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A STUDY OF ELECTRONIC DATA PROCESSING AND ITS  
RELATIONSHIP TO THE AUDIT AND CONTROL FUNCTION

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A Thesis  
Presented to  
The Faculty of the Graduate School of Business

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Business Administration

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by  
Ana M. Barrio  
(June, 1980)

80030  
Accounting  
1980

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## CHAPTER 1

### INTRODUCTION, PURPOSE AND SCOPE OF THE STUDY

#### INTRODUCTION

The computer has caused significant changes in business information systems, expanding both scope and operations. During the earlier stage of this technological revolution, audit procedures required only minor revisions. The first data processing systems were in effect computerized mirror images of the existing clerical functions. Transaction registers, ledgers and reports were usually converted to data processing as exact replicas of the corresponding manual procedures. As a result, auditors could generally discontinue data processing without altering the effectiveness of their audit procedures.

Presently, however, the trend is toward more sophisticated information systems. The auditor must be adequately trained and sufficiently familiar with electronic data processing (EDP) techniques in order to utilize the computer in performing the audit. The computer has become an integrate part of many accounting systems and the auditor can no longer ignore the effects of EDP.

The American Institute of Certified Public Accountants (AICPA) supports this contention:

If a client uses EDP in its accounting systems whether the application is simple or complex, the auditor needs to understand the entire system sufficiently to enable him to identify and evaluate its essential accounting control features. . . .

Advanced information systems require control and audit techniques that differ from those applicable to manual systems. Frequently the system of internal control must be restructured because of the characteristics of a computer system. However, one must always bear in mind whether the audit is of a computerized system or a manual system, the criteria for evaluating internal control remain the same.

There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.<sup>1</sup>

In any system, a client has the same responsibility to control data and to produce reliable financial statements; an auditor has the same need to understand his client and the same responsibility to gain evidence that the underlying data may be relied on.<sup>2</sup>

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 7.

<sup>2</sup> P.L. Defliese, K.P. Johnson, R.K. MacCloud, Montgomery's Auditing, New York: The Ronald Press Company, 1975, p. 152.

Before expanding any further on the topic of EDP auditing, the author feels that a discussion on how and why auditing came to be will be of value to the reader. One must possess an understanding of the function of auditing before attempting to understand EDP auditing. For this reason, the following section will be devoted to this topic.

#### Auditing - Ancient Times to Present Day

During ancient times, auditing was fundamentally concerned with the fiscal activities of the government officers, and was limited to a hearing of accounts. The term auditing comes from the latin *auditus*, a hearing, and bears a great relationship with this elementary auditing technique.

During the Middle Ages, the basic responsibilities of the auditor shifted more toward revenue collection and bookkeeping. However, auditing objectives were still limited to verifying the honesty of individuals charged with pecuniary rather than managerial responsibility.<sup>1</sup>

#### The Rise of the Professional Auditor In England

As a result of the industrial revolution, the English manor of the Middle Ages began to degenerate. Professor A.C. Littleton commented that with the advent of

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<sup>1</sup> A. H. Adelberg, "Auditing on the March: Ancient Times to the Twentieth Century," The Internal Auditor, (Nov./Dec., 1975), p. 36.

business, there came instead of "accountability", the accounting of problems attendant upon the ownership of property and the calculation of profits and losses. Auditing shifted from checking on an individual's "stewardship" to scrutinizing written records and the testing of entries by documentary evidence.<sup>1</sup>

By the 19th Century, the auditing profession had received the support of the British government, and was hastened by a series of British Companies Acts, that required the performance of this function. Parliament enacted the first of these acts in 1844 in order to protect the shareholder. It required public registration of companies, as well as an independent verification of the accounting records, performed by an auditor appointed by the shareholders.

