IDENTIFICATION OF DATA PROCESSING EDUCATION

- FOR SELECTED ACCOUNTANTS

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

The introduction of the computer, only thirty years ago, has had a profound effect on almost every aspect of society today. Business practices and procedures, in particular, have changed drastically since International Business Machines began to manufacture electronic computers for business use in the 1950's. The sheer size of the business world's investment in computer installations is staggering. Silver and Silver (1981) estimate that by the end of 1982, the cumulative installed value of computers in industry and government will be $118 billion.

Almost every business application has been affected in some way by the computer. Nowhere has the impact of the computer and electronic data processing been more pronounced than in the applications performed by accountants. Many of these applications have changed dramatically. However, Tambrino (1979) contends that the increasing role of computers in businesses does not mean that all traditional accounting services have become obsolete. On the contrary, he believes computers have opened up many new opportunities for accountants to increase their effectiveness. The computer is helping accountants to provide better information for decision making.

To ensure maximum use of the capabilities of the computer, accountants must become knowledgeable in the analysis and design of

electronic data processing systems. According to Brown and King (1982), accounting students must have exposure to electronic data processing procedures so that they are better prepared to interact with the computer on the job.

Accounting educators must accept the responsibility of preparing accounting students to deal with electronic data processing. As Rosenberg (1979, p. 3) states, "As computer technology tucks the financial community under its wing, the demand for accountants with DP experience will soar." It is up to accounting educators to meet the demands of business by providing competent, qualified accountants who have a firm background in electronic data processing. Only through continual dialogue with the business community can accounting educators determine specifically what that electronic data processing background should include.

Statement of the Problem

The purpose of this study was to identify data processing knowledge and skills needed by accountants employed by oil companies as perceived by accounting supervisors. Identification of the knowledge and skills was accomplished by an analysis of data received from a questionnaire mailed to selected oil companies in Oklahoma, Kansas, and Texas. The data collected by the questionnaire were analyzed using a Statistical Analysis System (SAS) program to reveal frequencies and percentages of each response for each question included in the questionnaire. The SAS program was also used to analyze specific comparisons between items on the questionnaire using two-way tables and the chi-square test for significance.

Specifically, the purposes of this study were to determine:

1. The accounting procedures which oil companies complete with the aid of electronic data processing.

2. The current status of data processing education requirements for accountants employed by oil companies.

3. The data processing courses considered most important for accountants employed by oil companies as perceived by accounting supervisors.

4. The data processing knowledge and skills considered most important for accountants employed by oil companies as perceived by accounting supervisors.

Need for the Study

Many businesses today are attempting to utilize the great capabilities provided by the computer. With the proliferation of minicomputers and microcomputers, even small businesses are now able to take advantage of computer technology. One area in the businessworld where advanced computer technology has had a significant effect has been on traditional accounting functions and procedures. Manual manipulation of accounting data has been sharply curtailed since the advent of the computer. As noted by Heatherington (1980, p. 3) in a publication from the Illinois State Board of Education, "Accounting and data processing are so interrelated that any attempt to separate them is unrealistic in the 1980's." Cicero (1981) feels that data processing and accounting go hand in hand.

According to Burch and Sardinas (1975) in a paper submitted to the American Accounting Association (AAA), more and more accounting firms (also business and government) are looking for accounting students with a sound background in information systems. Rosenberg (1979) cites several recent developments which support the claim that today's and tomorrow's accountants will need exposure to computer techniques. First, the

Certified Public Accountant's examination now includes questions relating to computer auditing. Second, most professional conferences such as those offered by the AICPA have started to include lectures on computer-related issues.

Who, then, must provide this data processing education for accountants? This computer systems background must be provided by business educators. Mott and Wall (1975) cite the need for more electronic data processing in accounting courses as a major issue for business education. Business educators must meet this challenge.

The challenge of providing accounting students with an adequate data processing background will not be easy. At a Joint Symposium on Education for Expanding Computer Curriculums sponsored by the American Institute of Certified Public Accountants (AICPA) and the American Accounting Association (AAA) (1975), participants agreed that undergraduate computer education available to prospective accountants and auditors is viewed by employers as far more limited than it should be. It was further agreed that the existing computer education for accountants does not provide a sound understanding of commercial computer applications, or even a foundation upon which such an understanding can be based.

Nestman and White (1978) state that it is time for colleges and universities to organize their thoughts about computer education for accounting majors. They cite the great diversity of courses being offered through accounting departments as a significant problem and would like to see a concentrated curriculum in the area of data processing for accounting majors. Delta Pi Epsilon's (1978) Research Bulletin No. 5 lists the

development of a data processing program for anyone with a career objective in accounting as an area of needed research in business education.

Business educators and businesspersons must work together to insure that accountants are adequately prepared for employment. According to Render and Stair (1975), business educators face a specific problem in identifying the computer-oriented educational needs of future businesspeople, namely the office supervisor, accountant, economist, marketing analyst, and stockbroker. White (1978) suggests that further research should be conducted to determine the extent to which data processing should be integrated into accounting courses and to determine the level of data processing skills needed by accountants. It is vitally important that business educators attempt to identify these needs.

Computers have facilitated the production and analysis of a great bulk of information. The National Business Education Association (1976) views this as a challenge to accounting educators. Only when educators and the businessworld cooperate to identify the needs of accountants brought about by the computer can specific recommendations for programs be made. This study diagnoses and reports the data processing needs of accountants employed by oil companies as perceived by accounting supervisors.

Limitations

This study was limited to a survey of 205 oil companies in Oklahoma, Kansas, and Texas listed in the 1982 Midwest Oil Register. The companies were selected on the basis of one or both of the following criteria:

1. those companies having division or district offices
2. those companies with AACP (approximate annual crude production) of 1,000,000 BBLS (billion barrels) or more.

The data collected in this study refer only to oil companies in Oklahoma, Kansas, and Texas which meet one or both of the above criteria. Care should be exercised when generalizations are made from this data analysis to other sizes of oil companies, to other states, or to other types of businesses.

Definition of Terms

To clarify the interpretation of data, the following terms are defined as used in this study:

Accountant--One who keeps, audits, and inspects the financial records of individuals or business concerns and prepares financial and tax reports.

Data Processing (DP)--The restructuring, manipulating, or reordering of data by machines, to increase their usefulness and value for some particular purpose (Silver and Silver, 1981).

Data Processing Knowledge and Skills--A basic understanding of the role, capacity, and limitations of data processing systems. Skills might include such items as programming and systems design.

Electronic Data Processing (EDP)--Data processing largely performed by electronic devices.

Computer Information Systems--The network of all communication methods within an organization derived from a data processing unit or computer.

Integration--Incorporation of data processing concepts into accounting courses.

CHAPTER II

REVIEW OF RELATED LITERATURE

This study concerns the data processing knowledge and skills needed by accountants employed by oil companies. The following areas of research and literature were surveyed: (1) the use of data processing by accountants in the business world; (2) the status of data processing education for accountants in educational institutions; and (3) curriculum implications for accounting programs.

Data Processing as a Tool for Accountants

According to Wilkinson (1982), the financial impact of computers in the businessworld is enormous, representing more than ten percent of capital expenditures for many firms and many billions of dollars for all firms combined. More and more managers and employees are being affected personally by computers and aided by computer-generated information. Schrag (1976) relates that the computer has been used as a tool in accounting for a number of years. There is every indication that the relationship between accounting and computers will continue to grow at an increasing rate. Schrag further believes that it is therefore important that accounting students become acquainted with computers during their educational development. Tambrino (1979) agrees with Schrag, stating that automation can no longer be considered a thing of the future for the accounting profession. Tambrino feels that by utilizing computers,

accountants are capable of performing their jobs more smoothly, easily, and rapidly.

Toscano (1975) contends that with the use of the computer, the accountant of the future will have the ability to deal with current information at the time of its occurrence, rather than dealing with historical facts. Typical accounting functions that computers can perform include processing payrolls, keeping production records, preparing sales invoices, and figuring costs. As Tambrino (1979) indicates, computers are capable of performing many of the jobs previously required of accountants. Accounting students, therefore, must be fully aware of the capabilities of computers and must learn to use the computer effectively.

Stubbe (1981) relates that the number of accounting/bookkeeping firms without the use of computers is diminishing rapidly. She suggests that if computers are taking over the more tedious tasks of accounting such as posting and preparing financial statements, it is more important than ever to teach students how to use the data they have compiled. Because of the dramatic changes brought about by the computer in methods of information entry, storage, retrieval, and processing, Brown (1980) contends that the accounting student must be exposed to computers in order to successfully compete in today's job market.

According to Rosenberg (1979), in one particular company, in 1979 82% of the accounting job orders received by 45 of the company's 59 U.S. offices indicated a strong preference for some data processing expertise. In 1977, only 58% of the accounting job orders indicated a strong preference for some data processing expertise. An accounting graduate with data processing knowledge may be more employable. Morrison (1977) feels

that those individuals who are able to use the computer effectively will be in a better position in today's tight labor market.

A survey conducted by Spence, Grout, and Anderson (1981) found that all university business school graduates, regardless of major, definitely need to possess a knowledge of computing. Campagna, Georges, and Talarzyk (1980) conducted a survey using business and community leaders and found that the respondents felt that certain program components in undergraduate education in accounting and business administration would remain extremely important into the next decade. Computer and information science was one of those components listed.

According to Cerullo (1980), the majority of business school graduates will interact with computer and management information systems (MIS) specialists and will need to know how the computer can assist them in becoming better managers, accountants, consultants, and so on. Presently, most business school graduates cannot intelligently converse with computer specialists and MIS generalists and do not understand basic information systems concepts. This renders them unable to use the full service potential of the computer.

The auditor also must be capable of interacting with the computer and must have basic data processing knowledge. Savich (1980) claims that audit staff at all levels should have an understanding of EDP auditing. Jancura (1975) feels that auditors must recognize that in the future they may have few, if any, clients where the computer can be ignored. She feels that it is quite likely that (1) the number of firms computerizing their records will continue to increase and (2) the trend toward greater integration of data in database systems and use of real-time management information systems will grow. According to Mathieson (1979), clients

are coming to expect their auditors to be able to deal with data processing in the same way as they deal with financial matters at present.

Some auditors hesitate to use computer auditing techniques. Dale (1979) contends that the real reasons accountants are reluctant to use computer auditing is that either the accountant has had little exposure to a computer-based auditing system, or, more likely, simply lacks the skills to properly audit such a system.

Jancura (1975) lists minimum electronic data processing knowledge requirements of the general staff auditor which updates the Common Body of Knowledge included in Horizons for a Profession written by Roy and MacNeill in 1966. The list follows:

1. A basic understanding of computer systems including equipment components and their general capabilities.
2. A basic understanding of widely installed computer operating systems and software.
3. A general familiarity with file processing techniques and data structures.
4. Sufficient working knowledge of computer audit software to use existing, standardized audit packages.
5. Ability to review and interpret systems documentation including flowcharts and record definitions.
6. Sufficient working knowledge of basic EDP controls.
7. Sufficient knowledge of EDP systems to develop the audit plan and supervise its execution.
8. A general familiarity with the dynamics involved in developing and modifying programs and processing systems (p. 48).

Tussing and Helms (1980) list technical proficiency requirements necessary for a computer audit specialist.

1. Proficiency as an auditor.
2. Ability to review and evaluate EDP internal control and recommend the extent of audit procedures required.

3. Understanding of EDP system design and operations.

4. Knowledge of programming languages and techniques.

5. General familiarity with computer operating systems and software.

6. Ability to identify and reconcile problems with client data file format and structure.

7. Ability to bridge the communication gap between the auditor and the data processor.

8. Knowing when to call for the assistance of a data processing professional (p. 72).

Schneidman (1979) notes the professional accounting literature requirements for computer education and urges the need for an expanded program for auditors. The Joint Symposium on Education for Expanding Computer Curriculums sponsored by the AICPA and the AAA (1975) concurs by reporting that aside from developing management advisory services consultants, accountants in general, both public and private, must upgrade their knowledge of computers and systems. Kunreuther (1976) feels that a CPA, without computer knowledge, is less than fully prepared to practice his profession. Schiff (1980) uses the development of computer technology as one basis for his support of a five-year graduate program for CPA preparation.

Speaking for internal auditors, Culbertson (1978) states that it is extremely beneficial for the internal auditor to have a computer background, either by education or by experience. Morris (1978) agrees by saying that the internal auditor has to develop expertise in data processing to be able to provide internal auditing service to management.

There are some negative aspects of computer technology to the accountant. Wilkinson (1982) relates that the accounting functions in many firms no longer have sole jurisdiction over data processing. Some

accountants also see computer technology as a threat to traditional accounting methods. According to Toscano (1976):

> The threat of the computer to the accountant is one of 'keeping up' with understanding and utilization of the computer. . . . The accountant must interface with the new technology. He must be in a position to utilize computer systems as tools, enabling a more exacting view of business situations (p. 31).

Data Processing Education for Accountants

While it is evident that accountants need data processing knowledge and skills, it is equally evident that accounting programs are not fully providing this education. Moore (1975), in a speech given to a joint symposium of the AICPA and AAA lists three of the most common deficiencies of accountants relating to the computer.

1. The first involves computer applications in business. Accounting graduates' experience with computers has been in a problem-solving mode, using canned packages or programming rather simple mathematical problems. They seem to have very little feel for accounting transaction processing.

2. The second common deficiency was in flowcharting analysis and documentation, not strictly limited to computers, but emphasizing computers.

3. The third involved the area of auditing with a computer, including application of statistical sampling concepts, as well as the use of the computer in sample design, selection, and evaluation (p. 7).

Sweeney (1975), in his summarization of the same symposium, reported that the deficiencies resemble a large "shopping list," with employers having to settle for less than what they sought from the schools.

Skudrna (1980) conducted a study of the use of electronic data processing in Fortune 500 companies and of accounting programs in 167 colleges and universities. Skudrna found that the use of the computer in business has modified the educational background required for

accountants. The required educational background is not being supplied since candidates for auditing positions are not knowledgeable in the areas of audit software, programming, and system capabilities. White (1978) agrees with Skudrna. As a result of her study, she found that although colleges and universities had data processing departments and equipment, apparently very few data processing courses were required of accounting majors. Very few data processing courses were even recommended as electives for accounting majors.

In his summarization of a study of colleges and universities, Mason (1975) makes some interesting observations. First, 31 percent of the schools do not use the computer in accounting instruction, and the overall course utilization is 1.5 courses. Second, only 31 percent of the schools use the computer in a systems course. Third, a number of schools have discontinued the use of the computer in introductory accounting courses.

Smiley (1978) observes that in spite of the widespread use of automated data processing, too much of the advanced accounting courses is devoted to manual methods. Little attention is directed to the application of computers in preparing reports for management.

Callen and Holen (1982) advocate the utilization of computer resources in accounting. This approach does not mean running canned programs to obtain canned answers. Students should be able to explore the relationship of utility maximization and obtain a graphic picture of what is going on.

Brown (1980), upon consultation with her advisory committee made up of accountants and businessmen, found that the committee was of the opinion that accounting instruction has not kept pace with changes in the

application of accounting theory necessitated by the extensive use of new technology. According to Cerullo (1980), most business students receive computer exposure one of two ways. First, they may take an introductory computer course taught in either the computer science department or in the school of business. Second, some instructors integrate computer applications into advanced business courses. He feels that neither of these approaches provides business students with the knowledge required to design and/or use information systems.

Render and Stair (1975) agree with Cerullo. They state that the data processing preparation for an accounting major is generally limited to the content matter in a one-term introductory course. This one-term course may not meet the needs of the accounting major. It is not surprising to find a tremendous variance in teaching approaches and course content from institution to institution and from instructor to instructor.

What has caused the great discrepancy in business needs and educational offerings? In a paper submitted to the AAA, Burch and Sardinas (cited in Schneidman, 1979) place part of the responsibility on accounting educators.

> Many accounting educators have purposely been instrumental in restricting the role of accounting departments almost exclusively to teaching how to prepare historical/periodical/financial information while ignoring the potential of many other useful dimensions of information processing methods.

They go on to state:

> In many instances they (accounting educators) show indignation to anyone who even mentions the feasibility of incorporating in the accounting curriculum topics such as computers, programming, system analysis and design, and computer auditing and control (p. 31).

The Joint Symposium on Education for Expanding Computer Curriculums (1975) identified some constraints to any expansion or improvement of the computer curriculum for accounting majors. Two of those listed are lack of adequate teaching materials and lack of consensus within the profession as to what should be learned on the campus as contrasted with on the job.

Another constraint listed was the cost of computer hardware and maintenance. Moore (1975) believes the availability of a midrange, tape-disc computer would be more beneficial to schools than the very large computer that most of them now have. He also believes that accounting faculty and students both need hands-on experience with the hardware itself.

Davis (1975) identifies as a major problem in curriculum design the question of experience in coding and debugging computer programs. There are supporters on both sides of the issue. Those who advocate programming instruction feel that the comprehension of computer data processing is enhanced by exposure to computer programming. Callen and Holen (1982) contend that mere exposure to a programming language is not enough. They feel that the mere exposure of a student to a language is equivalent to developing a vocabulary, learning grammatical rules, and syntactical structure of a foreign language but never having to read, speak, or write in the foreign language. Those who oppose the inclusion of actual coding say that learning a language which the student may not use takes time that might be better spent elsewhere.

Another area of concern centers around where the accountant should receive his data processing education. According to Nestman and White (1978), many accounting students are required to take one course dealing

with data processing. That course is usually taught by the computer science department. As a result, the accounting major is often placed in an environment unlike many he will face in actual practice.

Mason (1975) recommends that a distinction must be made between computer science processing and business data processing. Nord and Seymour (1978) believe that business-oriented data processing curriculums allow students to learn business problem-solving with the aid of the computer. Singhania (1980) states that the proper design of the first course in computer methods in the business curriculum may be the key to positive attitudes of future businesspeople towards computers and computing.

Davis (1975) feels that the most challenging constraint of implementing computer education for accounting majors may be the recruitment of relatively competent accounting faculty to develop a program in information systems. Accounting faculty are already in short supply. Chairpersons of accounting departments may be reluctant to divert their faculty into new areas.

Another problem in implementing computer education for accounting majors is the lack of textbooks and materials. Strippoli (1980) advocates that all accounting textbooks used in the school should emphasize the use of the computer for preparation and storage of financial information and for the maintenance of internal control.

Cerullo (1977), in a survey of public accountants, found that lack of suitable instructional materials on computers and electronic data processing (i.e., exercises, textbooks, programs, etc.) and lack of opportunities to acquire skills and experience in computer (i.e., few university, professional development, and other short courses were two

reasons cited for limited computer knowledge). Adequate courses and materials must be developed.

Some experts feel that integration of data processing into existing accounting courses would be a helpful solution to the problem. Mott and Wall (1975) suggest that systematically incorporating data processing concepts into the accounting course has several distinct advantages which include: (1) data processing concepts can be more realistically identified, and (2) data processing can be more easily perceived as a valuable accounting tool. Stocker (1981) believes that data processing and accounting must be integrated as almost everything in this area is computerized. Friedman (1977) claims that working with the computer in accounting courses can enhance learning and enable the student to ask the "what if?" type questions and see immediate results when variables are changed.

Stubbe and Weaver (1980) advocate using a method called infusion. In this method, small amounts of data processing information are injected into the accounting course on a continuous basis. While integration may be one answer, Mason (1975) is of the opinion that the computer content in accounting courses is a series of one shot operations that does not provide an in-depth knowledge of systems work.

Dlabay (1982) stresses the fact that skills developed in accounting classes must be expanded to include student awareness and application of automated methods. Now that computers are taking over the traditional bookkeeping chores, the role of accounting personnel is changing. More emphasis must be placed on analysis and decision making.

Data Processing Curriculum Implications

There have been some efforts made to identify a data processing curriculum for accounting majors. Strippoli (1980) contends that post-secondary educational institutions have an obligation to provide a program that is relevant to the student. Introducing the computer in the school curriculum is one way to accomplish this. He suggests that a computer course in accounting might look like the following in an undergraduate college bulletin:

> Computerized Accounting Applications - The course acquaints students with basic accounting programs as applied to the areas of financial statement preparation, accounts receivable schedules, inventory pricing methods, depreciation schedules, budget projections, and audit procedures. Both BASIC and COBOL languages will be used and heavy emphasis will be placed on the creation of programs and the updating of previous information (p. 28).

Hart and Hart (1981) contend that elective courses dealing with the computer provide supplementary background essential to prospective accountants.

Nestman and White (1978) propose a six-course sequence of data processing courses for accountants. The courses are:

1. Computer Fundamentals (3 semester hours)

   This course would be used to expose the accounting students to the basic fundamentals of computer hardware and software.

2. Programming (3 semester hours)

   In this course, the student would learn the rudiments of several programming languages: BASIC, COBOL, RPG, and MARK IV.

3. Accounting Information Systems (3 semester hours)

   This course is a continuation of Course 2. Emphasis would be placed on one language--COBOL.

4. Management of Accounting Information Systems (3 semester hours)

   In this course, the student would examine the many accounting information systems available on the market.

