2010

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FROM TEACHING LARGE-SCALE ERP SYSTEMS TO ADDITIONALLY TEACHING MEDIUM-SIZED SYSTEMS

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Abstract:

Today, standardised enterprise resource planning (ERP) systems are used in a majority of enterprises. There are many ERP systems with different technologies and philosophies available on the market. Therefore, the need for providing ERP knowledge by teaching the concepts of ERP systems in study courses and above all the possibilities of using these systems themselves in courses are frequently discussed in literature. Thus, we suggest a 2-course combination for teaching ERP systems at German universities where single courses dominate with mainly one large ERP system. Within this paper we present our approach for setting up the courses, the description of the courses as well as the student evaluation of this combination.

Keywords: ERP systems, university curriculum, small and medium-sized enterprise, learner-centered teaching

I. MOTIVATION

Today, standardised enterprise resource planning (ERP) systems are used in a majority of enterprises. According to a survey conducted in Germany in 2009, ERP systems are used in more than 92 percent of all German industrial enterprises [Konradin, 2009]. Due to this strong demand, there are many ERP systems with different technologies and philosophies available on the market. Therefore, the ERP market is strongly fragmented, especially when focusing on systems targeting small and medium-sized enterprises (S&ME) [Winkelmann and Klose, 2008; Winkelmann et al., 2007]. This multitude of software manufacturers and systems makes it more difficult for enterprises that use or want to use ERP systems to find the "right" software as well as to hire the appropriate specialists for the selected system. Also for future investment decisions regarding the adoption, upgrade, or alteration of ERP systems it is important to possess the appropriate specialized knowledge and skills in the enterprise [Winkelmann and Matzner, 2009]. This is essential since errors during the selection, implementation, or maintenance of ERP systems can cause financial disadvantages or disasters for the companies, even leading to insolvencies of the affected enterprises. Several examples of such negative scenarios can be found in the literature [e.g., Barker and Frolick, 2003; Hsu et al., 2006]. In order to prevent this, the necessity arises for universities to transfer the specialized knowledge to their students and graduates, in particular through study courses in the field of information systems [Venkatesh, 2008].

The need for providing this knowledge by teaching the concepts of ERP systems in university courses and above all the possibilities of using these systems themselves in courses are frequently discussed in literature [e.g., Antonucci et al., 2004; Boyle and Strong, 2006; Fedorowicz et al., 2004; Hawking et al., 2004; Peslak, 2005; Stewart et al., 2000]. These discussions clearly point out that ERP systems are or should be an important component of the curricula of universities in information system-referred subjects and courses. However, this is not a trivial task as Noguera and Watson [1999] discuss in their study.

One of the goals of using ERP systems in university courses is to prepare students for their career by obtaining at least a first insight in ERP systems. A further goal is promoted by ERP manufacturers (especially by making their systems available for university courses) - students shall learn their products as early as possible, since they, as the later graduates, will work with these systems or will hold positions in the enterprises with an influence on ERP investment decisions. Considering these two goals, it is necessary for universities to offer the appropriate systems, processes, and suitable courses for their students [Brehm et al., 2009; Fedorowicz et al., 2004].

However, the choice of systems and their number as well as the structure and number of ERP courses differ from university to university [Seethamraju, 2007]. For teaching the respective systems, the lecturer has to be familiar with the concepts and handling of these systems. Thus, the choice of one or more ERP systems to be part of study courses strongly depends on the knowledge and experiences of the lecturers themselves. This results in a situation with only a small variety of systems and software manufacturers being represented at universities in spite of the heterogeneous ERP market.

We are currently conducting a survey with a focus on ERP systems and their integration in study courses at German universities. The first results of this survey show that among 87 chairs at 47 German universities more than the half are teaching only one or no ERP system. Above all, rather complex large-scale ERP systems from major ERP manufacturers dominate courses at universities. Smaller systems are rarely used in teaching. However, a more diversified integration of ERP systems into education is advisable, especially from the viewpoint of S&MEs. The idea of showing students large-scale systems and systems for small and medium-sized enterprises in comparison in order to ensure a market overview supports this demand. Additionally, the differences between S&MEs and large-scale companies [Welsh and White, 1981] should be illustrated to students because they are reflected in the appropriate design of the respective systems [Winkelmann and Klose, 2008]. Furthermore, by teaching different ERP systems the students' awareness of functional approaches, process support, interface ergonomics, and architectural concepts will increase.

