

8-5-2011

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Christian Leyh

Technische Universität Dresden, christian.leyh@tu-dresden.de

Axel Winkelmann

University of Muenster, axel.winkelmann@ercis.uni-muenster.de

Jingjie Lu

Technische Universität Dresden, Chair of Information Systems, esp. IS in Manufacturing and Commerce

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Recommended Citation

Leyh, Christian; Winkelmann, Axel; and Lu, Jingjie, "Exploring the diversity of ERP systems – An empirical insight into system usage in academia" (2011). *AMCIS 2011 Proceedings - All Submissions*. 203.

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Exploring the diversity of ERP systems – An empirical insight into system usage in academia

Christian Leyh

Technische Universität Dresden
Chair of Information Systems, esp. IS in
Manufacturing and Commerce
christian.leyh@tu-dresden.de

Axel Winkelmann

University of Muenster
European Research Center for
Information Systems
axel.winkelmann@ercis.uni-muenster.de

Jingjie Lu

Technische Universität Dresden
Chair of Information Systems, esp. IS in
Manufacturing and Commerce

ABSTRACT

Because of the increasing importance of ERP systems and their educational value, as well as the rapidly changing ERP market, many universities use or want to use ERP systems for their courses. The aim of these courses is to teach and demonstrate different ERP related concepts and processes. To support these courses, some ERP manufacturers co-operate closely with universities and offer their systems and resources for academic teaching. However, there are hardly any empirical insights on system usage in academia. As an initial survey, we developed a questionnaire to determine the current status of ERP system usage and integration in courses at IS chairs of German-speaking research-oriented universities. Among 92 responding university chairs, 59 are teaching ERP topics. Of these 59 chairs, only 38 are teaching ERP systems practically. Almost every university chair (35 out of 38) that is providing practical courses for students is using SAP.

Keywords

ERP systems, curriculum, teaching approaches, German universities, diversity

MOTIVATION

Today, standardized enterprise resource planning (ERP) systems are being used in a majority of enterprises. For example, more than 92 percent of all German industrial enterprises use ERP systems (Konradin, 2009). Due to this strong demand, there are many ERP systems with different technologies and philosophies available on the market (Winkelmann, 2010). Therefore, the ERP market is strongly fragmented, especially when focusing on systems targeting small and medium-sized enterprises (S&MEs) (Winkelmann and Klose, 2008). The growing multitude of software manufacturers and systems is making it more and more difficult for enterprises that use or want to use ERP systems to find the “right” software and then to hire the appropriate specialists for the selected system. Also, for future investment decisions concerning the adoption, upgrade, or alteration of ERP systems, it is important to possess the appropriate specialized knowledge and skills in the enterprise (Winkelmann, 2010; Winkelmann and Matzner, 2009). This is essential since errors during the selection, implementation, or maintenance of ERP systems can cause financial disadvantages or disasters, leading to insolvencies of the affected enterprises (e.g., Barker and Frolick, 2003; Hsu, Sylvestre and Sayed, 2006). In order to prevent this, it is necessary 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). Therefore, ERP systems have been used in the academic world for more than a decade.

Because of the increasing importance of ERP systems and their educational value, many universities use or want to apply ERP systems in study courses (Seethamraju, 2007) to teach and demonstrate different concepts and processes (Magal and Word, 2009). To support these courses, some ERP manufacturers co-operate closely with universities and offer their systems and resources for academic teaching. One of the goals of using ERP systems in courses is to prepare students for their career by giving them at least an introduction to ERP systems. A further goal, promoted by ERP manufacturers themselves (especially by making their systems available for university courses), is for students to learn about the products as early as possible since they, later as graduates, will work with these systems or will hold enterprise positions that influence ERP investment decisions. Therefore, it is necessary for universities to offer the appropriate systems, processes, and suitable

courses for their students (Brehm, Haak and Peters, 2009; Fedorowicz, Gelinis, Usoff and Hachey, 2004; Winkelmann and Leyh, 2010).

