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Abstract

Collaboration between universities and thus the sharing of expertise is of increasing importance when teaching complex systems like Enterprise Resource Planning (ERP) software. Results from an empirical survey give an overview about current activities in the area of collaborative ERP teaching. This paper presents an international pilot to teach ERP in the form of virtual teams. The learning objectives, the communication infrastructure and the evaluation of this project in the form of students' feedback are described. Planned future activities are discussed.

Keywords

Enterprise Resource Planning, Virtual University, Virtual Teams

Introduction

Virtual teamwork uses technology to enable collaboration. It potentially reduces the cost and inconvenience of travel. However, the challenge for virtual teams is to collaborate effectively without the benefit of face-to-face interactions, which build trust (Knoll and Jarvenpaa 1995, Lipnack and Stamps 1997, Jarvenpaa, Knoll and Leidner 1998, Pare and Dube 1999). Global virtual teams must also overcome possible cultural differences and time-zone issues.

The objective of this study is to explore virtual teamwork issues in the context of Enterprise Resource Planning (ERP) education. We discuss how three universities with ERP classes participated in an exploratory global collaboration with students in virtual teams. This type of teamwork is innovative in the still relatively new area of teaching Enterprise Resource Planning. The paper presents a possible outline for the design of such a collaboration, which may be of benefit for universities with similar objectives. An analysis of students' feedback highlights strengths and prerequisites of such an approach.

Results of an Empirical Survey

In order to get a precise picture of the current situation in initiatives related to Enterprise Resource Planning software (a.k.a. Enterprise Systems) at universities Lederer-Antonucci 1999, Scott 1999, Watson, Rosemann and Stewart 1999, Watson and Schneider 1999), an empirical survey was conducted in 1999 (Gable and Rosemann 1999). The data was gathered by sending out a questionnaire (8 pages) to universities that are members of the SAP University Alliance Program. Thus, this survey focused on the use of the market leading ERP solution SAP R/3. The survey had the following sections: A) Problems, issues and success factors, B) Learning R/3, C) Administering R/3, D) Research activities, *E) Cross-university collaboration*, F) Impact on public perception, G) R/3 related subjects. The questionnaire was piloted at two universities before initial circulation. Australasia and Germany were then surveyed and preliminary results presented at the 1st Global SAP University Alliance Congress in Nice, France, May 1999 (Rosemann et al., 1999). The survey was then extended to the rest of the world. First-round 'global' results were presented at the AMCIS 99 (August 1999) in Milwaukee (Stewart et al. 1999) and the SAPPHIRE (November 1999) in Singapore.

Table 1 lists by country, the number of individuals and institutes surveyed, the number of completed survey returns, and returns as a percentage of institutions surveyed. The lists of contacts supplied represent institutions that at the time of the survey were either: a) using R/3 in teaching and research, b) planning to use R/3 in teaching & research, or c) considering whether to use R/3 in teaching & research.

Among others, participants were asked, whether they are currently collaborating with other universities in their R/3 initiative. Interest in collaboration was also gauged. Fifty percent of all respondent institutes are collaborating in various ways with other universities. 35 % of all collaborations are on an international basis. There are no obvious patterns of differences across countries. Only two universities indicated that they are not interested in collaboration. A comprehensive discussion of the advantages in teaching ERP collaboratively can be found in (Stewart and Rosemann 1999). The following list shows the areas of interest for cross-university collaboration with the number of answers in brackets, respondents often mentioned multiple areas:

- research (19)
- teaching material (15)
- exchange of knowledge/experiences (15)
- staff/student exchange (10)
- curriculum design (8)
- interactive teaching (6),
- and case studies (3).

Table 1. Profile of Contacts/Respondents

Country	Contacts	Institutes	Returns	% return
Australia	63	17	9	53%
South Africa	31	20	5	25%
China	4	4	1	25%
England	2	2	2	100%
Germany	69	50	23	46%
India	4	2	1	50%
Japan	6	5	1	20%
Malaysia	4	2	0	0%
New Zealand	1	1	1	100%
Philippines	3	2	1	50%
Singapore	4	1	1	100%
Sweden	3	2	1	50%
Thailand	2	1	1	100%
USA	85	69	12	17%
Total:	281	178	59	33%

Research is the most popular reason for collaboration. It is expected that ERP-related research will be the 'second wave' of ERP-activities at universities once systems are established in curriculum. Sharing of teaching material like lecture notes and the general exchange of knowledge and experiences are also important reasons to collaborate. In many cases universities that have just commenced their ERP initiative are interested in input from experienced universities. It is anticipated that further analysis of the survey data will provide additional insights.

