

Hybrid Learning: “Neither Fish Nor Fowl” or “The Golden Mean”

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Abstract. Traditionalists will argue that conventional classroom lectures have been and always will be the most effective form of teaching. In contrast, people focusing on progress will put pure e-teaching on a pedestal. Confronted with these two extremes, a natural reflex is to search for a compromise. Hybrid learning could be such a compromise. However, the important question is whether this is only a compromise for the anxious, an interim arrangement on the transition to pure e-teaching, or the best conceivable solution, that is meant to stay.

In the present paper we are giving evidence for the latter position based on practitioners’ experiences of more than ten years of technology enhanced teaching. We address the need for university wide learning management systems and advocate simple, cost-effective, and sustainable solutions not asking too much from lecturers, but—nevertheless—causing a significant added value for the students.

1 Motivation

Buzzwords are a problem in computer science—and of course in other fields as well. Usually, many promises are associated with buzzwords and, unfortunately, very often only a few of them are kept. *E-learning* is one of the current buzzwords in computer science and even some other domains. E-learning was promised and expected to allow for an individual learning style and learning speed. It was also introduced as overcoming the need for lecturers and students to meet at a given time in a given place. Moreover, it was also seen as remedy for more efficient teaching at one and the same time reducing the costs. Of course, none of these promises is completely wrong, but at least each of them brings along a lot of preconditions to be met.

To show that there is no such thing as a free lunch we would like to go back to the early 1980s when the first author studied information systems. Programming assignments had to be prepared in card puncher pools with 10-15 card punchers in a small room. There were only very few card punchers for a lot of students. Therefore a reservation for a short time slot had to be made days in advance. Although this was annoying, the situation also had positive side effects. The maybe most important one—with respect to this paper—is, that all the time there were many people together in these card puncher rooms working on similar

tasks. Whenever a student had a problem, he or she was able to easily ask the students sitting next to him for help. This fostered a very communicative learning style. Therefore, in situations where a student was stuck in his working progress due to a minor mistake help was usually just one desk away. Obviously, personal computers—becoming a commodity—at first glance seemed to be a big gain in convenience to the students. However, now every student was sitting at home alone and immediate help was hard to find.

Interestingly, there are now two developments promising to combine the advantages of both scenarios. The first step is the availability of cheap and lightweight netbooks and laptops with comparatively long battery life. Now one can see students, sitting together in small groups in the university, solving their programming tasks or other exercises. Although this is a positive development, it brings with it another problem that remains to be solved: the availability of software for these student-owned portable computers. At least for special software, the license conditions of the software vendors hardly allow for an affordable availability on student-owned computers. The second development are instant messaging tools and social networks which allow to collaboratively solve problems without the necessity to meet physically. However, this is just a beginning. What is missing in most cases is an easy and secure possibility for desktop sharing, at best integrated into these tools.

The main message so far is that technological progress alone does not help or improve an existing situation a lot. It is very important to envisage all implications arising from the use of a technology with respect to the learning situation. An elaborated combination of technologies—considering the situation of lecturers and students—is needed to assure the success of hybrid learning.

In the following, section 2 will advocate the straightforward use of a university wide *learning management system* (LMS), also called *course management system* (CMS), *learning content management system* (LCMS), or *virtual learning environment* (VLE). We will argue for a low-threshold approach appealing for all lecturers and—as a consequence—employed all over the university. More advanced forms of hybrid learning efforts which can thrive on this ground will be discussed in section 3. Finally, section 4 complements hybrid learning with new participants and sketches a project aiming at the easy incorporation of practitioners and industrial partners into teaching activities using LMS. Section 5 concludes the paper and points out future directions.

2 Compulsory: Enabling Hybrid Learning by Using a Learning Management System

The idea of supporting teaching with digital supplements is not new. In the 1990s, the first colleagues started providing their course materials and supplements in digital form throughout the internet. Roughly spoken, the following years were characterized by three groups of lecturers:

1. Colleagues, maintaining the teaching approach of the previous years, who did not provide any supplementary material in digital form. They simply

continued to provide folders containing master copies of slides or scripts available in the secretary's office.