5. Systems Analysis (3 semester hours)

   Students in this course would be made aware of data processing/user relationships, forms design, interview techniques, flowcharting, use of decision tables and questionnaires, coding schemes, proposal and report writing, and time and costing estimates for computer projects.

6. Computer Auditing, Control, and Security (3 semester hours)

   This course would direct the students' attention to current literature on the topic of computer auditing, control, and security (pp. 12-13).

Davis (1975) considers the following to be fundamental courses which should be available to students in accounting:

1. A computer data processing course--should tend to emphasize control over the quality of computer processing as a major topic and also include flowcharting exercises.

2. Some exposure to computer programming, either using an algebraic language or a data processing language.

3. An information system analysis and design course--a teaching of tools, techniques, and materials relative to the design of application is required. The student will be apprised of principles and guidelines for data preparation, input procedures, document design, and output procedures.

4. An auditing and EDP course--handles the specific problems of auditing and control in an EDP environment (pp. 13-21).

There is a great diversity of opinion on how exactly to meet the challenge of insuring that accountants acquire needed data processing knowledge and skills. It is very important that business educators and businesspersons combine forces to remedy the situation of inadequately prepared accountants in regard to data processing.

Summary

A thorough review of the related research and literature revealed confusion on the part of both educators and businesspeople on what the accountant of today needs to know about computers and electronic data processing.

Researchers agreed that the computer has had a great impact on the accountant's job, but they could only offer suggestions on how best to prepare the accountant for this challenge.

Businesspeople were in agreement that accountants must be better trained to deal with electronic data processing. However, there was not agreement on what the accountant must know about electronic data processing or how he/she should acquire this training.

Additional inquiry is needed to determine from businesspeople what data processing knowledge and skills accountants will need to enter today's businessworld.

CHAPTER III

RESEARCH DESIGN AND PROCEDURES

The following steps were used in researching the problem, planning the study, conducting the survey of oil companies, and presenting the results of the study on data processing knowledge and skills needed by accountants:

1. Review of related literature
2. Development of the research questionnaire
3. Preparation of the cover letter and follow-up letter
4. Selection of the population
5. Collection of the data
6. Analysis and interpretation of the data
7. Presentation of conclusions and recommendations.

Designed to obtain data from oil companies, this descriptive study focused on accountants' use of data processing knowledge and skills. Data were obtained from the respondents regarding the number of full-time accountants employed, whether data processing education was required and/or preferred for prospective accountants, and the specific data processing knowledge and skills which were needed by accountants employed by the firm. The descriptive data obtained from the returned questionnaires made it possible to tabulate the number of oil companies which do and do not utilize in-house electronic data processing to process accounting data. Oil companies which use in-house electronic data processing have

provided data to reveal the make and model of computer used to process accounting data, the length of time electronic data processing has been used in the firm, the types of accounting procedures completed with the aid of electronic data processing, the computer languages used, and whether accounting and data processing were separate departments in the firm.

The research design and procedures chapter describes the research design by elaborating on each of the steps used in completing the study.

Survey of Related Literature

The available professional publications and literature dealing with accounting and business data processing were examined for the pusposes of determining if similar studies had been conducted and reviewing the literature concerning accountants' use of data processing knowledge and skills. Sources used were the Accountants Index (1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982), Business Education Index (1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982), the Index to Doctoral Dissertations in Business Education 1900-1975 (1975), Research: Process and Product (1977), Needed Research in Business Education (1979), on-line searches of the ERIC data base and a business data base by the Oklahoma State University Library, and numerous professional journals. The researcher was primarily interested in literature published since 1975 because of the ever-changing technology with regard to electronic data processing.

The Research Questionnaire

The research instrument designed to gather data for this study was a six-page questionnaire developed from a study of the literature, review

of similar questionnaires concerned with business data processing, and consultations with Oklahoma State University and Northwestern Oklahoma State University faculty members.

The questionnaire was revised after consultation with a statistician at Oklahoma State University, and after information systems faculty members and graduate students at Oklahoma State University completed the questionnaire indicating any unclear or ambiguous items. The preliminary questionnaire was also sent to Mr. Robert Innis, Assistant Director of the Pipeline Accounting Section of the Controller's Division of Conoco Oil Company for completion and evaluation. These consultations and evaluations resulted in minor revisions in wording and sequencing of the questions.

The final questionnaire was printed on 11 x 17 inch paper and folded in half to make the final size of 8 1/2 x 11 inches. An 8 1/2 x 11 inch insert was also included. This resulted in a six-page questionnaire with five printed pages and one blank page. (See Appendix A.) The questionnaire was unsigned in order to keep information by the respondents confidential. However, an identification number was used for purposes of follow-up by the researcher.

The questionnaire was divided into three sections:

I. Business Information

II. General Information

III. Data Processing Knowledge and Skills Information

Section I was to be completed by all respondents utilizing in-house data processing capabilities to process accounting data. Section I contained questions designed to obtain information on the firms' usage of business data processing for processing accounting information, including the make

and model of computer used, how long accounting procedures had been computerized, whether accounting and data processing were separate departments, specific accounting procedures completed with the aid of electronic data processing, and the computer language used to process accounting data. Those respondents who did not have an in-house computer were asked to go directly to Section II and complete the remainder of the questionnaire.

Section II was designed to obtain general information about the number of accountants employed by the firm, whether data processing education was required of prospective accountants, and the expected change in the amount of data processing education needed by accountants in the future. Those respondents who did not require data processing education background were asked to indicate whether or not they preferred data processing education coursework for their prospective accountants.

Section III of the questionnaire was designed to obtain information on the specific skills and/or topics which are needed by accountants. These skills and topics were divided into eight courses as recommended by the Data Processing Management Association. These courses and their related topics were selected by the researcher to encompass the DPMA Model Curriculum recommended core courses and additional DPMA recommended courses which might be available to an accounting major in a college or university. The first seven courses comprise the core curriculum for data processing as recommended by the DPMA. The eighth course deals specifically with the auditing function. All course information was selected from the DPMA Model Curriculum for Undergraduate Computer Information Systems Education, pages 22-41, 56-57. (See Appendix B.)

Permission was obtained from the Data Processing Management Association to use the course information. (See Appendix C.)

The questionnaire was designed in an easy-to-answer format to facilitate ease of completion by the respondents and to aid the researcher in tabulation of responses. Questions were formulated to be clear, concise, and consistent with data processing and accounting terminology. Complete directions were given at the beginning of each section of the questionnaire. Size and style of type were varied for headings and directions. Professional typesetting was utilized to insure a quality and attractive questionnaire.

Preparation of the Cover Letter and Follow-up Letter

The cover letter was written for the purpose of encouraging those businesses receiving it to participate in the study. The letter was reproduced on Oklahoma State University, College of Business Administration stationery, and was cosigned by the dissertation adviser, Dr. Richard Aukerman. (See Appendix D.)

Approximately three weeks after the original mailing was completed, a follow-up letter, a copy of the questionnaire, and an addressed postage-paid return envelope were sent to all nonrespondents. The follow-up letter was an additional attempt to encourage the businesses to complete and return the questionnaire as soon as possible. The follow-up letter was also reproduced on Oklahoma State University, College of Business Administration stationery, and was cosigned by Dr. Richard Aukerman, dissertation adviser. (See Appendix D.)

Selection of the Population

The researcher chose as the population for the study those oil companies listed in the Kansas, Texas, and Oklahoma Midwest Oil Register (1982) which met one or both of the following criteria:

1. those oil companies having division or district offices
2. those oil companies with AACP (approximate annual crude production) of 1,000,000 BBLS (billion barrels) or more.

The Midwest Oil Register (1982) for the three states provided names and addresses of the firms.

Collection of the Data

Mailing envelopes with the researcher's return address printed on them were used for mailing of the cover letter, questionnaire, and return envelope. The return envelopes also had the researcher's mailing address printed on them. Commemorative stamps were affixed to the mailing envelopes and return envelopes.

The timetable for the mailings of the original and follow-up materials was as follows:

1. Original mailing--July 12, 1982
   Date requested for return--July 22, 1982
2. Follow-up mailing--July 29, 1982
   Date requested for return--August 9, 1982.

Questionnaires were mailed to 205 firms. Five of these firms were deleted from the population for the following reasons:

1. Three firms did not have any full-time accountants employed.
2. Two of the firms had closed their offices.

There were 101 questionnaires returned from the 200 businesses contacted for a 50.5 percent response rate. One hundred of those questionnaires

returned were usable, which was a 50.0 percent usable response rate. One questionnaire was returned blank. An analysis of the returns and non-returns is reported in Table I.

TABLE I

DISTRIBUTION OF THE POPULATION BY RETURNS AND NON-RETURNS TO THE QUESTIONNAIRE

Category	Number	Percent Total (N=200)
Total firms in population	200	100.0
Total firms thought to have been contacted	198	99.0
Total firms with incorrect addresses not contacted	2	1.0
Total respondents from original mailing	60	30.0
Total respondents from follow-up mailing	41	20.5
Total respondents	101	50.5
Total usable returns	100	50.0
Total non-usable returns	1	.5
Total non-respondents	99	49.5

Analysis and Interpretation of the Data

Responses obtained from returned questionnaires were coded and punched on cards for use in computer tabulations. A Statistical Analysis

System (SAS) program was utilized to reveal frequencies and percentages of each response for each question included in the questionnaire.

Further analyses were conducted using a SAS program to indicate relationships between data processing topics checked as important and the number of years accounting procedures had been computerized, whether accounting and data processing were separate departments in the firm, and the number of full-time accountants employed by the firm. These comparisons were analyzed using two-way tables and the chi-square test for significance. The tabulation and interpretation of the data collection is presented in Chapter IV.

Presentation of Conclusions and Recommendations

Conclusions and recommendations, made on the basis of the findings reported in Chapter IV, are presented in Chapter V.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

The questionnaire was sent to 205 oil companies in Kansas, Texas, and Oklahoma. The data gathered from the questionnaire concerns data processing knowledge and skills needed by accountants. Findings are presented from a detailed analysis of the responses to the questionnaire.

Method of Analyzing the Data

Section I of the questionnaire was designed to obtain data on each firm's usage of data processing for the processing of accounting information. Specifically, this section contained questions concerning the make and model of computer used, the length of time accounting procedures had been computerized, whether accounting and data processing were separate departments in the firm, specific accounting procedures completed with the aid of data processing, and the computer languages used to process accounting data. Those respondents who did not have in-house computer capabilities were asked to go directly to Section II and complete the remainder of the questionnaire.

Section II of the questionnaire was designed to obtain general information about the number of accountants employed by the firm, whether data processing education was required of prospective accountants, and the expected change in the amount of data processing education needed by accountants in the future. If data processing education was not required

of prospective accountants, respondents were asked to indicate whether or not data processing education was preferred for prospective accountants.

Section III was designed to obtain information on the specific data processing skills and/or topics which are needed by accountants. Allowance was made in each section for the addition and clarification of "other" responses.

A Statistical Analysis System (SAS) program was used to tabulate the responses of each item in the questionnaire. The results from each response to a question were tabulated according to frequency of occurrence, cumulative frequency, percentage, and cumulative percentage. Tables of specific findings are presented in the following discussion.

Data Analysis

Responses were received from 106 oil companies in Texas, Kansas, and Oklahoma. Five of these companies were deleted from the population for the following reasons:

1. Three of the companies did not have any full-time accountants employed.
2. Two of the companies had closed their offices.

One questionnaire was unusable because it was returned blank.

The analysis of data utilized responses from 100 questionnaires. The analysis is divided into four sections: an analysis of the in-house data processing currently in use in the company; an analysis of the company's data processing requirements for accountants; an analysis of the specific data processing skills and/or topics which are needed by accountants employed by the company; and correlation comparisons of various items included in the questionnaire.

The first section, regarding the analysis of the in-house data processing currently in use in the company, was sub-divided into five areas: make and model of computer in use, length of time accounting procedures had been computerized, whether the accounting and data processing functions were separate departments in the company, specific accounting procedures completed with the aid of electronic data processing, and computer languages used to process accounting data. Each area was analyzed using frequencies and percentages.

The second section, regarding the analysis of the company's data processing education requirements for accountants, was sub-divided into three areas: number of full-time accountants employed by the company, whether data processing education background was required of prospective accountants, and the expected change in the amount of data processing education background needed by accountants in the future. The second area was further divided into number of credit hours of data processing coursework required for prospective accountants, and if data processing education was not required for prospective accountants, then whether data processing coursework was preferred for prospective accountants. The number of full-time accountants was used to classify the firms into three size categories: small, medium, and large. Each area was analyzed using frequencies and percentages.

The third section, regarding the analysis of the specific data processing skills and/or topics which are needed by accountants, was sub-divided into nine areas. The first eight areas dealt with skills and topics relating to specific courses as recommended by the Data Processing Management Association as undergraduate data processing education courses. The eight courses are: Introduction to Computer-Based Systems,

Applications Program Development I, Applications Program Development II, Systems Analysis Methods, Structured Systems Analysis and Design, Database Program Development, Applied Software Development Project, and EDP Audit and Controls. The ninth area of the third section was a ranking of the eight courses in order of their importance to an accountant. Each area was analyzed using frequencies and percentages.

Finally, various items of the questionnaire were compared utilizing two way tables and the chi-square test for significance. Responses to each of the specific data processing skills and topics from Section III of the questionnaire were compared with the length of time accounting procedures had been computerized and with whether the accounting and data processing functions were separate departments in the company. Responses to question one of Section II regarding the number of full-time accountants employed by the company were classified into groups of small, medium, and large, and were also compared to responses to each of the specific data processing skills and topics from Section III of the questionnaire.

Analysis of In-House Data Processing

Presented in this section are responses concerning the in-house data processing currently in use in the individual companies. Space was provided on the questionnaire for respondents to specify a response of "other". These responses are included in the text of this section.

The in-house data processing section included five questions. See Appendix A for the complete questions. An abbreviated form of the question is used in each table. The number of responses to each question and an analysis of the data are presented.

Respondents were asked to identify the make and model of computer used to process accounting data. A list of the responses given is presented in Table II, pages 34-35. Many respondents indicated more than one computer was used. In this case, all makes and models of computers are presented. Six of the companies indicated no in-house computer, but utilization of a computer service bureau. One company indicated that accounting procedures were not computerized. Fourteen brands of computers were represented, with IBM and Burroughs listed most often.

Table III, page 36, contains an analysis of the length of time accounting procedures had been computerized by the company. Forty respondents, or 43.01 percent, indicated that accounting procedures had been computerized for 15 years or more. Fifteen companies, or 16.13 per- indicated 1-3 years; 7 companies, or 7.53 percent, indicated 4-6 years; 13 companies, or 13.98 percent, indicated 7-9 years; and 16 companies, or 17.20 percent, indicated that accounting procedures had been computerized 10-14 years. Only 2 companies, or 2.15 percent, indicated that accounting procedures had been computerized for less than one year.

An analysis of whether the accounting and data processing functions were separate departments in the company is given in Table IV, page 37. Seventy companies, or 75.27 percent, indicated that the accounting and data processing functions were separate departments.

The fourth item in the in-house data processing section of the questionnaire requested respondents to indicate those accounting procedures completed with the aid of electronic data processing. Table V, pages 38-40, contains a list of accounting procedures that were included, whether a "yes" or "no" response was indicated, and an analysis of the response. Only six respondents, did not respond to this item.

TABLE II

MAKE AND MODEL OF COMPUTER

Make and Model	Frequency	Make and Model	Frequency
IBM System 3	2	Burroughs 7800	2
IBM System 23	1	NCR 499	1
IBM System 34	10	NCR V-8565MP	1
IBM System 38	10	NCR 8231	1
IBM System ? (unknown)	1	NCR 8400	1
IBM 360	1	NCR 8555	1
IBM 370	2	Hewlett Packard 3000, Series 30	1
IBM 370-148	1	Hewlett Packard 3000, Series 44	2
IBM 370-158	4	Hewlett Packard 3000, Series III	1
IBM 370-168	4	Honeywell 66/60	1
IBM 3033	3	Honeywell DPS/7	1
IBM 3081	3	Honeywell Level 6	1
IBM 3330	1	Univac 1100/82	1
IBM 4331	8	Datapoint ARC	2
IBM 4341 - Model I	2	Datapoint 6600	2
IBM 4341 - Model II	12	Amdahl V-6	2
IBM no model given	2	CDC Omega 480	1
Burroughs B800	1	VAX 1170	1
Burroughs B1955	1	Harris 125	1
Burroughs 2930	1	Wang VS-80	1
Burroughs 6800	2	Apple II	2
Burroughs 6900	1		

TABLE II (Continued)

Make and Model	Frequency	Make and Model	Frequency
Texas Instruments 990, no model given	2	Texas Instruments 990, Model 20	1
Texas Instruments 990, Model 6	1	Service Bureau	1
		No Computer	1
Texas Instruments 990, Model 8	1	Did Not Respond	4
Texas Instruments 990, Model 10	1		

TABLE III

ANALYSIS OF LENGTH OF TIME ACCOUNTING
PROCEDURES HAVE BEEN COMPUTERIZED

Length of Time	Frequency	Cum. Freq.	Percent	Cum. Percent
Less than 1 year	2	2	2.15	2.15
1 - 3 years	15	17	16.13	18.28
4 - 6 years	7	24	7.53	25.81
7 - 9 years	13	37	13.98	39.79
10 - 14 years	16	53	17.20	56.99
15 years or more	40	93	43.01	100.00
Did Not Respond	7	100	-	-

TABLE IV

ANALYSIS OF THE ACCOUNTING AND DATA PROCESSING FUNCTIONS AS SEPARATE DEPARTMENTS

Separate Departments	Frequency	Cum. Freq.	Percent	Cum. Percent
Yes	70	70	75.27	75.27
No	23	93	24.73	100.00
Did Not Respond	7	100	-	-

TABLE V

ANALYSIS OF ACCOUNTING PROCEDURES COMPLETED WITH ELECTRONIC DATA PROCESSING

Accounting Procedure	Frequency	Cum. Freq.	Percent	Cum. Percent
JOURNALIZING				
Yes	87	87	92.55	92.55
No	7	94	7.45	100.00
Did Not Respond	6	100	-	-
GENERAL LEDGER				
Yes	93	93	98.94	98.94
No	1	94	1.06	100.00
Did Not Respond	6	100	-	-
SUBSIDIARY LEDGERS				
Yes	91	91	96.81	96.81
No	3	94	3.19	100.00
Did Not Respond	6	100	-	-
PAYROLL				
Yes	80	80	85.11	85.11
No	14	94	14.89	100.00
Did Not Respond	6	100	-	-
INVENTORY				
Yes	59	59	62.77	62.77
No	35	94	37.23	100.00
Did Not Respond	6	100	-	-
ACCOUNTS RECEIVABLE				
Yes	87	87	92.55	92.55
No	7	94	7.45	100.00
Did Not Respond	6	100	-	-

TABLE V (Continued)

Accounting Procedure	Frequency	Cum. Freq.	Percent	Cum. Percent
ACCOUNTS PAYABLE				
Yes	89	89	94.68	94.68
No	5	94	5.32	100.00
Did Not Respond	6	100	-	-
DEPLETION ANALYSIS				
Yes	57	57	60.64	60.64
No	37	94	39.36	100.00
Did Not Respond	6	100	-	-
BILLING				
Yes	86	86	91.49	91.49
No	8	94	8.51	100.00
Did Not Respond	6	100	-	-
BUDGETS				
Yes	51	51	54.26	54.26
No	43	94	45.74	100.00
Did Not Respond	6	100	-	-
CASH FLOW ANALYSIS				
Yes	38	38	40.43	40.43
No	56	94	59.57	100.00
Did Not Respond	6	100	-	-
SALES ANALYSIS				
Yes	51	51	54.26	54.26
No	43	94	45.74	100.00
Did Not Respond	6	100	-	-

TABLE V (Continued)

Accounting Procedure	Frequency	Cum. Freq.	Percent	Cum. Percent
PURCHASES				
Yes	41	41	43.62	43.62
No	53	94	56.38	100.00
Did Not Respond	6	100	-	-
FINANCIAL STATEMENTS				
Yes	79	79	84.04	84.04
No	15	94	15.96	100.00
Did Not Respond	6	100	-	-
OTHER				
Yes	19	19	20.21	20.21
No	75	94	79.79	100.00
Did Not Respond	6	100	-	-

The percentages indicating accounting procedures completed with the aid of electronic data processing are presented in Table VI, page 42, arranged in descending sequence. Because the majority of respondents indicated more than one procedure, the percentages exceed 100 percent. It is interesting to note that more than 50 percent of the respondents indicated that 12 out of the 14 accounting procedures were computerized. Nineteen respondents, or 20.21 percent, computerize accounting procedures other than those listed on the questionnaire. The results of these responses are summarized in Table VII, pages 43-44.

Participants in the survey were also asked to indicate the computer languages used to process accounting data. The analysis of this item is reflected in Table VIII, pages 45-46. Table VIII contains a list of the computer languages, whether a "yes" or "no" response was given, and an an analysis the response.

