4-1983

Suggested EDP Knowledge Levels For Accounting Professionals

Elise G. Jancura

Accounting is the process of identifying, evaluating, recording, and communicating financial information about an economic entity. Accounting controls may be characterized as a system of procedures designed to facilitate the proper discharge of accounting responsibilities for the protection of company assets and the creation of a satisfactory audit trail. These control procedures should document all transactions and insure that only correct and authorized data enter the accounting records. Further, once the source data is identified and recorded, proper control procedures require that the use of that data be restricted to legitimate needs of the organization. Care must be taken that any operations performed on the data are done accurately and in a time frame that will produce usable results.

These concerns for proper collection and control of data extend beyond just the accounting records. They include all of the information and records that must be collected and organized for operational control of an organization. As organizations grow in size and complexity, the process of management has come to depend less on individual communication between people and increasingly on the formalized recording, organization, and reporting of data. The process of information flow and use encompasses the entire organization, and in dealing with the question of data collection, verification, and control, it is important to recognize that data processing and the use of computers is only one step in this process. In fact, much information flow never reaches the computer department at all but consists of communications between non-computer departments and between individuals of those departments. Further, even in those areas where the data involved does in fact move through the data processing department, it is important to keep in mind that it is usually generated outside of that department.

The Impact of EDP on Accounting

As computers have become more numerous, and have developed more data collection and communication ability, the impact of computers on management activities and the accounting process has increased significantly. Modern computers have provided an environment where it has been possible to service ever larger

Suggested EDP Knowledge Levels For Accounting Professionals

Editor:
Elise G. Jancura, CPA, CISA, Ph.D.
The Cleveland State University
Cleveland, Ohio 44102

portions of a company's information system and to generate more detailed, accurate information for management in a shorter period of time. Today this can be done through several different approaches. In some large organizations a marriage of telecommunications and mainframe computers facilitate strongly centralized systems. For other large organizations, the advent of the mini and micro-computers have created distributed processing systems that facilitate centralization of some information elements while allowing decentralization of others. Without question, these same developments have made computerized financial systems a reality for small companies.

The computer has facilitated the standardization and integration of total company information systems. Increasingly these information systems are expanding beyond the limits of classical financial and accounting data to encompass a broad range of operating information useful for decision-making. Many of these systems are shortening the recording and processing cycle to an environment in which transactions are recorded and processed as they occur and through which management can continuously monitor company performance and make immediate operating decisions in response to any exceptional conditions.

As data-processing operations assume great significance in the overall operation and financial activities of organizations, the exercise of firm control over the data-processing function becomes critically important. Similarly, the substantial impact of data processing on the financial records and data dictates the need for a greater involvement and expertise by the management accountant and the auditor.

The changes introduced by these computerized information systems have in turn often influenced the procedures used to collect, analyze, and report on accounting data. The extension of computer techniques to the very small-scale user and the expansion of computer applications to all facets of operations for larger organizations has put the computer into a position to exert substantial influence on the actual operation of the organizations using it. As a result, persons who have (or intend to have) responsibilities for developing or managing computerized information systems, or for auditing, evaluating, or controlling computer services, find themselves faced with two conditions:

1. A large portion of the organization's accounting and operating information flow, and at times even much of its decision making, are embodied in the computer applications. To effectively perform their responsibilities, these persons must adjust to this new technology, and, at times, force this new technology to adjust to their needs.

2. The major opportunity to achieve improved utilization of the computer is now open to them. There is a wide

and growing appreciation for the skills and objectivity of accountants and auditors which are vital components in the effective selection, design, implementation, and evaluation of computer applications.

Responsibilities of Management and Auditors

Although their perspectives may differ, the professional concerns and responsibilities of accountants and auditors require both to develop a working knowledge, and in some cases, a mastery of the functions of computerized information and control systems.

Management, especially accounting management, has the primary responsibility for instituting control procedures to insure that all data is properly recorded, that the recording process includes proper verification procedures, that safeguards exist to prevent duplication of proper data or inclusion of extraneous data, and that proper security and classification of the data so recorded is maintained. Management is also responsible for the exercise of continuing supervision to determine that these controls are functioning as prescribed and are modified as appropriate for changes in operating conditions.

Auditing (whether performed by the external auditor or the internal auditor) is an attest function involving objective review and evaluation of an organization's records and operations. In a *financial audit* the review and evaluation is primarily concerned with the fairness and authenticity of the records, measurements, and financial reports prepared by and for the management of an organization and for other users of the organization's financial reports. An *operational audit* is the review and evaluation of controls from a management viewpoint, considering such factors as efficiency, economy, and effectiveness of operations. An important part of this attest process is determining the adequacy of the controls in effect and the level of compliance with them, because these controls influence the accuracy and reliability of the resulting financial and operational information.

