Journal of Information Systems Education, Vol. 15(4)

A Framework for Comparing IS Core Curriculum and IS Requirements for Accounting Majors

Christine P. Andrews
Judy Wynekoop
College of Business
Florida Gulf Coast University
Fort Myers, FL 33965 United States
candrews@fgcu.edu jwynekoo@fgcu.edu

ABSTRACT

Core curriculum in information systems is of vital interest to the information systems community. Long scrutinized by the academic community and various stakeholders, the content of information systems core curriculum is once again a topic of debate. Accounting has undergone similar curriculum examination (including technology curriculum) amid criticisms for a variety of accounting failures in the 1990s. We map information systems core curriculum frameworks to accounting core curriculum frameworks for information systems courses and confirm the value of a core information systems curriculum for accounting majors. Using industry perspective as a focus, a pilot study in a graduate accounting information systems course identified information systems topics that are of distinct importance to managerial accountants as opposed to public accountants, suggesting different information systems curriculum needs within the major. This study resulted in the development of a three-dimensional modular information systems curriculum model mapping topical areas in information systems to specific major with Bloom's taxonomy represented on the third axis indicating how the learning takes place. Examination of information systems topics required by major within business may help confirm the identity of core concepts in information systems.

Keywords: Information Systems Curriculum, Curriculum Frameworks, Accounting Information Systems Education

1. INTRODUCTION

As early as 1980, the legitimacy of Information Systems (IS) as an academic discipline has been questioned. Originally, computer science was a discipline that produced computer programmers. Now, IS is challenged to produce technologically literate information analysts in addition to programmers. The strategic role IS plays has grown with advances in computing hardware and software, as processing power, bandwidth and storage capacity have increased exponentially and are predicted to continue to do so in the foreseeable future. By the end of the 20th century, IS education suddenly impacted all fields in business and needed to respond quickly to changes in program demands. IS programs have been criticized for a failure to respond to the business community and for offering too narrow a focus (Simon and Wang, 1999). IS curricula may indeed not be aligned with business needs and the concept of a generic IS curriculum may be obsolete.

The accounting profession has undergone similar curriculum examination. Technology curriculum in accounting was addressed throughout the 1990s by the International Federation of Accountants (IFAC, IEG 11, 2003), the CPA Vision Project (1992), and by Siegel and Sorenson (1994). This paper examines curriculum frameworks in both IS and Accounting and maps identified IS course components to requirements identified by accounting curriculum developers. Accounting was chosen since information systems are highly concentrated in accounting as a discipline and because the accounting profession has been struggling with IS curriculum as has the IS discipline. A pilot study was conducted targeting accounting and using industry as a focus to identify required IS skills. The analysis indicated that there is consistency between IS and accounting core concepts, but there are also topics that may be particular only to accounting information systems. The comparison of models and industry data results in a multidimensional curriculum model that may be useful for future curriculum design in both IS and Accounting. The following section discusses the background of the IS curriculum debate.

1.1 IS Curriculum Background

The undergraduate and graduate "Introduction to Information Systems" courses taught at different universities not only have different names, but different content (Gil & Hu, 1999). Some are more oriented toward technology, others toward management. Given evolving

standards and tight budgets, some business schools have eliminated IS courses from the business curriculum (Avison, 2003). This topic drew fresh attention when AASCB International proposed diminishing the importance of IS in undergraduate business core requirements (Benbasat & Zmud, 2003). Many IS academics believe there is some core knowledge all business students should know that can only be addressed in courses offered by the IS department, such as systems thinking, technological infrastructures and organizational processes and information systems (Ives, et al, 2002).

Educators, however, are only one of the stakeholders involved in university curriculum design decisions. In addition to educators, students, and the business community and in some cases, taxpayers and their elected representatives also have different perspectives on curriculum design. Businesses may have a short-term perspective and want to hire college graduates who can use the latest technology and applications since new employees would be immediately productive, reducing training expense. Students are aware of what business wants and therefore seek courses on the latest technologies. Educators however, want students to develop an in-depth understanding of underlying concepts to prepare them for life-long learning, cognizant that the latest technology and applications will only help students get their first job (Lightfoot, 1999).

Thus, IS and accounting's curriculum design is faced with the challenge of balancing a flexible curriculum characterized by a short term perspective that focuses on current IS tools and technologies with a more set curriculum based on underlying fundamentals and a long term perspective. Study of required skills by industry may indicate significant differences between industries and help separate those skills that are common to all disciplines in business and thus appropriate for inclusion in general IS core courses.

2. Curriculum Models

The early 21st century brought considerable debate as to what "information systems" embraces as a discipline and its status as a reference discipline (Baskerville & Myers, 2002). Contrary to the assertions of those representing a business perspective on education that current tools and skills should be taught at universities to train students for their first job, some argue (Lightfoot, 1999) that businesses currently seek people who can analyze problems by drawing on cross-discipline knowledge. The latter note that current business school graduates view business processes from a functional perspective (e.g. as accountants, financial analysts, marketers, IS personnel), not from an integrative viewpoint and point out that IS integrates these disciplines by providing information management skills to support management processes at all levels both on an individual and organizational level (Ehie, 2002).

