December 2004

A Thematic Approach To The Development Of Business Process Awareness In Students

Jennifer Leonard
University of Sydney

Ravi Seethamraju
University of Sydney

A THEMATIC APPROACH TO THE DEVELOPMENT OF BUSINESS PROCESS AWARENESS IN STUDENTS

Dr. Jennifer Leonard
Dr. Ravi Seethamraju
School of Business, The University of Sydney
j.leonard@econ.usyd.edu.au
r.seethamraju@econ.usyd.edu.au

Abstract

This paper describes the thematic development of integrated process understanding, using process modelling and Enterprise Systems, through three consecutive units of an undergraduate degree. It reviews the literature on process modelling and Enterprise Systems, and the pedagogy of their use as teaching tools. It then describes teaching materials and methods designed to ensure that the issues arising from that literature are communicated to students in ways which develop their critical evaluation skills, and their motivation for study. Methods used to ensure that students' learning is progressively developed from one unit to the next are also described.

Keywords

Process modelling, ERP, Enterprise Systems, ES, integration student learning, IS education

INTRODUCTION

This paper describes the thematic development of a process based understanding of business, and its information systems support, as part of a Business Information Systems undergraduate degree. This paper first reviews the literature and discusses the need to provide an integrated approach to business information systems education. (Walker and Ainsworth 2001; Seethamraju 2004), Two interrelated approaches for achieving this integrated understanding are considered; a process based approach (Walker and Ainsworth 2001) , and the use of Enterprise Systems (ES) solutions as teaching tools. (Becerra-Fernandez, Murphy et al. 2000; Seethamraju 2004). Process models and enterprise systems are seen not just as pedagogical tools to aid business understanding, but also as tools which students should learn to evaluate critically for their ability to solve business problems; therefore the review looks at their main features, strengths and weaknesses.

The paper then gives an overview of three consecutive units within an undergraduate Business Information Systems degree, all using process modelling and Enterprise Systems to meet various learning objectives. It discusses how the conclusions from the literature review are being used to inform the design and delivery of these units. It also discusses how the progressive introduction of these tools is handled. This involves clear identification, comparison and contrast of the learning objectives of each unit, and appropriate repetition and reinforcement of material between units. It finally proposes further research to evaluate the effectiveness of this thematic approach to the development of business process knowledge and modelling skills.

LITERATURE REVIEW

The need for an integrated approach to business information systems education

Several reports reveal that business graduates often lack the ability to gain the cross-functional and interdisciplinary perspective that their prospective employers require (Seethamraju 2004). For example a review in the accounting arena in the USA makes the point that "a pedagogical model developed decades ago, whereby students are taught business concepts through functional areas – accounting, management, marketing, finance, etc [may be producing students who are] inadequately prepared for a cross functional world." The review also makes the point that practicing accountants consider knowledge of how typical business organisations work and are managed to be among the most important competencies that accounting students could, but do not, learn in college (Walker and Ainsworth 2001). Reviews in Australia have reached the similar conclusions. See, for example Cecez-Kecmanovic et al (2002).

A process based approach

As a response to the problem of providing an integrated perspective, a process based approach to the business core curriculum has been proposed consistent with the trend towards processed managed organisations (Hammer 1996) (Teng et al. 1996). Walker and Ainsworth (2001) suggest using the common business processes in which most organisations engage, namely resource acquisition and payment, conversion/service provision, and acquisition of customers and collection of revenue. A similar approach is suggested to the IS core curriculum. Hershey (2002). having identified "the need for students to possess cross-functional perspectives and understandings": goes on to suggest that "IS professors might be in the best position of any business faculty to help solve the functional integration problem….systems and process analysis requires understanding of the entire organization, its functions, and the many activities in each function". Hershey (2002) has successfully introduced changes to an information systems unit by increasing emphasis on functional integration and business processes, and noted higher levels of students' satisfaction with the content and learning compared with the previous, traditional approach.