The General Audit Standards outlined by the American Institute of Certified Public Accountants in SAS 1 (which specify adequate technical training and proficiency, an independence in mental attitude, and due professional care) and SAS 3, "The

Effects of EDP on the Auditor's Study and Evaluation of Internal Control," require that the independent auditor have a functional knowledge of computer systems, including an understanding of when to use those systems for the audit function and how to test the systems to evaluate their adequacy.

Although the professional standards discussed in the preceding paragraph were written specifically for the independent auditor, it is important to recognize that the principles involved apply equally to the qualifications of the internal auditor and management accountant. Further, these standards have significance for the executive, manager, or supervisor whose activities impact the financial (or operational) information systems of the organization. In fact, management's responsibilities are even broader than those of the auditor, for management has responsibility for adopting sound accounting policies to maintain an adequate and effective system of accounts, for the safeguarding of assets, and for devising a system of internal controls.

Computer-Based Accounting Applications

The computer has changed many of the techniques employed in conducting an audit and has also made significant changes in the physical nature of financial records. This in turn has important implications for the nature and timing of audit procedures, as well as the nature of effective internal control. The increase in file integration and the introduction of new techniques such as those employed in data base systems and real-time systems are quickly making it impractical to limit the effective internal controls to manual procedures for capturing and transmitting data. Increasingly, controls are being incorporated into the computer programs themselves. Consequently, both the management accountant and the auditor must be able to understand, evaluate, and even use these control techniques.

Underlying the ability to effectively use and control the computer or to perform computer auditing tasks is an understanding of the basic elements of an accounting application which is computer processed. Accountants and auditors are not designers of such systems but they must be knowledgeable about their fundamental proper-

ties in order to effectively *and* efficiently use and/or audit them.

Knowledge of computer technology is the underlying foundation upon which an understanding of accounting applications is built, and from which computerized accounting and audit skills develop. However, a computer science orientation is not needed. The accountant is interested in computer technology only insofar as it has direct bearing on accounting controls, accuracy of results, and the eventual auditability of the system.

EDP Knowledge Requirements

There have been several attempts to define the necessary EDP knowledge for accountants and auditors. In the development or subsequent evaluation of many accounting applications, there is a required spectrum of technical knowledge and competency that is frequently beyond the capability of any one individual. Often the development or evaluation effort requires the cooperative efforts of several professionals each contributing to the overall objective. The emphasis on one discipline or another can be shifted, depending upon the technical demands generated by the specific environment. This allows for varying levels of expertise, experience and supervisory ability, including varying levels of technical EDP knowledge, among the individuals participating in any given project.

The amount of EDP technical knowledge which an accountant or auditor must possess in a given business environment will vary directly with the technical sophistication and complexity of the EDP processing involved in the significant accounting applications. In some instances, advanced specialized EDP knowledge may be required to meet the responsibilities involved. This EDP "knowledge/expertise" may be provided by the same individual directly responsible for planning and supervising the project or it may be provided by a separate individual with specialized expertise acting in a support capacity.

In reviewing the levels of EDP competency needed in an accounting or auditing staff one can visualize a continuing spectrum of EDP capabilities represented by the different members of the staff. However, rather than attempting to focus on the EDP knowledge of specific individuals this article will explore the EDP knowledge associated with levels of responsibili-

ty. It is important to keep in mind that in some instances one individual may perform several of these responsibility levels and thus would need the EDP competency associated with the highest responsibility assumed. In other instances, each of the responsibilities could be met by separate individuals who would each need only the EDP competence specified for that role.

In categorizing the levels of EDP competency required in an accounting staff, three levels of responsibility will be used as reference points. These three are:

1. Minimum responsibility

Minimum responsibility represents the minimum EDP knowledge required of all members of the staff. This level is usually associated with the entry level staff member. This responsibility level requires no or very limited accounting or auditing experience and rarely involves independent judgmental or evaluative functions.

2. Responsibility for supervision of the accounting or auditing function

Responsibility for supervision requires a level of EDP knowledge sufficient to plan and manage the accounting

or auditing function. This level requires a combination of knowledge and experience to make judgment regarding the effectiveness of, and to supervise and evaluate the work of, the rest of the professional and support staff.