The need for providing this knowledge through university courses and, above all, the possibilities of using these systems themselves in courses are frequently discussed in literature (e.g., Antonucci, Corbitt, Stewart and Harris, 2004; Boyle and Strong, 2006; Fedorowicz et al., 2004; Hawking, McCarthy and Stein, 2004; Peslak, 2005; Stewart, Rosemann and Hawking, 2000). These discussions clearly point out that ERP systems are or should be an important component of university curricula in information system-related subjects and courses. However, this is not a trivial task, as Noguera and Watson (1999) discuss. Because there is no standardized approach, 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 example, for teaching the respective systems, the lecturer has to be familiar with the system's concepts and its practical usage. Thus, the choice of one or more ERP system for a course strongly depends on the knowledge and experience of the lecturers themselves. Additionally, the variety of ERP systems used in courses is limited by the manufacturers' willingness to provide their systems. This results in a situation in which only a small variety of systems and software manufacturers are represented at universities in spite of the heterogeneous ERP market.

In particular, the software manufacturer SAP is represented in numerous universities through its University Alliance program. With more than 400 partner universities participating in this program, SAP is probably the most widely used system in study courses worldwide (Hawking et al., 2004; Pellerin and Hadaya, 2008). Smaller systems are rarely used in teaching; yet, a more diversified integration of ERP systems into education is advisable, especially from the viewpoint of S&ME (Leyh, 2010; Winkelmann and Leyh, 2010). Also, the argument to introduce students to more than one or two large systems in order to ensure a market overview supports this demand. Additionally, the differences between S&MEs and large-scale companies (Welsh and White, 1981) will 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. ERP systems and their concepts can also be described theoretically without direct system access. However, the learning experience and understanding are much better promoted through the use of real systems (Watson and Schneider, 1999). Yet, choosing the "right" number of ERP systems is difficult since too many systems can lead to student confusion or misunderstandings. However, there are hardly any empirical insights on system usage in academia. From the study of Bradford, Vijayaraman, and Chandra (2003), a survey on the usage in US business schools exists, but this is outdated and there are no recent surveys. Thus, with the rapidly changing ERP market, more recent studies are needed. Especially since the European situation, where SAP's predominance is even stronger, is different from that of the situation for US business schools. Therefore, this research studied the situation of German-speaking countries and tried to explore how diversified the usage of ERP systems in German study courses is. This leads to the following research question: *Which ERP systems are used in teaching in German-speaking research-oriented universities and which didactical (teaching) methods are employed in presenting these ERP systems?*

For this purpose, we developed a questionnaire with the goal to determine the current status of ERP system usage and its integration in study courses at information systems (IS) chairs of German-speaking research-oriented universities in Germany, Austria, and Switzerland. For an initial survey, we focused on these universities due to our cultural background and due to the high awareness of ERP at German universities. This questionnaire contained questions about the extent of ERP usage in study courses, the reasons for using or not using ERP systems, didactic aspects of the different ERP course programs, and the qualification and experience of the lecturers. Selected results of this survey are described within this paper. Therefore, the paper is structured as follows: Following this introduction, we describe how the questionnaire was developed and how the sample of university chairs was chosen. Then, the main section follows, where selected results of the survey are presented and discussed in detail. Finally, we address limitations and summarize the overall approach and major findings.

RESEARCH METHODOLOGY – WEB BASED SURVEY

For data collection, we decided to use a standardized questionnaire which was administered electronically. We selected this procedure due to convenience reasons for the respondents and due to economic efficiency. Additionally, a standardized questionnaire has the advantage of higher objectivity, comparability, and reliability (Bortz and Doering, 2009).

In a previous empirical study (cp. Leyh, Betge and Strahinger, 2010) we compared different online survey tools (criteria: price, tool handling, service, and support), and, therefore, chose the page "onlineumfragen.com" as the provider for our web based survey considering our experience with this tool in other studies (e.g., Leyh, Betge and Strahinger, 2010, Leyh and Huebler, 2011). The screenshot in Figure 1 provides an impression of the web based questionnaire's look and feel. The questionnaire is structured in two thematic sections. The first section deals with teaching ERP topics in general and the

second section is about the ERP systems used in study courses. Finally, the last section is intended to collect some demographic data. The overall questionnaire is not included in this paper and is available upon request.