2. Colleagues providing supplementary material in digital form using some type of web site—personal or official. These websites were often only accessible for a group of people, protected by .htaccess files.
3. The maybe most important group: Ambitious colleagues who developed their own e-learning system to use the new media in a more elaborate way.

Over the time, this variety and heterogeneity brought with it some problems for the students. They had to manage various user names and passwords, and were faced with different user interfaces and functionalities. Fortunately, in recent years, a market adjustment took place. Out of thousands of more or less ambitious individual projects—motivated by the lack of convincing off the shelf solutions—a small number of systems, which are now stable and powerful, arose. Nevertheless, it is important to mention that all of these early projects contributed to today's LMS. The few commonly accepted systems today would not have been possible without this grassroots process.

2.1 The Need for a University Wide Learning Management System

What has become obvious during the last decade of research and teaching is the need for technology enhanced learning. Since LMS—or the wide group of LMS, CMS, LCMS, and VLEs—have proven to be successful in lots of different scenarios and settings, it is a tenable statement to claim LMS as enabling technology for learning nowadays. Obviously, this claim leads to the necessity of providing supplementary material and communication means via a LMS to students for every teaching unit. Looking at the requirements and demands arising when hosting, maintaining, and supporting a LMS, it is apparently not possible to do so for every teaching unit on its own and—regarding costs—not very effective.

Therefore, it is our firm conviction that it is one of a university's duties nowadays to provide a university wide LMS as part of the IT infrastructure. Nevertheless, it is also crucial to give the lecturers the free choice on how to integrate this opportunity into their teaching concept.

Yet, there is work to be done. The main challenge today is to convince—nearly all—colleagues (1) to put their hybrid learning content and (2) also expend their efforts into a unified, university wide system which is centrally administered, has a high availability and offers the students access to all digital learning assets through one portal in a single sign-on manner.

2.2 Retrospect: Introducing a LMS at University of Bamberg

At the University of Bamberg a major relaunch of the university's website in 2006 brought with it a great chance [1]. The previous website—which was simple and manually created and administrated—was replaced by a new website based on the content management system TYPO3¹. Shortly before launching the new

¹ TYPO3 — <http://typo3.org/>, last visited February 19, 2010

website, we noticed that there would be the need for password protected areas in the new web presence very soon, because in the old website many colleagues used areas protected by .htaccess files to provide supplementary material for their lectures in digital form.

In a meeting—scheduled at short notice—it was decided that, from now on, general information on the university and its institutions should be clearly separated from content directly related to a particular course. Teaching material should not be included in the new website but in a specialized course management system. Unfortunately, the new website was scheduled to be relaunched soon. Hence, a good solution for a course management system was needed urgently and, to be honest, no time for a profound project with a comprehensive requirements analysis was left. For that reasons, it was decided to extend a moodle system², that was running at a single teaching unit since two years.

This proceeding automatically led on to a bottom-up approach instead of an imposed top-down order. Nevertheless, this course of action has proven to be successful. During a very short period of time, roughly one year later, about 75% of the teaching units at the University of Bamberg were using the system—more or less intense. Figure 1 gives an impression of the system today, which is four years later. Please note that the statistics on the right side point out that the moodle system had 2,850 (resp. 6,600) distinct active users during the last 24 hours (resp. week) at a university with about 9,000 enrolled students.

Looking back with today’s perspective, there were at least the following crucial factors, influencing the success of this solution:

- Due to the change in the university’s website, the colleagues previously using their website to provide teaching resources had to change their habits anyway. Also, it was much easier to move the content to moodle than to move it TYPO3.
- Some colleagues who maintained their individual e-learning solutions beforehand had already noticed that the maintenance effort for an individual solution increases over time. For these colleagues the new system was a nice opportunity to reduce their effort—especially in cases where the research focus had already stirred in other directions.
- After a short period of time students started asking lecturers to provide material in the moodle system, and the colleagues willing to try noted that it was easy to use.
- Another important aspect might have been that the system was labelled *Virtual Campus* and not particularly established as an e-learning platform. From the beginning on, the system was promoted as low-threshold opportunity. The potential users were not discouraged by pretentious e-learning plans and scenarios. Instead, the system was introduced as a platform to provide PDF files and links to students. Forums were seen as a nice add-on—and of course, there were further functionalities which were nice opportunities for the future but did not bother the occasional user.