Process modelling was originally developed as part of the systems development lifecycle, its focus at that time being on the production of software (Curtis, et al. 1992; Snowdon 2003). It is now used extensively to fulfil other objectives. A taxonomy of objectives suggested the following main groups: facilitation of human understanding and communication, support for process improvement, support for process management, automated guidance in performing processes, and automated execution support. (Curtis, et al. 1992). Further categorization of the "particular techniques and tools used for understanding and analyzing the business operation itself and with computers systems [includes] workflow, Computer Supported Cooperative Work, and more general groupware. These links draw in concepts such as Soft Systems, Systems Dynamics, role based modelling, procedure mapping, and more familiar techniques such as data flow models and activity decompositions" (Snowdon 2003).

When process modelling is applied specifically to the use of Enterprise Systems(also known as ERP systems) it includes "all activities related to the design of models of the current business processes (as-is modelling), the model based identification of weaknesses, the study of available ERP specific reference process-models, the design of a new business blueprint using process-models, and the use of process-models for end-user training." Using this framework , initial research indicates that the success of process modelling for ES implementations is dependent both on modelling specific factors, such as methodology, language and tools, and context specific factors, such as project management, user participation, and modeller's expertise. (Sedera et al. 2001)

Enterprise Systems

If a process based approach is adopted, then it can be argued that a good vehicle for doing so is via example Enterprise Systems, which provide integrated support for core business processes, and have specific process reference models embedded in their software. Indeed, it has been argued that "a key premise of ERP systems is the underlying, sometimes unstated but often implicitly promoted notion that reference models in ERP systems embody best business practices" (Kumar 2000). At least one University makes the link between the two explicit in its mission for its ERP initiative "to educate managers to lead future organizations using skills to model, measure and improve the performance of integrated business processes. (Becerra-Fernandez et al. 2000)

Another reason for adopting ES is their prevalence in business. Looking at stock market values of ES vendors, they were "major success stories of the mid-1990s", experienced difficulties from 1998 onwards, but, based on turn of the century evidence, can be "considered to be the price of entry for running, and, at least at present, for being connected to other enterprises in a network economy". They are also finding new markets: "The large, relatively untapped market of midsize companies is now beginning to embrace ERP. Also, while ERP is relatively well established in the U.S., Germany, Scandinavia and The Netherlands, it has only recently started making inroads in industrialized nations such as Singapore, Japan, the U.K., and Spain" They are also extending into new industries. (Kumar 2000; Van Everdingen et al. 2000)

In terms of justification of the use of Enterprise Systems in the classroom, then, there is the joint rationale of promoting an integrated business understanding and introducing undergraduates to systems that they are likely to meet early in their working lives. Some authors advocate a more vocational approach, suggesting, for example, that "demand for trained Enterprise Systems professionals" is motivation enough for "universities to join alliances with ERP software vendors" (Becerra-Fernandez et al. 2000). The Commonwealth Government in Australia recommends that Universities develop strategies for capturing the professional graduate market (Cunningham 1997). This can be thought of as a "realistic market pull" model (Seethamraju 2004).

If prevalence of Enterprise Systems, and a vocational approach are taken on board this gives yet further support for the requirements for graduates majoring in Business Information Systems to be able to model current processes, improve them and integrate them with other, internal and external processes, as these are the basic skills required in order to understand Enterprise Systems.

Having decided to use Enterprise Systems, there are some practical considerations that should be taken into account. These include high cost of entry, difficulties in acquiring adequate technical knowledge and support, lack of teaching materials, burden on IT staff, and staff training costs. (Becerra-Fernandez et al. 2000; Bradford et al. 2003). In this situation, the development of low maintenance, screenshot based demonstrations at the introductory level, followed at later stages by interactive work has been put forward as an effective pedagogical model. This approach provided demonstrable improvements to students' business understanding (David et al. 2003).

