

*Conversations with the Past:
Community, Technology and Interpretation
in Long-Term Knowledge Management*

**Following the Fingerprints:
Identifying Expert Assistance for Recontextualization**

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POSITION

Knowledge management (KM) and organizational memory (OM) initiatives have had a decidedly checkered history. Important understandings have been gleaned from examining successful, and unfortunately more often than not unsuccessful, efforts within diverse organizations. Resultant lessons learned include fostering an appropriate organizational culture, providing robust repositories replete with usable information-seeking tools, addressing personal cost/benefit tradeoffs, constantly culling the knowledge base, and creating/maintaining a critical mass of contributors/users. Also generalized from these cases, other challenges have been identified, both technical and social, with less clear cut solutions.

One of the most vexingly intractable problems has been the proper preservation of context – saving enough of the *right* detail at archival time to ensure that the record will be intelligible across time, domain, and audience. Vacuuming up all of the available contextual detail for the archive (“you never know what you might need”) results in a record that is unusably complex, while distilling away all of the relevant contextual detail, as is commonly done for “best practice” repositories, severely diminishes the value of that record to the point of rendering it an empty platitude.

Recently my research has focused on the other end of the transaction; not initially concerned with how to best preserve information, but instead observing how individuals attempt to reuse that information. I have concentrated on the processes of sense-making over the record (e.g., interpretation, reasoning by analogy), examining these complex behaviors for the contextual cues that we all leverage in our successful reuse activities. The intent is to re-embed these subtle hooks during the archival process to ease the later sense-making processes. As KM systems are inherently socio-technical systems, the steps of re-embedding contextual cues involve modifying both human behavior and KM system functionality.

An early finding of this line of research is that these sense-making processes are highly collaborative, which leads to the central position of this paper: people are the most critical component in recontextualization. Simply put, when we are trying to make sense of a historical record we most often trot down the hall in search of a colleague with the relevant expertise to help us out. It is through her inevitable story and our collaborative unpacking of that story, that we are able to judge the relevance of the record and adapt it to our task at hand. Thus, one of the core reuse tasks is to successfully find the *right* person to help you interpret the *right* record – it is both a social network navigation and an information retrieval challenge.

RELEVANT FIELD WORK

I have an ongoing interest in technical support environments. These have proven to be rich venues in which to explore the interplay of organizational memory and expertise in time critical collaborative problem solving. Technical support departments also tend to be on the vanguard of reuse initiatives. (This is likely due to the high volume of repetitive requests they process, coupled with the fact that they are traditionally non-revenue generating cost-sinks.) In the remainder of this paper I briefly introduce three recent field studies of technical support groups and highlight some of the emerging themes which are of relevance to this workshop.

Global Technical Services: GTS is a division within an international aircraft manufacturer which provides technical support for the operators of its aircraft (e.g., airlines and airfreight companies). Technical support in this domain involves assisting in creating, validating, and authorizing one-of-a-kind maintenance repairs to individual aircraft. One office, GTS-West, has over 200 service engineers, providing full coverage for all aspects of the aircraft. A thirteen month field study of these engineers (Lutters & Ackerman, 2002), identified myriad information artifacts functioning as “boundary objects” (Star & Griesemer, 1989). These mediated the interactions between the manufacturer’s design, customer support, and service engineering teams, the airline’s flight operations and maintenance teams, third party vendors, and federal regulatory agencies. Two important contributions of this work to the theory of boundary objects were viewing their negotiations *across time*, focusing on the requisite processes of decontextualization for archiving and recontextualization for reuse, and understanding them as *crystallizations of action* within ongoing event streams.

Medical Software Corporation: MSC is a mid-sized medical software development firm with 100 core employees. This multi-year study identified many critical expertise artifacts that mediated the interaction between development and support teams, most notably inline source code comments (McDonald & Ackerman, 1998; Lutters, et al., 2000; Ackerman, et al., 2003). Similar behaviors have been observed between design and maintenance teams in other software development firms (Seaman, 2002).

