Bridging the Gap between Knowledge Management and E-Learning with Context-Aware Corporate Learning

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Knowledge management and e-learning both address the same fundamental problem: facilitating learning in organizations. But they approach the problem with two different paradigms, resulting in two different types of system. This paper proposes context awareness with respect to the learner's or employee's context as a solution to bridge the gap. The project *Learning in Process* is illustrating a step into that direction.

1. Introduction

Learning in Organizations. That's what both (corporate) e-learning and knowledge management are about. It may appear as simple as that, but in practice there are two different paradigms resulting in two different types of systems. But with the shift to constructivist learning environments and the support of collaborative knowledge building in knowledge management systems, it becomes apparent that this separation does not make much sense and is an obstacle to more effective applications. Still, there are two rather different perspectives. In this paper, these differences and the respective shortcomings are briefly discussed. These shortcomings can be traced back to the unawareness of certain aspects of the context of the respective user. Therefore, a more thorough consideration of context is proposed as a solution.

2. E-Learning and Knowledge Management — Two Paradigms

2.1 Knowledge Management

Knowledge management is a discipline originating from management studies, but always going hand in hand with information technologies both as a reason for its necessity and as a technical solution for the implementation. Knowledge management takes an organizational perspective on learning, and the main problem it tries to address is the lack of sharing knowledge among members of the organization. Its solutions try to enable and encourage the individuals' making explicit their knowledge by creating knowledge assets or engaging in discussion fora.

The language of knowledge management is to some degree naive because it assumes that knowledge is an (almost tangible) good that can be "produced", "captured" or "transferred" and that can be summed up to a corporate memory. Starting from metadata-driven document management, knowledge management has now adopted communication and collaboration solutions in order to address the problem of tacit knowledge. Still, knowledge management does not fully realize that it is mainly about facilitating purpose-oriented *learning* in organizations and that thus understanding how *learning* takes place is extremely important to consider. And learning – in the view of modern constructivist learning theories – is not just transferring knowledge; it is a highly individualized task of construction.

2.2 E-Learning

E-Learning, or better computer supported learning, focuses on the individual's acquisition (or rather construction) of new knowledge and the technological means to support this construction process. One of the main assumptions in e-learning coming from pedagogy is that learning needs or can be improved through *guidance*. The typical form of guidance is the teacher or tutor organizing the learning process. But e-learning has also transferred the concept of lessons to computer-based courses, consisting of several learning resources that are connected with one another in a meaningful way. This comes from the pedagogical insight that it matters for the efficiency of learning in which order learning resources are offered, which can encompass both more traditional courses, modular learning objects, but also more elusive interaction possibilities. This concept of guidance also leads to an asymmetry and a separation of the roles author/tutor and learner. Authors and tutors are pedagogically and didactically trained persons while learners typically are not.

State of the art e-learning approaches provide very sophisticated ideas for improving the learning process. However, its focus on didactically well-founded learning material with rich media content and complex interaction profiles makes it impractical, especially in cost-sensitive corporate settings. While it is true that a clear didactical approach and rich learning programs facilitate the learning of the individual significantly, e-learning approaches have so far not been able to solve the problem of producing these kind of materials. Simulations close to the real world are the perfect answer to constructivist learning theories, demanding situated learning [8] with a high degree of engagement of the learner. But the "real world" in companies looks different. There are some more advanced courses, mostly bought from external training providers. But the majority of learning occurs from less perfect things, authored in a more peer-to-peer manner that still provide significant opportunities to learn. This is especially true for innovative topics, constituted by "less mature" knowledge for which there is no consolidated view, or highly specialized, company-specific subjects.

3. Towards an Integrated View with Context-Awareness

What separates the world of e-learning and the world of knowledge management is their respective limited and isolated consideration of context. If context is perceived on a broader scope, e-learning solutions can "learn" that corporate learning takes place in an organizational context, that learning processes are most often triggered by immediate real-world needs. e-learning can also "learn" that the authoring takes place (and is encouraged to take place) in the same context as the learning itself, thus integrating the peer-to-peer knowledge sharing philosophy.

