Towards Cooperative Knowledge Management

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ABSTRACT

Knowledge management is often viewed as a structured process of eliciting, storing, and later retrieving of knowledge by individuals. In this paper I argue that knowledge management should be seen as a dynamic process—an interaction between experts. I start with a motivation for this cooperative perspective of supporting knowledge management through support for the creation and exchange of knowledge in communities. I then introduce the CYCLADES environment—an open cooperative virtual archive environment based on open archives—as an example of a cooperative knowledge management environment.

INTRODUCTION

I would like to depart from some epistemological considerations. A thorough discussion of epistemology would go beyond the scope of this position paper; nevertheless, I need to clarify some basic notions: in the context of this paper data is seen as raw; information is data with meaning; and knowledge is verified information. Expertise is seen as the 'embodiment of knowledge and skills within individuals' [9]. Whereas data and information can be easily processed by and exchanged via computers, the verification that is inherent in knowledge is typically a human activity, which can only be delegated to computers and mediated through information systems and knowledge management system to some extent. Expertise is *per definitionem* human. It is important to also see the 'knowing' and not only the 'knowledge' [1]. Therefore, sharing and exchanging knowledge and expertise cannot be automated totally.

In a study Twidale and associates [11] identified several tactics of information seekers. Information seekers can consult colleagues and ask them for information and references; they can wander around to search for information and hope to meet others coincidentally; they can do brainstorming to generate numerous ideas; or they can bibble—that is, they can look for existing bibliographies to the same or a similar topic (this strategy is often used on the WWW, when users use the bookmark list of other users with similar interests).

The results of the above studies have clear implications for the design of systems that aim at supporting the flexible sharing and exchanging of knowledge.

First, technology has to extend the reach of the single knowledge worker; so, she can easily and flexibly contact other persons and share and exchange knowledge when needed. Flexible switching between solitary work and information seeking and spontaneous contacts and dialogues with others are a core requirement for flexible sharing and exchange of knowledge. Kuhlthau [7]

developed the notion of zone of intervention as an area in which users are very efficient in gathering the information needed. She defines a zone of intervention as: 'that area in which an information user can do with advice and assistance what he or she could not do alone'.

Secondly, technology needs to empower communities of knowledge workers to establish a common knowledge base over time—often called community memory. Marshall and associates [8] argue that 'when people work together—whether in designing a product, or creating training materials from video-based documentation, or writing a coherent analysis of a complex situation in the world—they require, and put effort into constructing and maintaining, shared understandings of what they are doing'. They define a community memory as an 'open-ended set of shared interpretations and understandings developed and maintained by the group'.

CYCLADES

The CYCLADES environment supports this cooperative approach to sharing and exchanging knowledge. The CYCLADES environment is an open collaborative virtual archive environment that supports knowledge workers with functionality for searching and browsing in pre-print (e-print) archives as well as for sharing and exchanging their findings in virtual communities.

Existing systems typically only provide a part of the functionality needed. CYCLADES combines functionality that is partly available in other, more or less isolated systems. For instance, some systems support the information retrieval of online literature such as the digital libraries of the ACM and of IEEE for computer science, Math-Net for mathematics [3], or arXiv for physics [13]. Other systems such as Wikis [14] or BSCW [2] allow users to share and exchange documents in groups or communities, but do not provide functionality for information retrieval of online literature. In general, most of these systems are designed and implemented as stand-alone, closed applications.

The CYCLADES environment combines functionality for information retrieval and for sharing and exchanging information in groups and communities. It is compliant to the Open Archive Initiatives (OAi) standard—a technical and organisational framework facilitating the discovery of content stored in distributed e-print archives [10]—and can connect to any e-print archive.

