

A Reference Model for Online Learning Communities

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MOTIVATION AND INTRODUCTION

Information and communication technology renews society and with it the skills expected to be developed in education. The new platforms for communication provide ubiquity and persistence for information and they distinguish themselves through interactivity and the means they provide for structuring data, communication and processes. They set apart successful platforms in their services to a community. Education may benefit from those platforms - provided the platforms are designed to meet the requirements education poses.

In this article, we present as our main contribution a reference model for online learning communities. This reference model structures the design of online communities and gives guidelines on how to design a medium for learning.

We think of online learning as a process that takes place at the intersection of social and technological systems. Accordingly, the models that we provide take equally social and technological perspective into account. The framework employs to some extent concepts and language of computer science, since requirements for learning have eventually be translated to computer science to build those platforms. For modeling, we employ the media approach of Schmid (1997, 1999, 2000) on communities and their media. Moreover, we think of learning to take place in any community and in collaboration. Therefore, we introduce with Online Learning Community a general framework for modeling the people involved in learning and the medium for learning that constitutes this community. A medium as defined by Schmid (1997) comprises the carriers for the transport of information, together with the syntax and semantics of information and the organizational context of roles, protocols and processes the carriers are embedded in. In modeling, we focus particularly on the role of a medium in structuring knowledge and communication in learning and for supporting meta-

cognition. In this paper, we focus on executive and higher education with their didactic goals and on platforms provided by information and communication technology for education.

This article is organized as follows. We discuss didactic goals in higher and executive education and the role of communication platforms in striving towards those goals. The theoretical framework of communities and media is introduced in the next session. Then, the concept of online learning communities is explained. Based on this concept, we then present the reference model for online learning communities. We then conclude the article with a brief discussion and further work.

LEARNING - DIDACTIC GOALS AND LEARNING PLATFORMS

Learning forms have undergone changes in the past and those changes have been triggered both by technology and by society. The discussion about new learning forms is provoked by changing requirements for Higher Education. In literature, many pedagogic models of interactive instructional design are proposed. Each of them has its dimensions to be considered for the instructional design of a system. Well known is, e.g., the model of Reeves (1992) with its 14 dimensions for the evaluation and positioning of interactive learning systems. This model provides methodical guidelines but neglects technological aspects for the design of learning environments. Apart from the pedagogic model,

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literature provides a number of technology-oriented frameworks. Well known is, e.g., the E-Learning Architecture Model of Milius (2000). Typically, in these frameworks methodical and community organizing aspects are not considered in those frameworks.

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intersection of complex social and technological systems. Education is supposed to develop skills necessary in a society increasingly influenced by information and communications technology. Let us discuss the requirements towards education concerning knowledge, learning methods, meta-cognition and context.

Regarding *knowledge*, information and communications technology contributes to the increasing amount of information available. The goal in education is to teach knowledge not additively but inter-linked by means of questions arising from business practice and scientific research. Only such inter-linked knowledge can be consciously disposed of in concrete situations. The quantity of information and the speed information gets outdated demands that *formative, open-up knowledge* be taught which enables the learner to apply knowledge creatively to problem-solving, and, also gives her/him the opportunity to create new knowledge. The linkage of factual knowledge and creative problem solving techniques may constitute such formative open-up knowledge.

Regarding the *learning method, process-oriented learning methods* gain more and more importance compared to subject-oriented or product-oriented methods. The reasons are twofold. First, actively accomplished knowledge in learning- and thought-processes facilitates future problem solving by similar modes of thinking and learning in an environment where the mere quantity of information and the speed at which it outdates increase. Second, objectively correct truth of knowledge which the learner is required to accept and store up in their entirety can no longer be

However, both the requirements for Higher

Education and the potential of technology have to be considered in the design of learning methods and platforms for education. Online learning is a process that takes place at the

assumed. This holds true in particular in executive education, where students and teacher share knowledge gained in individual careers. The role of learners as passive recipients is reconsidered, as the community of teachers and students share knowledge following *collaborative learning methods*. *Complex learning settings* foster acquiring of formative, open-up knowledge in a process-oriented, collaborative way.

With regards to the *steering and controlling, meta-cognition* has to be fostered as a crucial capability for acquiring and applying open-up knowledge. Learners must develop meta-cognitive capabilities, to plan, supervise and judge their own learning processes, reflect upon their own achievements, and, in the event of failures, upon ways of remedying them. Seufert and Seufert (1999) proposes that such meta-cognitive capabilities are best fostered in complex learning situations

Concerning the *context of learning*, complex learning situations provide the linkage between disciplines and between practical application and scientific research and provide the basis for collaboration to share knowledge among students and teachers. One goal of executive education is to foster the collaboration among teachers and students such that this collaboration evolves into a network that lasts beyond the learning in a course. Each participant in this community contributes with her/his experiences and knowledge and its connections to other communities where he/she belongs. Other context setting restrict the interaction to the classroom and consider only the knowledge to be taught, as e.g., the traditional teacher-centered learning methods.

Conventional media used in learning as, e.g., books can only support aspects of knowledge, method, controlling and context. E.g., books can themselves hardly be updated when information becomes outdated, they can be used in process-oriented learning and for collaborative learning - but they can hardly support the interaction and processes themselves. The same holds for conventional teaching in a classroom. Process-oriented learning, especially when done Online, i.e. in a computer mediated form, needs sophisticated services to support it. The media provided by information and communication technology provide properties that set them apart from traditional media. They provide ubiquity and persistence to information, are interactive, and provide various means for representing, supporting and structuring data, communication and processes. In this paper, we present a framework for designing online platforms.

Note however, that it is not technology alone that renews learning. Ubiquity and interactivity of the carriers facilitate distance learning or computer

supported collaborative learning. Those learning forms are basically electronically mediated forms of traditional learning. With the means to represent, structure and support processes media can be designed to support learning much better than conventional carriers. This means more freedom in choosing pedagogic approaches and using process-oriented methods, collaborative approaches and complex learning situations become feasible.

