TIES462b – Virtual Learning Environments

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Term Paper – Evaluation of Virtual Learning Platforms from different aspects

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eLearning; learning platforms, Virtual Learning Environment, VLE, usability, security, maintenance, e-learning quality, Blackboard Academic Suite 7

ABSTRACT
This paper serves the requirements of the learning assignments within my Ph.D. study course 'TIES462 – Virtual Learning Environments'. For the work I decided for following. For the use and description of a learning platform I decided to describe the platform product 'Blackboard – Academic Suite 7' (including the consideration of learning system, community system and content system features) using the general product descriptions at Blackboard homepage and through the use of the product is implemented and in use at the FH Amberg-Weiden (University of Applied Science, Germany). Because of my research activity handles the issue of e-Learning evaluation and therefore the review and conception of a holistic 'evaluation-criteria model' the dimension of virtual learning platforms might be seen as an important part of it.

This document includes the six learning assignments are postulated by the course instructions. The first assignment deals with the above-mentioned learning platform and its basic theory, components, procedures, tools etc. The second assignment turns to the consideration of the learning platforms from the basic concept of 'Virtual Learning Environments - VLE'. The third one deals in more detail with the topic 'VLE and its usability' before Assignment Four handles the issue of 'security' and Assignment Five the issue of 'maintenance'. Assignment 6 turns at least to the question of 'Quality in eLearning. Chapter 7 of this paper takes some summarizing statements for the evaluation of the selected platform and the issues are handled in Assignment One to Six.

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1. ASSIGNMENT ONE – AT THE VERY FIRST: BACKGROUND THEORY

Beforehand starting with the description of the functionalities of the above mentioned and selected learning platforms in sense of the requirements are needed for assignment 1, in this chapter there is a brief review of the understanding of learning platforms and the theory is provided within the literature are included the Moodle course outline. After illustrating the idea of good learning platforms in theory the real existing platforms will be reviewed and features (later used as equivalent for tools, instruments or functionalities) of it will be described based on the underlying theory.

1.1 Basic features of learning platforms based on evaluation theory

First there are some of the aims are given with using eLearning, respectively Virtual Learning Environments. The basic concept as described by Keltomäki (et al) does have implications for the issue at interest here – the basic features are needed for reaching these following illustrated basic goals:

- 'Function of VLE is, to provide opportunities to improve the quality and variety of teaching and learning that are not being achieved using current methods – detach the learning process from time an place for more convenience (…) flexibility in choosing different teaching methods can add value.' (Keltomäki, E., et al; 2001)
- A further goal of Virtual Learning Environments is the '(…) reduction of administrative burden for the teacher. (and the) using of time for more personalized teaching than mass lectures." (Keltomäki, E., et al; 2001)
- Also the balance between student and teacher (instructor) should be better within a VLE rather than in traditional learning environments. Keltomäki circumscribes this as follows: '(…) the goal should be to establish interaction and a genuine dialogue. (Britain, S., et al; 1999)'

Following Britain (et al) the in Figure 1-1 illustrated features are provided with a *prototypical Virtual Learning Environment:*

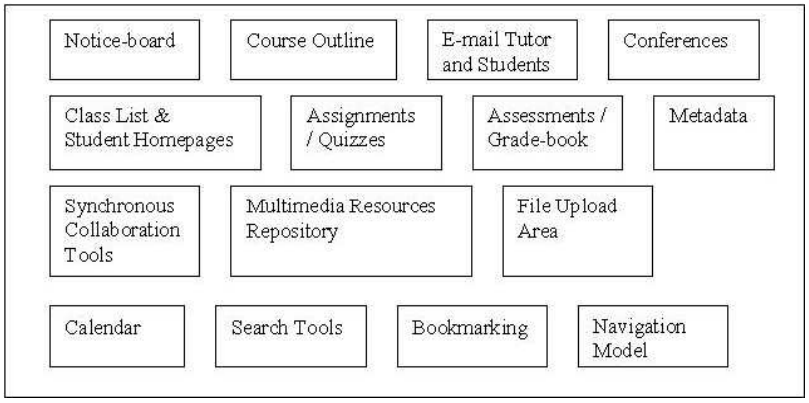

Figure 1-1: A schematic of a Prototypical VLE (Britain, et al)

Britain's overview over a prototypical VLE maybe seen as a first, non-ordered list of features a learning platform should provide. With reading the literature material is provided within the course outline the following two frames of categories may be considered as interesting for ordering the features and the later evaluation of learning platforms in context of technologically and pedagogically aspects:

1. Britain – A holistic, pedagogical view using *Conversational Model* and/or *Viable System Model* as anchor

Based on the two, above-mentioned models, Britain (et al) reviewed in her report the criteria, or better said the prerequisites for learning platforms from a more holistic, pedagogical point of view. Supporting pedagogical concepts like *collaborative learning*, *discussion-led learning*, *student-centred learning* or *resource-based learning* is in the centre of Britain's interesting.
In the report Britain (et al) therefore reflects well on the impact of the two models to the teaching and learning process (in the context of higher education). Over the question which tools can meet the different criteria, like that of Laurillard's (1993) *Conversational Model* (VLEs are: discursive, adaptable, interactive, reflective and/or supports the identified 6 actions within the teaching-learning process – see also Britain, sub-chapter 2.4) or that of Beer's (1981) *Viable Systems Model* (VLE supports from individual course point of view: resource negotiation, coordination, monitoring, individualization, self-organization, adaptation; or in a bit differing way for the organizational/formal point of view see also Britain, sub-chapter 3.2) Britain orders the tools and features of VLEs respectively learning platforms. Doing so, she comes to the in Table 1-1 illustrated raster of functionalities, tools and features:

Basic Category	Kind of software tools	Features
Teachers Tools		
	Resource Management Tools	Creating/importing content
		Store resources
		Add metadata
		Add description
		Add/play multimedia content
	People Management Tools	Store & view learners data
		Add & remove learners
		Track learner activities
	Course Management Tools	Course structuring
		Adding resources
		Creating assignments
		Performing assessments
		Rapid course revising
		Create discussion groups
Student Tools		
	Resource Management Tools	Web browsing
		Creating importing content
		Store bookmarks
		Add metadata
		Add description
		Play multimedia content
	People Management Tools	View people data
		Homepage authoring

	Learning Management Tools	Calendar tool
		Self-testing tools
		Searchable resource archive
		Create discussion groups
Interaction Tools		
	E-mail	Write and receive email
		Create context-based eMail
		Use integrated course address book
	Noticeboard	Create/Edit context-based notice
		Pin-up/delete notice
		'Call-attention-to-notice' feature
	File exchange	Up-load files
		Down-load files
		Properties information/comments
	Asynchronous Discussion	
	Chat	
	Whiteboard functionalities	
	Video-conferencing	

Table 1-1: Categories of Tools and Features provided by Learning Platforms after Britain

Table 1-1 shows the categories of tools and the features based on the concept of evaluation is recommended in Britain's report. Next it will be turned to a second, from the authors point of view as valuable rated, kind of categorization of tools and features for a good learning platform, respectively Virtual Learning Environment.

2. Tsinakos – Operative and educational important features of VLEs

Tsinakos (2004) in his report 'The puzzle of Virtual Learning Environments: what criteria should be present in the ideal VLE?' also makes available an interesting raster for ordering tools and features a learning platform might provide. He basically structures his review after criteria in two directions: the operative aspect of learning platforms and the educational aspects. Following these two aspects and respect the work of different concepts like Britain's above mentioned approach, he comes to the categorization and overview as summarized in Table 1-2. This illustration of Tsinakos is partly convergent but also varies in some areas and involves features can be seen on the meta-functional levels like software usability and handling. For a better understanding the table comprises a basic differentiation between tools and functionalities depending to the learning/teaching process area or are of a meta-functional kind.

Kind of Tool/Feature	Kind of software tools	Features/Functionalities
Learning/teaching process related features and tools		
	Teacher's Tools	Course design wizard
		Simplicity of course design process
		Content Management
		Multiple Teacher per course
		Setting up students collaborative groups

		Selective assignment of educational material
		Adaptive content comprehension
		Monitoring of students' participation
		Constructing of table of content (ToC)
		Quiz/test construction
		Automatic grading
		Monitoring of students' performance (index of grades)
		Students' assistance towards performance improvement
	Student's Tools	Personal storage space
		Student profile card
		Search in the educational material
		Bookmarks
		Personal notes
		Use of vocabulary
		Printing ability of the course material
		Agenda – Calendar
		Setting up collaborative groups
		Anonymity
		Personal progress monitoring
		Homework reminder
		Self-assessment
		Personal grade information
		Students' queries database
	Communication Tools	Exchange of messages
		File sharing
		Forums
		Chat
		Whiteboard
		Bulletin board
Operative/Meta-functional specifications, issues and characteristics		
	Technical Specifications	Windows Compatibility
		Unix/Linux Compatibility
		Web Browser Dependency
	System Management Issues	Username and Password authentication
		Multiple Rights of Access
		Safety of Data
		Management of Educational Material
		Statistical view of Resources
		Technical Support
		Remote Management

	General Characteristics	Multimedia support
		Working without connection
		Content in CD-Rom version
		Use of metadata
		Multilanguage support
		Help files and tutorials
		Standardization of courses

Table 1-2: Categories of Tools and Features provided by Learning Platforms after Tsinakos

As apparently can be observed, Tsinakos has a different and partly comprehensive list of features compared to Britain's'. The reason for this might be caused in the additional view at the operative features included in his report.

