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Enterprise Systems (ES) Software in Business School Curriculum – Evaluation of Design and Delivery

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ABSTRACT

Considering the increasing importance of enterprise systems in business, and their pedagogical value in demonstrating business process orientation and concepts of integration, several universities have incorporated popular enterprise system (*ES*) software products such as SAP R/3 into their business school curricula. This paper describes an attempt at that integration and reports on the evaluation of the curriculum design and instructional strategies employed and the perceived knowledge gain. Based on the self-assessment of students' knowledge and students' perception of various aspects of the curriculum design and delivery, the effectiveness of the course was analysed. Analysis revealed that the students had perceived a significantly higher level of knowledge gain during the course on the knowledge domains such as implementation of enterprise systems and SAP software skills than on others such as interface knowledge and management knowledge. Expansion of the curriculum to enhance the depth of the SAP skills, more guest lectures to bring real-world experiences into the class room, integrated project that requires application of conceptual as well as technical (software) skills of students, more case studies that deal with post-implementation issues, better alignment of this course curriculum with other pre-requisite courses, and improvement in the knowledge of academic staff and their access to students are some of the potential improvements emerging from this study. The study also noted significant differences between Commerce and Information Technology (IT) students with IT students more satisfied with the course than the Commerce students.

Keywords: Enterprise Systems, Business Curriculum, Design, Evaluation, SAP

1. INTRODUCTION

Universities are generally criticised for lagging behind businesses in the adoption of new technologies in general and information technologies in particular. The integration of information technologies into the business school curricula in the past concentrated on imparting IT skills to students and/or using it as a technology based aid for improving the teaching and learning effectiveness and efficiencies. Enterprise resource planning (ERP) systems, also known as enterprise systems (ES) are one of the major technologies in recent times that had a significant impact on business organisations. Though the ability of enterprise systems (ES) in teaching concepts of cross-functional integration, are well recognised and discussed in the academic literature, many business schools/faculties are slow in incorporating these latest software products in their curricula. Enterprise systems, by their multi-dimensional, integrative and normative nature, offer the depth of functionality and breadth of integration required for managing global operations of business organisations today. These systems create new, hitherto unknown opportunities for demonstrating powerful concepts of business process integration (Fedorowicz et al, 2004) and may contribute to imparting innovative integrative skills to business graduates (Cecez-Kecmanovic et al, 2002). They are expected to enable a change in the delivery of business education from a functional orientation to a business process orientation and lead to the integration of curriculum across functions (Becerra-Fernandez et al, 2000; Johnson et al, 2004). In fact, long after their 'state-of-the-art' status, enterprise systems software solutions are expected to provide a sound pedagogical basis for teaching the concept of 'integration' and 'business process orientation' to business graduates (Joseph & George, 2002).

Incorporating SAP R/3 or any such ES software into business school curricula is considered difficult and challenging (Noguera & Watson, 2001; Seethamraju, 2004a). Though several universities have incorporated ES software into their business curricula, the extent and nature of such integration is different from one university to another. While some have incorporated ES software into one subject, others have designed a full-fledged program around enterprise systems. This paper reports on one such attempt by a large business school in Australia and analyses the effectiveness of curriculum design, delivery, administration and pedagogical issues.

2. BACKGROUND AND CONTEXT

There are several motives for the adoption of enterprise systems software into business curricula (Bradford et al, 2003) and several models of integration (Antonucci et al,

2004). This section will briefly discuss the background to the adoption of enterprise systems software solutions in business education in general and the options available to this university with regard to the model and scope of the curriculum integration.

2.1 Teaching Cross-functional Integration

Integration of information technologies and associated skills into the business schools curricula is not new. For years, the business school faculties have incorporated various IT tools as an aid to improve the teaching and learning effectiveness (Leidner & Jarvenpaa, 1995). It is also a common practice for the business school faculties to include IT tools into their courses and impart critical skills to business students and help them function effectively as business mangers. What is different and new about the enterprise systems software solutions is their ability to help 'integrate' the key knowledge and concepts from functional oriented courses such as accounting, marketing, operations, organizational behavior and help graduates develop integrative skills, in addition to equipping them with generic software and/or IT skills. In the past, a strategy course with a case/simulation-based approach is generally used to impart cross-functional perspective (Payne, 1998). Though their effectiveness is not clearly known, this strategy reportedly helps students to develop these integrative skills (AACSB, 2003). Today, enterprise systems act as an underlying link between various disciplines and facilitate integration of curriculum in business schools (Joseph & George, 2002). They facilitate development of integrative skills to graduates (Watson & Schneider, 1999) and serve as a focal point for integration of knowledge across functional disciplines (Johnson et al, 2004).

2.2 Inadequacies of Business Graduates

Whether from SAP R/3, JD Edwards, PeopleSoft or from some other software providers in the marketplace, the enterprise systems software is well in place in a majority of large business organizations in Australia and the number is reportedly increasing even in small and medium sized enterprises (Staehr et al, 2002). With PeopleSoft and JD Edwards becoming part of the Oracle Corporation, there are now effectively two large ERP vendors in the market place – SAP and Oracle, with several small players such as SSA Global, Microsoft (Axapta, Great Plains and Solomon), InTuit, Minicom etc.

In view of its pervasive nature in business today, a growing number of business graduates are already involved in the usage, maintenance and upgrade of the enterprise systems and their associated add-on software products (Bradford et al, 2003) and more working professionals are upgrading their skills in these areas. Enterprise systems are complex and need skilled people even after their implementation to manage the changes emerging from the alignment of organizational processes and structures with the software and to support the maintenance, upgrades and continuous improvements of the technology and processes (Markus, 2000; Davenport et al, 2002). In a matured ERP market, the focus now is on the total cost of ownership (TCO) and the need for skilled human resources to work on add-on implementations, upgrades, application enhancements, and ongoing support is rapidly increasing (Gartner Research, 2006).

A report by the Business Council of Australia (2001) pointed out the lack of business understanding and awareness of commercial applications of information technology among the information and communications technology professionals. A review of business education by the Australian universities teaching council (2001-2003) also confirmed the concerns expressed by the Business Council of Australia. Several earlier studies on business management education in USA and Australia have observed that the business graduates do not have the ability to integrate and generally lack cross-functional/interdisciplinary perspective (Barker et al, 1998; AACSB, 2003; AC Nielsen, 1998; Cecez-Kecmanovic et al, 2002). Cecez-Kecmanovic et al (2002) pointed out the need for graduates to acquire a holistic understanding of business processes and suggested the need for greater integration of disciplines. Hershey et al (2002) in their review of information systems education advocated process orientation in the core information systems course in business schools along with several other suggestions. In spite of such persistent demand for graduates with integrative skills and knowledge of enterprise systems, the adoption of enterprise systems software into the business school curriculum has been relatively slow.