From a pedagogic point of view, Paloff and Pratt (1999) have analyzed learning communities to be a new model for innovative learning. They provide methodical guidelines and effective strategies building learning communities in "cyberspace" - but do not consider technology with its means for structuring and organizing, opening and linking knowledge and communities, which enables organization of long-lasting communities with persistent communication and knowledge in an open way. We aim to explore in particular those dimensions in design. The translation of pedagogic goals into requirements towards a platform yields the following requirements:

- a means to present both factual knowledge and creative problem solving techniques and the linkage between them, as well as interdisciplinary linkage of knowledge and linkage of business practice and scientific research.
- support for subject-oriented and process-oriented learning, i. e., the platform has to present knowledge to be considered objectively true along with processes to strive towards shared knowledge and means to share individual knowledge within a community.
- support fostering self-steering capabilities and meta-cognition and to supervise processes and provide guidance if necessary.
- support of complex learning settings with an integration of business practice and scientific research in collaborative learning.
- foster a long lasting evolving community.

Platforms for learning can be designed to meet those requirements. However, models and design method have to take both methodical and technological perspectives into account. In the following section, we introduce such a comprehensive model.

COMMUNITIES, MEDIA AND COMMUNITY SUPPORTING PLATFORMS

Learning -as other communication or collaboration- involves carriers of information provided by technology and is embedded in organizational and social systems. The goal of the design of a platform is to provide the

channels for communication as well as the services for structuring and organizing information and processes according to the requirements of the organizational and social systems. The model for Online Learning takes both the technological as well as the social perspective into

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account. However, since learning cannot be considered a process to be isolated in space and time and since learning platforms can take advantage of services employed for other ways of interaction (cf. Complex learning settings and inter-linked knowledge) we base the model of Online Learning Community on Schmid's general model for communities and the notion of a learning medium on Schmid's generic model of a medium (1997, 1999).

At the beginning of the 1990s, important promoters of the Internet such as Esther Dyson (1997) and Howard Rheingold (1993) succeeded in fully establishing the term "community" – although it could be argued that they overidealized the concept in parts. Armstrong and Hagel (1996) were the first not only to see a social phenomenon in the concept of virtual communities, but also to combine this with a new business model, which uses new possibilities for communication on the Internet to generate electronic market places and to enhance customer relations. A *community* is defined as an ensemble of agents sharing a language and world with values and pursuing common interests. As Lechner and Schmid describe, the agents are connected via a medium on which they act in roles (Schmid 1999, Lechner and Schmid 2000). *Online communities* distinguish themselves by using electronic media.

We define media as information and communication spaces, which enable communication and coordination within a community of human and artificial agents. A *platform* is an implementation of a medium. According to the media model of Schmid (1997), media are described in terms of:

- (a) a shared logical space of the language employed in communication,

- (b) a channel system to transport information over space and time,
- (c) an organization with roles to describe rights and obligations of agents and with protocols the way interaction takes place.

Let us give an example for a medium and its platform. A learning unit is a medium. It is characterized in terms of (1) the language employed by teachers and students, e.g., natural language with a subject specific vocabulary, (2) the channels for transport of information over space, as e.g., air, blackboards and books, online learning environment as carriers of information that transport information over space and time and by (3) roles as "teacher" and "student" that are assigned to agents and protocols as "lecture" suggesting that, e.g., the teacher lectures while the students listen silently. The community is defined in terms of this medium and the people participating in the course.

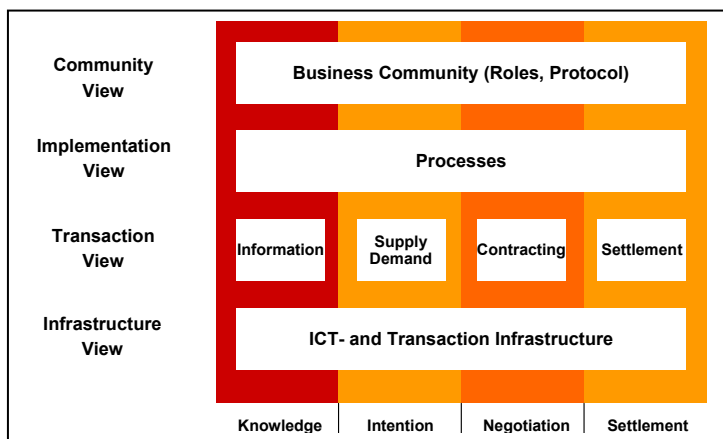


Figure 1. Media reference model (MRM)

As a platform for this medium, i.e. as the physical part of a medium, one can employ e.g., a collaborative learning environment, a shared application as NetMeeting or a (conventional) classroom. These three platforms distinguish themselves by the degree in which they actively support the community and the degree in which they implement the medium. Let us explain this. A collaborative learning environment may implement the roles of teachers and students with the respective protocols for interaction such that e.g., the input devices for students are blocked as long as the teacher lectures. Here, the platform supports learning and implements significant aspects of a medium. A shared application provides means for communication. However, it does neither restrict nor support interaction in a learning specific way, according to the learning methods with their roles and protocols. The platform facilitates communication but does not support actively the community in learning and implements only the channel system of a medium but not the services, organization

and processes. This is similar to a traditional classroom which provides the means for interaction (blackboard, whiteboard, air to communicate voice). Those carriers do not support the organization and the processes - students may chat while the teacher lectures. While a shared application can make interaction persistent - a traditional classroom even lacks this capability.

As this example illustrates, a medium can be implemented on a variety of platforms - we are particularly interested in platforms that provide more than mere facilities for communication. We would like to take advantage of the means for structuring information and processes and in the interactivity of novel carriers that facilitate the platform to play an active role in the community. To be able to initiate or support and foster online communities properly, a deep knowledge of their structure and components is required. We consider a community to be constituted by a set of agents and the medium. The interdependence of the two constitutional components of online communities implies that in order to support online communities the appropriate medium has to be built, which enables the required communication and coordination forms and storage facilities required by the community. This relation between community and platform, of social and technological perspective and the kind of services a community needs is detailed in the media reference model (Schmid 1999).

