

BLENDING LEARNING ARRANGEMENTS FOR HIGHER EDUCATION IN THE CHANGING KNOWLEDGE SOCIETY

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Abstract: This paper presents an advanced – international – blended learning arrangement. It has been developed, implemented and reviewed regularly in the last 4 years at the authors' institution. Instead of referring solely to traditional classroom teaching, we use and continually refine this arrangement in our every-day formal teaching and learning processes at Technische Universität Dresden. By this we take into regard the changes induced by the Bologna Roadmap and try better to support its “new” didactical objectives: more *interactive* and *interdisciplinary* modules with focus upon the (practical) *integration* of professional and methodical responsibility, decision-making and soft skills.

Additionally, this paper analyses the capability of our blended learning arrangement to answer the surfacing demands of the European changing (knowledge) environment, especially taking into account the developing gap between formal standardised learning processes in higher education and informal knowledge sharing behaviour of individuals embedded in their private and business social networks. It starts with a short analyse of the actual changing environment and then illustrates the different issues to be derived for formal learning and informal knowledge sharing processes. Next, it focuses on the design, repeated use, evaluation & refinement of a complex international blended learning arrangement following the formal learning paradigm. Concluding, the paper indicates what further changes have to be made to the current design to improve its suitability (also) for informal knowledge sharing.

1 Context: The European Dimension of Higher Education

Currently, the German university system undergoes a thorough structural change to implement Bachelor, Master and Ph.D. programs. Motivation is the alignment to the European model of Higher Education, as discussed in the meetings of the Bologna Process, following the Bologna Declaration in the year 1999 [1]. Triggered by impacts due to

- globalisation of business processes and of communication and collaboration,
- exploding variety of specialisations, skills and competencies, more and more linking formerly separated disciplines,
- reduction of actuality and of value of knowledge in connection with rapidly shortened product and process life cycles,
- the demographical factor (ageing society) and
- growing competitiveness between national and international, public and private educational institutions (transparency of structures and programs),

lifelong learning and especially vocational, occupational and extra occupational training become significantly more important and influential for the traditional Higher Education institutions [2].

When looking through the eyes of political institutions of the European Union, the year 2010 becomes the focal point in time for achieving several strategic goals set out in the first decade of the new millennium. Primarily responding to the challenges of the globalized economy, the Lisbon Declaration in the year 2000 developed the vision of the European Union in 2010 to become “[...] the most competitive and dynamic knowledge-based economy in the world,

capable of sustainable economic growth with more and better jobs and greater social cohesion” [3]. To support this economical mission, there are also many non-economical building blocks, like the educational system focussed upon in this paper, that have to be shaped adequately in order to attain it. The investment in people for a smooth shift into a knowledge-driven society can therefore be seen as one of the most important action lines of the Lisbon Strategy. Hence, the European Council calls upon the Member States to adapt Europe’s education and training systems “[...] both to the demands of the knowledge society and to the need for an improved level and quality of employment” [3]. In more detailed terms, the education system shall encourage the personal growth of European citizens in three aspects for the future wealth of the Union [4]:

- 1) *Skills* – currently needed technical, social and personal competencies, giving an individual a secure foundation for life and enabling him to work together in groups with specialists from other disciplines, intelligently using existing Information and Communication Technologies (ICT),
- 2) *Adaptability* – the ability to learn about and adjust to new situations, while staying independent and respecting others, and
- 3) *Mobility* – the skills required in today’s international and multicultural society, especially the ability to work and communicate with others across national boundaries and by this to adapt to the challenges of a global economy.

What changes to traditional teaching and learning processes and systems are demanded by the Bologna Process to improve the European citizen’s ability in the above mentioned aspects and thus to support the economical strategy?