2.1 IS 2002 Model Curriculum and Guidelines

IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems (Gorgone, Davis, Valacich, Topi, Feinsten & Longenecker, 2002) describes two general IS courses intended to provide information technology knowledge and skills to all business students. These include IS 2002 (Personal Productivity with IS Technology) and IS 2002.1 (Fundamentals of Information Systems). These curriculum guidelines were developed by a collaborative effort of key IS organizations (Association for Computing Machinery, Association for Information Technology Professionals, and the Association for Information Systems).

The IS curriculum is designed with the assumption that students possess prerequisite skills in software packages commonly used or have access to remedial modules that can provide these skills. Prerequisite skills include basic proficiency in e-mail, web browsing, spreadsheets, word processing, desktop database management systems, presentation graphics, and external database retrieval tools. Coursework in IS is programmatically organized into 3 levels including general courses that apply to all students regardless of majors or minors; courses for majors and minors in IS; and specialized application development and project management courses for IS majors. We are focusing on the prescribed content of general courses that apply to all students.

The first core course IS 2002 – Personal Productivity with Information Systems Technology, emphasizes personal productivity concepts. The second core course IS 2002.1, Fundamentals of Information Systems focuses on the use of information technology (IT) in organizations. Although the curriculum model arranges topics by course, topics may be taught in either course. Table 1. IS 2002 Personal Productivity with IS Technology summarizes course topics and learning unit goals for IS 2002. Learning unit numbers are divided between the two courses. The "Topic" column was added by the authors to facilitate comparison between curriculum models.These learning goals were designed to provide students with a broad introduction to the field of IS and focus primarily on improving personal productivity. Key IS topics including advanced personal software skills, systems development, and data management provide students with a foundation for careers in any field in business.

Table 2. IS 2002.1 Fundamentals of Information Systems, summarizes course topics in the second core course and is also designed for all Business students. This course broadens the focus to the use of information technology in organizations, explaining how IT enables improvement in quality, timeliness, and competitive advantage. This second core course extends student knowledge beyond individual applications of IT to the importance of IT to the organization. The personal use of IT for problem solving is expanded to organizational uses of information to improve overall quality and organizational business processes; personal data management concepts are expanded to

Table 1. IS 2002 Personal Productivity with IS Technology

Topic	Course Topic	Learning Unit No.	Sample Learning Unit Goals Description
Productivity	Knowledge work productivity concepts	1 3 4 13.1	Introduction to systems and IT (information technology) definitions; Introduction to problem solving; Relevance & application of IT in society; The concept of knowledge work;
Software	Advanced software functionality to support personal and group productivity such as templates and macros	2 13.2 13.3 13.4 13.5 13.13 13.14	Development of skills to effectively use standard software packages including document design, presentation and web authoring tools; Relation between individual vs. organizational IS requirements; Introduction to concepts of individual vs. collaborative knowledge work; To describe and explain goals and processes of analysis, documentation, IT for individuals and groups; Concepts and principals of management of individual software and data Design a graphical user interface facility Present the prototype process
Systems development		13.8 13.9 13.10 13.11 13.16	System development life cycle including acquisition vs. development Use of general purpose and application software Explore software development approaches Explore algorithm and structured code development To identify, investigate, analyze, design and develop with packages to enhance personal productivity
Data Organization and Management	Organization and management of data via spreadsheets and database tools	13.6 13.12	Explain organizational database concepts, complements, structures, access, security, and management considerations Use a relational database software package
Data access	Accessing organizational and external data; Information search strategies; Tool use optimization and personalization	13.7	Content, availability and strategies to access information external to the organization
Future of IS	Changes in technology	13.15	Present foundation technologies and importance in future IT capabilities

organizational database architecture, and data access techniques are expanded to include networking. Again, both of these courses are designed for all business majors. The curriculum was developed based on the expected requirements of industry.

IS academics also addressed this issue and believe there is some core knowledge all business students should know that can only be addressed in courses offered by the IS department, such as from Ives, et al, (2002). Ives et al (2002) key IS concepts map fairly closely to the topics identified in the IS 2002 Model Curriculum. Ives et al (2002) key concepts exclude learning goals related to personal software productivity and careers in IS but otherwise provide an articulation of the goals of IS curriculum. Model details are provided in Appendix 1 IS Curriculum Framework.

A graphic depiction of IS skills required of all business majors appears in Figure 1. IS Skills for All Business Majors. The x-axis represents the targeted population by major. The y-axis uses Blooms taxonomy (Bloom, 1956)to indicate how the learning takes place. The third dimension represents the topical areas of IS. Most topics covered in IS 2002 would generally be categorized as comprehension / remembering in the technological / operational area and

