Assessment Of An Accounting Information Systems Curriculum: An Analysis Of The International Federation Of Accountants' International Education Guideline No. 11

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Abstract

This paper evaluates our current Accounting Information Systems (AIS) curriculum, developed using a Model-Oriented, Tool-Enhanced (MOTE) framework, by comparing it to the recommendations of the International Federation of Accountants' (IFAC) Guideline No. 11. The IFAC recommendations offer guidance on the information technology content in accounting curricula and are supported by the AICPA. The evaluation resulted in suggestions for improvements to our existing curriculum. An analysis of the guideline was also completed.

Introduction

There are a variety of approaches to develop meaningful and relevant Accounting Information Systems (AIS) curricula. Over the past several years, a number of people (e.g., Borthick, 1996; Davis & Leitch, 1988; Groomer & Murthy, 1996; Macur, 1998) have expressed the need for curriculum reform and described existing curricula. It is also well documented that AIS is still taught very differently at different institutions (e.g., Hall, 1998; Macur, 1998; Smith & Bain, 1993). However, little research has been conducted in evaluating AIS curricula against the International Federation of Accountants' (IFAC) International Education Guideline (IEG) 11, "Information Technology In The Accounting Curriculum" (IFAC, 1998, hereinafter IEG 11). This guideline is supported by the AICPA (1996), and is the only authoritative AIS curriculum guidance offered since 1987, when the AAA Committee on Contemporary Approaches to Teaching Accounting Information Systems recommended curricular objectives for AIS (AAA, 1987; Macur, 1998). The purposes of this paper are to assess an existing AIS curriculum, by evaluating it against the IFAC recommendations, and to analyze the IFAC guideline.

Readers with comments or questions are encouraged to contact the authors via e-mail.

The content and conduct of AIS courses reflect the lack of consensus, both on what should be taught and how it should be taught. Course content ranges from workstation skills, such as word processing, spreadsheet, and database skills, to theoretical systems approaches, with an emphasis on diagramming techniques (e.g., systems and document flowcharts) associated with traditional accounting cycles. Orientations can range from a managerial emphasis to a financial accounting emphasis. Moreover, the conduct of the courses can range from a conventional lecture-discussion approach to a computer projects-based approach. This lack of consensus can probably be attributed to the lack of a standard framework for developing AIS curricula and a continually evolving technological environment.

Recently, a Model-Oriented, Tool-Enhanced (MOTE) (Callaghan et al., 1998) framework was advanced and implemented as the basis for an AIS curriculum. This is the curriculum that is being assessed. The MOTE framework follows a systems-development-life-cycle approach, with the incorporation of Information Engineering (IE) (Martin & McClure, 1988) principles. Activity, data and interaction modeling skills are emphasized, and an integrated software engineering toolset is used for planning, analyzing, designing and constructing accounting information systems. Building on Callaghan et al.'s work, which operationalizes the *REA* model promulgated by McCarthy (1979, 1982), the MOTE framework has been augmented by guidance from the literature, current texts, and the authors' recent industry experiences. In addition, their experiences from teaching, working with faculty, and faculty internships in the information systems area were used in the curricular development.

The analyzed AIS curriculum spans several courses. Two prerequisite Management Information Systems (MIS) courses are included, while the core of the curriculum consists of a three-course AIS sequence. The major elements of these courses are grouped into a content scheme and serve as the basis for a comparison with the prequalification educational requirements identified by IFAC.

The remainder of the paper is organized as follows. The next section summarizes the IFAC framework. The third section presents the existing AIS curriculum, maps the curriculum elements to those of the IFAC guideline, and identifies apparent weaknesses in the current AIS curriculum. The fourth section provides an analysis of the IFAC recommendations and suggests a strategy for curriculum development. The final section suggests improvements to the current AIS curriculum and concludes the study.

IFAC Framework

In developing its recommendation for incorporating Information Technology (IT) into the accounting curriculum, IFAC develops some useful taxonomies. First, in IEG 9, IFAC identifies IT as one of the four components of knowledge under its Elements of Accounting Education and Experience, the others being general knowledge, organizational and business knowledge, and accounting and accounting-related knowledge. This emphasizes the importance of IT in the educational framework (see International Federation of Accountants, IEG 9, 1996).