2 Issue: Learning in the Knowledge Society

The Bologna Process propagates 10 action lines [1] which are leading gradually to a European standardisation of study programs (based on Bachelor and Master cycles), degrees and their comparability, mobility of students, teachers and researchers, co-operation in quality assurance, lifelong learning processes and doctoral studies and the synergy between the European Higher Education Area and the European Research Area. The implementation of the action lines follows a set of European-wide communicated common rules and guidelines. As results emerge

- more professional-oriented qualification processes,
- more transparency of the study programs and their documentation in forms of reliable, structured module descriptions,
- a strengthening of didactical issues like target-focussing of the scope of lectures offered,
- an enhancement of project- and problem-orientation,
- an increase of self-study phases and stronger interaction between students and teachers.

Thus, the programs get gradually more comparable among themselves and in confrontation with common quality standards (assured by accreditation processes).

Parallel to the Bologna Process a European Information Society is to be created by implementing a modern electronic infrastructure and high-quality services accessible for all European citizens. The corresponding action plans have been named “eEurope” for the first two phases (2000-2002, 2003-2005) [5] and “i2010” for the third phase (2006-2010) [6]. The policy priorities recorded in these plans shall stimulate the information society by:

- promoting the development of the underlying infrastructure (e.g. broadband, security),
- stimulating the supply of advanced services, notably via the public sector (e.g. eGovernment, eHealth and *eLearning*) and
- promoting the uptake of eBusiness (e.g. by building on policies such as the .eu domain).

One of the important elements of the action plans to establish a true European Information Society is the use of “[...] new multimedia technologies and the Internet *to improve the quality*

of learning by facilitating access to resources and services as well as remote exchanges and collaboration” [7], as the term eLearning is understood by the European Commission. The underlying reasoning is here, that information and communication technologies (ICT) can “[...] contribute to the quality of education and training and to Europe’s move to a knowledge-based society” by reaping the benefits of the new multimedia technologies for learning purposes (e.g. independency from time and place) and increasing the individual flexibility and adaptability of all workers and employees (e.g. by learning on demand) [8].

2.1 eLearning: Support of Formal Learning Processes

As we see, electronic learning (eLearning) has been detected early as a vital support infrastructure with enormous technical, organisational and didactical consequences, not only for the Bologna Process, but also for the economical change process to form the European knowledge society. This link is described today by the term of “eBologna“ [9]. In this context, the understanding of electronic learning has changed significantly in the past decade. Whereas it has been originally often reduced to the mere production of stationary online courses for the purpose of individual, self-guided learning (web based trainings), the need for social exchange among the learners and the teachers is now being increasingly pointed out. One of the reasons for the growing demand for more human-human interaction in eLearning lies in the current changes in the Internet environment, which are often described with the “buzz-word” Web 2.0. The Internet has reached the status of a mass medium and the role of the end user is shifting from a passive information consumer to an active participant in the information production, transferring the citizen’s behaviour in his common social networks to the (primarily individual) exploitation of social software [10].

Especially the increased focus on professional qualification of the new Bachelor and Master programs in a lifelong learning environment demands new models of cognition and project-oriented learning. It leads to complex blended learning arrangements [11]:

- *Use of new teaching and learning support*: multimedia tools for visualisation and projection of digital learning materials, digital conferencing tools and digital libraries.
- *Case based learning by practical experience*: instead of delivering structured lectures, rather giving direct support for autonomous knowledge acquisition, e.g. by the integration of simulations or business games.
- *Integration of different learning locations*: e.g. dual study programs (integrating practical job experience and formal school studies).
- *Mobile learning*: exploitation of mobile technologies for learning purposes, and
- *Net based learning and teaching*: e.g. web based training, virtual classroom collaboration.