If students are to critically evaluate Enterprise Systems they must first have some understanding of their complexity. This complexity can be said to have three components: numerosity, arising out of the large number of information flows, processes and people using the system; diversity, due to their cross functional nature, and interdependence between elements (Urwin 2001). They must also understand that ES implementations are not always successful. Success is hard to measure directly, particularly since a single view of success is hard to provide in an ES environment where there is a "variety of associated stakeholders and the inter-relationships between them"(Skok and Legge 2002). However, there are several studies indicating high rates of failure in IS projects generally, many indicating that more than half such projects fail. See, for example Johnson (2000). The broadness of factors involved in a successful ES implementation should also be communicated to students. These should include information quality, systems quality, service quality, intention to use, user satisfaction, and net benefits (DeLone and McLean 2003). Factors to consider in implementing an ES include organizational and national culture, technical and business knowledge, environmental and post implementation change, and the heterogeneity of the user base (Urwin 2001)

Conclusions from the literature review

The literature gives the following pointers to the design of a subset of a business information systems undergraduate degree.

- The need for students to obtain an integrated understanding can be addressed at least in part, by modelling common business processes.
- Process modelling can be used to fulfil a number of different objectives. These are often different from those for which the tool was originally developed. The choice of process modelling tool, and the way in which it is introduced to students, should be informed by the taxonomies that have been developed in this area.
- The success of different process modelling techniques depends not only on the methodology, language and tools, but also on a series of contextual issues. Some of these (expertise and orientation of modeller) will affect the students' ability to absorb the techniques and tools they are being taught. Others (project management, user participation, top management support) should be communicated to students as part of the context in which these tools are used in business.
- Enterprise Systems represent a prevalent technology that students are highly likely to encounter in their daily lives.
- Enterprise Systems are extremely complex. They should be seen as a technology whose value to a business depends on a very large number of cross functional and interdisciplinary variables.
- Enterprise Systems implementations, along with IS projects generally, appear to have relatively low success rates, where success itself is a complex concept to define.
- For practical reasons, and to ensure that technical problems do not unnecessarily interrupt students' learning, the introduction of ES should begin with low maintenance demonstrations, incorporating screenshots. These should be supplemented by hands on practical work, as students' understanding of the system increases.

OVERVIEW OF UNDERGRADUATE UNITS

This study considers the design and deliver of three units within the Business Information Systems major within an undergraduate commerce degree, in the light of the above discussion. The units are Business Information Systems (BIS) (with an enrolment of approximately 200 students per semester), Business Process Integration and Modelling, BPIM, (enrolment 65 students) and Enterprise Systems, ES (65 students). Diagram 1 shows their position in the Business Information Systems undergraduate degree structure:-

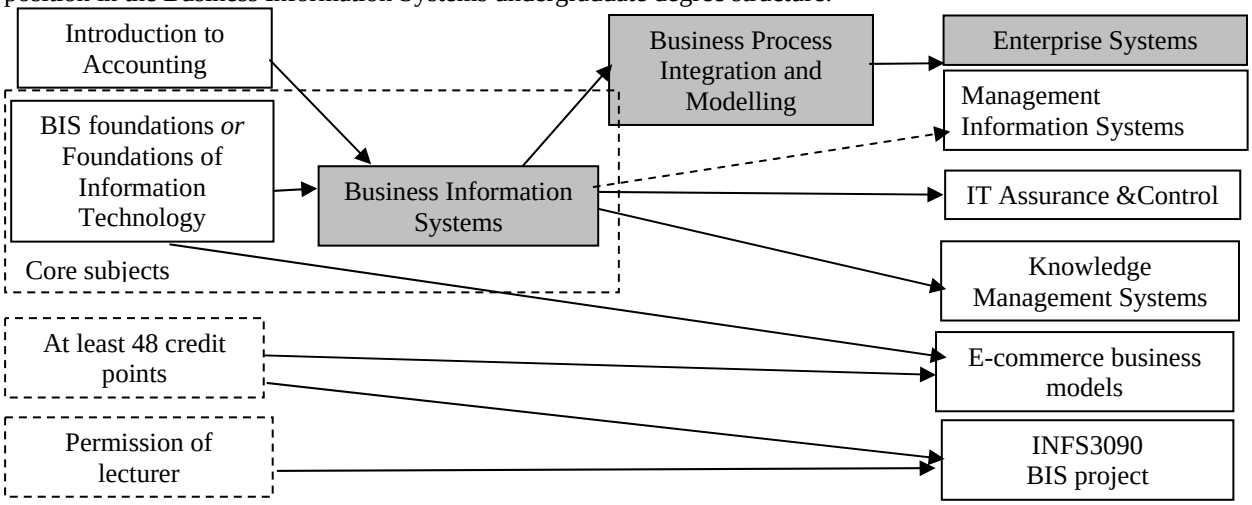

Diagram 1: Position of the three units within the degree

For each of these units, process modelling and Enterprise Systems implementations are incorporated in a subset of the material taught, with differences in depth and extent of usage of software tools. Table 1 gives the full coverage of the three units, with the subset of relevance to this paper shaded.