This three basic illustrations/lists, Figure 1-1, Table 1-1 and 1-2, provides from the reviewers point of view now a good starting point for the further work in assignment one and the other assignments. Finally to bridge the theoretical background to the practical issue of assignment one, the review scheme, which is provided by www.edutools.info is seen as a helpful checklist. This review scheme concentrates on typically and above mentioned functionalities, features and tools a learning platform might provide and will be used for the practical review of Blackboard Academic Suite 7.

1.2 Review of Blackboard Academic Suite 7

As mentioned above, this sub-chapter serves to meet the requirement of the course assignment one – the review of the selected learning platform product 'Blackboard – academic suite 7' with the focus at the software tools and features are provided within. The review section provides, in addition to the above-mentioned checklist for tools and its different categories, a continuative basic description of the products. The review considers the teachers as well as the learners/students point of view.

	Blackboard Academic Suite 7
Communication Tools	**Learning System / Content System**
Discussion Forum	✓
Discussion Management	✓
File exchange	✓
Internal Mail	✓
Online Journal/Notes	✓
Real-time Chat	✓
Whiteboard	✓
Productivity Tools	**Learning System / Content System**
Bookmarks	✓
Calendar/Progress Review	✓
Search within course	✓
Work offline/Synchronize	X
Orientation/Help	✓
Student Involvement Tools	**Learning System / Content System / Community System**
Group work	✓
Community Networking	✓
Student Portfolios	✓
Administration Tools	**Learning System / Content System**

Authentication	✓
Course Authorization	✓
Registration Integration	✓
Hosted Services	X
Course Delivery Tools	**Learning System / Content System**
Test Types	✓
Automated Testing Management	X
Automated Testing Support	X
Online Marking Tools	X
Online grade book	✓
Course Management	✓
Student Tracking	✓
Content Development Tools	**Learning System / Content System / Community System /**
Accessibility Compliance	✓
Content Sharing/Reuse	✓
Course Templates	✓
Customized Look & Feel	✓
Instructional Design Tools	✓
Instructional Standards Compliance	X (not explicitly provided)
Hardware/Software	
Client Browser required	No, works with standard internet browsers
Database requirements	Yes
Operational Systems	Windows, LINUX, Solaris
SCORM, AICC compatibility	✓
Company Details/Licensing	
Company Profile	http://www.blackboard.com/company/
Costs Licensing	No information found
Open Source	No information found
Optional Extras	E.g. Blackboard Building Blocks; Networked Learning Environment; Services (Consulting, Training)

Table 1-2: Features and Tools – Blackboard Academic Suite 7

Blackboard Learning Suite 7 – Core Products and feature description

The above verified features of the product 'Blackboard Academic Suite 7' are clustered into three main areas (Source: http://www.blackboard.com/europe; Category products, 2007 – see also Appendix One):

- *Blackboard learning System*; the *learning System* contains the functionalities in the area of instruction, communication and assessment. Following the generic product description, which is provided at the international product homepage (www.blackboard.com), the *Learning System* supports by the use of simple web-based tools the creation of learning content, the synchronous and asynchronous communication between the instructor/teacher and the students. Also the creation and deployment of tests, quizzes as well as the evaluation of such tests etc is possible by using the *Blackboard learning System*. A detailed description can be found in Appendix Two of this document. Getting a more interactive impression of the product please see the demo is provided at Blackboard homepage (here: http://www.blackboard.com/products/Academic_Suite/Learning_System/demo.htm)
- *Blackboard community System*; this part of the academic suite product supports institutions and organisations with the creation of learning communities, with tools for the personalization (roles and

customization) of the learning environment as well as tools for e-commerce. A detailed product description is provided with Appendix Three of this paper. Also for the *Blackboard community System* an online demo is provided at Blackboard homepage (http://www.blackboard.com/products/Academic_Suite/Community_System/demo.htm).

- *Blackboard content system*; this part of the product provides features and tools for managing and sharing of files (virtual hard drive), for managing the students development (e-portfolios) and for sharing and managing of learning materials (e.g. Learning Object catalogue). A detailed description about the functionalities of the *Blackboard content System* can be found in Appendix Four. There is no online demo provided at the Blackboard homepage.

With this description the basic functionalities in theory as well as in current existing learning platforms is illustrated from the authors point of view.

2. Assignment Two – From Learning Platform to Virtual Learning Environment

This chapter deals with the tasks and goals are given through the second course assignment. First there is a brief illustration of the important issues are described in the literature which is provided in the course outline, beforehand the chosen learning platform will be evaluated in sense of the reviewed criteria.

2.1 General social affordances and requirements for cognitive and communication tools in VLE

The papers and documents are provided illustrates an insightful contribution for answering the questions in Assignment Two of this course from an educational/pedagogical, a technological and the practical point of view.

Dillenbourg (2000) as one representative of the educational, pedagogical point of view on Virtual Learning Environments, concerns in his paper mainly on the basic question '*What is a Virtual Learning Environment?'* and '*Will Virtual Learning Environments improve education?'.* Following Gerstenmaier and Mandl (2002), Dillenbourg considers thereby all the relevant levels, like designing, teaching and individual learning process. The first part of Dillenbourg's work concentrates on the basic features and specifics of Virtual Learning Environments by working with the general issues like:

- The design of the information space within VLE,
- The turning of virtual spaces into places in sense of educational interactions is needed when learning occurs,
- The explicit representation of this social and information space through the use of different forms of illustration and media,
- The general involvement of students as actors for designing virtual courses,
- The issues of distance learning combined with physical co-presence in classrooms,
- The possibility of integration of heterogeneous technologies and pedagogical concepts Virtual Learning Environments
- And the general question how virtual environments overlap with physical circumstances/objects.

Within the second part of the document Dillenbourg presented at the EUN Conference 2000, deals with the issue if Virtual Learning Environments can improve education. In context of this question he discuss specific educational issues like…

- The motivational effects of media for learning,
- The affordances of Virtual Learning Environments,
- The general question after the practicality of VLE
- The general philosophy of effectiveness against the innovative aspect of VLE.

In context of the goal and task is given in Assignment Two, not all of the discussion Dillenbourg provides in his second part is directly relevant here. From the author's point of view, Dillenbourg provides a good general scheme to answer the question *'what features has a typical VLE make available from educational point of view?*'. These are features and tools supporting…

1) *Free access for the students to information,*
2) *Students and teachers creating contents in a structured, transparent collaborative way,*
3) *Educators to control the degree of instruction and/or collaboration in sense of cognitive processes and constructivist's approaches,*
4) *The explicitly representation of learning contents,*
5) *Social interactions in synchronous and asynchronous ways,*
6) *General technically architectures which allows the integration of different media, content types as well as supporting tools,*
7) *The use and combination of distance and prudential learning – also in mixed forms,*
8) *The integration of physical objects into the virtual course outline (e.g. non-computerized learning resources like books, videos, face-to-face sessions or role playing etc).*

Robinson's work, which was presented at the teaching and learning form 1999, and obviously concerns to the educational research discipline, deals in depth with the use of cognitive tools in context of designing, teaching and learning. After Robinson cognitive tools hereby support the learner to externalise cognitive processes by freeing up *short-term memory (STM).* He quotes Kozma (1987) and his definition of cognitive tools:
"Cognitive tools are devices that allow and encourage learners to manipulate their thinking and ideas." (Kozma, 1987, p. 21)

How does this statement effect the consideration of any VLE? Cognitive tools, or better a VLE which follows this constructivist approach, support the teacher/tutor at the issues of *enabling, modelling and guiding*. On the other hand the cognitive tools support the learner/student at the level of *individual learning* and *thinking processes* and helps for the construction of knowledge in the individual learning context. At least the integration and implementation of cognitive tools has to be in mind of the course designer. Therefore this is not always a mere programming of any functionality in software – it rather than a holistic integration of the '*cognitive-constructive-communication'* principles in the course design. The designer and his product VLE can support the concepts of cognitive tools within the VLE e.g. through the use of *visual aids and/or interactive functions*.