2.3 Enterprise Systems Software in University Teaching

In spite of the well-recognised need for employable skills for working professionals as well as full-time students, and the increasing competition for international student market, less than 10% of the business schools in Australia had attempted to incorporate enterprise system software into their curricula (Seethamraju, 2004a). The number of information technology schools that have incorporated ERP software into their curriculum, however, is slightly high (Hawking et al, 2004). On the market side, however, several major enterprise system software vendors such as SAP, JD Edwards, PeopleSoft in the late 1990s and recently Microsoft, have all developed university alliance programs to assist the universities to incorporate enterprise systems software into their curricula (Rosemann & Watson, 2002). Oracle since then took over PeopleSoft and JD Edwards and promised a technology convergence of all the three products - JD Edwards' Enterprise One, PeopleSoft's Enterprise and Oracle's eBusiness suite by the year 2007 (Forrester Research, 2005).

Though it started actively in Europe in 1990s, it has expanded later into USA and Asia-pacific region including Australia and New Zealand. Under these alliance programs, vendors will provide software, training database, along with associated documentation and training to the universities generally free of cost or for a very low fee (Watson & Schneider, 1999). The universities on their part, will invest on hardware, develop curriculum and course materials and incorporate these softwares in their programs. While some universities in USA, Europe and Australia have incorporated the enterprise system software into their business and information systems curricula, the nature of integration and depth of the enterprise system's software knowledge imparted in these courses is ranging widely. In terms of the level of integration and successful cooperation between the

software vendors and the higher education institutions, the business schools in Europe, however, are reported to be more effective and considered to be far ahead of the schools in USA (Bradford et al, 2003).

Even though about 400 universities have incorporated SAP in their curriculum all over the world in some form or the other (Hawking et al, 2004), only few universities in Australia and New Zealand have incorporated one enterprise system (ES) software or another in their curricula. The extent of integration in terms of the ES features and applications, and the specific bend towards technology/programming or business applications, range and number of courses/units that incorporate ES software, however, are significantly different from one university to another (Bradford et al, 2003). The approach adopted by various universities is generally influenced by the field or discipline initiating this move (whether computer science or information technology or business/commerce), and the specific focus on business process perspective and/or technology perspective. At one extreme, one university has an entire post graduate business course on enterprise resource planning incorporating all the applications and technology (Seethamraju, 2004a), other universities have incorporated a few aspects into one or two units/courses. Some focused on the programming and technology, while others concentrated on the business applications and business processes. There are some who attempted incorporating both technology and business processes in their curricula. For example a program teaching enterprise resource planning technology across three sequential courses in a Penn State University information sciences and technology degree program was successfully implemented (Pelsak, 2005). Similarly, at Carleton university business school in Canada, through a simulated company experience and SAP procurement process, students were able to appreciate the concepts of processes, enterprise integration and decision making relevant in today's process oriented data driven organizations (Haznal & Riordan, 2004). As suggested by Antonucci et al (2004), many universities are in varying stages of enterprise systems education deployment and differ in terms of the extent of multi-disciplinary or cross-functional perspective and process and inter-enterprise focus to their curriculum design and delivery.

Integrating enterprise systems software into curriculum is resource intensive, and is challenging for both the faculty members as well as students (Fedorowicz et al, 2004; Seethamraju, 2004b). Some studies on integrating ES software into business school curriculum and the anecdotal evidence published in the literature suggest that the resulting costs of curriculum materials development, training of academic staff, continuous upgrades and maintenance of the software generally far outweigh the pedagogical benefits of integrating ES into the business school curricula (Bradford et al, 2003; Seethamraju, 2004a). Considering the difficulties in upgrading the software versions and training every year, increasing demand on hardware for the newer versions of ES software and their advanced products, and the higher dollar investments required for replacing obsolete hardware and technology, it is a challenge for a single university to make a business case and obtain adequate funding support in current tight budgetary environments in universities. An application hosting centre was therefore established at a local university in Australia, the Queensland University of Technology by SAP AG in 1997, with some support from other technology hardware/software vendors to offer the software to various other universities in the Asia-pacific region. This application service provider is called QUT SAP Application hosting centre (AHC) from which SAP R/3 software is accessed by other universities in the region for a fixed annual fee from this centre.

3. METHODOLOGY AND APPROACH

3.1 Approach And Objectives

While there are several studies explaining the conceptual basis and strategies for deployment and integration of enterprise systems in the curricula, not much is known about the impact of ES integration in business curriculum after its introduction (Antonucci et al, 2004). Integrating enterprise systems software into the curriculum will influence the pedagogy and the content.

This study evaluates the effectiveness of one such strategy of integrating enterprise systems software into a curriculum at a single university and contributes to the knowledge on the impact of ES integration.on business curriculum. The objective of this study therefore is to analyze the design and instructional strategies employed in the delivery of integrated enterprise systems unit as a case study in an organization and provide guidance to other business schools to achieve effective integration. Thus an in-depth case study approach that incorporates a questionnaire survey data collection method consistent with the case study methodology (Yin, 2003) was employed in this study.

3.2 Survey Method and Response

Similar to other evaluations in the higher education context, this study collected data from students already enrolled in this unit/course because of its low cost of administration, confidentiality and relatively easier way to administer and analyze (Burns, 2002). A questionnaire survey was employed as the primary method of data collection. In addition, a formal feedback given by student representatives in the student-staff meeting was taken into consideration in the analysis and discussion.

The items in the questionnaire were designed based on the objectives of this course, learning outcomes expected from this unit, subject content, necessary skills and knowledge to be acquired in this unit, discussion with the other information systems scholars and educators, and the anecdotal informal feedback given by past students. This questionnaire thus designed was administered on all the students enrolled in this unit and therefore had no sampling problems.

The cohort of students participated in this study are also 'representative' of students typically enroll in this course every year. There are no changes to the entry requirements (into IT as well as commerce programs in the university), pre-requisite structure for enrolling in this unit, its offering in one semester per year, and its status as an 'elective' unit. Therefore, when compared with previous cohorts of students (past three years) and future cohorts of students (at least for the next 3 years), this group of students can be considered

representative of the typical cohor t enrolls in this unit every year and the results 'generalisable.'

3.3 Questionnaire Design and Administration

The questionnaire consisted of some demographic details such as gender, nature of enrolment, course they are currently enrolled in, number of IT or BIS related subjects completed so far, and current employment. In the second section, graduates perception of the course with respect to several aspects of course design & delivery, resources and support offered were measured using 'Likert' scale of 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). For example, several statements were included that seek students' perception of the course design, delivery, and resources on issues such as coverage of SAP modules, integrative nature of the design, structure, sequence of the topics, discussion of theoretical issues, relationship of ES with other solutions, computer laboratory usage in class, and quality of SAP R/3 manual etc. A detailed list of questions asked in the survey instrument is presented in the appendix.