We pre-tested the questionnaire with various members of an IS department from one university who were later excluded from the final study. The questionnaire was adapted on the basis of feedback and comments and was made available to university chairs in the summer of 2010.

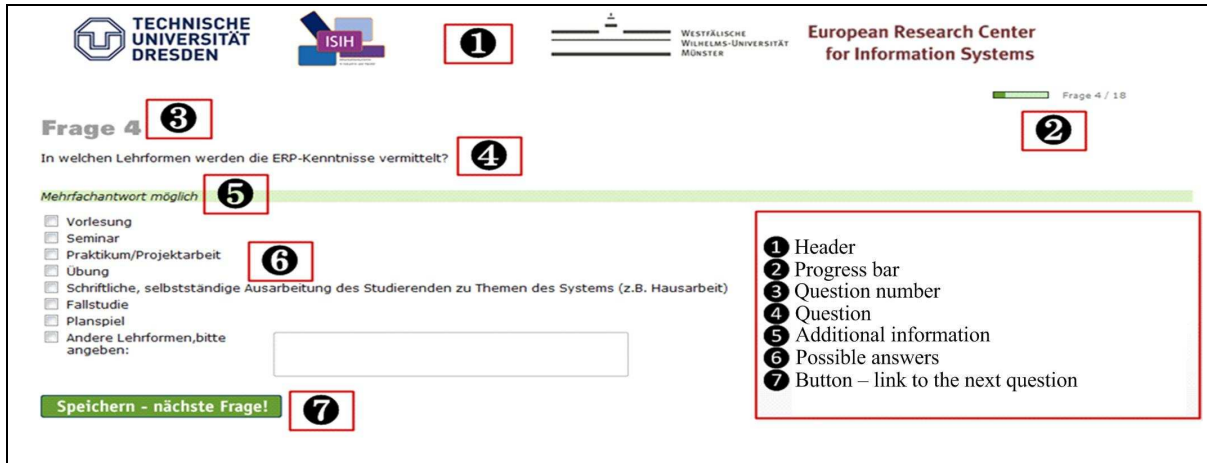


Figure 1. Design of the questionnaire

Our sample consisted of 222 German-speaking university chairs in Germany, Austria, and Switzerland who are affiliated with the field of information systems. These participants were derived from two sources of data: one database that listed all the universities with study courses in the field of IS (Project IFWIS, 2008) and, to check the database results for completeness, a list of all German-speaking university chairs in the field of IS (WI, 2010). The sample was distributed as shown in Table 1.

	Germany	Austria	Switzerland	Total
Number of universities	62	6	5	73
Number of IS chairs (participants)	180	22	20	222

Table 1. Sample distribution

RESULTS OF THE WEB BASED SURVEY

Because our exploratory approach focused on the differences and similarities of ERP usage in study courses at German-speaking universities, no hypotheses were developed for this investigation. Thus, we considered descriptive statistics as adequate to provide and discuss the results of the survey. We published the survey online between July 28, 2010, and September 3, 2010. The link for the survey was sent directly to the 222 participants at the German-speaking universities. Additionally, within an interval of two weeks each, we sent two reminder emails.

The initial return rate was 46.4% (cp. Table 2). After screening the answers, 11 questionnaires had to be excluded from the analysis since they were incomplete or duplicates. Thus, the return rate based on usable returns was 41.4%. As the contact information of the chairs was taken directly from the respective homepages, there were no losses due to errors in the email address list.

Sample size	222
Returns	103
Return rate	46.4%
Excluded returns	11

Usable returns	92
Return rate (usable)	41.4%

Table 2. Return rates

The 92 usable returns were distributed from among 50 universities. Therefore, we received a per-university return rate of 68.5% (50 out of 73 universities). The years of experience of the participating university chairs is shown in Table 3. However, the question regarding experience was optional and only 65 out of 92 participants answered this question.

Years of experience with ERP systems	University chairs
More than 20 years	5
Between 16 and 20 years	8
Between 11 and 15 years	8
Between 6 and 10 years	18
Between 1 and 5 years	24
0 years	2
	65

Table 3. Participants' experience with ERP systems (n=65)

Teaching ERP topics in general

Among the 92 participants, almost two-thirds are teaching ERP topics in general (cp. Table 4). It is interesting to see that although 63 chairs have experience with ERP systems (cp. Table 3) not all of these chairs are teaching ERP topics.