Jonassen writes in his report '*Technology as Cognitive Tools: Learners and Designers*' from the standpoint of Information Technology under the aspects of *educational communication.* Firstly he illustrates from his

point of view the roles that participate during the planning, designing, implementation, teaching and learning phase a VLE is affected with. He separates therefore after the educators and learners. Educators are *instructional designers*, *subject matter specialists*, *media producers* and *media managers*. Knowing these roles is an interesting aspect in context of the given task because it will be helpful to understand who is working within a Virtual Learning Environment and what is the needing for doing the particular job. Jonassen rather concentrates on the role of technology, *primarily computers,* as cognitive learning tools then on working with the construct or concept of instructional design. In his opinion a change in mind is necessary in sense of taking tools and features from the designer away and give it to the learner. This confirms to Dillenbourg's criteria that teachers and student should have access to course and content designing tools. He purpose that *"learner function as designers using the technology as tools for analyzing the world, accessing information, interpreting and organizing their personal knowledge, and representing what they know to others." (Jonassen, p. 2)*

Cognitive tools in his mind are "*generalizable computer tools that are intended to engage and facilitate cognitive processing – hence cognitive tools. (Kommers, Jonassen & Mayer, 1992) (…) Cognitive tools are both mental and computational devices that support, guide, and extend the thinking process of their users. (Derry 1990)"* (Jonassen, p. 2)

More concrete Jonassen names examples for such *computational devices* like databases, spreadsheets, semantic networks, expert systems, multimedia/hypermedia construction, computer conferencing, and collaborative knowledge construction environments. An important aspect of Jonassen's work is his standpoint how technology (VLE in the context of this work) might support the knowledge construction process during the learning. This means from his point of view "c*onstructivist models of instruction strive to create environments where learners actively participate in the environment in ways that are intended to help them construct their own knowledge, (…)." (Jonassen, p. 4)*

Beside the mentioned criteria of active participation of learners as part of a mental and computational concept for cognitive tools, Jonassen stress that technology should not control but give the freedom to learn in sense of cognitive conception. Computers therefore shall promote reflection, discussion and problem solving. At least Jonassen highlights the important role of *language*, which can be supported by technology.

All in all Jonassen supports the idea of cognitive tools and its use in mental and technological sense for Virtual Learning Environments. Tools in sense of his cognitive concept therefore supports that students actively participate, may have the change for communication and interaction, support learners to express and articulate their knowledge and questions and support the reflection process of the learner.

At least the alert of the University of Durham brings some summarizing aspects into the discussion of evaluation criteria for VLE in context of cognitive and communication tools. The pedagogical, practical and strategic recommendations provide some further aspects for the work here, e.g. the requirement for VLE to meet the afforadences that brings handicapped learners/users with them. Concretely VLE might respect the fact that learners do have decelerated cognition or physical handicaps and problems with the typing speed. But they are not really new, especially seen in the context of the above discussed affordances and requirements. Therefore the evaluation frame for the practical review of the chosen platform can be done guided by the 8 questions where extracted from Dillenbourg's comprehensive work.

2.2 Practice of cognitive and communication evaluation criteria of Blackboard Academic Suite 7

On the one hand obviously the Blackboard Academic Suite 7 meets the common structure of VLE's under the consideration of the mentioned educational, pedagogical and technological aspects. But on the other hand some of the features can only be observed under full operation of a real course. And some of the

criteria can only be observed in case of designing a course meeting all the cognitive process rules and the use of the communication tools. These are the restrictions for evaluating the chosen platform in this context. Lets see next how the reviewed theoretical criteria will help to evaluate this platform respecting consciously the restriction are mentioned above:

What VLE shall support	✓/×	With the tool(s)	Comment
Students do have free access to all relevant course and related information	✓	- Blackboard learning System (course outline, electric blackboard, discussion platform, glossary, homepages – tutor and students, announcements) - Blackboard content System - Blackboard community System	The most of the information are available within the course material and the course outline. Bottom the line the access is dependent from the course designer/administrator who makes information available. The platform is available in different languages – but the translation of contents depends on the course designer and/or students as authors for written/drawn contents.
Students and teachers can create contents in a structured, transparent and collaborative way	✓	- Blackboard learning System – Course management modus for tutors, course authoring functionality, electronic blackboard, discussion forum, file exchange - Blackboard content System – Learning Object Catalogue, Content and File Management, Versioning, workflow activities, e-Reserves	The mere of Blackboard learning System partly meets the requirement. But with implementation of Blackboard content System completes the features and therefore the possibility that Blackboard meets the requirement. Not clear is, if there is a disadvantage the use of Blackboard content System may create further investment/costs. Within the user administration features the roles of content manager, content assistant or tutor can be defined.
Educators can control the degree of instruction and/or collaboration in sense of supporting cognitive processes and 'constructivist' approaches	✓	- Blackboard learning System – adaptive release, syllabus builder, learning units, collaboration tools, virtual classroom, course management tools - Blackboard community System – see above, roles and rights administration	These criteria may be seen as very difficult to evaluate in Blackboard without any observation of a concrete running course within the VLE.
Explicit representation of learning contents	✓	- Blackboard learning System – course authoring, - Blackboard content System	It is possible to involve and add multiple-format media e.g. hypertext based pages, plain text.
Synchronous and asynchronous interactions and communication	✓	- Blackboard learning System – discussion board, group e-mail, virtual classroom, collaboration tool - Blackboard community System – Web broadcast announcements, community building tools (e.g. campus comprehensive	No comment

		communication; across-the-board communication)	
General technically architecture allows the integration of different media, content types as well as supporting tools	✓	- Blackboard learning System – system integration for data and system; Blackboard Building architecture allows the integration of campus back-office systems, student information systems and authentication systems. - Blackboard content System – e-Portfolios	No comment
Usable for distance and presential learning as well as for combinations	✓	Blackboard learning System, Blackboard content System and community System	From the authors point of view and experience with Blackboard this criterion may be seen as positive evaluated and is met by different tools within the Blackboard environment.
Integration of physical objects into the virtual course outline (e.g. books, videos etc)	✓	Blackboard learning System, Blackboard content System	No comment

Table 2-1 – VLE evaluation matrix with focus on cognitive and communication tool

Finally there are brief answers to the questions are given within Assignment Two:

Is there all kind of components (learning materials, cognitive and communication tools) available? Yes.

Which tools can be defined as cognitive tools and which as communication tools? In general the electric blackboard and all content creation and manage tools, combined with the access in involvement of students and learners can be seen as cognitive tool; typical communication tools are the chat, internal and external message and email system, virtual classroom and so on.

What kind of tools there are to create and import (as well as export) learning materials? The Blackboard learning System and content System supports the features and requirements for the creation and import of contents. Table 2-1 and Appendix One till Three provides more detailed information for the tools.

3. ASSIGNMENT THREE – THE ISSUES OF USABILITY OF VLE

Assignment Three particularly handles the issues of usability regarding Virtual Learning Environments. First there is the question after the meaning of usability in a definition sense. Usability in general context has to be expressed with the support degree of any *object* for reaching a particular goal. Reading the literature and therefore the research outcomes presented by Nielsen, Nokelainen (et al), Pitkänen (et al) and Silius (et al) leads to a basic understanding as well as the understanding of the meaning and partly differences in the terms usefulness, utility and usability as well as its capillary differentiation in the context of Virtual Learning Environments.

Jacob Nielsen is mainly quoted in literature with his basic definition of, and introduction to usability as a *quality attribute* in the area of software user interfaces and its designing processes. Nielsen focus in the narrow sense of the term usability at following five *quality components: learnability, efficiency, memorability,*

errors and *satisfaction* (Nielsen, J., 1993). Beside these five criteria he handles in his article topics like *how to improve usability, when to work on usability* and *where to test,* which are less interesting here. Nielsen's criteria may be used as the basic, general theory for the further consideration and capillary definition of usability in the area of Virtual Learning Environments and e-learning courses. Answering the basic question for Assignment Three, also VLEs as systems should follow Nielsen's basic concept and usability principles because of its status as a kind of software user interface combined with a necessary designing process.

