

# Exploiting User and Process Context for Knowledge Management Systems

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## 1 Introduction

In application areas like personal information agents and intelligent tutoring systems, user models typically maintain sophisticated representations of personal interest profiles and knowledge / skill levels. These representations can be utilized for effective information retrieval and filtering as well as for personalized information presentation.

Information delivery services within organizational memories mainly address the same goals, but prevalently derive information needs from the concrete business task at hand (e.g., see [2]). To this end, business process models are extended by task and role specific information needs. Usually, it is not taken into account which employee actually deals with a given task. Apparently, intelligent information services in a business environment should combine both, the personal and the business process perspective.

In this paper, we present the FRODO architecture for business process oriented Knowledge Management which amalgamates models of tasks, roles and users into a specific context for information supply. Thus, a better integration of individual and organizational concerns in the Organizational Memory (OM) can be achieved.

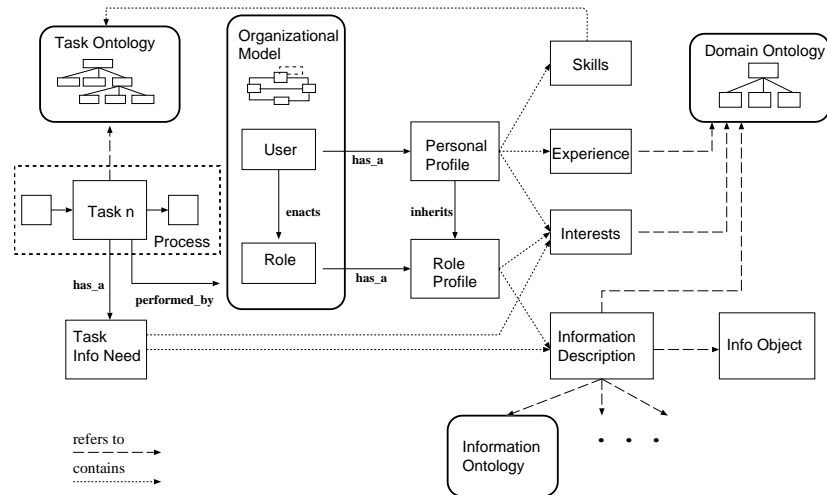
## 2 Process and User Models for Enhanced Information Support

The business process orientation in Organizational Memories allows active services as well as a powerful assessment of information relevance with respect to the actual work context. We will combine this with the User Modeling approach with its strict orientation towards personal needs and requirements. So we can say the context of a knowledge worker's information needs is determined by three main factors: 1) the individual person, 2) his/her position in the organizational structure, 3) the task at hand.

Taking into account all these dimensions promises better results than concentrating on any subset. For example, different persons may have varying information needs with respect to the same tasks, depending on their personal skills and knowledge. Surely, knowledge can vary individually within a group of people that can perform the same of tasks. On the other hand a large portion of

knowledge will typically be shared within such a group. The information need itself is—at a specific point of time—predominantly triggered by the task at hand. E-mail lists or news groups are a prominent example for systems that well take into account the user’s interests in specific topics, but ignore the actual task context. Such a continuous push without a notion of the job actually to be done can be very disturbing. A task and topic specific push service neglecting organisational roles and which does not regard the specific viewpoints, foci of interest or presentation preferences of, e.g., the project manager and the project secretary can be even unproductive.

If one accepts that personal factors, the actual task context in the business process and the user’s organization role are the relevant determinants of an actual information need at a moment, the next question is how to appropriately reflect this assumption in a system architecture. Besides basic ontological considerations which suggest that in a proper declarative system design different dimensions of information need context should also be represented separately, there are also practical reasons for having all three facets as explicit building blocks in a system toolbox. Fig. 1 shows the distribution of knowledge about information needs over several profile parts and constituents as we designed it for the FRODO system architecture [3]. Please note that this figure does not contain *all* elements and relationships which are relevant, just those useful for explaining the message of this paper.



**Fig. 1.** Integration of Task, User and Role Profiles in the OM.

What are the main elements of this modeling approach?

- *Business process models* (BPM) consist of a number of tasks.