	Germany	Austria	Switzerland	Total
Number of participants	75	9	8	92
Number of IS chairs teaching ERP topics	47	6	6	59

Table 4. Frequency of teaching ERP topics (n=92)

In the following analysis, we mainly focus on the 59 participants who are teaching ERP topics. Among those 59 participants, topics like ERP integration concepts and ERP business basics are mainly taught among the study courses. As Table 5 shows, these topics are followed by technical aspects of ERP systems as well as ERP system usage, whereas ERP configuration and implementation are not mentioned as often. Apart from total numbers, figures are differentiated along the three types of study programs in Germany: The bachelor program in Germany typically is a three year undergraduate program with two additional years in the master program; the diploma program is an old university program that is equivalent to a combination of bachelor and master studies within a single program.

	Business basics	Technical aspects	ERP integration concepts	ERP system configuration	ERP system usage
(1) Bachelor	45	32	35	16	29
(2) Master	24	21	34	20	24
(3) Diploma	22	18	24	14	19
Sum (1 to 3)	91	71	93	50	72
Not taught	4	12	5	17	14

Table 5. ERP topic distribution according to study programs (multiple answers allowed, n=59)

Our investigation resulted in a large variety of teaching methods which are used in order to familiarize students with ERP knowledge and skills (cp. Table 6). The question on the employed teaching methods was mostly answered with "Lectures".

85% of all the participants who are involved in ERP topics use ERP at least in their lectures. Practical exercises and case studies were mentioned by 36 and 29 participants (cp. Table 6). Therefore, lectures and practical exercises can be seen as the typical methods employed, whereas the other methods mentioned allow for a deeper learning experience. For example, case studies help students to not only understand enhanced ERP system functionality but also to strengthen their individual soft skills like problem solving or teamwork.

Teaching methods	Absolute frequency	Relative frequency (n= 59)
Lectures	50	85%
Practical exercises	36	61%
Case Studies	29	49%
Projects	23	39%
Seminars	20	34%
Assignment paper	14	24%
Simulation games	4	7%
Other teaching methods	4	7%

Table 6. Teaching methods (multiple answers allowed, n=59)

Rosemann and Watson (2002) use the different teaching methods to distinguish the depth and extent of ERP knowledge that is obtainable within a university's curriculum. As a starting point, typically, ERP knowledge is obtained without practical exercises (the so-called PowerPoint beginning). It is possible to provide general information on ERP systems in the form of lectures. However, teaching ERP topics without practical exercises is a limited method. The practical application of knowledge is extremely important for students in order to understand ERP systems and ERP implementation concepts more comprehensively and deeply (Watson and Schneider, 1999). Therefore, in addition to the question on which teaching methods are used in the curricula, we asked how many teaching methods are used.

The results show that 85% of the participants use more than one method for teaching ERP topics. Nearly one-third of the chairs use even more than four teaching methods (cp. Figure 2).

