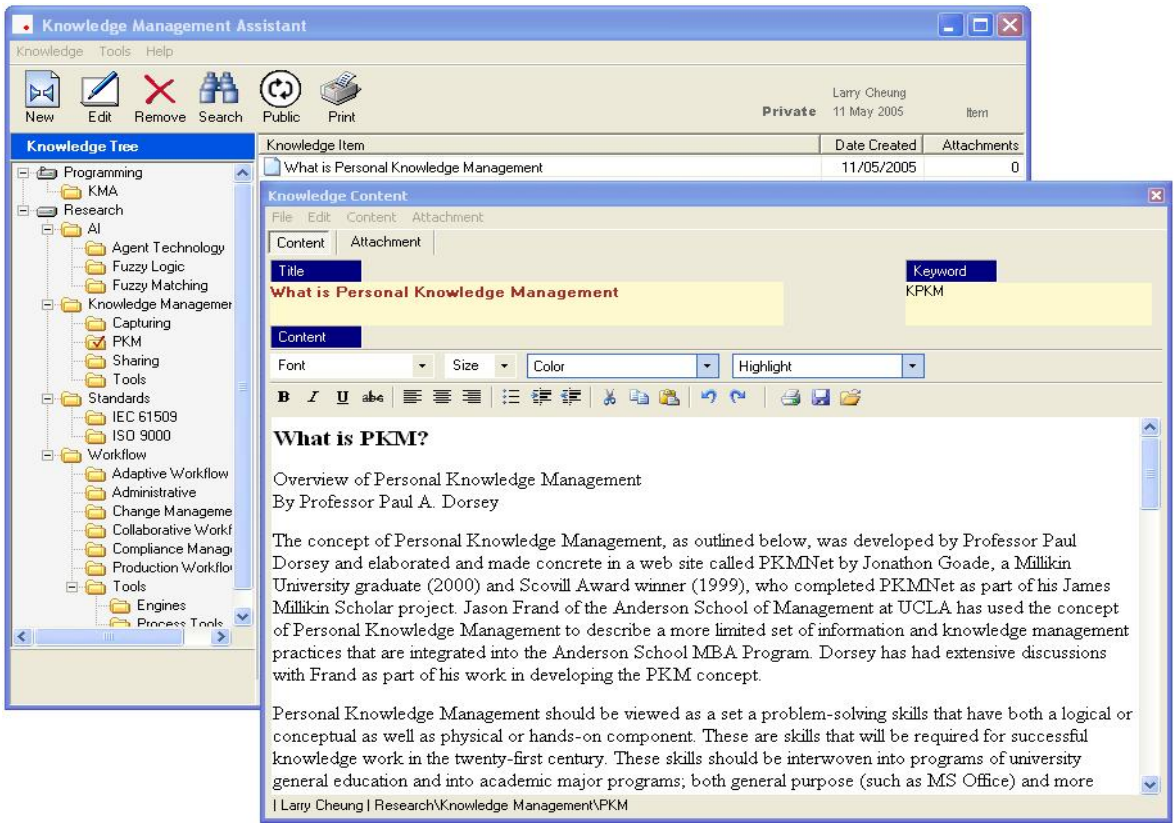

Figure 3: PK-MAST User Interface

Knowledge Sharing

Personalised support for knowledge sharing has been suggested (Dignum 2004) as a way of dealing with the poor motivation of knowledge workers to contribute their own knowledge to organisational knowledge. In PK-MAST the sharing is made automatic by links from personal to corporate ontologies. An ontology is a data model that "consists of a representational vocabulary with precise definitions of the meanings of terms of this vocabulary plus a set of formal axioms that constrain interpretations and well-formed use of these terms" (Campbell & Shapiron, 1995). An ontology is therefore an explicit representation of a "…shared understanding of some domain of interest…" (Uschold & Gruninger, 1996). An ontology can be used by co-workers within a particular domain to minimize ambiguity. An Web ontology model facilitating Web-based knowledge sharing within tourism domain was described in (Abrahams & Dai, 2005). Within PK-MAST there are corporate knowledge hierarchies and personal knowledge hierarchies. The terms used in the corporate hierarchy are drawn from the corporate ontology. Users are encouraged to (but do not have to) define their personal knowledge hierarchies. When a personal knowledge item is added to a folder, the system will make a copy in the corporate knowledge folder if a corresponding folder can be located. The correspondence of folders is determined by an ontology map. Figure 4 shows the knowledge hierarchies of two users. There is also a corporate knowledge hierarchy that represents how the knowledge items are categorized and organized organizational knowledge base. PK-MAST will compare the folder names on the corporate side with the ones on the personal sides. If a match is found the items in the user folder will be copied to the corporate side if there is no filter restriction. Matching folders are shown in the figure with lines joining them. In the example, the server side VB.NET folder would contain a copy of all the items from both VB.NET folders of User 1 and User 2, if there is no sharing restriction. The structure of the knowledge hierarchy on the personal side is not important in the matching

process. PK-MAST does not impose the corporate ontology on the user in naming folders as it will spoil the 'personal' feel, which is the strength of PKM systems. An ontology translator is embedded in PK-MAST system at the user side. It allows the user to define mappings between the corporate and the personal sides, without the constraint of using the same ontology.