Table 2. IS 2002.1 Fundamentals of Information Systems

Topic	Course Topic	Learning Unit No.	Sample Learning Unit Goals Description
Systems	Systems concepts System components and relationships	5	To introduce systems and quality concepts
	Cost/value and quality of information	6	To provide an introduction to the organizational uses of information to improve overall quality
Competitive advantage	Competitive advantage of information	9	To show how IT can be used to design, facilitate, and communicate organizational goals and objectives
	Specification, design, and re-engineering of IS	8	To provide concepts and skills for the specification and design or the re-engineering of organizationally related systems of limited scope
Software	Application vs. system software Package software solutions	7	To present hardware, software and related IT concepts
Programming	Procedural vs. non-procedural programming languages Object oriented design		
Database	Database features, functions, and architecture		
Networks	Networks and telecommunications systems and applications		
Careers	Characteristics of IS professionals and IS career paths	11	To show career paths in IS
Ethics	Information security, crime and ethics	12	To present and discuss the professional and ethical responsibilities of the IS practitioner

most topics covered in IS 2002.1 would move further up the x-axis from comprehension/remembering to analysis/application and deeper into the matrix to usage/product. For example, knowledge work and productivity concepts (learning unit goals 1,3,4 and 13.1) covered in IS 2002 would be comprehension/remembering of technological / operational information and advanced software functions (learning unit goal 2) would move further back to usage/product. Similarly, software topics covered in IS 2002.1 would move further up the x-axis to analysis and application of how software strategically applies to organizations and management. This representation of topics is not viewed as discrete "cubes" but as part of a range or continuum.

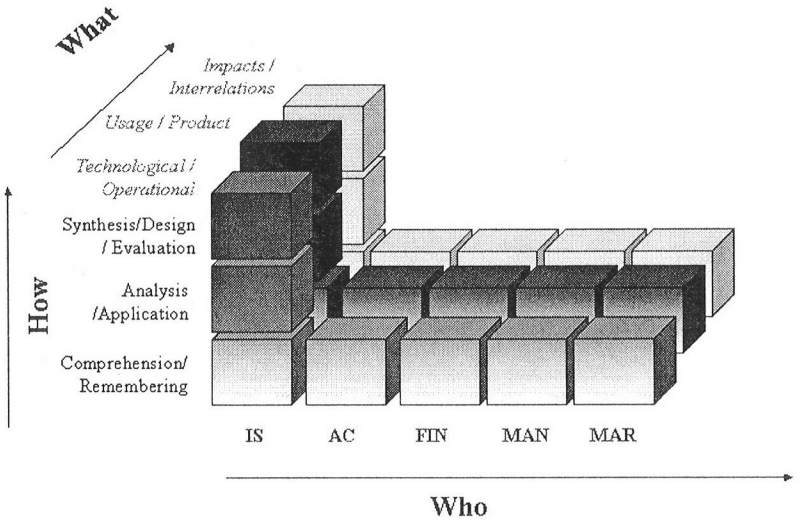
IS curriculum begins with a focus on the individual and how IS impacts personal productivity and broadens that focus to apply these same concepts to organizations. These topics presumably apply to all business majors. In the next section, we compare accounting IT curriculum models to IS models highlighting the overlap between the models. This overlap confirms the IS core curriculum topics and identifies some issues that may be important from a particular perspective within accounting.

2.2 Accounting Information Systems Curriculum

Although computer science and IS majors build and maintain the infrastructure over which business processes run, business graduates must understand how the technology and systems work as well as how they can be used and misused, in order to effectively plan, create and manage the infrastructure and business processes that depend on them. Accountants are involved as users of IS for financial statement and tax return preparation; as developers of IS to support internal business processes, and as evaluators of IS in their role as auditors (International Federation of Accountants, 2003).

The accounting profession has been re-examining curriculum since the 1990's in an effort to prepare students for the increasing rate of change in business. The profession also studied the necessary academic preparation of students to be CPAs (CPA Vision Project, 2004). Included in this effort was the study of IS skills to be included in accounting education. Research in this area has focused on what employers want in accounting graduates (Seigel and Sorenson, 1994), and on knowledge and skills that should be incorporated into accounting courses (IFAC, 2003). Both the IFAC study and the Vision Project resulted in frameworks that include elements of information systems.

Figure 1. IS Skills for all Business Majors



The International Federation of Accountants (2003) and the CPA Vision Project (1994) prepared two major skills inventories for professional accountants. The CPA Vision Project developed IS knowledge and skills deemed necessary to both prepare students for the accounting profession and maintain skills in professional accountants. The CPA Vision project is a profession-wide initiative to poise CPAs both as individuals and as organizations to respond to change. The IFAC's Information Technology for Professional Accountants - International Education Guideline 11 (IFAC, 2003) provides an inventory of required IS knowledge and skills for accountants. The Vision Project is discussed first, followed by skills listed in IFAC IEG 11 (2003).

2.2.1 CPA Vision Project With input provided by CPAs across the nation, the Vision developed the top five values, services, competencies, and issues of concern and interest for professional accountants. The five core competencies include communication and leadership skills; strategic and critical thinking skills; focus on the customer, client and market; interpretation of converging information; and technology skills. The fifth core competency - technology skills - affirmed that CPAs should be able to utilize and leverage technology in ways that add value to clients, customers and employers. In 1999, the American Institute of Certified Public Accountants endorsed a Vision-aligned online academic competency framework for use by educators to develop curriculum to support changes envisioned by the profession. The framework identifies core functional, personal, and broad business competencies that are consistent with the CPA vision. The competencies support a paradigm shift from a content-driven to an outcome-driven curriculum.