To summarize, both – courses about ERP systems for large companies as well as systems for S&MEs – should be part of the curricula for students in information systems. However, teaching ERP systems, especially systems for small and medium-sized enterprise is not a simple task. There are two challenges which arise when someone wants to include ERP systems in the curriculum. First, not many ERP system manufacturers do provide access to their systems for universities. Obtaining access to large-scale systems is easier than providing systems for S&MEs. Some ERP manufacturers (mostly the big players) have university programs (e.g. University Alliance Program of SAP or the Oracle Academy Program) to spread their systems throughout study courses. It is not an easy task to find the counterpart – ERP manufacturers for S&MEs who would willingly make their systems available for universities. The second challenge arises after the access to the systems is granted or established. Even if the systems could be provided to the students for example for hands-on courses, additionally course materials or case studies are needed. These materials are primarily necessary for teaching large-scale ERP systems. Because of the system complexity students and even lecturers could easily "get lost" in the systems without instruction materials and the systems could not be used adequately. Within the mentioned university programs such materials (e.g., click-by-click instructions or detailed case studies) are often made available. Therefore, setting up a course for large-scale ERP systems is somehow easier than setting up a course for ERP systems for S&MEs, as in most cases manufacturers for smaller systems do not provide course materials even if they provide access to their systems. To become familiar with these smaller systems and to create the required course materials and documentation a considerable amount of time and effort is needed which makes it even more difficult and complicated to use ERP systems for small and medium-sized enterprise in study courses. This could be one reason why only a few university chairs in Germany are integrating smaller ERP systems in their curricula.

Our suggestion, described in this paper, is a two-course combination: In order to provide a solution for this dilemma a combination of ERP courses is described with which students gain a detailed insight in at least two ERP systems. The focus of this paper lies in a detailed description of our two ERP courses that familiarize students with one large-scale ERP-system and one medium-sized ERP system. Our aim is to provide an insight into the preparation and execution of our approach. An overview about other possible approaches of teaching ERP systems or a comparison with other approaches [e.g. Fedorowicz et al., 2004; Noguera and Watson, 1999] will not be given in this paper.

Our courses are based on problem-oriented, learner-centred approaches [Saulnier et al., 2008; Stewart et al., 2000]. With case studies, the students train themselves independently. In the first course (Course 1) they get detailed instructions and materials which explain how to use the system (a large-scale ERP system) by providing click-by-click case studies. In this course the students can work with the system individually. In the second course (Course 2) small groups are formed and these groups have to explore the functionalities of another ERP system (a system for small and medium sized companies) without instructions. Only a small case study with generic tasks, which have to be fulfilled within the system, is provided to support the students. At the end of the second course the students have to document their findings and experiences of the respective system. Thereby, the course participants can increase their knowledge through investigating different ERP systems (e.g. scope of functionality, interface design, and usability). The students attend the courses in sequence – Course 1 within the first half of the semester, Course 2 afterwards during the second half.

In our set up, all of the students studied in a bachelor program. Typically, the bachelor program in Germany is a three year undergraduate program with an additional two years in the master program. Yet, the groups of students were heterogeneous both with respect to the courses of studies (students in information systems and students in business administration) and to the number of team members in the second course (5-6 students).

Instead of an empirical evaluation which would not be appropriate because of the small course sizes, our goal is to report on students' and lecturers' experiences. Therefore, our paper is structured as follows. The second section describes in detail the procedural model for setting up and conducting the courses. The third section presents the analysis of the course evaluations. Finally, we address limitations and summarize the overall approach and major findings.

II. PROCEDURE MODEL AND DESCRIPTION OF THE APPROACH

Following our procedural model, we used a multi-level procedure for setting up the courses and selecting the ERP systems adapted from Winkelmann and Leyh [2010]. This model is shown in Figure 1. Therefore, we first defined the topic that students should examine during the courses (e.g., examination of specific production processes or retail processes) and selected a domain-specific framework to give students some structure and guidance for their experience with case studies and ERP systems. This framework served as a basis for working on the tasks given to the students (Step 1). Afterwards, we selected suitable ERP systems. To this end, we had to gain an overview of the current situation on the ERP market (Step 2) so that we could select the software manufacturers and systems that promised the largest success for learning in line with the defined tasks (Step 3a). Our focus in the two courses was to make the students familiar with one large-scale ERP system and one system for S&MEs. So, the courses primarily focused on software training to provide a first insight in ERP systems. Therefore the selection of one system for large companies and a system for small and medium sized enterprises was necessary. As mentioned before, many ERP manufacturers of large-scale systems have universities programs. Thus, it is reasonable to choose one of these manufacturers for Course 1 because of the provided documentation und detailed instructions in case studies.

