

THEODORE J. MOCK  
ARTHUR ANDERSEN ALUMNI PROFESSOR OF ACCOUNTING  
SCHOOL OF ACCOUNTING  
(213) 743-8725



TO: AAA Committee on Contemporary Approaches to Teaching Accounting  
Information Systems

FROM: Ted Mock

SUBJECT: Final Version of Committee Report

DATE: October 7, 1986

Enclosed is a copy of the final version of our report. I have taken into account some of the feedback we received at the AAA meetings and the additional rankings I recently received. All in all I feel we have a very useful report. It is my understanding based on my discussions with Joe Wilkinson that this report will be published in the next issue of the Journal of Information Systems.

I sincerely appreciate your cooperation and help on this project. The project has been influential in my own thinking concerning my AIS class and I hope it will also be so in general.

Theodore J. Mock

TJM : im

Enclosure

cc: Steve Zeff Loren  
Nikolai Ray  
Summerfeld

SCHOOL OF BUSINESS ADMINISTRATION



REPORT OF THE AAA COMMITTEE ON  
CONTEMPORARY APPROACHES TO TEACHING  
ACCOUNTING INFORMATION SYSTEMS

MAY, 1986

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SEPTEMBER, 1986

COMMITTEE MEMBERS:

Theodore J. Mock (Chairman), University of Southern California

Barry E. Cushing, University of Utah

Gordon B. Davis, University of Minnesota

Miklos A. Vasarhelyi, Bell Laboratories / Columbia University

Clinton E. White Jr., Pennsylvania State University

Joseph W. Wilkinson, Arizona State University





## REPORT OUTLINE

I. INTRODUCTION, BACKGROUND, AND CHARGE	1
A. Background	
B. Charge	
C. Summary of Issues Identified	
D. Outline of Report Contents	
II. OUTPUT OBJECTIVES OF THE AIS COURSE	5
A. Preliminary Assumptions	5
B. Information Systems Users	11
C. Information Systems Auditors	13
D. Information Systems Designers	16
E. Information Systems Evaluators	18
F. AIS Course Objectives	21
G. Summary	25
III. CONTENT OF THE AIS COURSE (COMMON BODY OF KNOWLEDGE)	26
IV. PEDAGOGICAL SUPPORT ISSUES	34
A. Accounting Information Systems Texts and Support Materials	35
B. Accounting Application Software and Materials	37
C. Systems Design Software and Materials	38
D. E. End-User Software and Materials Summary	39
	41
V. ADMINISTRATIVE AND RESOURCE ISSUES	43
A. Problems and Issues	43
B. Possible Solutions	46
VI. FUTURES ISSUES	52
A. The Future	52
B. The Evolving Environment	52
C. The Electronic Classroom/Electronic Course	55
D. E. Curriculum Change	57
Coping with Change	58
VII. RECOMMENDATIONS	60



## SECTION I

## INTRODUCTION, BACKGROUND, AND CHARGE

Whether measured by the number of educational conferences held, the number of committees assembled, or the amount of faculty time and effort expended, the topic of accounting information systems currently ranks high within both the academic and practice areas in accounting. This interest has been the result of a number of technological and environmental changes:

- \* Diffusion of powerful yet inexpensive computer hardware, particularly microcomputers, into accounting education and practice.
  - \* Development of powerful and relatively user-friendly computer software, such as spreadsheet software, which has profoundly changed the ways accounting education and practice is and may be conducted.
  - \* Changes in accreditation standards for both business and accounting programs which place more emphasis on computers and information systems.
  - \* Broadening of the nature of accounting and auditing within industry and government and related changes in the services provided by public accounting firms.
  - \* The suggestion by the AAA Committee on the Future Structure, Content and Scope of Accounting Education that "colleges and universities (1) approach accounting education as an information development and distribution function for economic decision making" (Issues in Accounting Education, Spring 1986, p.169)
- .

Technological and environmental changes such as these contradict the assertion that knowledge of the accounting delivery (processing) system is not necessary to understand accounting concepts. Current information processing technology offers the possibility of providing financial, managerial and audit information that was not feasible or cost effective even a few years ago.

In view of these changes, this committee was formed with the following charge:

1. To identify the unique problems of teaching information systems in an accounting environment.
2. To propose ways and means of dealing effectively with these problems.

In order to meet this charge the Committee first developed an inventory of issues that relate to teaching information systems in an accounting environment. Approximately 40 issues and problems were initially identified. As a way of bounding the problem, it was decided to focus on the first AIS course in an accounting curriculum.

Additional assumptions or constraints that the Committee adopted in preparing this report were to consider a three to five year time horizon (a longer time horizon is not realistic in such a rapidly changing environment) and to assume that students entering the accounting information systems curriculum would meet a minimal computer literacy requirement (to be defined in sections II and III). Thus, the issues that are discussed in this report and the alternative ways and means that are suggested focus on the objectives, content, available resource materials, and

administrative issues of the basic or introductory accounting information systems course.

Upon analysis, it was clear that the many issues that were included in the original inventory of 40 issues could be classified into a few generic categories:

1. Changes in the nature of the student input including general improvements in computer literacy, lack of homogeneity in student computer knowledge and lack of control over the level of literacy.
2. A rapidly changing technical and software environment necessitating both remedial instruction for existing faculty and students in process and ongoing development to avoid recurring deterioration in faculty knowledge.
3. Evolution of accounting education and accounting practice, implying the derivation of a revised set of output objectives for the AIS course.
4. Resource and administrative issues including lack of qualified faculty, inadequate hardware and software, and inappropriate pedagogy.

The kinds of issues not considered in this report relate primarily to the long run future or to specific courses or tracks that would build upon the basic AIS course. Many of the latter issues are probably best considered in specific educational programs of various colleges and universities. However, some of the longer run issues including future research are introduced in sections VI and VII of this report.

Our report proceeds in section II to identify the output objectives of the basic AIS course and then in Section III to

suggest the content (common body *of* knowledge) that would be appropriate for these output objectives. Sections IV and V then discuss the existing computer resources that may support the AIS course, administrative and resource issues and suggested remedies.

SECTION II  
THE OBJECTIVES OF THE AIS COURSE

The objectives of the Accounting Information Systems (AIS) course are based on certain assumptions that are spelled out in the first part of this section. These assumptions relate to the place of the AIS course within an accounting and information systems curriculum, and to the professional roles for which students are being prepared by this curriculum. The analysis is facilitated by the application of a widely' used taxonomy of educational objectives. The AIS course objectives are derived from an analysis of functions performed by accounting graduates in each of four major professional roles and the educational objectives associated with the preparation of students for each of those roles.

Preliminary Assumptions

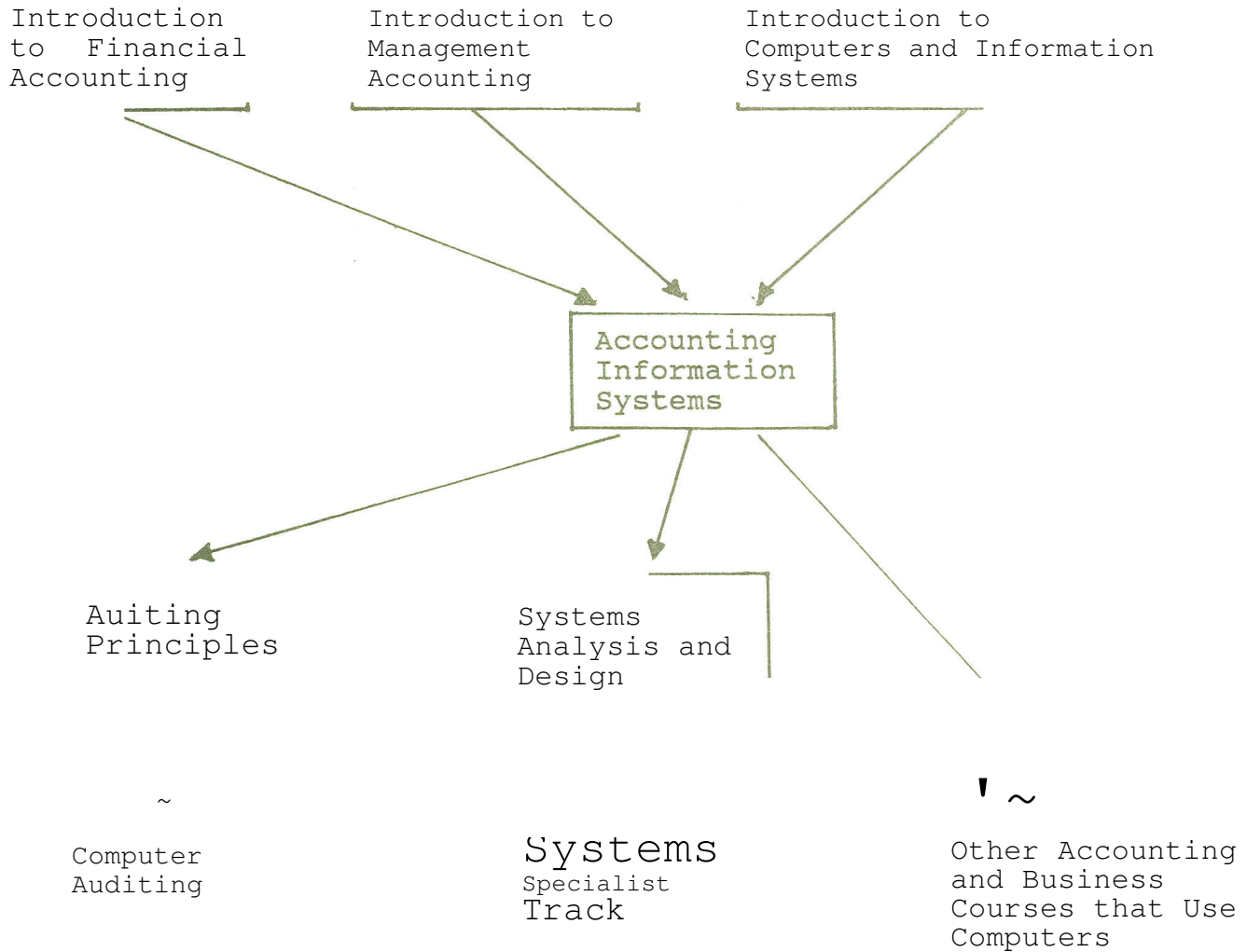
It is assumed that the AIS course will generally be taken by students midway through a four or five year educational program in accounting or business administration, probably during the student's junior year. This course with some adaptation may even be an elective within an MBA program. Figure II.1 illustrates the relationship that is presumed to exist between the AIS course and (1) prerequisite courses, and (2) subsequent courses that build upon what is learned in the AIS course.