Competencies are categorized as functional (technical competency), personal (individual attributes), and broad business perspective (related to an understanding of internal and external business context). Each competency (functional, personal, and business perspective) in turn includes a section that focuses on *leveraging technology to develop and enhance* the competency. Functional competencies relate to technical competency and include skills to determine how new technologies should be best incorporated into CPA practices. Personal competencies relate to attitudes and behaviors of future accountants and are related to the enhancement of professional relationships and the facilitation of learning. The accounting professional must commit to continual learning to both acquire new skills and to determine how to incorporate new technologies. The final recommendation included elements to enhance a broad business perspective. These recommendations focus on gaining an appreciation of the effects of technology on the broader business environment. Table 3. CPA Vision Project maps the Vision elements to IS model curriculum topics.

Mapping the Vision elements to the IS 2002 curriculum model does not reveal obvious groupings of personal, business or functional skills. However, it does indicate that risk assessment and controls are of particular importance to accountants and not addressed to this level of detail by the IS core. In addition, systems development, software, programming and careers were not identified as key technology skills for certified public accountants. Note however, that public accounting is only one career path for accountants. A graphic representation of IS education for accounting majors follows in Figure 2. IS Skills for Accounting Majors

Table 3. CPA Vision Project – Elements relating to Leveraging Technology

Topic	Type	Vision Element
IS 2002 Productivity	Personal	Exchange information using communication technologies such as email, discussion boards, and video-conferencing
Software	Functional	Use electronic spreadsheets and other software to build appropriate models and simulations
Systems Development		
Data Org and Mgt	Business	Mine electronic data for business and industry information
Data Access	Functional	Access databases to obtain decision-supporting information
Future of IS	Business	Recognize business opportunities and risks associated with e-commerce
IS 2002.1 Systems	Personal	Explore new technologies and their application to business and accounting scenarios
Competitive Advantage	Business	Use technology to develop and present strategic information
Software		
Programming		
Database	Business	Recognize common information architectures
Networks	Personal	Acquire skills through technology-based learning modules when available
Careers		
Ethics	Personal	Address privacy, intellectual property rights and security issues related to electronic communications
Not in IS 2002		
Risks & Controls	Functional	Use technology to assess and control risk and document work Assess the risk of technology and automated business processes

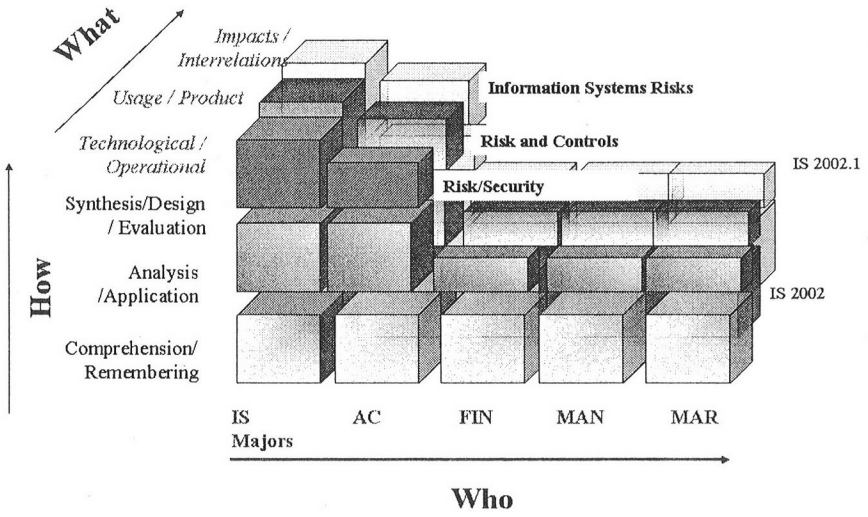
Topics of increased importance to accounting majors (i.e. risk assessment and controls) are represented as upper level skills in the accounting dimension and without sufficient demand from other non-IS business majors would likely be taught within accounting (i.e. Accounting Information Systems). The x-axis represents student population by specific major and the z-axis represents the topical areas of IS. The x-axis uses Blooms taxonomy to indicate how the learning takes place. For example, to introduce and explore application software would be a usage/product learning goal with the objective that the learner be able to apply the software to a business case; to analyze, design and develop an information system application would be a learning goal at the usage/product level, and would also effect impacts/interrelationships learning goals. To achieve this goal, the learner would utilize synthesis / design / evaluation. For accountants, identification of risks and controls would involve analysis and application within the technological/operational aspects of organizations and would be a topic that may not be important to finance, marketing or management majors.

2.2.2 International Federation of Accountants The International Federation of Accountants (IFAC) is the global organization of the accounting profession whose "overall mission is to serve the public interest, strengthen the worldwide accountancy profession, and contribute to the development of strong international economies" (from http://www.ifac.org/About/, 2004). The Education Committee of IFAC issued Guideline 11 (IEG 11, 2003) "Information Technology for Professional Accountants" in January 2003. This guideline was first issued in December 1995 and the guideline has been reviewed each year since issuance. Part of the mission of the IFAC is to enhance the accounting profession with harmonized standards. The IFAC views technological competence as imperative for the professional accountant. The purpose of IEG 11 was to assist members to prepare professional accountants to work in the information technology environment. The guideline outlines general IT knowledge requirements, knowledge and competency requirements related to IT controls, and requirements related to the professional accountants' role as user, manager, designer, and evaluator of IS.

IEG 11 points out that rapid change in IT has created challenges that the accounting profession must address, namely:

- IT is affecting the way in which organizations are structured, managed and operated.
- IT is changing the nature and economies of accounting activity.
- IT is changing the competitive environment in which professional accountants participate.