Problem-oriented learning has been established as a successful concept for teaching information systems [Stewart et al., 2000]. Therefore, we chose a scenario that served as a starting point for

the students' evaluation of the ERP systems especially in Course 2 (Step 3b). At the beginning of the semester, Course 1 – the analysis of the large-scale ERP system (Step 4a) – took place. The students had to gain experience with a specific large-scale ERP system (SAP ECC 5.0) individually for themselves by using detailed click-by-click case studies. After getting used to this system, the students had to evaluate the smaller ERP system (Microsoft Dynamics NAV 5.0) on their own and they had to document their results (Course 2 – Step 4b). The lecturer was responsible for Steps 1 to 3b, while the analysis and documentation were the tasks of the participating students. For Course 2 we divided the students into groups of 5-6 each. Here, every group had to fully explore the same ERP system.

Course 3 which is also illustrated in Figure 1 was not part of our two-course combination. This third course can be added as an enhancement of the two-course combination later on. The following sections will concentrate on Course 1 and 2, the optional Course 3 enhancement will be discussed afterwards.
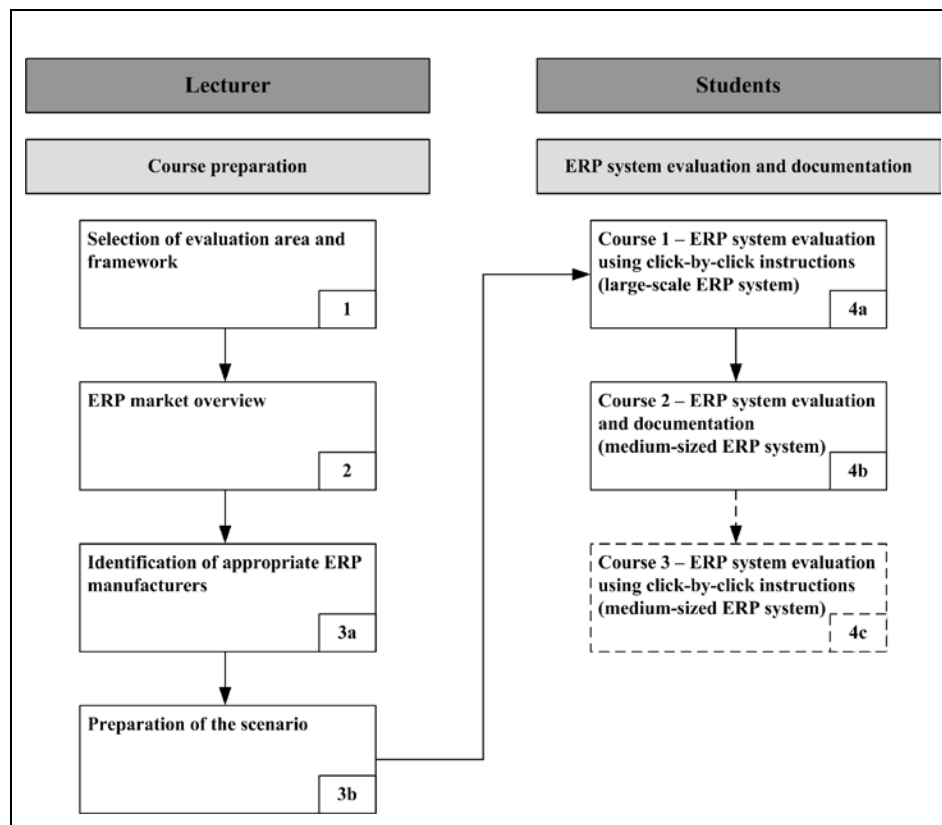

Figure 1: Procedure model for the implementation of the courses

Selection of evaluation area and framework

Even small and medium-sized ERP systems offer complex and extensive functionalities to cover a broad spectrum of functionality for potential customers. Therefore, considering the knowledge of the students participating and the limited amount of time, a serious limitation of the processes that should be evaluated by students is reasonable. The ERP courses should not result in a frustrating experience but should rather aim at providing an understanding of the basic capability of a system [Winkelmann and Leyh, 2010].