3. EDP technical support

Responsibility for EDP technical support requires specialized EDP expertise which can be a resource to the rest of the accounting/auditing group. This support is critical when additional, specialized technical knowledge is needed for the planning and implementation of a computerized accounting application or the audit of these applications.

A basic knowledge of computer technology is a critical element in an understanding of computerized accounting systems. But this knowledge must extend beyond mere exposure to how computers work. It must also include a basic understanding of the flow of data through typical computer based accounting systems. This includes an understanding of data capture and data verification techniques, file maintenance and updating, report generation, and the systems design and documentation process.

Table 1 attempts to show, in matrix form, the relationship of the levels of EDP competence discussed above and the elements of computer-based accounting applications. Table 1 outlines the fundamental elements of computer-based accounting application systems under the following main headings:

A. Basic Application System Steps
B. Characteristics of Common Application Systems
C. Application System Development Life Cycle
D. Application System Documentation Elements

Each of these elements are analyzed in terms of the EDP knowledge required at each of three levels of professional responsibility discussed above.

It is important to note that the EDP technical support level may be met by a member of the data processing department (i.e., a computer professional) or by a member of the accounting staff who is basically an accountant who has developed, through extensive training and actual experience, proficiency in the actual use of computers and the development of computerized accounting systems. The functions addressed in Table 1 deal

with the contributions the individual performing at the level would make to the accounting function. The responsibilities for actual programming and computer operations are not included, for these are functions of the data processing organization.

Understanding Controls in EDP Systems

In addition to understanding the basic elements of an application system (which reflect the flow of data and the processing sequence), accountants and auditors must understand the system of controls which protect the system from compromise due to error or fraud.

Table 2 shows the general and application controls in a computerized accounting system. With some experience, individuals at the "Minimum Responsibility Level" should develop the ability to recognize the existence of particular controls in a given installation environment and take into consideration the impact of such factors as organization size, equipment and software environment, and systems design. Individuals at the supervisory level should be able to determine which controls are appropriate, to assess their adequacy and impact on the effectiveness of the application, and to perform the instruction, guidance, and evaluation functions.

Implications for Accounting Education

Technical competence is the result of both education and experience. The "minimum responsibility level," which usually characterizes the entry level staff accountants, deals with an understanding of basic concepts. While the knowledge requirements at this level are sometimes described as an ability to "understand" a task, and at other times, an ability to "perform" a task, the performance alluded to is mainly a vehicle for demonstrating understanding. It is contemplated that any actual performance at this level will be limited to specified tasks and will be subject to considerable instruction, guidance, and critical evaluation by an auditor at the supervisory level.

In a real sense today, academic or collegiate programs provide the raw material of the profession. The abilities and knowledge level that "entry level" junior accountants obtain in their collegiate programs and carry with them into their initial professional respon-

sibilities will affect not only the quality of their initial performance and the extent of supervision they require but also the degree to which continuing education programs can be devoted to advanced professional work rather than more basic material.

Individuals at the entry level, will utilize their computer auditing knowledge initially under direct supervision, followed by progressively more independence and greater levels of responsibility. It should be expected that on-the-job experience will provide practical knowledge to compliment and reenforce the understanding and knowledge gained through formal academic training. The academic programs can provide basic understanding of computerized accounting systems—experience should help develop competence in designing, controlling and/or auditing computerized financial information systems.

Thus the role of formal academic training is to provide adequate knowledge of computers and computerized accounting systems to understand those systems, to understand the controls in those systems (both general and application), and to at least be aware of the implications of those systems. Actual ability to evaluate adequacy of these systems and their controls, and to plan and manage the systems will develop as the individual acquires the additional insights and experience through actual participation in these professional assignments.

No one anticipates that students will develop functional expertise in the areas of computer technology, computerized accounting applications or controls as a result of a typical undergraduate program. However it should be possible, and it is necessary, that students be given a basic understanding of these functions upon which to begin their professional expertise. Despite an already crowded curriculum, coverage of these aspects of EDP must be incorporated into accounting programs. A simple programming course (usually featuring FORTRAN) is not adequate to provide an understanding of processing system.

Summary

Computer technology and the operations of the EDP Department can directly influence (1) the design and operation of accounting application systems, and (2) the accounting and auditing functions as performed in a computer environment. Thus, the accounting and auditing staffs should include person(s) who know enough about computer technology and procedures to perform competent evaluations of the controls needed as computerized applications are developed, to design and effect the implementation of effective computerized accounting systems, to adequately evaluate the effectiveness of the controls actually in effect, and to evaluate the effectiveness and accuracy of the accounting results produced by the computerized applications.