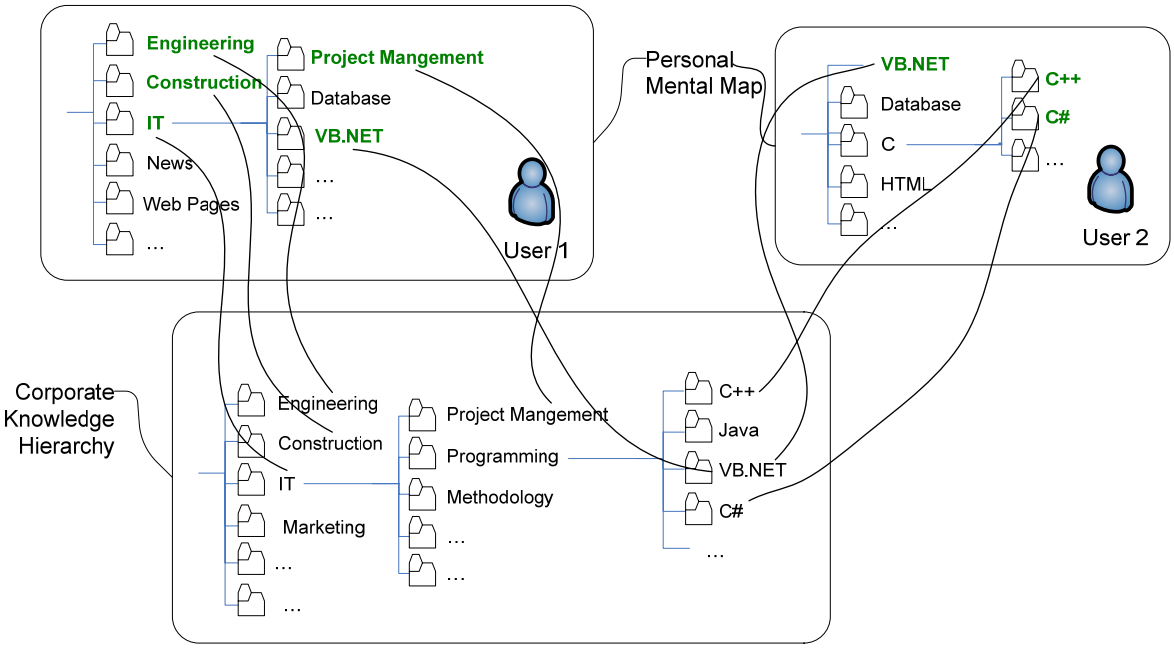

Figure 4: Knowledge hierarchy mapping

For example, the user can link the term 'activity' at the personal side to the term 'task' on the corporate side. Users are allowed to define multiple correspondent folders to one personal folder if required. If no user mapping is given then the system will simply apply the term mapping as shown in Figure 4. As an alternative to requiring the user to define the ontology mapping, a system for automatic mapping between ontologies (c.f. Chaffee & Gauch, 2000) might be considered in a later refinement.

Knowledge Searching

There are two ways to perform a search in the PK-MAST system. One is by using keyword search and the other is browsing. When using keyword search, the system will first search for personal knowledge items and then organizational knowledge items. The user can also request that the specified keywords be passed to a web search engine. Every item returned from organizational knowledge has a query score representing how many times that item has been read or downloaded. The location where the item is stored under the knowledge hierarchy is also given. The user can also browse the knowledge hierarchy to look for items of interest in a way similar to using Windows Explorer. PK-MAST provides a hot swap button on the tool bar to switch between the personal view and the organizational view.

Discussion and Conclusions

Organizational knowledge management and personal knowledge management provide two different perspectives on the development of knowledge management tools. Efforts on organizational knowledge management emphasize the importance of creating an environment where knowledge is generated, shared and used. However, it is quite common that the implementation of organizational-level knowledge management systems suffers from a lack of motivation from participants and an associated high cost. On the other hand, personal knowledge management focuses on understanding how the activities of a knowledge worker contribute to that worker's own performance. As a result, users of personal knowledge management (PKM) tools are highly self-motivated in managing their own information. An obvious limitation of current PKM tools is that they only focus on providing knowledge management support at an individual level. Given the pros and cons of the two perspectives, the research reported in this paper seeks to bridge the gap between organizational knowledge management and personal knowledge management. We propose to use a PKM tool for capturing knowledge and

sharing it with others. To the user, PK-MAST functions like a personal management tool but the framework allows personal knowledge items to be automatically transferred as organizational knowledge items if there is no sharing restriction specified on those knowledge items. Also, when looking for knowledge items, the organizational as well as the personal repositories are searched. It is these additional features for sharing and searching that makes PK-MAST an organisational knowledge management tool also. To what extent it is personal or organisational depends on how knowledge hierarchies are defined and how sharing restrictions are set by individual users. For example, if all PK-MAST installations within a company have the same knowledge hierarchy on the personal side and the organizational side and there is no access restriction then it mirrors the implementation of an organisational knowledge management system. At the other extreme, if every installation has a different knowledge hierarchy tailored for individual preferences and no item is to be shared centrally then it becomes solely a personal knowledge management tool. The degree to which these two different extremes can be mixed is entirely flexible.

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