The British Companies Act of 1862 strengthened the accounting provisions of the earlier law and provided that the stockholders could engage supposedly professional "auditors" possessing specialized training and technical knowledge at the corporation's expense to perform a complete investigation of the accounting records and to report whether in their opinion the balance sheet is a full and fair

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<sup>1</sup> W.T. Porter, J.C. Burton, Auditing: A Conceptual Approach, Belmont, California: Wadsworth Publishing Company, Inc., 1971, p. 74.

balance sheet containing the particulars required by these regulations and properly drawn up so as to exhibit a true and correct view of the state of the company's affairs.<sup>1</sup>

C. A. Moyer has expressed the rationale underlying British audit as follows:

It is generally recognized that auditing in Great Britain had been instituted to a great extent by specific statutory requirements. The principal function of the audit was considered to be an examination of the report of stewardship of corporation directors and the most important duty of the auditor was to detect fraud. The search for defalcations resulted in a minute painstaking checking of the bookkeeping work done by the employees of the client. Almost all of the time of the auditor's staff was devoted to checking footings and postings in detail, in looking for bookkeeping errors, and in comparing the balances in the ledger with the trial balance and with the statements.<sup>2</sup>

#### Early Developments in the United States

The auditing profession in the United States developed at a much slower pace than in Britain. The British investors served as the main stimulus for the profession in the United States, by bringing auditors to protect their interests in American corporations.

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1 Ibid.

2 W. S. Boutell, Auditing With the Computer, Berkely, California: University of California Press, 1966, p. 48.

"The British auditor provided America with a much needed exposure and insight into the nature and responsibilities of the practice of professional auditing at a time when our local accountants did not have the necessary preparation or experience."<sup>1</sup> Many of these accountants returned to England, however, those who remained formed the starting point of the American profession.

The main objective of the auditing function during this period was the detection of fraud and errors. In order to achieve this objective it was necessary to perform a detailed analysis of the transactions. The audit procedures included: vouching all cash receipts and payments, checking the ledger to the trial balance, and comparing the latter to the financial statements. As the size of the firms increased, it became impossible to perform such a detailed analysis and a greater emphasis was placed on internal control and sampling. In practice, however, auditing procedures still required detailed checking.

By the end of the 19th Century, the objective of the examination had widened to more than simply detecting fraud and clerical errors. Auditors were turning toward the balance sheet and stressing a more analytical approach.

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<sup>1</sup> A.H. Adelberg, "Auditing on the March: Ancient Times to the Twentieth Century," The Internal Auditor, (Nov./Dec., 1975) p. 39.

The auditing profession realized that it was necessary at times to look outside the records of the client to verify certain transactions and balances such as the valuation of assets and liabilities.

The 20th Century was a period of rapid industrial growth. This growth brought about an increased interest in audited financial statements. It was felt that the distribution of audited financial statements would stimulate investment in corporate securities. During this period, the Federal Reserve Board began requiring audited financial statements to support applications for the discount of commercial paper and in 1917, The Board, in cooperation with the American Institute of Accountants, published Approved Methods for the Preparation of Balance Sheet Statements, outlining the nature of a balance sheet audit.

The Securities and Exchange Commission (SEC) had a significant influence on the development of accounting and auditing. The Securities Act of 1933 substantially increased both the business and the responsibilities of auditors by requiring that all new issues of securities would have to be registered with the Federal Trade Commission, and that the registration statement would have to include financial statements audited by an independent public accountant.



The Securities and Exchange Act of 1934 required audited financial statements for all listed companies.<sup>1</sup>

During the late 1930's and early 1940's statistical sampling began to play a greater role as an auditing tool, and there was a shift from the traditional year-end audit to the concept of interm auditing, where audit work is performed prior to the end of the year.

In 1941 the SEC issued Accounting Series Release No. 21 which required that the auditor's report contain a statement to the effect that the examination was made in accordance with generally accepted auditing standards applicable in the circumstances.<sup>2</sup> This indicated that the profession was under close supervision, and had to gear itself to the standards established.

During the 1940's and 1950's, three significant changes occurred in the auditing profession. First, a greater emphasis was placed on the income statement. Up to this period the balance sheet had been the main focal point. Now, a greater level of importance was placed on the earnings per share figure.

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1 W.T. Porter, J.C. Burton, Auditing: A Conceptual Approach, Belmont, California: Wadsworth Publishing Company, Inc., 1971, p. 76.

2 A.H. Adelger, "Auditing on the March: Ancient Times to the Twentieth Century," The Internal Auditor, (Nov/Dec., 1975) p. 46.

The second major change, was the increase emphasis on internal control. A greater part of the audit was devoted to the system of internal control, and where tests of control indicated a reliable system, less emphasis was placed on detailed verification.

The third major change was the introduction of the computer into the business world. It must be clearly understood however, that computers did not in any significant way alter accounting theory, but the methods by which the theory is put into practice.