More specific to this topic are the research reports and concepts of Nokelainen (et al) and Silius (et al). Nokelainen illustrates in his work therefore, based on an empirical assessment of digital learning material with elementary school students, a more precisely definition of usability in context of digital learning which comes close to the idea and concept of Virtual Learning Environments. In his central concept, firstly Nokelainen structures and recommends that the term usability in sense of definitions given by Nielsen etc., should be considered as characteristics for following objects:

1. *The product's design process,*
2. *The product itself,*
3. *Use of the product,*
4. *User experiences of the product or*
5. *The users expectations.*

This extension of the term is from the author's point of view essential in context of VLEs. Nikolainen quotes in his work to Nielsen's enhanced, clear illustration and classification of usability under the term of the *practical acceptability* of user interfaces and design processes. Practical acceptability and its under category *usefulness* gives a more holistic idea of usability. Usability therefore may be seen under two different standpoints, which are from the authors point of view strongly interwoven concepts; the concept of '*Utility → Pedagogical Usability*' and '*Usability → Technical Usability*' (Nikolainen, P., 2006). Consequently the consideration of usability of Virtual Learning Environments might respect both concepts, the concept of pedagogical and technical usability. Silius (et al) also follows this basic categorization of usefulness into *usability* (technical usability) and *utility* (pedagogical usability) in the provided report about a multidisciplinary framework and tool for usability evaluation in context of web-based courses (Silius, K., et al, 2003). Regarding to Pitkänen's (et al) report, he focused the criterion of reusability of learning objects may be seen as a sub-criteria of usability in both categories, pedagogical and technical.

Summarizing Nielsen's and Nikolainen's (et al) work and the introduction of an additional structure - the consideration and evaluation of e-learning courses or VLEs in the context of '*Planning-Designing-Implementation-Introduction'* activities, *'Teaching-Tutoring'* activities and the process of '*Individual Learning'* (Gerstenmair, J., Mandl, H., et al, 2002) - the following set of criteria might be seen as important at the different stages of use:

(1) Planning, Designing, Implementation and Introduction of e-learning courses in Virtual Learning Environments:

a) Technical Usability and criteria for evaluation of VLEs:

- **Learnability** - VLE is easy to learn for course planner, designer, technical implementation and course roll-out people
- **Efficiency** - VLE is efficient to use when planning (e.g. integration of curriculum), designing (e.g. using multimedia technology objects as learn contents), implementation (e.g. use of different software programming technologies) and the introduction of courses (e.g. via a high-capacity technical environment like databases, GUI and/or Client/Server architecture).

- **Memorability** – VLE should be easy to remember after a while of not using the functionalities and tools for planning, designing, implementing and introducing courses. In sense of this criterion the user interface and business logic should follow the 'keep simple and stupid' principle as well as it attend on a consistency design of the software functionalities and tools.
- **Errors** – VLE should first have a low error rate and catastrophic errors were denied during the use of the VLE for planning, designing, implementing and introducing any course with the VLE system.
- **Satisfaction** – a VLE should be pleasant to use. Therefore the designer, planning people as well as technical implementation people and roll-out person do like the use of the system.
- **Reusability of Learning Objects** – a VLE supports the aspects of reusability of learning aspects in sense of technical aspects (e.g. storage of learning objects within database structure; re-use of learning-objects through dynamic content creation in sense of content management systems or indexing of learning objects for efficient search and use of it).

b) Pedagogical Usability and criteria for evaluation of VLEs:

- **Added Value** – VLEs provide concrete advantages for the planning, designing, implementation and introduction activities compared to common methods. E.g. the environment is adaptable to the individual needs of course designers. This may be given through the integrated use of specific tools and software features.
- **Valuation of Previous Knowledge** – VLEs provides data to the course planner, designer, implementation team and introducer of e-learning courses that bases on previous experience and knowledge from e.g. former courses. This can be a feature similar to a management information system where a multidimensional database supports decision.
- **Flexibility** – VLEs support mainly course designers in the creation of the most possible flexibility. Flexibility means therefore that the learning content and path may be markable for individual learners decision. E.g. this criterion will be met if the VLE system support the creation of pre-tests, which allows an dynamic and individual decision for learning contents, are shown in a course outline.
- **Feedback** – VLSs provide a feedback loop feature direct from teachers and/or students. This might improve the quality of learning contents and sometimes helps to react fast to given problems with the course outline and chosen pedagogical concept of the course.
- **Reusability of Learning Objects** – VLEs support beside the technical aspect also the reusability of learning objects from the pedagogical point of view. Course designers and implementation teams do have access to learning objects and it structured storage. E.g. VLEs provides the attributed storage of learning objects and a search functionality over this database.
- **Reusability of Best Pedagogical Concepts** – VLEs provide the recycling/reuse of former courses and their explicit pedagogical concept. This means courses were kept in the past with some specific pedagogical concept (e.g. e-learning by doing, the use of scaffolding etc.) are searchable and findable and reusable for course planner and designers.
- **Use of Cultural Learning Course Profiles** – VLEs course designers and planners do have access to a set of profiles which are dependent to the specific learner group and its specific culture.

(2) Teaching and Tutoring with e-learning courses through the use of VLEs

a) Technical Usability:

- **Learnability** - VLE is easy to learn for teachers and tutors. Teachers and tutor do not have a lot of effort to understand and use the Virtual Learning Environment.
- **Intuitive Efficiency** - VLE is intuitively efficient to use when teaching a course, e.g. for controlling of different course groups or parallel controlling of different discussion groups.
- **Memorability** – VLE should be easy to remember after a while of not using the functionalities and tools for teaching courses. In sense of this criterion the user interface and business logic should follow the 'keep simple and stupid' principle as well as it attend on a consistency design of the software functionalities and tools.
- **Errors** – VLE should first have a low error rate and catastrophic errors were denied during the use of the VLE for teaching any course with the VLE system.
- **Satisfaction** – a VLE should be pleasant to use. Therefore the teacher and tutor do like the use of the system.

b) Pedagogical Usability:

- **Sociality, Cooperative and Collaborative Teaching, Flexibility and Feedback, Learner Activity** (teachers items) – VLE support the teacher/tutor with conducting individual and/or collaborative learning-oriented courses and supports to be flexible and take care to individuals. Best will be that both forms, individual and collaborative/cooperative learning is possible. VLEs support the teacher and tutors with receiving and giving direct feedback. VLE supports teachers and tutors in their 'didactic role' VLE can support all of these with the integration of functionalities and tools
    - Supporting synchronous and asynchronous communication (in the forms of 1:1, 1:many, many:many);
    - Supporting the tutors in the process of scaffolding (supporting the students/learners with more or less instructional activities) and support of *in situ* driven and/or cognitive learning processes;
    - Supporting the use of pre-tests and individual repetition of learning modules if necessary without holding up the rest of the students;
    - Supporting the formulation and location of feedback.
- **Added value for teaching** – VLEs are beneficial for the teacher/tutor concerning all activities must be done during conducting a course.
- **Motivation** – VLEs provides the teacher/tutor tools and features which helps the him/her to control extrinsic motivational patterns, e.g. beginning with incentives, grades, punishment, integration of graphs and multimedia content etc.
- **Goal orientation** – VLEs support teachers and tutors to start und pursue the learning goal definition and documentation. The system provides explicitly this information on an exposed position in the system. This will improve the degree of transparency.

- **Valuation of Previous Knowledge / Immediate reusability of Learning Objects** – VLEs allows the teacher and tutors the flexible integration of learning materials, which embodies previous knowledge and are unaccounted in the original course design, e.g. the teacher and tutor do have easy access to learning objects database.
- **Applicability** – VLEs support teachers and tutors with the integration of real objects, the combination of theory and practice lessons to make the learning material less abstract and more applicable for students and learners. The teacher and tutor can use tools that helps him/her with the organization of additional excursions or the involvement of experts and real objects into the course.

(3) Individual Learning Process

a) Technical Usability:

- **Learnability** - VLE is easy to learn for students. Students do not have a lot of effort to understand and use the Virtual Learning Environment.
- **Intuitive Efficiency** - VLE is intuitively efficient to use when participate a course as student.
- **Memorability** – VLE should be easy to remember after a while of not using the functionalities and tools. In sense of this criterion the user interface and business logic should follow the 'keep simple and stupid' principle as well as it attend on a consistency design of the software functionalities and tools.
- **Errors** – VLE should first have a low error rate and catastrophic errors were denied during the use of the VLE.
- **Satisfaction** – a VLE should be pleasant to use. Therefore the students do like the use of the system.

b) Pedagogical Usability:

- **Applicability** - VLEs support students with learning materials are authentic, useful and needed. The VLE supports the integration of learning-by-doing components. VLE helps the student to find his/her individual learning path under consideration of given experience and knowledge. VLE and course design allows the student the request for scaffolding activities (e.g. through the request of a particular hint from the teacher/tutor or fellow student) at the individual point it is needed.
- **Goal orientation** – VLE support the student with defining, redefining, tracking and focus and learning goals. The system can provide the
- **Cooperative and Collaborative Learning** (students items only) – VLE support the student to move from the mere acquisition of knowledge to the metaphor of participate and construct knowledge. In this case VLEs supports conversation and dialog in all forms (student2student, student2teacher, 1:1 or 1:many or many:many), group work and/or asynchronous/synchronous social navigation within the course participants as temporary social group.
- **Reusability of Learning Objects** – VLE supports students with the access to learning objects database. In case of constructivist course setting/pedagogical concept, the student also acts partly as designer and producer of learning material (see also remarks to cognitive

tools and processes in Assignment Two). Therefore the VLE might support the access to learning objects that helps the student to express his meaning in a fast way.

