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Christine Daun

*Institute for Information Systems (IWi)*

Thomas Theling

*Johannes Gutenberg University Mainz*

Peter Loos

*Institute for Information Systems (IWi)*

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# Teaching Enterprise Systems in a Blended Learning Environment

**Christine Daun**

Institute for Information Systems (IW<sub>i</sub>)  
at the German Research Center  
for Artificial Intelligence (DFKI)  
daun@iwi.uni-sb.de

**Thomas Theling**

Johannes Gutenberg University Mainz  
theling@uni-mainz.de

**Peter Loos**

Institute for Information Systems (IW<sub>i</sub>)  
at the German Research Center  
for Artificial Intelligence (DFKI)  
loos@iwi.uni-sb.de

## ABSTRACT

This paper describes how a traditional face-to-face course on enterprise systems is transformed into a blended learning course. Therefore the relevant theoretical background on blended learning and on a multi-perspective approach to enterprise systems is given. Furthermore the case study of an ERP e-learning project called “ERPeL” at the Saarland University is depicted. The components of the ERPeL blended learning course as well as its development procedure are introduced. An exemplary learning unit of the e-learning component of ERPeL is used to illustrate the concept of teaching enterprise systems in a blended learning environment.

## Keywords

Enterprise Systems, ERP Systems, Multi-Perspective Approach, Blended Learning, E-learning

## INTRODUCTION

### Motivation and Related Work

Although many universities and academic facilities offer courses on enterprise systems (ES, also known as Enterprise Resource Planning or ERP systems) literature does not obtain any e-learning approaches regarding ES teaching. Many articles about ES teaching depict how ES can provide special knowledge about Information Technology (IT) (Gant, 2001; Nelson, 2002; Watson and Schneider, 1999). Some papers describe how ES can be an integrative component of a business school or Master of Business Administration (MBA) curriculum (Becerra-Fernandez, Murphy and Simon, 2000; Reich, 2000). With respect to current discussions about inter-organizational concepts, also collaborative education scenarios are presented (Hawking and McCarthy, 2000; Rosemann, Scott and Watson, 2000; Rosemann and Watson, 2001; zur Muehlen and Lederer Atonucci, 2001).

E-learning as such is nevertheless a field of growing importance. Technology-mediated learning is a major trend in postsecondary management education in North America and elsewhere (Alavi and Gallupe, 2003). As a consequence the question whether there is an optimal design for online MBA courses has already been addressed in a multi-course and multiple time period research design (Arbaugh, 2005) - a fact which underlines the growing importance of e-learning. The use of e-learning is however not limited to postsecondary management education or MBA courses. Undergraduate university students may as well benefit from e-learning for example in the context of language learning (Hu, Milton, Hui, Ma, Clark and Tam, 2005). Even though a limited application of e-learning in Information Systems (IS) teaching or research is perceived (Bostrom, 2003), an inter-university e-learning network regarding IS contents has been successfully established (Bohl, Grohmann and Martin, 2002). Especially for IT courses the potential of internet based e-learning courses is seen (Sasidharan, 2005). In this context the blended learning paradigm is already in use for example to provide Linux lessons in a blended

learning environment (Nakada, Akutsu, Walton, Fujii, Ichimura, Yamada and Yoshida, 2004). Thus it should as well be possible to provide ERP courses online or as blended learning courses.

### Aim and Structure of this Contribution

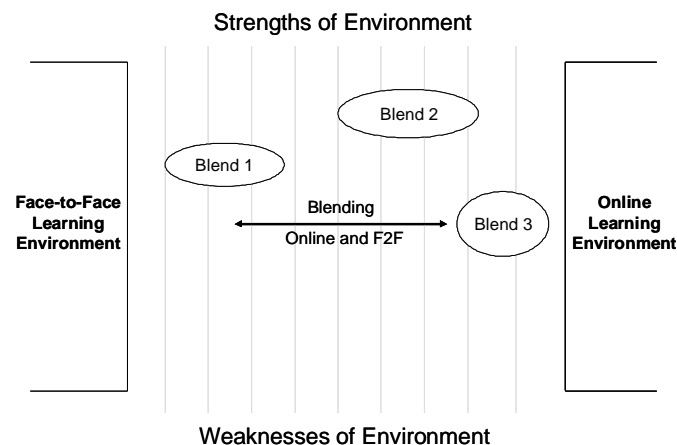
This paper shows how a sophisticated multi-perspective ERP teaching approach can be realized as a blended learning solution. Starting from the curriculum of a traditional face-to-face (f2f) course presented in (Theling and Loos, 2005), a procedure on how to transform this course into a blended learning course is described.

