

Microlearning and the Knowledge Maturing Process: Towards Conceptual Foundations for Work-Integrated Microlearning Support

Andreas Schmidt

FZI Research Center for Information Technologies
Haid-und-Neu-Str. 10-14, 76131 Karlsruhe (Germany)
Andreas.Schmidt@fzi.de

Abstract: As a response to the new flexibility in work environments, work-integrated learning on demand is an appropriate form of learning which is in line with microlearning ideas. But in a world of microcontent, we need to consider that not all content is appropriate for everybody. The knowledge maturing process allows for distinguishing between different levels of maturity, and technical learning support based on the maturity level can provide automated guidance to make microlearning more efficient.

1 Introduction

The new flexibility of workers and work environments makes traditional conceptions of training in advance, in rather large units and separate from work activities, more and more obsolete. It is not only the problem of inert knowledge (i.e., knowledge that can be reproduced, but not applied; Bereiter 1985), but also the degree of individualization of learning paths (especially of knowledge workers) these traditional methods cannot cope with. It is increasingly recognized that what we actually need is a learning on demand, embedded into work processes, responding to both requirements from the work situation and from employee interests, a form of learning crossing boundaries of e-learning, knowledge management and performance support (Schmidt 2005).

Such an embedding can be realized with microlearning approaches (Peschl 2006) which can be characterized as forms of learning in which learning processes consist of fine-grained, interconnected, but loosely coupled learning opportunities. Such learning opportunities can range from didactically prepared learning objects, via microcontent in the context of social interaction (like weblogs, wikis) up to direct communication opportunities with others. The conception of microlearning corresponds with results from information behavior research, e.g., Bates' berry-picking model (Bates 1989) combined with Kuhlthau's constructivist view of information seeking as a learning process (Kuhlthau 2004): knowledge workers collect bits and pieces from various sources in order to solve their problems, and the whole information seeking process is characterized by an accompanying learning process.

Experiences with implementing a microlearning approach for workplace learning (Schmidt & Braun 2006) have shown we cannot rely on a completely self-directed form of learning, but rather have to find a new form of guidance appropriate for the fine-grained learning experiences. Initiating learning activities within work processes is cognitively challenging because it requires realizing a learning need and translating into searching, structuring, reflection, and other activities – and all this in a world of abundant microcontent and other micro opportunities.

In this world of microcontent, which will become even more abundant with empowering every user to contribute their microcontent, we desperately need some form of orientation that allows some form of judgment what is appropriate for whom. It should be obvious that beginners in a topic area have a hard time in learning from informal discussions (instead of high-quality text books) while for expert these contextualized bits and pieces are just what they need. The idea of microcontent does not render quality or pedagogical appropriateness obsolete. So we need a notion of maturity both on the side of the learner and on the side of the content (or the knowledge it tries to convey, respectively).

In this paper we want to investigate how the knowledge maturing process model from (Schmidt, 2005), designed as a conceptual bridge between e-learning and knowledge management, is helpful in that respect. In a first step, we provide a brief review of the process model (section 2) before discussing the implications in section 3 and drawing conclusions in section 4.

2 Background: The Knowledge Maturing Process

Based on observations in corporate environments, the main driver for developing the knowledge maturing process was to structure the landscape of learning in organizations and to overcome the disruptions between disciplines like knowledge management, human resources development, and e-learning. The starting point was the idea of a “knowledge flow”, which is seen as a metaphor for interconnected individual learning processes where knowledge is passed on and reconstructed and enriched by the individuals involved (through transformation, combination etc.). Translated into the microlearning environment, this means that learning in such a knowledge flow involves learning from others or their microcontent and further developing and passing on of constructed knowledge to others by direct communication or producing (micro)content.

If we have a closer look at this knowledge flow, we will discover that we intuitively speak of “consolidating” knowledge, “putting things into the context of a bigger whole”, or just about knowledge that is “not mature enough yet”. This applies to both the individual knowledge and the artefacts produced in the course of passing on. In a first step of formalizing these observations, five phases have been identified (see fig. 1):

1. **Emergence of Ideas.** New ideas are developed by individuals in highly informal discussions. The vocabulary used for communication is vague and usually not shared beyond the originator. Typical microcontent involved are personal notes.
2. **Distribution in Communities.** This phase accomplishes an important maturing step, i.e. the development of common terminology shared among community members, e.g., in discussion forum entries or blog postings.
3. **Formalization.** Artefacts created in the preceding two phases are inherently unstructured. In this phase, purpose-driven structured documents are created, e.g., project reports or design documents. In the microcontent perspective, these documents are not necessarily monolithic wholes, but can consist of connected content chunks that are put into a meaningful order (by making explicit their implicit relationships).
4. **Ad-Hoc-Training.** Documents produced in the preceding phase are not well suited as learning materials because no didactical considerations were taken into

account. Now the topic is prepared in a pedagogically sound way, enabling broader dissemination.