Insert Figure II.1 here

Prior to entering the AIS course, all students will have completed traditional introductory financial accounting and management accounting courses. In addition, students are assumed to have completed a course in computer hardware and software that introduces them to some of the most

FIGURE 11.1

TYPICAL ACCOUNTING AND INFORMATION  
SYSTEMS COURSE SEQUENCE





widely used types of software packages, including spreadsheet, database and word processing software. Finally, students that enter the AIS course may have completed an introductory course in data processing or information systems which emphasizes hardware and software technology and which may also expose students to basic concepts of systems analysis and design and business computer utilization. Having a second prerequisite course prior to the AIS course is more common in schools on the quarter system than those on a semester system.

The exact distribution of course content between any prerequisite IS course or courses and the AIS course will likely vary from school to school. Accordingly, our goal is to specify the educational objectives that accounting students should have met upon completion of the AIS course, without specifying which two or three courses should meet which objectives. It is recognized that some schools may have only one systems-related course that would precede the AIS course. Our approach should allow each school the flexibility to implement our recommendations in a way that is consistent with its particular circumstances.

In identifying objectives to be achieved by the end of the AIS course, it is useful to think in terms of the roles or activities for typical accounting and business school graduates as they pursue their careers. Four general roles are, (1) users of information systems and system outputs, (2) auditors of accounting information systems and their outputs, (3) designers of information systems for use by others, and (4) evaluators of the effectiveness and efficiency of information systems. Though these roles are certainly not mutually exclusive, each of them represents a distinct perspective on accounting information systems. Furthermore, most accounting graduates will perform one or more of these roles during their professional careers. Thus it is appropriate to conceive of the objective of the AIS course as to begin to prepare students to perform these roles.

students select an educational program that is consistent with their career objective. Preparation for each of the four roles demands a different pattern of coursework subsequent to the AIS course. Possible options are reflected in Figure II.1. For example, those students preparing for career positions in which they will primarily be users of information systems are expected to follow the AIS course with other accounting and business courses that incorporate an emphasis on the use of computer technology to generate information, solve problems, and make decisions. Those students preparing to be auditors would, after completing the AIS course, complete introductory and advanced auditing courses that include a computer auditing course. Those students preparing for careers as designers of information systems would complete the AIS course and a systems analysis and design course in preparation for advanced study in a specialized program in information systems. Those students preparing for careers involving the evaluation of information systems, such as management accounting, internal auditing, or management administrative services functions, are likely to select some coursework from each of these other tracks.

A key assumption underlying our analysis is that the AIS course must provide a core body of knowledge required by all students who subsequently pursue educational programs designed to prepare them for one of these specialized roles. This assumption is consistent with AACSB accreditation standards for accounting programs, which specify that all such programs must require a minimum coverage of accounting information systems and computer utilization.

To derive the education objectives of the AIS course, we begin by identifying in greater detail the functions performed by persons involved in each of the four roles specified above. Based upon this, we describe the educational objectives that must be met in order to prepare students for

entry level positions relating to each of the four roles. From these four sets of objectives, we factor out a common core of objectives which must be met in the AIS course and its prerequisite courses.

Bloom's "taxonomy of educational objectives" is used in defining educational objectives. The taxonomy posits six broad categories of intellectual understanding, ability, and skill that are presented in outline form in Figure II.2. Each ability or skill at a higher level in this outline is presumed to require and build upon abilities and skills represented in lower levels of the outline. Brief definitions of each broad categories are as follows:

1. Knowledge. Recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure or setting. In other words, this involves basic terminology and survey knowledge.
2. Comprehension. This means that the individual can make use of the material or idea being communicated. This is primarily at a simple level rather than in a larger context.
3. Application. This is the use of principles, ideas, and theories in concrete situations. This use goes beyond reproducing a solution or process given previously in class to producing a solution to problems that are structurally different to those previously presented.
4. Analysis. The ability to analyze relationships, recognize patterns, and apply general techniques.
5. Synthesis. The ability to apply knowledge in developing plans and organizing operations.
6. Evaluation. Quantitative and qualitative assessment using both internal evidence and external criteria.

For a more detailed description of each of the categories, see B. S. Bloom, Ed. Taxonomy of Educational Objectives, Handbook I: Cognitive Domain, (1956), especially pages 201-207.

[Insert FIGURE II.2 about here]

FIGURE II.2  
BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES

- 1. 00 Knowledge
  - 1.10 Knowledge of Specifics
    - 1.11 Terminology
    - 1.12 Specific Facts
  - 1.20 Knowledge of Ways and Means of Dealing with Specifics
    - 1.21 Conventions
    - 1.22 Trends and Sequences
    - 1.23 Classifications and Categories
    - 1.24 criteria
    - 1.25 Methodology
  - 1.30 Knowledge of Universals and Abstractions
    - 1.31 Principles and Generalizations
    - 1.32 Theories and Structures
- 2.00 Comprehension
  - 2.10 Translation
  - 2.20 Interpretation
  - 2.30 Extrapolation
- 3.00 Application
- 4.00 Analysis
  - 4.10 Analysis
  - 4.20 Analysis of Elements
  - 4.30 Analysis of Relationships
- 5.00 Synthesis
  - 5.10 Production of Organizational Principles
  - 5.20 Derivation of a Unique Communication
  - 5.30 Derivation of a Plan or Proposed Set of Operations
- 6.00 Evaluation
  - 6.10 Judgments in Terms of Internal Evidence
  - 6.20 Judgments in Terms of External criteria
  - 6.30 Judgments in Terms of a Set of Abstract Relations

Finally, the analysis of objectives utilizes a classification of the content of the AIS course into nine broad categories. These are:

- (1) data base and file processing concepts, including the nature of data, records, files and databases and the operations required to maintain stored data and make it accessible to users,
- (2) internal control of accounting information and related processes,
- (3) the technology of information systems, including concepts and principles underlying computer hardware, software, data communications and program structures,
- (4) utilization of information systems technology, including familiarity with major types of computer software and decision support systems,
- (5) accounting information system applications, including the data, information, and processing requirements associated with the most common accounting transaction processing applications,
- (6) management utilization of information and information technology in decision-making for planning, directing, evaluating, and controlling organizational activities,
- (7) management of information systems technology in an organizational context,
- (8) systems analysis and design process and selected tools, techniques and methodologies used in this process, and
- (9) principles and techniques of auditing accounting information systems.

These nine broad content areas are presented here solely to facilitate our analysis of AIS educational objectives. A more detailed breakdown of AIS course content is presented in Section III.

We now examine in turn each of the four roles in terms of activities and functions performed by persons in those roles, and in terms of the appropriate interface between educational objectives and content areas.

#### Information Systems Users

Users of information systems technology and outputs are assumed to have staff and management positions within functional areas such as production, finance and accounting, marketing, or personnel administration. Users include specialists such as financial analysts, tax advisors, cost accountants, industrial engineers, market analysts, portfolio managers, budget analysts, strategic planners, purchasing agents, credit managers and many others. Persons having such responsibilities are generally involved in activities such as choosing among alternative courses of action, planning and scheduling of operational activities, directing the allocation of resources, implementation of planned operations, gathering and analyzing information, devising strategies, evaluating performance, documenting findings and conclusions, and communicating with others.

In order to maximize their effectiveness in performing such responsibilities, users must have basic familiarity with a broad range of information systems tools and techniques and the ability to develop (with a minimum of specialized assistance) end-user systems which satisfy their requirements. Among the available tools and techniques are spreadsheet packages, database software, database query languages, word processing packages, audit software, data communications software and services, accounting packages, graphics software, modelling and simulation software, decision support systems, statistical packages, graphics software, operations research packages, report generators, and expert systems. While no user could be expected to be expert in utilizing all of these tools, all users should

have a solid working knowledge of those tools most useful for their most common applications and a general familiarity with the nature of other tools that might be useful to them in certain cases.

Users must frequently choose between the development of a simple end-use system and the elicitation of assistance from systems specialists in order to develop a more complex system, possibly utilizing large-scale centralized information systems. In order to make such choices intelligently, users must be aware of the relative advantages and disadvantages of alternative approach to solving problems. Also, users must know enough about the capabilities and limitations of large-scale centralized systems to be able to interact effectively with systems specialists in preparing specifications for the development of suitable applications.

To best prepare students for entry-level positions as users of information systems, we suggest a curriculum designed to accomplish educational objectives in each of the nine broad content areas as indicated in Figure II.3. That is, all six of Bloom's categories of objectives would be addressed in the educational program with respect to the content areas of usage of systems technology and management use of information for decision making. The objectives of knowledge, comprehension, application and analysis would be addressed with respect to the content areas of file processing concepts, internal control, the technology of information systems, AIS applications, and systems analysis and design. only knowledge and comprehension of information systems management concepts would be covered, and treatment of AIS auditing would be limited to basic knowledge.

