

## Using Social Software in E-Learning Initiatives in Developing Countries

Tanja Kohn, Ronald Maier

Information Systems  
University of Innsbruck  
Universitaetsstrasse 15  
6020 Innsbruck

tanja.kohn@uibk.ac.at, ronald.maier@uibk.ac.at

**Abstract:** In e-learning, social software is used for co-existence, communication, coordination, collaboration and networking, and, in a more specific view, supports knowledge sharing. When e-learning initiatives from developed countries expand or establish an initiative in developing countries, knowledge needs to be transferred. This paper shows that developing countries still are lagging behind in the use of social software within learning environments. But this could be easily overcome, nowadays, by implementing open-source tools or simply using Web-based free services and well-directed training on teachers. This paper also points towards benefits and possible barriers of using social software because barriers can limit or even prevent the knowledge sharing process.

### 1 Introduction

With the recent rise of collaborative (use of) technology sometimes termed *social software* or *Web 2.0*, supporting knowledge management (KM) with information and communication technology (ICT) seems to have survived the trough of disillusionment. It is particularly joint creation of knowledge, knowledge integration and transfer as well as networking and collaboration that potentially can profit from these new technologies. With respect to developing countries, so far the barriers to deploy time- and cost-intensive KM systems have been extremely high. However, with the advent of sophisticated solutions being available at marginal cost over the Web, the most relevant barrier for adoption of KM technologies in developing countries has been substantially lowered. Still, competency gaps prevail [HST07]. Consequently, e-learning initiatives have to be customized when they should be useful for knowledge transfer (KT) involving developing countries.

Eight, partly (inter-)national and cross-national case studies of e-learning initiatives in developing countries conducted between 2005 and 2007 have been found in the literature regarding ICT, especially social software. Case studies have been selected on the basis of keywords that refer to content and notable scientific publications. Keywords amongst others are *e-learning*, *developing country*, *education*, and *ICT*. The sources are published

in the “International Journal of Knowledge and Learning”, “International Journal of Education using ICT” and “Globalized Learning and Cultural Challenges” [Ed06].

The research question underlying this paper refers to what social software is used in e-learning initiatives in developing countries. Based on definitions of relevant terms (section 2), main goals of this paper are to elaborate a model of e-learning initiatives including stakeholders, KT and examples (section 3), to show social software in use on the basis of a review of selected case studies (section 4.1) and to discuss current benefits and barriers to find solutions for how they could be overcome (section 4.2). Finally, section 5 concludes this paper with current limitations and an outlook on future work.

## 2 Definitions of relevant terms

The term *knowledge transfer* carries a wide variety of meanings. Therefore, it is necessary to briefly define the use of the term adopted in this paper. In KM literature, *knowledge transfer* and *knowledge sharing* are not used in a consistent way. KT [Pa99:115] is used equally as terms like *knowledge sharing* [Re02], *knowledge distribution* [Ma07], *knowledge diffusion* [CJ04], *knowledge dissemination* [SW03], and *knowledge exchange* [TON03]. KT is also seen as part of knowledge sharing [BK03] because knowledge can be transferred through interaction. This transfer is supported by ICT in e-learning. Knowledge sharing is the process of one person (source) deciding to share knowledge, remembering, explicating it to contextualized information on a medium, actively or passively transferring it to another person (recipient) which perceives the information, interprets it in the given context and evaluates it so that the knowledge is re-constructed and integrated in the person’s knowledge base [MH09:412]. In this paper, KT is part of the knowledge sharing process and is fostered by social software for co-existence, communication, coordination and collaboration that are used for e-learning.

KT plays a major role in e-learning environments because learning is based on shifting knowledge to and amongst learners. Tools to support collaboration, communication and networking are called *social software* [An05]. Social software definitions have a common stress on the importance of creating networks and relations between people and the support of group interaction. Wever et al. define social software as “software that enables communication through digital technologies during which people connect, converse, collaborate, manage content, and form online networks in a social and bottom-up fashion.” [WM07:512] Social software can be categorized in various ways. One general categorization is synchronous and asynchronous social software, whereby synchronous tools allow interaction at the same time and asynchronous tools do not [MH05]. In e-learning, social software is used to support co-existence, communication, coordination, collaboration and networking amongst learners and between teachers and learners. This can be, e.g., text, audio and video blogs, wikis, fora, real-time communication, software platforms for rich interaction, message-boards, musical taste-sharing, photo-sharing, instant messaging, mailing lists, and social networking software [Ma07:628, WM07].