Figure 2. IS Skills for Accounting Majors



IEG 11 states that accountants need to possess entry-level competencies in core IT areas prior to qualifying for membership in the profession. Further, competencies include both relevant conceptual knowledge and practical, concrete skills. Conceptual material should form a foundation for the development of practical skills. IEG 11 provides competency requirements in the following areas:

- General IT knowledge requirements related to business systems
- Knowledge requirements related to IT controls
- Competency requirements related to IT controls
- Competency requirements related to the role as user
- Role related competency requirements associated with generic IT roles as manager, designer, or evaluator of IS

General IT knowledge requirements include IT architecture, systems acquisition and development, management of IT, IT strategy and business process enablement related to business systems. IT controls knowledge requirement include control objectives and frameworks, layers and responsibility for control, control environment, risk assessment and control activities, information and communication and monitoring of control compliance. These concepts are considered essential to the body of IT control knowledge that all accountants should possess. IT control competency requirements relate to the selection of suitable control criteria to evaluate and analyze: controls; system acquisition/development process and controls; risk assessment processes and activities; system processing operations and controls; and monitoring processes and activities.

Personal Productivity with IS emphasizes personal productivity concepts; computer software such as spreadsheets, databases, and presentation graphics; and Web authoring tools. Fundamentals of Information Systems focuses on how information is used in organizations and how IT is used to make an organization competitive. Table 4. IS Curriculum Topics and IFAC Guideline 11 maps IS topics previously identified to IFAC prequalification knowledge requirements and role competencies. Examination of the table reveals that the majority of IS topics were also of importance to IFAC IS curriculum as either a prequalification requirement or a role competency. The "Future of IS" was not specifically addressed by IFAC but was included by the authors in the role competency of "exploring new technologies and their application to business and accounting." Processes, Risks and Controls, and Continuing Education are topical areas identified by IFAC IEG 11 (2003) but were not previously identified as IS core curriculum topics. Both processes and risks and controls are topics that are of vital importance to accounting majors but may not be of value to general business majors. These topics would be addressed in accounting information systems courses within accounting. IFAC IEG 11 (2003) is a broader concept than the CPA Vision Project (1994) because IFAC standards apply to both CPA and management accounting career tracks. This framework corresponds with topics identified by the CPA Vision Project (1994) and further confirms IS curricular components as identified by IS 2002 and IS 2002.1. (2002) Note also that no core IS curriculum topics were left unidentified by IFAC IEG 11 (2003).

2.3 Industry Perspective

Siegel and Sorensen (1994) surveyed the needs of corporate executives concerning the appropriate preparation for entry-level *management* accountants. The purpose of this study was to identify accounting knowledge and skill areas to be included in academic preparation. Their results indicated that universities were doing the best job teaching computer literacy (this category received the highest mean evaluation

Table 4. IS Curriculum Topics and IFAC Guideline 11

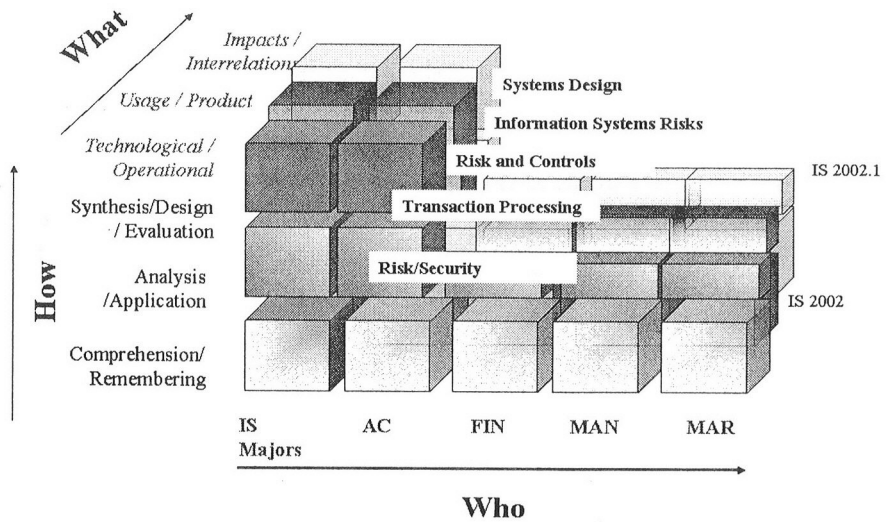
Topic	**IFAC Prequalification Knowledge requirements**	IFAC Competencies
	Includes general, control knowledge, and controls competency	*Accountant as User, Manager, and* ***Evaluator of Information Systems***
IS 2002 Basic IS Concepts	General systems concepts and physical and hardware components	Builds appropriate models and simulations using electronic spreadsheets and other software
Productivity		Exchanges information using appropriate communication technologies such as email, discussion bards and video-conferencing
Software	Software	
Systems Development	Systems acquisition and development process	
Data org and Mgt	Data organization and access methods	Accesses appropriate electronic databases
Data Access		Mines electronic data sources for business and industry information
Future of IS		Explores new technologies and their application to business and accounting
IS 2002.1 Systems	General systems concepts Physical and hardware components	
Competitive Advantage	IT strategy including ERP and strategic planning	Uses technology to develop and present strategic information
Software	Systems acquisition and development process	
Programming	Protocols, standards, enabling technologies	
Database		Recognizes commonly used information architectures
Networks	Networks and electronic data transfer	Recognizes business opportunities and risk associated with electronic commerce
Careers	IT professionals and career paths in IT management Management of IT	
Ethics		Addresses privacy, intellectual property rights and security issues
Not in IS 2002 Processes	Transaction processing in typical business and accounting applications. Business process enablement	
Risk and controls	Control objectives and frameworks; risk assessment and control; monitoring of compliance. Evaluation of control environment, systems acquisition development process, risk assessment processes, processing operations and controls, monitoring activities	Assesses the risk of technology and automated business processes. Uses technology assisted tools to assess and control risk and document work performed
Continuing Education		Acquires skills through technology based learning modules when available