- Specific *tasks* in a BPM are instances of generic tasks (e.g., programming, negotiating, searching for information, ...) which are arranged in a task ontology. The task is equipped with a specification of the organizational role of a possible performer of this task (e.g., the leader of department XY, or the boss of the employee who started the business process) and a specification of the generic information need, the task info need.
- An *organizational role* is embedded in the organizational model and has a role information profile.
- A *role profile* states the generic, stereotype information needs of each person who fills this role in the organization. These information needs are specified in terms of topics of interest and in metadata coming from the information ontology (e.g., all department leaders are interested in all Financial Times articles independent from their content).
- *Interests* as part of a profile refer to a topic in the application domain ontology, maybe together with some more detailed information like the strength of interest.
- *Information descriptions* instantiate and use concepts and notions of the information ontology in order to characterize information objects with respect to their form, structure, context, meta properties, and content (expressed in terms of the domain ontology).
- Roles can be filled by concrete, individual *users* (one person may be in different roles in the company, and one role may also be distributed over several users) who possess a personal user profile.
- *Personal profiles* make assumptions about skills, experience level, and interests of a given person. When creating a personal profile for a new employee, one merges parts of the stereotype role profiles of the roles the employee enacts and adds individual details.
- *Skills*, typically part of a company yellow page system, describe the ability of an employee to perform certain tasks (in contrast to the responsibilities or competencies usually attached to the organizational role). Such skills influence not only the process enactment (who should do this job?), but can also have impact on assumed knowledge or information needs.
- An individual *experience level* describes the degree of prior knowledge of a person about a given topic.
- *Personal interests* specify in which topics (with which strength and what ordering, presentation etc., preferences) a user is interested.
- A *task information need* represents the interest topics relevant for a given task in a business process, maybe plus some retrieval constraints in form of metadata from the information ontology (e.g., a specific information source should be consulted to answer a given question , ...).

A similar approach is presented in [10] which uses an a-priori defined hierarchy of tasks together with their information needs as context provider. Here, the user has to select the task she currently performs. Whereas our approach profits from the **process enactment** where an instance of a business process model forms the basis for a workflow controlled by a Workflow Management System

(WfMS). The WfMS interprets the process logic represented in the BPM, goes through the modeled tasks and assigns each task to appropriate actors, according to the role they perform in the company, considerations about available resources and load balance, and existing skills as specified in the personal profile. In order to actively offer useful information support, the system uses the information flow of the workflow to instantiate the generic task info need, combines the task info need with further restrictions or additional information of the personal user profile and thus achieves a result highly adapted to the given task context, yet tailored for the individual user performing the task. (More information on using a WfMS as context-provider can be found in [7].) Such a play-together of different profile elements provides further advantages in other situations than this standard procedure:

For instance, if a user is not in a certain process at a given point of time (or, in a highly knowledge-intensive process which is not formally modeled because it is too complex or too much ad-hoc), his personal and/or role interests can be the basis for filtering or push services nevertheless. This is one of the benefits of extending a standard OM scenario with personal and role profiles.

More benefits of integrating UM and OM techniques can be seen in the area of **system adaptivity and evolution**. Though self-organization and self-adaptiveness are considered ambitious goals of OM technology, work has not been concentrated on these topics, up to now. On the other hand, the User Modeling community provides manifold approaches and achievements [5] in the area of adapting profiles on the basis of feedback and user observation. Since a main idea in the organizational KM context is not only to have precise personal profiles, but also to ‘lift’ as much profile information as possible to the level of role profiles (thus having it as a part of the corporate structural knowledge assets), techniques from UM should be integrated and adapted in a larger scenario with appropriate organizational roles (profile editors, thematic area managers, etc.) and processes. An advantage of the wide organizational scope is the coverage of potentially many individual users thus allowing us to employ social and collaborative filtering mechanisms that can process more information than that what would have been available at the single-person level.

### 3 Summary and Future Directions

User models have been identified as valuable to tailor general information delivery services to individual users. In organizational memory information systems — as parts of comprehensive/broad knowledge management endeavours — information supply is a central service. However, in addition to *personal* information agents that act on behalf of a (private) user e.g. in the WWW, systems for knowledge management also have to take into account an organizational view. In this paper, we proposed to separately model the portions of an information need that are induced by the individual information consumer, by his/her organizational role, and by the business task at hand. This allows for a flexible enactment, in the “standard case” when a task processed as well as when no

complete information about the three parts is available. Beyond that, the trade-off between demands of the individual user and the organization (prevention of knowledge isles and information drain) can be better balanced.

Our architectural assumptions fit well with other comprehensive approaches, e.g. [4] and [6]. While the former focus on cross-organizational workflows and information integration, the latter promote the integration of heterogeneous communication structures through “collection-mediated collaboration”, thus unifying personal information management with shared representations for OM. We investigated the transition from individual to shared information with special regard to the responsibilities of the various roles in such a social information space [8, 9].

In the FRODO project [3] we leverage this approach and the results of predecessor project KnowMore [1] towards a modular, agent-based framework for organizational memories in distributed environments.

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