Therefore, technical and domain-specific frameworks are suitable for the selection of appropriate ERP systems and as a guideline for the evaluation of student participants. Adapted from

Winkelmann and Leyh [2010], we selected the Retail-H framework [Becker et al., 2001; Klaus et al., 2000] for structuring our scenario, because it is internationally renowned for teaching as well as in the international business community. This framework (shown in Figure 2) serves as reference model for retail firms. It differentiates between functions, data, and processes.
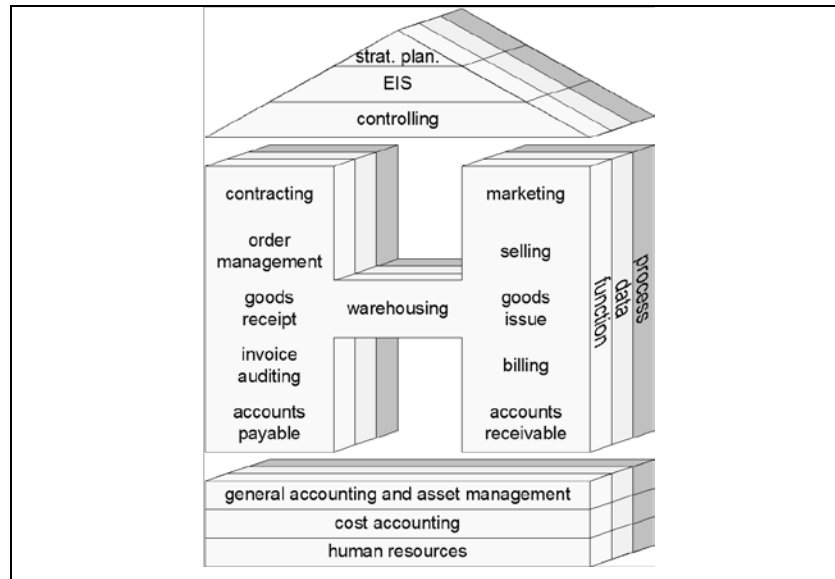

Figure 2: Retail-H on course granular level.

Each function (e.g., contract management, purchasing) is divided into sub-functions that are deposited with best practice processing concepts (modeled with event-driven process chains) and data models (entity relationship models).

The form of Retail-H is based on the logical structure of a retail enterprise. On the left (vertical) side (logically arranged) all functions interfacing with suppliers are positioned and on the right (vertical) side the functions aiming toward the customers are represented. The functions on the horizontals comprise the logistic tasks. Retail-H is particularly suitable for this two-course model, since it allows viewing partial functionalities, whereby only specific functions can be used depending upon the tasks stipulated. In addition, students become familiar with best practices and the underlying data models. Therefore, they can gain experience with different approaches to the requirements analysis for ERP systems on the data, function, and process levels [Winkelmann and Leyh, 2010].

Market Overview

There are numerous possibilities for gaining an overview of the ERP market (shown in Table 1). However, many of the so-called market reviews are often focused only on the large ERP manufacturers (SAP, Microsoft, Oracle, etc.), so these market reviews can serve as a good source of information for identifying manufacturers which might provide a university program. Thus, for Course 1 these reviews are appropriate. However, many smaller systems are not part of these market overviews and identification of manufacturers of such systems is needed for Course 2. Winkelmann and Matzner [2009] suggest several methods with which the spectrum of possible ERP manufacturers for the ERP courses can be extended – personal meetings on conferences or fairs (e.g., CeBIT), articles about ERP systems in technical journals (e.g., ERP Manager), and market review studies and/or platforms for software evaluation (e.g., IT-Matchmaker, ERP Evaluation Centre (erp.technologyevaluation.com)). All of these methods offer a fast and intuitive entrance to the ERP market.

Table 1: Methods for identifying appropriate ERP products

Choice	Examples	Advantages and disadvantages
Face-to-face meeting at conferences or fairs	CEBIT, Hannover, Germany CES, Las Vegas, USA Retail Solution, Birmingham, UK	+ Face-to-face meeting - mostly wrong contact person at fair - incomplete market overview
Discussion of ERP systems in technical or retail journals	ERP Magazine Retail Technology Journal Computer Week	+ detailed ERP lists + reviews and background information - random search for articles - incomplete market overview
Market overview studies and software evalu-ation platforms	IT-Matchmaker ERP Evaluation Center Gartner studies	+ detailed ERP lists + in-depth functionality overview
Case studies	eXperience research methodo-logy [Schubert and Wölfle, 2007]	+ comparability of systems with a continuous structure - different scenarios in case stu-dies - only one system is observed per case study

Identification of appropriate ERP manufacturers

The selection of suitable systems took place according to the criteria of Winkelmann and Leyh [2010]:

- Size of the enterprise/customer basis: Reputation and importance of the ERP manufacturer in the market.
- Functionality: Range of the functions provided within the system for the scenario.
- Maturity: Experience of the manufacturer in the market.
- Ergonomics: Efficiency and effectiveness of the system handling for users.
- Access: System use at justifiable complexity, either through installation by the students (for Course 2) or through remote access (for Course 1).
- University Programs: Provided materials and documentation for learning and using the system in university courses (necessary for Course 1).