Table 1: Coverage of the three units

Topic	BIS	BPIM	Enterprise Systems
Introduction to BIS	Introduction to concepts	Introduction to business process orientation	Introduction to integrated IS concepts and tools
Business concepts and models overview	Functions, systems, Strategic planning	Business process analysis, reengineering/ redesign and modelling	Options and selection of Enterprise Systems
Databases and data warehouses	Databases, ER diagrams and normalisation		Systems installation, maintenance and upgrades
E-Commerce	Taught through examples	Designing collaborative supply chain processes for e-business	Enterprise systems and SCM, CRM business intelligence and other advanced DSS products
Process modelling	Evaluating and representing current processes for using DFDs and Flowcharts.	Reengineering and integration using the Event Driven Process Chain.	Implementing an Enterprise Systems system using the Event Driven Process Chain; customizing and configuring enterprise systems
Controls	Control environment, Pervasive control plans, Application control plans	Simulation and optimization of business process performance	Controls available via SAP, security in enterprise systems
Business models	Cycles analysed in detail	Different approaches to business models	Cycles implemented in SAP, and links with business process modelling
Ethics	Taught as appropriate to all topics		Ethics in the selection and implementation of ES
Systems Development Lifecycle and process change	SDLC – including evaluation of SAP and other products using a case study	Process change emphasized as part of models	
Information Management	Discussed as part of each cycle		Management of and trends in Enterprise Systems
Demonstration technologies	MsAccess, Excel, Screenshots of SAP	ARIS	SAP and ARIS

ISSUES FROM THE LITERATURE

Use of common business processes

In the introductory unit (Business Information Systems), the business cycles used in typical merchandising and service firms are explored, namely the revenue cycle (order entry and sales, billing, accounts receivable and cash recipts), the expenditure cycle (purchasing, accounts payable, cash disbursements), the general ledger, and business reporting. See for example Gelinas and Sutton (2002).

In the subsequent unit, Business Process Integration and Modelling, the Supply Chain Operations Reference model (SCOR) is used. This is a framework developed by the Supply Chain Council (an organization with 800 members all over the world that include manufacturers, retailers, distributors, technology suppliers, implementers, academicians and government organisations). It is used to teach the concepts of modelling and integration beyond the enterprise and to the supply chain in an e-business context.

The third unit builds on the knowledge of business processes, process cycles, and business process management acquired in the previous units and develops an understanding of process and information flows through a detailed exploration of SAP. Business process integration is a central theme of this unit.

Mapping process modelling techniques to objectives

The choice of modelling tools is driven by the difference in objectives and emphasis of the three units, and on links to available technology. For the first unit (Business Information Systems) the emphasis is on understanding and evaluating current processes. The choice of tools is informed by the requirement to provide examples with contrasting strengths and weaknesses. Therefore logical data flow diagrams are compared and contrasted with physical flow charts, which are linked to control matrices. Choice of modelling techniques was also informed by prevalence and ease of use – students are likely to come across these diagrams in their working lives and can produce them by hand or using desktop products such as MsWord or MsVisio. Students learn to produce these models from narratives of example businesses, and from an integrative case study. During these exercises, debate is encouraged regarding the ability of each modelling technique to fulfil the objective for which it is designed. Other process modelling objectives (such as modelling future processes) are discussed as part of the Systems Development Lifecycle, and at this point, reference is made to the approaches taken in the BPIM and ES units. These units use the Event Driven Process Chain with ARIS, the process modelling tool and technologies accompanying SAP. In these units students build on the basic business process knowledge acquired in the first unit (BIS). They analyse those processes for redesign and improvement in the Business Process Integration and Modelling unit. In addition, students are exposed to the concept of business process simulation with the help of software and trained to develop skills in optimizing business process performance by considering cost, flexibility and quality. Students analyse business processes in a real business and model different granularities of processes (marcro and micro) from individual activites to inter-organisational interfaces. In the Enterprise Systems unit, students learn how to configure and customize a simple enterprise system by selecting the appropriate process cycles relevant to a particular business environment.