Insert FIGURE II.3 here



FIGURE I I. 3

SUGGESTED EDUCATIONAL OBJECTIVES FOR  
INFORMATION SYSTEMS USERS

Educational Objectives:

AIS Content Categories:

- 1) Database concepts
- 2) Internal control
- 3) Technology of information systems
- 4) Use of systems technology
- 5) AIS applications
- 6) Management use of information
- 7) Management of information systems
- 8) Systems analysis and design
- 9) Auditing of AIS

	0	0	U)	0	U)
	rl	rl	U)	rl	rl
	U)	+J	rl	U)	rl
	Q)	(lj	U)	Q)	rl
	o...c:	ou	o	o...c:	O(lj
	.rl	.rl	.rl	'+J	.j
	rl:::	I"J rl	7(lj	UJ	\Orl
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1)	u				
2)					
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4)					
5)					
6)					
7)					
8)					
9)					



### Information Systems Auditors

The  
This category includes both external and internal auditors. The responsibilities of auditors include reviewing the reliability and integrity of information produced by information systems, evaluation of the quality of internal controls used in information processing, and evaluating the efficiency and effectiveness of the use of information systems resources.

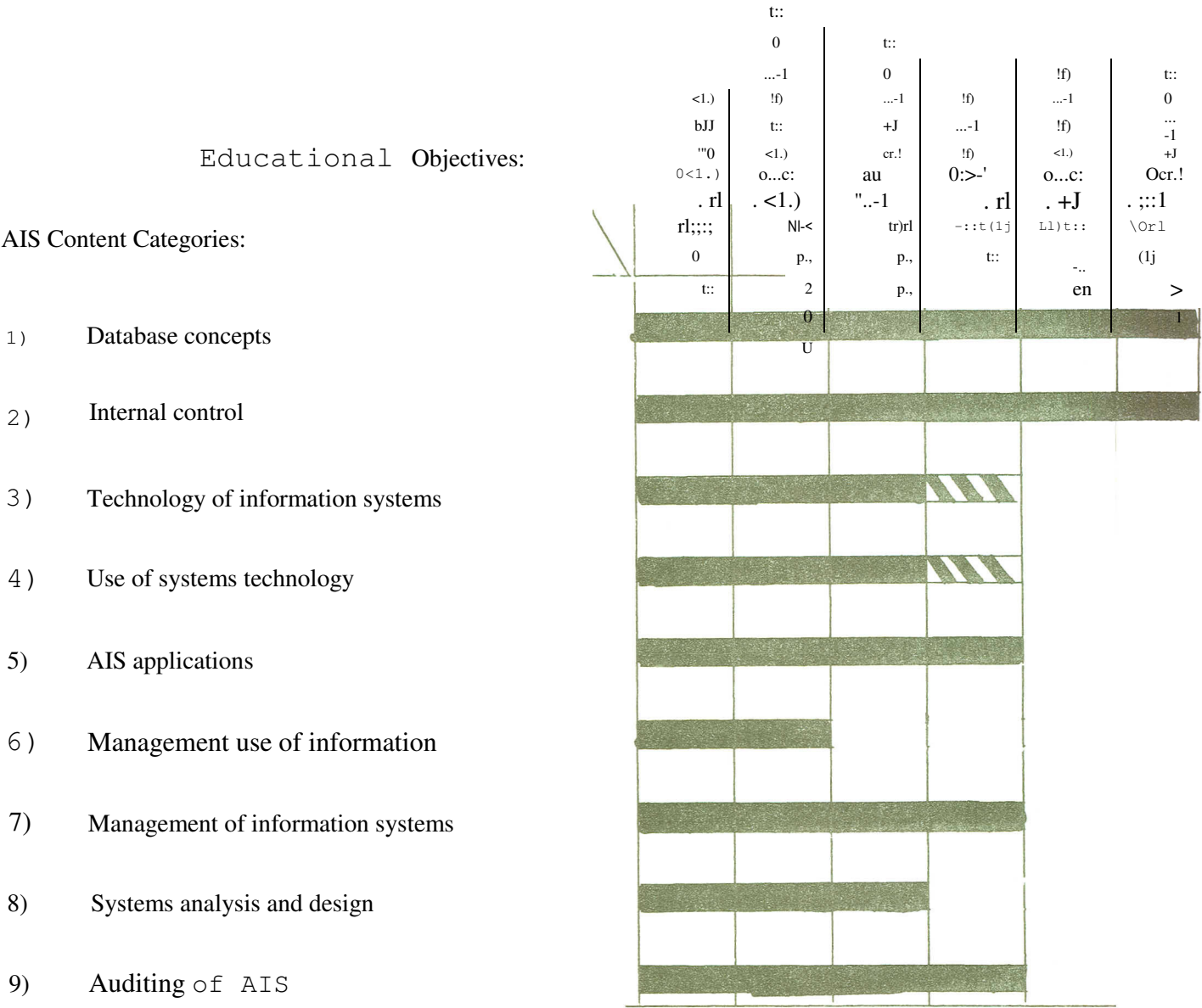
In order to perform these responsibilities effectively, the information systems auditor requires a detailed knowledge of accounting and administrative controls relating to the data processing function, including security controls, integrity controls, organizational controls, safeguard controls, and management controls. Auditors must also understand the process of reviewing and evaluating internal controls, and be familiar with the tools and techniques available for this purpose. Auditors also require a working knowledge of the most useful software tools available to assist them in their tasks, including audit software, spreadsheet software, database query languages, statistical packages, report generators, word processing software, and expert systems.

To best prepare students for entry-level positions as information systems auditors, a curriculum designed to accomplish educational objectives in each of the nine broad content areas as indicated in Figure II.4 is suggested. Regarding the content areas of database concepts and internal control, the educational program would address all six of Bloom's categories of objectives. with respect to the technology of information systems, usage of systems technology, AIS applications, management of information systems, and auditing of AIS, only the objectives of knowledge, comprehension, application, and analysis would be addressed. (Although for some of these content areas the experienced auditor must also be capable of synthesis and evaluation, we are identifying only those objectives that must b.

attained by the entry-level auditor.) For systems analysis and design, 'the .  
~bjectives of knowledge, comprehension, and application would be treated, while for  
management use of information in decision'making coverage would be limited  
to the knowledge and comprehension objectives.

Insert FIGURE II.4 here

FIGURE II. 4  
SUGGESTED EDUCATIONAL OBJECTIVES FOR  
INFORMATION SYSTEMS AUDITORS



### Information Systems Designers

Designers of information systems are assumed to hold positions such as systems analyst within a centralized information systems department, information analyst, systems support within functional areas, or independent management consultants specializing in systems work.

In any case they must possess an in-depth knowledge of the systems analysis and design process and of the tools, techniques, and methodologies available for use in this process. They must be capable of effectively performing such functions as information requirements analysis, system documentation, system evaluation, system development and testing, selection of system technology for specific applications, and system implementation. Among the tools and techniques which designers must utilize are programming languages, utility programs, flowcharting, database software and query languages, data communications software and services, modelling and simulation software, and expert systems.

To best prepare students for entry-level positions as information systems designers, we suggest a curriculum designed to accomplish educational objectives in each of the nine broad content areas as indicated in Figure II.5. All six of the objectives would be addressed in the educational program with respect to the content areas of database concepts, the technology of information systems, use of systems technology, and systems analysis and design. The objectives of knowledge, comprehension, application, and analysis would be addressed with respect to the content areas of internal control and AIS applications. Only knowledge and comprehension would be covered with respect to management use of information in decision-making, management of information systems, and auditing of AIS.

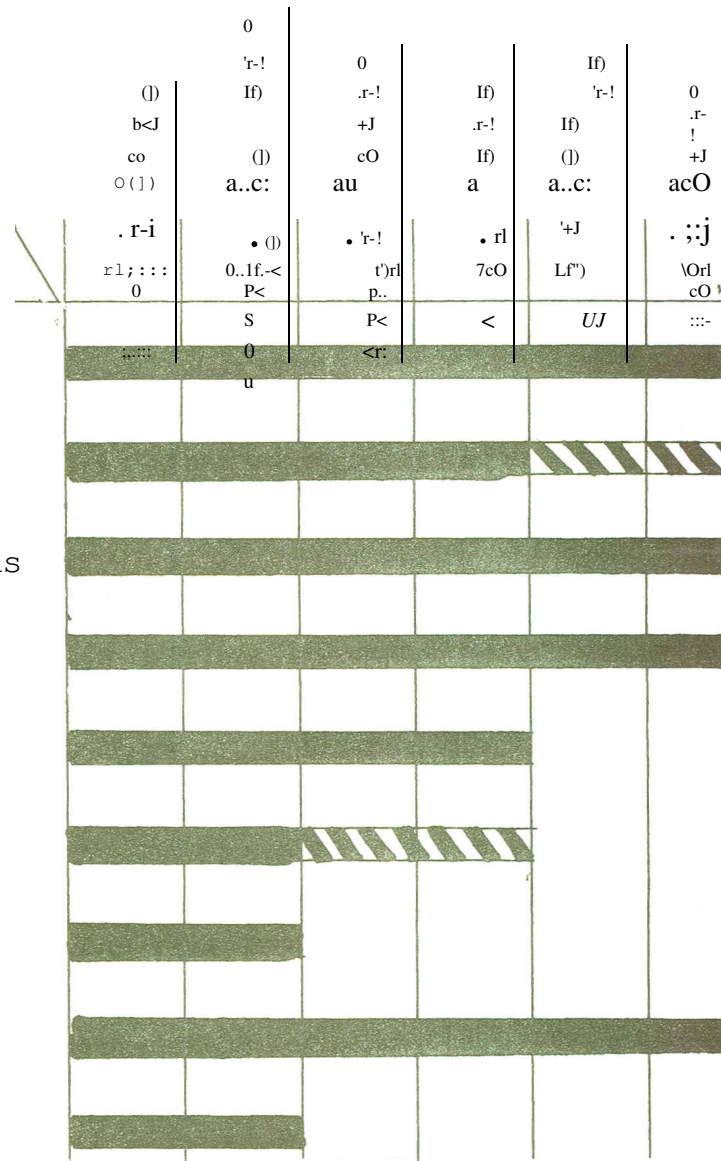
FIGURE 11.5

## SUGGESTED EDUCATIONAL OBJECTIVES FOR INFORMATION SYSTEMS DESIGNERS

Educational Objectives:

### AIS Content Categories:

- 1) Database concepts
- 2) Internal control
- 3) Technology of information systems
- 4) Use of systems technology
- 5) AIS applications
- 6) Management use of information
- 7) Management of information systems
- 8) Systems analysis and design
- 9) Auditing of AIS



## Information Systems Evaluators

The role of information system evaluator overlaps to some extent with the role of information system auditor. However, while the auditor focuses more on the reliability and integrity of information system outputs and the quality of internal accounting controls, the evaluator is assumed here to focus more on administrative procedures and the efficiency and effectiveness of systems management. The systems evaluator might hold a position as a management accountant, an internal auditor specializing in operational or management audits, or as an administrator with direct or indirect responsibility for management of an information systems function.