Second, in IEG 11, IFAC establishes three work domains for professional accountants and five roles served in these work domains. The work domains are industry and commerce, public practice and public sector. The IT-related roles served are: 1) user, 2) financial manager (e.g., accountant, controller), 3) designer (e.g., design team member, analyst), 4) internal or operational auditor and 5) external "advisor" (e.g. accountant, auditor, tax practitioner, or consultant). Professional accountants may play some or all of these roles to varying degrees in these three work domains throughout their careers. The framework is intended to support professional accountants as they serve these roles in whatever work domain they choose.

Third, in establishing their framework, IFAC distinguishes between prequalification and postqualification education, and between knowledge and skills obtained in that education. Prequalification education delivery is the primary responsibility of educational institutions, while postqualification education and requirements are primarily the responsibility of regulatory bodies and professionally-mandated Continuing Professional Education (CPE). Though knowledge and skills are intrinsically related, knowledge is more theoretical, while skills are more practical in nature. Since we are primarily concerned in analyzing undergraduate curriculum at educational institutions, the curriculum outlined in this paper focuses exclusively on prequalification education. Further, to the extent the distinction is meaningful, the curriculum outlined emphasizes knowledge over specific skills. The curriculum emphasizes business process modeling. The models developed (based on business knowledge) can be deployed in any number of technical environments (practical effects) through the appropriate use of technology.

IFAC uses the following breakdowns in developing their role-based educational framework. They establish general IT educational requirements that are, in turn, divided into IT concepts for business systems and internal control in computer-based systems. They then establish four professional roles, which are:

- The professional accountant as user of IT (*user* role),
- The professional accountant as manager of information systems (*manager* role),
- The professional accountant as designer of business systems (*designer* role), and
- The professional accountant as evaluator of information systems (*evaluator* role).

A satisfying curriculum would meet the general requirements and permit accountants to fulfill their *user* role. In addition, curriculum supporting one of the three remaining roles (*manager*, *designer* or *evaluator*) would need to be established. The curriculum proposed herein elects a curriculum in support of the *designer* role. The rationale for this choice is given in the section dealing with curricular strategy.

The Curriculum

One way of describing the range of treatments of AIS courses is in terms of the relative emphasis on the conceptual and practical. Emphasizing the conceptual at the expense of the practical leaves the student without adequate grounding to understand how everything fits together. Conversely, a bias toward the practical usually implies settling on a particular choice of implementation. The student is left with a set of skills in the absence of a conceptual context that will not transfer well to other environments. Usually, due to the enormity of the task of including judicious coverage of both the conceptual and the practical, compromises are made. However, new software developments provide an opportunity to overcome the current tangled context in which AIS course content decisions are made.

The curriculum being assessed uses these new developments and is comprised of a pre-core and core component. The pre-core courses, MIS 200 and MIS 300, roughly correspond to IFAC's (1) IT concepts for the business systems component of the general IT education requirements, and (2) core IT knowledge and skill areas in support of the professional accountant as *user* of IT.

The first pre-core course, MIS 200, is entitled "Personal Productivity with Information Technology." The course content includes an introduction to concepts, principles and methods to organize and manage individual information resources. It also introduces the following information technologies: the Internet, word processors, spreadsheets, graphics and database management systems. Hands-on exercises are a major part of the course.

The second pre-core course, MIS 300, is entitled "Management Information Systems." It entails an examination of information systems from the perspective of the user. Coverage includes behavioral, organizational and systems theory foundations; the systems development process; and the integration of data processing, database management, decision support systems, office automation and telecommunications.

Table 1 maps the course elements of MIS 200 and MIS 300 into IFAC guideline elements for the general education "Information Technology Concepts for Business Systems", while Table 2 maps course elements in support of IFAC's elements for "The Professional Accountant as a User of Information Technology." Some of the IFAC guideline elements are covered in various other courses in the curriculum (e.g., Introduction to Financial Accounting, Auditing, Tax, core AIS courses). These are indicated in the "Other" column of both tables.

The core component consists of a three-course sequence: ACC 418, ACC 419 and ACC 480 that are entitled: AIS: Planning and Analysis, AIS: Design and Construction, and AIS-Special Applications, respectively. These courses are designed to encompass the four stages of the systems development life cycle: Planning, Analysis, Design and Construction. The first course includes planning and analysis, the second, design and construction, and the third is a complete application of the entire cycle using a realistic scenario.