A brief comparison of the strengths and weaknesses of each tool has been agreed by the unit coordinators as indicated in Table 2 below. A comparison of each unit's objectives with Curtis's taxonomy is given in Table 3. This taxonomy has informed the production of a table comparing the objectives, emphasis and tools across the three units, as shown in Table 4. This comparative table is used as a basis to ensure that the different aspects of process modelling covered in each unit complement and contrast with each other.

Table 2: comparison of the process modelling tools used in the three units

	Flowchart	Logical Data Flow Diagram	Event-Driven Process Chain
Shows	Physical process flows – who, what where something is done	Data and process flows: what is done	Initial model shows event-process-event flow, at logical level. Has capability of overlaying this with physical – who – view, and how view via functions
Start and end points	External entity or "start" and "end"	External entities	Events
Decision branches	Not represented: decision branches shown as a sequence	Not represented specifically	Rigorously and specifically
Business strengths	Identifying many aspects of a process in one diagram Reasonably widely used Fairly intuitive	Identifying the core of what a business does Allows drill down Captures complete business process	Maps complex processes Identifies how businesses can change processes Captures complete business process Shows time and cost elements
Business weaknesses	Complex to produce and maintain Failure modes inadequately represented Does not show time and cost elements	Not widely understood Failure modes inadequately represented Does not represent controls Does not show time and cost elements	Not widely understood Would not fully represent controls Too complex to show initial physical process
Business uses	Representation of processes as they are now Identifying controls	Representation of what a business is doing	Representation of complex integrated processes What if analyses showing full business consequences
Pedagogical strengths	Shows many aspects of a process in one diagram	Rigorous definitions and interpretation Develops analytical and visual skills	Rigorous definitions and interpretation Develops analytical and visual skills
Pedagogical weaknesses	Lack of rigour in definitions and interpretation		Too complex for an initial introduction to process modeling?
Best used for	Initial introduction to representing physical processes and controls, particularly for auditing	Initial introduction to representing processes, particularly for requirements definition.	Advanced, integrated process mapping, evaluation and reengineering.
Broad business area	Auditing Implementation of simple software solutions	Requirements definition Evaluation of simple software solutions	Business process reengineering Complex software implementation

Table 3: Curtis's taxonomy applied to the three units

Process modelling objectives and goals (Curtis et al. 1992)	Business Information Systems	Business Process Integration and Modelling	Enterprise Systems
FACILITATE HUMAN UNDERSTANDING AND COMMUNICATION			
Represent process in form understandable by humans	Understand/ represent	Understand/ represent	Understand/represe nt
Enable communication about and agreement on software processes	Understand/represe nt	Understand/ represent	Understand /represent
Formalise the process so that people can work together more effectively	Produce standard diagrams	Use integrated modelling package	Implement ES solution
SUPPORT PROCESS IMPROVEMENT			
Identify all the necessary components of a process to ensure that it is complete	Business cycles and controls		Demonstrate via ES solution
Reuse well-defined and effective processes	Business cycles		
Compare alternative processes	Overview via SDLC	Produce reengineered solutions	
Estimate the impacts of potential changes to a process without first putting them into actual practice	Overview via SDLC	Evaluate reengineered solutions	
Assist in the selection and incorporation of technology (eg tools) into a process	Evaluate range of technologies	Use a process modelling technology	Use an ES solution
Facilitate organizational learning regarding effective processes	Documentation as an organizational resource	Compare current and proposed processes	Implement processes
Support managed evolution of a process		Conduct BPR and integration exercises	
SUPPORT PROCESS MANAGEMENT			
Develop a specific process to accommodate specific attributes such as its product, or organizational environment	Develop process documentation from case study	Reengineer processes from actual business examples	
Support development of plans (forecasting)	Event based data capture		
AUTOMATED EXECUTION SUPPORT			
Enforce rules to ensure process integrity	Controls		ES rules enforce process integrity