Information systems evaluators must have a working knowledge of the principles and practices of effective information systems management. In addition to the accounting and administrative controls with which auditors must be familiar (as described above), this includes systems planning methods, the use of steering committees, project management techniques and controls, cost analysis of information systems technology, systems personnel performance evaluation standards, computer operations controls, and facilities protection, backup and recovery procedures.

In the role of information systems evaluator, a person is likely to make less use of information systems technology than that made by a person in any of the other three roles. However, the evaluator may also function as an auditor or a user, and in those roles make much greater use of systems technology.

To best prepare students for entry-level positions involving the evaluation of information systems, we suggest a curriculum designed to accomplish educational objectives in each of the nine broad content areas as

indicated in Figure 11.6. All six of the educational objectives would be addressed with respect to the content areas of internal control and management of information systems. The objectives of knowledge, comprehension, application and analysis would be addressed with respect to the content areas of file processing concepts, the technology of information systems, systems analysis and design, and auditing of AIS. with regard to use of systems technology and AIS applications, only the objectives of knowledge, comprehension and application would be treated, while for management use of information in decision making the program would cover only the knowledge and comprehension objectives.



FIGURE II. 6

SUGGESTED EDUCATIONAL OBJECTIVES FOR  
INFORMATION SYSTEMS EVALUATORS

Educational Objectives:							
AIS Content Categories:							
1)	Database concepts						
2)	Internal control						
3)	Technology of information systems						
4)	Use of systems technology						
5)	AIS applications						
6)	Management use of information						
7)	Management of information systems						
8)	Systems analysis and design						
9)	Auditing of AIS						



### AIS Course Objectives

The educational objectives for the AIS course and prerequisite courses n be derived by identifying, for each of the nine AIS content categories, the minimum level of educational objectives that must be met to satisfy the requirements for all four roles. By satisfying this set of objectives, the A course meets the core requirements for students preparing for careers involvi each of the four roles, and leaves those objectives needed for some but not a roles to be met by advanced coursework subsequent to the AIS course, and through work experience. Following this procedure, we obtain a suggested AIS course content designed to accomplish educational objectives in each of the nine broad content areas as indicated in Figure 11.7.

Insert FIGURE 11.7 here

According to this plan, the prerequisite coursework plus the AIS course would be designed to achieve the objectives of knowledge, comprehension, application and analysis relative to the content areas of database concepts, internal control, and the technology of information systems. Coverage of use of systems technology, AIS applications, and systems analysis and design woul, address the objectives of knowledge, comprehension and application. with regard to management use of information in decision'making and management of information systems, only the objectives of knowledge and comprehension would be treated. Coverage of auditing of AIS would be limited to the knowledge objective.

FIGURE 11.7

SUGGESTED EDUCATIONAL OBJECTIVES FOR  
FOR AIS COURSE

Educational Objectives:		0	0	(f)	0
AIS Content Categories:		(f)	(f)	(f)	(f)
		bO	+J	'rl	'rl
		'rl	m	(f)	+J
		o..r::	ou	0>..	Om
		.<!)	. 'rl	. 'rl	'j
		ON I-<	t"l rl	7m	\Orl
		p..	p..		m
		E	p..		>
		0			[.LI
		u			
1)	Database concepts				
2)	Internal control				
3)	Technology of information systems				
4)	Use of systems technology				
5)	AIS applications				
6)	Management use of information				
7)	Management of information systems				
8)	Systems analysis and design				
9)	Auditing of AIS				

As mentioned earlier, some of these objectives might be partially met in courses prerequisite to the AIS course. For example, assuming the AIS prerequisites identified in Figure II.1, it would be expected that (1) some coverage of management use of information in decision making would be included in the introductory financial and managerial accounting courses, (2) some coverage of usage of information technology would be part of the introduction to microcomputer skills course, and (3) some coverage of the technology of information systems and of systems analysis and design would be included in the introduction to information systems course. Of course many other pattern of courses, course sequences, and distribution of course content are possible

### Summary

The AIS course is a central part of a curriculum designed to prepare students for roles as users, auditors, designers, or evaluators of information systems. By delineating the educational objectives that must be met to prepare students for each of these four roles, we are able to derive a minimum set of core objectives for the AIS course. Whether all of these objectives can be met in a single AIS course is unclear. Perhaps some of the objectives will have to be met in related courses (e.g. EDP auditing) or in a second AIS course. These objectives form the basis from which we address the issues of AIS course content, pedagogical support, and administration and resources in subsequent sections of this report.

SECTION III  
CONTENT OF ACCOUNTING INFORMATION SYSTEMS COURSE  
(COMMON BODY OF KNOWLEDGE)

The content of the accounting information systems course is based on the assumption discussed in Section II that students who enter the course already have elementary computer literacy. If they do not, then this may be required as a prerequisite or there may be remedial lectures at the beginning of the course. The content of the prerequisite computer literacy is defined in Table III-I. The list of topics that should be considered by the time a student completes the accounting information systems course is listed in Table III-2. This latter list may be considered to be a suggested common body of knowledge for an accounting information systems course.

TABLE III-1 ABOUT HERE

TABLE 111-1

TOPICS LIKELY TO BE COVERED IN COURSE(S) PREREQUISITE  
TO ACCOUNTING INFORMATION SYSTEMS COURSE

Physical storage devices

Data structures and file organizations

Hardware:

Microelectronics

Computer hardware designs

Input and output devices

Data representation by computers

Software:

Computer software structure

Operating systems

Utility software

Application programming:

Procedure-oriented languages (E.G. BASIC)

Word processing

Data base programming

Spreadsheet

Wide area communications networks

Message and document communication

External databases and databanks

The objective of any introductory information systems course is to achieve information literacy, which is a knowledge of information systems and how information systems are used in organizations and how they are managed. There is often an emphasis on being able to use information in professional work in organizations.

The information systems course assumes that students will be developing computer skills and an ability to use a set of software (professional software toolkit for knowledge workers). This proficiency may be developed as part of an introductory information systems course, but portions also may be assigned to functional area courses. The rationale for the latter assignment is that the software may be best learned in connection with application problems the students are assigned in the course.

The items listed in the Table III-2 represent a comprehensive listing of topics under the nine AIS categories introduced in Section II. In general, many of these topics would be surveyed in a computer literacy course and then they would be covered in more depth in subsequent courses. The table includes an indication of where each topic might be first introduced, in a prerequisite computer literacy requirement or in the accounting information systems course.

Table III-2 also indicates the desired (minimal) level of knowledge (using Bloom's taxonomy) that students would be expected to achieve in the AIS course. Within each of the nine aggregate levels, a suggested level of competency has been derived by

considering the minimal level specified for the four roles discussed in section II of this report and by considering what level is typically covered in the courses taught by the Committee members. It should be noted that in some cases the individual committee member's ratings differed significantly. Thus the ratings in Table III-2 represent consensus, not unanimity.

Both the aggregate levels and specific topics are coded as follows:

1. Knowledge. Recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure or setting. In other words, this involves basic terminology and survey knowledge.
2. Comprehension. This means that the individual can make use of the material or idea being communicated. This is primarily at a simple level rather than in a larger context.
3. Application. This is the use of principles, ideas, and theories in concrete situations. This use goes beyond reproducing a solution or process given previously in class to producing a solution to problems that are structurally different to those previously presented.
4. Analysis. The ability to analyze relationships, recognize patterns, and apply general techniques.
5. Synthesis. The ability to apply knowledge in developing plans and organizing operations.
6. Evaluation. Quantitative and qualitative assessment using both internal evidence and external criteria.