The purpose in focusing on the three "responsibility levels" discussed above is to identify the basic roles of education and experience in the development of professional competence, and to attempt to identify the responsibilities of collegial education in the spectrum of EDP abilities required in today's environment.

The author wishes to thank the following individuals for their thoughtful reviews, comments, and constructive suggestions: Donald A. Beanston, Robert V. Boos, Jeffrey D. Green, Eugene H. Kramer, James C. Kinard, Robert B. Nadel, P. Jarlath O'Neil-Dunne, and George Tucker.

BIBLIOGRAPHY

AAA Committee on Accounting Education, AICPA Computer Education Subcommittee, "Inclusion of EDP in an Undergraduate Auditing Curriculum: Some Possible Approaches," *The Accounting Review* (October 1974), pp. 859-864. See *The Journal of Accountancy* (December 1974), pp. 118-121.

Ashenhurst, (Editor) "Curriculum Recommendations for Graduate Professional Programs in Information Systems," A Report of the ACM Curriculum Committee on Computer Education for Management, Association for Computing Machinery, Inc., 1972.

Cutting, Guiltinan, Lilly, and Mullarkey, "Technical Proficiency for Auditing Computer Processed Accounting Records," *The Journal of Accountancy* (October 1971), pp. 74-82.

Dock, Guy, and Williams, "Integrating the Computer in the Classroom: An Approach to Auditing," *The Accounting Review* (January 1974), pp. 149-153.

Gage, Dorricott, Gambles, and Mashens, "Competence and Professional Development for the CA," *CA Magazine* (September 1974).

Jancura, "Technical Proficiency for Auditing Computer-Processed Accounting Records," *The Journal of Accountancy* (October 1975), pp. 46-59.

Schroeder, "Systems and EDP Courses in the Accounting Curriculum," *The Accounting Review* (April 1972), pp. 387-389.
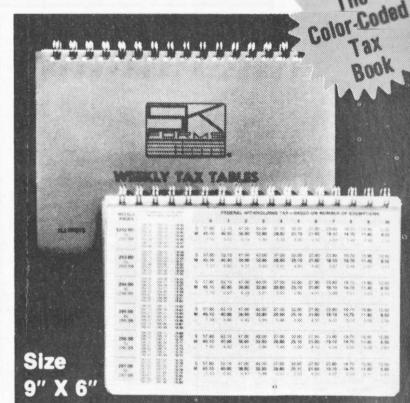
Solomon, "The Computer in Undergraduate Accounting (December 1974).

Sweeney, (Editor) "Education for Expanding Computer Curriculums: A Symposium" American Institute of Certified Public Accountants, 1976.

TABLE 1
Suggested EDP Knowledge Necessary To Review & Understand Computer Based Accounting Application Systems