Table4: A comparison of objectives, emphasis, tools and implementation across the three units

	Business Information Systems	BPIT	Enterprise Systems
Objectives and emphasis	Modelling current processes Process controls Capturing and using high quality information Typical business processes (cycles) Improving processes via the Systems Development lifecycle Evaluation of alternative technologies	Modelling proposed, integrated processes	Implementing integrated process models Utilising best practice models for business processes (cycles)
Modelling tools	Logical Data Flow Diagrams Systems Flow Charts Control Matrices Entity Relationship Diagrams	Event Driven Process Chain ARIS	ARIS
Technology implementation	Ms Access and Excel (for ER diagrams),SAP screenshots	ARIS	SAP

Contextual issues and process modelling

With regard to contextual issues and students themselves: surveys have shown that the majority of students have no prior experience of process modelling. The Business Information Systems unit reflects this, by spending considerable time in introducing and reinforcing topics. Subsequent units make explicit reference to this prior learning. With regard to contextual issues and students' understanding of their role in process modelling success: students are encouraged to understand that the modelling techniques they use should be informed not just by the objectives they are meeting, but also by their prospective audience.

Prevalence of Enterprise Systems as a technology

In the first unit (BIS), Enterprise Systems are introduced as one of a range of technologies. In theoretical lectures and exercises, example processes are illustrated in many types of business, with different types of technological solutions. In addition, an integrative case study is used in a series of ten workshops. This describes a chaotic, small firm that, in response to growth opportunities, and requirements to interact with other organisations, needs to review its technological support. The case study is used as a mechanism to consolidate process modelling, to introduce the concepts of the Systems Development Lifecycle, to introduce SAP as a sample solution, and . In future semesters it is hoped that an alternative, non ES solution will also be introduced to these workshops.

Complexity of Enterprise Systems

The literature shows that Enterprise Systems have to be introduced not only as complex technologies, but also in terms of the complex effects on all areas of an organization. Introducing an appropriate level of critical evaluation at the first stage (BIS) is difficult given that students typically have very limited industry experience. However, precisely because of that inexperience it is important that they realize that they must think broadly to understand the impact of ES. A complete coverage of evaluation techniques for large software suites is not feasible or appropriate at this stage. Coverage of the systems development lifecycle also has to take into account the fact that students are not from a software engineering background. Coverage therefore centres around the integrative scenario , and guided class discussions incorporate the following issues:-

- length of time for which organization is likely to use the product it chooses. This question is an "eye opener for students. Their answers vary from "ten years" to "ages and ages", and they are then asked to consider how the business environment changed in the last ten years, as a context for their subsequent discussion.
- issues to be considered over that timeframe, including technical support, changing business environments, changing requirements of the business, technical integration with other businesses
- changes to work practices and culture of the organization if SAP were implemented.
- Ethical issues, particularly concerning preserving the continuity of service, integrity, security and confidentiality of information, providing products and services which match the needs of clients and employers and provide value for money, and health, safety, privacy, personal satisfaction and competence and control of those at work (ACS 2004).

In the subsequent units, the focus of the complexity discussion is on a more detailed, hands on understanding of the evaluation, configuration, and customization of typical ES technologies, and their potential for supporting complex, integrated processing.

Enteprise Systems and IS project success

In BIS, in theoretical lectures, students are introduced to the Systems Development Lifecycle. Some of the variables for project success form part of this discussion, as do anecdotes of and statistics on project successes and failures. The integrative case study moves on to consider some specific issues in an evaluation and implementation project.

Practical considerations

The BIS unit currently uses SAP screenshots only. There are plans to provide a very limited hands introduction to some aspects of SAP, during supervised laboratory sessions only. Subsequent units require students to undertake considerable amounts of hands on work, and so each enrolled student has their own account. Technical support for these units is found to be significant.

