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Lessons from the field:

A reflection on teaching SAP R/3 and ERP implementation issues

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Abstract

This paper reports the experiences of faculty in teaching about SAP R/3, teaching IS concepts using SAP R/3 and teaching post-graduate students how to research about implementation issues with ERP.

Introduction

We have been teaching with SAP R/3 since 1997. At that time, we acquired our first SAP R/3 environment and began the process of embedding it into our IS curriculum where it added value to the students knowledge. We have taught over 400 students elements of SAP R/3 through our diverse course offerings, and expect the numbers to increase.

This paper briefly describes the range of courses that we offer in both on-campus and off-campus modes and then presents the technical environment that supports our initiatives. We then discuss issues with teaching technology and issues with teaching about implementations. We close with some reflections about our experiences to date. These experiences demonstrate the difficulties in developing appropriate curriculum that keeps abreast of practice while maintaining its educational value, and of training and keeping committed academic staff.

Courses

We offer three means by which students can gain experience with SAP R/3: through an undergraduate minor, a post-graduate major delivered on campus, and a post-graduate major delivered off campus. Our students are mainly enrolled in the Faculty of Information Technology, though we are getting increasing number of MBA students and extra-mural students.

The undergraduate experience is limited to two subjects: ABAP/4 Programming and Issues in Information Technology Management. The first unit presents material on dialog programming and report writing. The second unit introduces the student to the architecture of SAP R/3, its functionality and key implementation issues. Enrolments in ABAP/4 were limited to 55 students in our first semester of offering. We had over 120 students in the second semester offering, and expect these numbers to remain. We have averaged 100 students in the management subject, with students reporting a high level of satisfaction with their experiences.

We offer similar units to post-graduate students: ABAP/4 Programming and Issues in Information Technology Management. In addition to these units, we offer Process Engineering, Case Study Research into ERP Implementation Issues and R/3 Systems Administration.

Just recently, we have offered a range of subjects to off-campus students through our flexible delivery Masters course. Subjects in this course include ABAP /4, Issues in Information Technology Management, Case Studies and EWS, Process Engineering and a project. We are currently developing a unit in Knowledge Management and EWS. The effort cannot be underestimated in developing these leading edge subjects for delivery over the net!

Process Engineering is concerned with the strategic and organisational issues of process and workflow management and the use of ERP-software to realise efficient business processes. Process Engineering aims to: **1.** Provide students with an awareness of the issues concerning the management of processes in a business organisation. **2.** Develop in students a capability to identify, model, reorganise, introduce, and manage continuously processes in a business organisation. **3.** Provide students with an awareness of the critical issues affecting the use of ERP-software and workflow management systems in a business organisation; and **4.** Develop in students the capability to understand and customise the processes of ERP-software according to given requirements in a business organisation. We had 30 students in the pilot course, and have 14 off-campus enrolments for this semester.

Case Study Research into ERP Implementation Issues seeks to develop competencies as a consultant by introducing them to the Case Study Research Method (Yin 94). This structured methodology allows the students to formulate a research question about a key implementation issue.

We have covered issues such as Change Management, Business Process Reengineering, and Training. We have extended this range of topics to look at Facilities Management and Outsourcing. This unit seeks to develop consultancy skills in SAP implementation through applying recognised research methods to a SAP implementation issue. The research objective or consultancy objective is defined in this unit and the resulting protocol is piloted. The actual research or consultancy project is to be completed in ITN248 Research Project in Enterprise Wide Systems.

This unit is offered in the Masters module on Enterprise Wide Systems because we believe that the student seeks to apply relevant theory into a current problem encountered at work. The key outcome from this unit for the student and the employer or prospective employer is the design of research into a current situation. This adds value to all parties and gives clear linkage

between theory and practice. The student will gain significant skills in action research processes or the case study research method, the fundamental aspects of the theory relevant to the current problem and improved competence in their chosen area. The employer will have seen the effective application of theory to practice, an improvement to the problem situation posed and evidence of the benefits of life long learning. These projects are too large for individual students to attempt. Consultancy groups of 3 to 4 students select an area.