The four phases distinguish four kinds of communication acts with their services to communicate, structure and organize communication relevant for collaborative achievement of targets in a community setting. The services provide the channels offered by the medium. We distinguish communication and services:

- (1) for knowledge, more concisely for information which is known and available in the medium,
- (2) for communicating of intentions, which express interests, needs, requirements, requests and offers of community participants (intention phase),
- (3) for negotiation of binding contracts between agents documenting obligations of agents necessary for achieving common goals (negotiation phase),
- (4) for settling obligations with the respective means for cooperation and coordination in order to perform the in a contract agreed upon task (in the settlement phase).

These four views of the reference model also provide a guideline on how to structure the design and implementation of building a medium for online communities: The first step is the identification of the community of agents with their interests, the common logical space for capturing the information to be

communicated and the organizational structure which describes Stanoevska-Slabeva and Schmid (2000). This step is represented by the community view to design the organizational model. In the implementation view, the scenario model is planned and the descriptive model of the community view is related to the required or available services. Here, the services are determined and combined in processes. The service view designs the interaction model for the community. Finally, the infrastructure view aims to create the technological model of the learning community supporting platform. Note however, that those steps can be combined in a different way, e.g., to design the scenario model for a community with its pedagogic approach from a given set of services implemented in some given technology. Here, the community view on the one hand, and the service and technology view on the other hand, have to be provided for the process model.

ONLINE LEARNING COMMUNITIES

The concept of an Online Learning Community is derived from the general concept of community to be constituted by agents and a medium on the one hand and the didactic objectives of learning on the other hand. This is depicted in Fig. 2.

We define online learning communities as *ensembles of agents, who share a common language, world, values in terms of pedagogical approach and knowledge to be acquired and pursue a common learning goal by communicating and cooperating through electronic media in the learning process*. The common interest of this type of community is the common interest in learning.

Usually, within online learning communities several communities can be distinguished. Similar to academic or corporate universities, campus-wide activities and social life can be differentiated from the activities in a classroom. We distinguish two kinds of online learning communities:

- the "*Campus Community*" characterizes the campus-wide community including course management activities (e.g., applying for courses, choosing electives, offers and demands for internships, etc.) as well as social life and knowledge exchange activities that happen informally and are not initiated by any course design or didactic approach.
- the "*Classroom Community*" identifies the formalized community of a class in a study program. Here, the learning takes place following a designed didactic approach. More or less concretized learning goals are planned for the knowledge exchange and transfer among the students that takes place in a

more formal learning setting combining different learning methods.

The key question that we would like to answer in the next section is how the issues in learning can be implemented in a structured way in media and on a platform. By applying learning processes and approaches into the media reference model we will present a reference model for online learning communities.

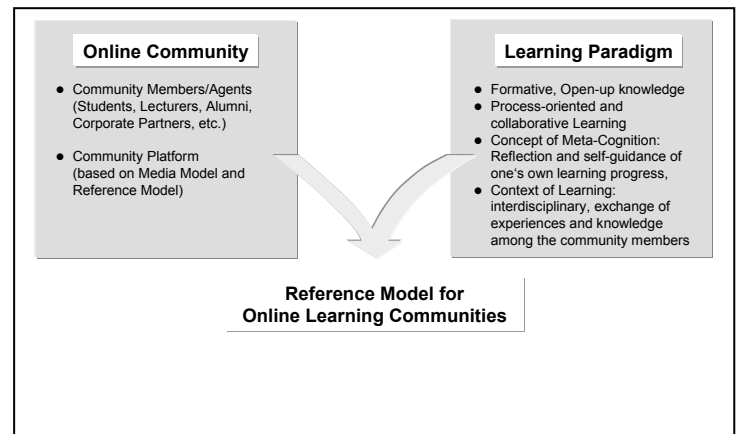


Figure 2. Online learning communities

THE REFERENCE MODEL

In this section, we map the above described learning methods and courses into the generic media reference model (c.f. Sect. 3) which results in a reference model for online learning communities. We proceed as follows. Fig. 3 gives the Reference Model of Online Learning Communities and, subsequently, we explain the views beginning with the Community view.

COMMUNITY VIEW

The *community view* defines the "*organizational model*". Here, first the goal of the community, second its language and third the organization in terms of roles and protocols are being determined. We proceed as follows. We explain the interest first, then protocols and roles and subsequently define the language.

COMMON INTEREST

The common interest of a learning community is "learning". The goal of a community can be described in terms of knowledge, processes, meta-cognition and social aspects (the context which is to be established) (cf. Sect.2). According to those four dimensions that can be applied to the initial community and the goal to be achieved in learning, we distinguish three study categories (1) contact studies, (2) self-studies and (3) context studies.

- *Contact Studies*: At the beginning of a study program, i.e. in a community with little common knowledge, organization and language to base learning on, the focus is on guided learning processes and socializing processes. Face-to-face contacts play an important role. The instructor assumes a very active role, directly conducting and controlling the learning processes. In contrast, the learners remain inactive, as they are assigned the passive role of recipients of instruction. The methods of choice are instructor-centered, such as lectures, and question-and-answer sessions.
- *Self-Studies*: At a more advanced learning level, less frontal-approach methods of teaching (indirect leadership) can be applied. Here, all activities come under the heading of Self-Studies or self-directing learning and are controlled by the learners themselves. They guide, plan and supervise their own activities and learning processes, thus fostering meta-cognitive development. Learner-centered methods are integrated, such as learning with self-study materials, learning with webquests, case studies, and field studies with problems to be solved: each of them allow learners to work independently.