² Moodle — <http://moodle.org/>, last visited February 19, 2010

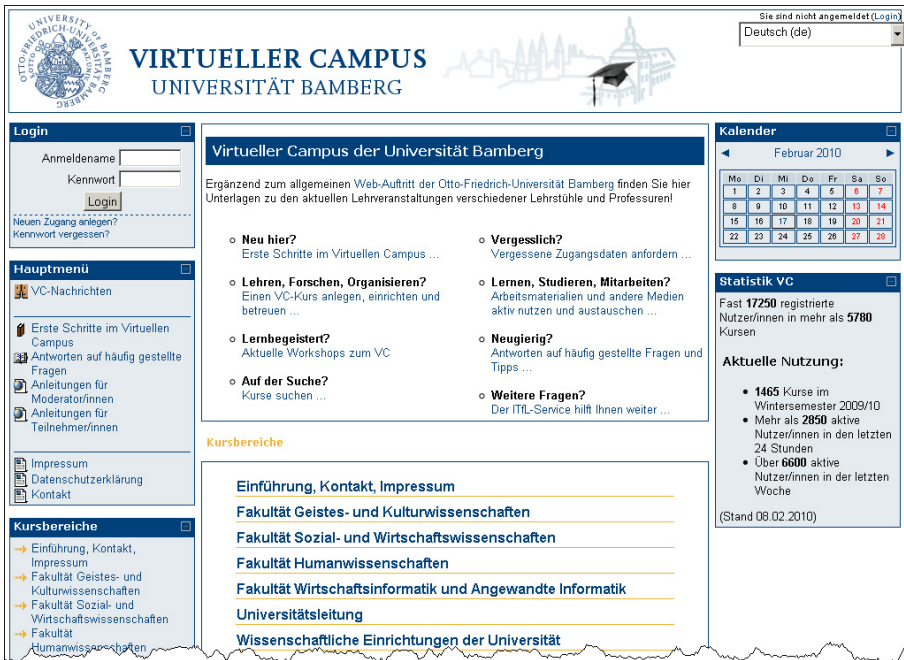


Fig. 1. Virtual Campus of the University of Bamberg (<http://vc.uni-bamberg.de/>): Moodle in action or—from another point of view—yet another moodle system

To sum up, it turned out that the introduction of a university wide LMS was appreciated by lectures and students. Among others, this has been proven by official, Germany-wide evaluations that are accomplished by the independent Centre for Higher Education Development (CHE)³ every year. The CHE prepares independent rankings of universities by conducting comprehensive surveys among students—including a rating of the e-learning offer available at a university. This year’s evaluations involved six different study paths at the University of Bamberg—all of them from the group of humanities, psychology and pedagogics. Three out of six rankings rated our e-learning offer as being in the leading group, the other three confirmed the offer as being in the midfield. These are very pleasant and convincing results, considering that the usage of our Virtual Campus in departments belonging to these groups is very often still at a basic level. Students obviously appreciate the broad and consistent provision of supplementary material and communication means via a unified LMS.