Thus implementing the eBologna paradigm, the changes driven by the Bologna Process, based on formal standardisation and harmonisation, can principally lead to advanced

- *Interactivity* by enhancing the proportion of self-study phases within the modules, integrating virtual classroom technologies and applying modern didactical paradigms like problem based learning and collaborative learning,
- *Interdisciplinarity* by constructing modules which integrate different disciplines and/or perspectives, or by promoting non-consecutive master programs (e.g. Master in “Business & Law” as a combined product of the Law Faculty and the Business Management Faculty at Technische Universität Dresden), and
- *Internationality* in forms of aligned study programs (e.g. Bachelor or Master program) in two different countries, or by developing exchangeable international modules which can be integrated into different national programs, exploiting the potentials of virtual classroom technologies [12].

2.2 Knowledge Sharing: Flexibility of Informal Learning Processes

Besides support of formal learning, with the growing number of Internet users and the quickly increasing amount of information available, the “new media” are also currently changing the role and the understanding of knowledge in our society. At the moment, the established and acknowledged structures of our society are facing a rapidly changing environment. In this new age, noted by nearly universal availability of information, ever growing information overflow and changing perception of knowledge, it is necessary to re-evaluate and re-think traditional structures. George Siemens [13] points out, that the time of Francis Bacon when knowledge was available to a selected few and was thus a key to power is passing. The environment has changed and so have the characteristics and the flow of knowledge. Siemens describes eight factors that define knowledge today:

- the overwhelming abundance and the rapidly shrinking life-span of knowledge,
- the growing capacity for recombination of knowledge,
- the changed relation to certainty as knowledge is now constantly a subject to change,
- the increasing development pace of new knowledge,
- the new possibilities of knowledge representation,
- the changes in the flow of knowledge from hierarchies to networks,
- the need for new spaces and structures of knowledge and
- the decentralisation of knowledge.

This is important for all educational institutions, preparing people for the future knowledge society. Traditionally, academic institutions concentrate on teaching the “*know-how*” and the “*know-what*”. However, the changed knowledge environment places increased stress on the “*know-where*” and “*know-who*” [14]. The ability to connect and create knowledge networks including human as well as technological sources of information and the ability to evaluate, sort and otherwise deal with different media (*transliteracy*) [15] will be crucial to future knowledge employees and society members. Therefore, the academic institutions need to adapt their educational methods and structures not to equip their students for the future with mostly inadequate skills of the past [13]. Also, because of the changing knowledge environment, learning can no longer take place solely at the beginning of the individual life. This leads to a shift in importance of lifelong learning and just as much of informal learning in comparison to the traditional education [14].

What is the impact on eLearning? Necessarily the need for new methods and structures in education has a direct effect on the form and the use of eLearning as well. Analogously to the focus on the “*know-how*” and “*know-what*” in the traditionally academic education, eLearning has often focused on the *products* – concentrating strongly on the production and the management of electronic learning materials. It is thus necessary to shift the focus of eLearning from the products to the *processes* of learning [16] [17]. A possible way to do this shift, while at the same time supporting the development of connectivity and transliteracy skills, is the use of *Social Software* as means to facilitate learning. The term Social Software is often cited in connection to the topic of Web 2.0. Following Hippner [18], Social Software can be defined as web-based applications supporting the communication, relationships and information exchange of humans in a social context. Specific focus is set upon individual/group needs and integration, transparency of content, participants and relationships, self-organisation, feedback and information structures and networks rather than information itself. Typical examples for Social Software tools are Wikis, Blogs, Social Bookmarking/Social Citation systems, RSS, Communities and Networks [13]. According to Anderson [19], “Educational Social Software” supports and encourages individuals to learn together as a group, while still retaining individual control. However, there are not yet Social Software tools specialised on the use in education, although most of Social Software tools can be used for this purpose.