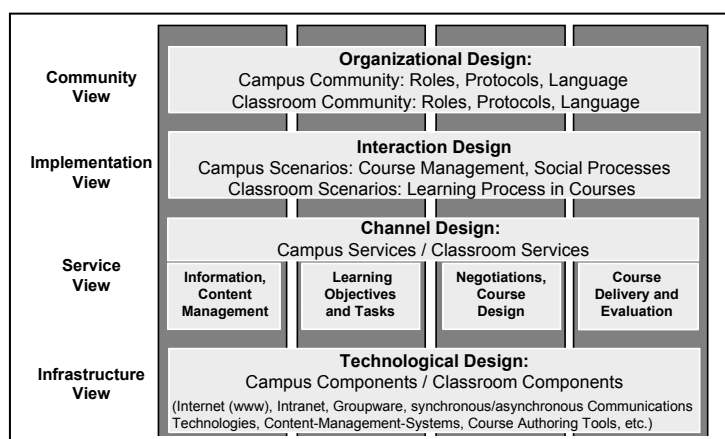


Figure 3. Reference model of online learning communities

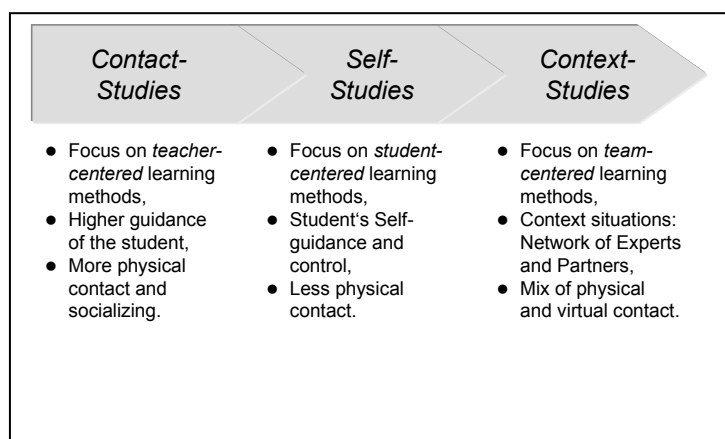


Figure 4. Study categories

- *Context-Studies*: At the highest achievement-level, the emphasis can be laid even more strongly on the learners' own creation of knowledge, in consultation with the instructor. Work in groups leads to critical reflection and can thus contribute to the building-up and maintenance of values. Examples of such team-centered methods are role-playing, or virtual seminars using different, conducted discussion-forms. Webquests, too, can be developed as groupwork, often in combination with role-playing. The individual members take a very active part, although the group-interaction is of chief importance. The learning situations are extremely problem-oriented corresponding to "real world projects" focusing on multidisciplinary aspects.

Note that a course typically uses a variety of learning methods to accomplish a learning goal stepwise. We refrain from discussing this combination of goals, learning methods and media here. These three study categories are to be applied depending on the state of the community and the goal to be achieved. In Fig. 4, from left to right the students are given more and more scope for an informal exchange of information, so that an informal learning community can flourish, with, if so desired, the additional presence of experts to play the part of consultants. The changing function of the teacher from direct instruction to indirect instruction and, finally, to learning consultation reflects, after all, the various didactic goals mentioned in chapter 2: formative, opened-up knowledge should be taught (especially for beginners), to prepare for self-guidance, and focused on process- and context-oriented collaborative learning). Each learning community applies one specific combination of learning methods and courses or several of them. The specific combinations define the required services and processes which should be made available by the medium. Note that in this first step in the design of a learning community we do not distinguish campus and classroom community - both have to design their goals to be achieved in learning and in both cases they state in an initial community status.

PROTOCOLS AND ROLES

After the goal in terms of pedagogic aspect is determined, the organization to reach this goal has to be chosen. This organization is also given in terms of the pedagogic approach, i.e., the learning method to be applied. Here we focus on Online learning methods. The protocols of the community deal with the interaction on the campus in general - with management, organization of courses, selection of

courses, informal interaction. Examples of protocols that organize the *campus community* are the following:

- Protocols for the course management (e.g. for application processes, career services, information and help desk services)
- Protocols for "informal learning communities" and social forums (e.g. "netiquette", code of ethics, etc.)

The protocols for the *classroom community* as didactic guidelines which capture the methodical approach of the learning setting are to be designed. In order to determine the basic components and services of learning platforms we will briefly refer to known learning methods. Hereby, the interaction mode is the key variable for this categorization in four types of learning methods. Those learning methods together with their instances are depicted in Figure 4 and are subsequently explained.

1. *Online Teaching*: The interaction happens between the teacher who is the dominant expert and the students. The methods of choice are instructor centered, such as online lectures, online symposium, or teacher-oriented dialogue. The teacher is the expert and the learners are firmly guided and receive precise instructions as to what they are to learn. During the learning process, prepared knowledge and thinking structures are imparted. Becker and Carnine (1980) appears to be saying that the instructor assumes a very active role, as they are assigned the passive role of recipients of instruction.
2. *Online Tutorials*: The interaction takes place between students and a learning system. Feedback is given by the system implemented in the program. Guided tutorials and drill and practice systems are more teacher- or system-oriented enabling a low degree of flexibility for the learners. Hypermedia and simulation systems provide a higher degree of flexibility and are more learner centered. Students can guide, plan and supervise their own activities and learning processes as Jonassen has observed (1992).
3. *Online Assignments*: The interaction happens between students and tutors communicating via an internet based learning platform. With web course authoring tools tutors can develop assignments, webquests, or assessments very easily. The learning situations are framed in such way as to elicit more and more complex responses to questioning, for which particular information and materials must be to hand. The teacher gives individual feedback to the students but the teacher's function of guidance and assistance is gradually relinquished as the

learners become more and more capable of learning on their as described by Seufert and Seufert (1999).

4. *Online Discussions*: The focus is on group-learning and interaction among learners. Work in groups leads to critical reflection and can thus contribute to the building-up and maintenance of values. Examples of such team-centered methods are several discussion formats, group reports, or learning cycles. As McDermott (1999) has noticed the instructor works as a coach who makes suggestions and encourages the meta-cognitive development of the learners by reflecting the learning and dynamic group-processes. The individual members take a very active part, although the group-interaction is of chief importance.

Those learning methods are based on a number of roles. *Roles* describe the different types of memberships, including their rights and duties, that the agents in a learning community can possess. The *campus community* is constituted by roles who organize campus-wide activities and are not related to a specific course or study program. The following table shows some examples for roles and their descriptions.

The roles forming the *classroom community* are mostly determined by the learning method which is designed for the course delivery in an online environment. For two learning methods, the roles are given in Table 2.