score of 68 out of 100). Information systems design was identified as part of the essence of management accounting. These executives perceived a major difference between skills required for management accountants and skills required for public accountants. Academic preparation for accountants focuses mainly on providing knowledge to enable students to pass the CPA exam and secure jobs in public accounting. Management accountants need skills that support business operations including budgeting, cost-volume-profit analyses, and systems design. The content of accounting information systems courses is currently undergoing a shift in emphasis from the conceptual understanding of accounting business processes (revenue, purchases, and production cycles) to an enterprise wide view of information systems including value system and value chain modeling in addition to accounting systems modeling. (Dunn, Cherrington and Hollander, 2005)

Examination of the matrices related to IS curriculum, the Vision Project and IEG 11 reveals that no study specifically identified systems design as a core competency; yet industry executives identified systems design as the essence of management accounting. IS curriculum places systems design in the body of knowledge required for IS majors and doesn't include it in IS core courses for all business majors. Both the Vision Project (1994) and IFAC IEG 11 (2003) include using systems and accessing information but neither address designing systems. In this case, use of an industry perspective identified a critical area for accounting competency.

The following graphic represents curriculum content for accounting majors adjusted for topics identified in Siegel and Sorenson (1994) as well as the Vision Project and IFAC IEG 11. Note that areas that require greater understanding move from comprehension to analysis and evaluation. In addition, users skills range from understanding the technology to being able to use the technology and appreciate the impacts and interrelationships of the issue.

Figure 3. IS Skills for Accounting Majors including Industry Perspective



To gain more information on employers' perspectives relative to IS curriculum topics, a graduate class of one of the authors conducted a simple research project to gather preliminary data that investigated the applicability of the Vision Project to local area employer needs. A stratified sample of 100 firms from the top 10 industries in southwest Florida was selected from the *Reference USA* business database. Companies with over $5 million in revenue and with over 20 employees were selected from Lee and Collier counties. Local counties were selected as a convenience sample to reduce telephone costs for the interviewers. A total of 1300 companies in Lee County and 1000 companies in Collier County fit these parameters. Companies were then sorted by North American Industry Classification System (NAICS) code. The largest 10 to 15 companies were chosen from industries with the largest number of companies per classification and distributed to the interviewers.

A list of IS topics generally covered in a required information systems course was developed by one of the authors who has taught the course for several years. The class's charge was to review the list for understandability and prepare a questionnaire to use to interview the employers. The students developed the questionnaire and the questionnaire format, deciding on the use of a 5 point

Likert scale to rank the answers ranging from 5 for very important to 0 for minimally important. The students provided topic details for their use to insure consistent explanations of IS topics. Students specialized in one industry, calling specific businesses within one industry. Students interviewed a contact at each firm who would be in charge of hiring new accounting staff. Students contacted all employers at least twice, leaving messages when not successful contacting the individual at first. Results were then tabulated and summarized. Usable results were obtained from the following industries in Table 5. Surveyed Industries:

Table 5. Surveyed Industries

Industry	Number of Firms
Healthcare	10
Banks	4
Retail	4
Manufacturing	2
Education	8
Hospitality	7
Retirement	7
CPAs	5
Construction	4

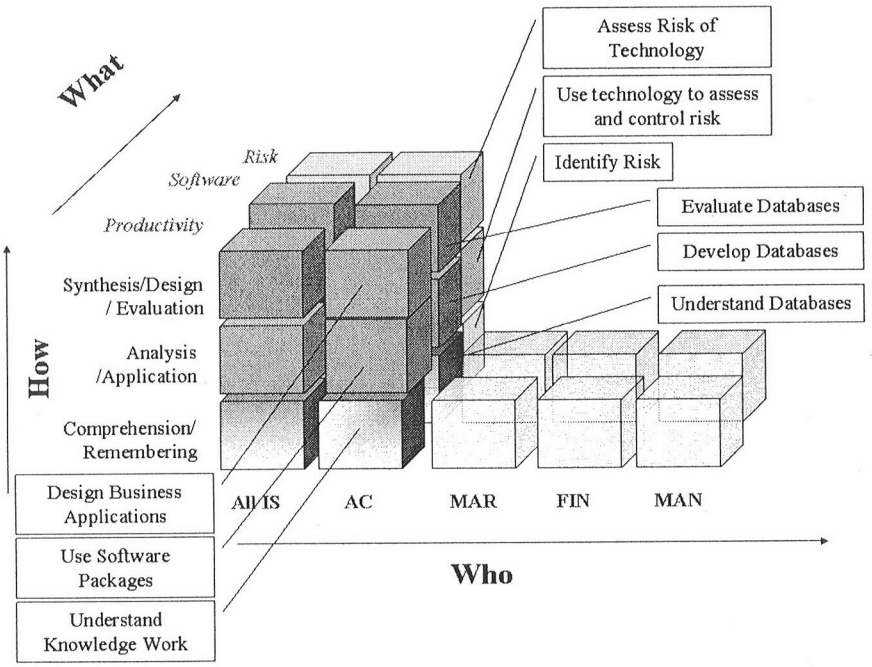
The most important IS concepts for a new accounting hire included database management systems, systems security and privacy, transaction processing systems, and software. Least important concepts included networks and database development. The industry perspective confirmed topics identified by IS and accounting curriculum models as well as identified additional topics that are important for managerial accountants, a specialty within accounting. Use of the modular curriculum model with the addition of a third dimension further refined topical identification by major to identification the depth of learning necessary for the profession. Expansion of this concept to all business majors may result in identification of other common areas or overlap between majors. The following exhibit represents modular components of accounting technology education utilizing Bloom's taxonomy (1956) by topic.