Elements of an Application System	Minimum Responsibility	Responsibility for EDP Technical Support	Supervisory Responsibilities
A. Basic Application System Steps 1. Job Preparation			
a. Scheduling b. Data Control	Be able to understand the purpose of the processing schedule.	Be able to test that jobs were processed in accordance with the schedule.	Be able to understand and evaluate the use of the schedule as part of the control procedures.
	Be able to identify common data control techniques and be able to test compliance, e.g. reconciliation of dollar totals or record counts.	Be able to design and perform compliance tests of control procedures requiring technical knowledge, e.g. checking operating system output for verification of correct use of files, programs and job control.	Be able to recognize and evaluate the effect on internal control of the data control procedures.
c. Job Set-Up	Be able to understand the impact of the job set-up procedures on the application, job control, and operating instructions.	Be able to review job control operating instructions to detect incorrect job set-up.	Be able to recognize and evaluate the effect on internal controls of the job set-up procedures.
2. Transaction Data Processing a. Data Capture	Be able to identify and describe the common methods of data capture, including but not limited to —Keyed off-line entry —Keyed on-line entry —Machine readable documents —Automatic transaction initiation	Be able to identify potential control weaknesses and recommend procedures to minimize and/or compensate for those weaknesses. Be able to design and implement tests of data capture procedures.	Be able to evaluate the effect on internal controls of the data capture procedures used.
b. Data Validation	Be able to identify and describe the common methods of data validation.	Be able to evaluate procedures in effect to ensure control effectiveness and efficiency, be able to design and implement tests of control strengths; be able to recommend appropriate validation procedures for programs and hardware.	Be able to recognize and evaluate the effect on internal controls of the data validation procedures used.
3. Internal Processing Steps	Be able to understand the purpose of and need for typical internal processing steps such as computation, selection and generation of new data.	Be able to identify and describe to the supervisor the internal functions of a system; be able to design and execute tests of these functions.	Be able to recognize and evaluate the effect on internal controls of the internal processing steps performed.
4. File Processing a. File Sorting	Be able to understand the reasons files must sometimes be sorted and the features of common sort programs such as include/exclude and ascending/descending.	Be able to review and evaluate sort procedures for accuracy and potential internal control problems; be able to design and implement tests of sort procedures.	Be able to recognize and evaluate the effect on internal control of the particular sorting procedure used.
b. Updating a Master File With a Transaction File	Be able to understand the basic differences between updating a sequential file and a direct access file.	Be able to review and evaluate an updating procedure for accuracy and potential internal control problems; be able to design and implement tests of updating procedures.	Be able to recognize and evaluate the effect on internal control of the particular updating process used.
c. Periodic Maintenance of a Master File	Given the contents of a master file and the types of events affecting the file, be able to understand the need for maintenance procedures.	Be able to review and identify sources of potential inaccuracy and to recommend corrective procedures; be able to evaluate maintenance procedures for control weaknesses; be able to design and implement tests of maintenance procedures.	Be able to recognize and evaluate the effect on control of the particular maintenance procedures used
d. File Back-up and Recovery Procedures	Be able to understand why the back-up procedures are needed.	Be able to identify the potential control problems in the back-up procedures in both batch and on-line systems and to suggest corrective measures; be able to design and implement tests of control strengths.	Be able to recognize and evaluate the effect on control of the particular back-up and recovery procedures used
e. Integrated or Shared Files (Data Bases).	Be able to understand the general nature of shared data and the potential control and auditing problems introduced by shared data.	Be able to read and understand data base documentation to identify shared data items, authorized use of such shared data items, and potential internal tests of data integrity. Be able to identify and describe controls related to objectives specified by the auditor. Be able to design and implement any required tests.	Be able to identify significant data items and describe their significance for audit purposes and control objectives to EDP technical personnel on the audit team. Be able to understand control procedures described by EDP technical personnel, and evaluate these control procedures for their effect on the audit.
5. Output Generation	Be able to understand the relationships between data output and the data in transactions and files.	Be able to review and evaluate out put generation procedures for accuracy and potential internal control problems; be able to design and implement tests of such procedures.	Same as Minimum responsibility.

TABLE 1 (Con't)
Suggested EDP Knowledge Necessary To Review & Understand Computer Based Accounting Application Systems

Elements of an Application System	Minimum Responsibility	Responsibility for EDP Technical Support	Supervisory Responsibilities
B. Characteristics of Common Application Systems 1. Payroll 2. Inventory 3. Accounts Receivable 4. Accounts Payable 5. General Ledger and Financial Statements	Be able to describe a typical system in the following manner. —identify typical transaction input —identify typical data elements —identify typical output reports —prepare a simple system flowchart showing typical processing steps. Describe common processing methods such as batch, on-line, distributed and data base systems.	Be able to describe the characteristics of complex systems, including the program steps; be able to evaluate accuracy and effectiveness in existing systems with particular attention to adequacy of general and application controls.	Be able to identify the common control problems inherent in each application system.
C. Applications System Development Life Cycle 1. Feasibility Study	Be able to describe the different stages of the life cycle.	No additional EDP knowledge needed.	Be able to understand the application life cycle and be able to identify the steps where auditor involvement is called for.
2. Analysis		Be able to review statements of processing objectives, and proposed software to insure that they are best suited to achieve the stated objectives.	
3. Design		Be able to specify the procedures and processing activities necessary to accomplish the stated objectives (emphasizing standards for effective internal control). Be able to review systems for accuracy, completeness, effective internal control and adherence to stated objectives.	
4. Programming		Be able to review programs for accuracy, completeness, and adherence to stated objectives.	
5. Program and System Testing		Be able to review and evaluate the plan and results of testing and, if necessary, be able to execute program and system tests.	
6. Conversion		Be able to evaluate procedures to convert files from one medium to another, with specific attention to controls which prevent loss or distortion of data during the process.	
7. Operation	Be able to describe the different stages of the life cycle.	Be able to evaluate data processing operations with particular attention to the adequacy of general controls.	Be able to understand the application life cycle and be able to identify the steps where auditor involvement is called for.
8. Applications which use Integrated File Systems and/or Data Base Management Systems	Does not apply.	Be able to identify data base administrator (DBA) functions over application design and maintenance and describe these to the supervisory level. Be able to identify and describe the separation of functions of controlling data in the data base from application program development and maintenance. Be able to identify, describe and evaluate planning, control and support functions which apply to data base oriented applications, and the effect of these on data base applications. Be able to understand the logical view of the data base. Be able to correlate data items to be accessed with logical view and communicate auditor's needs to data base administration personnel to obtain necessary authorizations. Be able to use appropriate data manipulation language (DML) (but not data description language—DDL). Be able to determine that proper data items are to be accessed as a result of communication with client. Be able to communicate with client's data processing personnel, vendors, and others, and perform research as appropriate to understand technological innovations used by client and explain them to the supervisory level to enable him to evaluate their effect on the financial statements and the audit.	Be able to evaluate effect on audit of DBA control functions over data base application design and maintenance. Be able to identify and specify data items to be accessed with audit software (any kind) and be able to describe control requirements for using such software on data base. Be able to determine the impact on controls and auditing of the findings of the EDP technical ability level.

