

# Virtual Communities: Analysis and Design Support

Ralf Klamma<sup>1</sup>, Marc Spaniol<sup>1</sup>, Matthias Jarke<sup>1,2</sup>

<sup>1</sup> RWTH Aachen, Informatik V, Ahornstr. 55, 52072 Aachen, Germany

<sup>2</sup> Fraunhofer FIT, Schloß Birlinghoven, 53754 Sankt Augustin, Germany  
klamma@cs.rwth-aachen.de

**Abstract.** Information systems engineering for design or knowledge communities is characterized by the fact that these communities constantly monitor themselves and initiate repair processes (i.e. re-design and community learning) when disturbances occur. In this paper, we present ATLAS, a digital media information systems engineering environment that takes systematic advantage of the productive role of such disturbances which typically occur when designers recombine digital artefacts for new applications. The approach is based on interdisciplinary research on the mutual impact between media change, knowledge organization and cultural communication conducted in Germany's Collaborative Research Center on Media and Cultural Communications. The approach has been validated in an advanced chat tool for aphasics.

## Introduction

Current information systems engineering support for web communities focuses on a priori known needs, tools/media, community topics, and user groups. This is neglecting the fact that these are part of a learning process which outcomes can not be known in advance. ATLAS (Architecture for Transcription, Localization, and Addressing Systems) is a community analysis and design environment aiming at alleviating these shortcomings. ATLAS conceptualizes the analysis and design processes of communities as learning processes which integrate discursive communication structures and knowledge organization within digital media. Starting point of goal definition and needs elicitation within communities are disturbances in the communities. Since we do not know community goals and needs in advance ATLAS needs the ability to recombine digital media in an almost arbitrary manner. Learning, knowledge creation, usage, and maintenance processes are traceable in media commenting on media. Analysis and design methods are content or community based (semantic zapping) and concentrate on de-contextualizing and re-contextualizing media specific knowledge in a multimedia knowledge repository. This requires metadata management facilities for description of context knowledge, multimedia search and retrieval as well as automatic reasoning support in our knowledge base. The underlying software must be flexible enough to allow community users to design and implement their own community services. Integrated with the platform there should be tools for measurement and simulation.

The rest of the paper is organized as follows. We present our community learning approach. Then, we describe the ATLAS architecture which is designed to fulfill the requirements. For validation we report a case study implemented on top of the ATLAS architecture. We conclude with a discussion and an outlook on further work.

## **ATLAS: A community analysis and design environment**

We conceptualize the learning process within communities with modifications and extensions to existing models of learning in organizations [5]. Nonaka and Takeuchi [4] presented a comprehensive model of how Japanese organizations dynamically create knowledge. Knowledge creation is reached by the interplay of implicit and explicit knowledge. Implicit knowledge is personal knowledge that is hard to formalize or communicate to others. Explicit knowledge is formal knowledge that is easy to transmit between individuals and groups. The four modes of knowledge conversion are: socialization (implicit → implicit), externalization (implicit → explicit), combination (explicit → explicit), and internalization (explicit → implicit).

Community learning can be characterized as a form of network learning since the learning process is oscillating ontologically from individual to extra-organizational structures like networks and markets. The five enabling conditions for learning - intention, autonomy, fluctuation and creative chaos, redundancy, and requisite variety - are features which are also suitable to describe network structures.

The design of community systems depends on a tight interplay between the organization of knowledge and communicative processes within the communities of practice [6]. While the prerequisites are made very clear by Nonaka and Takeuchi it was always a mystery what was driving the organizational learning spiral. Following discussions in many disciplines like organizational theory, learning psychology and information systems we argue that observed disturbances from inside or outside the network are the critical factor for successful learning.

Recent linguistic studies [2] claim that it is impossible to create knowledge separately from the media through which it is communicated. Therefore, the traceable process of knowledge creation requires a careful integration of multimedia processing and ontology-based knowledge engineering techniques to add formal but community specific semantics to multimedia artefacts.

ATLAS (cf. figure 3) is a community analysis and design system especially handling digital multimedia knowledge representations created by virtual communities. It consists of several crucial parts which can be best explained by starting within learning communities dealing with digital content. With the proposed theory, learning takes place when the knowledge is successfully internalized within our community. One way of externalizing this progress is by *creating new content for the community*: reports, chat room contributions, etc. Externalized content is managed in a community *usability repository* together with community relevant information while all the metadata are managed in an *XML multimedia repository*.