Table IX, page 47, summarizes the percentages of respondents indicating computer languages used to process accounting data. The percentages are arranged in descending sequence. Respondents were encouraged to check all languages used; therefore, percentages add up to more than 100 percent. Forty-one respondents, or 45.05 percent, used more than computer language to process accounting data.

Almost 70 percent of the respondents indicated that COBOL was one of the computer languages used to process accounting data, while 39.56 percent indicated RPG and 20.88 percent indicated BASIC. All other languages were indicated by less than 20 percent of the respondents.

Seventeen of the respondents, or 18.68 percent, used computer languages other than those listed on the questionnaire. These responses are shown in Table X, page 48.

TABLE VI

SUMMARY OF ACCOUNTING PROCEDURES COMPLETED WITH ELECTRONIC DATA PROCESSING

Accounting Procedure	Percentage
General Ledger	98.94
Subsidiary Ledgers	96.81
Accounts Payable	94.68
Accounts Receivable	92.55
Journalizing	92.55
Billing	91.49
Payroll	85.11
Financial Statements	84.04
Inventory	62.77
Depletion Analysis	60.64
Budgets	54.26
Sales Analysis	54.26
Purchases	43.62
Cash Flow Analysis	40.43
Other	20.21

TABLE VII

ACCOUNTING PROCEDURES COMPLETED WITH ELECTRONIC DATA PROCESSING THAT WERE NOT LISTED ON THE QUESTIONNAIRE BUT SPECIFIED UNDER "OTHER"

Accounting Procedure	Frequency
Lease Records	5
Depreciation	4
Lease Income and Expense Reports	4
Royalty Distribution	4
Federal and State Tax Reports	3
WPT Liability	3
Joint Billing	2
Land Management	2
Oil Revenue Accounting	2
Payout	2
Revenue Distribution	2
Audit Schedules	1
Auto Unit Costs	1
Capital Budgets	1
Economic Evaluations	1
Excise Tax Accounting	1
Financial Planning	1
Lift Cost	1
Limited Partnership System	1
90% Limitation	1
Property Operating Statements	1

TABLE VII (Continued)

Accounting Procedure	Frequency
Regulatory Reports	1
Undeveloped Acreage	1

TABLE VIII

ANALYSIS OF COMPUTER LANGUAGES USED
TO PROCESS ACCOUNTING DATA

Computer Language	Frequency	Cum. Freq.	Percent	Cum. Percent
COBOL				
Yes	63	63	69.23	69.23
No	28	91	30.77	100.00
Did Not Repond	9	100	-	-
FORTRAN				
Yes	11	11	12.09	12.09
No	80	91	87.91	100.00
Did Not Respond	9	100	-	-
BASIC				
Yes	19	19	20.88	20.88
No	72	91	79.12	100.00
Did Not Respond	9	100	-	-
PASCAL				
Yes	1	1	1.10	1.10
No	90	91	98.90	100.00
Did Not Respond	9	100	-	-
PL/1				
Yes	12	12	13.19	13.19
No	79	91	86.81	100.00
Did Not Respond	9	100	-	-
RPG				
Yes	36	36	39.56	39.56
No	55	91	60.44	100.00
Did Not Respond	9	100	-	-

TABLE VIII (Continued)

Computer Language	Frequency	Cum. Freq.	Percent	Cum. Percent
OTHER				
Yes	17	17	18.68	18.68
No	74	91	81.32	100.00
Did Not Respond	9	100	-	-

TABLE IX

SUMMARY OF COMPUTER LANGUAGES USED
TO PROCESS ACCOUNTING DATA

Computer Language	Percentage
COBOL	69.23
RPG	39.56
BASIC	20.88
OTHER	18.68
PL/1	13.19
FORTRAN	12.09
PASCAL	1.10

TABLE X

COMPUTER LANGUAGES USED TO PROCESS ACCOUNTING DATA
THAT WERE NOT LISTED ON THE QUESTIONNAIRE
BUT SPECIFIED UNDER "OTHER"

Computer Language	Frequency
ALC	1
ADZ 52	1
ASSEMBLER	1
CP/M	1
DATABUS	3
EASYTRIEVE	3
FOCUS	1
IFPS	1
MARK IV	6
NATURAL	1
NEET 3	2
SASS	1
SPL	1

Analysis of Data Processing Requirements for Accountants

The second part of the questionnaire was designed to obtain general information about the company's data processing requirements for accountants. It also included a question on the number of full-time accountants employed by the firm. See Appendix A for the complete questions. An abbreviated form of the questions is used in each table. The number of responses to each question and an analysis of the data are presented.

Table XI, pages 50-52, contains an analysis of the number of full-time accountants employed by the companies. Responses ranged from 1 full-time accountant to 1,000 full-time accountants. One full-time accountant and three full-time accountants employed were indicated most often with 7 respondents, or 7.44 percent, indicating one full-time accountant and the same number indicating three full-time accountants. Thirty-four respondents, or 36.17 percent, indicated that between one and ten full-time accountants were employed; 30 respondents, or 31.91 percent, indicated that between 11 and 30 full-time accountants were employed; 30 respondents, or 31.92 percent, indicated that more than 30 full-time accountants were employed. Responses to this question were divided into three categories for use in two-way tables and the chi-square test for significance. The categories are: 1-10 full-time accountants, 11-30 full-time accountants, and more than 30 full-time accountants.

Respondents were also asked to indicate whether data processing education was required for prospective accountants seeking employment with the company. Only 6 respondents, or 6.06 percent, reported that

TABLE XI

NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED

Number	Frequency	Cum. Freq.	Percent	Cum. Percent
1	7	7	7.44	7.44
2	5	12	5.32	12.76
3	7	19	7.44	20.21
4	2	21	2.13	22.34
5	4	25	4.25	26.59
7	1	26	1.06	27.66
8	2	28	2.13	29.79
9	3	31	3.19	32.98
10	3	34	3.19	36.17
11	1	35	1.06	37.23
12	2	37	2.13	39.36
14	1	38	1.06	40.42
15	4	42	4.26	44.68
16	2	44	2.13	46.81
18	2	46	2.13	48.94
19	1	47	1.06	50.00
20	3	50	3.19	53.19
21	1	51	1.06	54.25
22	2	53	2.13	56.38
23	2	55	2.13	58.51
24	1	56	1.06	59.57
25	1	57	1.06	60.63

TABLE XI (Continued)

Number	Frequency	Cum. Freq.	Percent	Cum. Percent
26	1	58	1.06	61.69
28	2	60	2.13	63.82
29	2	62	2.13	65.95
30	2	64	2.13	68.08
31	1	65	1.06	69.14
34	1	66	1.06	70.20
35	1	67	1.06	71.26
36	1	68	1.06	72.34
37	1	69	1.06	73.40
40	2	71	2.13	75.53
45	2	73	2.13	77.66
50	2	75	2.13	79.79
60	1	76	1.06	80.85
67	1	77	1.06	81.91
70	1	78	1.06	82.97
75	2	80	2.13	85.10
109	1	81	1.06	86.17
115	1	82	1.06	87.23
120	1	83	1.06	88.29
150	1	84	1.06	89.36
159	1	85	1.06	90.42
170	1	86	1.06	91.48
212	1	87	1.06	92.55
240	1	88	1.06	93.61

TABLE XI (Continued)

Number	Frequency	Cum. Freq.	Percent	Cum. Percent
250	1	89	1.06	94.68
300	1	90	1.06	95.74
325	1	91	1.06	96.80
500	1	92	1.06	97.87
800	1	93	1.06	98.93
1000	1	94	1.06	100.00
Did Not Respond	6	100	-	-

TABLE XII

ANALYSIS OF DATA PROCESSING EDUCATION REQUIREMENTS FOR PROSPECTIVE ACCOUNTANTS

Data Processing Education Required	Frequency	Cum. Freq.	Percent	Cum. Percent
Yes	6	6	6.06	6.06
No	93	99	93.94	100.00
Did Not Respond	1	100	-	-

data processing education was required. Table XII, page 53, shows the analysis of the responses.

The respondents who indicated that data processing education was required were asked to indicate how many data processing hours were required, and whether these were semester or quarter hours. Only one of the six respondents who indicated data processing education was required did not respond to these further questions. Table XIII, page 55, reports the type of hours and Table XIV, page 56, reports the number of hours required. All five respondents indicated semester hours. Three of the respondents, or 60.00 percent, required 1-3 hours of data processing; one respondent, or 20.00 percent, required 4-6 hours of data processing; and one respondent, or 20.00 percent required 10-12 hours of data processing.

The respondents who indicated that data processing education was not required were asked to indicate whether they preferred that their prospective accountants have data processing coursework. Table XV, page 57, contains an analysis of the responses to this question. Seventy-eight respondents, or 88.64 percent, indicated that data processing coursework was preferred for prospective accountants. Two comments made by respondents follow:

"Up to a minimum of six hours."

"Would prefer at least six semester hours."

Responses to the changes in the amount of data processing education background needed by accountants in the future are tabulated in Table XVI, page 58. More data processing education was checked by 79 respondents, or 81.44 percent. Less data processing education was checked by 2 respondents, or 2.06 percent, while 16 respondents, or 16.50 percent,

TABLE XIII

TYPE OF HOURS OF DATA
PROCESSING REQUIRED

Type	Frequency	Cum. Freq.	Percent	Cum. Percent
Semester	5	5	100.00	100.00
Quarter	0	5	0.00	100.00

TABLE XIV

NUMBER OF DATA PROCESSING
HOURS REQUIRED

Number	Frequency	Cum. Freq.	Percent	Cum. Percent
1 - 3 hours	3	3	60.00	60.00
4 - 6 hours	1	4	20.00	80.00
7 - 9 hours	0	4	0.00	80.00
10 - 12 hours	1	5	20.00	100.00
More than 12 hours	0	5	0.00	100.00

TABLE XV

ANALYSIS OF DATA PROCESSING EDUCATION PREFERRED FOR PROSPECTIVE ACCOUNTANTS

Data Processing Education Preferred	Frequency	Cum. Freq.	Percent	Cum. Percent
Yes	78	78	88.64	88.64
No	10	88	11.36	100.00
Did Not Respond	12	100	-	-

TABLE XVI

ANALYSIS OF THE CHANGES IN DATA PROCESSING EDUCATION BACKGROUND NEEDED IN THE FUTURE

Change	Frequency	Cum. Freq.	Percent	Cum. Percent
More Data Processing Education	79	79	81.44	81.44
Less Data Processing Education	2	81	2.06	83.50
No Change	16	97	16.50	100.00
Did Not Respond	3	100	-	-

checked no change in the amount of data processing education needed by accountants in the future.

Analysis of Data Processing Skills and/or Topics Needed by Accountants

Section III of the questionnaire was designed to elicit information on specific data processing skills and/or topics needed by accountants. This section was divided into nine areas. The first eight areas dealt with topics and skills included in eight undergraduate data processing education courses as recommended by the Data Processing Management Association. The ninth area was a ranking of the eight courses.

Introduction to Computer-Based Systems was the first course examined. This course is designed as an overview of computer information systems. Respondents were asked to indicate the specific skills and/or topics included under this course that are needed by accountants. Respondents were encouraged to indicate all skills and/or topics applicable and were also given the opportunity to list other skills and/or topics not included in the questionnaire. Twenty-four skills and/or topics were included under this first course. A special response "none of these topics are needed" was also included for respondents who felt that none of the skills and/or topics were needed by accountants.

An analysis of responses is tabulated in Table XVII, pages 60-64. Twelve of the twenty-four skills and/or topics included were indicated by at least forty percent of the respondents as being needed by accountants. The three skills and/or topics receiving the largest number of "yes" responses were basic computer operations, 79 "yes" responses, or 80.61 percent; data preparation, 73 "yes" responses, or 74.49 percent; and

TABLE XVII

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE INTRODUCTION TO COMPUTER-BASED SYSTEMS

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
BASIC COMPUTER OPERATIONS				
Yes	79	79	80.61	80.61
No	19	98	19.39	100.00
Did Not Respond	2	100	-	-
ELEMENTS OF HARDWARE				
Yes	36	36	36.73	36.73
No	62	98	63.27	100.00
Did Not Respond	2	100	-	-
EVOLUTION OF COMPUTER INDUSTRY				
Yes	10	10	10.20	10.20
No	88	98	89.80	100.00
Did Not Respond	2	100	-	-
COMPUTER TYPES AND SIZES				
Yes	24	24	24.49	24.49
No	74	98	75.51	100.00
Did Not Respond	2	100	-	-
SOFTWARE CONSIDERATIONS				
Yes	48	48	48.98	48.98
No	50	98	51.02	100.00
Did Not Respond	2	100	-	-

TABLE XVII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
DATA PREPARATION				
Yes	73	73	74.49	74.49
No	25	98	25.51	100.00
Did Not Respond	2	100	-	-
COMPUTER PROBLEM SOLVING				
Yes	45	45	45.92	45.92
No	53	98	54.08	100.00
Did Not Respond	2	100	-	-
PROCESSING APPLICATIONS				
Yes	56	56	57.14	57.14
No	42	98	42.86	100.00
Did Not Respond	2	100	-	-
DATA REPRESENTATION				
Yes	31	31	31.63	31.63
No	67	98	68.37	100.00
Did Not Respond	2	100	-	-
BASICS OF OPERATING SYSTEMS				
Yes	40	40	40.82	40.82
No	58	98	59.18	100.00
Did Not Respond	2	100	-	-
ELEMENTARY COMPUTER PROGRAMMING				
Yes	45	45	45.92	45.92
No	53	98	54.08	100.00
Did Not Respond	2	100	-	-

TABLE XVII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
LIMITATIONS OF COMPUTERS				
Yes	45	45	45.92	45.92
No	53	98	54.08	100.00
Did Not Respond	2	100	-	-
INPUT/OUTPUT DEVICES				
Yes	45	45	45.92	45.92
No	53	98	54.08	100.00
Did Not Respond	2	100	-	-
INPUT/OUTPUT OPERATIONS				
Yes	42	42	42.86	42.86
No	56	98	57.14	100.00
Did Not Respond	2	100	-	-
INPUT/OUPUT CONTROL SYSTEMS				
Yes	42	42	42.86	42.86
No	56	98	57.14	100.00
Did Not Respond	2	100	-	-
DISTRIBUTED PROCESSING				
Yes	24	24	24.49	24.49
No	74	98	75.51	100.00
Did Not Respond	2	100	-	-
COMPONENTS OF PRIMARY MEMORY				
Yes	10	10	10.20	10.20
No	88	98	89.80	100.00
Did Not Respond	2	100	-	-

TABLE XVII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
TYPES OF MEMORY				
Yes	18	18	18.37	18.37
No	80	98	81.63	100.00
Did Not Respond	2	100	-	-
COMPONENTS OF SECONDARY STORAGE				
Yes	9	9	9.18	9.18
No	89	98	90.82	100.00
Did Not Respond	2	100	-	-
DATA COMMUNICATIONS FRAMEWORK				
Yes	26	26	26.53	26.53
No	72	98	73.47	100.00
Did Not Respond	2	100	-	-
FILE ORGANIZATION				
Yes	32	32	32.65	32.65
No	66	98	67.35	100.00
Did Not Respond	2	100	-	-
VIRTUAL STORAGE CONCEPTS				
Yes	12	12	12.24	12.24
No	86	98	87.76	100.00
Did Not Respond	2	100	-	-
FUTURE OF COMPUTERS IN SOCIETY				
Yes	20	20	20.41	20.41
No	78	98	79.59	100.00
Did Not Respond	2	100	-	-

TABLE XVII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
ADVANTAGES OF COMPUTERS				
Yes	45	45	45.92	45.92
No	53	98	54.08	100.00
Did Not Respond	2	100	-	-
OTHER				
Yes	5	5	5.10	5.10
No	93	98	94.90	100.00
Did Not Respond	2	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	6	6	6.12	6.12
No	92	98	93.88	100.00
Did Not Respond	2	100	-	-

processing applications, 56 "yes" responses, or 57.14 percent. Those three skills and/or topics receiving the smallest number of "yes" responses were evolution of the computer industry, 10 "yes" responses, or 10.20 percent; components of primary memory, 10 "yes" responses, or 10.20 percent; and components of secondary storage, 9 "yes" responses, or 9.18 percent. Respondents were given the opportunity to indicate that none of the listed skills and/or topics were needed by accountants. Only 6 respondents, or 6.12 percent, checked this response.

Table XVIII, pages 66-67, summarizes the percentages of respondents indicating Introduction to Computer-Based Systems skills and/or topics needed by accountants. The percentages are arranged in descending sequence. Respondents were encouraged to check all skills and/or topics needed; therefore, percentages add up to more than 100 percent.

Only 5 respondents, or 5.10 percent, listed skills and/or topics needed by accountants other than those listed on the questionnaire. These responses are shown in Table XIX, page 68.

The second course examined was Applications Program Development I. This is a beginning computer problem-solving and programming course using COBOL as the vehicle language. Table XX, pages 69-72, contains a list of the skills and/or topics included in this course, whether a "yes" or "no" response was given, and an analysis of the response. Only seven respondents did not respond to this item. Only three topics were indicated as being needed by an accountant by at least 20 percent of the respondents. The topics were: the programming process - program design, structured design concepts, and the programming process - documentation with 27.96 percent, 22.58 percent, and 22.58 percent respectively. All other topics were indicated by less than 20 percent of the respondents, with table

TABLE XVIII

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE INTRODUCTION TO COMPUTER-BASED SYSTEMS

Skill and/or Topic	Percentage
Basic Computer Operations	80.61
Data Preparation	74.49
Processing Applications	57.14
Software Considerations	48.98
Computer Problem-Solving	45.92
Elementary Computer Programming	45.92
Limitations of Computers	45.92
Advantages of Computer	45.92
Input/Output Devices	45.92
Input/Output Operations	42.86
Input/Output Control Systems	42.86
Basics of Operating Systems	40.82
Elements of Hardware	36.73
File Organization	32.65
Data Representation	31.63
Data Communications Framework	26.53
Distributed Processing	24.49
Computer Types and Sizes	24.49
Future of Computers in Society	20.41
Types of Memory	18.37
Virtual Storage Concepts	12.24
Components of Primary Memory	10.20

TABLE XVIII (Continued)

Skill and/or Topic	Percentage
Evolution of Computer Industry	10.20
Components of Secondary Storage	9.18
None of These Topics Are Needed	6.12
Other	5.10

TABLE XIX

INTRODUCTION TO COMPUTER-BASED SYSTEMS SKILLS AND/OR TOPICS THAT WERE NOT LISTED ON THE QUESTIONNAIRE BUT SPECIFIED UNDER "OTHER"

Skill and/or Topic	Frequency
Microcomputer Operations	1
Disadvantages of Computers	1
Use and Application of DBMS	1
Use of CRT's	1
Mini/Microcomputers	1

TABLE XX

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE APPLICATIONS PROGRAM DEVELOPMENT I

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
STRUCTURED DESIGN CONCEPTS				
Yes	21	21	22.58	22.58
No	72	93	77.42	100.00
Did Not Respond	7	100	-	-
STRUCTURED PROGRAMMING CONCEPTS				
Yes	17	17	18.28	18.28
No	76	93	81.72	100.00
Did Not Respond	7	100	-	-
FILE PROCESSING				
Yes	18	18	19.35	19.35
No	75	93	80.65	100.00
Did Not Respond	7	100	-	-
CONTROL BREAK PROCESSING				
Yes	11	11	11.83	11.83
No	82	93	88.17	100.00
Did Not Respond	7	100	-	-
PROGRAMMING PROCESS-- PROGRAM DESIGN				
Yes	26	26	27.96	27.96
No	67	93	72.04	100.00
Did Not Respond	7	100	-	-

TABLE XX (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
PROGRAMMING PROCESS-- PROGRAM CODING				
Yes	17	17	18.28	18.28
No	76	93	81.72	100.00
Did Not Respond	7	100	-	-
PROGRAMMING PROCESS-- DOCUMENTATION				
Yes	21	21	22.58	22.58
No	72	93	77.42	100.00
Did Not Respond	7	100	-	-
TABLE PROCESSING-- SINGLE DIMENSIONAL				
Yes	10	10	10.75	10.75
No	83	93	89.25	100.00
Did Not Respond	7	100	-	-
TABLE PROCESSING-- MULTI DIMENSIONAL				
Yes	9	9	9.68	9.68
No	84	93	90.32	100.00
Did Not Respond	7	100	-	-
TABLE PROCESSING-- TABLE SEARCHING				
Yes	11	11	11.83	11.83
No	82	93	88.17	100.00
Did Not Respond	7	100	-	-
PROGRAMMING DECISION MAKING--COMPARISON OF DATA VALUES				
Yes	16	16	17.20	17.20
No	77	93	82.80	100.00
Did Not Respond	7	100	-	-

TABLE XX (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
PROGRAMMING DECISION MAKING--COMPARISON OF DATA TYPES				
Yes	12	12	12.90	12.90
No	81	93	87.10	100.00
Did Not Respond	7	100	-	-
PROGRAMMING DECISION MAKING--CONDITIONAL TESTS				
Yes	13	13	13.98	13.98
No	80	93	86.02	100.00
Did Not Respond	7	100	-	-
PROGRAMMING DECISION MAKING--TRANSFERS OF CONTROL				
Yes	12	12	12.90	12.90
No	81	93	87.10	100.00
Did Not Respond	7	100	-	-
FILE CREATION AND PROCESSING--ORGANIZATION OF SEQUENTIAL FILES				
Yes	14	14	15.05	15.05
No	79	93	84.95	100.00
Did Not Respond	7	100	-	-
FILE CREATION AND PROCESSING--ORGANIZATION OF DISK FILES				
Yes	17	17	18.28	18.28
No	76	93	81.72	100.00
Did Not Respond	7	100	-	-

TABLE XX (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
OTHER				
Yes	1	1	1.08	1.08
No	92	93	98.92	100.00
Did Not Respond	7	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	58	58	62.37	62.37
No	35	93	37.63	100.00
Did Not Respond	7	100	-	-

processing topics being indicated least often. Fifty-eight respondents, or 62.36 percent, indicated that none of the topics in this course were needed by accountants.