The first course, ACC 418, has three core components:

Part I is a general introduction to information and accounting information systems (generally manual systems). It covers a review the financial accounting cycle, general ledger system, general journal and special journals. Following Hollander et al.'s (1999) implementation of McCarthy's Resource Event Agent (REA) (McCarthy, 1979, 1982) modeling approach to AIS, the enterprise is decomposed into business processes. For each business process, the business events of interest are identified and REA modeling is used to model these events. The data and activity models implied by the foregoing are documented by students in their first computer project, based upon a business scenario developed for this course. This project corresponds to the planning phase of systems development.

Part II introduces the students to AIS development; the systems development life cycle and program development tool support; the IE framework and the four phases of systems development (i.e., planning, analysis, external design, internal design); and systems construction. The technical environment, hardware and software are also covered. Finally, the relational model and programming concepts, data modeling, activity modeling and interaction analysis are introduced.

Part III further examines one of the business processes identified in the first computer project. This corresponds to the analysis phase of systems development. A completely developed data model is documented and is fully represented by an Entity Relationship Diagram (ERD), using the data-modeling feature of the program development software. Activity models are developed for a selected business process and documented using both the Activity Hierarchy Diagram (AHD) and an Activity Dependency Diagram (ADD). This method of process modeling hierarchically decomposes the higher level processes into elementary processes and then shows dependencies between the elementary processes. Finally, Process Action Diagrams (PADs) are developed to outline the pseudo-logic of the elementary process, further confirming both the data and activity models.

The second course, ACC 419, is concerned with describing and documenting how specific procedures are used to implement the business processes. The design of procedures leads directly to their implementation in the construction stage through the generation of computer code, user interfaces, and the creation of a relational database.

This course also has three parts:

In Part I, a review is conducted of the systems

TABLE 1. General Education IT Concepts for Business System

Broad Knowledge	Main Topic	MIS 200	MIS 300	Other
General Systems Concepts	Nature & Types of Systems		✓	
	System Architectures	✓	✓	
	Control & Feedback in Systems		✓	
	Nature & Types of Information		✓	
	Attributes of Information		✓	
	Role of Information in Business		✓	
Management Use of Information	Decision Theory			✓
	Human Information Processing		✓	
	Transaction Processing		✓	
	Communication of Information	✓	✓	✓
	Financial Analysis			✓
Hardware	Components of a Computer Configuration	✓		
	Processing Units	✓		
	Input/Output Devices, Processing Speeds	✓		
	Physical Storage Devices	✓	✓	
	Communication Devices	✓		
System Software	Software Configuration	x	x	x
	Operating Systems	✓	✓	
	Communications Systems	✓	✓	
	Security Software	✓		
	Utility Software	✓		
	Programming Languages/Compilers	x	x	x
	Programming Aids, Programming Software			✓
	Library Management Systems	x	x	x
	Data Management Systems	✓	✓	
Application Software	Application Software Strategy		✓	
Data Organization & Access	Data Structures & File Organization	✓	✓	
	Access Methods & File Maintenance		✓	
	Types of Data Files		✓	
	Database Management Systems	✓	✓	
	Document Management		✓	
Networks & Electronic Data Trf.	Components, Configurations & Designs		✓	
	Internet/Intranet/extranet applications	✓	✓	
	Data Communication & Transmission	✓	✓	
	Message & Document Communication		✓	
	Operations, Management & Control			✓
Transaction Processing in Business & Accounting Applications	General Application Processing Phases		✓	
	Processing Modes		✓	
	Revenue/Receivables/Receipts			✓
	Purchases/Payables/Payments			✓
	Inventories/Cost of Sales			✓
	MRP & Control/Costing		✓	✓
	Production Planning & Scheduling; Tracking, Monitoring & Control; Quality Management; Computer Integrated Manufacturing/ Computer Assisted Design/Computer-Assisted Manufacturing			✓
	Payroll & Personnel			✓
	Fixed Assets/Treasury/Administration			✓
	General Ledger/Budgeting/Information Systems			✓

✓ indicates coverage of topic
x indicates deficiency

TABLE 2. User Role Requirements

Broad Knowledge	Main Topic	MIS 200	MIS 300	Other
Experience in Business & Accounting Applications	Key IT Acquisition Decisions/Approaches		✓	
	Assessing IS		✓	
	Organizing System Resources		✓	
	Control & Safeguarding of IS		✓	
	Electronic Commerce	✓		
Software	Operating Systems		✓	
	System Architectures		✓	
	Basic Accounting Packages	x	x	x
	Small Business Systems		✓	
	Financial Spreadsheets	✓		
	Word Processing	✓		
	E-mail Software	✓		
	Web Browser	✓		
	Business Graphics & Presentation	✓		
	Database Tool	✓		
	Utility Programs	✓		
	Access Control Software	✓		
	Anti-virus Software	✓		
	Communications Software	✓		
	Statistical Analysis			✓
	Tax Preparation			✓
	Audit Software	x	x	x
	Decision Support & Expert Systems		✓	