The paper is structured as follows: At first the theoretical background on blended learning, ES and the multi-perspective approach to teaching ERP systems is discussed. The subsequent chapter presents the blended learning components of the new curriculum. Afterwards, the transformation of the “traditional” ERP teaching curriculum into the different components is described. Finally, we draw a conclusion and give an outlook on upcoming work.

## THEORETICAL BACKGROUND

### Blended Learning

In a European study that among others analyzed examples of innovative practices in training teachers and trainers using e-learning, five models of e-learning have been distinguished: the virtual classroom, tele-teaching, blended learning, collaborative learning, and supported self-learning. Although each of these five categories could be found in the case studies, the largest category of learning strategies was blended learning (Battezzati, Coulon, Gray, Mansouri, Ryan and Walker, 2004). Blended learning as such can be seen as an innovative approach. E-learning started in the beginning of the 1990s with so called computer based trainings (CBTs) which allow the learner to work offline using a computer supported learning program. These CBTs are characterized by the extended use of graphical animations and lacking possibilities of communication. In a second step, CBTs have been complemented or substituted by so called web based trainings (WBTs). WBTs use internet technologies and are provided via the internet or intranet. One major advantage of these WBTs is that the learner can always access up-to-date learning content. In contrast to CBTs, WBTs as well tend to provide online communication possibilities. Blended learning – i. e. integrating f2f teaching and e-learning in one learning arrangement – can be seen as the next step (Sauter, Sauter and Bender, 2004). Blended learning approaches try to make use of both, the benefits inherent to f2f interaction and inherent to online learning. At the same time the weaknesses of each type of learning environment shall be avoided (cf. Figure 1). The balance between online and f2f components however will vary for every course and there is always the risk that the wrong blend frustrates both student and teacher (Osguthorpe and Graham, 2003).



**Figure 1. Blending the Strengths of Online and Face-to-Face Learning Environments (Osguthorpe and Graham, 2003)**

For a blended course three elements – namely online and f2f learning activities, online and f2f students and online and f2f instructors – might be considered for mixing (Osguthorpe and Graham, 2003). The first mentioned will be of relevance for this paper. A traditional f2f course on ERP systems shall be transformed into a blended learning course. The approach of the traditional course is described in the next section.

### The multi-perspective approach

In (Theling and Loos, 2005), a multi-perspective ERP teaching approach is discussed. For the e-learning component presented in this paper, the content is simplified in order to concentrate on significant topics being taught in the blended learning course. Figure 2 shows the arrangement into different roles dealing with an ERP system by segmenting the system into different shells. Core of an ERP system is a common repository containing meta data, which describe the ERP system's tables. Table contents are updated by transactions which are based on source code. The source code provides the logic for end-user's applications and customizing transactions. The integration of the different shells leads to a complex business process knowledge. In our approach we use the following perspectives onto the ERP system:

- The end-user's view. An end-user knows best about the processes he is responsible for and has to deal with the user interface (GUI) of the ERP system.
- The software consultant's view. A consultant knows about business processes and the interaction between different operational functions and processes. Based on this knowledge he is responsible for the customizing of an ERP system.
- The software engineer's view. A software engineer knows about meta data of the tables, maintains and enhances ERP systems' source codes, and knows about the customizing of an ERP system.