Meanwhile, the system is used for other purposes such as committee work, bulletin board for job offers, or internal knowledge management as well. Even if today’s usage patterns show that the system is mainly used for resource provision

³ Centre for Higher Education Development (CHE) — <http://www.che-concept.de/cms/?getObject=302&getLang=en>

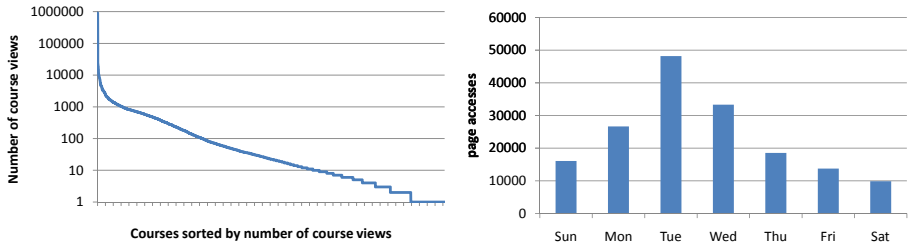


Fig. 2. (left) Number of course views in each course for the 4,423 courses (from the current and previous semesters) with at least one course view within the last 120 days (dashes at the horizontal bar are given at a distance of 100 courses), (right) Distribution of user activities over the days of a week

Table 1. Most frequently used activities (based on the analysis of 5,780 courses)

Activity	No. of uses	Avg. no. of uses per course
Forum	7,900	1.367
Assignment	1,135	0.196
Database	539	0.093
Choice	479	0.083
Wiki	346	0.060
Quiz	300	0.052
Glossary	59	0.010
Chat	52	0.009
Questionnaire	47	0.008
Lightbox Gallery	36	0.006

and forum discussions, the system can be seen as an enabling platform for the whole spectrum of hybrid learning and even pure e-learning.

To illustrate the use of the system, some statistics are presented in figure 2 and table 1. In order to interpret these statistics, please keep in mind that the University of Bamberg has about 9,000 enrolled students and about 130 professors. 1,465 courses in the LMS are explicitly assigned to the winter semester 2009/10.

2.3 A Short Guideline: Steps to Introduce a University Wide LMS

Learning from our experiences and looking at related and similar projects, we propose a clear two step strategy when introducing a university wide learning management system. In order to do so, we would like to refer to the continuum of blended learning as defined by Norah Jones [2] and shown in Figure 3.

1. In the *first phase* the main issue should be to convince as many colleagues as possible to simply use the system to whatever extent. Here, the voluntary

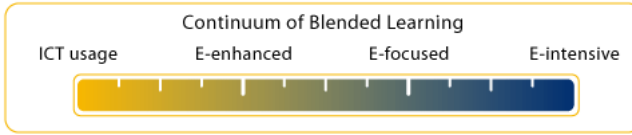


Fig. 3. Continuum of Blended Learning [2]—<http://celt.glam.ac.uk/Enhancing-Learning-Teaching/Technology-Enhanced-Learning>

and flexible character of the system is indispensable to foster usage and utilisation. No one should be forced to use the system.

It has to be an easy to use system everyone is able to try out. Of course, there should be a centralized support infrastructure such as short online instructions, video tutorials, a support forum, a hotline, face to face introductory courses etc. And—most important—the support should, at this stage, primarily support the simple use of the system which corresponds to blended or hybrid learning in the left part of the continuum of blended learning.

2. The *second step* can be taken if the system is commonly accepted and a considerable proportion of colleagues is using the system, an additional focus now can be on advanced concepts of hybrid learning using the LMS. It is not until this point in time that hybrid learning on the more right part of the continuum of blended learning should be pushed.

Again, appropriate support is crucial for a successful progress. Before doing this step, support needs to be taken to the next level. New trainings introducing more advanced features of the LMS and possible concepts for hybrid learning need to be designed as well as promoted throughout the university. Also, fostering an exchange of best practices among different teaching units of the university can be helpful.

3 Voluntary: Augment Your Teaching

Obviously, the use of a university wide LMS allows for a wide variety of hybrid learning scenarios. A basic scenario—building on a traditional face-to-face lecture—includes at least the provision of digital content and, in our opinion, the establishment of a digital communication channel. According to our experience, the provision of slides or scripts as PDF files and the utilisation of forums for communication forms a valuable foundation. It turned out that, since the provision of content is maybe the most important aspect, this is not as trivial as it might seem. It is not that natural and easy to provide a “good” PDF file with a reasonable ratio of file size and presentation quality. Therefore, it is a good idea to include instructions for this aspect into the basic support offers of the university wide LMS.