✓ indicates coverage of topic
x indicates deficiency

development life cycle, through the analysis phase. A selected business function is given to the student in the form of an ERD, an AHD, an ADD and related PADs. User interfaces, in particular graphical user interfaces (GUIs), are discussed and developed, along with various processing methods and topologies. More specifically, batch, on-line, and real-time processing methods are explored. Client-Server environments are also examined.

Part II entails a project that designs a given business process by establishing the Procedure Action Diagrams (PrADs) and Dialog Flow Diagrams. Whereas PADs document *what* needs to be done by the system, the PrADs establish *how* the system is implemented, given a processing style and interface choice. Window designs are established that permit the system user to interact with action modules and the underlying data model. The dialog flows establish the pathways the user will follow in interacting with the sys tem components.

Part III of the course relates to how an actual system is generated in a particular computer environment. An operating system, a higher-level programming language, and relational database are selected for construction. The PADs and PrADs are code-generated into the chosen language. The data model is converted into the chosen relational database. The GUIs are generated for the chosen operating system. This completes the systems development life cycle and produces an actual running application for the selected business systems.

The objective of the third course, ACC 480, is to take students through an exercise where they use all they have learned in the first two courses. They will plan, analyze, design and implement a business system. In order to do this, the course uses a sophisticated business scenario that introduces students to problems related to the allocation of overhead in a complex manufacturing environment. The scenario involves a manufacturing company with a range of products and several different processes. The solution to the scenario leads to an activity-based overhead allocation system.

The content of these three AIS courses roughly corresponds to IFAC's (1) "Internal Control in Computer-Based Systems", which are part of the general IT education requirements, and (2) core IT knowledge and skill areas in support of "The Professional Accountant as a Designer of Business Systems." The syllabi for these courses can be found at the URL listed in the footnote[1]. Tables 3 and 4 map the AIS course elements into the particular IFAC guideline elements.

Some deficiencies in the current curriculum were revealed by the analyses contained in Tables 1 to 4. These are:

TABLE 3. Internal Control in Computer-Based Systems

Broad Knowledge	Main Topic	ACC418	ACC419	ACC480
Control Objectives	Risks & Exposures in Computer Systems	✓		
	Effect of the Computer on Processing Controls	✓		
	Effect of IT Audit on Organization Controls	x	x	x
	Responsibility for Control	✓		
	Effectiveness & Efficiency of Operations	✓		
	Reliability of Financial Reporting	✓		
	Compliance with Applicable Laws & Regulations	x	x	x
	Cost Effectiveness of Control Procedures	x	x	x
Control Environment	Management Philosophy & Operating Style	✓		
	Plan/Structure of Organization	✓		
	Methods to Communicate Assignment of Authority & Responsibility	✓		
	Management Control Methods	✓	✓	✓
	Systems Development Methodology	✓	✓	✓
	Controls: System Selection, Acquisition/Development	✓		
	Controls Over System Implementation	✓	✓	
	Control over System & Program Changes	✓	✓	
	Personnel Management Methods	x	x	x
	External Controls	x	x	x
Risk Assessment	Risk Exposures	x	x	x
	Probability of Loss	x	x	x
	Consequences	x	x	x
	Preventive/Detective/Corrective Strategies	✓		
Control Activities	Accounting System	✓		
	Control Procedures	✓		
	Control Design	✓		
	Control Over Data Integrity, Privacy & Security	✓	✓	
	Continuity of Processing/Disaster Recovery Planning	x	x	x
	IS Processing/Operations	✓	✓	✓