#### Unit Record Keeping

In the evolutionary process from purely manual techniques to electronic techniques, the punched card was used principally to avoid rewriting each transaction when needed and to achieve electronic counting speeds. Each transaction was recorded on a card. By altering the position of the card, or unit record, one could obtain different summarized results.

In order to process the data on the unit record, it had to be recorded, classified, and summarized. The keypunch machine, the verifying machine, the sorter, and the tabulator were used to facilitate these operations. In order for any system to be effective, whether manual or electronic, it must have controls. Color coding is a control that may be applied with punched cards.

Cards of different colors or even with colored stripes are used to distinguish the different types of information, or different types of transactions. Another control, is to order the records sequentially and then process them through a collator. The collator will indicate if a transaction is missing or has not been placed in the proper order.

Unit record keeping was certainly a step in the right direction. However, as businesses grew, the number of transactions grew, and more advanced methods of processing data were necessary.

#### Advanced EDP Systems

The computer is one of the most important technological developments of the twentieth century. Although the first commercially available computer was installed in 1951 and the first business installation was in 1954, the popular business-oriented computers can be dated from the early 1960's.<sup>1</sup>

With the arrival of the computer, the card although still used extensively for input, was replaced by other means of data retention. The evolution of the computer can be traced through three generations. From the use of vacuum

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<sup>1</sup> G.B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, pp. 1-2.

tubes to transistors to solid logic and monolithic chips.

Computerization has had a significant impact on the business world. The goal of this study will be to determine the effects of EDP on the auditing and control functions.

#### THE PURPOSE AND SCOPE OF THE STUDY

##### THE STATEMENT OF THE PROBLEM

The auditor's environment is changing, and the auditor must be aware of, understand, and be able to adapt to this automation in order to perform effectively and independently in an electronic data processing environment.

The main objective of this study was to analyze the effects of EDP on control and auditing procedures, in order to provide the auditor with information useful for meeting the requirements of Statement on Auditing Standards No. 3 - "The effects of EDP on the Auditor's study and Evaluation of Internal Control".

The Subproblems were:

1. To describe the concept of electronic data processing and its relationship to the audit function.
2. To determine the effects of a computerized system on internal control.

3. To ascertain how selected auditing tasks can be performed more effectively through the use of computers.

4. Given the current extensive use of computers, this study had as one of its goals to determine the minimum computer knowledge needed by public accountants in fulfilling their auditing responsibilities.

5. Based upon the forgoing, to draw conclusions and make recommendations that will improve auditing practice.

#### Definition of Terms

##### Audit Trail

A means for systematically tracing the progress of specific items of data through the steps of a process (particularly from a machine-generated report or other output back to the original source document) in order to verify the validity and accuracy of the process.<sup>1</sup>

##### Auditing

The examination of information by a third party other than the preparer or the user with the intent of establishing its reliability and the reporting of the

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<sup>1</sup> W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, p. 253.

results of this examination with the expectation of increasing the usefulness of the information to the user.<sup>1</sup>

#### Computer

A device capable of solving problems by accepting data, performing prescribed operations on the data, and supplying the results of these operations, all without intervention by a human operator.<sup>2</sup>

#### Computer - assisted audit techniques

Techniques which utilize the computer itself to carry out audit procedures.<sup>3</sup>

#### Computer - based accounting systems

Accounting systems which use a computer to perform all or part of the tasks necessary to process accounting entries from their point of origination to final reporting.<sup>4</sup>

#### Documentation

Preparation of documents during programming that describe the program and document its preparation, its

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1 Ibid.

2 Ibid., p. 254.

3 Study Group on Computer Control and Audit Guidelines, Computer Audit Guidelines, Toronto, Canada: The Canadian Institute of Chartered Accountants, 1975, p. 315.

4 Ibid.

approval and any subsequent changes.<sup>1</sup>

#### EDP Function

The function within the organization which is responsible for the development, maintenance and operation of computer - based systems.<sup>2</sup>

#### EAM (Electrical Accounting Machine)

Pertaining to predominantly electromechanical data processing equipment, such as keypunches, collators, mechanical sorters and tabulators.