However, moving on to the proposed second phase of introducing a LMS, there has to be more. If a lecturer is willing to go beyond this level different opportunities arise for the provision of content. Built-in content formats of the

LMS, such as a *Book* or a *Lesson* in moodle, or alternative external tools can be used to prepare the content units and integrate them into the LMS. Before making this decision, three important aspects have to be considered:

1. First of all, it is important to consider which *type of hybrid learning scenario* is aspired. If pure e-learning scenarios—which are according to the continuum of blended learning also part of hybrid learning—have to be supported, the whole content has to be prepared in an appropriate way. If only selected aspects should be augmented, target-oriented additional digital resources—such as specialized applets—might be appropriate.
2. Secondly, there are *topics with different half-life periods* in teaching. Some basic principles in a field can be stable over ten or more years. If such content has to be prepared in digitalized form and there is also a huge target group, the preparation of well designed interactive multimedia presentations can be reasonable. In contrast, for more unstable fields—where the typical content of a lecture might change almost every year—a more rapid approach is need. In this case lecture recordings—as discussed in more detail in the following—might be a good solution.
3. Last but not least, the content presentation has to be in accordance with the teaching style of the lecturer—and the content to be presented. While some lecturers might prefer well elaborated and precise text forms, others might be more comfortable with a more personal, interactive, and emotional presentation style.

In summary, there is no single content preparation method which fits all needs. In [3,4] we have, for example, discussed the usefulness of different digital content presentation formats for various aspects of the field of information retrieval. To show that the extension of classical teaching scenarios does not necessarily require a lot of time and effort, the present paper concentrates on our current favourite for many situations—*lecture recordings*. Lecture recordings can be assigned to the group of *rapid e-learning* approaches [5] and offer an excellent benefit-cost ratio in many situations.

3.1 Best Practice: Lecture Recordings

In our experience, this rapid e-learning approach gives a good compromise between creation effort and presentation quality. The combination of a traditional lecture supplemented with slides—which is the only precondition to be met—and the easy creation of blended learning or pure e-learning content makes this approach attractive. Furthermore, universities are facing the need to deal with different target groups and a huge variety of personal living situations. For that reason it gets more and more important that we are able to support a broad spectrum of learning models respecting the individual situation of our students.

There are various tools to record slide-based presentations on the fly. To give some examples, Camtasia⁴, Lecturnity⁵, or Acrobat Connect Pro⁶ are familiar representatives. The focus of these tools stretches from screen grabbing through more elaborated lecture recordings to collaborative work. An elaborate presentation and discussion of thoughts on lecture recordings can be found in [3]. To include the most important aspects, three main issues are now briefly discussed. Please note that some of the following remarks are system-specific and—since we decided to use Lecturnity—at that point only tenable for Lecturnity.

Requirements to run the system. Lecture recording software can be used off the shelf. Even more important, no specific—and therefore expensive—recording equipment is needed. A tablet PC (or a notebook with an attached pen tablet) connected to a projector is needed to present the slides. An ordinary web camera can be used to record video and audio streams.

The result of a recording. The recording software combines slides, comments, and the corresponding video recording to a single file. The standard result is a proprietary format which can be viewed with a free player. Exports to other standard formats exist as well. Viewing the recording, a split screen is shown. This way the actual slide, the corresponding video recording and additional components to allow navigation within the recording are available all at once, as shown in figure 4. After all, the file size of a recording for a 90 minutes lecture is about 200 MB with reasonable parameter settings.

Usage of Lecture Recordings. In summary, lecture recordings can be used in two different settings. Of course, recordings can be employed in typical *hybrid learning scenarios* and provided in addition to classical lectures. That way the typical classroom setting remains unchanged but the whole learning scenario is extended. In addition the students can use the recordings to strengthen the content of the lecture or to prepare for the exam. Secondly, lecture recordings are also a valuable basis for pure e-learning offers such as in further education programs. The recordings are then supplemented with a support concept mainly based on an intense use of forums. Evaluations have shown that these students are very pleased with this form of e-learning because the recordings mediate real “university feeling”. However, it also turned out that recordings taken without any audience are not as precise, interactive and vivid.