Percentages of respondents indicating Applications Program Development I skills and/or topics needed by accountants are arranged in descending sequence in Table XXI, page 74. Respondents were encouraged to check all skills and/or topics needed; therefore, percentages add up to more than 100 percent.

Only one respondent, or 1.08 percent, listed a topic needed by accountants other than those listed on the questionnaire. This response is shown in Table XXII, page 75.

Table XXIII, pages 76-79, tabulates responses concerning the course Applications Program Development II. This course is a continuation of Applications Program Development I. Respondents were again asked to indicate the specific skills and/or topics applicable and were also given the opportunity to list other skills and/or topics not included in the questionnaire. Fourteen skills and/or topics were included under this course heading. A special response "none of these topics are needed" was also included for respondents who felt that none of the skills and/or topics were needed by accountants. Module design - use of flowcharts was the only topic reported as being needed by accountants by at least 20 percent of the respondents. All other topics were reported as being needed by accountants by less than 20 percent of the respondents. Sixty-two respondents, or 66.67 percent, reported that none of the topics included in this course were needed by accountants.

A summary of the percentages of respondents indicating Applications Program Development II skills and/or topics needed by accountants is

TABLE XXI

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE APPLICATIONS PROGRAM DEVELOPMENT I

Skill and/or Topic	Percentage
None of These Topics Are Needed	62.37
Programming Process--Program Design	27.96
Programming Processing--Documentation	22.58
Structured Design Concepts	22.58
File Processing	19.36
Structured Programming Concepts	18.28
Programming Process--Program Coding	18.28
File Creation and Processing--Organization of Disk Files	18.28
Programming Decision Making--Comparison of Data Values	17.20
File Creation and Processing--Organization of Sequential Files	15.05
Programming Decision Making--Comparison of Data Types	12.90
Programming Decision Making--Transfers of Control	12.90
Control Break Processing	11.83
Table Processing--Table Searching	11.83
Table Processing--Single Dimensional	10.75
Table Processing--Multi Dimensional	9.68
Other	1.08

TABLE XXII

APPLICATIONS PROGRAM DEVELOPMENT I SKILLS AND/OR TOPICS
THAT WERE NOT LISTED ON THE QUESTIONNAIRE
BUT SPECIFIED UNDER "OTHER"

Skill and/or Topic	Frequency
Programming in BASIC	1

TABLE XXIII

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE APPLICATIONS PROGRAM DEVELOPMENT II

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
PROGRAM DESIGN--TOP DOWN DEVELOPMENT				
Yes	18	18	19.35	19.35
No	75	93	80.65	100.00
Did Not Respond	7	100	-	-
PROGRAMMING IN COBOL-- CONTROL STRUCTURES				
Yes	12	12	12.90	12.90
No	81	93	87.10	100.00
Did Not Respond	7	100	-	-
PROGRAMMING IN COBOL-- SOFTWARE DEVELOPMENT TOOLS				
Yes	6	6	6.45	6.45
No	87	93	93.55	100.00
Did Not Respond	7	100	-	-
COBOL FILE PROCESSING-- SEQUENTIAL ORGANIZATION				
Yes	9	9	9.68	9.68
No	84	93	90.32	100.00
Did Not Respond	7	100	-	-
COBOL FILE PROCESSING-- DIRECT ORGANIZATION				
Yes	11	11	11.83	11.83
No	82	93	88.17	100.00
Did Not Respond	7	10	-	-

TABLE XXIII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
COBOL FILE PROCESSING-- INDEXED ORGANIZATION				
Yes	9	9	9.68	9.68
No	84	93	90.32	100.00
Did Not Respond	7	100	-	-
ADVANCED LANGUAGE FEATURES--SORT FACILITY				
Yes	11	11	11.83	11.83
No	82	93	88.17	100.00
Did Not Respond	7	100	-	-
ADVANCED LANGUAGE FEATURES--REPORT WRITER FEATURE				
Yes	16	16	17.20	17.20
No	77	93	82.80	100.00
Did Not Respond	7	100	-	-
PROGRAMS AND SYSTEMS OF PROGRAMS--INTERPROGRAM COMMUNICATIONS				
Yes	7	7	7.53	7.53
No	86	93	92.47	100.00
Did Not Respond	7	100	-	-
PROGRAMS AND SYSTEMS OF PROGRAMS--INTERMEDIATE FILES				
Yes	5	5	5.38	5.38
No	88	93	94.62	100.00
Did Not Respond	7	100	-	-

TABLE XXIII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
PROGRAMS AND SYSTEMS OF PROGRAMS--MENU-DRIVEN SYSTEMS OF PROGRAMS AND SUBPROGRAMS				
Yes	16	16	17.20	17.20
No	77	93	82.80	100.00
Did Not Respond	7	100	-	-
MODULE DESIGN--USE OF ITERATIONS CONTROL STRUCTURES				
Yes	5	5	5.38	5.38
No	88	93	94.62	100.00
Did Not Resond	7	100	-	-
MODULE DESIGN--USE OF PSEUDOCODE				
Yes	5	5	5.38	5.38
No	88	93	94.62	100.00
Did Not Respond	7	100	-	-
MODULE DESIGN--USE OF FLOWCHARTS				
Yes	20	20	21.51	21.51
No	73	93	78.49	100.00
Did Not Respond	7	100	-	-
OTHER				
Yes	1	1	1.08	1.08
No	92	93	98.92	100.00
Did Not Respond	7	100	-	-

TABLE XXIII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
NONE OF THESE TOPICS ARE NEEDED				
Yes	62	62	66.67	66.67
No	31	93	33.33	100.00
Did Not Respond	7	100	-	-

TABLE XXIV

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE APPLICATIONS PROGRAM DEVELOPMENT II

Skill and/or Topic	Percentage
None of These Topics Are Needed	66.67
Module Design--Use of Flowcharts	21.51
Program Design--Top Down Development	19.35
Advanced Language Features--Report Writer Feature	17.20
Programs and Systems of Programs--Menu-Driven Systems of Programs and Subprograms	17.20
Programming in COBOL--Control Structures	12.90
COBOL File Processing--Direct Organization	11.83
Advanced Language Features--Sort Facility	11.83
COBOL File Processing--Sequential Organization	9.68
COBOL File Processing--Indexed Organizationn	9.68
Programs and Systems of Programs--Interprogram Communication	7.53
Programming in COBOL--Software Development Tools	6.45
Programs and Systems of Programs--Intermediate Files	5.38
Module Design--Use of Iterations Control Structures	5.38
Module Design--Use of Pseudocode	5.38
Other	1.08

shown in Table XXIV, page 80. The percentages are arranged in descending sequence. Because respondents were encouraged to check all skills and/or topics applicable, percentages add up to more than 100 percent.

Table XXV, page 82, lists skills and/or topics reported by respondents other than those included in the questionnaire. Only two other responses were listed.

Systems Analysis Methods was the fourth course examined. This course gives an overview of the system development life cycle. Thirteen skills and/or topics were included under this course. Respondents were also given the opportunity to list other skills and/or topics not included in the questionnaire. A special response "none of these topics are needed" was also included for respondents who felt that none of the skills and/or topics were needed by accountants.

An analysis of responses is tabulated in Table XXVI, pages 83-85. Four of the thirteen topics included were indicated by at least thirty percent of the respondents as needed by accountants. The four were classical documentation tools and techniques - system flowcharting, 42 "yes" responses, or 46.15 percent; classsical documentation tools and techniques - file and record design, 30 "yes" responses, or 32.97 percent; classical documentation tools and techniques - input/output documentation, 33 "yes" responses, or 36.26 percent; and structured documentation tools and techniques - data flow diagrams, 31 "yes" responses, or 34.07 percent. All other skills and/or topics were given "yes" responses by less than 30 percent of the respondents. Forty-one respondents, or 45.05 percent, indicated that none of the topics were needed by accountants.

TABLE XXV

APPLICATIONS PROGRAMS DEVELOPMENT II SKILLS AND/OR TOPICS
THAT WERE NOT LISTED ON THE QUESTIONNAIRE
BUT SPECIFIED UNDER "OTHER"

Skill and/or Topic	Frequency
RAMIS and QLP	1
Programming in BASIC - User Friendly Packages	2

TABLE XXVI

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE SYSTEMS ANALYSIS METHODS

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
SYSTEM DEVELOPMENT LIFE CYCLE				
Yes	27	27	29.67	29.67
No	64	91	70.33	100.00
Did Not Respond	9	100	-	-
DERIVATION OF CURRENT LOGICAL SYSTEM				
Yes	18	18	19.78	19.78
No	73	91	80.22	100.00
Did Not Respond	9	100	-	-
CLASSICAL DOCUMENTATION TOOLS AND TECHNIQUES-- SYSTEM FLOWCHARTING				
Yes	42	42	46.15	46.15
No	49	91	53.85	100.00
Did Not Respond	9	100	-	-
CLASSICAL DOCUMENTATION TOOLS AND TECHNIQUES-- FILE AND RECORD DESIGN				
Yes	30	30	32.97	32.97
No	61	91	67.03	100.00
Did Not Respond	9	100	-	-
CLASSICAL DOCUMENTATION TOOLS AND TECHNIQUES-- INPUT/OUTPUT DOCUMENTATION				
Yes	33	33	36.26	36.26
No	58	91	63.74	100.00
Did Not Respond	9	100	-	-

TABLE XXVI (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
STRUCTURED DOCUMENTATION TOOLS AND TECHNIQUES-- DATA FLOW DIAGRAMS				
Yes	31	31	34.07	34.07
No	60	91	65.93	100.00
Did Not Respond	9	100	-	-
STRUCTURED DOCUMENTATION TOOLS AND TECHNIQUES-- DECISION TABLES				
Yes	23	23	25.27	25.27
No	68	91	74.73	100.00
Did Not Respond	9	100	-	-
DOCUMENTING CURRENT PHYSICAL SYSTEM-- OUTPUT SPECIFICATIONS				
Yes	23	23	25.27	25.27
No	68	91	74.73	100.00
Did Not Respond	9	100	-	-
DOCUMENTING CURRENT PHYSICAL SYSTEM-- INPUT DESIGN				
Yes	21	21	23.08	23.08
No	70	91	76.92	100.00
Did Not Respond	9	100	-	-
DOCUMENTING CURRENT PHYSICAL SYSTEM-- FILE LAYOUT AND DESIGN				
Yes	19	19	20.88	20.88
No	72	91	79.12	100.00
Did Not Respond	9	100	-	-

TABLE XXVI (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
INFORMATION GATHERING/ REPORTING--INTERVIEWING TECHNIQUES				
Yes	18	18	19.78	19.78
No	73	91	80.22	100.00
Did Not Respond	9	100	-	-
INFORMATION GATHERING/ REPORTING--REPORT PRESENTATIONS				
Yes	22	22	24.18	24.18
No	69	91	75.82	100.00
Did Not Respond	9	100	-	-
INFORMATION GATHERING/ REPORTING--DESIGN OF USER DOCUMENTATION				
Yes	27	27	29.67	29.67
No	64	91	70.33	100.00
Did Not Respond	9	100	-	-
OTHER				
Yes	1	1	1.10	1.10
No	90	91	98.90	100.00
Did Not Respond	9	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	41	41	45.05	45.05
No	50	91	54.95	100.00
Did Not Respond	9	100	-	-

The percentages of Systems Analysis Methods skills and/or topics needed by accountants are summarized in Table XXVII, page 87. The percentages are arranged in descending sequence.

One respondent, or 1.10 percent, listed a topic needed by accountants other than those listed on the questionnaire. This response is shown in Table XXVIII, page 88.

Table XXIX, pages 89-92, contains an analysis of the skills and/or topics included in the course Structured Systems Analysis and Design. This course is a continuation of Systems Analysis Methods. Fifteen skills and/or topics were listed under this course title. Respondents were asked to indicate those skills and/or topics needed by accountants. There were five of the fifteen skills and/or topics indicated by more than 20 percent of the respondents as being needed by accountants. The five topics were: implementation considerations--system testing, 23 respondents, or 26.44 percent; modeling the new logical system--data flow diagrams, 22 respondents, or 25.29 percent; documenting current physical system, 21 respondents, or 24.14 percent; implementation considerations--acceptance testing, 19 respondents, or 21.84 percent; and implementation considerations--evaluation considerations, 19 respondents, or 21.84 percent. Fifty respondents, or 57.47 percent, indicated that none of the topics were needed by accountants.

Table XXX, page 93, lists the percentages of Structured Systems Analysis and Design skills and/or topics. The percentages are arranged in descending sequence. Because respondents were encouraged to indicate all skills and/or topics needed, the percentages exceed 100 percent.

There were no skills and/or topics suggested by respondents in the "other" category.

TABLE XXVII

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE SYSTEMS ANALYSIS METHODS

Skill and/or Topic	Percentage
Classical Documentation Tools and Techniques--System Flowcharting	46.15
None of These Topics Are Needed	45.05
Classical Documentation Tools and Techniques--Input/Output Documentation	36.26
Structured Documentation Tools and Techniques--Data Flow Diagrams	34.07
Classical Documentation Tools and Techniques--File and Record Design	32.97
System Development Life Cycle Overview	29.67
Information Gathering/Reporting--Design of User Documentation	29.67
Structured Documentation Tools and Techniques--Decision Tables	25.27
Documenting Current Physical System--Output Specifications	25.27
Information Gathering/Reporting--Report Presentations	24.18
Documenting Current Physical System--Input Design	23.08
Documenting Current Physical System--File Layout and Design	20.88
Derivation of Current Logical System	19.78
Information Gathering/Reporting--Interviewing Techniques	19.78
Other	1.10

TABLE XXVIII

SYSTEMS ANALYSIS METHODS SKILLS AND/OR TOPICS
THAT WERE NOT LISTED ON THE QUESTIONNAIRE
BUT SPECIFIED UNDER "OTHER"

Skill and/or Topic	Frequency
Collecting, Analyzing, and Defining the True User	1

TABLE XXIX

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE STRUCTURED SYSTEMS ANALYSIS AND DESIGN

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
REVIEW OF SYSTEM DEVELOPMENT LIFE CYCLE				
Yes	17	17	19.54	19.54
No	70	87	80.46	100.00
Did Not Respond	13	100	-	-
DOCUMENTING CURRENT PHYSICAL SYSTEM				
Yes	21	21	24.14	24.14
No	66	87	75.86	100.00
Did Not Respond	13	100	-	-
DERIVATION OF CURRENT LOGICAL SYSTEM--DATA DICTIONARY				
Yes	12	12	13.79	13.79
No	75	87	86.21	100.00
Did Not Respond	13	100	-	-
DERIVATION OF CURRENT LOGICAL SYSTEM--DATA FLOW DIAGRAMS				
Yes	11	11	12.64	12.64
No	76	87	87.36	100.00
Did Not Respond	13	100	-	-
MODELING THE NEW LOGICAL SYSTEM--DATA FLOW DIAGRAMS				
Yes	22	22	25.29	25.29
No	65	87	74.71	100.00
Did Not Respond	13	100	-	-

TABLE XXIX (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
MODELING THE NEW LOGICAL SYSTEM--PROCESS DESCRIPTIONS				
Yes	14	14	16.09	16.09
No	73	87	83.91	100.00
Did Not Respond	13	100	-	-
MODELING THE NEW LOGICAL SYSTEM--LOGICAL DATA STRUCTURES				
Yes	11	11	12.64	12.64
No	76	87	87.36	100.00
Did Not Respond	13	100	-	-
DERIVATION OF NEW PHYSICAL SYSTEM--HUMAN-MACHINE INTERFACES				
Yes	13	13	14.94	14.94
No	74	87	85.06	100.00
Did Not Respond	13	100	-	-
DERIVATION OF NEW PHYSICAL SYSTEM--SYSTEM ARCHITECTURE				
Yes	9	9	10.34	10.34
No	78	87	89.66	100.00
Did Not Respond	13	100	-	-
DETAILED DESIGN--DESIGNING SYSTEM BRANCHES				
Yes	5	5	5.75	5.75
No	82	87	94.25	100.00
Did Not Respond	13	100	-	-

TABLE XXIX (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
DETAILED DESIGN--MODULE DESIGN				
Yes	4	4	4.60	4.60
No	83	87	95.40	100.00
Did Not Respond	13	100	-	-
DETAILED DESIGN--SYSTEM CONTROLS				
Yes	13	13	14.94	14.94
No	74	87	85.06	100.00
Did Not Respond	13	100	-	-
IMPLEMENTATION CONSIDERATIONS--SYSTEM TESTING				
Yes	23	23	26.44	26.44
No	64	87	73.56	100.00
Did Not Respond	13	100	-	-
IMPLEMENTATION CONSIDERATIONS--ACCEPTANCE TESTING				
Yes	19	19	21.84	21.84
No	68	87	78.16	100.00
Did Not Respond	13	100	-	-
IMPLEMENTATION CONSIDERATIONS--EVALUATION CONSIDERATIONS				
Yes	19	19	21.84	21.84
No	68	87	78.16	100.00
Did Not Respond	13	100	-	-

TABLE XXIX (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
OTHER				
Yes	0	0	0.00	0.00
No	87	87	100.00	100.00
Did Not Respond	13	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	50	50	57.47	57.47
No	37	87	42.53	100.00
Did Not Respond	13	100	-	-

TABLE XXX

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE STRUCTURED SYSTEMS ANALYSIS AND DESIGN

Skill and/or Topic	Percentage
None of These Topics Are Needed	57.47
Implementation Considerations--System Testing	26.44
Modeling the New Logical System--Data Flow Diagrams	25.29
Documenting Current Physical System	24.14
Implementation Considerations--Acceptance Testing	21.84
Implementation Considerations--Evaluation Considerations	21.84
Review of System Development Life Cycle	19.54
Modeling the New Logical System--Process Descriptions	16.09
Derivation of New Physical System--Human-Machine Interface	14.94
Detailed Design--System Controls	14.94
Derivation of Current Logical System--Data Dictionary	13.79
Modeling the New Logical System--Logical Data Structures	12.64
Derivation of Current Logical System--Data Flow Diagrams	12.64
Derivation of New Physical System--System Architecture	10.34
Detailed Design--Designing System Branches	5.75
Detailed Design--Module Design	4.60
Other	0.00

Nineteen topics were included under the course title, Database Program Development. Table XXXI, pages 95-98, contains a list of the topics, whether a "yes" or "no" response was given, and an analysis of the responses. Only six respondents did not respond to this item. Six topics were indicated as being needed by an accountant by at least 20 percent of the respondents. The topics indicated were: overview of database concept, 40 respondents, or 42.55 percent; storage device characteristics and physical input/output--random access files/media, 21 respondents, or 22.34 percent; database administration--roles, 24 respondents, or 25.32 percent; database administration--security, 28 respondents, or 29.79 percent; database administration--backup, 23 respondents, or 24.47 percent; and database administration--recovery, 21 respondents, or 22.34 percent. All other topics were indicated by less than 20 percent of the respondents, with applied data structures topics being indicated least often. Forty-eight respondents, or 51.06 percent of the respondents indicated that none of the topics were needed by accountants.

Table XXXII, page 99, reports the percentages of respondents indicating the topics from the course, Database Program Development, needed by accountants. The percentages are arranged in descending sequence. The percentages exceed 100 percent because respondents were encouraged to check as many topics as applicable.

Two topics other than those included on the questionnaire were listed by respondents. These topics are listed in Table XXXIII, page 100.