To facilitate educational processes for the future knowledge society, therefore the actual social change in handling knowledge and its influence on the use of educational software has to be taken into account, when we design complex problem oriented learning arrangements. A shift from centrally managed online learning processes based on traditional Learning Management Systems to more flexible, open Social Software environments is necessary [17]. While the control of learning effectivity – standardised accurately in Bachelor and Master modules and correlating examination and study orders – is quite easy in traditionally managed, single-learner/single-learning process centered environments, *open collaborative learning processes in real or in virtual classrooms demand for more flexible and more complex control mechanisms*. The design of these blended learning arrangements has to bridge the gap between formal standardised learning processes and informal knowledge sharing behaviour. It has to deal with two partly conflicting issues:

- the organisational and didactical (learning target focused) issues, as introduced by the Bologna Process, and
- the “discontinual” change of behaviour of the new students generations, by Prensky baptized as “Digital Natives” [20], in conjunction with knowledge sharing and learning processes.

How does the design and use of these blended learning arrangements look like?

3 Approach: Virtual Collaborative Learning – part of a complex Blended Learning Arrangement

Blended learning is defined as didactically reasonable combination of both traditional classroom learning processes and online learning processes in the virtual classroom, based on new ICT infrastructure and services [21]. This concept proves to be a suitable instrument to enhance

- singular learning processes (e.g. student passively watching a lecture or reading a textbook) to – interactive, interdisciplinary and integrated – collaborative and problem oriented learning processes on the one side and
- real classroom activities to – international – virtual classroom environments.

The combination of *personal dimension* (individual and team learning), *physical dimension* (real classroom and virtual classroom) and *time-based dimension* (asynchronous and synchronous communication) leads to 8 different learning scenarios. They can be combined (blended) into complex learning arrangements (see [22] for detailed examples how these can be implemented into every-day learning processes in Higher Education):

- Asynchronous individual learning process in the real classroom (e.g. reading a textbook, writing a thesis),
- Asynchronous team learning process in the real classroom (e.g. blackboard communication, business games),
- Synchronous individual learning process in the real classroom (e.g. traditional classroom lecture),
- Synchronous team learning process in the real classroom (e.g. business case exercises in small teams),
- Asynchronous individual learning process in the virtual classroom (e.g. self guided individual online learning: web based training or using video-captures of real classroom lectures),
- Asynchronous team learning process in the virtual classroom (e.g. virtual collaborative learning using Educational Social Software: jointly developing a WikiWeb enhancing the real classroom seminar’s discussion),
- Synchronous individual learning process in the virtual classroom (e.g. tele-lecture in an open distant learning environment) and

- Synchronous team learning process in the virtual classroom (e.g. virtual decision making: chat, Voice over IP or video conference).

Following Klauser et al. [23], “[...] learning is seen as an *active, socially transmitted and situated process of the individual construction of knowledge and ability, desire and feeling.*” This social and situated context of learning is given by the learner’s integration into the learning environment. Here interactions take place with teachers and other learners. Therefore, learners are members of a group with – at least partly – common interests and goals, collaborating on authentic (“real-life”) project tasks. Bair [24] describes in his *pyramid of interaction* 4 levels in succeeding order, which demand increasing cooperation, mutual understanding and interdependencies between the members of groups:

- On the basic *informing* level, the group’s members do not necessarily know each other; they interact by using a common information platform (e.g. database, website) following their individual goals.
- On the *coordinating* level, individuals are aware of being members of a community, they share common interests, but still follow individual, different goals.
- The *collaborating* level demands regular interactions and has a common process and a common goal for all group members, which can be sub-divided asynchronously in parallel tracks to achieve different sub-goals.
- On the highest level of interaction, the term *cooperating* describes groups with common process and common goal and tight, undivided interactivity, mostly synchronous.