TABLE III-2 STARTS ABOUT HERE

TABLE III-2

## ACCOVNTING INFORMATION S1ST~MS COMMON BODY OF KNOWLEDGE:

EXPECTED COVERAGE IN PREREQUISITE COURSE(S) and  
MINIMAL COVERAGE IN THE AIS COURSE

	COVERAGE IN PREREQUISITE COURSE(S)	MININAL EXPECTED COVERAGE IN AIS COURSE
Data Base Concepts:		4
Data Coding		2
File/record design		2
Batch/on-line processing		2
Data structures and file organizations	1	2
Database organizations		2
Conceptual data modeling		2
Defining database requirements		2
Model databases		1 3
Extracting data from databases	1	2
File maintenance procedures		
Internal Control:		4
Purposes of controls	1	2
Classifications of controls		3
Program error detection and correction	1	2
Error handling procedures Documentation standards	1	2
Information system controls (hardware, program, facilities, etc.)	1	4
Applications quality assurance	1	2
Role of auditors in internal control	1	2
Behavioral considerations		1 2
Control costs and benefits		
<u>Technology of Information Systems:</u>		3
Hardware:		
Microelectronics	1	2
Computer hardware designs	1	2
Input and output devices	1	2
Physical storage devices	1	2
Data representation by computers	1	2
Software:		
Computer software structure Operating systems	1	2
System software	1	2
utility software	1	2
Evaluation of programming languages	1	1
Application programming:		
Assembly language		1 2
Procedure-oriented languages	1	



	COVERAGE IN PREREQUISITE COURSE ill	MININAL EXPECTED COVERAGE IN AIS COURSE
Application programming (contin.):		
Very high level languages		2
Program generators		1 1
Programmer workbench tools		1 2
Methodologies for program design and development		
Testing and documentation		
Data communications:		
Data communications hardware	1	2
Data communications software	1	2
Wide area communications networks	1	1 1
Local area networks		1 2
Distributed systems		
Message and document communication	1	
Use of Systems Technology:		3
Decision support systems	1	3
Financial modeling		3
Professional, knowledge worker software toolkit:		
Word processing	3	3
Outliner		1
Database query language		2
Graphics package		3
Electronic mail		2
Spreadsheet package	2	3
statistical package		2
Modeling language		3
Expert systems		1 2
External databases and databanks	1	1 1 2
Office automation	1	
Industrial automation		
Small business information systems		
<u>Accounting Information Systems Applications:</u>		3
Transaction processing cycle		3
Revenue		3
Procurement		3
Personnel/Payroll		3
Production/Conversion		3
Treasury/Administrative		3
Methods for processing transactions		2
Financial statement analysis		3
Expert systems for accounting		1 2
Basic financial accounting applications		2
Budget and control models		

	COVERAGE IN PREREQUISITE COURSE(S)	MININAL EXPECTED COVERAGE <b>IN</b> AIS COURSE
<u>Management Use of Information:</u>		2
Decision theory	1	1
Decision modeling		1
Human information processing		1
Information concepts	1	1
Reporting concepts and systems		3
Management Information systems		
Information systems for competitive advantage		2
Executive support systems		1 2
Expert systems for management		1
<u>Management of Information Systems:</u>		2
Accounting for system costs		1
Organization of information systems function Management		1
of computer operations		1
Management of application development and maintenance		2
Management of information systems personnel Management		1
of end-user computing		1
Planning of information systems		1
Technology assessment and capacity planning Allocation		1
of information system resources Management of technology		1
diffusion		1
Acquisition of hardware and software		2
Assessment of the information systems function Economic		2
evaluation of computer systems		3
<u>Systems Analysis and Design:</u>		3
Role of information in organization design and behavior		1
Systems theory and concepts		2
Systems flowcharting	1	3
Development life cycle approach to application development		1
Prototyping approach to application development		1
Methodologies for systems analysis and design		2
Use of productivity tools in systems analysis		1
Information requirements determination methods		2
Behavioral considerations in information systems		2
Batch processing application design		3
Online processing application design		3
Command driven versus menu driven design		2
<u>Auditing of Accounting Information Systems:</u>		4
The effect of the computer on processing controls		4
Study and evaluation of internal control		2
Application post-implementation review		1
Security, backup, and recovery review		1
General controls for computer processing		2
Application controls		2
Audit trail in computer data processing		2
Computer audit tools and techniques		2

The codes for the aggregate categories in Table 111-2 (data base concepts, internal control, technology, etc.) are based upon the analysis presented in Section II. In general, these ratings are higher than the committee's ratings of the specific items which evidently take into account what is feasible in a single AIS course. This implies that it may not be possible to meet even the minimal objectives specified in Section II in a single AIS course.

As noted in Section II, the exact coverage of the topics would need to be tailored to each specific educational institution. The topics are presented as a list that may be useful in curriculum planning and in partitioning topics among courses. The list of topics in Table III-2 may also be used in defining the in-depth study in subsequent courses.

#### SECTION IV PEDAGOGICAL RESOURCES

There are many ways to support the educational objectives of an accounting information systems course; some more efficient and effective than others. Selecting the right tools requires a thorough understanding of the available resources and familiarity with the characteristics of specific ones gained through use and experimentation. In the final analysis, the teaching tools used reflect the orientation of the instructor. This section is designed to provide information on available accounting information systems teaching resources, including text materials, software packages, design tools, case materials and databases. The overall objective is to acquaint the accounting educator with tools available to assist in accomplishing the objectives presented in sections II and III.

There is a wealth of available text materials, software and other support materials (pedagogical resources) to help accomplish the objectives of the accounting information systems course. The list has been divided into four broad functional categories:

- 1) Accounting Information Systems Texts and Support Materials - that present the fundamentals and complexities of the accounting information systems discipline;
- 2) Accounting Applications Software and Materials - that help students to understand computerized applications of typical accounting systems and functions;
- 3) System Design Software and Materials - that help students to understand and participate in the design of manual and computerized applications;
- 4) End-User Software and Materials - that help students to understand and

design small computerized information systems for meeting individual information needs.

The following categorized list is designed to be used as a reference for accounting educators. Although such a list rapidly become out of date, the list should prove useful in the short run and may provide an impetus to the development of an updating mechanism. Each entry contains the title of a specific item, its author and publisher, a brief explanation of its function, an abbreviation pertaining to type (e.g. PC for personal computer package and T for textbook), and a number(s) in brackets pertaining to the AIS content categories [1 - 9] introduced in sections II and III. Our purpose is to suggest possible resources not to provide a totally comprehensive list. We also suggest that you use the most recent version or publication edition available.

ACCOUNTING INFORMATION SYSTEMS TEXTS AND SUPPORT MATERIALS:

This category contains many of the standard accounting information systems textbooks, text support materials, case books and supplementary readings. The textbooks are designed to present the fundamental topics that are necessary for an understanding of the accounting information systems discipline, while the supplemental materials discuss and extend important issues. Abbreviations used in this section are T for textbook and S for supplemental material.

Insert TABLE IV.1 here

TABLE IV.1

## SELECTED ACCOUNTING INFORMATION SYSTEMS AND SUPPORT MATERIALS

- A Casebook for Management Information Systems (Lucas and Gibson, McGraw-Hill). (S) [1-9]
- Accounting and Information Systems (Page and Hooper, Reston). (T) [1-9]
- Accounting and Information Systems (Wilkinson, Wiley). (T) [1-9]
- Accounting Information Systems (Bodnor, Allyn and Bacon). (T) [1-9]
- Accounting Information Systems (Hicks and Leininger, West). (T) [1-9]
- Accounting Information Systems (Leitch & Davis, Prentice-Hall). (T) [1-9]
- Accounting Information Systems (Lindhe & Grossman, Dame Publ.). (T) [1-9]
- Accounting Information Systems (Murdick, et.al., Prentice-Hall). (T) [1-9]
- Accounting Information Systems (Nash and Roberts, MacMillan). (T) [1-9]
- Accounting Information Systems: A Book of Readings with Cases (Davis and Cushing, Addison Wesley). (S) [1-9]
- Accounting Information Systems: A Control Emphasis (Li, Irwin). (T) [1-9]
- Accounting Information Systems: A Cycle Approach (plus casebook) (Robinson, Davis and Alderman, Harper & Row). (T) [1-9]
- Accounting Information Systems and Business Organizations (Cushing, Addison Wesley). (T) [1-9]
- Accounting Information Systems: Concepts and Practice for Effective Decision Making (Moscow and Simkin, Wiley). (T) [1-9]
- Accounting Information Systems Practice Case (Page, et.al., Reston). (S) [1-8]
- Accounting Information Systems: Theory and Practice (Wu, McGraw-Hill). (T) [1-9]
- Building Controls Into Structured Systems (Brill, Yourdon Press). (S) [1-5,8,9]
- Business Computer System Design (Dolan, Mitchell Publishing). (S) [2,5,8]
- Business Computer Systems and Applications (Eliason and Kitts, Science Research Associates). (S) [3,5,6]
- Business Systems Analysis (Hodge and Clements, Reston). (S) [8]
- Casebook in AIS (Romney, Cherrington, & Hansen, Wiley). (S)
- Cases in Accounting Information Systems (Robinson and Robinson, Harper & Row). (S) [2,5,8,9]
- Cases in Management Accounting and Control Systems (Rotch, Allen and Smith, Reston). (S) [2,5,8,9]
- Computer Applications Guide for Accountants (Weis, Reston). (8) [1,3,4,5]
- Developing Microcomputer-based Business Systems (Edwards, Prentice Hall). (S) [1,3,4,5]
- Guide to Accounting Controls (and supplements) (PW). (S) [2,5,9]
- Information Systems in Accounting Education (Jensen, ed., The Ohio state University). (S) [2,3,5,9]
- Microcomputers: Applications to Business Problems (Loebbecke and Vasarhelyi, Irwin). (S) [4,5,6]
- Online Business Computer Applications (Eliason, Science Research Associates). (S) [5]
- Structured Analysis and System Specification (DeMarco, Yourdon inc.). (S) [1,2,8]
- The Use of Microcomputers in Accounting (Hicks & Saftner, West). (S) [2,5]

#### ACCOUNTING APPLICATION SOFTWARE AND MATERIALS:

This category contains materials that help students to understand how computerized accounting information systems actually work. By using these software packages and support materials, students are able to apply previous knowledge about accounting topics such as, charts of accounts, trial balances, adjusting journal entries and financial statements, to computerized systems. In addition, these packages and materials help the instructor to illustrate many of the fundamentals of accounting information systems. The majority of the software packages in this section have been written by accounting educators and/or accounting professionals. They are menu-driven, user-friendly systems that are relatively easy to learn and understand. They are supplemented with case materials, training materials, and documentation. The majority of the software and support materials that are available through the "Big 8" CPA firms are free for educational purposes. In addition, they are usually well supported by their respective publishers, with "hot lines" for immediate problem solving.