R/3 Systems Administration seeks to educate the students in the processes of systems administration. We cover topics such as database management, user management, security, systems backup and recovery and systems tuning. The students use a text on R/3 Systems Administration (Roderiguez 1998) and have formal instruction in each area of systems administration. The bulk of the students' time is spent in managing the system and researching emerging issues that impact on such an environment. Some of these issues include datawarehousing and data-mining, support products for process engineering and support requirements for internet applications.

We acquired a small NT server with its own small network for students to practice installing SAP R/3. We intend using this system for teaching configuration management. This system is available for students to also practice backup and recovery, establishing user profiles and developing system monitoring systems. We restrict access to the production system to competent post-graduate students.

Student outputs include developing a comprehensive set of systems administration manuals, with details of R/3 procedures. These are professional looking manuals, with embedded screen cams showing system screen input details. There are extracts for a Standard Operating Procedure Manual, which focuses attention on daily tasks and common problem solving strategies. We extend these manuals each new semester, by including more detail, greater scope and new product features. Students also develop appropriate system monitoring applications in ABAP/4 as required.

ABAP /4 introduces the use of the ABAP/4 Workbench and toolkit in developing client/server business applications. It uses the ABAP/4 Development Workbench, which is generally used for modifying or individually enhancing standard R/3 applications. However, its primary use in our course is in developing individual solutions separate from SAP standard software using the Workbench. The student covers the fundamental features of R/3 and the ABAP/4 Workbench environment; the principles of program design and testing using the ABAP/4 environment and the principles associated with good screen and report design. Students use analysis & design methods to effectively analyze, develop, and test solutions for a variety of business processing problems; utilize the ABAP/4 language basics

in report-writing, dialogue screen implementation and transaction-coding and develop an interactive report and a dialog program from given specifications in the ABAP/4 environment.

Knowledge Management and EWS was piloted in 1998. It is being redeveloped to include more on Knowledge Management products and capturing knowledge about SAP R/3 implementations. It presents the managerial and technical issues pertaining to the capture, storage, and use of organisational knowledge in an Enterprise Wide System.

The environment

We have been incrementally upgrading our hardware to cater for more students enrolled in a greater number of courses. At this stage, we have established a three tiered client-server system with a Dec Alpha as the database server, and a Compaq Proliant 3000 as the Application Server. On campus students get direct access to the system through our student network. Off campus students have remote access to the system. Remote access has proven to be difficult to establish owing to the complexities of our internal security and routing rules. We have only recently altered our network environment and now can support remote connections. We have students in all parts of Australia and New Zealand. We will soon have students in South East Asia, so remote access is essential. We are currently planning to upgrade the system to support greater student numbers.

Teaching the technology

Teaching ABAP/4 is no more challenging than teaching any other programming language. The advantage of using R/3 and its language is that the students have a real application on which to develop additional dialog screens and reports. We ran the off-campus unit in a series of 3 workshops. Access to R/3 is essential for students as ABAP/4 is not otherwise available. One difficulty is managing developer keys. A developer key is required for each student. These key must be obtained from SAP and access carefully managed. Another problem is controlling access to other students work. User profile setup is critical.

Teaching R/3 Systems Administration is more challenging. Students require formal instruction in the essential areas of systems administration, but then require access to a toy system in order to demonstrate competencies in the area. We have acquired such a system and the students have enjoyed destroying its integrity. Students commenced by forming teaching teams under the direct supervision of a senior post-graduate student. This project manager assisted the novices to become aware of the various elements of systems administration. Each pair produced a comprehensive manual including screen cams in order to provide technology transfer to the incoming group. Each pair had to complete a Standard Operating Procedure (SOP) component to their specialisation. This was useful in codifying their knowledge, and leaving material for

ongoing systems management. Outputs from this project include manuals on NT systems administration, Data Base administration, User Administration and Security and SAP Performance Monitoring.