The seventh course examined was Applied Software Development Project. This course involves the application of computer programming

TABLE XXXI

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE DATABASE PROGRAM DEVELOPMENT

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
OVERVIEW OF DATABASE CONCEPT				
Yes	40	40	42.55	42.55
No	54	94	57.45	100.00
Did Not Respond	6	100	-	-
INDEXED ORGANIZED FILES				
Yes	16	16	17.02	17.02
No	78	94	82.98	100.00
Did Not Respond	6	100	-	-
DIRECT FILE ORGANIZATION				
Yes	16	16	17.02	17.02
No	78	94	82.98	100.00
Did Not Respond	6	100	-	-
DATA MODEL OVERVIEW				
Yes	12	12	12.77	12.77
No	82	94	87.23	100.00
Did Not Respond	6	100	-	-
HIERARCHICAL DATA MODEL				
Yes	10	10	10.64	10.64
No	84	94	89.36	100.00
Did Not Respond	6	100	-	-
NETWORK DATA MODEL				
Yes	8	8	8.51	8.51
No	86	94	91.49	100.00
Did Not Respond	6	100	-	-

TABLE XXXI (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
RELATIONAL DATA MODEL				
Yes	7	7	7.45	7.45
No	87	94	92.55	100.00
Did Not Respond	6	100	-	-
APPLIED DATA STRUCTURES-- LINKED LIST STRUCTURES				
Yes	7	7	7.45	7.45
No	87	94	92.55	100.00
Did Not Respond	6	100	-	-
APPLIED DATA STRUCTURES-- POINTER CHAINS				
Yes	4	4	4.26	4.26
No	90	94	95.74	100.00
Did Not Respond	6	100	-	-
APPLIED DATA STRUCTURES-- RINGS				
Yes	4	4	4.26	4.26
No	90	94	95.74	100.00
Did Not Respond	6	100	-	-
APPLIED DATA STRUCTURES-- TREES				
Yes	4	4	4.26	4.26
No	90	94	95.74	100.00
Did Not Respond	6	100	-	-
APPLIED DATA STRUCTURES-- NETWORKS				
Yes	5	5	5.32	5.32
No	89	94	94.68	100.00
Did Not Respond	6	100	-	-

TABLE XXXI (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
APPLIED DATA STRUCTURES-- DATA STRUCTURE DIAGRAMS				
Yes	8	8	8.51	8.51
No	86	94	91.49	100.00
Did Not Respond	6	100	-	-
STORAGE DEVICE CHARACTERISTICS AND PHYSICAL INPUT/OUTPUT-- SEQUENTIAL FILES/MEDIA				
Yes	18	18	19.15	19.15
No	76	94	80.85	100.00
Did Not Respond	6	100	-	-
STORAGE DEVICE CHARACTERISTICS AND PHYSICAL INPUT/OUTPUT-- RANDOM ACCESS FILES/MEDIA				
Yes	21	21	22.34	22.34
No	73	94	77.66	100.00
Did Not Respond	6	100	-	-
DATABASE ADMINISTRATION-- ROLES				
Yes	24	24	25.53	25.53
No	70	94	74.47	100.00
Did Not Respond	6	100	-	-
DATABASE ADMINISTRATION-- SECURITY				
Yes	28	28	29.79	29.79
No	66	94	70.21	100.00
Did Not Respond	6	100	-	-

TABLE XXXI (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
DATABASE ADMINISTRATION-- BACKUP				
Yes	23	23	24.47	24.47
No	71	94	75.53	100.00
Did Not Respond	6	100	-	-
DATABASE ADMINISTRATION-- RECOVERY				
Yes	23	23	24.47	24.47
No	71	94	75.53	100.00
Did Not Respond	6	100	-	-
OTHER				
Yes	2	2	2.13	2.13
No	92	94	97.87	97.87
Did Not Respond	6	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	48	48	51.06	51.06
No	46	94	48.94	100.00
Did Not Respond	6	100	-	-

TABLE XXXII

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE DATABASE PROGRAM DEVELOPMENT

Skill and/or Topic	Percentage
None of These Topics Are Needed	51.06
Overview of Database Concept	42.55
Database Administration--Security	29.79
Database Administration--Roles	25.53
Database Administration--Backup	24.47
Database Administration--Recovery	24.47
Storage Device Characteristics and Physical Input/Output--Random Access Files/Media	22.34
Storage Device Characteristics and Physical Input/Output--Sequential Files/Media	19.15
Indexed Organized Files	17.02
Direct File Organization	17.02
Data Model Overview	12.77
Hierarchical Data Model	10.64
Network Data Model	8.51
Applied Data Structures--Data Structure Diagrams	8.51
Relational Data Model	7.45
Applied Data Structures--Linked List Structures	7.45
Applied Data Structures--Networks	5.32
Applied Data Structures--Pointer Chains	4.26
Applied Data Structures--Rings	4.26
Applied Data Structures--Trees	4.26
Other	2.13

TABLE XXXIII

DATABASE PROGRAM DEVELOPMENT SKILLS AND/OR TOPICS
THAT WERE NOT LISTED ON THE QUESTIONNAIRE
BUT SPECIFIED UNDER "OTHER"

Skill and/or Topic	Frequency
Advantages/Disadvantages of More Popular Databases: Adabase, IBM, etc., Especially Those with Versions for Minis	1
Basic Principles of Efficient Database Design Including Cost, Time, and Subject Versus Application Database	1

and system development concepts, principles, and practices to a comprehensive system development project. Table XXXIV, pages 102-105, contains an analysis of the responses. Eighteen skills and/or topics were included. Respondents were given the opportunity to list other skills and/or topics not included in the questionnaire. A special response "none of these topics are needed" was also included for respondents who felt that none of the skills and/or topics were needed by accountants.

Thirteen of the eighteen skills and/or topics were indicated by at least 20 percent of the respondents as being needed by accountants. The four skills and/or topics indicated most often were: program management concepts--project planning, 32 respondents, or 34.41 percent; communications--documentation, 32 respondents, or 34.41 percent; analysis of current system--identification of problems, 28 respondents, or 30.11 percent; and analysis of current system--project definition, 27 respondents, or 29.03 percent. Each response is analyzed in Table XXXIV, pages 102-105. Less than 50 percent of the respondents felt that none of the topics were needed by accountants.

The percentages of respondents indicating Applied Software Development Project skills and/or topics needed by accountants are arranged in descending sequence in Table XXXV, page 106. Because respondents were encouraged to check all skills and/or topics needed, the percentages add up to more than 100 percent.

Table XXXVI, page 107, reports topics other than those listed on the questionnaire. Only three topics were reported by the respondents.

The final course examined was EDP Audit and Controls, an introduction to the fundamentals of EDP auditing. Nine skills and/or topics were included under this course title. Respondents were also given the

TABLE XXXIV

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE APPLIED SOFTWARE DEVELOPMENT PROJECT

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
PROGRAM MANAGEMENT CONCEPTS--PROJECT PLANNING				
Yes	32	32	34.41	34.41
No	61	93	65.59	100.00
Did Not Respond	7	100	-	-
PROGRAM MANAGEMENT CONCEPTS--CONTROL TECHNIQUES				
Yes	23	23	24.73	24.73
No	70	93	75.27	100.00
Did Not Respond	7	100	-	-
PROGRAM MANAGEMENT CONCEPTS--RESOURCE BUDGETING				
Yes	23	23	24.73	24.73
No	70	93	75.27	100.00
Did Not Respond	7	100	-	-
ANALYSIS OF CURRENT SYSTEM--PROJECT DEFINITION				
Yes	27	27	29.03	29.03
No	66	93	70.97	100.00
Did Not Respond	7	100	-	-
ANALYSIS OF CURRENT SYSTEM--DATA COLLECTION				
Yes	24	24	25.81	25.81
No	69	93	74.19	100.00
Did Not Respond	7	100	-	-

TABLE XXXIV (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
ANALYSIS OF CURRENT SYSTEM--IDENTIFICATION OF PROBLEMS				
Yes	28	28	30.11	30.11
No	65	93	69.89	100.00
Did Not Respond	7	100	-	-
DESIGN OF PROPOSED/MODIFIED SYSTEM--PRIORITY SETTING				
Yes	24	24	25.81	25.81
No	69	93	74.19	100.00
Did Not Respond	7	100	-	-
DESIGN OF PROPOSED/MODIFIED SYSTEM--DATABASE SPECIFICATIONS				
Yes	20	20	21.51	21.51
No	73	93	78.49	100.00
Did Not Respond	7	100	-	-
DESIGN OF PROPOSED/MODIFIED SYSTEM--INPUT/OUTPUT SPECIFICATIONS				
Yes	19	19	20.43	20.43
No	74	93	79.57	100.00
Did Not Respond	7	100	-	-
DESIGN OF PROPOSED/MODIFIED SYSTEM--PROGRAM SPECIFICATIONS				
Yes	15	15	16.13	16.13
No	78	93	83.87	100.00
Did Not Respond	7	100	-	-

TABLE XXXIV (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
IMPLEMENTATION-- LANGUAGE SELECTION				
Yes	12	12	12.90	12.90
No	81	93	87.10	100.00
Did Not Respond	7	100	-	-
IMPLEMENTATION-- BUILDING TEST DATA				
Yes	19	19	20.43	20.43
No	74	93	79.57	100.00
Did Not Respond	7	100	-	-
IMPLEMENTATION--SYSTEM PERFORMANCE EVALUATION				
Yes	15	15	16.13	16.13
No	78	93	83.87	100.00
Did Not Respond	7	100	-	-
IMPLEMENTATION--PROJECT PERFORMANCE EVALUATION				
Yes	12	12	12.90	12.90
No	81	93	87.10	100.00
Did Not Respond	7	100	-	-
COMMUNICATIONS--USER INTERVIEWS				
Yes	26	26	27.96	27.96
No	67	93	72.04	100.00
Did Not Respond	7	100	-	-
COMMUNICATIONS-- DOCUMENTATION				
Yes	32	32	34.41	34.41
No	61	93	65.59	100.00
Did Not Respond	7	100	-	-

TABLE XXXIV (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
COMMUNICATIONS--WRITING MANUALS				
Yes	26	26	27.96	27.96
No	67	93	72.04	100.00
Did Not Respond	7	100	-	-
COMMUNICATIONS--FORMAL PRESENTATIONS OF PROJECT RESULTS				
Yes	18	18	19.35	19.35
No	75	93	80.65	100.00
Did Not Respond	7	100	-	-
OTHER				
Yes	3	3	3.23	3.23
No	90	93	96.77	100.00
Did Not Respond	7	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	44	44	47.31	47.31
No	49	93	52.69	100.00
Did Not Respond	7	100	-	-

TABLE XXXV

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE APPLIED SOFTWARE DEVELOPMENT PROJECT

Skill and/or Topic	Percentage
None of These Topics Are Needed	47.31
Program Management Concepts--Project Planning	34.41
Communications--Documentation	34.41
Analysis of Current System--Identification of Problems	30.11
Analysis of Current System--Project Definition	29.03
Communications--User Interviews	27.96
Communications--Writing Manuals	27.96
Analysis of Current System--Data Collection	25.81
Design of Proposed/Modified System--Priority Setting	25.81
Program Management Concepts--Control Techniques	24.73
Program Management Concepts--Resource Budgeting	24.73
Design of Proposed/Modified System--Database Specifications	21.51
Design of Proposed/Modified System--Input/Output Specifications	20.43
Implementation--Building Test Data Sets	20.43
Communications--Formal Presentations of Project Results	19.35
Design of Proposed/Modified System--Program Specifications	16.13
Implementation--System Performance Evaluation	16.13
Implementation--Language Selection	12.90
Implementation--Project Performance Evaluation	12.90
Other	3.23

TABLE XXXVI

APPLIED SOFTWARE DEVELOPMENT PROJECT SKILLS AND/OR TOPICS
THAT WERE NOT LISTED ON THE QUESTIONNAIRE
BUT WERE SPECIFIED UNDER "OTHER"

Skill and/or Topic	Frequency
Evaluation of Software Packages	1
Cost Evaluation	1
Determination of Who Users Are	1

opportunity to list other skills and/or topics not included on the questionnaire. For respondents who felt that none of the skills and/or topics were needed by accountants, a special response, "none of these topics are needed" was included.

Table XXXVII, pages 109-110, reports the analysis of responses. All of the nine topics were indicated by at least 25 percent of the respondents as being needed by accountants. The three topics indicated most often were: EDP audit environment, 42 "yes" responses, or 46.47 percent; computer audit techniques--types of EDP audits, 37 "yes" responses, or 41.11 percent; and computer audit techniques--computer-assisted audit techniques, 33 "yes" responses, or 36.67 percent. Forty respondents, or 44.44 percent, indicated that none of the topics were needed by accountants.

Table XXXVIII, page 111, summarizes the percentages of EDP Audit and Controls skills and/or topics needed by accountants. The percentages are arranged in descending sequence. Respondents were encouraged to check all skills and/or topics applicable; therefore, the percentages exceed 100 percent.

Respondents did not indicate any "other" skills and/or topics needed by accountants that were not included on the questionnaire.

The ninth area of Section III of the questionnaire requested respondents to rank the eight data processing courses included in the questionnaire in order of their importance to accountants. A rank of one was considered most important, with a rank of eight considered least important.

Table XXXIX, page 113, tabulates all courses given the rank of one. Only seven respondents did not respond to this item. Introduction to

TABLE XXXVII

ANALYSIS OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE EDP AUDIT AND CONTROLS

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
EDP AUDIT ENVIRONMENT				
Yes	42	42	46.67	46.67
No	48	90	53.33	100.00
Did Not Respond	10	100	-	-
AUDITING ADVANCED INFORMATION SYSTEMS				
Yes	24	24	26.67	26.67
No	66	90	73.33	100.00
Did Not Respond	10	100	-	-
SYSTEMS APPROACH TO AUDITING				
Yes	30	30	33.33	33.33
No	60	90	66.67	100.00
Did Not Respond	10	100	-	-
INFORMATION SYSTEMS CONTROLS--TYPES				
Yes	24	24	26.67	26.67
No	66	90	73.33	100.00
Did Not Respond	10	100	-	-
INFORMATION SYSTEMS CONTROLS--SECURITY				
Yes	23	23	25.56	25.56
No	67	90	74.44	100.00
Did Not Respond	10	100	-	-

TABLE XXXVII (Continued)

Skill and/or Topic	Frequency	Cum. Freq.	Percent	Cum. Percent
COMPUTER AUDIT TECHNIQUES-- TYPES OF EDP AUDITS				
Yes	37	37	41.11	41.11
No	53	90	58.89	100.00
Did Not Respond	10	100	-	-
COMPUTER AUDIT TECHNIQUES-- COMPUTER-ASSISTED AUDIT TECHNIQUES				
Yes	33	33	36.67	36.67
No	57	90	63.33	100.00
Did Not Respond	10	100	-	-
COMPUTER AUDIT TECHNIQUES-- USE OF AUDIT SOFTWARE				
Yes	28	28	31.11	31.11
No	62	90	68.89	100.00
Did Not Respond	10	100	-	-
COMPUTER AUDIT TECHNIQUES-- ADVANTAGES AND DISADVANTAGES				
Yes	28	28	31.11	31.11
No	62	90	68.89	100.00
Did Not Respond	10	100	-	-
OTHER				
Yes	0	0	0.00	0.00
No	90	90	100.00	100.00
Did Not Respond	10	100	-	-
NONE OF THESE TOPICS ARE NEEDED				
Yes	40	40	44.44	44.44
No	50	90	55.56	100.00
Did Not Respond	10	100	-	-

TABLE XXXVIII

SUMMARY OF SKILLS AND/OR TOPICS NEEDED BY ACCOUNTANTS INCLUDED IN THE COURSE EDP AUDIT AND CONTROLS

Skill and/or Topic	Percentage
EDP Audit Environment	46.67
None of These Topics Are Needed	44.44
Computer Audit Techniques--Types of EDP Audits	41.11
Computer Audit Techniques--Computer-Assisted Audit Techniques	36.67
Systems Approach to Auditing	33.33
Computer Audit Techniques--Use of Audit Software	31.11
Computer Audit Techniques--Advantages and Disadvantages	31.11
Auditing Advanced Information Systems	26.67
Information Systems Controls--Types	26.67
Information Systems Controls--Security	25.56
Other	0.00

Computer-Based Systems was overwhelmingly ranked number one by the respondents. Seventy-seven respondents, or 82.80 percent, felt that this course was most important for accountants. All other courses were ranked number one by less than five percent of the respondents.

A tabulation of courses given the rank of two is shown in Table XL, page 114. Twenty-two respondents did not respond to this item. Applications Program Development I was indicated by 17 respondents, or 21.80 percent. Systems Analysis Methods and Applied Software Development Project were the next two courses given a rank of two most frequently. Thirteen respondents, or 16.67 percent, indicated that these two courses should be ranked number two.

Table XLI, page 115, reports the courses ranked number three. EDP Audit and Controls was ranked number three by 18 respondents, or 23.08 percent. A close second was Database Program Development which was ranked number three by 15 respondents, or 19.23 percent. Twenty-two respondents did not respond to this item.

Table XLII, page 116, reports the courses that were given a rank of four. Twenty respondents did not respond to this item. Nineteen respondents, or 23.75 percent, ranked Applications Program Development I as number four. Structured Systems Analysis and Design was ranked number four by 12 respondents, or 15.00 percent.

Courses ranked number five are listed in Table XLIII, page 117. Over twenty percent of the respondents ranked Applied Software Development Project as number five while almost eighteen percent of the respondents ranked either Database Program Development or EDP Audit and Controls as number five. Twenty-two respondents did not respond to this item.

TABLE XXXIX

COURSES RANKED NUMBER ONE IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	77	77	82.80	82.80
Applications Program Development I	4	81	4.30	87.10
Applications Program Development II	2	83	2.15	89.25
Systems Analysis Methods	3	86	3.22	92.47
Structured Systems Analysis and Design	4	90	4.30	96.77
Database Program Development	2	92	2.15	98.92
Applied Software Development Project	0	92	0.00	98.92
EDP Audit and Controls	1	93	1.08	100.00
Did Not Respond	7	100	-	-

TABLE XL

COURSES RANKED NUMBER TWO IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	2	2	2.56	2.56
Applications Program Development I	17	19	21.80	24.36
Applications Program Development II	11	30	14.10	38.46
Systems Analysis Methods	13	43	16.67	55.13
Structured Systems Analysis and Design	11	54	14.10	69.23
Database Program Development	6	60	7.69	76.92
Applied Software Development Project	13	73	16.67	93.59
EDP Audit and Controls	5	78	6.41	100.00
Did Not Respond	22	100	-	-

TABLE XLI

COURSES RANKED NUMBER THREE IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	1	1	1.28	1.28
Applications Program Development I	1	2	1.28	2.56
Applications Program Development II	8	10	10.26	12.82
Systems Analysis Methods	8	18	10.26	23.08
Structured Systems Analysis and Design	14	32	17.95	41.03
Database Program Development	15	47	19.23	60.26
Applied Software Development Project	13	60	16.66	76.92
EDP Audit and Controls	18	78	23.08	100.00
Did Not Respond	22	100	-	-

TABLE XLII

COURSES RANKED NUMBER FOUR IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	5	5	6.25	6.25
Applications Program Development I	19	24	23.75	30.00
Applications Program Development II	11	35	13.75	43.75
Systems Analysis Methods	9	44	11.25	55.00
Structured Systems Analysis and Design	12	56	15.00	70.00
Database Program Development	11	67	13.75	83.75
Applied Software Development Project	6	73	7.50	91.25
EDP Audit and Controls	7	80	8.75	100.00
Did Not Respond	20	100	-	-

TABLE XLIII

COURSES RANKED NUMBER FIVE IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	2	2	2.56	2.56
Applications Program Development I	4	6	5.13	7.69
Applications Program Development II	6	12	7.69	15.38
Systems Analysis Methods	10	22	12.82	28.20
Structured Systems Analysis and Design	11	33	14.10	42.30
Database Program Development	14	47	17.95	60.25
Applied Software Development Project	17	64	21.80	82.05
EDP Audit and Controls	14	78	17.95	100.00
Did Not Respond	22	100	-	-

TABLE XLIV

COURSES RANKED NUMBER SIX IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	1	1	1.28	1.28
Applications Program Development I	9	10	11.54	12.82
Applications Program Development II	8	18	10.26	23.08
Systems Analysis Methods	10	28	12.82	35.90
Structured Systems Analysis and Design	7	35	8.97	44.87
Database Program Development	19	54	24.36	69.23
Applied Software Development Project	10	64	12.82	82.05
EDP Audit and Controls	14	78	17.95	100.00
Did Not Respond	22	100	-	-

TABLE XLV

COURSES RANKED NUMBER SEVEN IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	2	2	2.53	2.53
Applications Program Development I	5	7	6.33	8.86
Applications Program Development II	18	25	22.79	31.65
Systems Analysis Methods	10	35	12.65	44.30
Structured Systems Analysis and Design	7	42	8.86	53.16
Database Program Development	10	52	12.66	65.82
Applied Software Development Project	10	62	12.66	78.48
EDP Audit and Controls	17	79	21.52	100.00
Did Not Respond	21	100	-	-

TABLE XLVI

COURSES RANKED NUMBER EIGHT IN RELATION TO THEIR IMPORTANCE TO ACCOUNTANTS

Course	Frequency	Cum. Freq.	Percent	Cum. Percent
Introduction to Computer-Based Systems	6	6	7.31	7.31
Applications Program Development I	22	28	26.83	34.14
Applications Program Development II	10	38	12.20	46.34
Systems Analysis Methods	8	46	9.75	56.09
Structured Systems Analysis and Design	10	56	12.20	68.29
Database Program Development	4	60	4.88	73.17
Applied Software Development Project	1	61	1.22	74.39
EDP Audit and Controls	21	82	25.61	100.00
Did Not Respond	18	100	-	-

TABLE XLVII

FINAL RANKING OF COURSES IN ORDER OF THEIR IMPORTANCE OF TO ACCOUNTANTS

Course	Average Rank	Final Rank
Introduction to Computer-Based Systems	1.88	1
Applied Software Development Project	4.46	2
Structured Systems Analysis and Design	4.50	3
Systems Analysis Methods	4.69	4
Database Program Development	4.80	5
Applications Program Development I	4.96	6
Applications Program Development II	5.35	7
EDP Audit and Controls	5.51	8

Courses given a rank of six are shown in Table XLIV, page 118. Twenty-two respondents did not respond to this item. Database Program Development received a rank of six by 19 respondents, or 24.36 percent. EDP Audit and Controls received a rank of six by 14 respondents, or 17.95 percent.