TABLE 1 (Con't)
Suggested EDP Knowledge Necessary To Review &
Understand Computer Based Accounting Application Systems

Elements of an Application System	Minimum Responsibility	Responsibility for EDP Technical Support	Supervisory Responsibilities
D. Application System Documentation Elements	Note: The application documentation which the minimum ability level should be able to use is that designed for use by user departments and general management.	Note: The application documentation which the EDP technical ability level should be able to use is that designed for use within the EDP department.	Note: The application documentation which the supervisory ability level should be able to use is that designed for use by user departments and general management.
1. Narrative	Be able to interpret a narrative description of an application system.	Be able to assist the supervisor in assessing the technical content of application system documentation.	No additional EDP knowledge needed.
2. System Flowcharts	Be able to interpret a system flowchart for a simple application system.		Be able to determine the control and audit significance of the system flow.
3. Logic or Program Flowcharts	Be able to interpret a logic flowchart for a typical program in a simple application system.		Be able to determine the control and audit significance of the logic flow.
4. File and Data Definition	Be able to determine how the data is stored and used within the application.		Be able to determine the control and audit significance of the data used in the system.
5. Record of Test Data and Results	Be able to determine the involvement of users in the testing phase.	Be able to review and evaluate the plan and results of testing.	Be able to evaluate the overall effectiveness of the testing procedures.
6. Job Set-Up and Operating Instructions	Does not apply.	Be able to interpret the effect of the job set-up and operating procedures on the application.	Be able to determine the overall control and audit significance of job set-up and operating instructions.
7. User Department Procedures	Be able to determine the effect of the user's procedures on the application.	No additional EDP knowledge required.	Be able to determine the control and audit significance of user department procedures.

TABLE 2
Suggested EDP Knowledge Necessary For Understanding Controls In EDP Systems

Control Classification*	Minimum Responsibility	Responsibility for EDP Technical Support	Supervisory Responsibilities
A. General Controls 1. Organization and Operation Controls a. Segregation of Functions Between the EDP Department and Users	Be able to understand the need for the segregation of functions necessary to maintain control over data passing through the system.	Assist the supervisor in interpreting or analyzing the consequences of a lack of segregation in such a situation i.e., to identify the potential risks.	Be able to determine possible weaknesses in the system and determine the effect of strengths and weaknesses.
b. Authorization Over Execution of Transactions	Be able to understand the functions necessary to maintain control to ensure that only authorized transactions enter the system.	Assist the supervisor in interpreting or analyzing the consequence of specific procedures to identify potential risks.	Be able to identify controls which provide reasonable assurance that data is appropriately entering the system and determine the effect of strengths and weaknesses.
c. Segregation of EDP Functions Within the EDP Department	Be able to understand the need for the segregation of functions necessary to maintain proper controls within the department.	Be able to describe and evaluate the organizational structure and functions of the EDP department, assist the supervisor in interpreting or analyzing the consequences of a lack of segregation (i.e. to identify potential risks) and prescribe alternate control procedures, where feasible. Be able to identify and describe control functions of persons or groups responsible for data base administration and to determine that adequate segregation of duties exists.	Be able to evaluate the functions within the EDP department to determine the strengths and weaknesses of the particular organizational structure. Be able to evaluate the effect of the segregation of these functions on accounting applications.
2. Systems Development and Documentation Controls a. User Participation in Design	Be able to understand the need for user participation in the design of application systems.	Be able to serve as a resource in the supervisor's review of the design process.	Be able to evaluate evidence of user participation as an indication of appropriate authorization and inclusion of proper controls.
b. User and Management Approval	Be able to understand the need for user and management approval in the design of application systems.	Be able to serve as a resource in the supervisor's review of design process.	Given the system specifications and the resources of the EDP technical level, be able to determine the appropriateness of the approvals and make recommendations for any necessary improvements in control.
c. System Testing	Be able to understand the need for system testing to ensure that correct input will provide desired output and that incorrect input, processing or output would be detected.	Given system tests, be able to evaluate testing procedures used to produce test results, assist the supervisor in determining the validity of the results, and perform compliance tests to ensure that controls are working properly.	Given system tests, be able to evaluate the validity of the test results by reviewing, with the assistance of the EDP technical ability level, the procedures used in designing test data and comparing output to predetermined results.
d. Final Approval	Does not apply.	Serves as a resource in the auditor's review of the approval process.	Given final approval procedures, after understanding the flow of the application, determine that the proper personnel approved the system.
e. Conversion Control	Be able to understand the errors which may occur in conversion.	Be able to compliance test the effectiveness of the conversion controls and assist the supervisor in evaluating their adequacy.	Given conversion procedures, be able to evaluate the conversion controls in effect.
f. Control of Program Changes in a System	Be able to understand why program changes arise and the need for control over them.	Be able to determine that systems changes are adequately controlled, be able to perform compliance tests to ascertain that control strengths are working; be able to assist the supervisor in assessing the effectiveness of specific techniques.	For a given installation, understand procedures in effect to prevent unauthorized changes to the processing system.
g. Documentation Standards	Be able to understand the need for documentation standards.	Be able to review the prescribed documentation and determine that it is sufficient to contribute to effective internal control.	Be able to determine the effect on the audit of different levels of documentation standards.