Note: EAM equipment is still widely used in lieu of or in support of, electronic digital computers; the computers themselves are classified "EDP equipment" rather than "EAM equipment".<sup>3</sup>

#### IDP (Integrated Data Processing)

Data processing by a system that coordinates a number of previously unconnected processes in order to improve overall efficiency by reducing or eliminating

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1 Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 307.

2 Study Group on Computer Control and Audit Guidelines, Computer Audit Guidelines, Toronto, Canada: The Canadian Institute of Chartered Accountants, 1975, p. 316.

3 W. Thomas Porter and William E. Perry, EDP Control and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, p. 253.

redundant data entry or processing operations.<sup>1</sup>

#### On-line system

A computer system which maintains files of information in a form which is immediately accessible for either the acceptance of input transactions or the reporting of information through a device which is connected to the main computer system.<sup>2</sup>

#### Operating system

An organized collection of routines and procedures for operating a computer. Note: these routines and procedures normally perform some or all of the following functions: (1) scheduling, loading, initiating and supervising the execution of programs, (2) allocating storage input/output units and other facilities of the computer system, (3) initiating and controlling input/output operations, (4) handling errors and restarts, (5) coordinating communications between the human operator and the computer system, (6) maintaining a log of system operations and (7) controlling operations in a multi-programming, multiprocessing, or time-sharing mode; among

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1 Ibid., p. 258.

2 Study Group on Computer Control and Audit Guidelines, Computer Audit Guidelines, Toronto, Canada: The Canadian Institute of Chartered Accountants, 1975, p. 317.



the facilities frequently included within an operating system are an executive routine, a scheduler, an IOCS, utility routines and monitor routines.<sup>1</sup>

#### Delimitations

This study was limited to the identification of auditing and control practices used in electronic data processing systems. It did not deal with controls involved in the conversion of a manual system to an automated system nor did it deal with the detailed procedures followed when auditing an EDP system. Instead this study was meant to serve as a means of instruction for those who possess a limited knowledge of EDP and its role in auditing and control.

#### Need for the Study

The use of electronic data processing is gaining greater acceptance by the business community. "The decreasing cost of computer equipment plus the development, now in embryonic stages, of computer sharing arrangements clearly portend computer use by an increasing number of organizations and an involvement with computer-based records by more and more CPA firms."

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<sup>1</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 315.

<sup>2</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 2.

With this shift from manual processing to automated processing, there is a trend toward the centralization of data and a shift in control. It is obvious that new control procedures must be implemented if we are to avoid such scandals as Equity Funding,<sup>1</sup> where \$2 billion in bogus insurance was issued undetected by auditors.

As the quantity of financial data generated by automated systems increases, the responsibility and required knowledge of auditors increases. In order to comply with the first general auditing standard which is as follows: "The examination is to be performed by a person or persons having adequate technical training and proficiency as an auditor,"<sup>2</sup> the auditor must be able to understand the entire system and identify and evaluate its controls.

Perhaps the major difficulty faced by auditing firms relative to audits of computer-based records is the staffing of audits with personnel adequately trained in computer methods. Relatively few auditors have received instruction in computer methods as part of their formal training, so the profession must provide substantial training for existing personnel in order to ensure an adequate number of auditors

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1 Edith Myeis, "Certified Auditing," Datamation, April 1979, p. 72.

2 Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 7.

competent to conduct audits in an EDP environment.<sup>1</sup>

### Methodology

In order to resolve Subproblem 1, it was necessary to follow the evolution of EDP in the auditing profession from its inception to the present. This was accomplished by reviewing books and other publications which address this topic.

To resolve Subproblem 2, a review was made of SAS No. 3 "The Effects of EDP on the Auditor's Study and Evaluation of Internal Control" and an audit and accounting guide put out by the AICPA - "The Auditor's Study and Evaluation of Internal Control in EDP Systems," as well as other publications which discuss the effects of a computerized system on internal control.

Subproblem 3 was resolved by reviewing the various auditing tasks which are now performed with the use of the computer as opposed to manually.

To resolve Subproblem 4 and 5, it was necessary to rely on recent articles from publications such as the EDP Auditor, Automation and the Journal of Accountancy. Conclusions were then drawn as to the present status of the accounting profession with respect to EDP.

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<sup>1</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 7.

## CHAPTER II

### RELATED LITERATURE

Dissertations and theses were examined to determine whether they were related to the present study. One dissertation and seven masters' theses were uncovered that discussed some aspect of electronic data processing in the field of auditing.