E-learning programs are also implemented in developing countries [HST07]. The term *developing country* is defined by various institutions. The World Bank classifies coun-

tries based on 'annual per capita gross national income' into three categories with thresholds of maximum 935 US\$ (low income countries), 3,705 US\$ (lower middle income countries) and 11,455 US\$ (upper middle income countries) in 2007 [WB07].

### 3 Knowledge transfer with social software

E-learning initiatives can be implemented between developed and developing countries. Export and reuse of e-learning content is possible, but time- and cost-intensive. During transfer of such programs, country-specific differences and differences between learners, but also teachers, e.g., their backgrounds and language should be considered because they possibly form barriers to the achievements of the objectives of e-learning programs [HST07:177]. Therefore, adaptation of learning resources or general customization of the entire e-learning initiative should be considered.

In order to analyze the selected cases in which social software supports KT, it has to be elaborated where exactly KT takes place and how it is already supported. Figure 1 gives a general overview of an e-learning initiative between two institutions and the stakeholders involved in KT together with example categories of social software.

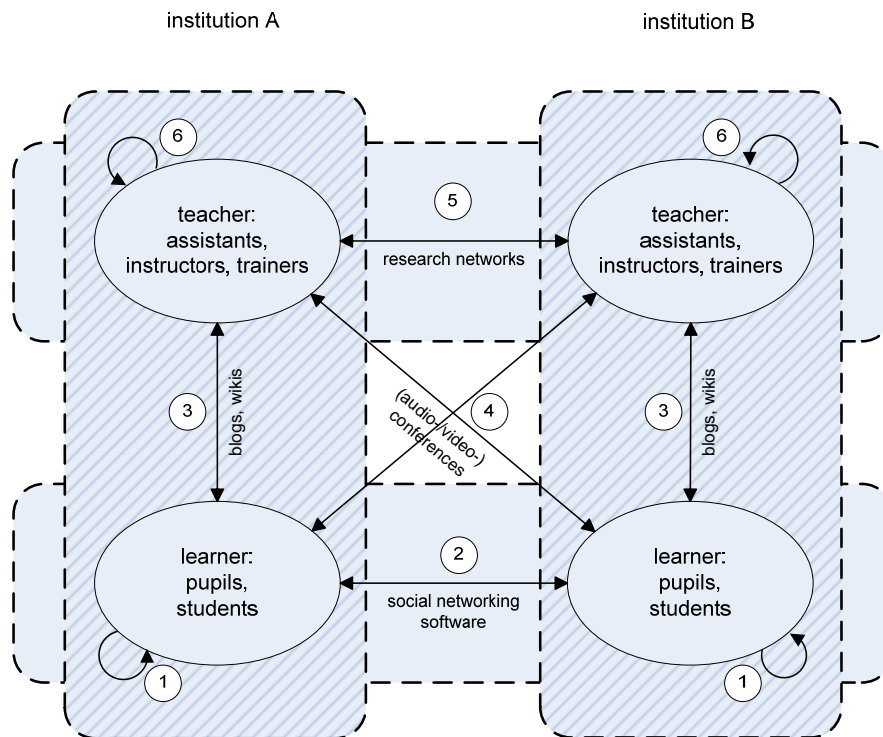


Figure 1: Model of e-learning initiatives: knowledge transfer between and within institutions with examples of social software

To simplify reality of e-learning initiatives, only two involved educational institutions are displayed in the model: institution A and institution B. The initiative can be, e.g., an “international online discussion” as part of a „Master Program of Adult Education”. University of Georgia (institution A) and University Botswana (institution B) cooperated in such a program [GS05]. Each institution has its stakeholders. On the one hand, there are teachers involved which can be instructors, trainers and assistants and on the other hand, learners, i.e. pupils and students. KT between institutions and stakeholders is displayed by arrows in Figure 1. Examples of social software are shown to give a clear idea how KT of stakeholders in e-learning environments can be supported. Social software tools are used synchronously or asynchronously within or between groups of stakeholders at institutional (vertical) or inter-institutional level (horizontal, diagonal). Examples within groups at institutional level can be, e.g., teachers interacting via mailing lists created in free e-mail accounts and learners via student fora. Social software used between groups at institutional level can be, e.g., Blogs like WordPress, Wikis, but also social awareness software, e.g., instant messaging tools like Skype, micro-blogging tools like Twitter and social bookmarking software like del.icio.us. Social software used between stakeholders at inter-institutional level can be, e.g., research networks at teachers’ level like Harvard Research Network, ISWorld and SEWorld, and social networking software at learners’ level, e.g., Facebook. So far, only little social software is used for e-learning in developing countries as the case study analysis shows.