- **Added Value** - VLE brings benefits for students compared to the participation of traditional courses and learning materials.
- **Learner Control –** VLE support students to find his/her individual best way of course structuring and helps to disburden learners/students memory. Therefore tools and features as well as the general design of VLEs can support the learner in this issue. For example the offering of storage space, the tracking of learning progress and exits are possible features help the student. But also the free arrangement of the course outline to an individual learning path support the student in sense of having control.
- **Learner Activity** (students items only) – VLE support students in different forms of 'own activity' and participation in the learning course. Students can individually or in groups actively participate in the course. Therefore VLEs has to have this criterion in the main focus and might provide tools and features oriented in this direction. Examples for such features are communication tools (synchronous and asynchronous), whiteboards, chats and designer tools for learning material.
- **Motivation** – VLE gives space for motivational triggers. There is a correlation between some of the above mentioned pedagogical usability criteria and the motivation of a student. First, how much motivated a student is in case of participating any particular course may depend from the pedagogical course concept and the design of course material. Secondly, and perhaps the most important sub-criteria here, is the degree of how much the learning context and content meets the appreciative settings of the student. Thirdly the degree of learner control and opportunity for learner own activity can be seen as motivational factors for the student. Motivation is quite individual and only can be controlled via extrinsic factors. The choice of the pedagogical concept and the relevance (applicability) of the learning context may be seen as the strongest influence factors to the intrinsic motivation of the individual student. Also collaborative and cooperative learning frames may have influence to the individual motivation of the student. VLEs can, as it is described above, support with its features and tools this area motivation.
- **Feedback** – VLE might encourage accurate feedback and therefore support faultless learning as well as learning with scaffolding factors. This support can be done by the provision of feedback functionalities as well as the immediate evaluation of course exercises and questionnaires.

These are the criteria, which has to be seen as important for evaluating Virtual Learning Environments from the technical and pedagogical usability point of view in relation to its stage of use. Next there are concluding and summarizing answers to the questions are given in course outline for Assignment Three.

How would you define usability in Virtual Learning Environment context?

The definition of usability and its evaluation criteria provided by the workings of Nielsen, Nikolainen, Pitkänen and Silius meet in general the needs for the evaluation of Virtual Learning Environments. From my point of view there is the differentiation of the usability criteria dependent from the stage of use (see above) necessary.

What you mean by usability and what elements are especially important in VLE?

Also here in my opinion the importance of usability criteria depends on the stage of use. In general I would see the technical usability as a kind of basic prerequisite (in sense of Herzberg's Hygienefaktor). Considering the pedagogical usability the space for choosing the kind of concept during the designing process of a course may be seen as most important. Within the teaching-learning activities usability in sense of collaboration and communication are very important as well as all motivational factors can be supported by VLEs.

What factors influences on usability in VLE?

First I see the most influence through a consistent design of the Virtual Learning Environment itself. Secondly there is of course the influence of the individual satisfaction with the system (also because of efficient work with it), which can be improved by personalization and feature clustering for the especial roles. So much intuitively a VLE is designed not at least the satisfaction depends on the individual experience of the user with VLEs or traditional courses. Errors are 'show stopper' and will decrease the acceptability a lot.
In addition to these factors culture plays a role and influence the success of a Virtual Learning Environment. The most influencing and hardly controllable factor is the individuality of the humans and the learning contexts are involved in the creation and conducting of the courses within Virtual Learning Environments.

What is important to take account in VLE while improving usability?

- Transparency over and support for pedagogical activities for students, teachers and designers.
- The use of workflows in VLE operation.
- Rigidity of technical platform and infrastructure.
- Space for individualization and personalization.
- Over-all search functionalities.
- Backend data integration rather than extensive front-end integration

How these issues have been considered in selected platform?

Please see Chapter 7.

Considering Virtual Learning Environments from the perspective of usability is from the author's point of view a very interesting issue which defines the satisfaction and degree of using. Especially the enhancement of the objects are under consideration and the doing the assessment of VLEs within pedagogical and technical dimensions provides a first, well-founded way to evaluate the effectiveness and efficiency of e-learning courses or learning process supported by digital media. From the authors point of view the differentiation between the three mentioned stages which VLE are involved in is essential. The usability aspect, or better said the effectiveness question might be also considered under the aspects of intercultural differences and micro as well as macro economical effects.

4. Assignment Four – Security Issues and its Avoidance in context of VLE

Security is an increasing issue because of the increasing use of the Internet for the use of information systems in general, therefore also for the use of virtual learning platforms supporting classroom and distance learning and its activities during the phases of planning, developing and designing courses, conducting it and the individual learning processes. Outside disciplines like Computer Science or Information Technology the issues of security are mainly associated with technical issues, like the often-heard problems with virus

attacks and its consequences. As a matter of fact there is a widespread range of security issues are not obviously at a first look. Especially in the context of education and distance learning, as it is mostly named by the authors are listed in the course outline of TIES462, there are security issues in the area of technology is used (hardware and software) and human beings who are involved into the activities are usual for education. Following Alwi (2001) security issues are given at all stages of eLearning or within all stages of the use of Virtual Learning Environments, which are embodies the technical solution for distance learning. She structures the risks to following four categories of risks:

- *Interruption; (…) is a security threat that results in the system's asset becoming lost, unavailable or unusable.* (Alwi, N., p. 6, 2001) Concrete examples are that hardware and software will be destroyed in a physical or virtual way, VLE tools become unusable and/or unavailable.
- *Interception; (…) relates to access gained by an unauthorized party(ies). Virtual learning, by virtue of its on-line presence, makes it extremely vulnerable to characters that intend to intercept the information available on its web site. (…), it would not only result in monetary losses for the institution but also invasion of privacy on the part of the students.* (Alwi, N., p. 7, 2001) *Illicit* use, copy and therefore theft of original VLE software, access to and misuse of sensitive (privacy) information to unauthorized people.
- *Modification;* (…) *refers to the tampering of a system's asset by an authorized (e.g. via logic bombs) or an unauthorized party. Upon gaining access (via interception), the unauthorized party is able to modify/alter data available in the system. (…) Modification can be conducted via the use of logic bombs, Trojan horse, virus or information leaks.* (Alwi, N., p. 7, 2001) Concrete examples are that students information will be manipulated (grades, records etc), courseware material will be manipulated through unauthorized people, learning software tools will be altered, course communication information are manipulated with the consequence of confusion.
- *Fabrication;* (…) *relates to the counterfeiting of objects on a computer system.* (Alwi, N., p. 8, 2001) This maybe seen as an attack to the private issues of students and institutions based on the unauthorized change of personal data etc. Concrete examples for this kind of risk are the *Insertion of false records into student's database*, the manipulation of student's grades and course contents, the insertion and distribution of illegal and unethical contents.

Alwi's work gives therefore a first, good overview over the types of security risks may be given. These risks are given because of the use of unsafe Virtual Learning Environments (in technical and administrative sense) as well as because of the users of VLE (in sense of human motivated factors and the cultural differences are discussed in Slay, F., 2003). Furnell (et al) sees in his work 'Security Issues in Online Distance Learning' (2001) does have another, more technical orientated definition of risks are combined with the use of OLD (Online Distance Learning) which should have been respected from the LRP (Learning Resource Provided) because of the fact of using of the Internet at medium. These risks are:

- *Malicious software such as viruses, worms, Trojan Horses*
- *Hacking, Denial of service attacks*
- *Masquerading, spoofing*
- *Fraud, data theft, malicious damage*

Affected from the above-mentioned security risks are educators (planner, designer and teacher/tutors as well as institutions like universities) and students. Infringement of intellectual property and privacy rights of

course designers, teachers and tutors as well as of students may be seen as the most critical effects which can be entailed by Virtual Learning Environment. The crux is, that often these concerned person are (consciously or unconsciously) responsible for the violation of security of learning platforms and it is hard to differentiate them as hackers from normal students or educators.

Answering the first question of Assignment Four, what is security in VLE, easily said it is the safe and trustful use of Virtual Learning Environments for the roles are using it (students, teachers, designers and education institutions as the planning instance) under the avoidance of the above mentioned risks. Alwi's conclusion meets the answer to this question from the author's point of view in the best way.