Mid-State: Mid-State represents three unaffiliated, but geographically proximal public school districts. Combined, their technical support departments have 55 staff serving 17,000 users. A common problem is that when these IT departments exhaust their internal expertise and must escalate to costly, decontextualized external consulting. In addition to six months of participant-observation, a Wizard-of-Oz field experiment “combined” their three disparate helpdesk databases into one regional knowledge base. Key findings were that relevant expertise did exist in adjacent districts, that identified experts were able and willing to assist, and that these records were more contextually relevant than from external sources (White, 2004; White & Lutters, 2004).

EMERGENT THEMES

Thinking across these studies, a set of core themes have emerged which will be introduced in kind and can be unpacked upon request for the workshop.

“Fingerprints”

Given that other individuals are the most effective recontextualization agents in reuse efforts, finding the *right* person becomes a critical task. There is on-going work engaged with developing expertise recommender systems (e.g., McDonald & Ackerman, 2000) for this task and identifying relevant information from the work environment to calibrate/maintain these systems (e.g., Lutters, et. al, 2000).

A helpful sensitizing concept in this process was to visualize “fingerprints” across these work artifacts. These could be as obvious as the original author of source code (Lutters & Seaman, 2004), as simple as

the person who last modified the code (McDonald & Ackerman, 2000), as direct as the person who approved a repair (Lutters & Ackerman, 2002), or as informal as the last person to read a message.

Through identifying fingerprints the vast pool of potentially relevant experts is substantially condensed. Examining the character and relation of these experts, based on their fingerprint information, can reduce this further, resulting in a manageable subset of potential contacts for assistance in recontextualization.

Part of the call for this workshop is to consider long-term reuse. This was a significant problem at GTS where technical support was responsible for aircraft dating back to the 1930's. All of the obvious fingerprints no longer had current employees attached to them. The engineers were adept at finding surrogates – people in similar specializations, colleagues who had worked during that era, etc. Identifying the original fingerprints first was key to being able to navigate among the space of all possible surrogates.

Boundary objects

As mentioned above, a core finding of the GTS study is that boundary objects are uniquely rich sources of relevant fingerprints (and thus are optimal artifacts for archival within a KM system). These work artifacts are privileged because they serve as a locus of negotiation among the relevant original actors. Preserving the lightweight links to these individuals in the archival record proved more valuable to later reuse than cramming additional contextual detail into the record (a later, less successful KM system design). Current field work on software maintenance teams intends to confirm and expand these findings.

Informal work artifacts

Unfortunately, robust boundary objects are not omnipresent in all workplaces. Less fingerprint-dense, but infinitely more common are the epiphenomena of routine work. Information rich sources, such as help desk queries and knowledge base interaction histories, and information poor sources, such as personal meeting notes, bristle with expertise markers (Lutters, 2004; Lin, et al., 2004) and relevant fingerprinting.

Storytelling

Once the relevant expert has been identified, the primary means of sense-making around the organizational memory record is storytelling – explaining its relevance within its past contextual web and reasoning toward its current utility (Orr, 1996). This held true across all three field studies. Service engineers (Lutters, 2003), software engineers, customer service representatives, and IT staff all relied on stories amongst themselves to help make sense of historic records.

Storytelling is not only important for sense-making in particular instances of reuse, but also as a means of supporting the “ongoing process of reinterpreting, extending, and re-applying” as described in the workshop call. Personal, oral tradition is the primary social structure, operating in parallel with technical structures, in most successful knowledge management efforts. It is critical to acknowledge, address, and support this integral social component of socio-technical KM systems. (A CSCW'02 workshop on storytelling meaningfully engaged the design space surrounding the development of tools to support this collaborative activity.)

In conclusion, I am encouraged that a workshop is addressing these critical KM concerns and that it is doing so within the intellectual framework of the CSCW community. I look forward to engaging debate.

BIOGRAPHY

Dr. Wayne Lutters is an Assistant Professor of Information Systems at UMBC and is affiliated with its Interactive Systems Research Center. His research interests are in the intersection of CSCW, HCI, and knowledge management. Specifically, his contemporary research has centered on the role of memory and expertise, as mediated by information artifacts, in collaborative problem solving. He has significant

academic and industrial experience conducting field research (esp. requirements gathering and *in situ* evaluation) on collaborative information systems, including projects at both Microsoft and Boeing. Dr. Lutters earned his MS and PhD in Information and Computer Science from the University of California, Irvine and his BA in Cognitive Science from Connecticut College.

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