3. CONCLUDING REMARKS

Three aspects of this work contributed to our concept of IS curriculum development; curriculum model comparison, industry's perspective in the pilot study, and the use of a modular approach to curriculum development. Analysis and comparison of IS curriculum models and other business majors' curriculum models is one approach to validate a core curriculum in IS. Similar analyses of curriculum models relative to technology requirements in finance, management, and marketing may support this analysis and enrich the distinctions between levels of understanding required by major. The comparison was of interest in terms of overlapping topical coverage as well as excluded topics and challenged our preconceived notions of course content.

This pilot study was tested on a regional population to obtain preliminary data about employer technology

Figure 4. Modular IS for Accounting Majors



preparation beliefs. Industry's perspective highlighted varying degrees of importance of business process, systems design, and risk and controls for example depending on the industry. Interviews with industry may also be useful in identifying contents of core technologies required by business and in further delineating sub specializations within a major. Further work remains to be done in test instrument development and validation as well as sample selection to validate the preliminary results obtained in this study.

Use of a three dimension modular model for curriculum development could be a useful tool to further refine topical coverage to include a measure of depth and express the finer distinctions identified in model comparisons by major and by industry analysis. All core IS topics can be thought of on a continuum with a dimension expressed by Blooms taxonomy (1956). Areas of overlap between business majors could indicate candidate topics to be included in the IS core curriculum.

4. REFERENCES

AACSB International. Eligibility Procedures and Accreditation Standards for Business Accreditation. Retrieved March 1, 2004 from http://www.aacsb.edu/accreditation/business/standards01-01-04.pdf

Alsop, Stewart. (1999) "E or Be Eaten", Fortune, Nov. 8, p. 86.

Avison, David. (2003), "Information Systems in the MBA Curriculum: An International Perspective," Communications of the Association for Information Systems, Vol. 11, No. 6, p. 1-22.

Andrews, Christine P. and Judy Wynekoop. (2003), "IS in the Accounting Core Curriculum and Employer Knowledge Requirements: Integrating Research into a Graduate AIS Course", presented at the 2003 Americas Conference on Information Systems, pp. 590-594.

Baskerville, Richard.L. and Michael D.Myers, (2002), "Information Systems as a Reference Discipline." MIS Quarterly, Vol. 26, No. 1, p 1-14.

Benbasat, Izak. and Robert Zmud, . (2003), "The Identity Crisis Within the IS Discipline: Defining and Communicating the Discipline's Core Properties", MIS Quarterly, Vol. 27, No. 2, p. 3-16.

Bloom, Barry S. (Ed.) (1956), Taxonomy of educational objectives: The classification of educational goals: Handbook I, Cognitive Domain. New York; Toronto: Longmans, Green.

CPA Vision Project. (2003), Retrieved from http://www.aicpa.org/vision/ on March 1.

Dunn, Cheryl.L, J. Owen Cherrington, and Anita S. Hollander. (2005), Enterprise Information Systems. 3rd edition. McGraw-Hill Irwin. New York.

Ehie, Ike.C. (2003), "Developing a Management Information Systems (MIS) curriculum: Perspectives from MIS practitioners." Journal of Education for Business. Vol. 77, Iss. 3; p. 151-159.

Gill, T.Grandon. and Qing Hu, (1999), "The Evolving Undergraduate Information Systems Education: A Survey of U.S. Institutions," Journal of Education for Business, May/June, p. 289-295.

Gorgone, JohnT., Gordon Davis, , Joseph Valacich, , Heikki Topi, David L. Feinstein, & Herbert E. Longenecker, (2003), "IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems." Communications of the Association for Information Systems. Vol. 11, p. 1-53.

Information Technology for Professional Accountants. (2003), International Education Guideline 11. Issued by the International Federation of Accountants. Retrieved November 1, 2004 from http://www.ifac.org/Store/Category.tmpl?Category=Education&Cart=1086446191405771

Ives, Blake, Joseph Valacich,, Richard Watson, Robert Zmud, et al. (2002), "What Every Business Student Needs to Know About Information Systems," Communications of the Association for Information Systems, Vol. 9, No. 30, p. 1-16.