Table XLV, page 119, reports the courses ranked number seven. Eighteen respondents, or 22.79 percent, ranked Applications Program Development II number seven, while 17 respondents, or 21.52 percent, ranked EDP Audit and Controls number seven.

Table XLVI, page 120, tabulated the courses given a rank of number eight. Eighteen respondents did not respond to this item. Applications Development I was ranked eighth by 22 respondents, or 26.83 percent. EDP Audit and Controls was ranked eighth by 21 respondents, or 25.61 percent.

A final ranking of all courses is shown in Table XLVII, page 121. An average rank for each course was calculated by assigning point values to each rank and multiplying the points for a rank by the number of respondents assigning that rank to a particular course. This total was then divided by the total number of respondents assigning that rank to the course. Introduction to Computer-Based Systems was indicated by the respondents to be most important to accountants, while EDP Audit and Controls was indicated by the respondents to be least important.

Comparison of Selected Items in the Questionnaire

Statistics for two-way tables were utilized in comparing various items in the questionnaire. The chi-square test for significance was computed for each of the comparisons. The .05 level of significance was

selected for this study. The relationships which were analyzed are presented in statistical tables in Appendix E. The following information for each cell in the two-way tables has been given: observed frequency, expected frequency, percent, row percent, and column percent. Row and column totals and percentages are also given along with the results of the chi-square test and the significance level.

Each skill and/or topic in each of the eight courses was compared with the length of time accounting procedures had been computerized and with whether the accounting and data processing functions were separate departments in the company. The number of full-time accountants employed by the company, classified into groups of small, medium, and large, was also compared to responses to each of the specific data processing skills and/or topics.

Comparison of Specific Skills and/or Topics
by Length of Time Accounting Procedures
Had Been Computerized

The relationships investigated between specific data processing skills and/or topics and the length of time accounting procedures had been computerized are shown in Appendix E.

Introduction to Computer-Based Systems. The responses to each of the skills and/or topics listed under this course title were compared to responses to the length of time accounting procedures had been computerized in the company. The chi-square test for significance revealed that there is a significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance of the topic, limitations of computers, to accountants. Seventy-five

percent of the businesses who had accounting procedures computerized for 10-14 years indicated that this topic was important for accountants. Results are shown in Table XLVIII, page 167, in Appendix E.

There was also a significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance of the topic, data communications framework, to the accountant. One hundred percent of the companies who had accounting procedures computerized for less than three years indicated that this topic was not important for accountants. Tables XLIX, page 168, in Appendix E gives a complete summary of the results.

There was not a significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance to accountants of any of the other topics included in this course.

Applications Program Development I. There was not a significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance to accountants of any of the skills and/or topics included in the course, Applications Program Development I.

Applications Program Development II. The chi-square test for significance revealed no significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance to accountants of any of the skills and/or topics included in Applications Program Development II.

Systems Analysis Methods. The chi-square test for significance revealed no significant difference at the .05 level between the length of

time accounting procedures had been computerized and the importance to accountants of any of the skills and/or topics included in Systems Analysis Methods.

Structured Systems Analysis and Design. The chi-square test for significance revealed no significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance to accountants of any of the skills and/or topics included in Structured Systems Analysis and Design.

Database Program Development. The chi-square test for significance revealed that there is a significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance of the topic, data model overview, to accountants. One hundred percent of the firms who had accounting procedures computerized for less than three years indicated that this topic was not important for accountants. For those firms who had accounting procedures computerized for 4-6 years, 94.74 percent indicated that this topic was not important for accountants. Results are shown in Table L, page 169, in Appendix E.

Applied Software Development Project. There was not a significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance to accountants of any of the skills and/or topics included in the course, Applied Software Development Project.

EDP Audit and Controls. The chi-square test for significance revealed no significant difference at the .05 level between the length of time accounting procedures had been computerized and the importance to

accountants of any of the skills and/or topics included in EDP Audit and Controls.

Comparison of Specific Skills and/or Topics by Organization of Accounting and Data Processing Functions

The relationships investigated between specific data processing skills and/or topics and whether the accounting and data processing functions were separate departments are shown in Appendix E.

Introduction to Computer-Based Systems. The chi-square test for significance revealed no significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to accountants of any of the skills and/or topics included in the course, Introduction to Computer-Based Systems.

Applications Program Development I. Over eighty-five percent of the companies whose accounting and data processing functions were in separate departments indicated that the topic, organization of disk files, was not important for accountants. The chi-square test for significance revealed a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance of this topic to accountants. Table LI, page 170, in Appendix E gives a summary of the results.

There was not a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to accountants of any of the other topics included in this course.

Applications Program Development II. The chi-square test for significance revealed that there is a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance of the topic, advanced language features--sort facility, to the accountant. For those companies with separate accounting and data processing departments, 91.18 percent indicated that this topic was not important for accountants. Results are shown in Table LII, page 171, in Appendix E.

There was also a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to accountants of the topic, programs and systems of programs--menu-driven systems of programs and subprograms. Over 86 percent of the firms with separate accounting and data processing departments indicated that this topic was not important for accountants. Table LIII, page 172, in Appendix E gives a summary of the results.

There was not a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to the accountant of any of the other topics included in this course.

Systems Analysis Methods. For those firms with separate accounting and data processing departments, 77.94 percent indicated that the topic, documenting current physical system--output specifications, was not important to accountants. The chi-square test for significance showed a significant difference at the .05 level between the importance to accountants of this topic and the organization of the accounting and data processing functions. Table LIV, page 173, in Appendix E gives the results.

No significant difference at the .05 level was found between the organization of the accounting and data processing functions and the importance to the accountant of any other skill and/or topic included in this course.

Structured Systems Analysis and Design. There was not a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to accountants of any of the skills and/or topics included in the course, Structured Systems Analysis and Design.

Database Program Development. The chi-square test for significance revealed a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to accountants of the topics: storage device characteristics and physical input/output--random access files/media; database administration--backup; and database administration--recovery. Over eighty-one percent of those companies with separate accounting and data processing departments indicated that these topics were not important to accountants. Results are shown in Appendix E in Tables LV, page 174, LVI, page 175, and LVII, page 176, respectively.

No significant difference at the .05 level was found between the organization of the accounting and data processing functions and the importance to accountants of any of the other skills and/or topics included in this course.

Applied Software Development Project. The chi-square test for significance revealed a significant difference at the .05 level between the organization of the accounting and data processing functions and the

importance to accountants of the following topics: design of proposed/modified system--database specifications; design of proposed/modified system--input/output specifications; and design of proposed/modified system--program specifications. The three topics were indicated not to be important to accountants by 83.58 percent, 86.57 percent, and 89.55 percent respectively, of those companies with separate accounting and data processing departments. Tables LVIII, page 177, LIX, page 178, and LX, page 179, in Appendix E give summaries of the results.

No significant difference at the .05 level was found between the organization of the accounting and data processing functions and the importance to accountants of any of the other skills and/or topics included in this course.

EDP Audit and Controls. There was not a significant difference at the .05 level between the organization of the accounting and data processing functions and the importance to the accountant of any of the skills and/or topics included in the course, EDP Audit and Controls.

Comparison of Specific Skills and/or Topics by Number of Full-Time Accountants Employed

The relationships investigated between specific data processing skills and/or topics and the number of full-time accountants employed by the firm are shown in Appendix E.

Introduction to Computer-Based Systems. The responses to each of the skills and/or topics listed under this course title were compared to responses to the number of full-time accountants employed by the firm. The chi-square test for significance revealed that there is a significant

difference at the .05 level between the number of full-time accountants employed and the importance of the topic, evolution of the computer industry, to accountants. Results are shown in Table LXI, page 180, in Appendix E. Over 94 percent of those firms which employ at least 30 full-time accountants indicated that this topic was not important for accountants.

Of those companies which employ more than 30 full-time accountants, 66.67 percent indicated that the topic, computer problem solving, was important for accountants. The chi-square test for significance revealed that there is a significant difference at the .05 level between this topic and the number of full-time accountants employed. Table LXII, page 181, in Appendix E gives a summary of the results.

Finally, the chi-square test for significance shows a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of the topic, distributed processing. Over 80 percent of those firms who employ 30 or fewer accountants indicated that this topic was not important for accountants. Results are shown in Table LXIII, page 182, in Appendix E.

There was not a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of any of the other topics included in this course.

Applications Program Development I. Over 92 percent of those firms which employ at least 30 full-time accountants indicated that the topic, control break processing, was not important for accountants. At the .05 level, the chi-square test for significance revealed a significant difference between this topic and the number of full-time accountants

employed. Table LXIV, page 183, in Appendix gives a summary of the results.

No significant difference at the .05 level was found between the number of full-time accountants employed and the importance to accountants of any of the other skills and/or topics included in this course.

Applications Program Development II. The chi-square test for significance revealed that there is a significant difference at the .05 level between the importance to the accountant of the topic, COBOL file processing-sequential organization, and the number of full-time accountants employed by the firm. Over 94 percent of the firms who employ 30 or fewer full-time accountants indicated that this topic was not important for accountants. Results are shown in Table LXV, page 184, in Appendix E.

The chi-square test for significance did not reveal a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of any of the other topics included in this course.

Systems Analysis Methods. The chi-square test for significance revealed a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of the topics: system development life cycle overview; derivation of current logical system; and information gathering/reporting--interviewing techniques. Over 88 percent of those firms which employ ten or fewer full-time accountants indicated that these topics were not important for accountants. Results are shown in Appendix E in Table LXVI, page 185, LXVII, page 186, and LXVIII, page 187, respectively.

The chi-square test for significance did not reveal a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of any of the other topics included in this course.

Structured Systems Analysis and Design. The chi-square test for significance revealed a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of the specific topic, derivation of current logical system--data dictionary. Of those firms with ten or fewer full-time accountants, 93.75 percent indicated that this topic was not important for accountants. Of those firms with between 11 and 30 full-time accountants, 92.86 percent indicated this this topic was not important for accountants. Table LXIX, page 188, gives a summary of the results.

A significant difference was also revealed between the number of full-time accountants employed and the importance to accountants of the topic, modeling the new logical system--data flow diagrams. Over 82 percent of those firms employing 30 or fewer full-time accountants indicated that this topic was not important to accountants. Results are given in Table LXX, page 189, in Appendix E.

A significant difference was revealed between the number of full-time accountants employed and the importance to accountants of the topics: modeling the new logical system--process descriptions; modeling the new logical system--data structures; and derivation of new physical system--human-machine interfaces. Over 85 percent of those firms employing 30 or fewer full-time accountants indicated that the first topic was not important for accountants. Over 89 percent of the firms employing 30 or fewer full-time accountants indicated that the second

topic was not important for accountants. Over 90 percent of those firms employing 30 or fewer full-time accountants indicated that the third topic was not important for accountants. Results are shown in Appendix E in Tables LXXI, page 190, LXXII, page 191, and LXXIII, page 192, respectively.

Finally, the chi-square test for significance revealed a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of the topic, implementation considerations--system testing. Of those firms employing ten or fewer full-time accountants, 81.25 percent indicated that this topic was not important for accountants. Of those firms employing between 11 and 30 full-time accountants, 82.14 percent indicated that this topic was not important for accountants. Results are shown in Table LXXIV, page 193, in Appendix E.

The chi-square test for significance did not reveal a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of any of the other topics included in this course.

Database Program Development. There was not a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of any of the skills and/or topics included in the course, Database Program Development.

Applied Software Development Project. The chi-square test for significance revealed a significant difference at the .05 level between the number of full-time accountants employed and the topic, communications--user interviews. Over 78 percent of those firms with at

least 30 full-time accountants indicated that this topic was not important for accountants. Table LXXV, page 194, in Appendix E gives the results.

The chi-square test for significance did not reveal a significant difference at the .05 level between the number of full-time accountants employed and the importance of any of the other topics included in this course.

EDP Audit and Controls. There was not a significant difference at the .05 level between the number of full-time accountants employed and the importance to accountants of any of the skills and/or topic included in the course, EDP Audit and Controls.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The computer and electronic data processing have had a tremendous impact on the applications performed by accountants. Electronic data processing has expanded the role of the accountant and has opened up opportunities for increased effectiveness. To ensure that the capabilities of the computer are utilized effectively, the accountant must become knowledgeable in the analysis and design of electronic data processing systems. Accounting students must be prepared to deal with the complexities of the computer and must have an adequate electronic data processing education background. Accounting educators, with the aid of the business community, must determine specifically what that electronic data processing background should include.

Purpose and Design of the Study

The purpose of this study was to obtain information concerning in-house data processing currently in use, data processing education requirements for accountants, and the specific data processing knowledge and skills which are needed by accountants. To obtain this information, questionnaires were mailed to oil companies in Kansas, Texas, and Oklahoma which were listed in the Midwest Oil Register. The data on the returned questionnaires were interpreted and analyzed to determine the use of data processing by accountants in business.

The Questionnaire

In keeping with the purposes of this study, a six-page printed questionnaire was designed. The questionnaire was developed from a study of the literature, review of similar questionnaires concerned with business data processing, and consultations with Oklahoma State University and Northwestern Oklahoma State University faculty members. The questionnaire was mailed to 200 oil companies in Kansas, Texas, and Oklahoma in the summer of 1982. One-half, or 50.0 percent, of the companies contacted responded to and returned the questionnaire.

Analysis of the Data

The responses to the questionnaire were coded and analyzed with the aid of computer tabulations. Frequency counts and percentages were calculated for the descriptive data. Two-way tables and chi-square tests were utilized to analyze the comparison of selected items in the questionnaire.

Results of the Study

The results of the study are summarized in four sections according to (1) the in-house data processing currently in use, (2) data processing education requirements for accountants, (3) specific data processing skills and/or topics which are needed by accountants, and (4) comparison of selected items in the questionnaire.

In-House Data Processing Currently in Use

Only seven of the one hundred respondents did not have in-house data processing capabilities. Fourteen different brands of computers were indicated, with IBM and Burroughs listed most often.

Forty respondents, or 43.01 percent, indicated that accounting procedures had been computerized for 15 years or more. Almost three-fourths, or 74.19, percent of the respondents with in-house data processing indicated that accounting procedures had been computerized for at least seven years.

Over three-fourths of the respondents, or 75.27 percent, indicated that the accounting and data processing functions were separate departments.

More than 50 percent of the respondents indicated that 12 out of the 14 accounting procedures listed were completed with the aid of electronic data processing. General ledger, subsidiary ledgers, accounts payable, accounts receivable, journalizing, and billing were all indicated by more than 90 percent of the respondents.

COBOL was the programming language used most often to process accounting data with RPG being second. Percentages of respondents were 69.23 and 39.56 percent respectively.

Data Processing Education Requirements for Accountants

Of those oil companies that participated in the study, 34 respondents, or 36.17 percent, indicated that between one and ten full-time accountants were employed; 30 respondents, or 31.92 percent, indicated that between 11 and 30 full-time accountants were employed; and 30

respondents, or 31.92 percent, indicated that more than 30 full-time accountants were employed.

Only six respondents, or 6.06 percent, indicated that data processing education was required of accountants. However, 78 respondents, or 88.64 percent, indicated that data processing coursework was preferred for prospective accountants.

Of those respondents who indicated that data processing education was required of prospective accountants, one-half reported that 1-3 semester hours of data processing coursework met the requirement.

Over 81 percent of the respondents reported that more data processing education would be needed by accountants in the future.

Data Processing Skills and/or Topics Needed by Accountants

Introduction to Computer-Based Systems. The respondents indicated that many of the skills and/or topics included in this course were needed by accountants. Twelve of the twenty-four skills and/or topics included were indicated as being needed by accountants by at least forty percent of the respondents. The three topics receiving the largest number of "yes" responses were: basic computer operations, 80.61 percent; data preparation, 74.49 percent; and processing applications, 57.14 percent.

Applications Program Development I. Many of the respondents indicated that the skills and/or topics included in this course are not needed by accountants. Fifty-eight respondents, or 62.37 percent, indicated this. Only three topics were reported as being needed by accountants by at least 20 percent of the respondents. They were: the programming process--program design, 27.96 percent; structured design

concepts, 22.58 percent; and the programming process--documentation, 22.58 percent.

Applications Program Development II. As with course number two, 62 respondents, or 66.67 percent, felt that none of the skills and/or topics included in this course were needed by accountants. Module design--use of flowcharts was the only topic reported as being needed by accountants by at least 20 percent of the respondents.

Systems Analysis Methods. Four of the thirteen topics included in this course were indicated by at least thirty percent of the respondents as being needed by accountants. The four were: classical documentation tools and techniques--system flowcharting, 46.15 percent; classical documentation tools and techniques--file and record design, 32.97 percent; classical documentation tools and techniques--input/output documentation, 36.26 percent; and structured documentation tools and techniques--data flow diagrams, 34.07 percent.

Structured Systems Analysis and Design. Five of the fifteen topics included in this course were indicated as being needed by accountants by at least 20 percent of the respondents. The topics were: implementation considerations--system testing, 26.44 percent; modeling the new logical system--data flow diagrams, 25.29 percent; documenting current physical system, 24.14 percent; implementation considerations--acceptance testing, 21.84 percent; and implementation considerations--evaluation considerations, 21.84 percent.

Database Program Development. Six topics were indicated as being needed by accountants by at least 20 percent of the respondents. The

topics were: overview of database concept, 42.55 percent; storage device characteristics and physical input/output--random access files/media, 22.34 percent; database administration--roles, 25.32 percent; database administration--security, 29.79 percent; database administration--backup, 24.47 percent; and database administration--recovery, 22.34 percent.

Applied Software Development Project. Thirteen topics were indicated as being needed by accountants by at least 20 percent of the respondents. The four indicated most often were: program management concepts--project planning, 34.41 percent; communications--documentation, 34.41 percent; analysis of current system--identification of problems, 30.11 percent; and analysis of current system--project definition, 29.03 percent.

EDP Audit and Controls. All of the nine topics were indicated as being needed by accountants by at least 25 percent of the respondents. The three topics indicated most often were: EDP audit environment, 46.47 percent; computer audit techniques--types of EDP audits, 41.11 percent; and computer audit techniques--computer-assisted audit techniques, 36.67 percent.

Rank of Courses. Respondents overwhelmingly ranked Introduction to Computer-Based Systems as the data processing course most important for accountants. Applied Software Development Project was ranked second with Structured Systems Analysis and Design and Systems Analysis Methods ranked third and fourth respectively.

Comparison of Selected Items

in the Questionnaire

Comparison of the importance to accountants of data processing skills and/or topics and the length of time accounting procedures had been computerized revealed that the companies which had their accounting procedures computerized for less than three years indicated that the following topics were not important to accountants:

1. data communications framework
2. data model overview

The importance to accountants of sepcific data processing skills and/or topics was also compared with the organization of the accounting and data processing functions. Over 77 percent of those firms with separate accounting and data processing departments indicated that the following topics were not important to accountants:

1. organization of disk files
2. advanced language features--sort facility
3. programs and systems of programs--menu-driven systems of programs and subprograms
4. documenting current physical system--output specifications
5. storage device characteristics and physical input/output--random access files/media
6. database administration--backup
7. database administration--recovery
8. design of proposed/modified system--database specifications
9. design of proposed/modified system--input/output specifications
10. design of proposed/modified system--program specifications.

The importance to accountants of specific data processing skills and/or topics was also compared to the number of full-time accountants

employed. Over 78 percent of those firms which employ at least 30 full-time accountants indicated that the following topics were not important to accountants:

1. evolution of computer industry
2. distributed processing
3. control break processing
4. COBOL file processing--sequential organization
5. modeling the new logical system--data flow diagrams
6. modeling the new logical system--process descriptions
7. modeling the new logical system--data structures
8. derivation of new physical system--human-machine interfaces
9. implementation considerations--system testing
10. communications--user interviews
11. derivation of current logical system--data dictionary

Discussion and Conclusions

The following conclusions and recommendations are based on the results of the descriptive analysis of data processing knowledge and skills needed by accountants and on the review of the related literature.

1. A majority of oil companies in Kansas, Texas, and Oklahoma currently utilize computerized data processing, and do have an in-house computer.