5. **Formal Training.** The ultimate maturity phase puts together individual learning objects to cover a broader subject area. As a consequence, this subject area becomes teachable to novices.

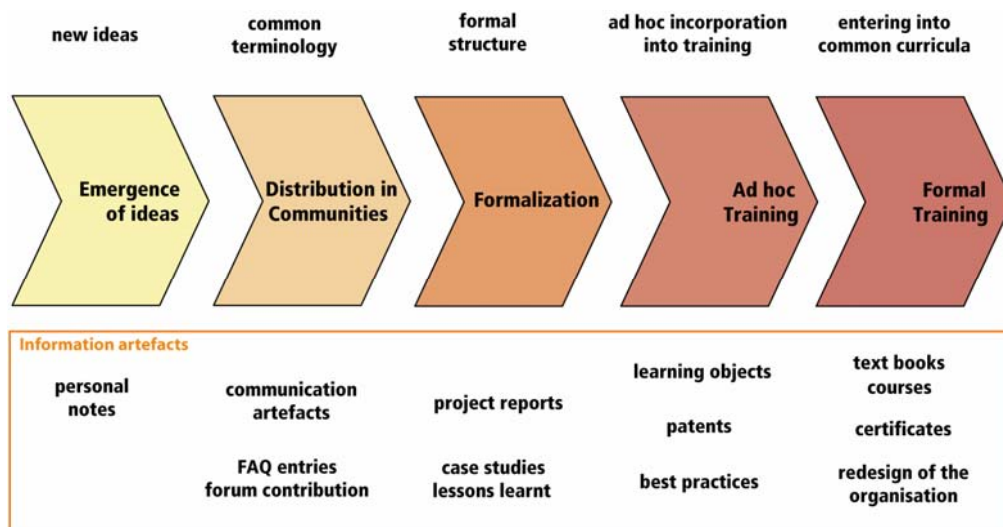


Figure 1: The Knowledge Maturing Process (Schmidt, 2005; Maier & Schmidt, 2007)

As (Maier & Schmidt 2007) have found out, there are (among others) three important characteristics to describe what happens along the process:

- **Interconnectedness/contextualization.** “Learning is network creation” (Siemens 2005). With the deepened understanding, connections to other topics become visible and explicit. This must not be confused with contextualization of knowledge which decreases in the knowledge maturing process and refers to the degree of *implicit* linkage to the creation context, so that it cannot be used outside the original context. Contextualization and interconnectedness are inverse properties.
- **Teachability.** As knowledge maturing is basically interconnection of individual learning processes where knowledge is taught and learnt, an important criterion is its teachability. Whereas immature knowledge is hard to teach (even to experts), formal training allows by definition for wide-range dissemination.
- **Commitment/legitimation.** Within organizations, the knowledge along the maturing processes increases with respect to the amount of support it gets. Support can be in the form of commitment by members of groups, teams, communities or other organizational units. Another form of support can be authorization to use knowledge by supervisors, executives or committees as well as legalisation and standardization.

3 Maturity-Awareness for Microlearning Support

The knowledge maturing process is an elegant macromodel to analyze the learning in organizations, but if we want to actually provide (technical) support to make this process

more efficient or to derive from it something that just makes the individual learning more efficient, what should we do? A generic approach is that we provide an environment where (1) the individual is seen as a consumer as well as a contributor and where (2) suitable forms of learning for each maturity level are fostered.

But we want to go beyond these generic issues. As (Schmidt & Braun 2006) have shown with their context-steered learning approach, recommending appropriate learning resources is a good way to support learning on demand from a technical side. The most important observation for supporting learning in the knowledge maturing process in that way is that the maturity of content (or the maturity of knowledge that a person tries to communicate to the learner) correlates with its appropriateness for the learner's competency level in the topic area. This can be naturally derived from pedagogical results about the appropriateness of different types of learning depending on the competency level (e.g., Röder 2003). An example: for a novice, discussion artefacts are often incomprehensible because they are highly contextualized. On the other side, an expert does not profit much from a textbook on the subject she is expert in. So we should take into account the maturity level together with the competency level of the target learner when recommending appropriate resources: point novices to introductory courses, point intermediates to past experiences and point experts to frontiers of where new ideas are communicated.

The idea sounds compelling, but what do we need to realize this?

- We need **indicators for the maturity** of microcontent. How do we determine that a certain resource is of a certain maturity?
- We need a relatively fine-grained **determination of the competence level** of the learner **with respect to the topic area**. How do we know which level of competence the learner actually has?
- We need to determine the **topic area** of microcontent and what it is potentially capable of conveying to the learner.

This definitely not an easy task, but is it a mission impossible? A first step could be wiki environments in which articles are tagged based on their alleged maturity (like in Wikipedia). While this approach does not require sophisticated technologies for automated determination of maturity levels, it is constrained to a single technical environment.