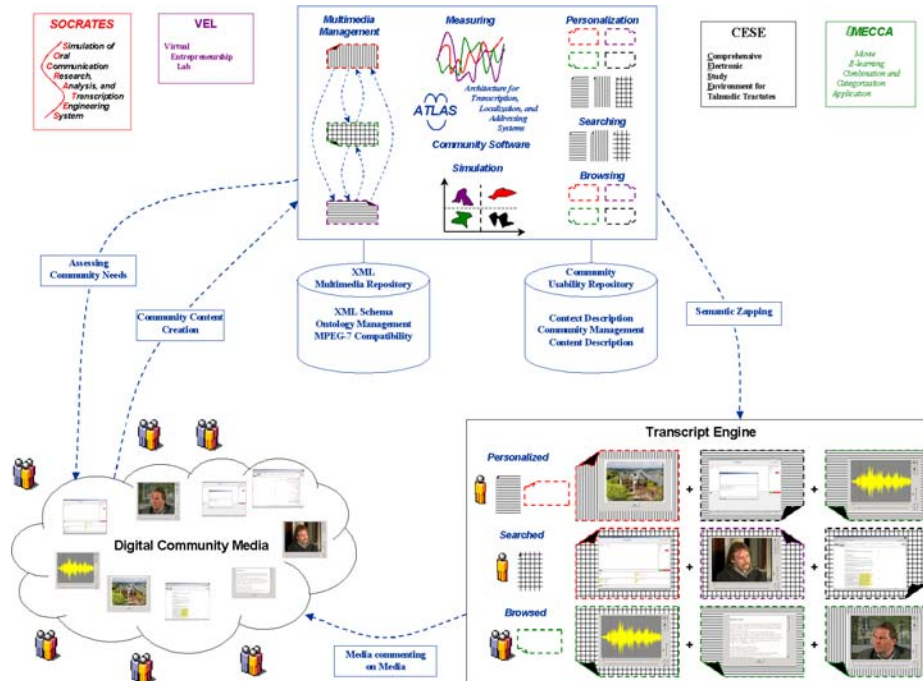


Fig. 1. ATLAS Conceptual Architecture

ATLAS components perform media specific operations on the *repository* guided by the metadata available in the repository. The *measuring component* is constantly *assessing community needs* by gathering and evaluating data while needs elicitation is also facilitated by community centered discourses producing other kind of digital content. *Searching, browsing, and personalization* are components for the transcript engine which allow the community to comment on existing media by using other digital media thus addressing their own needs or stabilizing media addresses. This is done by metadata supported *semantic zapping*. This is application independent so that it is possible to recombine multimedia artifacts in compliant ATLAS applications.

## Conclusions and Outlook

In this paper we argued that current community design environment lack support for community learning processes driven by productive disturbances caused by the media usage or the community practices. We provide a community learning framework. On the basis of this framework we defined a conceptual architecture ATLAS for specifying, realizing and hosting virtual communities. Community-centered analysis and design tasks could be traced in an XML based knowledge repository to support goal definition and requirements elicitation within the learning communities

together with the communities of designer and community developers. To prove our concepts we supported four communities with the ATLAS environment.

The Virtual Entrepreneurship lab (VEL) [3] and the video triage system MECCA are video based learning environments in a constructivist setting, focusing on learning from media specific disturbances and using the transcript zapping facilities of the ATLAS environment to support students in context and content switching. Main contribution of the design and implementation process to ATLAS was the openness of the systems. To guarantee this openness all metadata for the different media has to be represented in an open and flexible manner which reduced the development time for the second system dramatically from months to weeks.

The comprehensive study environment for a Talmudic tractate (CESE) [1], an XML based hypertext environment with dynamic stylesheets, focuses on making the disturbances productive caused by the multidimensionality of the original Talmud. It is possible to switch one context like language while other contexts are retained.

The SOCRATES combined chat and talk community tool for aphasics emphasizes the whole learning process for all community members, for the aphasics themselves, the therapists, the linguists and the community developers. This is realized by a series of self-monitoring processes and repair sequences to overcome disturbances caused by disabilities of the users and the digital media.

Further versions of the ATLAS system will be made public on a community host system (<http://www.graeculus.de>) to support emerging virtual communities.

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