As shown in Figure 1, there are six main social relationships which can be supported by social software: (1) learners of one institution among themselves, (2) learners between institutions, (3) learners and teachers of one institution, (4) learners and teachers between institutions, (5) teachers between institutions, and (6) teachers of one institution among themselves.

## **4 Benefits and barriers using social software**

Generally, e-learning has high potential for development in developing countries [Ha02:38]. Basic education and professional development is important for sustainable development [Sh87:35]. Based on the model presented in Figure 1, case studies were analyzed regarding social software used in developing countries (section 4.1). The structure of six social relationships depicted in Figure 1 is used for discussing current support by social software and barriers of their usage (section 4.2).

### **4.1 Overview of applied social software**

Results of the case study analysis are presented as an overview in the following table that shows social software, their description and benefits and barriers to the use of such tools. Mainly used tools are asynchronous tools like mailing lists (used in 7 of 8 cases) and discussion fora (used in 5 of 8 cases). Some benefits and barriers can be contradictory because of different settings of various analyzed cases. Also, identified barriers for certain tools are not only typical for one specific tool, but for others, too. They are only mentioned when they were expressed explicitly in the analyzed cases.

**Table 1: Benefits and barriers of the use of specific social software**

<b>social software</b>	<b>description</b>	<b>benefit</b>	<b>barrier</b>
<b>mailing list</b> [GS05] [HM05] [LTG05] [A106] [LOF06] [Na06] [HST07]	<b>AT:</b> exchange information, questions, answers etc. through e-mail within defined groups [MH05:26]	<b>D:</b> re-evaluating processes and contents of online debates (teachers) <b>S:</b> asynchronous interaction gives time for improving language skills and catching-up on debates (learners) [HM05:98]	<b>TF:</b> cost-intensive dial-up connections [HM05:98-102] and Internet access [LTG05, HM05:100] <b>S:</b> insufficient typing skills and language [HM05:98-102]
<b>discussion forum</b> [GS05] [HM05] [LTG05] [A106] [Na06]	<b>AT:</b> communication platform to exchange messages, thoughts and experiences which can be compared with blackboards [MH05:55]	<b>D:</b> encourage participation [HM05:98] <b>S:</b> asynchronous interaction gives time for reflection and cognitive development [GS05:163], improving language skills, development of argumentation and understanding perspectives [HM05:96-99]	<b>TF:</b> reliability of Internet [HM05:94] <b>D:</b> large groups conduct inefficient discussion [GS05:167] and participation [HM05:94-101] <b>D:</b> lack of instructions to use the tool <b>S:</b> insufficient typing skills [HM05:94-101]
<b>electronic quiz</b> [A106]	<b>AT:</b> interactive pages for exercises and assessment of participants [MH05:82]	<b>R:</b> flexible mode of delivery and alternative to other material and media [A106:334]	<b>TF:</b> slow Internet connection <b>R:</b> access to material [A106:332]
<b>chat</b> [A106] [LOF06] [Na06] [HST07]	<b>ST:</b> communication between two or more users through real-time text exchange [MH05:43]	<b>D:</b> independent from place and time <b>S:</b> easy access <b>D/S:</b> further review and reinforcement, keeping track of learning progress, better understanding and exam preparation [LOF06:19-23]	<b>TF:</b> slow Internet and limited access <b>D:</b> rarely used <b>S:</b> computer illiteracy <b>R:</b> scarce resources and material access [A106]
<b>(audio/video) conference</b> [HM05] [LTG05] [A106]	<b>ST:</b> verbal or video communication through media tools	<b>D/S:</b> synchronous interaction for lively communication and networking <b>R:</b> delivery of content	<b>TF:</b> cost-intensive dial-up connections [HM05:98] and Internet access [HM05:100,

		[LTG05:110]	LTG05]
<b>game software</b> [Mu07]	<b>ST:</b> integrated as an active experience, understanding and learning	<b>TF:</b> free of charge software <b>R:</b> individual and group game	<b>D:</b> integration problems to curriculum and classes
<b>digital whiteboard</b> [Na06]	<b>ST:</b> virtual blackboard where participants work together [MH05:96]	<b>S:</b> impact of students learning and understanding with positive attitudes [Na06:24]	<b>TF:</b> technology access <b>D:</b> didactical integration

**ST** = synchronous tool, **AT** = asynchronous tool  
**TF** = technical-financial, **D** = didactical, **S** = skills, **R** = resource

## 4.2 Discussion

Using social software can create barriers for stakeholders in e-learning initiatives. Barriers can influence the use of social software for KT. Generally, main barriers to the use of software for e-learning in developing countries are technology-based, e.g., lack of hardware, expensive and inappropriate software, limited access to technology and Internet, poor Internet connectivity, lack of technical support, and server breakdowns [HST07:179, GS05:165]. This barrier has to be limited by governmental cooperation and investments. Governments have to find solutions to make Internet access affordable for schools, e.g., to find telecommunication companies that make convincing offers like in Chile. There, high speed Internet increased satisfaction and motivation to participate and use social software [Ha02].