If we take this pyramid of interaction as a guideline, then for best possible results learning processes should

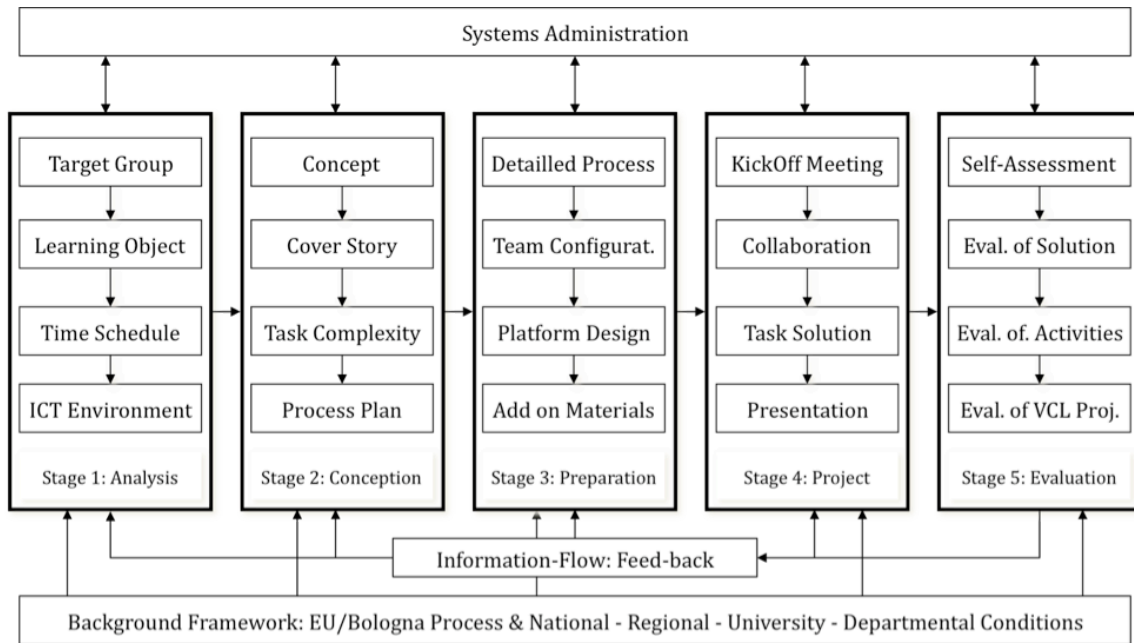
- integrate *interactions* between the students themselves and between students and teachers,
- consider *interdisciplinary* and potentially *multiperspective* approaches,
- stress both decision making and *professional & methodical responsibilities* with *soft skills* and
- take place on the *highest possible level* in this pyramid.

These objectives can be achieved by

- combining students with *different* academical – and possibly cultural/international – *background* into small learning teams (e.g. business management, business pedagogics, business informatics or language students from different European countries),
- assigning them *skill-specific roles* (e.g. project manager, media expert, communication manager, professional specialist or didactical consultant),
- having them solve *complex ill-structured cases/scenarios* (with open outcome and demand for self-structuring and organising) either
- in a real classroom environment (Bair’s most intensive level 4: e.g. *1-week blocked case seminars*) or
- in compact 2-4 weeks collaboration phases in a virtual classroom (Bair’s level 3: e.g. *VCL – virtual collaborative learning – projects*)
- using in both settings *Educational Social Software* for interaction and documentation (e.g. WikiWeb, Blog, VoIP, Communities & Networks).