TABLE 2 (Con't.)
Suggested EDP Knowledge Necessary For Understanding Controls in EDP Systems

Control Classification*	Minimum Responsibility	Responsibility for EDP Technical Support	Supervisory Responsibilities
5. Data and Procedural Controls a. Control Group	Be able to describe the functions of the control group and, in the absence of a control group, be able to explain compensating user department control procedures.	Be able to review any technical functions of the control group to insure that there is an adequate separation of responsibilities.	Be able to evaluate and test the effectiveness of the control group.
b. Systems and Procedures Manual	Be able to evaluate the content of the manuals with respect to user department procedures and reconciliation procedures performed by the control group.	Be able to evaluate the manuals' content and relate this to the scope of auditing procedures. Be able to perform tests (e.g., observations) to see that prescribed procedures are being performed with respect to job set-up and computer operations procedures.	Be able to relate the purpose and content of the manuals to the scope of the auditing procedures.
c. Internal Audit Review of Systems Design	Be able to determine the scope of the involvement of the internal audit department	Be able to assist the supervisor in reviewing and testing the work of the internal audit department.	Be able to review and evaluate the extent and quality of the involvement of the internal audit department.
d. Internal Audit Review of Data Processing Activities on a Continuing Basis	Be able to determine the scope of internal audit department's involvement.	Assist the supervisor in Reviewing and testing the work of the internal audit department.	Be able to review and evaluate the extent and quality of the internal audit department's involvement.
e. Physical Security	Be able to understand the need for physical security over EDP operations.	Assist the supervisor in identifying and testing physical conditions and technical procedures which impact physical security.	Be able to evaluate the impact of physical security procedures on the accounting controls.
3. Hardware and Systems Software Control a. Hardware/Software	Be able to understand the role of hardware and software controls in the overall control over operations	Be able to describe common control features in the hardware and software, including the operating systems and be able to determine that proper use is made of the existing controls.	Be able to determine the effect of potential weaknesses in the use of hardware and system software controls.
a.1. Hardware and Software in the Data Base Environment	Does not apply.	Be able to identify and describe controls within the data base management system and the extent to which they affect the integrity of data in the data base	Be able to evaluate the effect of data integrity controls in the data base management system.
b. Control of Changes	Be able to understand why hardware and software control changes arise and the need for control over them.	Given a systems flow, be able to determine that the integrity of the software has been preserved by reviewing and testing system change procedures.	For a given set of hardware and software procedures, be able to understand the controls in effect to prevent unauthorized changes and be able to determine their effect.
4. Access Controls a. Access to Program Documentation	Be able to understand the reasons for controls over program documentation.	Be able to determine who should have access to program documentation and assist the supervisor in assessing the effectiveness of specific procedures.	Be able to evaluate the restrictions placed on documentation access and determine their impact.
b. Access to Data and Program Files	Be able to understand why access to data and program files is limited.	Be able to determine the adequacy of the various means of restricting access to program and data files.	Be able to evaluate the methods used to control unauthorized access to programs or data files and determine their impact.
b.1. Access to Data and Program Files in the Data Base	Does not apply.	Be able to identify and describe controls within the data base management system used to restrict unauthorized access to items in the data base.	Be able to evaluate the effect of controls within the data base management system used to restrict unauthorized access to items in the data base.
c. Access to Hardware	Be able to understand the measures needed to restrict access to computer hardware.	Be able to determine the adequacy of the controls that restrict access to computer equipment and terminals. Be able to assist the supervisor in evaluating and testing the procedures.	Be able to review and evaluate the procedures necessary to restrict access to computer hardware and to determine their impact.
d. On-line Access to System, Data Files, and Programs	Does not apply.	Be able to identify and describe software, hardware and manual procedures used by the client to restrict access to terminals and on-line data files and programs; evaluate how effectively the client prevents authorized users from performing unauthorized functions on the system.	Be able to evaluate effect of controls on significant accounting applications.