For Course 1 we chose SAP as one of the big players because our university was already member of the SAP University Alliance Program and this course is already part of the curriculum since several semesters. The access to the system (SAP ECC 5.0) was easy to establish. Also detailed instruction materials and click-by-click case studies needed for Course 1 were provided through SAP´s University Competence Centers (UCC). Furthermore, the lecturers were already familiar with this course and with the corresponding system. For Course 2 we chose Microsoft as manufacturer of ERP systems for small and medium sized enterprises. Even though Microsoft has a university program, too – the so called Microsoft Business Solutions Academic Alliance (MBSAA) – detailed instruction materials are not provided. Instead, access to the ERP systems of Microsoft (Microsoft Dynamics NAV and Microsoft Dynamics AX) as well as to other Microsoft Business Solutions are provided without fees. Therefore, in Course 2 the participating students had to evaluate the functionalities of Microsoft Dynamics NAV 5.0.

Both selected systems offered functionalities for trade, production, and inventory control. SAP provided remote access to their system on computers at the university through the UCC and Microsoft Dynamics NAV was made available locally on the students' own desktop PCs or notebooks through an installation CD.

Preparation of the scenario

The selection of suitable ERP systems and the preparation of the scenario for the students are interrelated tasks. It is unreasonable to ask manufacturers of ERP systems for their cooperation if the scenario only contains retail functionality and processes. On the other hand, evaluating production processes in systems that do not provide these functions is pointless, too [Winkelmann and Leyh, 2010].

The scenario for Course 1 was predetermined because of the used click-by-click instructions provided by the UCC. For Course 2 the chosen scenario contained a generic retail process that was examined by the students. Additionally, a generic production process that contained the assembly of a product consisting of individual parts was added to the scenario. Because of the lack of space the case studies of both courses including the scenario cannot be described in detail. Therefore, Table 2 and Table 3 give a general overview of the processes and tasks that make up the scenarios. However, the complete scenario for Course 2 in English and German can be requested from the author. The scenario for Course 1 is part of the materials of the UCC. In order to gain access to the detailed instructions, one has to be a member of the SAP University Alliance Program.

Table 2: Scenario for Course 1 (compendium)

Generic production process	Create a stock of materials Create bill of materials Create routings Generate a production order Assembly of the individual parts Assembly of the whole product
Controlling Case Study	Create Cost Centers Plan the Number of Employees Plan Primary Cost Inputs Plan Internal Activity Inputs Automatic Price Calculation Create Work Center Integrate Work Center in Routing Perform New Product Cost Estimate
Generic retail process	Create master data for customers and vendors Enter a framework contract Create Sales Order Create Production Order Create Purchase Order Outbound Delivery with Order Reference Create Transfer Order for Delivery Note

Table 3: Scenario for Course 2 (compendium)

Generic production process	Create a stock of materials Create bill of materials Generate a production order Assembly of the individual parts Assembly of the whole product
Generic retail process	Create master data for customers and vendors Enter a framework contract (1,000 PCs for 299 Euro each)

Normal purchase price 349 Euro each
Order 150 PCs for next month for 299 Euro each
Supplier sends a delivery notification
Supplier delivers 150 PCs that have to be checked and stored
A customer asks for an offer for 10 PCs
The customer orders 8 PCs relating to the initial offer
Take order amount from the warehouse and ship to the customer

By providing the scenarios, the students should be able to identify the processes that have to be performed within the ERP systems and therefore to define the necessary work packages that is most notably in Course 2 where the students have to organize their teams for themselves. Furthermore, additional literature is helpful to compensate possible gaps in the students' knowledge (e.g., for retail literature, [Becker et al., 2001; Mason and Burns, 1998; Sternquist, 2007]). Students had to evaluate the ERP systems based on the requirements of the scenario. They had to enter all necessary data in order to properly document the functionality later and had to reproduce the processes based on the functionalities of their ERP systems. If some aspects of the scenario were not supported by the system because of missing functions, students mentioned this in their written documentation.