The abbreviations used in this section include those used in the previous section plus the following: PC for personal computer software: MF for mainframe software: TS for time sharing software: M for manual system material: and the standard "Big 8" firm abbreviations - AA for Arthur Andersen: AY for Arthur Young: C&L for Coopers & Lybrand: DH&S for Deloitte Haskins & Sells: E&W for Ernst and Whinney; PMM for Peat Marwick Mitchell & Co.: PW for Price Waterhouse; and TR for Touche Ross.

Insert TABLE IV.2 here



TABLE IV.2  
SELECTED ACCOUNTING APPLICATION SOFTWARE AND MATERIALS

- APSS (Lampe, PW) - A Lotus 1-2-3 based package with modules on working papers, flowcharting, statistical sampling, and engagement management. (PC) [4,6]
- AUDITS (DH&S) - An educational version of DH&S's generalized audit software, plus case materials and a database. (PC) [4,6,9]
- BOOK & TAX DEPRECIATION (C&L) - An asset management package for calculating, comparing and planning depreciation schemes; ties in to other C&L software and Lotus 1-2-3 and SuperCalc. (PC) [4,6]
- COMBO (C&L) - A package to assist with financial statement consolidations; ties into other C&L packages. (PC) [4,6]
- Computerized Financial Practice Problems (Dame Publications, Houston) To illustrate differences between manual and microcomputerized accounting systems. (PC) [4]
- Curriculum Development Program Cases (C&L) - Accounting case problems for classroom use with the C&L microcomputer software. (M) [4]
- Electronic Spreadsheet Applications (Dame Publications, Houston) - To work with accounting Lotus 1-2-3 based templates. (PC) [4,5,6]
- PREAUDIT (C&L) - A trial balance based package for the preparation and review of financial statements; interfaces with Lotus 1-2-3 and SuperCalc. (PC) [4]
- SCAD (Simulated Case for Audit Decisions, Felix, et.al, PW) - Software and case materials for auditing decision making. (MF, TS) [4,9]
- STAR (Statistical Techniques for Analytical Review in Auditing, DH&S) Applies analytical review to identify unusual variations in audit data using multiple regression techniques. (PC) [4,9]
- SYSTEM 2190 (PMM) - A generalized audit software package available for both the mainframe and microcomputer. (MF, PC) [4,9]
- 1120 TAX ASSEMBLY (C&L) - A corporate tax preparation package; ties in to other C&L packages. (PC) [4,6]



## SYSTEMS DESIGN SOFTWARE AND MATERIALS:

This category contains materials that help students to understand computerized information flows and to work with systems design tools. By using these packages and support materials, students are able to analyze computerized information systems, evaluate accounting information systems for internal controls and participate in the design of decision support systems. The majority of the software packages listed in this category were written by accounting educators and accounting professionals to support both classroom and field audit situations. As such, they are user-friendly, menu-driven systems that are also easy to learn and use. The abbreviations used in this section are the same as those used in the previous sections.

Insert TABLE IV.3 here

TABLE IV.;J  
SELECTED SYSTEM DESIGN SOFTWARE AND MATERIALS

ControlPlan (DH&S) - To assist in the study, evaluation and modeling of internal accounting controls. (PC) [2,4,8]

Diagramming Techniques for Analysts and Programmers (Martin and McClure, Prentice-Hall) - For diagramming and analyzing application systems. (M) [4,8]

Excelerator (Index Technology, Cambridge) - To assist in building data flow diagrams and presentation graphics linked to a data dictionary. (PC) [4,8]

Handbook of EDP Auditing (Halper, et.al, C&L, Warren, Gorham & Lamont, Boston) - A Reference handbook on system design, operation and auditing, with emphasis on internal control. (M) [1-9]

PC DRAW (Micrografx) - To assist in drawing systems flowcharts and creating accounting information systems graphics templates. (PC) [4] SEADOC (Systems Evaluation Approach: Documentation of Controls, PMM)

For the documentation and evaluation of internal accounting controls. (M) [1,2,5,9]

SEACAS (Systems Evaluation Approach: Computerized Audit Support, PMM)

For basic and consolidated financial statements, systems documentation, audit sampling and accounting database applications. (PC) [2,4,9]

systems Understanding Aid for Auditing (Arens and Ward, Systems Publications Inc.) - To enhance the understanding of document and information flows, with an emphasis on internal controls. (M) [2,5,9]

Systems Understanding Aid for Financial Accounting (Keiso, Arens and Ward, Systems Publications Inc.) - To enhance the understanding of financial accounting information systems. (M) [2,5]

Systems Understanding Aid-Microcomputer Version (Arens and Ward, Systems Publications Inc.) - A package to enhance the understanding of how microcomputer accounting applications work, with an emphasis on internal controls. (PC) [2,4,5,9]

## END-USER SOFTWARE AND MATERIALS:

This category contains materials that help students understand and use software designed to support the development of personal decision support information systems. By using these packages, students are able to understand how to design small computerized systems to assist in meeting personal information and analysis needs. The majority of the software in this section is written by software vendors. It is, therefore, well documented with manuals and introductory training materials oriented toward general business applications. The abbreviations used in this section are the same as those used in previous sections. Note that Table IV.4 contains only a sample of what exists in this area.

Insert TABLE IV.4 about here

TABLE IV.4

## END-USER SOFTWARE, DATABASES AND MISCELLANEOUS MATERIALS

dBASE III (Ashton-Tate, Los Angeles) - For creating and managing a microcomputer database application. (PC) [4J

Decision Support Modeling (Decision Systems Support, Inc.) - Statistical and optimization models. (PC) [6J

ENCORE (Ferox, Inc.) - A financial planning and modeling package, includes report generator and database. (PC) [6,4J

EXPRESS (Management Decisions, Inc., ) - A decision support system (4th generation language) for sophisticated data analysis, modeling and forecasting. (MF) [4J

FOCUS (Information Builders, Inc., NY) - A database-oriented decision support system (4th generation language) for sophisticated data manipulation and report generation. (MF) [4J

Framework II (Ashton-Tate, Los Angeles) - For database, spreadsheet modeling and graphics applications. (PC) [4J

IFPS (Interactive Financial Planning System, Execucom, Austin) - For financial modeling, "what if" analysis and report generation. (MF, PC) [4J

LEXIS (Mead Data Central, Dayton) - A full text database of federal law, including general, securities and tax, certain state laws and accounting information. (TS,PC) [4J

Lotus 1-2-3 (Lotus Development Corporation, Cambridge) - For spreadsheet modeling, database and graphics activities. (PC) [4J

Lotus 1-2-3 Structured Case Materials (DH&S) - Case materials and templates for accounting and auditing activities. (M) [4J

NAARS (National Automated Accounting Research System, Mead Data Central, Dayton) - A database of annual reports, authoritative accounting literature and proxy statements. (TS,PC) [4J

PC/FOCUS (Information Builders, Inc., NY) - For database-oriented data analysis, maintenance and reporting activities. (PC) [4J

PlusPlan (DH&S) - For accounting and financial statement based financial modeling and sensitivity analysis. (PC) [4J RBASE 5000 (Microrim) Database software similar to dBase III. (PC) [4J SIMPLAN - A financial modeling language for simulating multidimensional financial problems. (MF) [4J

spreadsheet Applications in Managerial Accounting (DiAntonio, Reston) To assist with the design of spreadsheet based managerial accounting applications. (M) [4,5 J

SuperCalcIII (Soccim/IUS, ) - For spreadsheet modeling, database and graphics activities. (PC) [4J

SYMPHONY (Lotus Development Corporation, Cambridge) - For spreadsheet, database, communications and word processing. (PC) [4J

System W (Comshare, Ann Arbor) - For financial modeling, planning and control. (MF, PC) [4J

## SUMMARY OF SECTION IV - PEDAGOGICAL RESOURCES:

Teaching accounting information systems is a time consuming endeavor when computer oriented projects or supplemental exercises are used as pedagogical tools. The software packages listed in this section all require significant time investments prior to and during classroom use. The time investment to learn a menu-driven accounting package well enough to use it for classroom activities, assuming a moderate amount of background computer knowledge, is relatively short; a package designed to be used by field auditors for financial statement preparation would require an estimated 10 to 20 hours. On the other hand, the time investment to learn a mainframe financial modeling package well enough to use it for classroom activities is quite long; an estimated 40 hours or more. Additional time and resources are also required to setup example problems and teaching materials.

Based on experience in using the majority of the software and materials listed in this section, we present the following recommendations as a guideline for using them as pedagogical tools in accounting information systems:

- 1) Make use of packages that include data and case materials for support: Much of the listed software is accompanied by exercises, example applications and case materials which are very handy for familiarization and classroom use.
- 2) Be aware of the size of the software package to be used in the classroom: Microcomputer software which requires more than one system and one data disk is hard for students to handle, unless you have a network or hard disk environment. In addition, some microcomputer software and mainframe packages have special hardware requirements, such as extensive amounts of internal

memory.

- 3) Be prepared to use assistants for computer lab periods and spend at least two to three classroom periods on use of the package before attempting independent student exercises. In addition, it is helpful to arrange "open lab hours," with a lab assistant present, for students to experiment with the software.
- 4) Take advantage of training programs and resources offered to accounting educators by the various public accounting firms including free software, training materials, and seminars sponsored by national and local offices of many of the large public accounting firms.