CONCLUSIONS AND FURTHER WORK

Process modelling and Enterprise System technologies have been introduced into three units of a Business Information Systems unit, in ways which allow students to gain not only knowledge of these tools, but also a critical appraisal of their benefits and weaknesses.

Further work will include consolidation of the courseware. For the first unit discussed, BIS, this will include limited hands on introduction to SAP, and introduction to one other technology as a comparison. For subsequent units, this will include higher levels of coordination with BIS.

Research will also be conducted to assess whether this course design is meeting its objectives. This will be done by a series of surveys of students, interviews, and comparison with examination and other assessment results.

COPYRIGHT

REFERENCES

ACS (2004). Australian Computer Society Code of Ethics, URL http://www.acs.org.au/national/pospaper/acs131htm accessed 20th Oct 2004

Becerra-Fernandez, I. et al. (2000). Integrating ERP in the business school curriculum. *Communications of the Association for Computing Machinery* **43**(4): 39-42.

Bradford, M., B. S. Vijayaraman, et al. (2003). The Status of ERP integration in Business School Curricula: Results of a survey of business schools. *Communications of the Association for Information Systems* **12**: 437-456.

Cecez-Kecmanovic, D. et al. (2002). Australian Business Education Study: enhancing the quality of Australian business education. URL http://www.autc.gov.au/projects/completed/aust_business_educ/split_pdf.htm accessed 20th Oct 2004

Cunningham, S. (1997). *New Media and Borderless Education: A Review of the Convergence between Global Media Networks and Higher Education Provision*. Commonwealth Australia, Canberra.

Curtis, B., et al. (1992). Process Modelling. *Communications of the Association for Computing Machinery* **35**(9): 75-89.

David, J. S. et al. (2003). Integrating Technology and Business Process Analysis into Introductory Accounting Courses. *Issues in Accounting Education* **18**(4).

DeLone, W. H. and E. R. McLean (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Upate. *Journal of Management Information Systems* **19**(4): 9-30.

Gelinas, U. J. and S. G. Sutton (2002). *Accounting Information Systems*, Thomson Learning.

Hammer, M. (1996). *Beyond Reengineering*. HarperBusiness, New York

Hershey, G. L. (2002). *A different focus and content for the core information systems course for business school majors.* Communications of the AIS **12**: 479-493.

Johnson, J. (2000). *The Chaos Report*, The Standish Group.

Kumar, K. and J. Van Hillegersberg (2000). ERP experiences and evolution. *Communications of the Association for Computing Machinery* **43**(4): 22-27.

Sedera, W., M. et al. (2001) Process Modelling for Enterprise Systems: Factors Critical to Success. *Proceedings of the Twelth Australasian Conference on Information Systems.*

Seethamraju, R. (2004). Effectiveness of a postgraduate program in enterprise resource planning incorporating SAP R/3. *Journal of Informatics Education Research.*

Skok, W. and M. Legge (2002). Evaluating Enterprise Resource Planning (ERP) Systems using an Interpretive approach. *Knowledge and Process Management* **9**(2): 72-82.

Snowdon, R. A. (2003). Overview of Process Modelling. URL http://www.cs.man.ac.uk/ipg/Docs/pmover.html accessed 20th Oct 2004

Teng, J., V. Grove, et al. (1996). Developing strategic perspectives on business process reengineering: From process reconfiguration to organizational change. *Omega, International Journal of Management Science* **24**(3): 271-294.

Urwin, G. (2001). Managing Complexity in Implementing ERP Projects. *Proceedings of Twelfth Australasian Conference on Information Systems.*

Van Everdingen, Y., J. Van Hillegersberg, et al. (2000). ERP adoption by European midsize companies. *Communications of the Association for Computing Machinery* **43**(4): 27-32.

Walker, K. B. and P. L. Ainsworth (2001). Developing a Process Approach to the Business Core Curriculum. *Issues in Accounting Education* **16**(1).

ACKNOWLEDGEMENTS

The contribution of all colleagues involved in delivering the units described, and of colleagues coordinating similar postgraduate units, is warmly acknowledged.