TABLE 2 (Con't)
Suggested EDP Knowledge Necessary For Understanding Controls in EDP Systems

Control Classification*	Minimum Responsibility	Responsibility for EDP Technical Support	Supervisory Responsibilities
B. Application Controls **1. Input Controls** a. Authorized Input	Be able to document and test the user authorization controls over data entry, file maintenance, and error corrections.	Be able to document the EDP procedures* relating to the authorization of input and execute tests to determine that only authorized input enters the system.	Be able to review and evaluate controls over the sources of input and authorizations necessary to initiate a transaction.
b. Code Verification, including check digits, table look-up, consistency checks, missing fields and invalid data	Be able to understand the concept of code verification and how it works.	Be able to document EDP procedures relating to code verification procedures and be able to execute testing procedures.	Be able to review and evaluate procedures for the verification of codes.
c. Input Conversion	Be able to understand the need for specific control techniques available to minimize input conversion errors and be able to describe some of the control techniques used.	Be able to document EDP procedures relating to input conversion and be able to execute testing procedures.	Be able to review and evaluate the effectiveness of conversion controls.
d. Data Movement Between Processing Steps and/or Departments	Be able to understand why it is necessary to control data movement.	Be able to document EDP procedures relating to data movement and be able to execute testing procedures.	Be able to review and evaluate data movement controls.
e. Error Handling	Be able to understand the procedures necessary to correct and reprocess errors in a system.	Be able to document EDP procedures relating to error handling and be able to execute testing procedures.	Be able to review error handling procedures and determine their adequacy.
2. Processing Controls a. Control Totals	Be able to document and test the user establishment and reconciliation of control totals.	Be able to determine whether control total procedures are adequate to insure that no data is lost or incorrectly processed. Be able to design and execute tests to determine that controls are adequate.	Be able to review control total procedures and evaluate their effectiveness.
b. Operation Controls	Be able to understand the need for operation controls.	Be able to document, design, and execute tests of programmed and manual operation controls such as file label routines and console controls monitoring operator actions.	Be able to review and evaluate file and processing controls to determine their effectiveness.
c. Logic Checks	Be able to understand the use of typical logic checks, such as limit and reasonableness checks, that may be built into a system.	Be able to determine that edit, data, generation and other program procedures are properly incorporated into the system.	Be able to evaluate the effectiveness of the edit procedures.
d. Run-to-Run Controls	Be able to understand the nature and purpose of run-to-run controls and be able to document and test the user procedures.	Be able to determine whether run-to-run control procedures are adequate to insure that no data is lost or incorrectly processed and be able to design and execute tests (e.g., audit software, test decks) to ensure that run-to-run controls are working properly.	Be able to determine the effectiveness of the run-to-run controls.
3. Output Controls a. Reconciliation of Output Total	Be able to document and test the user procedures for output reconciliation.	Be able to determine that the generation of control totals within EDP is properly performed and be able to design and execute tests to determine that control totals are being properly generated.	Be able to assess the effectiveness of the reconciliation procedures.
b. Output Scanning	Be able to document and test the use of output scanning.	No additional EDP knowledge required.	Be able to assess the effectiveness of output scanning within the context of output controls.
c. Output Distribution	Be able to document and test the output distribution to ascertain that only authorized users obtain output reports.	No additional EDP knowledge required.	Be able to assess the appropriateness of the distribution procedures to determine that only authorized persons are receiving data and that all copies produced are necessary.

*Refer to *The Auditor's Study and Evaluation of Internal Control in EDP Systems* for an explanation of each control.

*Note: EDP procedures in this context refers to programs, procedures and other functions performed within the EDP department.