✓ indicates coverage of topic
x indicates deficiency

Table 4. The Designer Role

Broad Knowledge	Main Topic	ACC418	ACC419	ACC480
Role of Information in Design & Behavior	Databases & Database Mgt. Systems	✓	✓	✓
	System Development Life Cycle (SDLC)	✓	✓	✓
	Risks: Economic, Technical, Operational, Behavioral	✓		
	Controls	✓	✓	✓
Systems Analysis & Design	Data Flow Diagrams	✓	✓	✓
	Entity-Relationship Model, etc.	✓	✓	✓
	Decision Tables & Trees	✓		
	Prototyping		✓	✓
	CASE Tools, Object Methods, etc.	✓	✓	✓
	Database Design/Files/Records/Forms/Screen Layout	✓	✓	✓
System Acquisition/Development Life Cycle Phases, Tasks/Practices/Maintain Controlover System Development	Investigation & Feasibility Study	✓		
	Requirements Analysis & Initial Design	✓	✓	✓
	Detailed Design Specification/Documentation	✓	✓	✓
	Hardware Evaluation & Acquisition	✓		
	Software Evaluation & Acquisition/Development	✓	✓	✓
	Hardware Contracts & Software Licenses	x	x	x
	System Installation/Implementation	✓	✓	✓
	Testing (system verification)		✓	✓
	User Procedures & Training	✓	✓	✓
	Design of User/Operator Control Procedures		✓	✓
	Testing (system validation)		✓	✓
	System conversion and start-up		✓	✓
	Post implementation review		✓	✓
	Maintenance of hardware and software	✓		
	Systems documentation and operations manual	✓	✓	✓

✓ indicates coverage of topic
x indicates deficiency

Table 1 - General Education IT Concepts: For the "Systems Software" category, the following main topics are not covered: Software Configuration, Programming Languages/Compilers, and Library Management Systems. We intend to remedy the situation by requesting that the MIS department include these topics in the pre-core MIS 200 and MIS 300 courses.

Table 2 - User Role Requirements: For the "Software" category, the following two main topics are not covered: Basic Accounting Packages and Audit Software. We intend adding an additional accounting course at the third-year level, entitled "Auditing and Control in Computer Systems." This course, in which the two missing topics will be covered, will be a required course for students wishing to major in AIS.

Table 3 - Internal Control in Computer-Based Systems: We have identified a number of omissions in our current course offerings. Under the "Control Objectives" category, the following

topics are not covered: Effect of IT Audit on Organization Controls, Compliance with Applicable Laws and Regulations, and Cost Effectiveness of Control Procedures. In the "Control Environment" category, we appear to lack coverage of Personnel Management Methods, and External Controls. Under "Risk Assessment", Risk Exposures, Probability of Loss, and Consequences are missing. Finally, under "Control Activities", the topic dealing with Continuity of Processing and Disaster Recovery Planning is inadequately covered. The existing auditing courses do not include the audit of computer-based systems. To overcome this deficiency, we intend introducing these topics in the course "Auditing and Control in Computer Systems".

Table 4 - The Designer Role: The only IFAC topic not covered by our three-course AIS sequence is Hardware Contracts and Software Licenses. We will include the topic in our future course readings.

From a classroom-experience perspective, we have noted that many students in the ACC 418 course do not have the level of skills in database design and management that we would prefer. Valuable class time is expended in an effort to bring these students up to speed. This is frustrating for both instructors and students. We are, therefore, planning to introduce a third pre-core MIS database management and design course, which will a prerequisite for ACC 418.

IFAC Analysis and Curricular Strategy

In discussing various roles as a basis for accounting curriculum development, IFAC (IEG 11, para. 17, 1998) states that:

The education requirements may be viewed as building blocks in the sense that the general IT education requirements form the foundation for the user-oriented education requirements and these, in turn, form a foundation for the other role-related education requirements. In addition, the education requirements related to the roles of user, manager, designer and evaluator may be viewed as building blocks for one another, in the sense that the accountant's design role may be enhanced by the skills developed as a user, the accountant's managerial role may be enhanced by the skills and insights obtained through a combination of user and design roles, and the accountant's role as evaluator can be enhanced by skills developed in the user, designer, and manager roles. Thus, an aspiring management accountant would be guided by the portions of the Guideline dealing with the general IT education requirements, user-oriented education requirements and education requirements related to the manager role. An aspiring public accountant would be guided by the portions of the Guideline dealing with the general IT education requirements, user-oriented education requirements and education requirements related to the evaluator role.

This seems to imply a hierarchy, starting (on the top of the hierarchy) with the *evaluator* role, then the *manager* role, followed by the *designer* role, and finally the *user* role, all underpinned by the general IT education requirements. Figure 1 depicts the implied hierarchy. One rationale for developing curricula based on the *designer* role would be that it would permit the maximum flexibility to students in terms of providing building blocks for other roles.