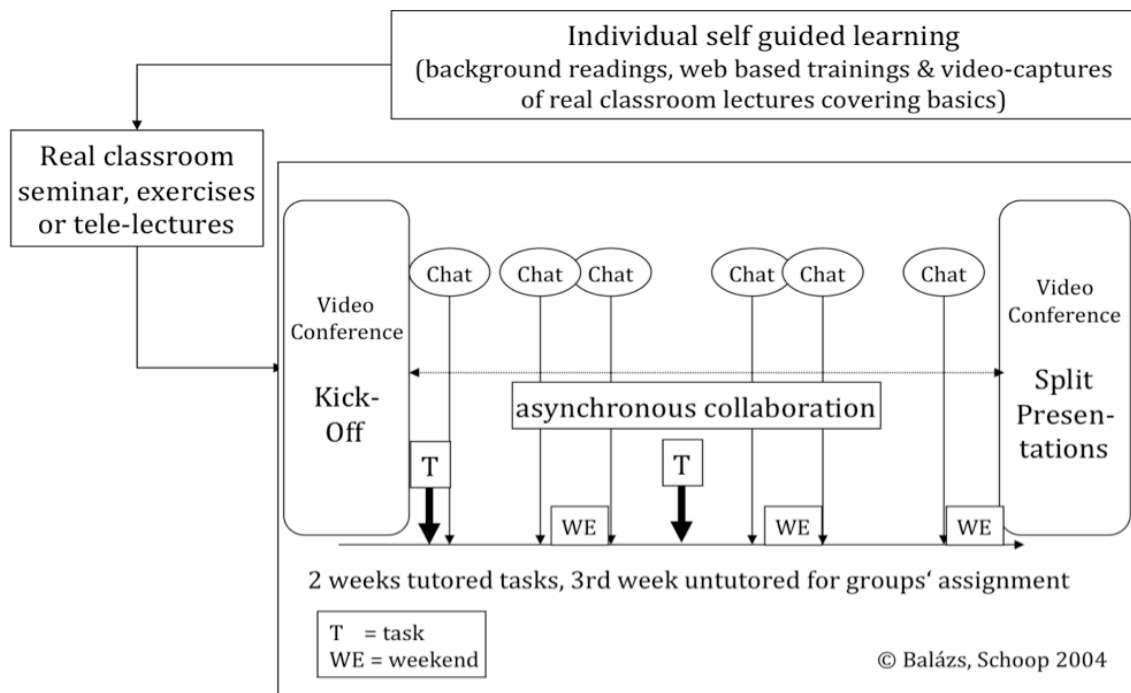
Following this scheme, from 2001 to 2009 26 VCL (virtual collaborative learning) projects, 12 with international (bi-/tri-national) mixed teams, took place at Technische Universität Dresden to complement traditional real classroom activities by interdisciplinary virtual classroom interaction. Starting with voluntary projects, they stepwise became compulsory and integral part of regular Bachelor-/Master-modules and since 2004 run every semester. Participating students have to expend the defined workload, perform given tasks to achieve educational objectives and thus gain their ECTS (European Credit Transfer System) credits.

Figure 1 demonstrates the standard framework for VCL projects, figure 2 details the structure of stage 4 for a typical 3-weeks VCL project with international teams. For more details of the implementation of the VCL concept into complex blended learning arrangements see [25].



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Figure 1: Framework for VCL project's design, implementation, utilisation and evaluation



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Figure 2: VCL project with internationally mixed teams solving complex business case

4 Conclusion: Blended Learning in the Knowledge Society

What are the lessons learned from intensive VCL utilisation and evaluation? Can this complex blended learning arrangement bridge the gap between formal learning processes and informal knowledge sharing? Students and teachers see VCL projects embedded in traditional modules as time consuming, but worthwhile additional value. Working in virtual teams comes close to later professional working environments, and students appreciate the chance to collaborate in heterogeneous teams, use foreign language and Internet technology to communicate, train to compromise on common results, to cope with time and additional project restrictions, and to get into touch with students from other countries and universities.

Over time the learning objectives of our VCL projects shifted. In the first years we focused on improving teamwork and media skills based on strict rules what to achieve, how to communicate and which tools to use for what purposes in the concern not to overcharge students being quite unfamiliar with this new learning environment. With growing familiarisation to the Internet and especially to Web 2.0 technology we gradually unfastened our restrictions on technical platforms, tools, communicative behaviour and also opened up our expectations for the possible solutions of the ill-structured business cases. Today, the VCL virtual classroom is no longer based on traditional learning management systems, but is implemented in any desired open-source community platform students already know from private experience (e.g. NING), students are free what communication media they use (e.g. Blogs, or Google-Docs), the outcome, having formerly been pre-structured pdf versions of the project documentation, switched to flexibly structurable WikiWebs, and the use of external sources is not only accepted, but desired and strongly recommended.