Description of the pilot project

Motivation and Learning Objectives

For the reasons mentioned above, the main objective of this project was to facilitate further exchange of knowledge and experiences among the faculty as well as among the students. Furthermore through interactive teaching between the universities, students gain valuable ERP industry knowledge while they simultaneously learn how to communicate effectively using the latest Internet technologies and services (Hanna 1998, Kimball 1998).

This pilot was the first step towards a more comprehensive participation and understanding of global collaboration in the area of teaching ERP using SAP R/3 software. It took place in September and October 1999. The involved institutions were the Queensland University of Technology (QUT) in Brisbane, The University of Texas at Austin (UT), and the Louisiana State University (LSU).

The Assignment

The participating students had to work on one common assignment. Every student had to pick one of the following five topics. The numbers in brackets indicate how many students (first number) from how many universities (second number) were in each team: Customer Relationship Management (CRM) (5/3), Supply Chain Management (4/2), Internet-based ERP-Processes (7/2), Workflow Management (4/2), and Activity-based Costing (ABC) (5/2). Each team had to write within seven weeks one consolidated report (max. 25 pages) and to design a Powerpoint presentation. Both had to describe their chosen concept in general (50 %) and the current support offered by SAP-products in particular. The students had to present the results in their classes.

Involved Experts

In addition to the three lecturers (the authors of this paper) every team received further support from associated "experts". These experts were academics or experienced practitioners committed to

- provide the students with reading recommendations,
- recommend further material and information (e.g. web links),
- participate in a discussion group, and
- review the final assignment.

The following experts took part in this project:

- Michele Bassir
  - Customer Relationship Management

  Michele is head of the area Telecommunication at the German consulting company Mummert & Partner. She is an expert in the area of Customer Relationship Management. She also published about Customer Relationship Management.

- Michael zur Muehlen
  - Workflow Management

  Michael was at the time of this project a guest lecturer at the University of Tartu, Estonia. He is lecturer at the University of Münster, Germany, and heading the task force 'Resource Modeling' within the Workflow Management Coalition. He published various papers about workflow management.

- Prof. Mauricio Neves, Prof. Sergio Godoy, Assoc. Prof. Constantinos J. Stefanou
  - Supply Chain Management

  Mauricio is working at the Cicade University in Rio de Janeiro, Brazil. He is an expert in Supply Chain Management and familiar with the SAP approach. Sergio works in the SAP laboratory of the Cicade University and is researching in the areas of Process Engineering and Supply Chain Management. Constantinos is with the Technological Educational Institution (TEI) of Thessaloniki, Greece. His main research areas are Supply Chain Management and Accounting Information Systems.

- Prof. Hans-Jürgen Scheruhn
  - Internet-based ERP-Processes

  Hans-Jürgen teaches SAP R/3 since many years at the University Harz, Germany, and at the Florida Gulf Coast University, USA, since 1999. As an expert for Internet-based ERP processes he is developing a workflow-integrated ERP-Internet scenario to have students from different countries collaboratively participate on an international sales process.

- Martin Schulz and Jan vom Brocke
  - Activity-based Costing

  Martin and Jan are lecturers at the Department of Information Systems at the University of Münster. They are both working within their Ph D thesis on topics related to Activity-based Costing (ABC).