As seen in the two tables both scenarios are not identical. The main difference is the controlling case study which is only part of Course 1. With respect to the workload students had to perform in Course 2 by learning a complete new ERP system without instructions the controlling process was not included. Also, the course scenarios in production and retail do not involve the exact same parts and materials. But they are very similar so that the students gain a good comparison of the functionalities and processes of an ERP system for large companies and a system for small and medium-sized enterprises.

ERP system evaluation and documentation

During the first half of the third semester the students attended Course 1. Since the students learned some theoretical basic knowledge about ERP systems within the lectures of the second semester, the students got a first practical hands-on understanding of one ERP system (SAP ECC 5.0) while attending Course 1. The three parts (production, controlling and retail) of this course were performed in three separate sessions which took place in the computer lab of the university. For every session a time slot of three hours was scheduled. This was enough time to let the students perform the case studies in their own pace. Before the beginning of each case study a lecturer gave a short overview of the process which should be performed during the session. Additionally, one or two lecturers (depending on the number of students) stayed in the lab during the whole session to provide helpful advises or solve problems if the students had done a wrong click, forgot to enter some data, etc. Furthermore, before the three sessions took place a "navigation-session" was offered to the students during which they could learn how to work with a SAP system. This was optional for the students and was done by the majority of the students who did not have any experience with SAP. For example, students who had worked with SAP during internships did not attend this "pre-session".

Within the second half of the third semester Course 2 took place. During a kick-off-meeting we described the organizational basics and general conditions of the course as well as the idea of the scenario and the tasks that had to be fulfilled. During the course, participants worked independently in small groups on the given processes with their ERP system. The students were given two months (until the beginning of the fourth semester) to evaluate the ERP system and to write the documentations. There was no training for the students by the ERP manufacturers. The initial skill adaptation training was performed by the students themselves independently after they got access to the system. The mentoring of the lecturers was only required for individual group meetings, during which the teams could ask questions concerning technical aspects or problems with regard to the content of the scenario. The access to the system (Microsoft Dynamics NAV

5.0) was granted during the kick-off-meeting. There, the students had to install the system on their own laptops. Afterwards, the students had to organize themselves to fulfill the tasks.

It has to be pointed out that Course 1 has been part of the curriculum at the university for several years and can be attended independently from Course 2. Hence, the students could decide, if they only wanted to attend the SAP course or if they wanted to perform the evaluation of Course 2, too. There were 38 students who attended Course 1, and 17 of them also attended Course 2. Therefore, in Course 2 we formed three teams – two teams with six group members and one team with five.

At the beginning of the next semester, they provided a written evaluation of "their" ERP system. The main part of the written documentation was to create a click-by-click case study, similar to the one with which the students received in Course 1. To be able to prepare the click-by-click materials the students had to gain a deep insight into the processes of the system and to understand what click had which effect. In addition, a summary of the basic technical principles of the assigned system and a concluding upshot that showed the pros and cons of the solution were asked for.

Alternatively, it is possible to let the students present their systems during a "live demo", as it is done in the seminar of Winkelmann and Leyh [2010]. But this was not done in our 2-course combination.

Course 3 which is mentioned in Figure 1 as well can be seen as an optional enhancement of the existing 2-course combination. This course is planned as an additional counterpart to Course 1. In this course different ERP systems for small and medium-sized companies should be experienced by the students in a manner which is not too time-consuming. As in Course 1 detailed click-by-click instructions will be handed out to the students so that they can learn the different systems individually. Hence, this course is designed as course for large groups of students who are to learn different ERP systems in a limited amount of time. Here, once again the challenge arises on how to prepare the needed instruction materials for the systems to be used. To solve this problem, Course 2 can be used. After repeating Course 2 several times with different systems the lecturers gain different click-by-click instructions created by the participants of Course 2. Afterwards, these materials can be used in Course 3 as instructions. Therefore, Course 3 is planned to be part of the curriculum in some years after having repeated the existing 2-course combination at least two times.