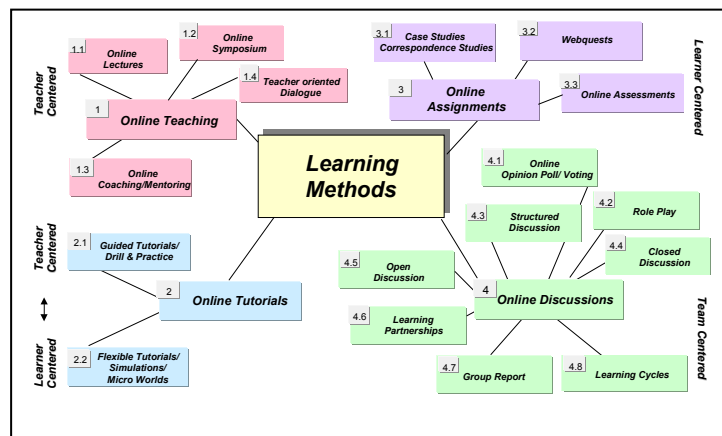


Figure 5. Framework for learning methods

LANGUAGE

To complete the organizational design of the community, the common language and world has to be determined. In learning, mostly natural languages are used. They are enriched by subject-specific symbol systems, ontologies and theories.

The community has to capture which information it thinks to be objectively true and which not, i.e. it has to determine which books or other media it uses within the course and which of them provide information relevant for the common learning goal. In addition the

community has to decide in which form the information will be made available: for example in downloadable form as an HTML or XML document, as a hypertext allowing also unstructured search and access, or as a link to a physical resource To sum up, the community has to determine its logical space for learning with syntax and semantics.

- The campus community has to agree, e.g., on a language for describing courses, on a language of marking and on the value of education and degree.
- The learning community has to agree on a common understanding of learning method with their roles and on the knowledge on some subject to be communicated in the medium

Role	"Campus Community"
Host	<ul style="list-style-type: none"> • establishes and designs the learning environment platform, debugging, technical support, • provides and controls access for the community participating member with the corresponding access rights.
Content Manager/ "Librarian"	<ul style="list-style-type: none"> • act as information specialists (for searching and monitoring, up-to-date information, course material), • act as lecturers, experts in indexing and organizing key words (for integrating), • act as editors (for publishing on the web, eventually multimedia-based), • responsible for updating and quality of the learning contents (e.g. checking the web-links).
Interested Student/Applicant	<ul style="list-style-type: none"> • reads guest information, questions and answers, • applies online, • gets an invitation, enrollment
Student	<ul style="list-style-type: none"> • initiates a permanent information process about course structure and contents, and learning tasks, • uses existing (course) material and searches actively for further information/resources (Glossary, digital Library, etc.), • socializes, exchanges informal knowledge
Campus Group	<ul style="list-style-type: none"> • builds informal communities, "communities of interest", clubs, • initiates self-study groups or network organizations on the (online) campus (e.g., alumni, clubs), organizes events.
Alumni	<ul style="list-style-type: none"> • uses the knowledge database and updates his/her knowledge, • searches for knowledge experts, • socializes: staying in contact with other alumni, getting in contact with new students, or organizing events.
Business/ Corporate Partner	<ul style="list-style-type: none"> • searches in the knowledge database, to update, • searches for knowledge experts and students, • uses recruitment services.

Table 1. Roles in campus communities

The community has to agree on a formal and structured representation of this world, such that information processing by services and the use of the services are being given.

Note that again, campus and classroom community both have to determine this logical space.

IMPLEMENTATION VIEW

The *implementation view* characterizes the "*interaction design*" or "*process model*". Here, the architecture of the learning platform is to be determined. This architecture describes the mapping of the community view to services and technology in scenarios and workflow processes. This architecture includes (1) the selection of the services (cf. subsequent section) and (2) the composition of services to form the scenario in which the processes takes place (that are given in the service view).

The main design decision is in how far the learning methods are to be implemented on the platform, i.e. to which degree the medium relies on the platform to communicate information, to structure and govern information, communication and processes.

More design decisions are how far the platform is able to control and govern the interaction, the degree in which the capability of information processing is being utilized and how the language used for teaching is translated to formal representations to be utilized by the services technology. Design decisions to be made include also, the sharing of information and services among courses on a campus and between course and campus community.

In this view rights and obligations of roles have to be implemented in the interaction with the service. E.g., that the teacher with the right to provide knowledge and the student with the right to obtain knowledge may access an information providing service accordingly. Dually, a well designed platform will not allow the student to change information the teacher has provided when the community follows the teacher-oriented approach of learning. Such a service may monitor the classroom protocols describing which pieces of information is to be learned by a student for an exam. The service for communication of knowledge may monitor whether the students indeed access all the information they are required to know and it may react proactively in notifying students and teachers. Note that the knowledge service ranges from, e.g., a service designed and implemented for this course, an online library in which students look for the relevant information by themselves to Web-page with course material.

Roles		"Classroom Community"
<i>Learning Method: Online Assignments</i>		
Lecturer	<ul style="list-style-type: none"> • has more a passive role during the lesson, • generates assignments: case studies, correspondence studies, etc., • supports individual feedback, • is responsible for grading the assignments. 	
Test Generator	<ul style="list-style-type: none"> • generates online exams and question databases, • is responsible for the assessment and feedback-information (e.g. as online documents). 	
Student	<ul style="list-style-type: none"> • has more an active role, self-studies, • uses existing (course) material and searches actively for further information/ resources (Glossary, digital Library, etc.), • studies cases, assignments, tests, etc., • analyzes his/her learning progress with help of personal given feedback. 	
Learning Method: Online Discussions		
Moderator	<ul style="list-style-type: none"> • moderates discussion formats, • controls the access of closed discussion groups, • implements and supervises rules for interaction, • stimulates the discussion participants to questions, comments and summarizes important points, concludes some statements, • initiates topics, sends news, updates discussion information. 	
Study Group	<ul style="list-style-type: none"> • works on team assignments, realizes project work (in cooperation with companies), or generates reports (e.g. evaluation studies, expert report), • organizes team work by managing (self-organized or predetermined) roles and processes (e.g. editors, discussion-leader, etc.), • opens and moderates online team spaces (e.g. for closed user groups, especially if competitive team work). 	
Student	<ul style="list-style-type: none"> • has more an active role, collaborative learning, learning from each other, • studies team work, • peer review and personal feedback. 	