SECTION V.  
RESOURCE AND ADMINISTRATIVE ISSUES

The purpose of this section is to survey the issues and problems pertaining to needed resources for and administration of the AIS course. Our survey will encompass such resources as faculty, computer hardware, and computer software, as well as such administrative support elements as computer laboratory assistance. After identifying the problems and issues, we will propose various solutions.

Problems and Issues

1. Availability of Qualified Faculty. Perhaps the most critical resource problem in AIS education is the availability of AIS instructors. Since the AIS course has been a required part of the accounting curriculum for only a short time in most universities, many current faculty have little understanding of the AIS area. Thus, relatively few current faculty are qualified to teach the AIS course, and few are motivated to undertake a study program that would enable them to become qualified.

The status of new doctorates in accounting is also discouraging. Although most, if not all, recent graduates have taken one or more AIS courses, very few of the graduates are choosing AIS as their primary area of teaching interest. According to the available data, the demand for tenure-track systems instructors greatly exceeds the supply. Furthermore, the gap is not expected to narrow in the foreseeable future. (It might be noted that a new study of the demand and supply of systems instructors has been commissioned by the Information Systems Management Advisory Services section of the American Accounting

Association. The results of this study, expected during the fall of 1986, may shed more light on the situation.)

Assuming that instructors are acquired to teach the AIS course, a continuing problem is encouraging the instructors to keep up-to-date in a rapidly changing arena. On the one hand, the instructors must keep up-to-date with respect to new concepts (e.g., structured analysis techniques, prototyping), applications (e.g., decision support systems for controllers), and technology (e.g., distributed systems, relational data bases). On the other hand, the instructors must keep up-to-date with respect to new pedagogical techniques (e.g., computer-integration via assignments involving electronic spreadsheets and data management software).

## 2. Availability of Suitable Computer Hardware and Software.

Since the integration of "hands-on" computer assignments is widely recognized as essential to the AIS course, the availability of computer hardware for student use is an urgent issue. This computer hardware should likely include microcomputers, mainframes, terminals, printers, graphics plotters, and modems. The quantities of these devices should be sufficient to minimize the times that students must wait for their use or for the outputs (i.e., printed statements or plotted graphs) from computing sessions. In selecting the particular makes of computers to acquire, university administrators should consider the availability of compatible educational software packages. For instance, IBM PCs (or IBM-compatible PCs) and Apple microcomputers should be given careful consideration, since many of the educational software packages are written for such microcomputers.

In addition to making computers available to students in general is the problem of providing an adequate teaching environment, e.g. a



"computer classroom". The design of such a classroom involves issues of projection equipment, networking of workstations, sharing of software, testing complications and faculty training. One rule of thumb is to make the computer classroom identical to the environment the student faces when completing assignments. Unfortunately, this environment is likely to differ from the environment faced by the faculty and compatibility problems will obtain.

Microcomputers and related hardware must also be made available to those faculty who instruct the AIS course. An issue is whether such hardware should be permanently located in the faculty members' offices, in order to enable them to demonstrate software, to illustrate solutions and approaches, and to prepare and grade assignments more efficiently.

Equally critical problems concern suitable software packages. Administrators, in consultation with affected faculty, must evaluate and acquire those software packages that can best meet the objectives of the AIS course. Such software may be widely applicable packages, such as Lotus **1-2-3** and dBase **III**, or educational packages supplied by textbook publishers. In the process of evaluating such software packages, the decision makers must consider how the packages are to be accessed by students, e.g., by downloading from a mainframe within the structure of a computer network or by hand-loading individual diskettes.

A continuing problem that relates both to computer hardware and software is the incorporation of updates and revisions that are made available by the manufacturers.

3. Availability of Adequate Administrative Support. Several issues concern the adequate support of administrators, both at the department

level and above. Some of these issues, such as adequate secretarial and word processing support, are general to all accounting courses and will not be considered in this report. Other issues have an impact primarily on the AIS course.

One issue concerns the availability of computer-related personnel and facilities. Consultants or assistants are needed in the computer laboratory on a continuing basis. Thus, they must be hired (perhaps for a quarter or semester) and scheduled on a week-by-week basis. Classrooms with built-in features such as microcomputers and large screens are needed on an occasional basis for computer-related demonstrations and team projects. If not currently available, they need to be constructed. When available they need to be scheduled for the temporary but exclusive use of AIS sections (and perhaps other accounting courses). A second issue concerns the added time burdens on AIS instructors due to the need to prepare and administer computer related assignments. These time burdens may adversely affect the ability of tenure-track faculty to conduct activities, such as research and publication, that are vital to their personal career development.

A third issue concerns the desirability of maintaining reasonably uniform contents and approaches within multiple sections of the AIS course. If more than one instructor is assigned to teach AIS (with perhaps the adoption of different textbooks), considerable diversity may occur from section to section with respect to contents and approaches.

A final issue concerns the courses that are prerequisite to the AIS course, particularly the computer fundamentals (also called the EDP or MIS) course. If a prerequisite course is taught by instructors who are administratively located outside the accounting department, the

course may not provide the contents or approaches that are most suitable to the AIS course.

#### possible Solutions

The remainder of this section consists of suggestions that represent possible solutions to the above problems and issues. These possible solutions are based on the assumption that administrators at the university and college levels concur in the importance of the AIS course to the undergraduate accounting curriculum and are therefore willing to devote adequate resources in support of the course.

1. The availability of qualified faculty can be enhanced in the short-term by taking the following actions:

- a. Giving priority, through available lines and remuneration enhancements, to the acquisition of faculty having primary interests in teaching AIS.
- b. Retraining faculty in related areas (e.g., auditing, computer information systems, management accounting) to teach AIS, at least on a temporary basis. (For instance, interested faculty could attend the Information and Systems Faculty Development Institute which is offered under the auspices of the AACSB).
- c. Experimenting with team teaching, e.g., using auditing faculty to teach the controls and audit techniques portion of the AIS course, so that AIS faculty can be spread over more sections.
- d. Employing adjunct faculty, such as management advisory services consultants from local public accounting firms, on a temporary basis.
- e. Assigning doctoral students who have an interest in AIS, as well as sufficient related coursework, on a temporary basis.

On a long-term basis the availability of qualified faculty will likely depend upon the relative attractiveness of teaching at the university level versus alternative opportunities. The solution may rest upon the support of outside organizations (e.g., public accounting firms) who have a vital interest in well-educated accounting graduates. This support may take the form of summer faculty internships, salary supplements, consulting opportunities, etc.

In order to help AIS instructors to keep up-to-date, their departments might undertake the following actions:

- a. Sending faculty to seminars, such as microcomputer software seminars sponsored by local public accounting firms, CPE courses sponsored by the American Accounting Association, and workshops sponsored by the AACSB.
- b. Encouraging faculty to apply for summer internships with the management advisory services section of public accounting firms or with the information systems departments of industrial firms.
- c. Encouraging faculty to apply for sabbatical leaves in which systems updating projects are undertaken.
- d. Providing financial support for faculty to subscribe to a variety of systems-related publications (e.g., DATAMATION, MIS QUARTERLY, JOURNAL OF INFORMATION SYSTEMS) and updating services (e.g., DATAPRO).

2. The availability of suitable hardware and software can be enhanced by the following actions:

- a. Obtaining grants from the university and college.
- b. Obtaining financial support from public accounting firms,

computer manufacturers ,commercial software firms, and other prospective employers of accounting graduates.

c. Providing significant discounts to students and faculty for purchases of microcomputers and related hardware and software.

d. Encouraging or requiring students to acquire their own microcomputers before admission to the accounting professional program. (If this action is taken, the acceptable models of microcomputers should be clearly specified.)

e. Providing microcomputer work stations to AIS instructors that are located permanently in the instructors' offices. This action should be taken in preference to locating all available equipment in common rooms, even if sufficient equipment is not available for all accounting faculty members. Experience has shown that overall satisfaction and productivity is higher when those faculty members who are the most frequent users have work stations close at hand and continually available.

f. Requesting the university computing service to network all software packages that are to be used by more than one course (or by more than one section, if a package is to be used by only one course) . If only a one-section course (e.g., the AIS course or microcomputer course) is to use the package, individual diskettes may be employed on a temporary basis.

In order to aid the evaluation of software and the incorporation of software and hardware updates, accounting departments might undertake the following actions:

a. Appointing standing computer resource committees that review

all requests and suggestions from individual faculty members and make recommendations to the department.

- b. Subscribing to journals (e.g., Byte, PC Week) and services (e.g., DATAPRO) that evaluate software and hardware.
  - c. Maintaining close relationships with the university computer service.
  - d. Maintaining a clearinghouse of the availability of software and computer-related instructional materials from publishers, public accounting firms, and other universities.
  - e. Performing updates of software and hardware during summers or semester breaks. Updates should be weighed very carefully, to determine if their benefits clearly outweigh the turmoil that they might create for students.
3. The availability of adequate administrative support can be enhanced by the following actions:
- a. Assigning a high priority to the incorporation of computer features in a designated classroom and to the hiring of computer laboratory assistants and perhaps a full-time computer-support person, in order to obtain appropriate financial support from the university and college.
  - b. Assigning a key AIS instructor to be the coordinator of the AIS course sections. This coordinator should schedule periodic meetings with all AIS instructors to discuss the contents and approaches to the course. He or she should also schedule the time periods during which the computer laboratory assistant(s) will be available to assist students. Careful consideration should be given to a requirement that a common textbook be adopted for use by all sections.

c. with respect to the prerequisite computer fundamentals course, monitoring closely the contents and approaches employed. If the course is taught outside the accounting department, the needs of the AIS course should be clearly specified in writing to the teaching department. The assignment of a course coordinator with adequate authority should be encouraged. If the course does not satisfactorily meet the needs of the AIS course over a reasonable period of time, the accounting department should consider teaching the prerequisite course within the department when adequate faculty and/or graduate assistants are available. In order to reduce the added time burdens on AIS instructors, their departments might undertake the following actions:

a. Requesting university or college summer grants for the purpose of developing computer-related instructional materials. (For instance, one of the members of this AAA committee has received a summer grant from his college to develop a case involving the use of the R-Base 5000 data management package.)

b. Reducing the course teaching load for a semester in which an AIS instructor is expected to develop new computer-related assignments.

c. Assuring AIS faculty that activities involving the development of computer-related materials will receive due recognition during promotion-tenure-merit pay reviews, and that publication of such activities in such journals as The Accounting Review, MIS Quarterly, and the Journal of Information Systems will also receive publication credits during such reviews.