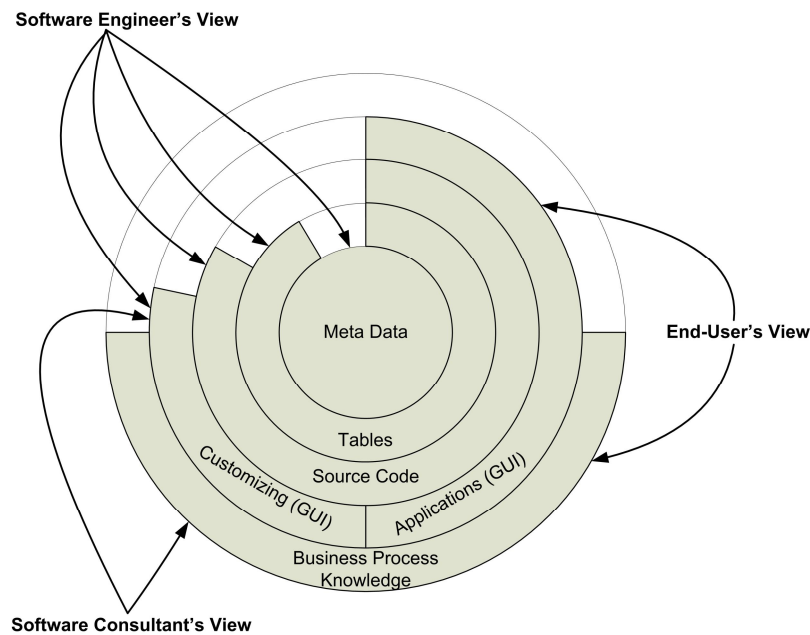


Figure 2. Used ERP perspectives, following (Theling and Loos, 2005)

## TRANSFORMING A TRADITIONAL COURSE INTO A BLENDED LEARNING COURSE – THE ERPEL PROJECT

### Background

The ERPeL (ERP e-Learning) project is funded by a program initiated by the Saarland University. This program stimulates on the one hand the creation of e-learning environments and on the other hand the creation of e-learning contents. As already mentioned, the aim of the ERPeL project is to transform a traditional f2f course into a blended learning course. The decision not to create a mere online course is mainly based on three factors:

1. An important part of the traditional course is to allow the students to get an impression of the “look and feel” of an ERP system. This can however not be totally simulated by an online component.
2. The focus of the course is not to enable students to deal perfectly with a specific ERP system. Rather they shall get to know how such an ERP system works and what correlations and interdependencies have to be considered. So the e-learning component can be used to prepare students to work with any ERP system and not only with the one of a special company.

3. Even if focusing on a specific ERP system, integrated manuals on operating the ERP system would require constant updates of the e-learning modules as cyclical release changes may cause different navigation through the system.

Therefore the ERPeL project is realized as a blended learning approach. In the following section the components of ERPeL are described.

### Components

Within the ERPeL project, the two main components of blended learning (f2f and e-learning) are supplemented by an online communication component. The e-learning component of ERPeL is intended to provide students the theoretical background on ERP systems. It also contains exercises on theoretical facts. The f2f component consists in hands-on exercises. The communication component allows students to interact with each other and with the lecturer. The design of the communication component is not a main part of the ERPeL project. Rather the learning management system of the Saarland University allows both the use of e-Mail and of online forums or chats for communication purposes.

The curriculum of the traditional f2f course presented in (Theling and Loos, 2005) is slightly adopted highlighting the multi-perspective approach. Each chapter of the curriculum is either assigned to the e-learning component (eL) or the f2f component (cf. Table 1).

ERP curriculum	eL	f2f
<b>Introduction</b>		
Intro Session		--
ERP Features	--	
Integration	--	
Introduction to Case Study	--	
Creating Organizational Structures in ES		--
<b>Material Master Data</b>		
Aims and Functions of Material Management and Production Planning	--	
Aims, Attributes, and Data Structures of Material Master Data	--	
Creating Material Master Data, Exploring Meta Data and Table Contents		--
<b>Bills of Material (BOM)</b>		
Aims, Attributes, and Data Structure of BOM	--	
Gozintographs	--	
Creating BOM, Exploring Meta Data and Table Contents		--
<b>Vendor Master Data</b>		
Aims, Attributes, and Data Structures of Vendor Master Data	--	
Creating Vendor Master Data, Exploring Meta Data and Table Contents		--
<b>Info Records</b>		
Aims, Attributes, and Data Structures of Info Records	--	
Creating Info Records, Exploring Meta Data and Table Contents		--
<b>Purchasing Processes</b>		
Logistic Chain	--	
Documents (Purchase Requisition, Request for Quotation, Quotation, Purchase Order)	--	
Performing the Logistic Chain, Exploring Meta Data and Table Contents		--
<b>Material Requirements Planning (MRP)</b>		
Theory of Gross-Net-Calculation	--	
Gross-Net-Calculation within the ES		--
Creating Planned Independent Requirements, Performing MRP, Raising Purchase Order, Exploring Meta Data and Table Contents		--

**Table 1. Curriculum of the blended learning ERP course**

Topics of mere factual knowledge are represented within the e-learning component. Other subjects concerning experiences are provided within the f2f component.