Lightfoot, Jay .M. (1999), "Fads versus fundamentals: The dilemma for information systems curriculum design". Journal of Education for Business. Vol. 75, Iss. 1; p. 43-51.

Lee, Denis.M., Elaine M. Trauth, ., and Douglas Farwell, (1995), "Critical skills and knowledge requirement of IS professionals: A joint academic/industrial investigation." MIS Quarterly, Vol. 19, No. 3, p. 313-340.

Pyrczak, Fred (1999), Evaluating Research in Academic Journals. Pyrczak Publishing, Los Angeles, CA.

Siegel, Gary and James Sorenson. (1994), "What Corporate America Wants in Entry-Level Accountants," Management Accounting, September, p. 26-31.

Simon, Steven J. and S.Michael Wang,. (1999), "The Current Status of the IS Discipline: A Survey of American and International Business Schools," Information Resources Management Journal, Vol. 12, No. 2, p. 5 – 15.

AUTHOR BIOGRAPHIES

Christine P. Andrews is an Assistant Professor of Accounting at Florida Gulf Coast University. She has worked as a CPA in public accounting, a cost analyst in manufacturing, and as an analyst in banking. She holds a D.B.A. in Accounting from Cleveland State University. Her current research interests include pedagogical issues including service learning and distance education and issues related to environmental accountability. Her research has appeared in *The CPA Journal, Journal of Accountancy, Commercial Law Journal* and *Business Horizons.*

Judy L. Wynekoop is Professor of Information Systems at Florida Gulf Coast University. Her previous experience includes work in the private sector as a systems auditor and loss control analyst, and in government as a criminal investigator. She holds a PhD from the College of Business at Georgia State University. Her current research interests include team processes and performance, systems development, and pedagogical issues. Her research appears in *The Data Base for Advances in Information Systems, IEEE Transactions on Engineering Management, Information Systems Journal, Communications of the Association for Information Systems,* and *Information Technology & People.*

Appendix 1
IS Curriculum Framework (Ives et al, 2002)

Topic (authors)	Topic (Ives)	KEY IS CONCEPTS	SAMPLE LEARNING OBJECTIVES
Systems	Nature of IS	What are information systems?	• Explain the nature and interaction of technology, people, and organizational components • Distinguish between data, information and knowledge • Introduce elements of systems thinking - boundary, environment, scope, hierarchical decomposition, decoupling, etc
Competitive Advantage	Organizational Competitiveness	How do information systems influence organizational competitiveness?	• Discuss the use of IS for automation, integration, organizational learning, reengineering, and strategy • Understand the need to align IT investments with strategic plans • Understand how IT can be used to achieve and sustain competitive advantage • Discuss how IS can both constrain and enable organizations
Database	Databases	Why have databases become so important to modern organizations?	• Understand the nature, importance of, and uses for an integrated database • Understand the concept of, and means to ensure, data integrity • Explain the value of data warehousing and data mining concepts
(not specified	Infrastructure	Why are technology infrastructures so important to modern organizations?	• Explain the nature of, and organizational dependence on, technology and business platforms • Explain concepts of interoperability and scalability as well as the role of standards • Compare open versus proprietary architectures • Understand the problems in justifying investments in infrastructure • Recognize total cost of ownership for technology investments
Networks	Networking	What is the role of the Internet and networking technology in modern organizations?	• Discuss networking concepts, components, capabilities, and trends • Distinguish among internets, intranets, extranets • Describe the evolution of e-business and how e-business is transforming organizations and markets • Explain organizational implications of the pervasiveness of the Internet • Describe the development and impact of wireless networks and ubiquitous computing

(Not specified)	Economics of information and IS	What are the unique economics of information and information systems?	• Understand the economic characteristics of the information economy • Understand the cost structure of information systems and technology • Describe unique features of information economics – network effects, versioning and pricing of information products, lock-in, and so on
(Not specified)	Business Process	How do information systems enable organizational processes?	• Explain the importance of enterprise-wide business processes and associated IS roles • Explain the importance of extra-enterprise processes e.g., supply chain and CRM, and associated IS roles • Describe the various types of IS in support of operational, managerial and executive-level processes.
Systems Development	IS development	How do organizations develop, acquire and implement information systems?	• Understand the difficulties in designing and building IS well as the strength and weaknesses of alternative development processes • Understand the trade-offs involved in developing software in-house, using a domestic or offshore provider, and buying off-the-shelf packages • Understand the trade-offs involved in developing software in-house, using a domestic or offshore provider, and buying off-the-shelf packages • Understand the difficulties in implementing IS and in leveraging the full potential of IS
(not specified)	IS management	What is the nature of IS management?	• Discuss the evolving and current roles of enterprise IS management • Explain the operating, managerial and strategic processes associated with IS management • Discuss advantages/disadvantages of alternative governance structures for IS management • Discuss IT sourcing and contractual and relationship management with third-party service providers • Consider the unique problems of managing IT in globally dispersed organizations
Ethics	Ethics	What ethical, criminal and security issues do organizations face when using information systems?	• Explain what is meant by computer security and describe methods for providing computer security • Introduce the nature of computer crime • Consider cross-border implications regarding privacy of data and integrity of Internet