III. COURSE EVALUATION

Students' perspective

Since an evaluation of seminars and/or courses in general is of high importance for the improvement of teaching concepts [Seethamraju, 2007], questionnaires were handed out to all three teams that participated in Course 2 to evaluate the combination of the courses after the semester. Each group could decide if they wanted to fill out one questionnaire for the whole group or if every team member wanted to answer the questions individually. This questionnaire served to identify possible weaknesses and opportunities for improvements with respect to the course realization, scenario, and support from the lecturers as well as the adequateness of the respective ERP systems. Also, the positive aspects that should be repeated in the next courses could be emphasized. The questionnaire consisted of 21 questions based on scale evaluations (grades 1-5), yes/no, and free text answers. Some of the evaluation results are shown in Table 4. Additionally, feedback discussions were conducted with each team separately to gather further suggestions from the students.

Based on the results of the questionnaires and discussions we realized that without exception all participants said they acquired knowledge and skills concerning functional, methodological, social, and technical aspects. Also, the use of the scenario was classified as good.

Regarding the complexity of the courses, especially the extensive evaluation of the ERP system in Course 2, we noticed that the bachelor students classified the scope of work they had to perform nearly as adequate. The students could communicate with each other across the teams. During the kick-off meeting this was explicitly mentioned as being allowed. Therefore, important information for solving problems could be inquired from the team members of the other groups. This was positively appraised, even though this option was not used very often. Rather, the teams preferred to solve occurring problems internally within their own group. During the feedback discussions the seminar (Course 2) turned out to be very popular among students.

Table 4: Results of the course evaluation

	Average grade per team (1=very high, 5=very low)		
	Team 1	Team 2	Team 3
ERP knowledge **before** course	4	2.5	2.5
Interest in ERP issues **after** course	2	2	2.5
Motivation for thoughts and opinion building	1	1	1
Increase of ERP knowledge in general	1	2.5	2
Increase of knowledge regarding the respective ERP system	2	2	1.5
Usefulness of the scenario	2	2	2
Adequateness of the respective ERP systems	2	2.5	1
Level of difficulty (-**2=much too low, 0=reasonable, 2=much too high**)	0	0	0
Effort needed (**2=much too high, 0=reasonable, -2=much too low**)	0	-0.5	0
Effort needed in comparison to other courses (**2=much too high, 0=reasonable, -2=much too low**)	0	-0.5	0

Lecturer's perspective

The expansion of the already existing SAP course (Course 1) with the addition of a "self-learning" ERP course (Course 2) was a good opportunity to enhance the information systems curriculum at our university. This did not only enable a deeper insight in an ERP system for small and medium-sized enterprises for the students, also the lecturers gained a valuable insight into ERP systems previously not known to them. A further benefit of these courses, especially of Course 2, lies in the documentation of the respective ERP system produced by the students. Thereby, the lecturers obtained click-by-click instructions that an be used in a further enhancement of the 2-course combination (Course 3) in the next years. If the teams perform well in Course 2, these documentations can be used without considerable effort for adjustment of the materials. Hence, by repeating this 2-course combination several times, the lecturers gather a large amount of materials with which the ERP system education can be expanded and enhanced by allowing various ERP systems and teaching formats. Therefore, it is advisable to repeat the courses (especially Course 2) by changing the ERP system, which has to be evaluated, in each cycle.

IV. LIMITATIONS AND CONCLUSIONS

The idea of the course-combination was to create an additional education unit for the application of ERP systems at the university with which the students gain insight in two different ERP systems and become familiar with using these systems (software training). This idea resulted in an extension of the SAP course which was already taught at the university. Additionally, a course was created during which students had to evaluate an ERP system for S&MEs in small groups. Although we regard this type of course combination as very successful, there are some limitations. First, we are only able to handle two ERP systems per semester and are not able to fully cover the market. However, we do not consider this a severe disadvantage. Furthermore, not all ERP systems on the market are suitable for such an ERP course. For example, older systems are often very complicated in their installation procedure. Also, ERP systems for large companies may also not be very suitable for Course 2 as they may be too complex for unsupervised student exercises.

In conclusion, for both students and lecturers/tutors, the seminar offers a good opportunity to gain a deeper insight into ERP systems and extend their knowledge about a variety of ERP systems.

Future steps are repeating the 2-course combination each winter semester at the university and varying the ERP system used in Course 2 in each cycle. After several iterations of this course combination an additional course (Course 3) will be included in the information systems curriculum in order to provide even more diversified ERP systems to students.

References

Antonucci, Y. L. et al. (2004) "Enterprise systems education: Where are we? Where are we going?", *Journal of Information Systems Education,* (15)3, pp. 227-234.

Barker, T. and M. N. Frolick (2003) "ERP implementation failure: A case study", *Information Systems Management,* (20)4, pp. 43-49.