This semester, we again offer the R/3 Systems Administration unit in project mode, though there will be more formal instruction. This will take place in the first 5 weeks, and then students will practice on the sandbox. In addition, they will install R/3 on a bare box and manage our production system. We have just migrated to version 4, and this will require substantial changes to our procedures. Students will be updating the manuals to reflect these changes, and thus gain experience in both version 3.1H and version 4.

One significant problem is access control to software and hardware. Another is recovery from student induced fatal errors. These elements put additional burdens on academic staff.

Teaching about implementation issues

These topics are addressed in three subjects: Process Engineering (PE), Issues in Information Technology Management (IITM), and Case Studies and EWS (CSEWS). These units have assisted students in understanding the underlying research and organisational problems in their chosen area. The basic problems have been introduced IITM. Here the students undertake a literature review assignment and make a class presentation. This ensures that all students have an understanding of the underlying problems (challenges) in a SAP R/3 implementation.

In PE and CSEWS we have SAP consultants presenting case studies. These real life reports add value and interest for the students. Students in CSEWS then go onto develop a detailed case study protocol to examine one implementation issue. This subject completes the research design. Students then conduct the research in another semester.

We have had several successful projects this year, in which students developed detailed case study protocols for examining Business Process Reengineering issues, Change Management issues, and Outsourcing issues. The designs were thorough. None of these projects were implemented because of the time constraints involved and the need to get appropriate access to organisations currently implementing SAP R/3. All government agencies are currently in completing this phase, and so have extremely tight timelines for completion. Thus, access to these organisations is very restricted.

Reflecting on our experiences

It has been difficult in establishing the R/3 System and training academic staff to a level in which they are competent and comfortable. We acquired some of the equipment through donation from DEC through DATA #3 and at reduced educational rates, due to the strong support from SAPIENT College, the SAP Training Institution. We were able to train our staff, again through the support of Sapient College. It has not been possible to

train a technical support person for R/3 administration, and we have had to rely on academic staff and post-graduate students to provide this level of support. This has been difficult and is one key problem in supporting an R/3 site. Competent R/3 systems administrators are commanding large salaries, far in excess of the salary of academics in Australia. Only through the academics' commitment to their profession, have we been able to function and provide the largest academic SAP R/3 site and most comprehensive curricula offerings in the Asia-Pacific region.

The design and management of student research projects in implementation issues is very time consuming. It is difficult to obtain access to organisations in the throes of implementation. Time is tight, tensions are high, and an external observer can be an embarrassment. They are certainly a luxury. Relationship management with industry partners is a key constraint, and this relationship management takes enormous effort on part of the supervising academic staff.

Maintaining contact with the rapidly changing systems environment is difficult. The move to version 4 cost in terms of new equipment, training and establishing procedures. It cost in requiring a rewrite of the curriculum material. We are developing a medium-term systems enhancement plan in order to anticipate further growth needs and systems requirements. A constant creep in systems requirements is very difficult to anticipate and resource. This is exacerbated when changing versions from 3 to 4, as there is a significant increase in processing and space requirements. Systems management remains a critical issue.

Developing the curriculum to support flexible delivery has been costly. The standards expected of such material is much higher than that expected in a in-house similar course. The support costs are much higher, because of the lack of group interaction between students and staff. The impact of these factors is only now being assessed.

Student satisfaction with the material has been high. Not only are we teaching relevant technology practice, but also relevant IT consultancy skills. Students have been willing to put in the extra effort demanded in these advanced courses. Most have found very well paid positions in SAP R/3 fields with large and small consultancy houses. Their skills have found immediate application. Nonetheless, developing these skills has been costly to academic staff in terms of time taken away from research. Consequently, we are seeking to align all student research projects with the objectives of our research centre and its industry partners.

References Supplied by the first author on request. Contact to other authors can be arranged through the first author or via our web site at <http://www.fit.qut.edu.au/InfoSys/ism/>