But barriers do not only occur at the technological side, but also with respect to culture and skills, e.g. limited motivation of learners because of computer illiteracy and constraints to attendance of teachers using social software in their classes because of lacking competence using such software and computer illiteracy. Cultural barriers were not expressed explicitly in the analyzed case studies, but can be interpreted through barriers like large groups conduct inefficient discussions [GS05:167], barriers to participate [HM05:94-101], didactical integration problems of digital whiteboards [Na06], and rarely used chat applications [Al06].

Typically, social software allows for easy-to-use mechanisms to create and maintain online profiles (social identity), build relationships and reputation (social capital), stay aware of a network's activities (social awareness), comment on and recommend to others (social feedback), interact with others (social interaction), organize physical meetings (social planning), and share content (social spaces) on the Internet. Still, social software is not used with all its potential in these learning settings, e.g., to create social identity, capital and spaces. Social awareness is related to social identity, capital and spaces and was not found in the analyzed cases. So far, the case study analysis shows that tools for social feedback, interaction and planning are used. The benefits and barriers are discussed in detail in the following (acronyms are used to characterize the type of barrier).

The relationship between learners within (1) and amongst institutions (2) is supported so far by discussion fora, electronic quizzes, chat, (audio-/video-) conferences, and game software. Explicitly mentioned benefits of *discussion fora* are an increased encouraged participation [HM05:98] of learners, enough time for learners to reflect on their posts through asynchronous interaction and therefore, cognitive development [GS05: 163], improving language skills and development of argumentation by posting contributions, and understanding different perspectives of other learners (S) [HM05:96-99]. Barriers to the use of discussion fora in such initiatives are reliability of Internet (TF) [HM05:94-101], large groups that conduct inefficient discussions [GS05:167] and limited participation of certain learners [HM05:94-101] which can be put down on cultural issues (D), lack of instructions to use the tool (D/S) as well as insufficient typing skills (S) [HM05:94-101]. Benefits of *electronic quizzes* are the flexible mode of delivery of content and its alternative character to common learning material as a new learning media for learners (R) [AI06:334]. Barriers to the use of electronic quizzes are of technical-financial nature like slow Internet connection and a resource problem to access this kind of learning material [AI06:332]. Elaborated benefits of *chat* are the independence from place and time using it (D) and easy-to-use free software (S). Chat can be used for further review and reinforcement of learning material, keeping track of the learning progress, better understanding of learning contents through discussions between learners, and, therefore, better exam preparation (D/S) [LOF06:19-23] than learning alone. Barriers found in [AI06] are slow Internet connection and limited Internet access (TF). Chat is rarely used between learners (D) which might be traced back to limited Internet connection and access, promotion of teachers to use it and, still, even though chat is easy-to-use, learners have problems to use it because of computer illiteracy (S). Benefits of (*audio-/video-*) *conferences* are the lively communication and networking aspect of synchronous interaction (D/S) and the use as a new channel of the delivery of content (R) [LTG05:110]. Barriers are, again, of technical-financial nature as there are cost-intensive dial-up connections [HM05:98] and scarce Internet access [HM05:100, LTG05]. *Game software* was used in only one of the analyzed cases [Mu07] where it was a free of charge software (TF) and was used as individual and group games (R). The occurring barrier using game software in this e-learning initiative was the integration to the curriculum and to the classes (D). Social networking software, different types of learning resources and Web pages are often provided only in English language but 43% of Web users do not speak English [Wo08]. Translation and further adaptations are necessary regarding this issue.