4 One Step Ahead: Integrating External Partners

The previous considerations (cf. section 2) have pointed out that a university wide LMS is an enabling infrastructure for hybrid learning. Currently, the communication between teachers and students as well as the communication among

⁴ TechSmith Camtasia Studio — <http://www.techsmith.de/camtasia.asp> (visited May, 21st 2010)

⁵ imc Lecturnity — <http://www.lecturnity.com/en/com/> (vvisited May, 21st 2010)

⁶ Adobe Acrobat Connect Professional (formerly Macromedia Breeze) — <http://www.adobe.com/uk/products/acrobatconnectpro/elearning/> (visited May, 21st 2010)

The screenshot shows a video player window titled "HENRICH: 020WebTechnologien - Player". The main content area displays a slide titled "Dynamisch generierter Content". The slide text includes:

- ▶ Problembereich Aktualität
- ▶ Rückgriff auf operative Anwendungen erleichtert Konsistenz
- ▶ Idee daher:
 - ▶ Dokumente liegen nicht fertig auf dem Server sondern
 - ▶ werden auf Anfrage aus aktuellen Daten erzeugt
 - ▶ Erzeugte Seiten können JavaScript enthalten oder Applets nutzen
 - ▶ Folgen:
 - ▶ Datenerfassung am Web-Client für operative Systeme möglich
 - ▶ Personalisierung der Seiten möglich

Below the slide is a diagram of a web-client-server architecture:

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graph LR
    WC[Web-Client] -- "URL + Parameter" --> WS[Web-Server]
    WS -- "HTML + ..." --> WC
    WS --> P[Programm]
    P --> DB[(DBMS)]
  
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Annotations in red callouts point to various features: "Thumbnails and search facilities for quick navigation" points to the slide thumbnail; "Slides with annotations made using a tablet PC" points to the slide content; "Video of the lecturer" points to the video feed; and "Video controls" points to the playback controls at the bottom.

Fig. 4. Lecture recordings: an easy way to digital learning content

students themselves is in the main focus of those LMS. In this section we want to give an outlook on potential future enhancements by describing a project on how to integrate external partners into the teaching and learning process.

The ESF-funded⁷ project *LMS4KMU*⁸ investigates if, how, and to which extent LMS can be used as an enabling technology to involve companies into academic teaching. Personally, we are convinced that LMS can be an enabling technology for knowledge transfer between universities and companies as well.

The need for knowledge transfer and co-operations is well-known and accepted on both sides. Even though a lot of effort has already been invested to intensify co-operations and knowledge transfer between universities and companies, the potential is not fully exploited by now. On the one hand, companies often simply do not know (1) which topics are researched and taught at universities, and (2) the opportunities to integrate real-life business problems into the process of teaching and learning. On the other hand, lecturers at universities—willing to co-operate with partners to increase real-life focus of their research and teaching as well as to provide business contact to their students—face the problem to find companies with a matching profile. Our project focuses on small and medium-sized enterprises (SMEs) as they often lack the possibilities to accomplish professional training for their employees. Furthermore, taking part gives

⁷ European Social Fund — http://ec.europa.eu/employment_social/esf/index_en.htm (last visited May, 21st 2010)

⁸ LMS4KMU — <http://tinyurl.com/LMS4KMU> (last visited May, 21st 2010)