Table 2. Roles in classroom communities

Figure 6 illustrates that the community model is mapped via processes to the services. Each process or workflow implements protocols with their roles. Each workflow passes the four phases and utilizes the services of those phases. E.g., consider in the classroom community the learning method of online assignments. In the implementation view, the sequence of learning steps is implemented in a workflow within the "scenario" of services. E.g., a service for communicating knowledge, as e.g., online teaching material and information on assignments and how the requirements of an assignment can be met are provided by the service of the knowledge phase. The student is supported in developing intentions on what kind of material to look at for the assignment

and which part of the assignment to do first, by some recommendation agent as part of the service of the intention phase. Then the student makes a plan and schedule on how to proceed, i.e., which material to read and which parts of the assignment to do first in the online planning service as part of the contracting phase and, finally, the online service of the settlement phase guides the student through the schedule.

Note that the learning methods -the protocols- can be implemented by a variety of workflows. Those workflows can be structured or unstructured. Note furthermore that the platform may have the ability to provide the means for interaction, to supervise the actors, to control them and even to govern them. E.g., consider a online assignment with several questions to be answered in a given sequence. E.g. a workflow can be designed in a loose way, such that the student can do the parts of an online assignment in any sequence, such that the adhering to the sequence is strongly suggested by providing the student with a single choice of what to do next or such that the next question is only available when the last question has been answered correctly. Such a scenario can integrate services designed for learning as well as services designed for some other purpose. In particular complex learning settings such external services which are to be utilized for learning.

Note that structured workflows that guide the student are typically used in more subject-oriented, teacher focused learning methods. They are not adequate in process-oriented, collaborative learning methods. Determining the scenarios on the basis of services and the decision which service to take and how structured or unstructured a workflow is, is the third step in the design (after determining goal, language and education). Note that at this point one can take advantage of the general model of media - to have a model of services in general, such that external services that have not been designed to support learning can be integrated in that model. Note furthermore that at this point one determines the role of the platform - which role it plays in structuring and organizing data, communication and processes.

SERVICE VIEW

The implementation of the learning processes happens by using the generic services of the *service view*. This view constitutes the "*channel design*" of the community that determines the transport and transfer of knowledge. It includes several basic services, for example, services for content management, for task analysis and learning objectives, for the negotiation and management of learning tasks and for the evaluation of the learning results. The various services are explained in terms of

the specific phase and stage in the interactions of the different scenarios (see also Schmid 1998):

In the *Knowledge Phase*, knowledge about the community and its members, the medium, or the knowledge domains is provided and communicated. The community members (e.g. lecturers, students, alumni, etc.) may obtain knowledge about the behavior expected from them, about the communication channels on which to exchange information, about the protocols and guidelines to follow in communication. Here, the information and common world and common values are determined and communicated within the services. This includes, in particular, knowledge within the domain about which students learn within this medium. Knowledge and discovery services are offered to use the platform as a knowledge medium.

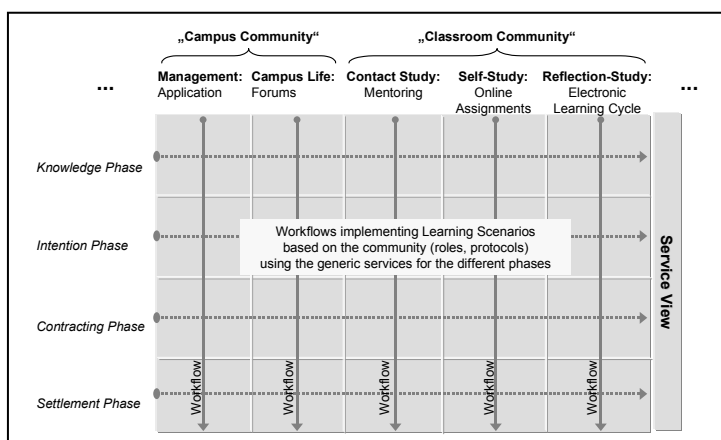


Figure 6. Implementation view of learning processes based on the service layer

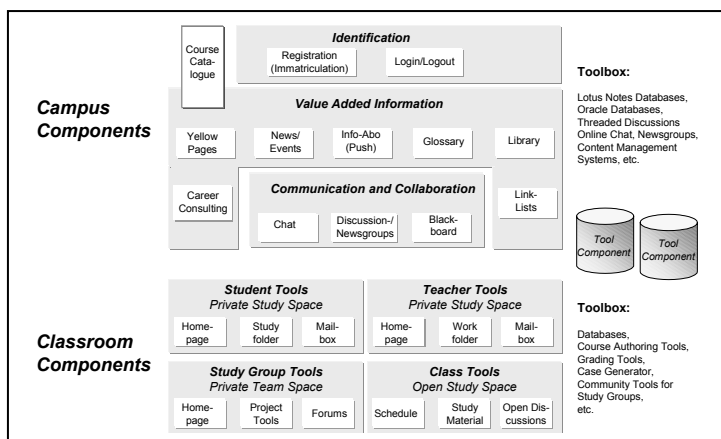


Figure 7. Campus and classroom components

In the *Intention Phase*, agents of the community signal their intentions, developed from the knowledge provided in the knowledge phase, and from their desires and goals. For example, market services in the campus community provide channels for offers and demands of internships, self-organized study groups, topics for thesis, etc. In the classroom community instructors plan

and signal their learning objectives intended by the course.

In the *Contracting Phase* agents negotiate contracts to obtain commitments from the agents participating the learning community. In some cases, this phase is more formalized and ends - in the case of success - with a "contract" (e.g., details, negotiations about a thesis, mentoring contracts, task lists of a study group). Other examples don't have this strict formalized character and this phase is just indicated by the commitment of the community members.