Becker, J. et al. (2001) *Retail information systems based on SAP products*, Berlin, Germany: Springer.

Boyle, T. A. and S. E. Strong (2006) "Skill requirements of ERP graduates", *Journal of Information Systems Education,* (17)4, pp. 403-412.

Brehm, N., L. Haak and D. Peters (2009) "Using FERP Systems to introduce web service-based ERP Systems in higher education", in Abramowicz, W. and D. Flejter (eds.) *Business Information Systems Workshops: BIS 2009 International Workshops, Poznan, Poland*, Berlin, Germany: Springer, pp. 220-225.

Fedorowicz, J. et al. (2004) "Twelve tips for successfully integrating enterprise systems across the curriculum", *Journal of Information Systems Education,* (15)3, pp. 235-244.

Hawking, P., B. McCarthy and A. Stein (2004) "Second wave ERP education", *Journal of Information Systems Education,* (15)3, pp. 327-332.

Hsu, K., J. Sylvestre and E. N. Sayed (2006) "Avoiding ERP Pitfalls", *Journal of Corporate Accounting & Finance,* (17)4, pp. 67-74.

Klaus, H., M. Rosemann and G. G. Gable (2000) "What is Enterprise Resource Planning?", *Information Systems Frontier,* (2)2, pp. 141-162.

Konradin Business GmbH (2009) *Konradin ERP-Studie 2009: Einsatz von ERP-Lösungen in der Industrie*, Leinfelden-Echterdingen, Germany: Konradin Mediengruppe.

Mason, J. B. and D. J. Burns (1998) *Retailing*, Houston, Texas, USA: Cengage Custom Publishing.

Noguera, J. H. and E. F. Watson (1999) "Effectiveness of using an enterprise system to teach process-centered concepts in business education" in *Proceedings of the 5th Annual Americas Conference on Information Systems*, Milwaukee, Wisconsin, USA, Paper 279.

Peslak, A. R. (2005) "A twelve-step, multiple course approach to teaching enterprise resource planning", *Journal of Information Systems Education,* (16)2, pp. 147-155.

Saulnier, B. M. et al. (2008) "From teaching to learning: Learner-centered teaching and assessment in information systems education", *Journal of Information Systems Education*, (19)2, pp. 169-174.

Schubert, P. and R. Wölfle (2007) "The eXperience methodology for writing IS case studies" in *Proceedings of the Thirteenth American Conference on Information Systems*, Keystone, Colorado, USA, Paper 345.

Seethamraju, R. (2007) "Enterprise systems software in business school curriculum – Evaluation of design and delivery", *Journal of Information Systems Education,* (18)1, pp. 69-83.

Sternquist, B. (2007) *International Retailing*, London, England: Fairchild Books & Visuals.

Stewart, G., M. Rosemann and P. Hawking (2000) "Collaborative ERP curriculum developing using industry process models" in *Proceedings of the 6th Annual Americas Conference on Information Systems*, Long Beach, California, USA, August 2000, Paper 128.

Venkatesh, V. (2008) "One-Size-Does-Not-Fit-All: Teaching MBA students different ERP implementation strategies", *Journal of Information Systems Education,* (19)2, pp. 141-146.

Welsh, J.-A. and J.-F. White (1981) "A small business is not a little big business", *Harvard Business Review,* (59)4, pp. 18-32.

Winkelmann, A., and K. Klose (2008) "Experiences while selecting, adapting and implementing ERP systems in SMEs: a case study" in *Proceedings of the 14th Americas Conference on Information Systems*, Toronto, Ontario, Canada, August 2008, Paper 257.

Winkelmann, A., R. Knackstedt and O. Vering (2007) *Anpassung und Entwicklung von Warenwirtschaftssystemen - eine explorative Untersuchung. Handelsstudie Nr. 3, Münster*, Münster, Germany, Retrieved December 10, 2009, from http://www.wi.uni-muenster.de/udoo/downloads/publications/1975.pdf.

Winkelmann, A. and C. Leyh (2010) "Teaching ERP systems: A multi-perspective view on the ERP system market", *Journal of Information Systems Education,* (22)2, p. 233-240.

Winkelmann, A. and M. Matzner (2009) "Teaching medium sized ERP systems – a problem-based learning approach" in Papadopoulos, G. A. et al. (eds.) *Information Systems Development: Towards a Service Provision Society*, New York USA: Springer, pp. 891-901.

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