In the third section, students were asked to make a self-assessment of their knowledge on specific topics/dimensions and the competence gained during the course. These statements/dimensions were developed taking into consideration the learning outcomes specified in the unit, objectives of the course and on the specific issues and concepts discussed in the curriculum on generic business processes, business terminology, implementation of enterprise systems, managerial and interface issues, and technical software skills. They were asked to rate their knowledge in a scale of 1 to 7 (1 = very very low to 7 = very very high) before enrolling in the unit and after completing the unit.

Even though a traditional pre-test/post-test method is suitable to measure the effectiveness of the pedagogical intervention in educational research (Gribbons & Herman, 1997), this method is not used in this research for the following reasons. Importantly, it is difficult for students to comprehend the statements that deal with different knowledge constructs of enterprise systems without completing the subject and especially in the very first week of the semester. In addition some of the following logistical and feasibility constraints have also restricted our ability to administer pre and post-test method. Those constraints include smaller and significantly varying sample size (ranging anywhere from 35 to 80 students in the class depending upon the content to be covered, lecturer and other factors) from week to week, university ethics guidelines that would not allow identification of students in the questionnaire and matching their pre and post-test responses to determine the differences, no separate control and experimental groups of students (Cook & Campbell, 1979; Hair et al, 1998), no randomization of the sample (all the students participated in the study), and the dynamic and constantly changing nature of the SAP content in the course.

Even though the study was designed by the author, an academic in the university, the data collection was carried out by a research assistant. The questionnaire sought respondents' perception of their skills in software, business process terminology, implementation and interface knowledge as defined in table 1. All the responses were sealed and kept confidential till academic results were finalized. Only 84 out of 96 responses found to be complete and valid and therefore used for analysis. The data thus collected was analysed and findings are presented in the next section.

4. CURRICULUM DESIGN AND DELIVERY

In response to the demand for graduates with ability to evaluate, apply and use information technologies for managing day-to-day business operations and to bridge the gap between business and information technology, the Business school of this university has designed a major in business information systems (BIS) in their post graduate business program (UoS, 2004). Within that program, a unit/course titled 'integrated enterprise systems' is designed incorporating SAP R/3 system. The selection of this model that incorporates SAP into the curriculum and several features of this initiative are explained below.

4.1 Selection of a Model for this University

The University of Sydney, as a relatively late entrant into this SAP R/3 curriculum space, has decided to adopt 'application service provider' model and integrate SAP into one post graduate unit within the business information systems major. Instead of investing in hardware, installation and implementation, and its ongoing maintenance and support, it is decided to access the SAP R/3 software through the Internet from QUT SAP Application hosting centre. SAP was chosen because of its higher market share in the enterprise systems software market relative to other software vendors, its continued support to the university alliance programs and ES research, the previous curriculum development experience of the academic staff members in the School, and the availability of the SAP Application hosting centre in Australia.

As discussed in the background section, different universities incorporated SAP into their subjects and programs differently. For example, one university in Australia has designed a comprehensive post graduate business program in enterprise resource planning focusing on all the application modules and processes and incorporating SAP software in 8 subjects (Seethamraju 2004a). There are other universities that have incorporated SAP into one or two units/subjects with varying focus on technology, accounting processes, or logistics or process modeling (Antonucci et al, 2004; Bradford et al, 2003; Davis & Comeau, 2004; Noguera & Watson, 2001). Considering the objectives and structure of the major in business information systems offered by the School of Business, limited availability of academic staff to teach SAP integrated curricula and pedagogical and administrative challenges, the University of Sydney has decided to integrate SAP into one postgraduate unit/subject.

4.2 Unit/Course Objectives

In addition to developing a demonstrated understanding of enterprise systems concepts and change management associated with their implementation, this subject provides hands-on experience with the technical tools that serve to administer and analyse these processes within the enterprise (Becerra-Fernandez, 2000). The specific objectives of

incorporating SAP R/3 in this unit/course were i) to impart necessary software skills to the students and enhance their employability (Webster, 2003), ii) to develop "understanding of business process concepts that extend across organisational functions and expose them to business process focus" embedded in the enterprise systems (Bradford et al, 2003) and, iii) to develop awareness and knowledge in the selection, adoption, implementation, usage and maintenance of the enterprise-wide information systems.

The learning outcomes and the objectives envisaged in this unit fall under the cognitive and affective domains and focus on the expected change in the skills and knowledge. Combined with other specializations such as accounting, marketing, or human resources offered within the School of Business, this unit incorporating SAP R/3, along with other units in the BIS major were expected to provide graduates with capability to assist implementation of the technologies that lead to e-business transformation (University of Sydney, 2004). Building on the basic knowledge of business information systems, business processes, information flows, and technologies learnt in other units, and drawing knowledge from sales/marketing, accounting, logistics and human resources disciplines, this unit provides a multi-disciplinary view of the enterprise and demonstrates benefits of process and information integration.

4.3 Unit/Course Content and Scope

The conceptual content that is covered in this unit includes business processes, business cycles, information flows, enabling technologies for integration including client-server architecture, making a business case for the need, selection and implementation of enterprise systems, configuration and customization of the enterprise systems, maintenance and upgrades of enterprise systems, latest developments in the second wave of enterprise systems, implications of enterprise systems implementation on the organizations emerging from the latest research on enterprise systems.

The unit emphasizes both conceptual/theoretical content as well as procedural knowledge in order to reduce the risk of information overload while teaching the software. Since SAP R/3 is a complex software, the focus in this unit is on process cycles, transactions, master data and configuration. Even though the SAP uses the term customization for configuration, customization involves changing the code in the software and involves heavy programming, while configuration means selecting various options in the software to suit the business requirements (Brehm et al, 2000). Unlike in an industrial training environment, the university environment will facilitate a combination of various learning models such as cognitive information processing, constructivist, and collaborative models and takes into consideration the individual learning styles (Leidner & Jarvenpaa, 1995) to students. By incorporating variety of teaching methods that include case study discussions, reflection, class discussions, presentations, live demonstrations and guest lectures, individual learning needs (Noguera & Watson, 2001) are catered to in this course. In view of the complexity of the software and objective of demonstrating cross-functional integration concepts, the focus of this course was on only five SAP R/3 modules namely, sales and distribution, procurement, accounts receivable, accounts payable and general ledger.

4.4 Assessment

Assessment is an important aspect of course design and delivery. Considering the variety of learning styles, different backgrounds (from information technology, computer science, accounting, marketing, transport/logistics etc.), the assessment principles, university/faculty assessment policies, the procedural and conceptual knowledge in the content, and the learning outcomes specified in the unit, assessment components were designed. In addition to the theory-based examinations, it has a group project, a case study analysis and exercises on the software. These assessment tasks are designed to test the theoretical understanding, critical thinking, ability to apply the concepts and principles to practice, and SAP R/3 software specialist technical skills.