> *'The concept of virtual learning are exposed to threats since treats could be intentionally happen. In providing the flexible ways of learning, the security issues should never be neglected since students will depend on the virtual learning online system to get all information needed. And it is a must to serve a correct data of information to them on order to give them confidentiality and a comfortable place to study.*
> (Alwi, N., p. 10, 2001)

The creation and operation of a Virtual Learning Environment may consider that it is not just a peccadillo if not taking care after the risks are aligned with it. That this is the case can also be comprehended with the existence of national data protection laws and EU regulations which handles the violations in a kind of codex. Not taking care about the risks and the infringement of privacy and/or intellectual property rights can not only lead to a fine but also to a prison sentence up to two years (Bundesdatenschutzgesetz (BDSG), Germany, 2006).

The question at this point is, what are concrete countermeasures, controls and activities which can be used to avoid security risks and how to handle given security issues in a fast and efficient way within VLEs. There are different activities provided from Alwi (Countermeasures or controls), Furnell *et al* (SDLearn – Secure Distance Learning; a security framework for online distance learning and training), Slay (Information Systems security, trust and culture) and Ko *et al* (e-Test – secure Internet examination system based on video monitoring). As practiced in the alignments before, a common structure in sense of a checklist next will be created which provides and allowed for the most critical risks are given when using or operating a VLE. Before doing so the essence of the in the literature provided countermeasures is provided:

<u>Alwi – Countermeasures or controls</u>
Alwi provides in her work a comprehensive list of *countermeasures or controls* especially for the use and operation of Virtual Learning Environments. Following measures are provided in here work (Alwi, H., p. 9-10, 2001):

- Physical controls
- Asset-tagging and maintenance of an Asset Register
- Conduct of periodic audits
- Establishment and implementation of policies and procedures
- Encryption of data/information
- Assignment of passwords
- Installation of Anti-Viruses and Scanners
- Filtering data – Firewall
- Establishment and implementation of a human resource plan

Furnell (*et al)* – the SDLearn security frameworks

Furnell (et al) in his provided SDLearn security framework sees following measures against security risks which can be clustered with the course lifecycle elements *enrolment, study, completion, suspension (optional) and termination (optional)* (Furnell, S.M. *et al*, p. 239-241, 1998):

- Authentication and accountability
- Access control
- Intrusion detection
- Protection of network communications
- Non-repudiation issues
- LRP (learning resource provider) 'housekeeping issue'

Ko (*et al)* – secure Internet examination system based on video monitoring

Ko and Cheng (Ko, C.C. & Cheng C.D., 2004) provide only a partial solution for the prevention of security risks in the field of online course exams. They mainly concentrate on the issue of malpractice the freedom and non-physical presence in course examination because of the fact of distance learning. Both researchers tested a measure which helps to avoid this malpractice – the e-Test approach which bases on video monitoring via installed video cameras of students during the exams.

Slay – IS security, trust and culture: a theoretical framework for managing IS security in multicultural settings

Slay (Slay, F., 2003) handles in his document the issue of cultural impacts to the security issues are caused by *human factors* for Information Systems (IS) in general. The very interesting, holistic approach therefore allowed for cultural differences remarks to three main components; Technology, Organisation and the Human Beings are in the context of the organisation using this technology as a whole – a system. Slay's work gives a further impact and idea for the handling of secure issues within VLEs, the handling of issues are induced by the appreciative, cultural settings and its resulting individual and peer group behaviour.

From the authors point of view the check against security issues for any specific VLE may be done under consideration of the dimensions *user of, and phase of using of VLE, technology is in use (software and hardware), physical environment of VLE* and *administrative and organizational affairs in VLE.*

VLE user and the phases of use

The consideration of security issues has to be oriented and structured after the user role and/or the phase of using it. This means, that it makes sense having a detailed and transparent picture over the processes and therefore the human activities of each phase of use (learning, teaching, designing and planning). This allows the role-dependent, and activity individual development and implementation of security concepts (as a combination of the below following dimensions). VLE can support this during the use of a security concept, which is individual tailored to the role of the user and e.g. for the tools are in use.

VLE Technology

The choice and use of safe technology in the area of hardware and software may be seen as the very first and therefore as basic prerequisite for security in Virtual Learning Environments. The use of HTTPS 128bit encryption technology, certification and authentication concepts, enrolment codes, WLAN network encryption technology, shielded transmission of sensitive data or the storage and backup of data, or the often-mentioned use of a Firewall can be seen as examples for it.

VLEs physical environment

As above mentioned from Alwi, there is also the necessity to take into account the measurements are of a physical nature. Physical access control to computer rooms, the use of video monitoring for exams or for the authentication process, a student and teacher identification via biometrical attributes, the use of extra-protected server rooms for servers or extra network circuits might be seen here. Virtual Learning Environments should consider for the individual case that physical restriction do not disturb the common learning and teaching activities, the usability of the platform in the above mentioned sense as well as the possibility for the integration of physical control mechanism.

Administrative and Organizational security concepts

In this area of security measurements administrative and organizational activities and concepts might be seen. The administration of roles, access and user-rights are effectual measurements against the misuse of data and tools within a Virtual Learning Environment. These administrative processes can be supported through the provision of user administration, the general provision of rights for VLE features, tools and/or access to data as well as a tool which allows the individual arrangement/customizing of profiles. Therefore organizational security concepts, like the structure of VLE user roles and its combined rights should have space for implementation within VLEs. Beside this the formulation of rules and a user codex conjunct with sanctions can be seen as general organizational concepts.

The check of the selected Blackboard Academic Suite 7 learning platform shows the general security of it. More details are described in chapter 7. Bottom the line; security is the basic prerequisite for the use of VLE for conducting courses in an online manner. The Internet harbours a lot of risks which should not influence the further development of Online- or eLearning courses. As well as it should play the ‘showstopper’ for the increasing number of institutions using it as an opportunity for education in future.

5. ASSIGNMENT FIVE – MAINTENANCE OF VLE

Each other Information System – either based on Information Technology or not – has to be maintained through its life cycle. In case of Virtual Learning Environments the maintenance management has to handle different areas like the technological maintenance (hardware, software and physical infrastructure components) as well as the pedagogical maintenance (enhancement and/or adaptation of course contents, features, workflows, tools, roles and rights and concepts). Therefore the maintenance activities, as they are well categorized in the course outline of assignment 5 as citation of Swanson's and Pressman's work, are conducted by different roles are involved into the use and administration of a Virtual Learning Environment. Maintenance categories/typologies after Swanson and Pressman are therefore *Corrective Maintenance, Adaptive Maintenance, Perfective Maintenance or Enhancement* and/or *Preventive maintenance/Re-engineering.*

So first in this section there should be given an answer to the question 'why is maintenance for IS and especially for Virtual Learning Environments necessary?' Swanson (1976) for example provides in his early work the basic reasons for maintenance in context of any application software which distinguish between *program won't run, program runs but proceeds wrong output, business environment changes* and *enhancement and optimization.* He consequently built up a typology of the bases of software maintenance:

1. *Processing failure*; e.g. the abnormal termination of a program forcing job cancellation through bugs in the software.
2. *Performance failure*; e.g. the software does not perform satisfactorily in terms of the functional specifications (e.g. response time is long), and modification is called for to remedy the situation.
3. *Implementation failure*; e.g. software programming was incomplete or inconsistence.
4. *Change in Data Environment*; e.g. the logical restructuring of a database.
5. *Change in Processing Environment*; e.g. in case of new generation of system hardware. For example the use of Java instead of C++.
6. *Processing Inefficiency;* e.g. the used program algorithm are inefficient or the program does use the computer performance in an inefficient way.
7. *Performance enhancement;* the given software program has to provide the possibility for improvements within the specifications are given for it.
8. *Maintainability;* describes the general ability of software programs for maintenance.

Bases 1, 2 and 3 meets to the type of corrective maintenance; 4 and 5 to the adaptive maintenance type; 6,7 and 8 to the perfective maintenance type. In a common understanding Virtual Learning Platform has to be understood as *application software*, or in the timely more adequate sense, as Information System. Therefore reasons (bases) and types for maintenance have not changed since Swanson's work was published in 1976 and are valuable for the consideration of VLEs. But these typologies are mainly described in the context technical maintenance. Therefore it is necessary also to have a look at the causes that are pedagogical nature of maintenance. In this context the above-mentioned topic concerning the pedagogical usability and tools are important to understand. In sense of *up-to-datedness* because of changing organizations, changing pedagogical methods and concepts and, most important, the improvement and change of factual knowledge (e.g. documents, scientific reports, literature) itself demands a concept of maintenance in this area.