On the other hand, knowledge management can "learn" that the context of the individual matters, that delivery of information pieces does not help if the individual is ignored, her current state of knowledge into which the new knowledge pieces should be integrated, her most efficient form of learning, which probably includes more than just a document.

On a technical level, what do we have to do?

We need to **capture the context** of the learner and the situation in which learning occurs. This encompasses both the work context (the individual's position and role in the organization, current process or task) and the personal characteristics with respect to learning (previous knowledge, personal goals, cognitive style etc.). This context should be managed in a way so that several applications can view and update this context in a mutually enriching way.

We need to **provide context-aware delivery methods** to account for the fact that a learner in a company is not primarily learning, but usually working and interrupting their work for learning. Current methods are only suitable for long-term strategic learning, but not for immediate learning on demand (although there is some research in that direction, e.g.[9]).

We need to perceive that **resources themselves are created in context and interrelated** with other resources and this context makes a difference in making sense of the individual resources.

In knowledge management research, there have been some approaches to exploit context for improving the solution (e.g. process context in [1] or [2]). An approach to the problem from the e-learning point of view was taken by the project "Learning in Process" the results of which are briefly summarized in the following section.

4. The Case of LIP

Learning in Process ([3], [4]) has been a project with a consortium with learning technology experts, knowledge management companies and researchers of context-aware information systems. Its primary goals have been the integration of working and learning on a process level and learning management, knowledge management, human capital management and collaboration solutions on a technical level. The focus of the project has been on the incorporation of context-awareness into the design of learning solutions[5].
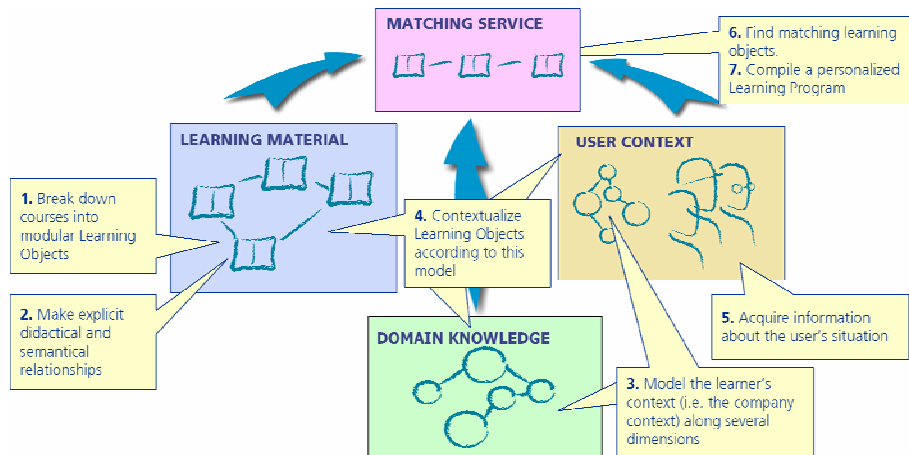
Fig. 1. LIP Matching Procerdure for learning material

Its nucleus is a matching procedure (see Fig. 1) that allows for compiling on demand personalized learning programs based on the current competency gap. This competency gap is computed based on the previously acquired competencies of the user and the competency requirements of the user's current work context. This context is modelled along dimensions like role, organizational unit, process and process step and tasks. Each of these context entities has some competency requirements attached. Additionally, this context model has also features for expressing learning related properties for selecting the most appropriate learning resource (e.g. interactive vs. passive content). The competencies are based on a knowledge area ontology, which can be shared with knowledge management application and skills management in HR applications. The context can be captured from other systems having a partial view of it already (e.g. like HR or workflow management systems) or from the user's interaction with everyday applications (e.g. Microsoft Office or enterprise software).

The context information is furthermore exposed via the SCORM API and can be used for the creation of adaptive learning objects. Learning objects themselves are expected to be modular and self-contained; they are described by their objectives and prerequisites in terms of competencies. They can have dependencies on other learning objects, which are taken into account by the system.