Group project, the most critical assessment component in the course, is designed to assess both practical/applied aspects and the conceptual/theoretical content of the course. This group project requires students to study a real organization and evaluate the suitability and usage of SAP R/3 ES software solution, and compare it with any other ES software product in terms of product functionality, support and flexibility for customization and configuration, architecture and technology compatibility, web-based functionality, ease of interfacing with other legacy systems and implementation costs. In addition, the group is required to design and configure a simple workable integrated enterprise system using SAP R/3 that demonstrates the integration of information from at least three modules (account receivable, sales, manufacturing/production, procurement, account payable and general ledger modules). Students as a group of not more than four are required to analyse the organisational elements in a real organization, and map it in SAP R/3 context. Students must create an enterprise structure, relevant master data in the software, transactions that demonstrate integration of core business processes and provide documentary as well as system evidence. Students are required to apply specialist skills and knowledge drawn from other traditional disciplines to an actual organization and demonstrate their generic attributes such as communication skills, team working skills and problem solving skills.

SAP-based assignments/exercises require students to work individually on the software and carry out series of transactions and configuration of the system, and demonstrate their knowledge and understanding of the enterprise system and software skills. Some of these exercises include creation of master data (vendors, customers, materials, work centers, etc); carrying out full transaction cycles for processes such as order to cash, procure to buy; producing various standard and flexible management reports. In addition, students are required to configure a simple working system that can carry out 'order to cash' and 'procure to pay' process cycles in the system. All these exercises require understanding of general ledger, procurement, inventory management, production, sales order processing, warehousing and delivery, account payable and account receivable modules in SAP R/3 software. This assessment component is designed to test students' specialist technical skills. In addition they help them develop problem solving skills and self-learning skills. Building from first to the final exercise, this assessment component gives students

comprehensive knowledge of enterprise system in action and imparts specialist skills required for practice.

4.5 Delivery

Delivery of the unit was carried out in a computer laboratory setting where audio-visual facilities and facilities to take control of the students' computer screens are available. The delivery strategy employed in this unit include modified lectures in the class along with live demonstration of the system wherever necessary, practical work/exercises using the SAP R/3 software, case study discussions, access to SAP R/3 help, and presentations by students on topics/issues and one or two guest lectures from industry practitioners. Team teaching approach is adopted taking advantage of the differing, but complementary expertise of the two academics – one from the Accounting/finance background and another from the logistics/operations background. Both the lecturers have considerable process knowledge in their specific fields, ERP implementation/project management expertise, sound software skills and are actively researching in enterprise systems.

5. ANALYSIS AND RESULTS

The following section reports on the analysis of the data collected from a cohort of students and discuss the findings and their implications for the design and delivery of SAP R/3 based units in future.

5.1 Demographics & Preliminary Analysis:

Out of the 84 valid responses received, 60% of the respondents to the survey were male and 40% were female. Preliminary analysis revealed that 43% of the students were local students and the remaining 57% of the students were international students coming from different countries such as China, Indonesia, India, Japan, Thailand and Scandinavian countries. Even though this subject was offered by the School of Business, 34% of the students enrolled in this course came from the School of Information technology/computer science. On the employment indicator, data revealed that 28% of the respondents were currently employed. Age was not considered a major differentiating variable in this study, since 60% of the respondents were below the age of 25 years. According to the study, 46% of the participants did not have any previous work experience.

After careful examination of the data, missing values and the outliers in the data set were eliminated. This refined data was used for further analysis. The difference between the self-assessment of perceived knowledge before enrolling in this unit and after were computed and used for analysis in this study. This difference was considered a measure of the level of knowledge and skills gained by the students as perceived by them during the course. In addition, total indices for various hypothesized constructs were computed using responses for individual items.

5.2 Definition of the Knowledge Dimensions/Constructs:

The definitions of the seven constructs used in further analysis are given in table 1. These constructs also refer to the content covered in the course.

5.3 Reliability and validity

In order to test the psychometric properties of the questionnaire, a reliability analysis was carried out using Cronbach alpha. All 49 items in the questionnaire were grouped into seven constructs namely – business knowledge, process knowledge, implementation knowledge, interface knowledge, management knowledge, SAP transaction skills and SAP configuration skills (Seethamraju, 2004b). The total scores for each of the constructs were computed as a sum of the values and used for this analysis and shown in the table 2. This table shows Cronbach alpha scores for each of the constructs (in the last column) and the correlations between various constructs. In general, an internal consistency (Cronbach alpha values) of less than 0.6 is regarded poor while above 0.70 is acceptable (Cavana et al, 2001). As shown below in table 2, the Cronbach alpha value is more than 0.86 for all the constructs. The instrument, can therefore be considered internally consistent.

Knowledge dimensions/ constructs	No. of items	Definition
Business knowledge	5	Knowledge of the basic business terminology that relate to various functions and cross-functional relationships
Process knowledge	8	Knowledge of various core business processes, their significance and their relationship with information systems
Implementation knowledge	7	Knowledge of the implementation of enterprise system that include product evaluation, approaches for implementation, mapping of processes and configuration issues
Interface knowledge	5	Knowledge of the role and significance of enterprise systems in their interface with other applications such as supply chain management (SCM), customer relationship management (CRM), electronic commerce (EC) etc.
Management knowledge	7	Knowledge of the role and impact of enterprise systems on various organizational and managerial issues after its implementation and day-to-day management
SAP transaction skills	7	Basic software skills in the creation of master data and performing transactions in various SAP application modules
SAP Configuration skills	3	Basic software skills in the configuration of SAP system for implementing relevant application modules

Table 1. Definition of the Knowledge Dimensions

imilarly the inter-item correlations were also computed in order to analyze the convergent and discriminant validity of the items in the instrument for each of the constructs and between seven constructs and the overall global measure. As shown in the above table, the lowest correlation was between 'SAP transaction skills' and 'business knowledge' constructs (0.34) and highest between 'process knowledge' and 'business knowledge' constructs (0.88).

This high correlation between 'process knowledge' and 'business knowledge' constructs may raise some issues with multi-colinearity. These two factors, however, were maintained as separate constructs considering the emphasis on teaching 'business process knowledge' in this course. Imparting business process knowledge and business process orientation was the primary objective of this course and was imparted through teaching and learning strategies. In case of business knowledge, however, students were expected to possess some basic knowledge of business before enrolling in this course.

All the eight constructs correlated significantly with the 'overall knowledge gained' and the values ranged from 0.61 to 0.91. Inter-item correlations for each of the construct ranged from 0.51 to 0.94 (not shown in the above table) and are significant at $p<0.01$ level (2-tailed). The analysis thus confirmed the sound psychometric properties of the data collection instrument in terms of its validity and reliability. Since these constructs and the instrument were developed and refined after carrying out exploratory factor analysis (Seethamraju, 2004b) no further confirmatory factor analysis was conducted in this study. These seven constructs reflect seven distinct aspects of the curriculum that are taught in the course and are therefore measured separately.