2. A large percentage of the oil companies have had accounting procedures computerized for at least seven years.

3. A majority of oil companies have separate accounting and data processing departments.

4. The general ledger, subsidiary ledgers, accounts payable,

accounts receivable, journalizing, and billing are the most common types of accounting procedures computerized.

5. COBOL is the most frequently used computer language in oil companies for processing accounting data.

6. Basic computer operations is considered to be the most important data processing topic for accountants employed by oil companies.

7. Very few oil companies require prospective accountants to have data processing coursework, but a very large majority prefer their prospective accountants to have data processing coursework. This particular conclusion seems to be contradictory. It is apparent that while the oil companies are eager for their accountants to possess any additional knowledge and skills to increase their effectiveness, they are not yet eager to make this added education a prerequisite for employment. This could be explained by several different reasons. It could be that practicality has not yet caught up with idealism. It may be that there are not enough accounting graduates with data processing education to make it feasible for companies to require data processing education as a prerequisite for employment. Or, it may be that data processing education falls too far down on the list of important knowledge and skills for prospective accountants to acquire. Another possibility might be that the people instrumental in making policy decisions on such matters as requirements for employment would probably be in relatively senior positions in the company and could be out of touch with the day-to-day role of the entry-level accountant. Therefore, job requirements might be outdated. Nevertheless, the study would seem to indicate that an accounting graduate with data processing education would be more likely to be hired than

an accounting graduate without data processing education, all other things being equal.

8. A large majority of accounting supervisors in oil companies predict that accountants will need more data processing education in the future. While it is evident that more data processing education will be needed by accountants in the future, it is not evident what that education should be.

9. Introduction to Computer-Based Systems, an introductory data processing course, is considered to be the most important data processing course for accountants employed by oil companies. This was the only data processing course that the accounting supervisors indicated to be needed by accountants. The possibility exists that while the supervisors feel more data processing education is needed by accountants, they do not feel that the traditional data processing courses included in the questionnaire meet the accountant's needs. Perhaps, the development of specially integrated data processing/accounting courses is needed. Another avenue would be the integration of data processing knowledge and skills into existing accounting courses. This particular avenue may prove to be difficult, as existing accounting courses are already very intensive with few spare moments for the inclusion of other topics.

The need for only one data processing course for accountants as identified by accounting supervisors appears to be in conflict with authors cited in the review of literature in Chapter II. Several possibilities arise to explain this conflict. First, it may be that the authors cited in the literature are idealistic and not in touch with the real world of the accountant. The researcher tends to disagree with this assumption because many of the authors cited are practicing accountants.

Another possibility exists that the oil companies are unique and have different needs from other types of businesses. However, basic accounting procedures are similar in all types of businesses. Therefore, the researcher also disagrees with this assumption.

There are two remaining possibilities that the researcher does not discount. First, the supervisors completing the questionnaire may not be close enough to the functions of the beginning accountant to ascertain how much data processing education is actually needed by that accountant. Very different results may have been obtained if the questionnaire had been completed by individual accountants rather than accounting supervisors. The accounting supervisors may have very little or no data processing education or experience themselves. This points to the second possibility, which may have been a matter of communication. The data processing language used in the questionnaire may not have been familiar to the accounting supervisors; therefore, the topics were left blank, even though some of them may have been very important to accountants.

An interesting trend in the data that was noted was that the more full-time accountants employed by the oil companies surveyed, the greater the number of data processing knowledge and skills was indicated as being needed by accountants. In fact, seven of the ten companies employing the largest number of full-time accountants were among the companies indicating the greatest number of data processing knowledge and skills needed by accountants. This would indicate that the larger the company, the more important data processing education becomes to the accountant. The smaller companies may be using their computers only for mechanical-type processing and manipulation of data. Higher level data processing, such as systems work and auditing with the computer, may not be used;

therefore, the accounting supervisors see no need for their accountants to be familiar with these topics. A questionnaire aimed at only the larger companies may have yielded very different results from this study.

10. A review of the related literature indicates that accountants will need to continually acquire more data processing knowledge and skills in order to stay current in their field.

Recommendations

1. Because of the percentages of respondents indicating that many of the data processing skills and/or topics listed under the course, Introduction to Computer-Based Systems, were important to accountants, all accounting majors should be required to take an introductory data processing course similar to the course, Introduction to Computer-Based Systems.

2. The field of electronic data processing is progressing rapidly and technological changes are introduced daily. Therefore, accountants should be encouraged to enroll in data processing continuing education courses to maintain current knowledge and skills.

3. Because of the disparity between academicians' and practitioners' perceptions of data processing needs for accountants, the two groups should be encouraged to work together through studies, workshops, seminars, etc. to determine true needs.

4. A study of colleges and universities should be conducted to determine the data processing education that is currently being required of accounting majors to see if business needs are being met.

5. Studies of the data processing education needs of accountants employed in businesses other than oil companies should be conducted to determine if there are similarities of needs in all businesses.

6. Studies of the data processing education needs of accountants employed in small, medium, and large businesses should be conducted to determine if there are similarities of needs in all sizes of businesses.

7. A study should be conducted to determine if the individual accountant's perception of data processing education needs and the accounting supervisor's perception of data processing education needs are similar.

8. This study should be duplicated periodically in the future to continually assess the data processing education needs of accountants.

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APPENDIX A

THE QUESTIONNAIRE

Identification Number

Questionnaire On Data Processing For Accountants

This questionnaire is a survey of selected oil companies in Kansas, Texas, and Oklahoma to determine data processing knowledge and skills needed by accountants. The questionnaire should be completed by the accounting supervisor.

I. BUSINESS INFORMATION

This portion of the questionnaire pertains to the use of electronic data processing by your firm.

1. What make and model computer, if any, do you use to process your accounting data?

If your firm does not have a computer, go directly to Part II, page 2, and complete the remainder of the questionnaire.

2. How long has your firm had any portion of its accounting procedures computerized?

- ☐ Less than 1 year
- ☐ 1 - 3 years
- ☐ 4 - 6 years
- ☐ 7 - 9 years
- ☐ 10 - 14 years
- ☐ 15 years or more

3. Are the accounting and data processing functions separate departments in your firm?

- ☐ Yes
- ☐ No

4. Which of the following accounting procedures are completed with the aid of electronic data processing? (Check all that apply)

- ☐ Journalizing
- ☐ General ledger
- ☐ Subsidiary ledgers
- ☐ Payroll
- ☐ Inventory
- ☐ Accounts Receivable
- ☐ Accounts Payable
- ☐ Depletion analysis
- ☐ Billing
- ☐ Budgets
- ☐ Cash flow analysis
- ☐ Sales analysis
- ☐ Purchases
- ☐ Financial statements
- ☐ Other (please specify)

_____

_____

5. Which computer languages are used by your computer to process accounting data? (Check all that apply)

- ☐ COBOL
- ☐ FORTRAN
- ☐ BASIC
- ☐ PASCAL
- ☐ PL/1
- ☐ RPG
- ☐ Other (please specify)

_____

_____

II. GENERAL INFORMATION

This portion of the questionnaire pertains to general information about the accountants employed by your firm.

1. How many full-time accountants are employed by your firm at this location?

_____ full-time accountants

2. Is a data processing education background required for a prospective accountant seeking employment with your firm?

☐ yes
☐ no

If yes, how many data processing credit hours are required? Check the measure that is appropriate and the range of hours.

☐ Semester ☐ Quarter

☐ 1 - 3 hours
☐ 4 - 6 hours
☐ 7 - 9 hours
☐ 10 - 12 hours
☐ more than 12 hours

If no, do you prefer that the prospective accountant have some data processing coursework?

☐ yes
☐ no

3. What changes in the amount of data processing education background will be needed by accountants in your firm in the future?

☐ more data processing education
☐ less data processing education
☐ no change

III. DATA PROCESSING KNOWLEDGE AND SKILLS INFORMATION

This portion of the questionnaire looks at specific data processing courses and their content. The first seven courses comprise the core curriculum for data processing as recommended by the Data Processing Management Association. The eighth course deals specifically with the auditing function. All course information has been selected from the DPMA Model Curriculum for Undergraduate Computer Information Systems Education, pages 22-41, 56-57. Following each course description, please check all the skills and/or topics which you feel are needed by an accountant in your firm.

1. Introduction to Computer-Based Systems - an overview of computer information systems.

☐ basic computer operations
☐ elements of hardware
☐ evolution of computer industry
☐ computer types and sizes
☐ software considerations
☐ data preparation
☐ computer problem solving
☐ processing applications
☐ data representation
☐ basics of operating systems
☐ elementary computer programming
☐ limitations of computers
☐ input/output devices
☐ input/output operations
☐ input/output control systems
☐ distributed processing
☐ components of primary memory
☐ types of memory
☐ components of secondary storage
☐ data communications framework
☐ file organization
☐ virtual storage concepts
☐ future of computers in society
☐ advantages of computers
☐ other (please specify)

_____

☐ none of these topics are needed

2. Applications Program Development I - a beginning computer problem solving and programming course using COBOL as the vehicle language.

- ☐ structured design concepts
- ☐ structured programming concepts
- ☐ file processing
- ☐ control break processing

PROGRAMMING PROCESS
- ☐ program design
- ☐ program coding
- ☐ documentation

TABLE PROCESSING
- ☐ single dimensional
- ☐ multi dimensional
- ☐ table searching

PROGRAMMING DECISION MAKING
- ☐ comparison of data values
- ☐ comparison of data types
- ☐ conditional tests
- ☐ transfers of control

FILE CREATION AND PROCESSING
- ☐ organization of sequential files
- ☐ organization of disk files

☐ other (please specify)

_____

☐ none of these topics are needed

3. Applications Program Development II - a continuation of Applications Program Development I.

PROGRAM DESIGN
- ☐ top-down development

PROGRAMMING IN COBOL
- ☐ control structures
- ☐ software development tools

COBOL FILE PROCESSING
- ☐ sequential organization
- ☐ direct organization
- ☐ indexed organization

ADVANCED LANGUAGE FEATURES
- ☐ sort facility
- ☐ report writer feature

PROGRAMS AND SYSTEMS OF PROGRAMS
- ☐ interprogram communication
- ☐ intermediate files
- ☐ menu-driven systems of programs and subprograms

MODULE DESIGN
- ☐ use of iterations control structures
- ☐ use of pseudocode
- ☐ use of flowcharts

☐ other (please specify)

_____

☐ none of these topics are needed

4. Systems Analysis Methods - an overview of the system development life cycle.

- ☐ system development life cycle overview
- ☐ derivation of current logical system

CLASSICAL DOCUMENTATION TOOLS AND TECHNIQUES
- ☐ system flowcharting
- ☐ file and record design
- ☐ input/output documentation

STRUCTURED DOCUMENTATION TOOLS AND TECHNIQUES
- ☐ data flow diagrams
- ☐ decision tables

DOCUMENTING CURRENT PHYSICAL SYSTEM
- ☐ output specifications
- ☐ input design
- ☐ file layout and design

INFORMATION GATHERING/REPORTING
- ☐ interviewing techniques
- ☐ report presentations
- ☐ design of user documentation

☐ other (please specify)

_____

☐ none of these topics are needed

5. Structured Systems Analysis and Design - a continuation of Systems Analysis Methods.

- ☐ review of system development life cycle
- ☐ documenting current physical system

DERIVATION OF CURRENT LOGICAL SYSTEM
- ☐ data dictionary
- ☐ leveled data flow diagrams

MODELING THE NEW LOGICAL SYSTEM
- ☐ data flow diagrams
- ☐ process descriptions
- ☐ logical data structures

DERIVATION OF NEW PHYSICAL SYSTEM
- ☐ human-machine interfaces
- ☐ system architecture

DETAILED DESIGN
- ☐ designing system branches
- ☐ module design
- ☐ system controls

IMPLEMENTATION CONSIDERATIONS
- ☐ system testing
- ☐ acceptance testing
- ☐ evaluation considerations

☐ other (please specify)

_____

☐ none of these topics are needed

6. Database Program Development - introduction to application program development in a database environment using a host language (COBOL).

- ☐ overview of database concept
- ☐ indexed organized files
- ☐ direct file organization
- ☐ data model overview
- ☐ hierarchical data model
- ☐ network data model
- ☐ relational data model

APPLIED DATA STRUCTURES
- ☐ linked list structures
- ☐ pointer chains
- ☐ rings
- ☐ trees
- ☐ networks
- ☐ data structure diagram

STORAGE DEVICE CHARACTERISTICS AND PHYSICAL INPUT/OUTPUT
- ☐ sequential files/media
- ☐ random access files/media

DATABASE ADMINISTRATION
- ☐ roles
- ☐ security
- ☐ backup
- ☐ recovery

☐ other (please specify)

_____

☐ none of these topics are needed

7. Applied Software Development Project - application of computer programming and system development concepts, principles and practices to a comprehensive system development project.

PROGRAM MANAGEMENT CONCEPTS
- ☐ project planning
- ☐ control techniques
- ☐ resource budgeting

ANALYSIS OF CURRENT SYSTEM
- ☐ project definition
- ☐ data collection
- ☐ identification of problems

DESIGN OF PROPOSED/MODIFIED SYSTEM
- ☐ priority setting
- ☐ database specifications
- ☐ input/output specifications
- ☐ program specifications

IMPLEMENTATION
- ☐ language selection
- ☐ building test data sets
- ☐ system performance evaluation
- ☐ project performance evaluation

COMMUNICATIONS
- ☐ user interviews
- ☐ documentation
- ☐ writing manuals
- ☐ formal presentations of project results

☐ other (please specify)

_____

☐ none of these topics are needed

8. EDP Audit and Controls - an introduction to the fundamentals of EDP auditing.

- ☐ EDP audit environment
- ☐ auditing advanced information systems
- ☐ systems approach to auditing

INFORMATION SYSTEMS CONTROLS

- ☐ types
- ☐ security

COMPUTER AUDIT TECHNIQUES

- ☐ types of EDP audits
- ☐ computer-assisted audit techniques
- ☐ use of audit software
- ☐ advantages & disadvantages

☐ other (please specify) _____

☐ none of these topics are needed

Please rank the following courses in order of their importance to an accountant in your firm.

1 = most important
8 = least important

_____ Introduction to Computer-Based Systems

_____ Applications Program Development I

_____ Applications Program Development II

_____ Systems Analysis Methods

_____ Structured Systems Analysis and Design

_____ Database Program Development

_____ Applied Software Development Project

_____ EDP Audit and Controls

Would you like a copy of the results of this study?

☐ Yes
☐ No

Comments: _____

APPENDIX B

DESCRIPTION OF COURSES FROM THE DPMA MODEL CURRICULUM FOR UNDERGRADUATE COMPUTER INFORMATION SYSTEMS EDUCATION

DESCRIPTIONS OF SELECTED COURSES FROM THE DPMA MODEL CURRICULUM FOR UNDERGRADUATE COMPUTER INFORMATION SYSTEMS EDUCATION

Introduction to Computer-Based Systems

An overview of computer information systems. This survey course introduces computer hardware, software, procedures, systems, and human resources and explores their integration and application in business and in other segments of society. The fundamentals of computer problem solving and programming in a higher-level programming language are discussed and applied.

Applications Program Development I

An introduction to computer programming in a business environment. Emphasis on the fundamentals of structured program design, development, testing, implementation, and documentation of common business-oriented applications using COBOL. Discussion and application of top-down design strategies and structured progamming techniques for designing and developing problem solutions. Coverage of language syntax, data and file structures, input and output devices, and operating system facilities for implementing batch programs for report generation, input editing, table processing, and sequential file creation and access.

Applications Program Development II

Emphasis on structured methodology of program design, development, testing, implementation, and documentation of common business-oriented applications using COBOL. Includes coverage of sequential and random access files and processing techniques and development of programs and systems of programs for batch and interactive environments.

Systems Analysis Methods

Overview of the system development life cycle. Emphasis on current system documentation through the use of both classical and structured tools/techniques for describing process flows, data structures, file designs, input and output designs and program specifications. Discussion of the information gathering and reporting activities and of the transition from analysis to design.

Structured Systems Analysis and Design

Advanced study of structured systems development. Emphasis on strategies and techniques of structured analysis and structured design for producing logical methodologies for dealing with complexity in the development of information systems.

Database Program Development

Introduction to application program development in a database environment with an emphasis on loading, modifying and querying the database using a host language (COBOL). Discussion and application of data structures, indexed and direct file organizations, models of data including hierarchical, network and relational. Discussion of storage devices, data administration and data analysis, design and implementation.

Applied Software Development Project

Application of computer programming and system development concepts, principles and practices to a comprehensive system development project. A team approach is used to analyze, design and document realistic systems of moderate complexity. Use of project management methods, project scheduling and control techniques, formal presentations and group dynamics in the solution of information systems problems. Development of a database to support the system.

EDP Audit and Controls

An introduction to the fundamentals of EDP auditing. Emphasis on EDP controls, types of EDP audits, and concepts and techniques used in EDP audits. Exposure to risk assessment and professional standards in the field of EDP auditing.

APPENDIX C

CORRESPONDENCE TO DATA PROCESSING MANAGEMENT ASSOCIATION

International Headquarters
505 Busse Highway, Park Ridge, Illinois 60068
(312)825-8124

Data Processing Management Association

May 6, 1982

Ms. Janet Cunningham
Instructor of Business
Northwestern Oklahoma State University
Alva, OK 73717

Dear Ms. Cunningham:

Regarding your letter of April 30 requesting permission to use selected portions of the DPMA Model Curriculum for a questionnaire relating to your dissertation, you have our permission to do so.

We have one request; that is that you clearly credit the DPMA Model Curriculum for Undergraduate Computer Information Systems Education wherever it is used in the questionnaire, giving the page numbers for the portions used.

I would be most appreciative if you would send a copy of your questionnaire to this office, to my attention.

I hope your dissertation goes well, and I'm glad we could be of help.

Sincerely,

Martin A. Kantor
Manager of Educational Services

MAK:as

APPENDIX D

CORRESPONDENCE TO ACCOUNTING SUPERVISORS OF OIL COMPANIES

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
(405) 624-5064

July 12, 1982

Dear Accounting Supervisor:

SUBJECT: ACCOUNTANTS' USE OF DATA PROCESSING SURVEY

The use of electronic data processing has changed dramatically the functions and roles of the accountant in business and industry. I am requesting your assistance in determining the data processing education that will enable accountants to work effectively with the computer. It is the purpose of this study to collect data which will help identify the data processing knowledge and skills needed by accountants.

Your company has been selected from the 1982 Midwest Oil Register for Texas, Kansas, and Oklahoma. As the accounting supervisor of your company, would you please complete the enclosed questionnaire? Your questionnaire will be identified with you only by the researchers who will use the identification number for follow-up purposes. Neither you nor your firm will be identified in the study. If possible, the questionnaire should be returned on or before July 22. An addressed, stamped envelope is enclosed for your convenience in returning the questionnaire.

Your cooperation is very much appreciated. By taking a few minutes of your valuable time to provide your professional expertise, you are contributing a great deal toward the development of more effective education for the accountant. Thank you for participating in this study.

Sincerely,

Janet Cunningham

Richard Aukerman

Richard Aukerman
Dissertation Advisor

Oklahoma State University

COLLEGE OF BUSINESS ADMINISTRATION

STILLWATER, OKLAHOMA 74078
405 624-5064

July 29, 1982

Dear Accounting Supervisor:

SUBJECT: FOLLOW-UP OF ACCOUNTANTS' USE OF DATA PROCESSING SURVEY

Recently you received a questionnaire requesting your participation in a study to determine the accountant's need for data processing education. This is a regional survey involving oil companies in Kansas, Texas, and Oklahoma. At the time this letter was mailed, a response had not been received from your firm. If the questionnaire has since been completed and returned, I thank you.

As the accounting supervisor of your company, would you please complete the enclosed questionnaire? If possible, the questionnaire should be returned on or before August 9. An addressed, stamped envelope is enclosed for your convenience in returning the questionnaire.

Your cooperation is very much appreciated. By providing your professional expertise, you are contributing a great deal toward the development of more effective education for the accountant.