The Participating Students

Queensland University of Technology, Brisbane

The participating 16 students from Brisbane were enrolled in the post-graduated subject "Process Engineering", which was offered on-campus (in total 51 students) and off-campus (7 students). Most of the off-campus students were not located in Brisbane. The students had the choice to work in a local team or to participate in this international project. For these students this assignment was the last one of in total five assignments. Before they started with this assignment, they were dealing with process management, process modelling and had an introduction to SAP R/3. They had been working on group assignments before, though all previous group work was done with local students.
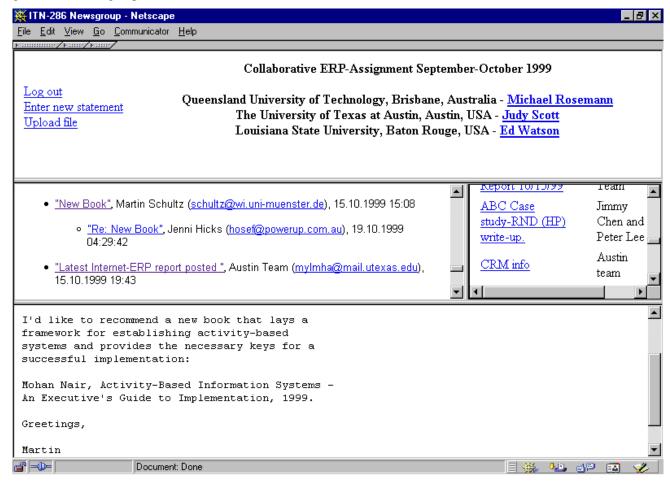
The University of Texas at Austin

Forty-three students were enrolled in an elective graduate course called "Cross-functional Systems Integration." The course is an overview of various aspects of enterprise systems and systems integration. Students were full-time, most studying for MBA, MPA and PPA degrees. A few students were from Engineering and Computer Science. The class had eight teams, each of which had four to six members. All teams had a group assignment due in the last week of the semester. They were given the option to participate in the global virtual team project. One group, with six members, chose to participate in the virtual team project. The other seven teams collaborated locally. The six students in the virtual team participated in the CRM, ABC and Internet projects. In contrast, their classmates did projects on just one topic.

Louisiana State University

Thirty-two students were enrolled in an elective graduate course called "Enterprise Systems." Similar to UT Austin's course, this course is an overview of enterprise systems and the processes that they support. These students were full-time graduate students from various programs: MBA and MS in Information Systems, Computer Science, and Engineering. Early in the semester, three students volunteered to participate in the global collaboration exercise as an extra credit project. These students turned out to be among the best in the class in terms of attitude towards learning. They each joined a global team: Customer Relationship Management, Supply Chain Management, and Workflow Management. Later in the semester, the class was split into five teams: Customer Relationship Management, Data Warehouse, Supply Chain Management, B2B, and Enterprise Application Integration. The resulting project reports are available at http://isds.bus.lsu.edu/cvoc/sap/ by following the "Enterprise Systems" link. The original global team members became the natural leaders (and local experts) for their teams. These particular project teams produced a report that was clearly superior compared to the report from the teams that lacked the head start.

Figure 1: The Newsgroup

The Infrastructure

The entire communication between the three participating locations was done by Internet-services. At the beginning, the list of all participants, lecturers, students and experts was distributed including all email addresses. Moreover, a newsgroup was offered to all participants. Chat sessions were recommended for the coordination between the group members. Due to budget constraints (also common in industry) an exchange of audio or video data did not take place and tools like electronic bulletin boards were not used. The main focus of this pilot was the international collaboration between universities rather than technological issues. The more elaborated use of these tools will be part of future collaborations.

Figure 1 gives an example of the structure of the password-protected newsgroup, which was maintained from Germany (University of Münster). In order to facilitate the exchange of documents it was possible (see right window) to upload and download documents.

Students' Feedback

After the assignment was completed, but before it was graded, the participating students were asked some questions related to their evaluation of this form of assignment. 9 of the 25 students answered (36 %). The main feedback was:

- 88 % of these students said they enjoyed this exercise.
- All students answered they would take part again.
- 77 % of these students thought the outcome was higher than in a pure local teamwork.

This feedback shows the positive acceptance of the collaboration. In further statements, it was highlighted that especially the *international* collaboration was regarded as an exiting element of this project. Students seem to be aware of the increasing importance of virtual teamwork. Besides the learning outcome regarding further understanding of ERP and SAP R/3, the developed skills in communication in these kind of networks was very much appreciated by the students.

The students saw the following reasons for the improved outcome:

- shared knowledge,
- different ideas contributed to a higher level of work,
- higher motivation, in part due to their attempt to impress their colleagues at the other universities.

These arguments list the main reasons for the higher learning outcome of this type of teamwork.

However, the students believed their virtual teamwork required also more effort than the corresponding local group work. Moreover, they saw problems in the existence of different deadlines for each university, which lead to different motivation and pressure. Further suggestions from the students included the availability of pictures of all students on the web and the availability of more interactive chat sessions to improve the involvement of all members.

