Work in Progress - A Collaborative ERP Configuration Project: Preparing Engineering Students for the Global Economy

Young B Moon¹, Teresa Sánchez Chaparro², Alfonso Durán Heras³

Abstract - Calls from the industry to reform engineering education have been consistent through the past decades. The clear message is that graduates not only need to possess sound technical knowledge in their chosen disciplines but also need to be better educated in the areas of communication skills, teamwork, leadership and other professional skills. Despite of the recognized importance, it is not easy to develop and implement a curriculum that fosters such skills. Also, subsequent outcome assessment of the achieved skill levels poses many challenges and demands much creativity. This paper describes a joint experience between Syracuse University in USA and Carlos III University in Spain. The context is the education of engineering students in fundamental business processes and integration using an industry-scale Enterprise Resource Planning (ERP) system. Groups of multinational engineering students from the two schools carried out a project of developing an executable ERP system using various distributed collaboration tools. Findings from this experience are discussed and other on-going efforts are described in this paper.

Index Terms - ERP, Global Economy, International Collaboration, Professional Skills.

INTRODUCTION

As an effort for addressing the identified competency gaps in professional skills, the Accreditation Board for Engineering and Technology (ABET) in USA now requires a set of six outcomes of the professional skills in its new program criteria EC2000:

- an ability to function on multi-disciplinary teams;
- an understanding of professional and ethical responsibility;
- an ability to communicate effectively;
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- a recognition of the need for, and an ability to engage in life-long learning; and
- a knowledge of contemporary issues.

Despite of the recognized importance, it is not easy to develop and implement a curriculum that fosters such skills. Also subsequent outcome assessment of the achieved skill levels poses many challenges and demands much creativity [1, 4]. Syracuse University in USA and Carlos III University in Spain conducted a joint educational project as an attempt to address such professional skills. The context is the education of engineering students in fundamental business processes and integration using an industry-scale Enterprise Resource Planning (ERP) system.

The collaboration project between University Carlos III and Syracuse University had the following objectives:

- to teach engineering students the fundamentals of the ERP system through the construction of an executable ERP system;
- to provide the students with a challenging environment where they are required to build several professional skills such as an ability to function on culturally diversified teams and an ability to communicate effectively;
- to provide the students with the broad educational awareness of a global economy; and
- to develop effective assessment methods for students' learning.

THE JOINT PROJECT

The joint project reported in this paper began on 27th of September 2004 and ended on the 29th of November 2004. This collaboration project was a part of MFE654 (Production Systems Design and Control) for Syracuse University students while the project was an independent study for Carlos III University. 17 students from Syracuse and 5 students from Carlos III have participated in the project. All the students were enrolled in Masters level engineering programs such as Manufacturing Engineering, Engineering Management, Mechanical Engineering, and Aerospace Engineering.

Team Formation and Communication

Five teams were formed from a total of 22 students. Three teams had members both from Syracuse and Carlos III while two teams had Syracuse students only. In this way, we sought
for outcome assessment comparisons between the international teams and the non-international teams.

Various communication tools had been used throughout the collaboration including emails, instant messages, and web pages. For this experience, we opted the communication mediums that became a part of everyday necessity for the students and avoided sophisticated tools such as video-conferencing. First, we wanted to encourage the students to communicate with each other frequently and easily without waiting for a special setup or a certain period. Second, since the students were already very familiar and comfortable with the communication tools, they could focus on content learning from the very beginning rather than spending some time to get familiarized with new communication tools.

Time difference created some challenges but most of the meeting times were well observed. Language difference was another challenge but the students in the international teams indicated that they enjoyed interacting with students of different native languages and learning new languages. Despite of the additional communication challenges that the international teams had to face, the final assessment data indicate that the international team members were more effective in teamwork and communication.

The ERP Configuration Exercise

The Enterprise Resource Planning (ERP) System is an information system designed to integrate and optimize the business processes of an enterprise. Functions integrated by the ERP system include manufacturing, distribution, personnel, project management, payroll, and financials. Despite its high implementation and maintenance cost, the ERP System has become the de facto solution in industry to realize an enterprise-wide information system. According to a report by Advanced Manufacturing Research (AMR), the ERP software market is expected to reach $31 billion by 2006.

The biggest challenge of teaching the fundamentals of the ERP systems in Universities is to teach it as a whole since the essence of the ERP system is its integrative nature. The first author developed a configuration exercise lab [2] which enables the novice students to build an executable ERP system from ground-up. The lab was adopted for this collaboration project. Both Syracuse and Carlos III Universities have been members of SAP University Alliance program. So both universities already had the environment of providing hands-on ERP experience to the students [2,3].

The Collaboration Procedure and Outcome Assessment

As the first step, each team had to come up with a product with which each team's enterprise manufactures and conducts several business transactions. Once the product was accepted, other detail data had to be developed such as bills of material, material master, vendor master, customer master, etc. Next, each team performed the configuration tasks that laid out required information infrastructure for each enterprise. Then master data were entered into the ERP system. Finally students verified the correctness of their system by sequencing and executing a given set of business processes. If the configuration and master data sections were completed without any error, the business process transactions would be carried out without a problem. However as typically, students made a few mistakes thus real communication and debugging challenges occurred at this stage. On the last day, all the members gathered and demonstrated their systems.

Various assessment methods had been used to collect data for the evaluation of the students' learning [4]. The methods include surveys, instructor observations, analysis of the recorded conversation in instant messages, a personal diary that recorded both individual and joint working sessions, and a final team demonstration in order to assess the degree of correctness of the ERP configuration. The initial evaluation results indicate the effectiveness of the collaboration projects on several professional skills.

DISCUSSION AND CONCLUSION

The engineering education community has recognized the professional skills for a long time and now has institutionalized the requirement through the accreditation process. However, the efficient execution and rigorous assessment process remain considerable challenges for the community. The collaboration experience between Syracuse University and Carlos III University illustrates a number of promising results for such efforts.

The subject area - ERP - adopted for this project is equally important for business majors [5]. Therefore, natural collaboration between engineering and business students is feasible and numerous joint efforts are under way.

The experience also taught a number of lessons for conducting such an international collaboration better in the future and brought in new ideas for a different and rigorous assessment procedure, which is also being developed.

REFERENCES