The relationship between learners and teachers within (3) and amongst institutions (4) is supported so far by mailing lists, chat, (audio-/video-) conferences, and digital whiteboards. Chat and (audio-/video-) conferences were already discussed regarding (1) and (2). *Mailing lists* were used nearly in all analyzed cases. Benefits on teachers' side were possible re-evaluating processes of their learners and the delivery of contents of online debates (D). Generally, asynchronous interaction gives time for improving language skills and catching-up on debates which were important to learners (S) [HM05:98]. As seen before, barriers of technical-financial nature occur through cost-intensive dial-up connections [HM05:98-102] and limited or lack of Internet access [LTG05, HM05:100]. Insufficient typing skills and deficits of language constrained the use of mailing lists (S) [HM05:98-102]. The use of *digital whiteboards* was only found in [Na06]. Using it had

a constructive impact on students' learning and understanding with positive attitudes (S) [Na06:24]. Main barrier was the access to this technology (TF) and the didactical integration to the curriculum and the classes (D). The didactical barrier often results from lack of instructions. If more instructions are given, participation can be motivated by teachers explaining the aims of the use of a certain tool. Then motivation will increase. This is meant on teachers' and learners' side when implementing an e-learning program to support an interactive relation between these stakeholders.

The relationship between teachers within (6) and amongst institutions (5), so far, is supported only by mailing lists. In some of the analyzed cases mailing lists were used for communication between the involved teachers. To improve KT and its quality research networks can be used such as Harvard Research Network, ISWorld and SEWorld.

Resource barriers occur according to the lack of adequate material to teach. But as mentioned in the beginning, sophisticated solutions are available at marginal cost over the Web. A lot of services can be used free of charge that provide collaboration, communication and network building for e-learning initiatives in developing countries. As computer and also Internet literacy rates are on the rise [IWS08] not only in developed, but also in developing countries, these tools could be supplemented by the extensive use of systems offered on the Web, such as Google Apps, Skype, Wikipedia etc. which all help to lower the barrier to access documented knowledge. Also, free and open-source tools can be considered as a cost-effective solution, e.g., to avoid high investments apart from investments in hardware and to overcome the lack of synchronous interactivity in e-learning. Examples for open-source tools beside fora, chat and digital whiteboards are Web-Content-Management-System (WCMS), Community-Content-Collaborative-Systems (C3MS), Weblogs, Groupware, Learning-(Content) Management-Systems, Wikis [MH05:41-106].

Summarizing the discussion, there are already some tools (see table 1) in use in e-learning initiatives in developing countries. But they are confronted by several barriers. Cooperation and investments are suggested to overcome the technical-financial barrier which is currently seen in e-learning initiatives like OLPC and Classmate PC. To limit the didactical barrier, adaption of curriculum and pedagogical training for teachers to integrate new tools into classes, are recommended. OLPC Peru, for example, provides accompanying monitoring besides technical and pedagogical introduction training. A qualified team of about 40 coaches visits participating schools of the project. Skill barriers will be limited by sufficient training for all and the constant use of technology. Two main solutions to overcome the resource barrier are suggested: Web-based social software free of charge and installation of open-source tools.

## **5 Conclusion and future work**

This paper shows the importance of how KT takes place on the level of international exchange of e-learning initiatives especially to developing countries. A model of e-learning initiatives (figure 1) visualizes KT and highlights six distinct social relations between stakeholders and examples for the use of social software to transfer knowledge

between them. Benefits and barriers found in the case studies are contrasted regarding so-called social software in table 1. Web-based services free of charge and open-source tools were mentioned to challenge commonly used commercial tools and supply collaborative work amongst participants of e-learning programs. The authors strongly believe that there is a trend from creating and composing ICT infrastructures specific for single institutions towards configuring and, most of all, simply consuming services that are offered on the Web in a standardized way. This might be all the more true for developing countries so that technological barriers would be removed with the exception of the need for strong and ubiquitously available bandwidth in order to be able to access the Internet.

Limitations of this research work are the limited number of analyzed case studies underlying the confrontation of benefits and barriers to the use of social software and disregarding cultural aspects.

Future research will cover measuring success of e-learning initiatives in developing countries concerning the added value with regards to the use of ICT, especially social software. To achieve this, initiatives like OLPC which started implementing their cheap computers to developing countries in February 2007 are currently studied. By analyzing selected e-learning programs offered in developing countries, “new” collaborative tools could be found useful as sets of individual services available free of charge for various forms of KT required between the key stakeholders. These sets of services could outperform centralized solutions like the ones offered in all-in-one learning (content) management systems. This proposition is backed by the clearly visible e-learning usage patterns in developed countries that currently point towards a rapidly increasing number of tools being used in parallel by the stakeholders. As envisioned in figure 1, it is supposed that KT between different stakeholders will result in specific aims and potential problems and thus different solutions might be needed for different groups of stakeholders. This requires in-depth analysis of richly described scenarios of KT that reveal the specifics of aims, benefits and barriers from the perspective of developing countries.

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