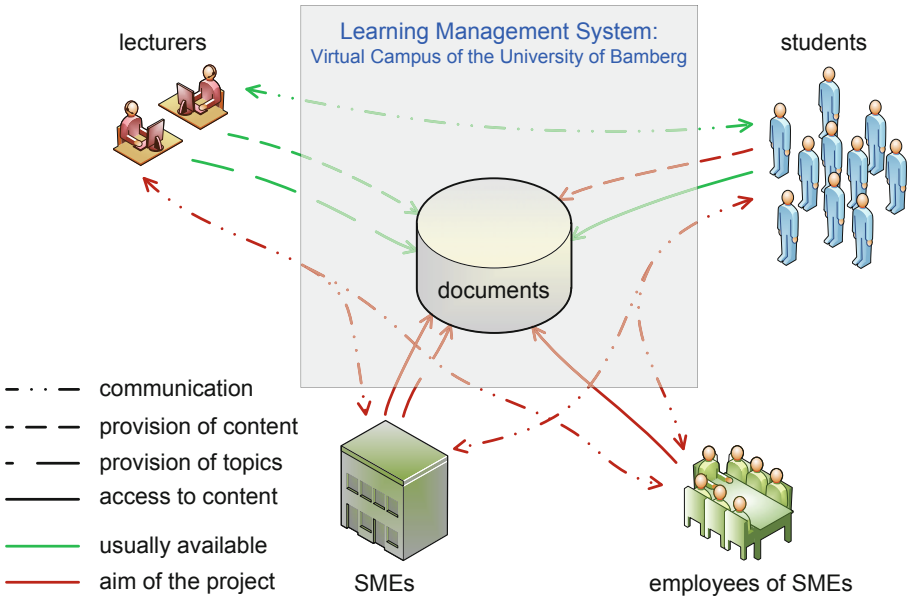


Fig. 5. Usage scenario for a university LMS extended by companies

companies the opportunity to get to know future university alumni and also to present themselves as potential employers.

LMS are used widely for sharing and transferring knowledge within one organization—the university in our case. Whereas using LMS for knowledge transfer, communication, and team work among universities or universities and companies is not usual at all. However, established LMS offer interesting opportunities in this context. Companies, interested in co-operating can apply to access the LMS and choose from courses that are opened for SMEs. Figure 5 depicts the aspired future use of LMS researched and fostered within the project LMS4KMU.

As a first step, we developed a platform helping to provide information about possible co-operation partners, available topics, people, and possibilities on the “other side”. Moreover, different kinds of co-operation models are currently developed. Summarizing, the possible scenarios are dependent on the course of a lecturer, the amount of time and effort each party is willing to spend, and the choice of an active or passive role for the company. Typically, a co-operation will start with one of the less intense forms and maybe evolve in the course of time.

Since there are a lot of influencing factors in this overall process, it is certainly necessary to mention and consider some critical success factors in this context: matching partners with common interests/topics, minimizing the initial effort to use the platform, legal aspects, costs, and incentives for joining the project. Of course, opening a course in a LMS for company representatives will be an

exception and only applicable in particular cases. However, for these special courses and lecturers, it is a nice opportunity that benefits all parties involved.

5 Conclusion and Outlook

The present paper has depicted that university wide LMS are an important enabling technology. Nowadays, they are an indispensable part of each university’s infrastructure. Speaking about learning content to be transferred to the “world of hybrid learning” and its creation, an interesting and cost-effective solution for digital content provision are lecture recording systems. That way students can be provided with content, flexible for different usage opportunities and therefore adaptable to their individual situation. Finally, taking a step ahead, we sketched our project LMS4KMU which tries to foster the integration of external partners into a LMS to benefit teaching and learning with all its participants.

All these aspects demonstrate that hybrid learning comes in various forms—each of them suitable and useful for a particular purpose. It is not possible to make a judgement or recommendation for *the* best form of hybrid learning. Each, ideal form and ideal usage depend on the individuals involved, on the course topic, and on various other factors.

That is why we, personally, prefer teaching and hybrid learning arrangements providing students with the freedom to arrange their learning process according to their personal learning style and their individual needs. Still, some students rely on traditional lectures and use additional material for reinforcement. Whereas others appreciate the independence of time and place and prefer self-study arrangements. Mature hybrid learning supports all these learning styles without huge additional effort for the lecturer. Having said this, we regard hybrid learning as “the golden mean” and a big window of opportunities for everybody.

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