Sincerely,

Janet Cunningham

Richard Aukerman

Richard Aukerman
Dissertation Advisor

APPENDIX E

RESULTS OF COMPARISON TESTS OF SELECTED ITEMS IN THE QUESTIONNAIRE

TABLE XLVIII

COMPARISON OF LENGTH OF TIME ACCOUNTING PROCEDURES HAD BEEN COMPUTERIZED BY SPECIFIC TOPIC: LIMITATIONS OF COMPUTERS

Length of Time Accounting Procedures Had Been Computerized	Limitations of Computers		
	No	Yes	Total
Less than 3 years	10	6	16
	8.3	7.7	
	0.3	0.4	
	10.87	6.52	17.39
	62.50	37.50	
	20.83	13.64	
4 - 9 years	14	6	20
	10.4	9.6	
	1.2	1.3	
	15.22	6.52	21.74
	70.00	30.00	
	29.17	13.64	
10 - 14 years	4	12	16
	8.3	7.7	
	2.3	2.5	
	4.35	13.04	17.39
	25.00	75.00	
	8.33	27.27	
15 years or more	20	20	40
	20.9	19.1	
	0.0	0.0	
	21.74	21.74	43.48
	50.00	50.00	
	41.67	45.45	
$p < .05$ Total	48	44	92
$p > .01$	52.17	47.83	100.00

TABLE XLIX

COMPARISON OF LENGTH OF TIME ACCOUNTING PROCEDURES HAD BEEN COMPUTERIZED BY SPECIFIC TOPIC: DATA COMMUNICATIONS FRAMEWORK

Length of Time Accounting Procedures Had Been Computerized	Data Communications Framework		
	No	Yes	Total
Less than 3 years	16	0	16
	11.5	4.5	
	1.8	4.5	
	17.39	0.00	17.39
	100.00	0.00	
	24.24	0.00	
4 - 9 years	11	9	20
	14.3	5.7	
	0.8	2.0	
	11.96	9.78	21.74
	55.00	45.00	
	16.67	34.62	
10 - 14 years	10	6	16
	11.5	4.5	
	0.2	0.5	
	10.87	6.52	17.39
	62.50	37.50	
	15.15	23.08	
15 years or more	29	11	40
	28.7	11.3	
	0.0	0.0	
	31.52	11.96	43.48
	72.50	27.50	
	43.94	42.31	
$p < .05$ Total	66	26	92
$p > .01$	71.74	28.26	100.00

TABLE L

COMPARISON OF LENGTH OF TIME ACCOUNTING PROCEDURES HAD BEEN COMPUTERIZED BY SPECIFIC TOPIC: DATA MODEL OVERVIEW

Length of Time Accounting Procedures Had Been Computerized		Data Model Overview: No	Data Model Overview: Yes	Total
Less than 3 years		14	0	14
		12.1	1.9	
		0.3	1.9	
		16.09	0.00	16.09
		100.00	0.00	
		18.67	0.00	
4 - 9 years		18	1	19
		16.4	2.6	
		0.2	1.0	
		20.69	1.15	21.84
		94.74	5.26	
		24.00	8.33	
10 - 14 years		10	5	15
		12.9	2.1	
		0.7	4.2	
		11.49	5.75	17.24
		66.67	33.33	
		13.33	41.67	
15 years or more		33	6	39
		33.6	5.4	
		0.0	0.1	
		37.93	6.90	44.83
		84.62	15.38	
		44.00	50.00	
$p < .05$	Total	75	12	87
$p > .01$		86.21	13.79	100.00

TABLE LI

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: FILE CREATION AND PROCESSING--ORGANIZATION OF DISK FILES

Organization of Accounting and Data Processing Functions	File Creation and Processing--Organization of Disk Files: No	Yes	Total
Separate Departments	59	10	69
	55.5	13.5	
	0.2	0.9	
	67.82	11.49	79.31
	85.51	14.49	
	84.29	58.82	
Same Department	11	7	18
	14.5	3.5	
	0.8	3.4	
	12.64	8.05	20.69
	61.11	38.89	
	15.71	41.18	
$p < .05$ Total	70	17	87
$p > .01$	80.46	19.54	100.00

TABLE LII

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: ADVANCED LANGUAGE FEATURES--SORT FACILITY

Organization of Accounting and Data Processing Functions	Advanced Language Features--Sort Facility		
	No	Yes	Total
Separate Departments	62	6	68
	59.4	8.6	
	0.1	0.8	
	71.26	6.90	78.16
	91.18	8.82	
	81.58	54.55	
Same Department	14	5	19
	16.6	2.4	
	0.4	2.8	
	16.09	5.75	21.84
	73.68	26.32	
	18.42	45.45	
$p < .05$ Total	76	11	87
$p > .01$	87.36	12.64	100.00

TABLE LIII

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: PROGRAMS AND SYSTEMS OF PROGRAMS--MENU-DRIVEN SYSTEMS OF PROGRAMS AND SUBPROGRAMS

Organization of Accounting and Data Processing Functions	Programs and Systems of Programs--Menu-Driven Systems of Programs and Subprograms		
	No	Yes	Total
Separate Departments	59	9	68
	55.5	12.5	
	0.2	1.0	
	67.82	10.34	78.16
	86.76	13.24	
	83.10	56.25	
Same Department	12	7	19
	15.5	3.5	
	0.8	3.5	
	13.79	8.05	21.84
	63.16	36.84	
	16.90	43.75	
$p < .05$ Total	71	16	87
$p > .01$	81.61	18.39	100.00

TABLE LIV

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: DOCUMENTING CURRENT PHYSICAL SYSTEM--OUTPUT SPECIFICATIONS

Organization of Accounting and Data Processing Functions		Documenting Current Physical System--Output Specifications: No	Yes	Total
Separate Departments		53	15	68
		49.6	18.4	
		0.2	0.6	
		62.35	17.65	80.00
		77.94	22.06	
		85.48	65.22	
Same Department		9	8	17
		12.4	4.6	
		0.9	2.5	
		10.59	9.41	20.00
		52.94	47.06	
		14.52	34.78	
$p < .05$	Total	62	23	85
$p > .01$		72.94	27.06	100.00

TABLE LV

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: STORAGE DEVICE CHARACTERISTICS AND PHYSICAL INPUT/ OUTPUT--RANDOM ACCESS FILES/MEDIA

Organization of Accounting and Data Processing Functions	Storage Device Characteristics and Physical Input/Output-- Random Access Files/Media		
	No	Yes	Total
Separate Departments	57	12	69
	52.7	16.3	
	0.3	1.1	
	64.04	13.48	77.53
	82.61	17.39	
	83.82	57.14	
Same Department	11	9	20
	15.3	4.7	
	1.2	3.9	
	12.36	10.11	22.47
	55.00	45.00	
	16.18	42.86	
$p < .05$ Total	68	21	89
$p > .01$	76.40	23.60	100.00

TABLE LVI

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: DATABASE ADMINISTRATION--BACKUP

Organization of Accounting and Data Processing Functions		Database Administration--Backup: No	Yes	Total
Separate Departments		56	13	69
		51.9	17.1	
		0.3	1.0	
		62.92	14.61	77.53
		81.16	18.64	
		83.58	59.09	
Same Department		11	9	20
		15.1	4.9	
		1.1	3.3	
		12.36	10.11	22.47
		55.00	45.00	
		16.42	40.91	
$p < .05$	Total	67	22	89
$p > .01$		75.28	24.72	100.00

TABLE LVII

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: DATABASE ADMINISTRATION--RECOVERY

Organization of Accounting and Data Processing Functions		Database Administration--Recovery: No	Yes	Total
Separate Departments		58	11	69
		53.5	15.5	
		0.4	1.3	
		65.17	12.36	77.53
		84.06	15.94	
		84.06	55.00	
Same Department		11	9	20
		15.5	4.5	
		1.3	4.5	
		12.36	10.11	22.47
		55.00	45.00	
		15.94	45.00	
$p < .05$	Total	69	20	89
$p < .01$		77.53	22.47	100.00

TABLE LVIII

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: DESIGN OF PROPOSED/ MODIFIED SYSTEM--DATABASE SPECIFICATIONS

Organization of Accounting and Data Processing Functions		Design of Proposed/Modified System--Database Specifications: No	Yes	Total
Separate Departments		56	11	67
		52.4	14.6	
		0.3	0.9	
		64.37	12.64	77.01
		83.58	16.42	
		82.35	57.89	
Same Department		12	8	20
		15.6	4.4	
		0.8	3.0	
		13.79	9.20	22.99
		60.00	40.00	
		17.65	42.11	
$p < .05$ $p > .01$	Total	68	19	87
		78.16	21.84	100.00

TABLE LIX

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: DESIGN OF PROPOSED/ MODIFIED SYSTEM--INPUT/OUTPUT SPECIFICATIONS

Organization of Accounting and Data Processing Functions	Design of Proposed/Modified System--Input/Output Specifications: No	Yes	Total
Separate Departments	58	9	67
	53.1	13.9	
	0.4	1.7	
	66.67	10.34	77.01
	86.57	13.43	
	84.06	50.00	
Same Department	11	9	20
	15.9	4.1	
	1.5	5.7	
	12.64	10.34	22.99
	55.00	45.00	
	15.94	50.00	
$p < .05$ $p > .01$ Total	69	18	87
	79.31	20.69	100.00

TABLE LX

COMPARISON OF ORGANIZATION OF ACCOUNTING AND DATA PROCESSING FUNCTIONS BY SPECIFIC TOPIC: DESIGN OF PROPOSED/ MODIFIED SYSTEM--PROGRAM SPECIFICATIONS

Organization of Accounting and Data Processing Functions	Design of Proposed/Modified System--Program Specifications		
	No	Yes	Total
Separate Departments	60	7	67
	56.2	10.8	
	0.3	1.3	
	68.97	8.05	77.01
	89.55	10.45	
	82.19	50.00	
Same Department	13	7	20
	16.8	3.2	
	0.9	4.4	
	14.94	8.05	22.99
	65.00	35.00	
	17.81	50.00	
$p < .05$ Total	73	14	87
$p > .01$	83.91	16.09	100.00

TABLE LXI

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: EVOLUTION OF COMPUTER INDUSTRY

Number of Full-Time Accountants Employed		Evolution of Computer Industry: No	Yes	Total
1-10 full-time accountants		36	2	38
		34.1	3.9	
		0.1	0.9	
		36.73	2.04	38.78
		94.74	5.26	
		40.91	20.00	
11-30 full-time accountants		29	1	30
		26.9	3.1	
		0.2	1.4	
		29.59	1.02	30.61
		96.67	3.33	
		32.95	10.00	
More than 30 full-time accountants		23	7	30
		26.9	3.1	
		0.6	5.1	
		23.47	7.14	30.61
		76.67	23.33	
		26.14	70.00	
$p < .05$	Total	88	10	98
$p > .01$		89.80	10.20	100.00

TABLE LXII

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: COMPUTER PROBLEM SOLVING

Number of Full-Time Accountants Employed		Computer Problem Solving: No	Computer Problem Solving: Yes	Total
1-10 full time accountants		22	16	38
		20.6	17.4	
		0.1	0.1	
		22.45	16.33	38.78
		57.89	42.11	
		41.51	35.56	
11-30 full-time accountants		21	9	30
		16.2	13.8	
		1.4	1.7	
		21.43	9.18	30.61
		70.00	30.00	
		39.62	20.00	
More than 30 full-time accountants		10	20	30
		16.2	13.8	
		2.4	2.8	
		10.20	20.41	30.61
		33.33	66.67	
		18.87	44.44	
$p < .05$	Total	53	45	98
$p > .01$		54.08	45.92	100.00

TABLE LXIII

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: DISTRIBUTED PROCESSING

Number of Full-Time Accountants Employed	Distributed Processing		
	No	Yes	Total
1-10 full-time accountants	31	7	38
	28.7	9.3	
	0.2	0.6	
	31.63	7.14	38.78
	81.58	18.42	
	41.89	29.17	
11-30 full-time accountants	26	4	30
	22.7	7.3	
	0.5	1.5	
	26.53	4.08	30.61
	86.67	13.33	
	35.14	16.67	
More than 30 full-time accountants	17	13	30
	22.7	7.3	
	1.4	4.3	
	17.35	13.27	30.61
	56.67	43.33	
	22.97	54.17	
Total	74	24	98
	75.51	24.49	100.00

$p < .05$
$p > .01$

TABLE LXIV

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: CONTROL BREAK PROCESSING

Number of Full-Time Accountants Employed		Control Break Processing		
		No	Yes	Total
1-10 full-time accountants		34	2	36
		31.7	4.3	
		0.2	1.2	
		36.56	2.15	38.71
		94.44	5.56	
		41.46	18.18	
11-30 full-time accountants		26	2	28
		24.7	3.3	
		0.1	0.5	
		27.96	2.15	30.11
		92.86	7.14	
		31.71	18.18	
More than 30 full-time accountants		22	7	29
		25.6	3.4	
		0.5	3.7	
		23.66	7.53	31.18
		75.86	24.14	
		26.83	63.64	
$p < .05$ $p > .01$	Total	82 88.17	11 11.83	93 100.00

TABLE LXV

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: COBOL FILE PROCESSING-- SEQUENTIAL ORGANIZATION

Number of Full-Time Accountants Employed		COBOL File Processing-- Sequential Organization: No	Yes	Total
1-10 full-time accountants		35	2	37
		33.4	3.6	
		0.1	0.7	
		37.63	2.15	39.78
		94.59	5.41	
		41.67	22.22	
11-30 full-time accountants		27	1	28
		25.3	2.7	
		0.1	1.1	
		29.03	1.08	30.11
		96.43	3.57	
		32.14	11.11	
More than 30 full-time accountants		22	6	28
		25.3	2.7	
		0.4	4.0	
		23.66	6.45	30.11
		78.57	21.43	
		26.19	66.67	
$p < .05$	Total	84	9	93
$p > .01$		90.32	9.68	100.00

TABLE LXVI

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: SYSTEM DEVELOPMENT LIFE CYCLE OVERVIEW

Number of Full-Time Accountants Employed	System Development Life Cycle Overview		
	No	Yes	Total
1-10 full-time accountants	30	4	34
	23.9	10.1	
	1.5	3.7	
	32.97	4.40	37.36
	88.24	11.76	
	46.88	14.81	
11-30 full-time accountants	19	9	28
	19.7	8.3	
	0.0	0.1	
	20.88	9.89	30.77
	67.86	32.14	
	29.69	33.33	
More than 30 full-time accountants	15	14	29
	20.4	8.6	
	1.4	3.4	
	16.48	15.38	31.87
	51.72	48.28	
	23.44	51.85	
$p < .05$ Total	64	27	91
$p < .01$	70.33	29.67	100.00

TABLE LXVII

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: DERIVATION OF CURRENT LOGICAL SYSTEM

Number of Full-Time Accountants Employed		Derivation of Current Logical System: No	Yes	Total
1-10 full-time accountants		33	1	34
		27.3	6.7	
		1.2	4.9	
		36.26	1.10	37.36
		97.06	2.94	
		45.21	5.56	
11-30 full-time accountants		20	8	28
		22.5	5.5	
		0.3	1.1	
		21.98	8.79	30.77
		71.43	28.57	
		27.40	44.44	
More than 30 full-time accountants		20	9	29
		23.3	5.7	
		0.5	1.9	
		21.98	9.89	31.87
		68.97	31.03	
		27.40	50.00	
$p < .05$	Total	73	18	91
$p < .01$		80.22	19.78	100.00

TABLE LXVIII

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: INFORMATION GATHERING/REPORTING-- INTERVIEWING TECHNIQUES

Number of Full-Time Accountants Employed	Information Gathering/Reporting Interviewing Techniques		
	No	Yes	Total
1-10 full-time accountants	32	2	34
	27.3	6.7	
	0.8	3.3	
	35.16	2.20	37.36
	94.12	5.88	
	43.84	11.11	
11-30 full-time accountants	20	8	28
	22.5	5.5	
	0.3	1.1	
	21.98	8.79	30.77
	71.43	28.57	
	27.40	44.44	
More than 30 full-time accountants	21	8	29
	23.3	5.7	
	0.2	0.9	
	23.08	8.79	31.87
	72.41	27.59	
	28.77	44.44	
$p < .05$ $p > .01$ Total	73	18	91
	80.22	19.78	100.00

TABLE LXIX

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: DERIVATION OF CURRENT LOGICAL SYSTEM--DATA DICTIONARY

Number of Full-Time Accountants Employed	Derivation of Current Logical System--Data Dictionary		
	No	Yes	Total
1-10 full-time accountants	30	2	32
	27.6	4.4	
	0.2	1.3	
	34.48	2.30	36.78
	93.75	6.25	
	40.00	16.67	
11-30 full-time accountants	26	2	28
	24.1	3.9	
	0.1	0.9	
	29.89	2.30	32.18
	92.86	7.14	
	34.67	16.67	
More than 30 full-time accountants	19	8	27
	23.3	3.7	
	0.8	4.9	
	21.84	9.20	31.03
	70.37	29.63	
	25.33	66.67	
$p < .05$ $p > .01$ Total	75	12	87
	86.21	13.79	100.00

TABLE LXX

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: MODELING THE NEW LOGICAL SYSTEM--DATA FLOW DIAGRAMS

Number of Full-Time Accountants Employed	Modeling the New Logical System-- Data Flow Diagrams		
	No	Yes	Total
1-10 full-time accountants	28	4	32
	23.9	8.1	
	0.7	2.1	
	32.18	4.60	36.78
	87.50	12.50	
	43.08	18.18	
11-30 full-time accountants	23	5	28
	20.9	7.1	
	0.2	0.6	
	26.44	5.75	32.18
	82.14	17.86	
	35.38	22.73	
More than 30 full-time accountants	14	13	27
	20.2	6.8	
	1.9	5.6	
	16.09	14.94	31.03
	51.85	48.15	
	21.54	59.09	
$p < .05$ Total	65	22	87
$p < .01$	74.71	25.29	100.00

TABLE LXXI

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: MODELING THE NEW LOGICAL SYSTEM--PROCESS DESCRIPTIONS

Number of Full-Time Accountants Employed	Modeling the New Logical System--Process Descriptions		
	No	Yes	Total
1-10 full-time accountants	30	2	32
	26.9	5.1	
	0.4	1.9	
	34.48	2.30	36.78
	93.75	6.25	
	41.10	14.29	
11-30 full-time accountants	24	4	28
	23.5	4.5	
	0.0	0.1	
	27.59	4.60	32.18
	85.71	14.29	
	32.88	28.57	
More than 30 full-time accountants	19	8	27
	22.7	4.3	
	0.6	3.1	
	21.84	9.20	31.03
	70.37	29.63	
	26.03	57.14	
Total	73	14	87
	83.91	16.09	100.00

$p < .05$
$p > .01$

TABLE LXXII

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: MODELING THE NEW LOGICAL SYSTEM--LOGICAL DATA STRUCTURES

Number of Full-Time Accountants Employed	Modeling the New Logical System--Logical Data Structures		
	No	Yes	Total
1-10 full-time accountants	31	1	32
	28.0	4.0	
	0.3	2.3	
	35.63	1.15	36.78
	96.88	3.13	
	40.79	9.09	
11-30 full-time accountants	25	3	28
	24.5	3.5	
	0.0	0.1	
	28.74	3.45	32.18
	89.29	10.71	
	32.89	27.27	
More than 30 full-time accountants	20	7	27
	23.6	3.4	
	0.5	3.8	
	22.99	8.05	31.03
	74.07	25.93	
	26.32	63.64	
Total	76	11	87
	87.36	12.64	100.00

$p < .05$
$p > .01$

TABLE LXXIII

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: DERIVATION OF NEW PHYSICAL SYSTEM--HUMAN-MACHINE INTERFACES

Number of Full-Time Accountants Employed	Derivation of New Physical System--Human-Machine Interfaces: No	Yes	Total
1-10 full-time accountants	29	3	32
	27.2	4.8	
	0.1	0.7	
	33.33	3.45	36.78
	90.63	9.38	
	39.19	23.08	
11-30 full-time accountants	26	2	28
	23.8	4.2	
	0.2	1.1	
	29.89	2.30	32.18
	92.86	7.14	
	35.14	15.38	
More than 30 full-time accountants	19	8	27
	23.0	4.0	
	0.7	3.9	
	21.84	9.20	31.03
	70.37	29.63	
	25.68	61.54	
$p < .05$ Total	74	13	87
$p > .01$	85.06	14.94	100.00

TABLE LXXV

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: COMMUNICATIONS--USER INTERVIEWS

Number of Full-Time Accountants Employed		Communications--User Interviews: No	Yes	Total
1-10 full-time accountants		31	7	38
		27.4	10.6	
		0.5	1.2	
		33.33	7.53	40.86
		81.58	18.42	
		46.27	26.92	
11-30 full-time accountants		22	6	28
		20.2	7.8	
		0.2	0.4	
		23.66	6.45	30.11
		78.57	21.43	
		32.84	23.08	
More than 30 full-time accountants		14	13	27
		19.5	7.5	
		1.5	3.9	
		15.05	13.98	29.03
		51.85	48.15	
		20.90	50.00	
$p < .05$ $p > .01$	Total	67 72.04	26 27.96	93 100.00

TABLE LXXIV

COMPARISON OF NUMBER OF FULL-TIME ACCOUNTANTS EMPLOYED BY SPECIFIC TOPIC: IMPLEMENTATION CONSIDERATIONS--SYSTEM TESTING

Number of Full-Time Accountants Employed		Implementation Considerations--System Testing: No	Yes	Total
1-10 full-time accountants		26	6	32
		23.5	8.5	
		0.3	0.7	
		29.89	6.90	36.78
		81.25	18.75	
		40.63	26.09	
11-30 full-time accountants		23	5	28
		20.6	7.4	
		0.3	0.8	
		26.44	5.75	32.18
		82.14	17.86	
		35.94	21.74	
More than 30 full-time accountants		15	12	27
		19.9	7.1	
		1.2	3.3	
		17.24	13.79	31.03
		55.56	44.44	
		23.44	52.17	
$p < .05$	Total	64	23	87
$p > .01$		73.56	26.44	100.00

VITA

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Doctor of Education

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