Another rationale for the *designer*-role approach is that is permits a disciplined, normative approach to systems development. IE and software development tools are used to support the IE framework, notably program development tools. These tools are key enablers to the MOTE approach. Model-Oriented means that a conceptual foundation for the enterprise is developed based on models of data, processes, and their interactions. Tool-Enhanced refers to the use of an appropriate software development tool in support of information systems modeling and the construction and implementation of actual accounting information systems. This takes advantage of a trend during the past several years in information technology, namely to provide

Figure 1. IFAC Hierarchy of Building Blocks

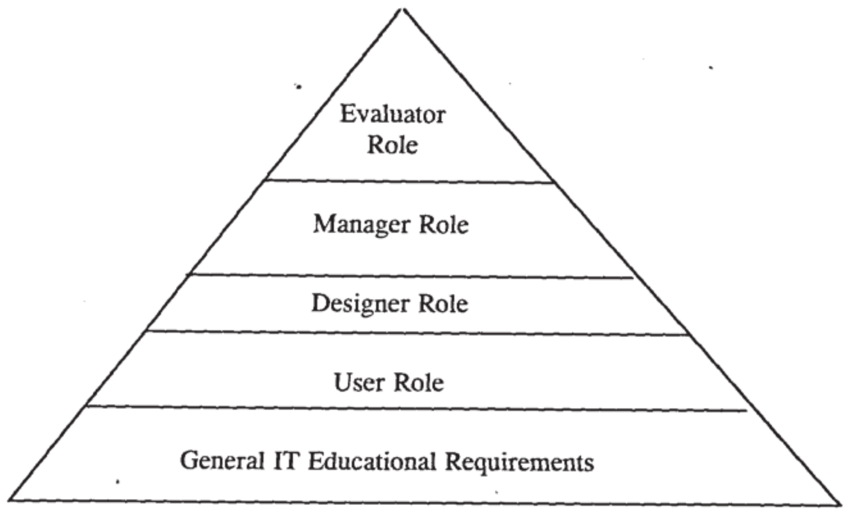
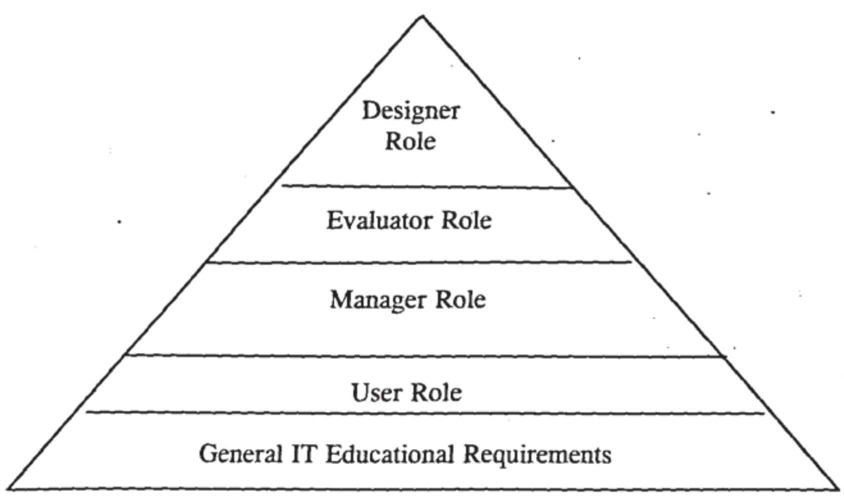


Figure 2. Hierarchical Alternative for IFAC Building Blocks



professional programmers with a variety of software development tools that facilitate the production of higher quality applications in less time. These tools provide support for planning, analysis, design and construction activities and are characterized by technological independence, i.e., independence from specific IT environments, the user system interface, database management systems, hardware, operating systems, and networks. The MOTE approach makes it possible to provide an even balance of the conceptual and the practical by leveraging the student's abstraction skills, while concurrently allowing the construction and implementation of actual accounting information systems.

Traditionally, accountants have only been able to participate as team members in the development and design of information systems, because they generally lacked the specific technological skills required for systems development. Consequently, they relied on technologists to do systems design and implementations. Typically, accountants merely specified requirements, usually in terms of reports, or advised technologists with respect to appropriate controls for the information system. This may be why IFAC relegated the *designer* role as subordinate to the *manager* and *evaluator* roles. In any case, the MOTE approach, which is a designer-role approach, permits the individual accountant an expanded role as *designer*. This results from advances in technology tools that permit accountants to leverage their modeling skills, while implementing actual accounting systems. Thus, we view the hierarchy differently than IFAC does.