The intro session is f2f and used to explain the e-learning system as well as content and structure of the course. Some general topics like ERP features, integration topics, and the introduction to the case study are described within the e-learning component. Issues dealing with master data like materials, BOM, vendors, and purchase info records are all structured in a

similar way. After describing aims of related operational functions, entity relationship models (ERM (Chen, 1976; Loos, 1993)) are used to describe data structures and correlations to other relevant data. This is all factual knowledge and is similar in different ES products. Much of these concepts can be found and immersed in common scientific literature like (Scheer, 1994; Wight, 1995) or (Wigand, 2003).

The exercises of the f2f component are tailored to the used software. Students adopt the different perspectives: From an end user's view, they create relevant master data using end user transactions. From the software engineer's view, they explore corresponding meta data and examine relevant tables, their attributes, and keys. So the factual knowledge presented in the e-learning component can be experienced with a live ERP system. Students get a "look and feel" of the system.

Process-oriented issues like purchasing or MRP are taught in a quite similar way. At first the students have to work out the relevant e-learning components: Common theories are instructed in a product-neutral way. Methods like event driven process chains (EPC (Keller, Nüttgens and Scheer, 1992)) are applied to describe the processes. ERMs are used to depict the amendment of purchasing documents and the integration of various data throughout the discussed processes. The f2f component is used to apply the theoretical knowledge within the ERP system from an end user's and a system engineer's perspective.

In order to

1. keep the e-learning modules quite simple and
2. have enough data for exercises in the f2f component,

two different case studies are covered. Within the e-learning component a case study of a company producing one kind of table is used. This makes the topic being discussed quite simple. Within the f2f component, the case study of a bicycle manufacturer mentioned in (Theling and Loos, 2005) is used.

During the whole time of the course an online forum provided in the e-learning platform allows students to discuss with other students and lecturers independent from time and place.

## THE E-LEARNING COMPONENT OF ERPEL

### Development

For developing the e-learning course, procedure models are described e. g. in the ADDIE method (Hall, 1997; McGee and Wickersham, 2002). The methodology consists of five phases, namely Analysis, Design, Development, Implementation, and Evaluation. During the analysis phase, we identified the multi-perspective approach to be taught as presented in the concept above. Further on, we defined preconditions for the students participating in the course, e. g. to have basic knowledge about data and business process modelling methods as well as concepts of ES.

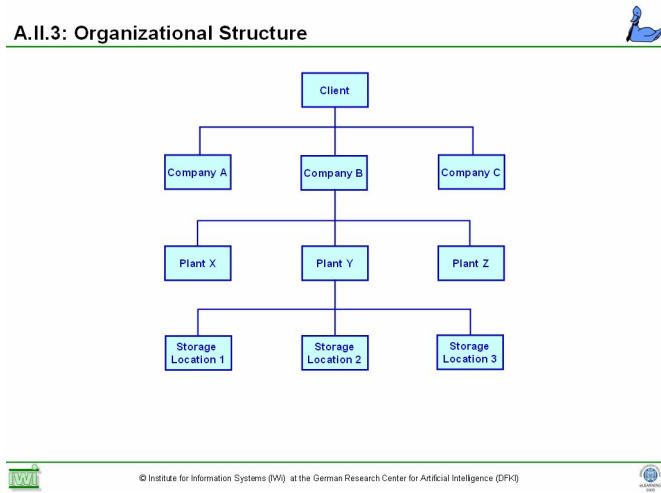
During the design phase, we defined that the established course should be realised as a blended learning course. A special task of the design phase was the realization of the multi-perspective approach. In order to include the different views in the e-learning component, a visualization of the perspectives is necessary. The idea to represent the different perspectives by different drakes was derived from the fact that ERPeL is not only the name of the e-learning project, but is also the German word for a drake. Therefore in the e-learning modules the end user's view is symbolized by a white drake with a hat, the consultant's view by a blue drake with a tie and the software engineer's view by a green drake with glasses. Thus the problem identified in (Theling and Loos, 2005) that students get lost in case of changing the perspectives on the ERP system is avoided.