5.4 Perceived Knowledge gains:

Based on the self-assessment of knowledge before, and after the course, the perceived knowledge gained during the course was computed. A summary of the knowledge/skills self-reported by the students at the beginning, at the end and the perceived gain in the knowledge levels for each of the knowledge dimension is presented in table 3.

A gain of 3 and more was considered significant and a gain of 1 or less was defined as very little or no gain in the knowledge in this analysis. As shown in table 3, significant levels of gain in knowledge is perceived by students in one dimension - SAP transaction skills (more than 3.00 perceived gain). The perceived knowledge gain in enterprise system interface knowledge and SAP customizing skills is the lowest among all the dimensions. The overall knowledge gain of 2.75, and a good increase in the business process knowledge and implementation knowledge of 2.71 and 2.64 respectively denote a successful achievement of the program objectives.

Knowledge/skill factors	Before	After	Gain
Business knowledge	2.72	5.28	2.56
Process knowledge	2.15	4.86	2.71
Implementation knowledge	2.10	4.74	2.64
Interface knowledge	2.01	4.18	2.17
Management knowledge	2.27	4.68	2.41
SAP transaction skills	1.32	5.19	3.87
SAP Customizing skills	1.22	3.46	2.24
Overall knowledge	2.12	4.87	2.75

Table 3. Average Scores – Before, After and Perceived Gain

A detailed analysis of the perceived knowledge gain in each of the knowledge dimensions is presented in table 4. Study found that 65% of the students acquired a significant level of SAP transaction skills (more than 3.00) that includes creation of master data and transaction cycles in procurement, sales and distribution, accounts receivable, accounts payable and general ledger modules. With reference to the SAP configuration skills, however, only 20% reported a significant gain in knowledge (3 and more), with almost 60% reporting that they have acquired very little configuration skills (less than 2.01).

Knowledge/ skill factors	Bus. know.	Pro. know.	Impl. know.	Inter. Know.	Mgt. know.	SAP Tran. Skill	SAP Config skills	Scale reliability (Cronbach alpha)
Business knowledge	---	---	---	---	---	---	---	0.87
Process knowledge	0.88	---	---	---	---	---	---	0.89
Implementation knowledge	0.74	0.82	---	---	---	---	---	0.87
Interface knowledge	0.68	0.77	0.81	---	---	---	---	0.86
Management knowledge	0.63	0.68	0.85	0.75	---	---	---	0.93
SAP transaction skills	0.34	0.40	0.47	0.44	0.46	---	---	0.96
SAP Configuration skills	0.35	0.38	0.45	0.43	0.41	0.58	---	0.92
Overall knowledge	0.80	0.86	0.91	0.85	0.85	0.70	0.61	0.97

Table 2. Reliability Analysis of the Data Collection Instrument

On ES interface dimension, the perceived knowledge gain is less significant and a large percentage of respondents reported no significant gain in knowledge (61%). Consistent with the course objective of imparting business process knowledge through enterprise system software solutions, limited time was allocated for interface and management issues and the results reflect this aspect of the course design. On the issues such as knowledge of security issues in ES, knowledge of ES interface with electronic commerce, supply chain management and customer relationship management application, the respondents did not perceive any significant gain in the knowledge.

On aspects that deal with enterprise system implementation and management, more than 60% of the respondents reported significant level of perceived knowledge gain. On dimensions such as business process knowledge and business knowledge, the results appear satisfactory with about 23% and 32% of the students perceiving a significant gain (more than 3.00) and the relatively higher level of knowledge students reported on these two dimensions before the course.

5.5 Effectiveness of course design and delivery

In addition to their knowledge, students were asked to rate in a scale of 1 (strongly disagree) to 5 (strongly agree), their general agreement/satisfaction with reference to various aspects of curriculum design and delivery in this unit to measure effectiveness. All the 26 statements were grouped into three dimensions – design (8 items), delivery (9 items) and resources (9 items).

In addition, respondents were asked to rate their overall satisfaction with the course. Details are summarized in table 5. As shown in the table 5, all the three dimensions were rated generally as 'good' by the respondents. In a scale of 1 to 5 (where 1 = poor, 2 = average, 3 = good, 4 = very good and 5 = excellent), the average rating for all the three dimensions was 'good' (more than 3.00). Response to individual items, however varied from 2.72 (text book resources) to 3.50 (discussion of issues relevant to industry/practice and hands on work on SAP R/3), but still can be interpreted as 'good'. The overall satisfaction rating of 3.81 suggested a reasonably effective design and delivery of this unit and is higher than the individual constructs.

On other aspects that deal with the SAP R/3 software and associated learning resources that include access from home and availability of software in all the computer labs, satisfaction rating was close to 'very good' (higher than 3.70). With regard to student facilities at the faculty, text book, availability of online help and lecture notes etc that deal with the resources, respondents had given relatively lower rating (between 2.7 to 3.0). Similarly, delivery of lectures and assessment components such as SAP based assignment and group project and discussion of theoretical issues were rated relatively low (between 2.8 to 3.0), while on aspects such as case studies used in the course, knowledge of academic staff, unit coordination, and discussion of issues relevant to industry and practice, students had given a relatively higher rating (more than 3.5). In general the satisfaction with reference to each of the three constructs and overall with the course is 'good'. Thus, these findings have identified the strengths and weaknesses of the course design and delivery, and given a meaningful and constructive feedback for further improvements.

Dimensions of teaching effectiveness	Mean	Std. deviation
Curriculum Design	3.03	0.58
Delivery	3.14	0.59
Resources	3.17	0.73
Overall satisfaction with the course – global measure	3.81	0.52

Table 5. Teaching Effectiveness

5.7. Differences between Commerce and IT students

In order to see whether there are any significant differences between different groups of respondents (classified with reference to various independent variables), two tailed t-tests for two independent samples at 5% significant levels are considered appropriate and employed. Because of its robustness, versatility and its general acceptance in the literature, parametric tests such as t-tests are increasingly used with ordinal data (Hair et al, 1998). Table 6 gives details of the t-test results that analyzed the differences between IT and Commerce students on perceived knowledge gain. Significant differences were observed with reference to the perceive knowledge gain on two dimensions – enterprise system management and implementation knowledge. No significant differences, however, were noticed between groups classified according to other independent variables such as gender, and citizenship status with reference to these knowledge dimensions.