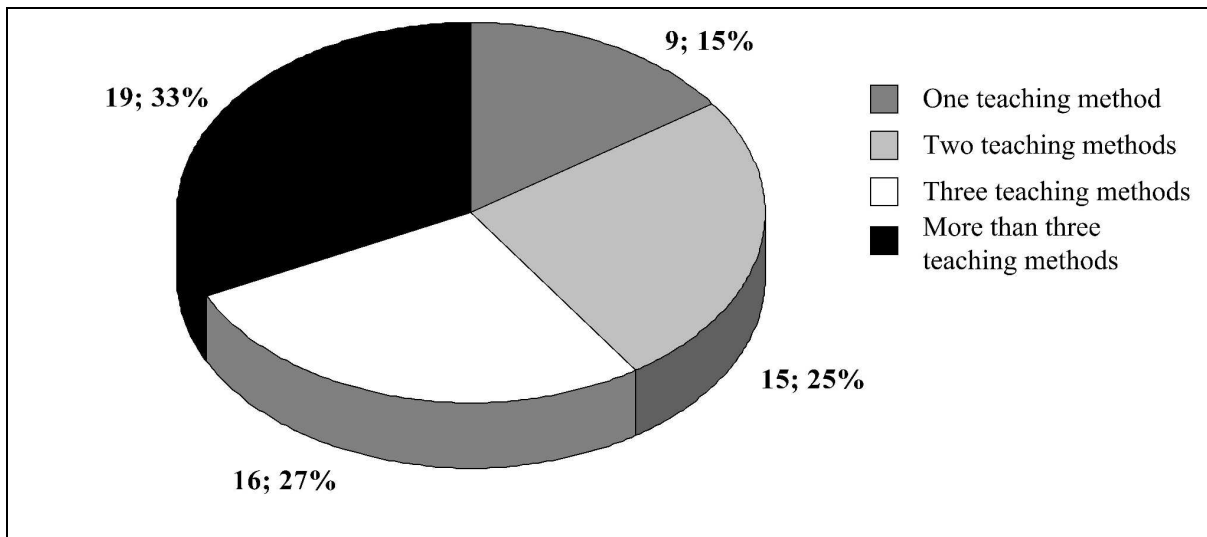


Figure 2. Frequency of teaching methods (n=59)

ERP systems in study courses

In addition to our investigation of ERP teaching methods, our survey also sought to determine which ERP systems are being used in study courses. Therefore, the 59 participants actually teaching ERP topics were asked whether or not they also use ERP systems practically. Table 7 shows that out of these 59 participants, 38 (64%) are using ERP systems practically (e.g., in

computer lab exercises, projects, independent teaching formats, etc.). Additionally, the results show that the ERP systems and functionalities used focus on the industry sector (84%), followed by the retailing sector (50%). Only few institutions focus on other sectors such as the financial sector (13%), public administration (5%), health services (3%), communication (3%), or the service sector (3%).

	Germany	Austria	Switzerland	Total
Number of IS chairs teaching ERP topics	47	6	6	59
Number of IS chairs using ERP systems practically	32	4	2	38

Table 7. Frequency of using ERP systems practically (n=59)

The question of which ERP systems are used within the different study courses was answered quite in line with our expectations. As shown in Figure 3, a majority of the participants who are teaching ERP systems practically are using SAP (35 out of 38; 92%). Other ERP systems used are Microsoft Dynamics NAV and AX (39%), Semiramis (10%), and ProAlpha (10%).

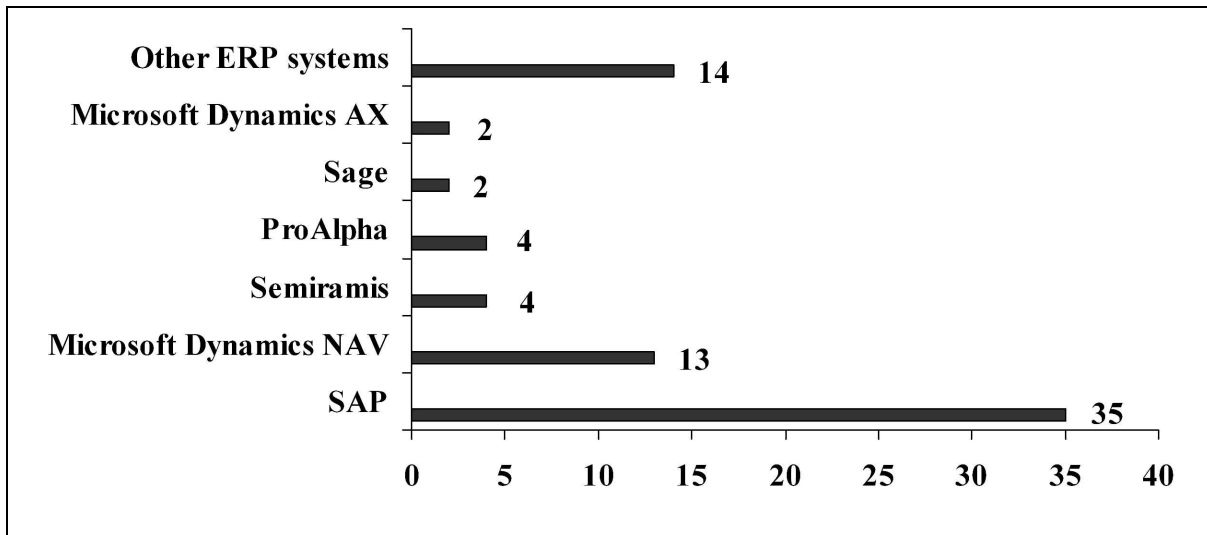


Figure 3. Frequency used ERP systems (multiple answers allowed, n=38)