In a face-to-face interview with the Austin team at the end of the semester, the students expressed satisfaction with the project. However, they explained that there were communication problems at times and confusion on what to post and what to email. Apparently, virtual team members told them "Don't post till the end because other teams could see the information." For the ABC project, this procedure worked well. The student leader (QUT) organized and emailed the report and slides before posting.

The students recommend an interim deadline for posting - ".. we thought we were late - but we were first to post." Although they were invited to use MS-Netmeeting, that was a problem because Internet connections at home were relatively slow. Also an Internet-based chat was not used because of the time difference.

They thought it would be good at the beginning of the project if the members announce themselves. This could have been a worthwhile team building exercise.

The students in Austin thought that the participants from the QUT had an advantage since they probably got feedback instantaneously from Michael Rosemann, who initiated this project.

The students did not consider that trust was a problem, although the literature stresses the importance of trust in virtual teams (Knoll and Jarvenpaa 1995, Lipnack and Stamps 1997, Jarvenpaa, Knoll and Leidner 1998). Students from Lousiana commented that trust was an issue only in the capability of all members to prepare the presentation. "For this, we all trusted each other."

Some further feedback received via email from the LSU students included the following:

- "Frankly speaking, there was little coordination between the team until very late. Exchange of messages was not spontaneous, and therefore it took time to reach to a basic agreement regarding the project approach."
- "Though this project provided an opportunity for collaboration, there was a lack of coordination for a very long time. Probably it would have been better if there were one person *assigned* to lead and coordinate in each team from the start."
- "Basically what happened is that I ended up doing my part of the presentation and the paper and emailing it to everyone. I couldn't get anyone to work. I tried emailing them assignments after I became 'Team Leader'. Most of the time that I wrote to them I didn't receive a reply – until another team member realized that his deadline was approaching quickly."
- "It is difficult to say if this was a successful collaboration. We were on time and we covered the scope of the project."
- "This project provided a good opportunity to learn virtual team management and coordination on a global scale. There was excellent support from the experts. This provided a unique learning experience."

Basically, the students perceived the fact that they were all being evaluated at different times as a major problem. Because of this, their time-based goals and priorities were misaligned. And although most students did not perceive trust as an issue, their behavior and comments indicate isolated incidences of unreliability, a symptom of lack of trust. The consolidated recommendations from the students for the design of these kinds of exercises were:

- "A leader defined from the outset with clear roles and responsibilities,
- teams of roughly equal size responsible for equal bodies of work,
- evaluation milestones that occur simultaneously across teams, and
- a better communication method than email - maybe chat room."

Although some of these comments are due to management and coordination issues, there was clearly an issue with the effectiveness of the communication mechanism for teams distributed across the globe. From various further statements, we summarize with a quote from the UT students' team: "Overall, this has been a great and fun learning process for all of us."

Conclusion

Our pilot study reinforced the literature's view that it is a challenge for virtual teams to collaborate effectively without the benefit of synchronous face-to-face interactions, which build trust (Knoll and Jarvenpaa 1995, Lipnack and Stamps 1997, Jarvenpaa, Knoll and Leidner 1998, Pare and Dube 1999). There were several incidents that illustrated the difficulties of coordination and

communication among.global virtual teams that also need to overcome possible cultural differences and time-zone issues. Despite the obstacles and extra work, the outcome for most students and faculty was positive. Not only did effective learning take place, but the attitude of most participants was eagerness to experience virtual teamwork again. An implication for practitioners is to set realistic expectations for virtual team members by experimenting on a small scale pilot project. Future research should investigate whether synchronous technologies such as videoconferencing would make coordination easier.

Further Projects

Within the established network of universities, the aim is to continue our collaborative teaching efforts with an eye towards improving the process. In the current semester the students are required to logon to the same system (based in Louisiana). The common exercise involves getting data/information (e.g., process models, data models, transaction level information) about a certain process, interpreting it, changing it, and communicating to the next person for further action. For the next semester it is planned to offer a complete subject at the same time in three different universities. Besides the common work on an assignment, it is targeted to realize a virtual worldwide value chain, in which every university has a different role. One university may, for instance, represent a supplier, another one a manufacturer, and a third one a university retailer. All participating universities will use the same ERP system.

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