Avg. Level of knowledge gain	Busi-ness know.	Process know.	Imple-menta-tion know.	Inter-face know.	ES mana-gement know.	SAP Transac-tion skill	SAP custo-mizing skill	Over-all know.
Below 1.01	14%	9%	13%	28%	15%	6%	21%	13%
1.01 to 2.00	37%	31%	30%	33%	32%	11%	39%	29%
2.01 to 3.00	26%	28%	31%	29%	35%	18%	19%	27%
3.01 to 4.00	19%	26%	21%	8%	16%	27%	15%	21%
Above 4.00	4%	6%	5%	2%	2%	38%	6%	10%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Mean	2.56	2.71	2.64	2.17	2.41	3.87	2.24	2.75
Standard deviation	1.26	1.02	1.08	1.05	1.15	1.23	1.22	0.89

Table 4. Levels of Perceived Knowledge Gain

Construct	Independent variables & significance	Values
ES management knowledge	Commerce students (54) IT students (30) T-value Significance	20.8 16.2 2.12 0.010**
Implementation knowledge	Commerce students (54) IT students (30) T-value Significance	18.2 14.6 1.96 0.03*

Table 6. Knowledge gain - Differences between Commerce and IT students – t-test results

With regard to the teaching effectiveness dimensions (design, delivery and resources), similar analysis was carried out and results of the t-tests are given in table 7.

Construct	Independent variables & significance	Values
Overall satisfaction with course	Commerce students (54) IT students (30) T-value Significance	3.6 4.2 2.12 0.00**
Delivery (dimension of teaching effectiveness)	Commerce students (54) IT students (30) T-value Significance	27.2 29.9 1.94 0.05*

Table 7. Teaching effectiveness - Differences between Commerce and IT students – t-test results

As shown in the above table, significant differences were noticed between IT and Commerce students and IT students on overall satisfaction with the course. Similarly, on delivery dimension also, there are significant differences between these two groups of students. In general the IT students expressed a better overall satisfaction with the course as well as with the delivery of the course. There were, however, no significant differences noticed between groups classified according to other independent variables - gender, experience and citizenship status with reference to the teaching effectiveness dimensions.

6. DISCUSSION AND IMPLICATIONS

6.1 Overall observations:

Integration of enterprise system software products into the business school curriculum is challenging and resource intensive. Irrespective of the model adopted by the university/schools, integrating such products will have significant impact on the pedagogy, content, resources and relevance of the skills and knowledge gained by the students, as demonstrated in this study. This attempt by the business school in this university is no different and has noticed some discernable benefits to student learning as well as some challenges in the ongoing delivery and resource management. These challenges are presented from three perspectives – students, academics and administration.

Inability and inadequacy of the academic staff to offer opportunities to individual students for developing specific in-depth knowledge in a particular module is by far the biggest issue raised by the respondents. While the students see the potential benefits of real-world application through hands-on work and case studies, they felt that the depth of coverage in general was inadequate, particularly the SAP configuration part. The course attempted to take the students through four modules in SAP R/3 focusing more on the integration of end-to-end business processes across the enterprise and from a business perspective. Therefore, the curriculum design, keeping in view of its objective, its positioning within the school of business and semester time frames, focused more on the breadth rather than on the depth of the software, more on the business transactions rather than on configuration and technical aspects of the software.

From the academic perspective, it is always challenging to continuously update, expand and improve one's software skills, balance the time allocated to theoretical issues and hands-on component of the course within the time frames and pressures of university teaching and research, and balance the varying needs of students from different backgrounds (technical and business backgrounds, no business back ground, local, international etc.). This is particularly significant in business information systems courses that are considered to be multi-disciplinary and will have students from different disciplines and backgrounds. For example, the learning needs of students from technical background (computer science, IT, engineering) are found to be different from those with business background/experience (commerce/business students), with technical group demanding more technical content, while the business group demanding more business content. Similarly, students with no business experience struggled to understand the business and process terminology and concepts, and enterprise system management and interface issues.

From the administration point of view, the significant cost of resources required to teach these courses, particularly when the number of courses/subjects offered are relatively less is observed to be a major challenge. The cost per student is significantly high in these courses, considering the high cost of accessing the SAP R/3 software from an application hosting centre. In addition, the need to attract more academic staff members into teaching these kinds of courses is also another challenge for the administration. Unlike other courses in information systems that have a traditional teaching and learning models, courses that involve extensive use of complex business software products, though exciting, would always put pressure on the resources and academic efforts.

For example, considering the additional efforts required throughout the semester to maintain the system and deal with unique individual student problems while working on this complex software, this business school had offered some temporary assistance to the academic staff. While this is a temporary solution to the ongoing problem, business schools/universities must develop strategies and new workload distribution models to deal with these challenges and continue to motivate the academic staff to adopt best practice software products into their curriculum.

Based on significant level of perceived knowledge gain in a majority of the dimensions and good satisfaction rating with reference to various aspects of teaching and learning (design, delivery and resources), and the strong correlation of the perceived knowledge gain with the academic

performance of students, this attempt at integrating the enterprise system software into the business curriculum can be concluded as a reasonable success. Expansion of the curriculum to enhance the depth of the SAP skills, more guest lectures to bring real-world experiences into the class room, integrated project that truly tests the conceptual as well as technical (software) understanding and skills of students, more case studies that deal with ES interface and post-implementation issues, better alignment of this course curriculum with other pre-requisite courses, improvement in the knowledge of academic staff and their access to students are some of the potential improvements emerging from this study.

6.2. SAP Software Skills – Issues And Challenges

A significantly higher level of perceived gain in SAP software skills than in other dimensions of knowledge was observed in this study. In general, software based courses stimulate learning because of their hands-on nature, opportunities they present to participate actively in the learning by doing things in the class, and by facilitating self-directed learning through help facilities and online tutorials. In addition to these, if the software products such as SAP expose students to real-world business contexts, transactions and business processes and potentially equip students with employable skills, students' interest will be further stimulated enhancing learning effectiveness.

Confirming this observation, a large majority of students reported satisfaction with this part of the course and reported improvement in their integrated view of the business enterprise. In addition, they were able to understand the complex inter-relationships between different processes and functions, and appreciate the significance and impact of integrated information systems on business operations. The ability to access SAP software from home, availability of online tutorial help throughout the semester, and the online discussions and communications on the blackboard, appear to have significantly enhanced their learning experience.

While SAP component of the course was taught in the computer laboratory environment with hands-on exercises, online help, tutorial support, and a SAP manual, rest of the topics such as business processes, ES concepts, implementation, management and interface of enterprise systems were taught in a traditional lecture mode interspersed with case studies. Therefore, it is not surprising that the perceived gain was significantly higher in SAP software skills and knowledge than on theoretical issues. These significantly higher perceived gains in SAP skills reinforce the central role played by the ES software in the course.

6.3 Business Process Perspective

Students generally appreciated the way the business processes were introduced and discussed through demonstration of the transaction cycles in procurement, account payable, sales and distribution, accounts receivable and general ledger modules and reinforced by hands-on activities using SAP R/3. The comments provided by less than 10% of the participants at the bottom of the questionnaire, however, were mixed and varied. For example, some students reported failure to understand the business process perspective and information flows behind the transactions and viewed the entire exercise as routine data entry. Some other students expressed satisfaction with the mix of business concepts and technology, others appreciated the importance of integrative view facilitated by the software solution and its importance to business. Closer scrutiny of this anecdotal evidence and background of some of these students revealed the absence of any previous business experience for some.