Also, additional eLearning components of the complex blended learning arrangement, complementing the VCL nucleus, have changed. Instead of using traditional (linear and quite inflexible) web based trainings, today students can refer to numerous external (e.g. Wikipedia or open-source thesauri), internal (e.g. glossary and seminar documentations of the participating institutions) or personal WikiWebs or Blogs or further Social Software applications. These are complemented by teachers and students delivering video-captures of lectures or invited expert talks (or captures of crucial project meetings via video conference), video podcasts or other multimedia learning materials. More and more, students have the proficiency to network, collaborate and actively contribute to common solutions.

Blended learning arrangements – and also VCL projects –are still part of formalised learning processes. But by the use of new Web 2.0 tools and by the use of new students generations already being familiar with knowledge sharing in Social Software environments, these arrangements rapidly open up to the demands of the knowledge society, as introduced in this paper. Given the readiness of the decision makers at universities, the formal teaching and learning processes (in forms of module descriptions, learning objectives, blending of different teaching/learning styles, but also advanced regulations regarding examinations and evaluations – e.g. utilisation of eAssessments or ePortfolios) can be opened to more and more informal learning and knowledge sharing in Higher Education.

5 References

- [1] Schnitzer, K. Von Bologna nach Bergen. In: M. Leszczensky, A. Wolter (eds.), *Der Bologna-Prozess im Spiegel der HIS-Hochschulforschung*. Hochschulinformationssystem, Hannover 2005, pp. 1-10.
- [2] Maassen, O. T. *Die Bologna-Revolution: Auswirkungen der Hochschulreform in Deutschland*. Frankfurt am Main: Bankakademie, 2004, pp. 5-6.
- [3] European Council. *Presidency Conclusions of the Lisbon European Council*.