The development of the course is done step-by-step. For each module, at first a script is elaborated. Creating rapid e-learning courseware (Bersin, 2004), the script-based content is then transformed into PowerPoint slides. These PowerPoint slides are animated. Audio explications are added using a special software program. These results are used as a prototype for testing purposes. For a pilot session, a "traditional" ERP course is used to evaluate the e-learning component. Results of the evaluation will be taken into consideration before implementing the final course in the e-learning platform and going live. Because most of the exercises are held within the f2f component, the number of exercises being offered in the e-learning component is minimized.

In the following section an exemplary module of the e-learning component is used to illustrate the use of the drakes.

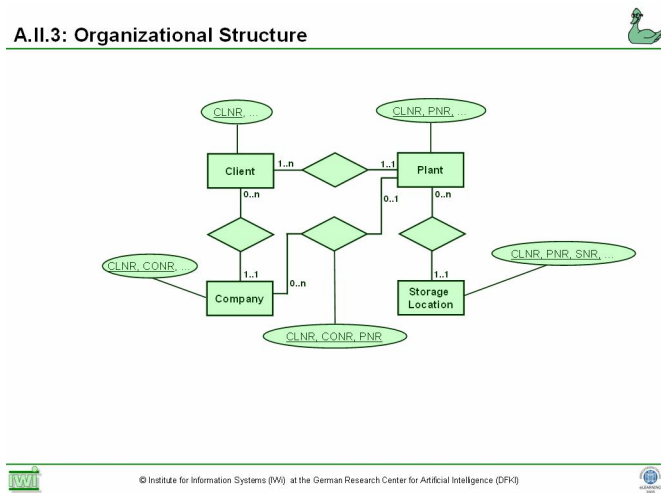
**EXAMPLE**

One of the first units of the e-learning course deals with the organizational structure of a company which has to be mapped in the ERP system. Figure 3 shows this structure. The blue drake in the right upper corner symbolizes that currently the ERP system is examined from a consultant’s view. A client of the ERP system can be divided in several companies which on their part can dispose of various plants. For each plant several storage locations may be relevant.



**Figure 3. Software Consultant’s View onto the Organizational Structure**

From a software engineer’s view – symbolized by the green drake in the upper right corner of Figure 4 – the organizational structure can be represented in the shown ERM. For each of the entities there is a table in the ERP system. Storage locations are for example identified via a storage location number. One specific storage location has to be unambiguously assigned to a specific plant whereas a plant can dispose of several storage locations. Due to this 1:n relation the primary key attributes client number and plant number are a foreign key in the table for the storage location.



**Figure 4. Software Engineer’s View onto the Organizational Structure**

These and other relations are explained in the e-learning module so that students finally know why there are specific table structures in the ERP system and as well find out what are the consequences of these kinds of structures for the user. A user works in one of the organizational units introduced so far. He thus does not see all existent data for e. g. a material. He is rather only shown the data relevant for the organizational unit he is working in by the ERP system. Nevertheless data integration in the ERP system enables that data relevant for different organizational units do not have to be stored twice or

even more often. The proceeding to achieve this by using different segments of master data is explained in the following sections of the e-learning component.

The already mentioned case study used in the e-learning component further deepens the theoretical approaches explained in the learning units. For the organizational structure the client ERPeL AG only has one company: the ERPeL Holding GmbH. The last mentioned is composed of two plants, one in Saarbruecken and another one in Mainz. The plant in Saarbruecken has two storage locations: A53 and D32 whereas the plant in Mainz only has the storage location WW9.

This example of the ERPeL AG, its corresponding organizational structure and its product – a simple table – helps students to combine theoretical knowledge with its application in practice.

## SUMMARY AND OUTLOOK

This paper discussed how a sophisticated, “traditional” ERP teaching approach can be transformed into a blended learning course. After highlighting the existing gaps in the intersection between ES teaching and e-learning we presented the concept of the multi-perspective ERP teaching approach and showed how lecture contents are assigned to e-learning and f2f components. The interaction of the different introduced views is depicted. By choosing the presented blended learning approach, the students are enabled to get factual knowledge in an e-learning environment with all known e-learning advantages (Hu et al., 2005). Furthermore, the f2f component allows students to work with an ERP system and get an impression of such a system’s typical “look and feel.”

In our future work we will evaluate the implemented course. The main topic is to determine whether the students understand the theoretical concepts offered within the e-learning course and if the design and case study of the course is adequate to the learner’s preconditions. An empirical analysis of existing e-learning evaluations should help finding an optimal evaluation design fitting to our situation.

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