While the course does not require students to possess previous business experience, it assumes that the students acquire the basic knowledge of business processes, information systems, data/information flows from the pre-requisite course in business information systems or its equivalent. Even though 40% of the students had studied at least 4 information systems/technology related subjects, some students viewed the software-related curriculum as some routine data entry activity. This perception of some part of the curriculum as some data entry activity threw up a challenge to the academic staff and course coordinators. Subjective comments by the students pointed out towards the inadequate course materials that deal with cross-functional and process related issues, insufficient coverage in the classroom and inability of students to understand the information flows behind the transactions.

While there are no immediate solutions to this problem, an attempt is made by the coordinators/academic staff to improve students' learning by offering extra material on business processes and additional case studies to work at home and by explicitly stating the basic process and business knowledge underpinning this course at the beginning of the semester. In addition to this, better alignment of course needs with the pre-requisite course is also being tried by having frequent discussions between the academics and regular reviews of each other's courses. Fine tuning of the course sequence and relative emphasis on each of the topics was also carried out based on the mid-semester review and student feedback sessions.

Considering the demands on students' time and attention, inevitable variation of the quality of student recruits from year to year, significant proportion of enrolled students with no previous business experience/knowledge, insufficient students' motivation to learn on their own, ever increasing content in each of the courses, and varying styles of teaching and differing relative emphasis by academic staff, these attempts so far, are not yet completely successful. With numbers increasing, the administration is contemplating a separation of part-time students who had some business experience from the full-time cohorts of students (with no business experience) and deliver the course differently to these two groups considering their learning needs and business knowledge.

6.4 Theoretical Issues

The perceived knowledge gain on dimensions that deal with the implementation of enterprise systems was significant, while the gain in ES interface and ES management was relatively low. Even though a traditional teaching and learning model with case studies was used in teaching all these topics, the perceived knowledge gain was different. Closer scrutiny of the course content and delivery revealed

that the case studies employed in this course predominantly dealt with the implementation issues. This together with the experience of the academics in ES implementations and not on managing the ES interface and post-implementation issues, made it easy for students to understand the implementation better than others.

The ES interface with other applications such as CRM, SCM and EC can still be considered to be in a formative stage, especially in Australia and no case studies were available that deal with those issues in the wider curriculum world. Moreover, concepts of supply chain management and customer relationship management, for example are very complex and difficult to cover them in one single lecture. Considering that these issues were not the main focus of the course and with each of the topic by themselves being very large, it is logical to expect students not to feel confident on these issues.

Students generally sought more information about the second generation ES products on supply chain management, customer relationship management and electronic commerce. Just one lecture on these topics, did not seem to satisfy the students' requirements. Given that there are 12 lecture sessions in the course effectively (after taking out the last one for review); it is always challenging to determine the most effective combination of theoretical topics and practical hands-on component with appropriate breadth and depth.

With the enterprise systems well embedded in most of the large organizations today, the emphasis could possibly be shifted towards the interface and post-implementation issues rather than implementation issues and basic business process issues. With more and more business courses in marketing, accounting, logistics and human resources disciplines emphasizing the business process perspective, it is possible that the students in future will have a sound understanding of the integrated view of business. This will allow the administrators of this course to focus more on the post-implementation and interface issues.

6.5 Differences between commerce and IT students:

There are significant differences between commerce students and IT students in terms of ES implementation and management constructs, and in overall satisfaction with the course and its delivery. The enterprise system management construct measures the knowledge gained on issues such as impact of enterprise systems on managerial decision making and organizational structures, maintenance and upgrade of software solutions and ability to improve and control business expenses using enterprise system. The implementation knowledge construct measures the issues relevant to ES implementation. As expected the business knowledge of business/commerce students gained from other units helps them to better understand the business impact of enterprise systems, its implementation and management than the IT/computer science graduates. A majority of the business/commerce students have completed at least four business units before enrolling in this unit. Therefore, it is reasonable to assume that they have started with some business knowledge. With regard to the implementation knowledge (which deals with the issues of implementation) also, there are significant differences with Commerce students gaining a much higher knowledge during the course. This can also be attributed to their generally higher level of knowledge of organizations and management than the IT students.

With regard to the overall course design and delivery, it appears that IT students are more satisfied with the course than the commerce students. The fact that this unit is a business oriented unit that gives an integrative perspective of business to IT students than a pure technology-based unit, and that IT students will have to make an effort to enroll and study this unit by moving to a different faculty demonstrates their higher level of interest in the course. Their higher level of interest and motivation to do the course, and relatively low level of business knowledge with which they start the course, appears to have contributed to their higher satisfaction.

6.6 Limitations

Since the study was designed and managed by the author, the findings may have some inherent bias. While it may to some extent limit the generalisability of the findings, the author believes that the findings will make a positive contribution to the knowledge on the effectiveness of enterprise system education in particular and its integration with business curriculum in general.

In addition, general limitations of a typical questionnaire survey and self-assessment of students' knowledge would also apply to this study. Some of the weaknesses such as misrepresentation of the statements, ambiguity or vagueness in the statements designed, possibility of over or under assessment of the perceived knowledge gained by the individual students, non-flexibility for providing free expression of opinions and perceptions inherent in a questionnaire survey are applicable to this study. In order to overcome some of the weaknesses, respondents were asked to give their general opinion on the aspects that were done well, and aspects that needed improvement. In addition, before administering the questionnaire, students were informed about the purpose of the study and asked to participate voluntarily.

Measuring the effectiveness of any university course is complex, especially when the students have just completed the course and did not go into the industry as products of the university system and put their skills and knowledge to use. The effectiveness of one course in a series of courses for a degree cannot be felt immediately and largely depends upon the influence of this course on students' employment potential, their individual generic attributes, the skills and knowledge gained in other subjects/courses and their ability to perform the tasks in a workplace setting applying these skills and knowledge.

7. CONCLUSIONS

Considering the complexity of the software and the varied mix of students in the post graduate programs at the Australian universities, incorporating SAP R/3 into business curriculum is challenging. This paper described an attempt and reported on the effectiveness of the design and delivery of one SAP R/3 based unit/course in a business school within the University of Sydney. Findings suggest that the respondents are generally satisfied with the course, and have gained reasonable level of skills and knowledge during the course. Though support from the major software vendors in

terms of training, free software and application hosting have eased the burden on universities, significantly higher demands on academic time and effort than on traditional IS courses, balancing between the depth and breadth of the ES software skills and ES concepts, and, the very complexity of the software and the ever changing versions and expanding products in the second generation, are making it difficult for universities to cope up.