Also, Figure 3 shows that, mostly, more than one ERP system is used. Thus, many participants who use ERP systems in teaching employ different systems. This fact supports the demand mentioned in our motivation. The results present a variety of employed ERP systems besides the top 4. Other systems mentioned are Godesys SO, Infor, SAGE ClassicLine, and SAGE OfficeLine Evolution, in addition to open source ERP systems like OpenERP, Compiere, or SQL Ledger. Above all, the 38 participants gave 74 answers to the question about which ERP systems they use. Only 25 out of 38 participants answered positively when asked if the used ERP systems are suitable and appropriate for study courses. These 25 participants were especially satisfied with the ERP manufacturers' support and with the extensive instructional and educational material available. On the other hand, 13 of them were not satisfied with their systems. This was mainly due to the high complexity of the respective ERP systems and the extent of the needed resources, effort, and budget.

Additionally, we examined what actual ERP system functionalities were taught within the study courses. These results can be compared with the study of Bradford et al. (2003) (cp. Figure 4). Bradford et al. (2003) reported that, in 28% of the universities, only limited transactions within the ERP systems were taught, which reflects the lowest level of ERP system usage (see Rosemann and Watson, 2002). In our survey, out of the 34 participants that answered this question, only 1 (3%) teaches ERP systems on the most limited level. As Rosemann and Watson (2002) describe, the use of at least a

comprehensive module is the dominant teaching approach used throughout the universities. Our survey supports this statement since 16 participants out of 34 (47%) use mainly one or more selected modules within their respective ERP systems (cp. study of Bradford et al., 2003: 29%). Furthermore, our results show that nearly the same amount of chairs (14, 41%) has decided to teach the whole ERP system's core functionalities (operational core processes as well as administrative support processes). In the study of Bradford et al. (2003), the percentage for teaching the ERP system's core functionalities is the highest one, at 31%. However, teaching extended ERP system functions, e.g., configuration or tailoring of the respective systems, is done less often; within our investigation, only 9% of the participants are teaching these aspects (cp. study of Bradford et al., 2003: 12%). According to Rosemann and Watson (2002), the reasons for this are, above all, the lack of educational material for teaching extended ERP functions, the low amount of support from ERP manufacturers, the lecturers' lack of experience with these specific functions, and the high effort required for implementation and maintenance.