On the delivery side, LIP has elaborated a new type of learning process: context-steered learning. This learning process is initiated by recommendations of the system for the current situation (via a so-called Learning Assistant). These recommendations can be embedded into the user's application or displayed unobtrusively by a separate application.

The system (see Fig. 2) has been designed using a loosely coupled, service-oriented approach with SCORM compliance:
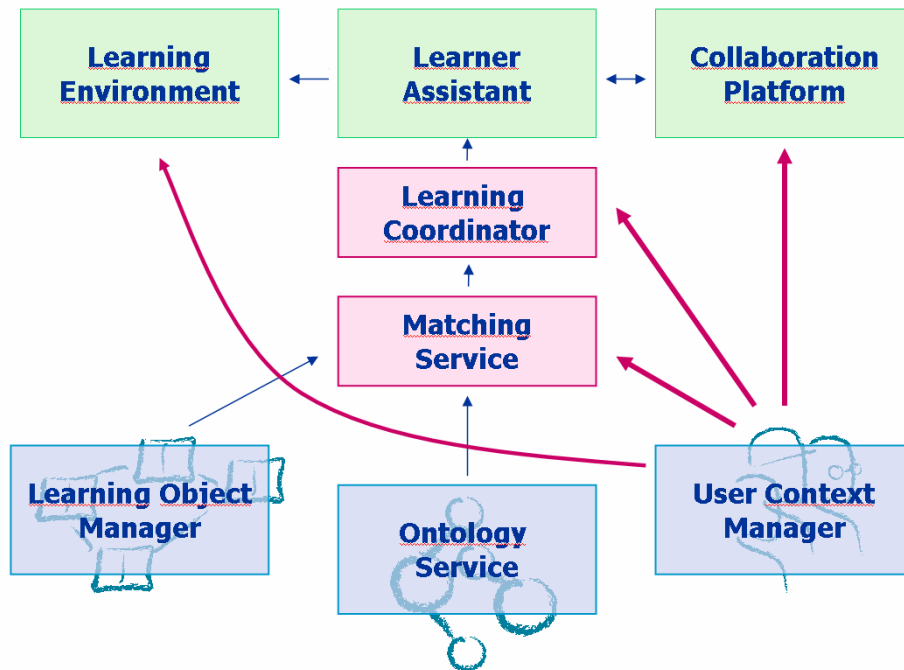
Fig. 2. Loosely coupled architecture of LIP

For managing the context, a generic **User Context Manager** [6] was developed that can collect this information from various sources and support different services with a specific views.

As sketched above, a **Matching Service** can compile personalized learning programs from the available learning material (*Learning Object Manager*), the user's current context (User Context Manager) and the context's knowledge requirements (provided by the *Ontology Service*).

A **Learning Coordinator** decides based on context changes when to display suggestions about available personalized learning programs and communication or collaboration spaces.

Learning can be organized by the learner in the **Learning Environment**, which allows for finding, scheduling and executing learning programs. Additionally, it makes available through the SCORM API the user's current context in order to enable adaptive learning content.

A **Collaboration Platform** was "contextualized" with the help of this service by providing contextualized expert finder functionality, group formation and interaction spaces, where learners can themselves create "knowledge assets" which can be made available (e.g. by recommendation or in self-steered learning processes) to other learners based on the context in which they were created.

5. Conclusions and Outlook

The LIP approach has shown how e-learning systems can be made more aware of the context in which learning takes place. This allows for a natural integration with knowledge management functionality which has a more peer-to-peer philosophy *and* for the creation of higher quality e-learning objects which are adaptable to the context in which they are executed. Evaluation studies have shown that the user acceptance of such systems is fairly high and suggest that this blending of e-learning and knowledge management functionality can help to improve workplace learning.

As a next step, we plan to explore the possibilities of automatically contextualizing resources to provide contextually enhanced navigation support [7]. This will allows for an exploratory learning environment in which both didactically prepared learning resources and knowledge assets created by users can be presented in a uniform way. These navigational support elements will not only be based on the user's context, but also on the context of the resource.

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