What are the fields of maintenance and which activities cover the claim for technical and pedagogical maintenance issues? Which of them are particular for and/or has to be taken into account of VLE? Which

role is conducting the activity? Answering the first two questions in this paragraph Figure 5-1 will give an overview over the fields of VLE maintenance and some of its activities:

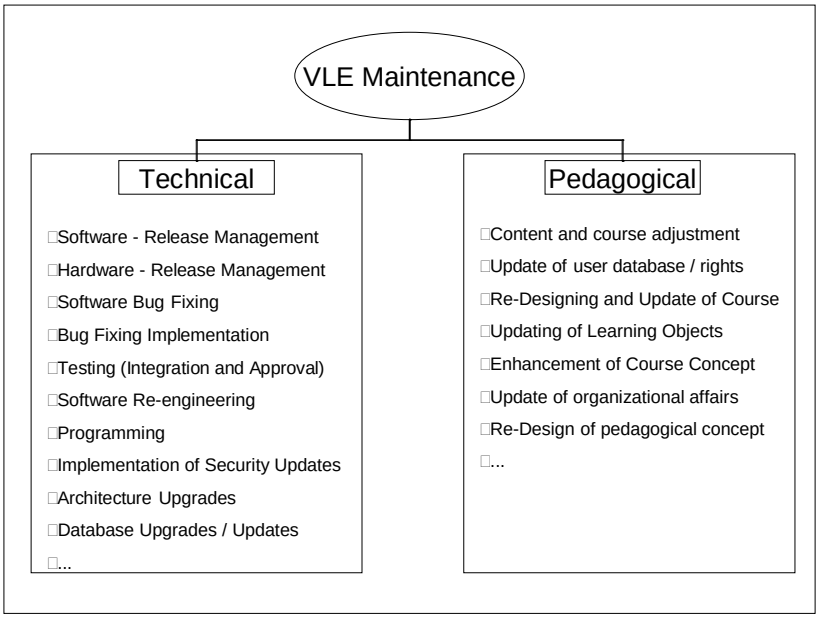

Figure 5-1: Fields and typologies of maintenance for VLE (Source: Hilgarth, B., 2007)

Next the consideration of the persons, roles and/or institutions that are mainly involved into these maintenance activities is interesting. As seen above different roles are involved during the use of VLEs in any particular learning context. Often the issues of maintenance are combined with the picture of a person sitting in front of a computer surrounded by servers etc – the picture of IT administrator. From the authors experience in the environment of Information Systems development and operation this picture does not meet the current job profile of an administrator. Surely the technical administrator of any Information System, consequently also for Virtual Learning Environment systems, does have the focus on the technical maintenance of it. The technical administrator often is doing his work in some maintenance or operational support structure which is from an organizational nature. Technical maintenance is also done by the programmers, network specialists, software architectures which are often part of last level support teams.
Who is doing the activities in the field of pedagogical maintenance? The role of course administrators, course and content designers and tutors/teachers do have the goal to maintain this field of a Virtual Learning Environment. Miller *et al* (1996) does see the role and tasks of administrators in distance learning environments in the implementation of *a reward system to promote creativity in distance education teaching. To assure success in distance education, administrators also identified the need to: 'make programmatic quality a high priority', (…) 'encourage continual updating of course content."* (Miller, M.T. & Husmann, D., p. 5, 1996). This also means that Virtual Learning Platforms do have a stringent organizational concept for roles and rights, which regards to the allocation of maintenance activities mentioned by Miller *et al* and Figure 5-1. Bottom-the-line there are different persons involved into the overall maintenance activities within a Virtual Learning Environment (System) regarding the technical and pedagogical affairs. Technical and course administrators, software programmer and course/content designer, course and software architectures, course conductors and other technical as well as pedagogical specialists.

Following the question in the course outline of Assignment 5, the most of the pedagogical roles can be administrated within the Blackboard Academic Suite 7. How these features are used for pedagogical maintenance is depend from the organizational concept each operative instance consists. Especially the assessment of the technical maintenance features of the product is difficult. An interesting aspect in sense of the technical maintenance is given by the hosting service 'Blackboard ASP'. This application software providing service offers also the central maintenance of hardware, software and security technical maintenance issues. This may be seen as an interesting, with costs, offer of Blackboard maybe seen as an alternative for small- and mid-sized institutions.

6. ASSIGNMENT SIX – QUALITY OF E-LEARNING

Quality, a very often used term in context of the production of goods and its evaluation concerning results and outcomes. Quality is often hard to measure because it depends on the subjectively evaluation of directly or indirectly involved persons and theirs appreciative settings and long-term preferences as well as experience in the field of context.
Quality is from the author's point of view an overall, holistic concept – especially for eLearning courses. Prerequisites of quality of VLE are in the author's opinion the sum of the above mentioned criteria determined through its features, its tools, the technical and pedagogical usability, its security and pedagogical and technical maintenance affairs. All these factors are hygienic factors for high quality in eLearning or in other words the quality basics of eLearning.
This also means that there are different and correlating approaches to consider; the levels or focuses influencing the consideration of quality in this field. Dependent from these correlations of different factors do determine the possibly knowledge about the quality of an eLearning course. Dimensions are from the author's standpoint and experiences are:

1. The phases a eLearning course pass through (Planning, Designing, Implementation, Adaptation, Teaching/Tutoring, Learning)
2. Roles are involved in each of the phases.
3. Pedagogical quality affairs (e.g. pedagogical concepts and its tool use)
4. Technical quality affairs (e.g. usability, maintenance efforts etc)
5. Cultural quality affairs
6. Content and subject-related quality (e.g. state of the art of course content)
7. Consistency and stability in the course repetition

Ehlers *et al* defines in his work the quality of eLearning basically from the learner's perspective. Following the principal component analysis (PCA) approach he analysed 7 fields including 30 dimensions for quality from the perspective of the learner. (Ehlers, U.-D., et al, p. 4-7, 2004) These 7 fields of eLearning quality after Ehlers *et al* are:

1. Tutor Support
2. Collaboration
3. Technology
4. Cost-Expectations-Benefits
5. Information Transparency of Provider/Course
6. Course Structure / Presence Course
7. Didactics

He also figured out that there are different *target groups* of learners with different preferences concerning the above listed fields of eLearning quality: *The Individualist, The Result-Oriented, The Pragmatic, The Avant-Gardist.* The quality of eLearning is, after a study Ehlers *et al* did concerning the quality approaches in European eLearning, given with *the best learning achievements* and *something that is excellent in performance (…).* (Ehlers, U.-D., et al, p. 8, 2005) In his study concrete quality criteria are illustrated by Figure 20 (p. 59). They are illustrated concerning the RQC (reference quality criteria), which is the basis for the ISO/IEC 19796-1 quality standard. It enfolds a catalogue of some 800 quality criteria.

Following on the other hand Moor's (2005) work as part of the *Sloan Consortium Quality Framework*, she is defining quality in eLearning with the *Five Quality Pillars*. These are:

1. Learning Effectiveness
2. Cost Effectiveness and Institutional Commitment
3. Access
4. Faculty Satisfaction
5. Student Satisfaction

Instead of Ehlers, Moor does not have the predefinition of any specific perspective or role to the quality affairs of eLearning. From the authors point of view it will be best to see both approaches in a complementary way. Ehlers approach defines a kind of quality pull principle – quality from the learner's point of view which needs also quality at the other perspectives of planning, designing, implementation and teaching. Whereas the *Sloan Framework* approach is a mixture of push and pull principle because of the inclusion of the additional perspectives of institutions as well as the cost drivers of eLearning. A further interesting view at this, the evaluation of eLearning, provides Schank in his work *eLearning Does Not Mean Copying School – Assessing and Measuring E-Learning.* (Schank, R., 2002) Schank therefore defines quality not with the stringent use of criteria; he works in the definition of quality of eLearning with the expectations of students, teachers and institutions in concern to their goals, activities and histories in school and university teaching.

How can quality be measured or evaluated? Moor provides for example in her paper a possible framework including *metrics* (combined with its goals and progress indices – see also Moor, J., Table 2, 2005) for each of the above listed quality pillar. The *Sloan Consortium Quality Framework* do also refer to a kind of long-term quality improvement strategy; the *CQI – Continuous Quality Improvement*. Another long-term approach is the quality roadmap the EFQUEL organisation provides.
Moor partly provides activities like the use of surveys or interviews for the determination of particular metrics. Partly her work is too superficially, e.g. in the Students Satisfaction – measuring the learning outcome. There is no definitive indication of methods like process analysis and monitoring to get results about the progress of the learner in the use of the learning knowledge in his/her learning context.
Ehler *et al* in his study he did with the European Quality Observatory (2005) mentions three different kinds of quality measurement and evaluation. There are:

- Explicit Type: *quality strategies or instruments coming from externally adopted approaches (e.g. ISO, EFQM, BAOL Quality Mark)*
- Explicit Type: *quality strategies that are developed within your organisation;*

- Implicit Type: *quality development* (and evaluation) *is not part of an official strategy but is rather left to individuals' professional activities;*

(Ehlers, U.-D., et al, p. 51, 2005)

Within his study Ehlers *et al* also gives some answers to the question which of the externally existing approaches do meet the requirements of quality management of eLearning. In section 4.8.3 he offers an overview over the possible approaches and its valence. In addition to the above mentioned literature the homepage of the European Foundation for Quality in eLearning - EFQUEL offers a lot of quite interesting papers, study, quality roadmaps and evaluation frameworks, which can help to apply quality management in different contexts, e.g. for schools or universities.