Steven M. Flory examined the adequacy of the generally accepted auditing standards promulgated by the American Institute of Certified Public Accountants when auditing a computer-based accounting system. The research objectives of this study were: (1) the definition of auditing standards and procedures; (2) the relationship of auditing standards and procedures to the determination of the audit examination scope; (3) the obsolescence of traditional auditing standards and procedures as applied to computer-based accounting systems; and (4) current practices of certified public accountants involving computer-based accounting systems.<sup>1</sup> He concluded that

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<sup>1</sup> Flory, Steven Mark, "An Inquiry Into Selected Problems of Auditing Computer-Based Accounting Systems," unpublished dissertation for the Ph.D., The Louisiana State University and Agricultural and Mechanical College, 1976.

although generally accepted auditing standards are adequate, the selection and application of proper auditing procedures should receive increased emphasis when auditing computer-based accounting systems. This conclusion corresponds with the conclusions of the present study.

The aim of Ronald J. Atwell's study was to explain advanced electronic data processing in simple terms. He was of the opinion that the auditor will have to get involved in the development and completion of advanced electronic data processing systems. "If the profession had taken a more avid interest in these systems, the major flaws in internal control and data security that were found would not have occurred."<sup>1</sup> He concluded by saying that the profession is now taking the subject of advanced EDP systems seriously however, the systems are so advanced that they are now racing behind simply to catch up.

Rino A. Caprari, in his thesis analyzed the impact of data processing on the accounting profession. He believed that with the greater use of EDP within the profession the scope of the attest function will expand. As in the present study Caprari considered the difference between conventional

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<sup>1</sup> Ronald A. Atwell, "Advanced Electronic Data Processing Systems and the Auditor's Concerns," unpublished thesis for the M.B.A., Pace University, 1967.

and EDP records. "When evaluating internal control in a manual system, the CPA relies upon such factors as human alertness, care, acceptance of responsibility, and separation of duties. EDP introduces new elements of control, and the traditional approach to the review and evaluation of internal controls must be altered to meet the problems posed by an EDP system."<sup>1</sup> He concluded by saying that the CPA will have to develop the ability to "audit through the computer" and that accounting education should be geared more toward the changed nature of accounting in the modern business world.

The main objective of Avraham Dan's study, was to evaluate the impact of EDP on internal control. In his thesis Dan hypothesized that the principles of internal control need not be altered in the changeover from traditional accounting to electronic data processing of business transactions. To test his hypothesis Dan examined two systems of control: the conventional system as it is used by the auditing profession, and an internal control system in EDP developed for the study from checks used in mechanical accounting systems. He concluded by stating that the principles on which the internal organizational controls of business are based are resistant

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<sup>1</sup> Rino A Caprari, "Electronic Data Processing and the Role of the Accountant," unpublished thesis for the M.B.A., Pace University, 1971.

to any changes of method or approach related to equipment, because the root of these principles lies in the behavioral-organizational concepts.<sup>1</sup> The present study concluded that although the essential objectives of control are not affected by the introduction of EDP systems, the procedures employed to accomplish these objectives are affected.

William A. Hallinan geared his thesis more towards executive management than the present study. The purpose of Hallinan's study was as follows: (1) to develop a program which will serve as a guide to the generalist in his performance of operational or management audits of systems and data processing organizations; (2) to present a program which is comprehensive, that is, which gives adequate coverage to all operational aspects of systems and data processing; (3) to present this program in a manner which is meaningful and selfexplanatory to the non EDP oriented auditor; (4) to devise a simplified and logical approach whereby the generalist may become effectively involved in system design.<sup>2</sup> The study presented a comprehensive operational audit

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1 Avraham Dan, "Internal Control in the Computer Age," unpublished thesis for the M.B.A., Pace University, 1973.

2 William A. Hallinan, "Internal Auditing and the EDP function: A Management Guide to the Evaluation of Systems and Data Processing Operations and Involvement in Systems Design," unpublished thesis for the M.B.A., Pace University, 1971.

guide for use by internal auditors or management consultants in evaluating the internal control of a given company's EDP effort.