The CYCLADES system integrates functionalities that support a knowledge worker in searching a large number of different digital archives. The most important features are: retrieval of information from many large, distributed digital archives; feedback on the degree of relevance of the retrieved articles; regular information about new
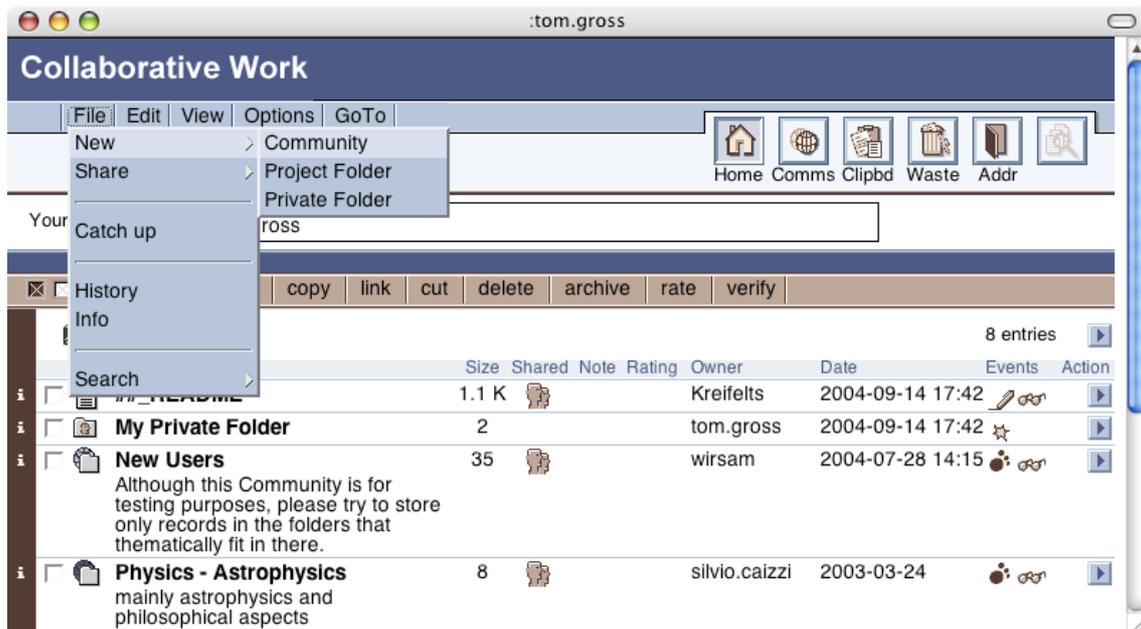
Figure 1. CYCLADES Collaborative Work Service user interface.

publications; automatic retrieval of users' long-term information needs (user profiling); automatic dissemination of relevant information to community members through recommendations; quick on-line annotations on search results; support in carrying out community services such as peer review. This community functionality enables the members to learn from, contribute to and collectively build upon the community's knowledge. Figure 1 shows a screenshot of the user interface for the Collaborative Work Service of CYCLADES, which provides the functionality for online communities.

More information on the CYCLADES functionality can be found in [4, 6]. CYCLADES is implemented as several interoperable services. The communication among these services is based on standard Internet technology using the XML-RPC protocol [12]. Consequently, the environment offers great flexibility to integrate new functionality as well as the possibility to easily update existing components. Details on the implementation can be found in [5].

DISCUSSION

In this paper I motivated a cooperative perspective on knowledge management. This has several advantages. It has advantages for real-time information retrieval, since it can help users when they are spontaneously searching for information on their own, but also when they want to contact others for ad-hoc help. It also has advantages for dealing with long-term challenges of knowledge management—through sharing documents, and search results, and so forth, the environment allows users to construct and maintain shared knowledge bases, which are persistent over time. In this workshop I would particularly like to discuss challenges and solutions for the combination of knowledge management and information retrieval on the one hand and cooperation support for presence information, communication, and cooperation on the other hand.

BIOGRAPHICAL INFORMATION
Tom Gross joined the Faculty of Media of the Bauhaus-University Weimar, Germany, as associate professor for CSCW in 2003. Before that, he was a senior researcher at the Fraunhofer Institute for Applied Information Technology FIT. His research interests include computer-supported cooperative work, human-computer interaction, and global information systems. He holds a diploma and a doctorate degree in Applied Computer Science from the Johannes Kepler University Linz, Austria.

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