SECTION VI  
FUTURE ISSUES

The Future

This section discusses a view of the future considering both general and specific features relative to the forthcoming technology and educational environment. Each subsection first addresses a panorama of evolution in education and then pinpoints specific points related to AIS. The discussion is divided into four sections: 1) the evolving environment and its technology, 2) the electronic classroom, 3) the electronic course and curriculum change, and 4) suggestions for coping with changes.

The Evolving Environment

Students are joining universities with ever increasing computer skills. This is a direct consequence of the emergence of a computer oriented secondary educational system, prerequisite courses that increasingly use data processing as an educational tool and the substantial increase of the use of computers as basic word processing and calculating devices in secondary schools.

Hardware devices of different origin and characteristics will continue to exist, but interface and compatibility issues will be substantially facilitated. Lack of standardization tends to lead to a "Tower of Babel" concerning both computer hardware and software, that is difficult communication problems for users and educators.



In addition to the changes in the nature of the input to business schools, the output product may be expected to change substantially. Students will graduate to jobs that: 1) are increasingly computer interactive, 2) require substantial expertise concerning system and software selection, 3) require a certain degree of software adaptation and 4) require the accountant to serve as the primary software system consultant to the client.

Many technological related accounting issues will emerge that will affect the knowledge AIS students need to be exposed to. These issues would include:

- \* quality assurance of applications on chips
- \* new forms of reporting (electronic, database oriented)
- \* security audits
- \* software attestation

A few major technological events will greatly effect the future computer environment:

- \* increasingly paperless, real-time systems leading to lack of source documents and limited audit trails
- \* substantial decreases in software and hardware costs leading to changing hardwarejsoftwarejpeopleware tradeoffs.
- \* the advent of major software productivity tools leading to an increasing amount of decentralized programming and practitioner programming.

- \* the advent of computing at 3 transparent levels (micro, mini, mainframe)
- \* a dramatic decrease in the costs of information utilities (e.g. The Source, Dow-Jones News Retrieval, etc.) which will greatly facilitate research and data analysis.

The AIS course will eventually need to service students that will have mastered the knowledge and perhaps the comprehension levels of Bloom's taxonomy for most or all of the computer literacy topics discussed in sections II and III. This will facilitate alternate teaching approaches such as direct learning by using documentation, demos and software tutorials. Course-related computer usage will evolve from the current emphasis on introduction and classification toward application, analysis and synthesis.                      Emphasis will evolve to be on 1) application accounting packages, 2) simulated accounting systems with realistic databases, and 3) group oriented, real-life projects.

## The Electronic ClassroomLElectronic Course

In terms of facilities, many classrooms will evolve to have:

- \* wiring for information exchange,
- \* plugs for lapsize computers,
- \* displays for public address,
- \* projection screens for multi-media (overhead projectors, VCR projection, public address screens),
- \* noise abatement,
- \* facilities for individual self-progress work,
- \* monitoring drivers and facilities (for instructor/lab assistant evaluation of progress),
- \* communication facilities for educational help and trouble shooting.

Pedagogically computers increasingly will be used to:

1) prepare, manage and display exhibits, 2) use educational database management tools for instructional materials, and 3) administer student teachingware usage for self-study, self-examination, variable course content, etc. In the long range AIS instruction could benefit from the implementation of four evolving concepts:

1. The educator's workbench: a super micro system to develop and administer instruction containing:
  - communication software, educational database software, accounting packages, educational administration packages (grading, grade computation, student progress

monitoring), presenter's workbench, presentation outlines, and full text of educational materials.

2. The student's workbench: similar to the instructors workbench except for increased emphasis on word processing and computational aids, including self-progress monitoring facilities (individual and encrypted for the instructor) and excluding the presenter's workbench.
3. The education command room: a professionally staffed room connected online to accounting lab workstations. It would monitor exercise difficulty, assignment performance, and questions to faculty and lab assistants. This monitoring would allow rapid evaluation of exercise efficiency and provide a record of difficulties. Specialized rooms will combine today's computer labs and the traditional accounting classrooms into modern day accounting labs.
4. The tailored instruction package: instructors often draw materials from various sources to prepare a course syllabus. Arrangements with publishers, desktop publishing, and high speed/low cost printers may allow for the acquisition of chapters from different books, the drawing of readings from publications, and the integration of pUblc-domain cases into one computer readable instructions package. This package would be printed locally for the students in the course or supplied in video-disk type devices.

The accounting system instructor's arsenal will include an arsenal of accounting packages for instructors, simulated accounting data, visual images of documents and screens, acquired teaching notes, problem solutions and a large menu of projection screens acquired and self-developed.

#### curriculum Change

An increased degree of computerization will pervade business school instruction. Basic computer skills will be expected at freshman admission time. The AIS and accounting curriculum are likely to evolve in the following ways:

- \* \_Traditional auditing may evolve to be information systems auditing.
- \* \_Computer aided auditing may be separate from the audit of computer controls and systems.
- \* \_Financial accounting instruction may increasingly incorporate information systems concepts and approaches. If so, increased emphasis will be placed on the nature of and validation of accounting systems and software packages.
- \* ^ Increased emphasis on Decision Support Systems, ways of reporting and analysis of performance in Management Accounting.

^ AIS courses may evolve toward 1) the analysis of specialized production and reporting systems, 2) surveys of available systems and features and, 3) discussion of emerging accounting related technological issues.

### Coping with Change

Faculty training, technological innovation, facility investments must be accompanied by careful management of change. These items are similar for general purposes and AIS:

1. Conversion from system-to-system must be facilitated. It should be a formalized service from the University computer center.
2. Computer related resources should be pooled at department levels and user-faculty should have an active voice on its utilization.
3. Clearing-houses must be created to contain pUblc-domain pedagogic items. These should be accessible by computer means, and funded by entities dedicated toward the dissemination of knowledge. There may be a role for the AAA on this issue.
4. Hardware and software resources such as those suggested in section V must be provided by the academic institution both for office and home use.

5. The AAA and other entities (e.g. AICPA) should offer regular computer related instruction and updating open to faculty members.
6. Doctoral programs should include basic requirements on computer skills and language utilization.

## SECTION VII

## OVERALL RECOMMENDATIONS

The charge for this committee involves both the identification of issues related to the teaching of accounting information systems within an accounting curriculum and proposing ways and means of dealing effectively with these problems. In this report this charge has been addressed by first identifying many of the difficulties one faces in teaching the AIS course. These difficulties seemed to relate to several generic issues, each of which have been addressed in a section of this report: what kind of output skills and attributes need to be provided by the AIS course? (Section II); what topics form the common body of knowledge for the introductory AIS course? (Section III); what computer software and other resources currently exist to help support the AIS course? (Section IV); what are the problems facing administrators of accounting programs and what are some possible solutions for these problems? (Section V) ; and what are some of the future technical and environmental events that will be impacting the AIS course? (Section VI) . For many of the identified issues it was possible to consider their impact from the standpoint of the standard taxonomy of educational objectives developed by Bloom.

Given that many issues and possible solutions have been discussed earlier in this report, we shall focus in this concluding section on suggestions and recommendations which seem either to transcend several of the earlier sections or those that seem particularly relevant to the American Accounting Association.



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One suggestion that emanated from several issues concerns the need for a national "clearing house" for accounting information systems resources. This could involve publishing current reviews of relevant software and technical advancements in appropriate AAA publications. This could build upon the efforts begun by the AAA Auditing section concerning audit software reviews and the software clearinghouse initiated within the Journal of Information Systems. This might also involve developing or enhancing appropriate data bases of case materials, course syllabi, financial and economic data, hardware and software reviews, and public domain software. Perhaps the large accounting and auditing firms could provide "hot lines" or access to their technical support groups. Some of the firms are currently providing technical support and also providing case materials that should be useful in AIS courses. An AAA standing committee that would track information systems developments relevant to accounting and would coordinate database (and model-base) development should be considered. The ability to tap a national AAA "bulletin board" of AIS relevant data, software and technical reports is one area where "contemporary approaches to teaching accounting information systems" may differ from teaching other accounting and auditing courses.

In a more general vein, there seems to be a general need to improve standards in information systems so that the barriers to using software, to communicating electronically, to using data bases, and to augmenting existing educational and research software may be removed or at least lessened. Computing standards developed

at least partly from the perspective of academia would certainly enhance accounting education and research. (Such standards might also be useful for accounting and auditing practice.) Although this has been an issue within computer science and information systems for many years, perhaps the AAA can take a leadership position in this regard.

Given the state of rapid development of computerization of accounting courses in general and of the AIS course in particular, the AAA needs to monitor and provide input to the AACSB standards development process related to information systems and to AIS in particular. Input to the AACSB might include a desired syllabus for the prerequisite course (or courses) to the AIS course and some detail as to the computer literacy needs of other accounting and auditing courses. As a means of providing such input, the AAA may need to appoint an appropriate body to continue the work included in sections II and III of this report; that is the specification of a common body of knowledge for the AIS course and prerequisite computer literacy.