In more open environments, the enabling technology is user context management (Schmidt & Braun 2006) and acquisition techniques like the attention metadata approaches of (Wolpers 2006) or task mining approaches like (Rath et al. 2007). These approaches try to capture what the actually does in order to exploit this information for adaptive applications. A user context management component provides an up-to-date view of the user's context, hiding from applications the complexity of acquiring, aggregating, augmenting and harmonizing raw data.

Based on such an infrastructure (cp. Fig. 2), we can *estimate the maturity of content* based on its creation context, its usage context and associated explicit user evaluations. The combination of these types of information allows for powerful heuristics, e.g., the average distance of creation and usage context is a good measure for maturity, reinforced by positive user evaluation.

This means that we need to conceptualize microcontent as artefacts

- created within user activities (resulting in metadata about the creation context, taken from the context of the creator at the respective instant in time)
- made use of within user activities (resulting in metadata about the usage context, also taken from the context of the user at the respective instant in time, possibly augmented by explicit user feedback like ratings or bookmarking)

Also for *determining the competence level of a user* (if not explicitly available within skills or competence management approaches), user context over time can provide hints what the user usually does – and thus infer with the help of some background knowledge which competencies the user is likely to have. The topic area, finally, can be determined based on explicit classifications (file system, document management system) or informal tagging approaches.

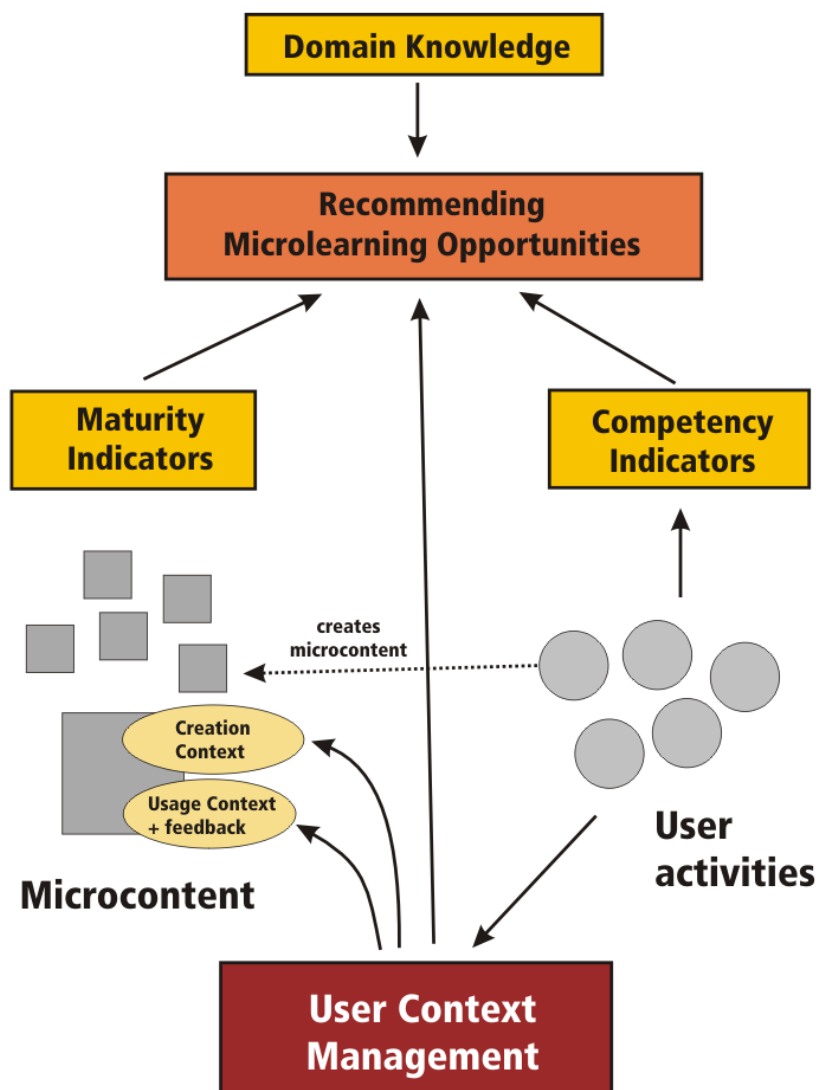


Figure 2: Concept of Maturity-Aware Learning Support based on Microcontent

4 Conclusions and Outlook

The notion of knowledge maturing allows for bringing structure into a world of microlearning with microcontent by distinguishing different levels of maturity and the transitions between them. Furthermore, it provides the conceptual foundations for supporting such learning activities by indicating the appropriateness of content pieces for a specific user. Such a support can be implemented using user context management as an enabling technology. First research results of such context-aware learning support (Schmidt & Braun 2006) are promising and are currently further developed towards a maturity-aware learning support. A step beyond would be the investigation into fostering maturing processes within microcontent environments, which can also be based on usage data.

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