Figure 2 presents our hierarchical view of accountant roles. At the pinnacle is the designer role that subsumes the knowledge and skills of the manager and evaluator roles.

Conclusion

The assessment of our existing AIS curriculum against IFAC's IEG 11 enabled us to detect weaknesses in the content of our courses, particularly with regard to internal control in computer-based systems. Consequently, we are planning to add an additional core course to the curriculum to address this area of concern. Furthermore, to strengthen the skills of students taking the first AIS core course, we intend adding a third pre-core course on database management and design.

An analysis of IFAC role building blocks was conducted. We believe, especially given technological advances, that the designer role subsumes the knowledge and skills of the manager and evaluator roles. This is particularly apt when viewing the accountant as an individual systems designer, rather than as one member of a design team, performing only a limited role.

Suggestions for Future Research

A planned expansion of this study could incorporate practitioner perceptions of the amended IFAC-compliant AIS curriculum. The major elements of the existing courses could be grouped into a content scheme, to serve as a basis for a practitioner survey instrument. A survey would elicit practitioner perceptions about the relevance of the course elements, and would also provide an open-ended section for practitioners to include what they believe to be missing elements. Practitioners could be taken from industrial firms, the "Big 5", and large regional accounting and multi-service firms. If the findings of practitioner surveys show that the IFAC Guidelines include material which they perceive to be not useful there will be questions regarding these guidelines.

Endnote

1. http://www.sba.oakland.edu/faculty/Savage/RAIS/syllabi.htm

References

1. American Accounting Association (1987, Spring). Committee on Contemporary Approaches to Teaching Accounting In-

formation Systems. *Journal of Information Systems.*

2. American Institute of Certified Public Accountants (1996). *Information Technology Competencies in the Accounting Profession. AICPA Implementation Strategies for IFAC International Education Guideline No. 11: Implications for Education and Practice.*
3. International Federation of Accountants (December 1995, revised June 1998), International Education Guideline No. 11, *Information Technology In The Accounting Curriculum,* IFAC.
4. International Federation of Accountants (July 1991, revised October 1996), International Education Guideline No. 9, *Prequalification Education, Assessment of Professional Competence and Experience Requirements of Professional Accountants,* IFAC.
5. Borthick, A.F. (1996). Helping Accountants Learn To Get the Information Managers Want: The Role of the Accounting Information Systems Course. *Journal of Information Systems, 10,* 75-86.
6. Callaghan, J., Lauer, T.W., & Peacock, E. (1998). Developing A Comprehensive Curriculum For Accounting Information Systems: A Model-Oriented, Tool-Enhanced Approach Review of Accounting Information Systems. *The Review of Accounting Information Systems.*
7. Davis, J.R., & Leitch, R.A. (1988, Fall). Accounting Information Systems Courses and Curricula: New Perspectives. *Journal of Information Systems,* 153-166.
8. Groomer, S.M., & Murthy, U.S. (1996). An Empirical Analysis of the Accounting Information Systems Course. *Journal of Information Systems, 10,* 103-127.
9. Hall, J.A. (1998). REA: An Evolutionary Perspective. *The Review of Accounting Information Systems, 2,* 1-10.
10. Hollander, A., Denna, E., & Cherrington, J.O. (2000). *Accounting, Information Technology, and Business Solutions* (2nd ed.). McGraw-Hill.
11. International Federation of Accountants (1995, December). International Education Guideline No.11, *Information Technology In The Accounting Curriculum.*
12. Macur, K.M. (1998). The Curricular Content of Accounting Information Systems. *The Review of Accounting Information Systems, 2,* 11-19.
13. Martin, J., & McClure, C. (1988). *Structured Techniques: The Basis for CASE.* Prentice Hall.
14. McCarthy, W. E. (October 1979). An Entity-Relationship View of Accounting Models, *The Accounting Review,* pp. 667-686.
15. McCarthy, W. E. (July 1982). The REA Accounting Model: A Generalized Framework for Accounting Systems in a Shared Data Environment, *The Accounting Review,* pp. 554-578.
16. Smith, L.M., & Bain, C.E. (1993). The Scope of the Accounting Information Systems Course: Based On Textbook Coverage and a Faculty Survey. *Accounting Educators' Journal, 5,* 1-11

Notes