In the *Settlement Phase*, services are provided for instructors, students and students groups to fulfill the intended learning objectives and tasks. For example, the learning tasks are processed by the students or student groups and the results (e.g. project report, expertise) are evaluated by defined feedback processes (e.g. review process, grading process).

Examples of services provided by the *campus community* are given in Tab. 3.

The services for the *classroom community* are partly determined by the applied learning method. Table 4 gives some examples.

INFRASTRUCTURE VIEW

The *infrastructure view* designs the "technological model" and provides communication, coordination and collaboration components. These components are utilized to implement the services and the processes that connect those services. The design decision to be made at this level is which technology and which components to employ to implement the services.

These components may be designed to be used for learning or for coordination and communication in general. With the trend towards process oriented learning and complex learning situations, closed learning environments with view services that are not much more than electronic counterparts of traditional media lose importance. We think a modern learning environment consists of components that can be shared among courses and for the use in classroom and campus communities, that are composed according to a variety of learning methods and that are open enough to be used in complex learning situations and flexible enough to last beyond the lifetime of a medium.

Software components supporting the *campus community* are typically based on Internet technologies, for example, databases (e.g., lotus notes databases for yellow pages, "product catalogue" listing all courses, seminars, etc.), asynchronous and synchronous communication media (e.g., email, chat, newsgroups, threaded discussions, videoconferencing tools), community tools, or content management systems and

user profiling. As Figure 7 exemplifies, the campus components provide channels for "added value information" (e.g. access to libraries, knowledge directories) as well as for communication and collaboration channels (e.g. chat, whiteboard, discussion forums).

Campus Community	
Phase: Type of Interaction	Examples of Services
Knowledge Phase: Information exchange, true-false	<ul style="list-style-type: none"> • Information Services about community, members, medium, or knowledge domains (e.g., homepages, netiquette, guided tour about the research worlds) • Knowledge and Discovery Services, e. g.: <ul style="list-style-type: none"> - Online Library, Glossary, case repository, - search engines, retrieval functionalities, - personalization, user profiling, - knowledge mapping.
Intention Phase: Signaling intentions (e.g., offers, demands)	<ul style="list-style-type: none"> • Course Management Services: course offers, offers, demands of electives • "Market Services", e.g.: <ul style="list-style-type: none"> - Thesis: offers, demands for research topics, - Internships: offers, demands for positions, - Open forums, blackboard: requests, demands, offers, open questions
Contracting Phase: Commitments (e.g. contract, task lists)	<ul style="list-style-type: none"> • Course Management Services: application, registration and course enrollment • "Market Services", e.g.: <ul style="list-style-type: none"> - Thesis: matching offers/demands, negotiations of the thesis's research questions and methods, - Internships: matching offers/demands, contract for positions, - Open Forums, blackboard: matching offers/demands, contracts, negotiations, answers to questions.
Settlement Phase: Actions, settlements	<ul style="list-style-type: none"> • Course Management Services: course delivery and certification • "Market Services", e.g.: <ul style="list-style-type: none"> - Actions: Writing thesis, monitoring internships, - Reviewing/ Evaluating thesis, internships.

Table 3. Services for the campus communities

To design the online classroom supporting the *classroom community*, one may consider further software components that are developed for that reason, e.g., course authoring tools and learning environments in general such as WebCT, Learning Space, Top Class, or WebCourse in a Box. A variety of specific tools exist to support learning scenarios in a classroom, for example, grading tools for assessment, case generator, or project management tools, team rooms for study groups. The tools can be used to offer channels for the classroom members, e.g. study folder for students and work folder for teachers which contains task lists, personal information, or an individualized "electronic school bag".

Note that the technological design provides a set of tools, a "toolbox" to offer the different services for the campus and classroom communities. Fig. 8 illustrates an

example of software components for the two kinds of communities. We distinguish hereby campus components which are more likely to be used at the whole campus and classroom components which are more likely to be used for a specific class, as e.g., a student folder. Note however, that the process view decides which components are to be individual for a course and which are to be individual to a teacher. E.g. a student folder may exist at the course level while the students collect all material in his electronic schoolbag which accompanies a student during this affiliation with the campus community as a student and later as an alumni. Similarly for a teacher, who has a folder for a course and an account on the campus to for doing research and teaching. Components as, e.g., course directory with schedule provide structure at the campus level and within a single course.

Classroom Community	
Phase: Type of Interaction	Examples of Services
Knowledge Phase: Information exchange, true-false	<ul style="list-style-type: none"> • Information Services about community, members, medium, course, and course content (e.g., homepages, netiquette, guided tour about the course and course structure) • Knowledge / Course Content Services, e. g.: <ul style="list-style-type: none"> - Organizing course material, - search engines, - personalization, user profiling.
Intention Phase: Signaling intentions (e.g., offers, demands)	<ul style="list-style-type: none"> • Instructor/Student/Student Group Services, e.g.: <ul style="list-style-type: none"> - Planning/offering learning objectives and tasks, - demands for learning objectives and tasks.
Contracting Phase: Commitments (e.g. contract, task lists)	<ul style="list-style-type: none"> • Instructor/Student/Student Group Services, e.g.: <ul style="list-style-type: none"> - Matching offers/demands, negotiations about learning objectives and tasks, - course design: design of learning scenarios (e.g., creating online assignments, case studies, team projects, exams), - schedule, task lists for students, or student groups.
Settlement Phase: Actions, settlements	<ul style="list-style-type: none"> • Instructor/Student/Student Group Services, e.g.: <ul style="list-style-type: none"> - Course delivery: working on the assignments, presentations of the results, monitoring the learning progress, team spaces for project work, etc., - assessment and feedback of the learning results and progress, - evaluation of the course.