At least there is the open question, how does the Blackboard Academic Suite 7 meet all this quality requirements for high-performing eLearning. As mentioned at the beginning of this chapter, the meet of the quality basics or hygienic factors may be seen as the prerequisite for further quality evaluation. As mentioned in the usability chapter many of the evaluations only can be done if there is a real running eLearning course. Regarding the evaluation of the selected platform the following chapter 7 is for.

7. SUMMARY ABOUT BLACKBOARD ACADEMIC SUITE 7

This chapter shall summarize the issues are handled from Assignment One till Six. It therefore is possible to consider each of the topics again.

1. *Is the Blackboard Academic Suite 7 a learning platform?*

Yes it is. Bottom the line the Blackboard Academic Suite 7 (and its optional enhancements) meets the requirements of a learning platform in the classical sense. Following Britain's holistic model and Tsinakos operational and educational feature list, this product offers the features and tools are important for conducting learning courses in sense of distance and presence lessons – see also the evaluation in Table 1-2. The core products of the Blackboard Academic Suite 7, the Blackboard learning System, Blackboard community System and Blackboard content system are separately available, this makes scalability of the system possible. To reach the full flexibility and functionality in sense of the above mentioned platform requirements, the combined implementation and operation is recommended. Detailed descriptions about the product can be found in the appendices One to Three.

2. *Social affordances for Blackboard Academic Suite 7 – does it meet the requirements for cognitive learning processes and communication affairs in learning?*

Assignment Two illustrates that the Blackboard Academic Suite 7 in general meets the requirements for cognitive learning processes and communication affairs in learning. Considering Virtual Learning Environments in general as the enabler for teaching and learning in sense of the above listed social and learning forms and its affordances (following mainly the findings of Dillenbourg, Jonassen, Gerstenmair and Mandl *et al*), the Blackboard Academic Suite 7 can, when deploying all the mentioned enhancements of the product, meet the standards of a VLE. The judgement has to be restricted to the issues cannot be evaluated

without conducting any real course by using the product. From the authors experience with this product in the environment of higher education at the FH Amberg-Weiden (University of Applied Science, Germany) it can be confirmed that Blackboard Academic Suite 7 meets the requirements. But as mentioned it depends on the planning of and the course design itself how will be the degree of meeting the requirements.

3. Blackboard Academic Suite 7 and its usability issues

Blackboard Academic Suite 7 can in general meet the pedagogical and technical usability criteria of a Virtual Learning Environment. Also here the evaluation cannot completely be done without using the platform in a real context of planning, designing, implementing or teaching and learning with Blackboard Academic Suite 7. From the authors experience with the product it is possible to do it. There is some negative issue, or better said the opportunities for improving the product in the future; the use of role-dependent modus (interface and illustration), the use of workflows for designing and content production. Also there is a clear restriction in the use of the product for 'learners-as-designers' principle. For the learner (e.g. student) it is hardly possible to structure his/her course in the individual setting and it is hardly possible to create own assignments and course structures as well as multimedia contents. For the designer, teacher/tutor and learner there is no learning object database combined with a feature available. For example, testing to give one test student access to the test course was created by the author shows that it is not intuitive to do so at it was time intensively to find the attribute why the enrolment to the student hasn't worked. Also there is no workflow which can provide support for the course instructor to create accessible course. This workflow or process orientation might be seen as a field for improvements of usability for the Blackboard product in the future.

4. Blackboard Academic Suite 7 and security issues

First the tested Blackboard Academic Suite 7 installation at FH Amberg-Weiden provides the use of the basic technical and physical security measures. There is a general login to the VLE given, a SSL certification can be used, the access to the environment can therefore happen with the safe HTTPS encryption technology. At the level of users the product provides standard roles combined with rights, e.g. instructor, teaching assistance, guest, student, grader or course builder. Additional to these roles at course enrolment level Blackboard provides a general user administration for the whole environment. A negative issue is that the student's password cannot be changed by the student himself/herself. Therefore the initial and further change of passwords will be done from one person, the system administrator or course instructor. With the system administration and personalization it is possible to operate some organizational concept of security. Therefore some misuse and disrespect of rules can be tracked and focused to groups consisting especially roles and its owning rights. Independent from the Blackboard product for the test installation at FH Amberg-Weiden there was the use of physical access control to the computer rooms implemented. The access control was individually assigned to the personal card each student received with the matriculation at the university. Bottom the line the Blackboard Academic Suite 7 provides security measures at technological level. It also supports the use of individual organizational and administrative security concepts which allows the tailoring of user access to information and functionality. The product therefore supports therefore the safe use of the VLE during the different phases of any eLearning course.

5. The Maintenance of Blackboard Academic Suite 7

The technical maintenance issues e.g. hardware and software release management, implementation of security updates or programming and testing of the Blackboard Academic Suite 7 product can hardly be evaluated because of the missing of steady observation of the test installation. Blackboard ASP Services as an alternative form for any local installation of the Blackboard product provides some additional available technical maintenance services, e.g. Full Managed Service.
In sense of pedagogical the functionalities and tools of Blackboard Academic Suite 7 meets the requirements. For example the adjustment of contents and courses itself, also with some restricted usability, is available. In sense of adjustment and re-use of Learning Objects the recycling functionality or cartridge feature supports the maintenance activities in this area.

6. Can Blackboard Academic Suite 7 provide and support eLearning quality?

Generally the selected product is part of the quality and can provide quality of eLearning if it is correctly used. As described above the Blackboard Academic Suite provides a lot of tools which might be used in an individual way for different pedagogical learning concepts. Also the product can be implemented and used in different languages and therefore support the quality criterion of cultural affairs in its very first way – the access of the platform in the language the user understands. In the context of technical quality the test platform has worked as long as it was used for the study without any bug and error. Because of quality in eLearning is from the authors point of mostly an organizational and therefore an individual issue at the level of each institutions, course designers as well as teachers and tutors, the evaluation in such a detail can not be conducted for this work. E-Learning quality needs first of all an individual strategy for each organisation and institution providing education. Some of the functionalities of Blackboard Academic Suite 7 support the implementation of the strategies measures. But the development of quality strategies and evaluation concepts are on an organizational level. These activities can be combined with the consulting services the company Blackboard offers. If standards of technical interfaces and/or course formats can be seen as the first step for quality, the Blackboard Academic Suite 7 supports this with, e.g. MS, SIF, SCORM and NLN standards.

CONCLUSION

As I currently can practice in my job, eLearning becomes in the international context of my work (Dealer Development in international BMW Group dealership) a very important tool as well as didactical method for improving the quality of learning and the improved vehicle for knowledge transfers. The ‘e-‘ therefore just has to be seen as a consequent evolution and as often propagated as a revolution for future education. eLearning and the use of VLE for eLearning need an overall and holistic concept for its individual use in different contexts of education. Important is that the usability of VLE software has to be improved in the near future with the effect that the added values for distance learning and blended learning can be used in a better and efficient way. Also there is the need of such a holistic concept to make better decisions. Decisions that are made in context of daily business management are often driven by investment-benefit consideration. Consequently the added value of the investment in and the use of Virtual Learning Environments should be observable or in the best case traceable by any management information system.

In this course and therefore in this paper there is the opportunity to built up and develop step-by-step the most important issues around this topic. The *coronation* is the last Assignment Six that combines under the aspect of quality all the other issues like the basic theoretical understanding of learning platforms, the necessary and provided tools within VLEs, usability issues from the pedagogical and technical point of view, security and maintenance affairs within Virtual Learning Environments.
Combined with the empirical demand, the check of all the above listed affairs and issues in a real given learning platform product – Blackboard Academic Suite 7, makes the theoretical descriptions more lively and plastically.
It is a pity that the most of the literature and research which is also provided in this course does not obsess a kind of holistic approach, which considers in an evaluation and optimization approach all levels and actors of eLearning. From my point of view it makes sense having more literature review also in other related scientific disciplines to figure out the holistic criteria and create a functional chain model.

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TABLES

FIGURES

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