Given the variety of students in terms of past experience, differing backgrounds from commerce to science/information technology, varying degree of business process knowledge and business knowledge, it is proving to be a difficult task to determine the appropriate combination of theoretical knowledge and practical software skills. Continuously evaluating the effectiveness of the design and delivery of such courses, and, improving them in line with the changes in business needs and technologies and changing demographics of student recruits is critical to keep the information systems education at least in line with the changing world, if not ahead.

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Ravi Seethamraju is ccurrently working in the University of Sydney, Faculty of Economics & Business, Australia, Ravi teaches and researches in the areas – enterprise systems, business process management and electronic commerce and received teaching excellence award by the School in the year 2004. He has extensive experience in curriculum design and designed one of the first few masters courses in ERP incorporating SAP R/3 software in 1997 and contributed to the curriculum design of various other courses in enterprise systems and business process management over the years. Ravi has more than 50 publications so far that include book chapters, refereed articles in international journals and international conferences in the areas of enterprise systems, electronic commerce and on business/IS education. Before his move into academe, he had 12 years of corporate management, training and consulting experience in business information systems and operations management. He has a Ph.D. from University of Western Sydney, Post graduate diploma in Adult education from University of Technology Sydney, a Masters in industrial engineering from NITIE, Mumbai.

APPENDIX I

YOUR PERCEPTIONS ON THE EFFECTIVENESS OF ENTERPRISE SYSTEMS CURRICULUM

Section I: KNOWLEDGE AND SKILLS:
Please give self-assessment of your knowledge and skills BEFORE enrolling in this unit (at the beginning of this semester) and NOW (gained in this unit after 12 weeks of teaching and learning), on a scale of 1 to 7, **where 1 = VERY LOW, 7 = VERY HIGH. Please give a number (from 1 to 7) in both the columns.**

No.	**Statement of knowledge/skills the respondent has**	**Before**	**Now**
BUSINESS KNOWLEDGE			
1	Knowledge of business terminology (such as MRP, production plan etc.) in manufacturing and execution process		
2	Knowledge of business terminology (such as sales order, discounts, inco terms, freight, transfer order, goods issue etc.) in Sales and distribution process		
3	Knowledge of business terminology (such as purchase order, invoice verification, goods receipt, material account etc.) in procurement process		
4	Knowledge of business terminology (such as general ledger, cost centre, journal, adjustment, balance sheets etc.) in Financial accounting process		
5	Knowledge of the inter-relationships and inter-dependencies between various functions (such as accounting, marketing, production etc.)		
PROCESS KNOWLEDGE			
6	Knowledge of the concept of business process		
7	Knowledge of business processes and activities in procurement		
8	Knowledge of business processes and activities in sales and distribution management		
9	Knowledge of business processes & activities in financial accounting		
10	Knowledge of business processes & activities in production management		
11	Knowledge of the importance of the integrated nature of business processes		
12	Ability to map organisational business processes with those in an enterprise system software		
13	Knowledge of how information systems are used in business		
IMPLEMENTATION KNOWLEDGE			
14	Knowledge of the issues in configuring an enterprise system software to a business organization		
15	Knowledge of the issues in managing an enterprise system implementation project		
16	Knowledge of various approaches for implementing enterprise system		
27	Knowledge of the importance of security, authorizations and user access in an enterprise system environment		
18	Ability to determine appropriate approach for implementing an enterprise system in a business organization		
19	Ability to evaluate different enterprise system software products and recommend a suitable one		
20	Ability to map the organisational structure with the enterprise system elements		
INTERFACE KNOWLEDGE			
21	Knowledge of the role of enterprise system in managing the supply chains (SCM)		
22	Knowledge of the role of enterprise system in customer relationship management (CRM)		
23	Knowledge of the role of enterprise system as a back-end system in conducting effective electronic commerce		
24	Knowledge of the role of enterprise system in decision support and business intelligence		
25	Knowledge of the nature and role of application interfaces in an enterprise systems software solution with other software applications/solutions		
SAP TRANSACTION SKILLS			
26	Ability to create master data in SAP R/3 - Procurement module		
27	Ability to create master data in SAP R/3 - Sales and distribution module		
28	Ability to create master data in SAP R/3 – Finance/Controlling module		
29	Ability to carry out complete transactions in the SAP R/3 – Procurement cycle		
30	Ability to carry out transactions in the SAP R/3 – Sales & distribution cycle		
31	Ability to carry out transactions in the SAP R/3 - Account Receivable		
32	Ability to carry out transactions in the SAP R/3 - Account Payable		
33	Ability to carry out transactions in the SAP R/3 - General Ledger module		
SAP CONFIGURING SKILLS			
34	Ability to configure Sales & distribution module in SAP R/3		
35	Ability to configure Procurement module in SAP R/3		
36	Ability to configure Finance/controlling module in SAP R/3		
ES MANAGEMENT KNOWLEDGE			
37	Knowledge of the nature and role of maintenance and upgrades of enterprise system software solutions		
38	Ability to determine data requirements for an enterprise system (ES) implementation		
39	Ability to analyse the impact of integrated information on managerial decision making		
40	Ability to analyse the impact of enterprise system on organisational structure, roles and responsibilities		

41	Ability to analyse the impact of individual employee actions on the operations of other functional areas		
42	Ability to improve controlling of business operating expenses through enterprise system		
43	Ability to understand the role and complexity of technology in enterprise system software solutions		
44	Ability to prepare management reports from enterprise system		

Section III -- CURRICULUM DESIGN AND DELIVERY:
Please indicate your perceptions of this unit in terms of the following dimensions by placing a 'tick' in the column (√):

No.	Description of the activity	**Poor**	**Aver-age**	**Good**	**Very Good**	**Excel-lent**
1	Integrative nature of the unit design (how this unit integrated with other BIS units)					
2	Clarity of the unit content and expectations					
3	Sequence of the topics					
4	Delivery of lectures					
5	Hands on work on SAP R/3 system					
6	Coverage of SAP R/3 modules (SD, MM and FI)					
7	Discussion of theoretical issues					
8	Lecture notes					
9	Text book					
11	SAP R/3 Manual					
12	Case studies used in the course					
13	Discussion of issues relevant to practice/industry					
14	Concern for students' learning needs					
15	Usage of Computer laboratory facilities in teaching by staff					
16	Assignments					
17	Group project					
18	Blackboard as an information and communication tool					
19	Availability of on-line help to students (SAP help on Econ server)					
20	Availability of system for practice in computer labs					
21	Availability of tutorial assistance/help on SAP R/3					
22	Availability of individual help/guidance when needed					
23	Access to SAP R/3 from Home PCs					
24	Knowledge of full-time academic staff					
25	Unit coordination and administration					
26	Access to academics for consultation and help					
27	Quality of student services in the Faculty					

Section IV:
Please indicate your overall rating on the effectiveness of this course:

	Poor	Average	Good	Very good	Excellent
Overall effectiveness of the course	**1**	**2**	**3**	**4**	**5**

Information Systems & Computing
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All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

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