Table 4. Services for the campus communities

CONCLUSION

Learning is facing new challenges in the digital age. Online learning communities are a new phenomenon, which provide the means for coping with these challenges. In online learning communities, students may acquire a wide range of fundamental knowledge in

the form of efficient learning methods (e.g. self-study) from such sources as web-based tutorials and assignments using the online library, all of which are independent of time and space. A significant additional benefit is that one learns to use modern tools for knowledge-acquisition. From a didactic point of view, online learning communities offer most attractive opportunities for a method mix. In this way, a gradual transition from chiefly direct to self-directed and collaborative learning, i.e., the “transfer”, to the ability to apply acquired knowledge and to engage in critical reflection, can be intensively encouraged. In the form of the electronic platform, students are given tools which enable them to plan their learning processes, carry them out, evaluate them, and constantly improve them. Metacognitive strategies are thereby promoted and consciously discussed in learning units. Knowledge thus gained can, in contrast to discussion and reflection in a real classroom, easily be documented and therefore becomes more transparent and subsequently readily retrievable.

In order to take advantage of the potential of online learning communities the appropriate medium has to be designed and the platform has to be built. Methods and implementation guidelines are required, which consider, in an integrated manner pedagogical requirements as well as social and technological aspects of learning communities. This paper illustrates the generic reference model for online learning communities. The organizational model, interaction model, channel or service model and the technology model are interdependent for the learning community to perform in an appropriate way. This reference model for online learning communities can be applied to:

- Structuring the requirements analysis upon platforms for learning communities.
- Evaluation of existing technology for supporting online learning communities.
- Extraction of specific reference models dedicated to specific learning methods or types of online communities (for example online classroom, online tutorials, etc.).
- Classification of technologies and components for online learning platforms according to the services they offer.

We are successfully using this model by designing, managing and evaluating the platform for an online learning community of MBA students (www.media-mba.unisg.ch).

REFERENCES

- Armstrong, A. and Hagel III, J. (1996) 'The Real Value of On-Line Communities', *Harvard Business Review*, May-June: 134-141.
- Becker, W. C. and Carnine, D. W. (1980) 'Direct Instruction. An Effective Approach to Educational Intervention with the Disadvantaged and Low Performers', *Advances in Clinical Child Psychology* 3: 452-468.
- Johnson, D. W. and Johnson, R. T. (1994). *Learning together and alone. Cooperative, Competitive and Individualistic Learning*. Boston: Allyn and Bacon.
- Jonassen, D. H. (1992) 'What are Cognitive Tools?', in: P. D. Kommers, D. H. Jonassen and Mayes, J. T. (eds.) *Cognitive Tools for Learning*, pp. 1-6. Berlin: Springer.
- Lechner, U. and Schmid, B. (2000) *Community and Media – Towards a Reconstruction of Communities on Media*, Proceedings of the 33rd International Conference on Systems Sciences, Hawaii, 2000.
- Lechner, U., Schmid, B., Schmid-Isler, S. and Stanoevska, K. (1999) *Structuring and Systemizing Knowledge on the Internet – Realizing the Encyclopaedia Concept as a Knowledge Medium*, Proceedings of the 10th int. Conference of information resources management association IRMA, Hershey USA.
- Lincke, D.-M., Schmid, B. and Schubert, P. (1998) *A Global Knowledge Medium as a Virtual Community – The NetAcademy Concept*. Proceedings of the AIS Annual Americas Conference on Information Systems, Baltimore Maryland.
- Harasim, L. (1995): *Learning Networks. A Field Guide to Teaching and Learning Online*. Cambridge: The MIT Press.
- McDermott, R. (1999) 'Learning Across Teams', *Knowledge Management Review*, 3(8): 32-36.
- Milius, F. (1999) 'E-Learning Framework', *Information Management & Consulting* 14(1), 37-45.
- Mynatt, E.D., Adler, A., Ito, M. and O'Day, V.L. (1997) *Design For Network Communities*. Online Proceedings of CHI'97, www.acm.org/sigs/sigchi/chi97/proceedings/edm.html.
- Nonaka, I. and Takeuchi, H. (1995) *The Knowledge Creating Company*. New York: Oxford University Press.
- Pressley, M., Harris, K. R. and Marks, M. B. (1992). But Good Strategy Instructors are Constructivists! *Educational Psychology Review*, 4: 3-31.
- Palloff, R. M. & Pratt, K. (1999). *Building Learning Communities in Cyberspace : Effective Strategies for the Online Classroom*. Cambridge: The Jossey-Bass Higher and Adult Education Series.
- Reeves, T. (1992) *Effective dimensions of interactive learning systems*. Proceedings of the Information Technology for Training and Education Conference (ITTE '92), University of Queensland, Brisbane, Australia.
- Rheingold, H. (1993) *The Virtual Community. Homesteading on the electronic frontier*. New York: Addison-Wesley.
- Schmid, B. (1997) *The Concept of Media*. Proceedings of the Electronic Markets Workshop, Maastricht.

- Schmid, B. and Stanoevska, K. (1998) *Knowledge Media: An innovative Concept and Technology for Knowledge Management in the Information Age*. Proceedings of the 12th International Telecommunications Society Conference "Beyond Convergence", Stockholm Sweden.
- Schmid, B. and Lechner, U. (1999) *Logic for Media. The Computational Media Metaphor*. Proceedings of the 32nd Annual Hawaii International Conference on System Sciences, Hawaii.
- Schmid, B., Schubert, P., Selz, D. and Lincke, D.-M. (1998). *The NetAcademy – A novel approach to domain-specific knowledge accumulation, dissemination, and review*. Proceedings of the 31st Hawaii International Conference on Systems Sciences, Hawaii.
- Schubert, P. and Lincke, D.-M. (1998) *A Global Knowledge Medium as a Virtual Community – The NetAcademy Concept*. Proceedings of the Americas Conference on Information Systems, Baltimore.
- Seufert, S. and Seufert, A. (1999) *The Genius Approach: Building Learning Networks for Advanced Management Education*. Proceedings of the 32nd Hawaiian International Conference on System Sciences, Hawaii.
- Stanoevska, K., Hombrecher, A., Handschuh, S. and Schmid, B. (1998) *Efficient Information Retrieval: Tools for Knowledge Management*. Proceedings of the Fifth European Research Workshop on Electronic Markets, Oxbridge London: Brunel University.
- Stanoevska, K. and Schmid, B. (2000) *Community Supporting Platforms*. Proceedings of the 32nd Hawaiian International Conference on System Sciences, Hawaii.