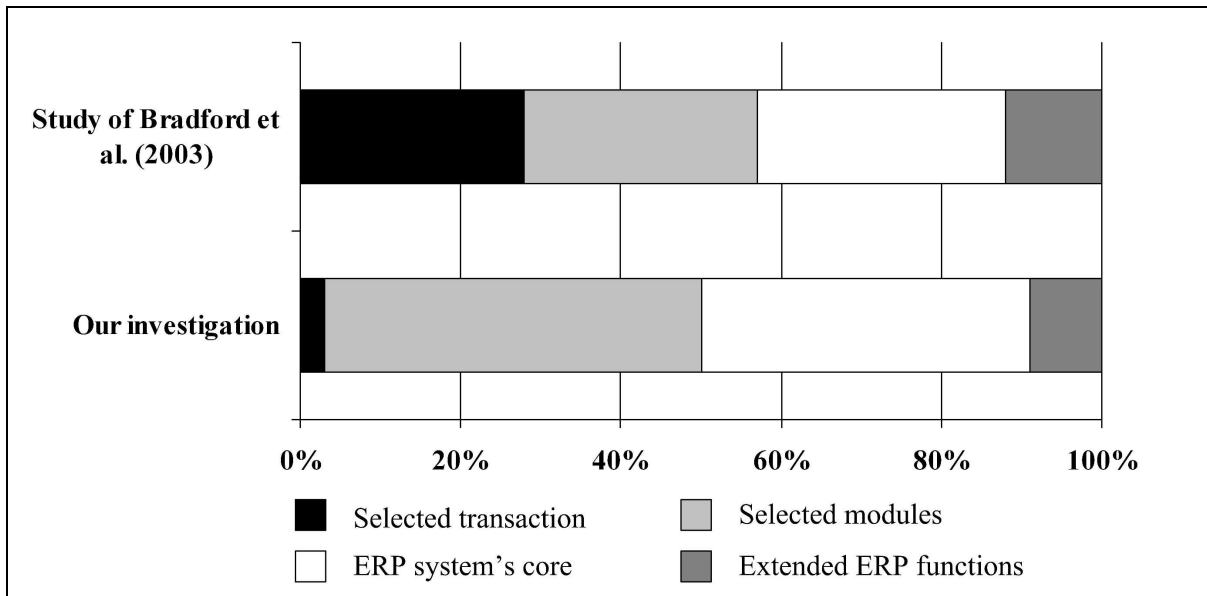


Figure 4. Comparison to Bradford et al., 2003 (Our survey n=34)

Our results obviously show that the majority of the participants who are teaching ERP systems use at least several selected modules or the complete ERP systems' core functionalities instead of teaching single or limited transactions. This tendency can be explained from two perspectives: On the one hand the universities have collected a fair amount of practical experience since they have been employing ERP systems for several years now. Thus, they have recognized that teaching single transactions does not provide the needed insight. On the other hand, the partnership between universities and ERP manufacturers has been optimized continuously throughout the past years. The types of co-operation are becoming more and more flexible and cover a wider range of systems and functionalities. Both the provided ERP systems as well as the manufacturers' support (hosting the ERP systems, instructional and educational materials, and documentations, etc.) are much better and have become more effective.

ERP manufacturers' support as well as access to documentation is often only granted if the university is a member of the manufacturer's university program, e.g., SAP's University Alliance or the Microsoft Business Solution Academic Alliance (MBSAA). Within our survey, 26 out of 38 participants are members in the SAP University Alliance (cp. Figure 5). The second and third most employed programs are the MBSAA (9/38) and the Oracle University (3/38). These results are not surprising since SAP, Microsoft, and Oracle are big players in the ERP market and together capture approximately 56.2% of the German ERP market (Konradin, 2009) and about 65% of the world-wide ERP market (Jacobson, Shepherd, D'Aquila and Carter, 2007). 9 out of the 38 participants are teaching ERP systems without being partners in a university program. Also, the results show, though three participants are members of Oracle's university program, this ERP system was not mentioned to be practically used in study courses (cp. Figure 3). Additionally, the results show that about 26% of these 38 participants are members of at least two or more university programs.