- http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm, 2000-03-24 [2006-08-01].
- [4] European Council. *The concrete future objectives of education and training systems*. <http://register.consilium.europa.eu/pdf/en/01/st05/05980en1.pdf>, 2001-02-14 [2006-08-01].
- [5] European Commission. *eEurope 2005: An information society for all. An Action Plan to be presented in view of the Sevilla European Council*. http://europa.eu.int/information_society/eeurope/2002/news_library/documents/eeurope2005/eeurope2005_en.pdf, 2002-06-22 [2006-08-01].
- [6] European Commission. *i2010 – A European Information Society for growth and employment*. http://europa.eu.int/information_society/eeurope/i2010/docs/communications/com_229_i2010_310505_fv_en.pdf, 2005-06-01 [2006-08-01].
- [7] European Commission. *e-Learning. Glossary Term*. <http://elearningeuropa.info/index.php?%20page=glossary&abc=E> [2006-08-01].
- [8] Directorate General Education and Training of the European Commission. *eLearning Programme. A programme for the effective integration of Information and Communication Technologies (ICT) in education and training systems in Europe (2004 – 2006)*. http://ec.europa.eu/education/programmes/elearning/programme_en.html [2006-08-01].
- [9] Gesellschaft für Medien in der Wissenschaft GMW. *E-Bologna: Hochschulstruktur-reformen und E-Learning*. <http://www.gmw-online.de/themen/bologna/ebologna.html>, 2005-05-31 [2006-08-01].
- [10] Bächle, M. Social Software. In: *Informatik Spektrum*, 29 (2006) 2, pp. 121-124.
- [11] Lewin, D., Pasternack, P., Bloch, R. *Künftige Trends in der Hochschulbildung*. In: P. Pasternack, R. Bloch, C. Gellert, M. Hölscher, R. Kreckel, D. Lewin, I. Lischka, A. Schildberg. *Die Trends der Hochschulbildung und ihre Konsequenzen. Wissenschaftlicher Bericht für das Bundesministerium für Bildung, Wissenschaft und Kultur der Republik Österreich*, bm:bwk, Wien 2006, 101-133.
- [12] Schoop, E., Gilge, S., Bukvova, H. *How to implement “eBologna“? Didactical and Organisational Issues of a mobile ERASMUS Module Network*. In: Blum, U., Eckstein, A., Eckstein, A. (Eds.): *Wirtschaftsinformatik im Fokus der modernen Wissensökonomie - Netzwerkökonomie und Electronic Business, Electronic Learning, Systementwicklung und Modellierung*. Festschrift für Prof. Dr. Dr. h.c. Wolfgang Uhr. TUDpress Dresden, 2007, pp. 169-192.
- [13] Siemens, G. *Knowing Knowledge*. Lulu.com 2006, www.knowingknowledge.com.
- [14] Siemens, G. *Connectivism: A Learning Theory for the Digital Age*. <http://www.elearnspace.org/Articles/connectivism.htm>, 2004.
- [15] Thomas, S. Transliteracy - reading in the digital age. In: *Higher Education Academy English Subject Centre Newsletter*, November 2005.
- [16] Baumgartner, P. Eine neue Lernkultur entwickeln: Kompetenzbasierte Ausbildung mit Blogs und E-Portfolios. In: V. Hornung-Prähauser, *ePortfolio Forum Austria*, 2005.
- [17] Siemens, G. *Learning or Management System? A Review of Learning Management System Reviews*. <http://lrc.umanitoba.ca/wordpress/wp-content/uploads/2006/10/learning-or-management-system-with-reference-list.doc>, 2006 [2007-11-20].
- [18] Hippner, H. Bedeutung, Anwendungen und Einsatzpotenziale von Social Software. In: *HMD - Praxis der Wirtschaftsinformatik*, Vol. 252, 2006, 6-16.
- [19] Anderson, T. Distance learning – social software's killer ap? In: *Proceedings of the 17th Biennial Conference of the Open and Distance Learning Association of Australia*, 2005.
- [20] Prensky, M. (2001). Digital Natives. Digital Immigrants. In: *On the Horizon*. NCB University Press, Vol. 9 No. 5, October 2001.
- [21] Seufert, S., Mayr, P. Blended Learning. In: *Fachlexikon e-learning. Wegweiser durch das e-Vokabular*. Bonn 2002.

- [22] Schoop, E., Böhme, R., Bukvova, H., Gilge, S., Kalb, H., Michel, K.-U., Petzoldt, O., Schneider, R. Blended Learning at the Chair of Information Management at Technische Universität Dresden: Infrastructure and Services for the right Mix. In: Schoop, E. & Gilge, S. (Eds.), *European eLearning Activities to support the Bologna Roadmap*. Conference Proceedings of the Third European Integration Forum at Technische Universität Dresden, Nov. 4, 2005. Dresden 2006, 114-127.
- [23] Klauser, F., Schoop, E., Wirth, K., Jungmann, B., Gersdorf, R. The Construction of Complex Internet-Based Learning Environments in the Field of Tension of Pedagogical and Technical Rationality. In: R. Bogaschewsky, U. Hoppe, F. Klauser, E. Schoop, Ch. Weinhardt (eds.), *IMPULS EC Research Report 10*, Osnabrück, 2004.
- [24] Bair, James H. Supporting Cooperative Work with Computers. Addressing Meeting Mania. In: *COMPCON – Computer Society of the IEEE*. San Francisco 1989, 208-217.
- [25] Bukvova, H., Gilge, S., Schoop, E. Virtual Collaboration in Higher Education Blended Learning Arrangements. In: K. Meißner, M. Engelen (eds), *Workshop GeNeMe 2006 (Gemeinschaften in Neuen Medien) – Virtuelle Organisationen und Neue Medien*, TU Dresden, 2006, 283-294.