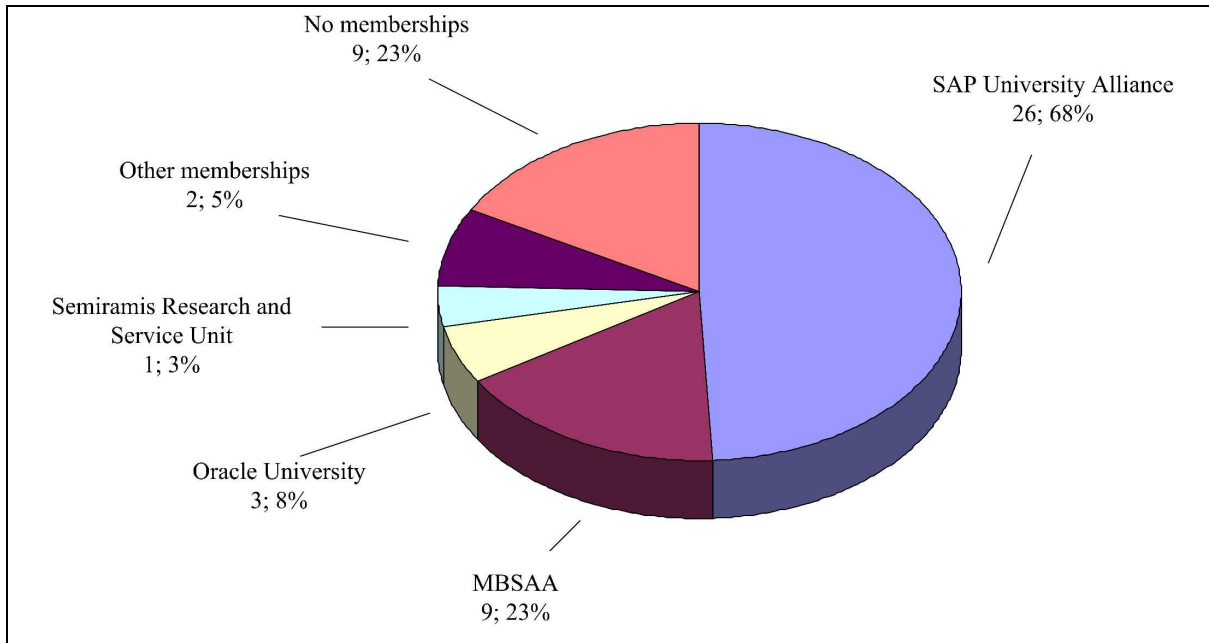


Figure 5. University program memberships (multiple answers allowed, n=38)

One of the last questions focused on the needs or requests to use (additional) ERP systems. All 92 participants were asked whether they would like to use a first ERP system or implement additional systems if they already use one. The results are shown in Table 8.

ERP systems in study courses	Request for (additional) ERP systems	Frequency	
Yes	Yes	36	42,4%
No	Yes	3	
Yes	No	18	44,6%
No	No	23	
Yes	No answer	5	13%
No	No answer	7	
		92	

Table 8. Demand for additional ERP systems

The number of participants who would like to integrate additional ERP systems in the curriculum (39) nearly equals the number of those that do not want to change the current ERP system usage (41). The follow-up question of which ERP systems would be preferred, if available without any costs, was answered by 31 participants. Here, 21 would like to use SAP, 5 Microsoft ERP systems (Dynamics NAV or Dynamics AX), 4 the Oracle Enterprise system, and 1 the SAGE ERP systems.

IMPLICATIONS, LIMITATIONS, AND CONCLUSION

Regarding our research concerning what ERP systems are taught in German-speaking research-oriented universities and how these systems are used, our survey showed that among 92 university chairs, 59 are teaching ERP topics. Of these 59 chairs, only 38 are teaching ERP systems practically and therefore provide their students an insight into selected systems. As expected, due to its strong influence and predominance, SAP’s ERP systems are the most often used systems in German-speaking universities. Almost every university chair that is providing practical study courses for students is using SAP; although other ERP systems are used in study courses, they are employed less often compared to SAP. Thus, we can point

out that at least a little variety of ERP systems is provided for the students since many university chairs often use more than one system in their curricula. However, nearly one-third of the chairs are not satisfied with the used ERP systems, due to high maintenance and costs as well as little support from ERP manufacturers.

Our study shows that teaching ERP topics and using ERP systems practically in study courses are important aspects confronting universities. Thus, the universities show a high level of willingness to deal with ERP topics and systems and the associated requirements. University chairs imply that ERP systems in study courses have a high importance. However, regarding the rapid changing and evolving ERP market, providing a wider market overview would be advisable. Besides SAP, there are many other ERP system manufacturers (especially manufacturers for S&MEs). In some universities, these systems are already employed, but not all manufacturers provide their systems and resources for all universities. Here, knowledge transfers between universities which are using different ERP systems seem reasonable and would be helpful.

As implications for ERP manufacturers, we can point out that there are many universities that would willingly employ (further) ERP systems. Here, ERP system manufacturers, especially those for smaller companies, could use this demand to later benefit from graduates' experience with their program and to provide first insights and contacts to their systems. Many universities would appreciate also employing smaller systems in their curricula.

To address the limitations of our study, we did not receive answers from all German-speaking university chairs within the field of IS. Also, universities of applied sciences were not part of our survey. Since universities of applied sciences teach more practical topics, ERP systems could even be more widely applied in their study courses. Therefore, further investigations addressing these aspects are necessary. Again, our survey can be seen as an initial study regarding the usage of ERP systems in study courses.

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