Douglas C. Hamilton in his thesis presented the two basic approaches an auditor may take in performing his evaluation, auditing without the use of the computer and auditing with the use of the computer. Two questions were posed in this study, How does the auditor decide on which approach to employ? and Does one method have advantages that outweigh the other?. Hamilton's conclusions were the following. "First, by not using the computer one is neglecting to take advantage of its tremendous capabilities. Secondly, if a computerized system is complicated, or if the audit trail is not clearly evident, the audit may be difficult to implement by hand. Thirdly, if the auditor manually tests a system, he is only able to check its input and output. This method therefore, does not permit program error to be discovered. Fourthly, because most companies have large volumes of records, it is usually impractical to manually test enough transactions of each type to obtain a representative sample. Finally, by using a computer, the comprehensiveness of the audit is greatly increased."<sup>1</sup> He also stated, as does the present

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<sup>1</sup> Douglas C. Hamilton, "Auditing Without the Use of the Computer Versus Auditing With the Use of the Computer," unpublished thesis for the M.B.A., Pace University, 1974.



study, that the use of the computer is a very powerful and valuable tool of the auditor. Therefore, he must continue to increase his knowledge in order to use the capabilities of the computer whenever possible.

Christopher J. Paltz in his study, divided internal control into three categories: organizational controls, administrative controls, and procedural controls. The present study divided control into similar categories. Paltz stated that in order for the independent auditor to express an opinion on the reliability of financial data generated by an EDP system, he must for one, be able to analyze internal control in an EDP environment.<sup>1</sup>

Andrew Ratti analyzed and evaluated the role of the internal audit function in relation to the effects of computerization on auditing and control concepts. He analyzed the responsibilities of the internal audit function and the effect of EDP on these responsibilities. The answer to this seemed to rest on the definition of the audit function.

Ratti stated that if the definition of the audit is a review of the financial records to verify that transactions have been properly recorded, authorized, and accurately reflect

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<sup>1</sup> Christopher J. Paltz, "Internal Controls in Electronic Data Processing Systems: Guidelines for the Independent Auditor," unpublished thesis for the M.B.A., Pace University, 1972.

the firm's financial position, than the auditor need not be an EDP expert. However, many firms had already expanded the definition of the audit function before the EDP explosion. The expanded role was to review and appraise the procedures generating the financial statements.<sup>1</sup> This would require auditors to have a working knowledge of EDP systems. The present study did not make this differentiation and did not limit the analysis to internal auditors.

From reviewing the various studies that have been mentioned, it is obvious that there is a need for EDP specialists if the audit of automated systems is to be as reliable as the audit of manual systems.

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<sup>1</sup> Andrew J. Ratti, "The Impact of Electronic Data Processing on the Internal Audit Function," unpublished thesis for the M.B.A., Pace University, 1971.

## CHAPTER III

### THE AUDITOR AND THE COMPUTER

#### THE AUDIT AND CONTROL FUNCTION

"Auditing is the examination of information by a third party other than the preparer or the user, with the intent of establishing its reliability and the reporting of the results of this examination with the expectation of increasing the usefulness of the information to the user."<sup>1</sup>

A distinction must be made, however, between the internal and independent auditor.

The objective of the ordinary review of financial statements by the independent auditor is the expression of an opinion on the fairness with which they present financial position, results of operations, and changes in financial position in conformity with generally accepted accounting principles.<sup>2</sup>

The need for an independent audit arises from the inherent potential conflict between a company's management and users of its financial statements. Management has a stewardship responsibility to the users of the financial statements, and the audit provides users with reasonable assurance that management has fulfilled this responsibility.

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1 W. Thomas Porter and C. John Burton, Auditing: A Conceptual Approach, Belmont, California: Wadsworth Publishing Co., 1971, p. 5.

2 Auditing Standards Board, Codification of Statements on Auditing Standards, New York, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 5.

The normal attest audit consists of two major segments:

- 1) Study and evaluation of the system of internal control in order to determine the reliability of the recorded transactions for the period subject to the audit. This evaluation provides for the degree of reliance which the auditor is prepared to place on the system of internal control, and for planning the extent of the subsequent tests of assets, liabilities, revenues and expenses.
- 2) Carrying out of subsequent tests of assets, liabilities, revenues and expenses which together with the assurance afforded by the system of internal control, provide sufficient evidence to support the expression of an opinion on the financial statements.<sup>1</sup>

In contrast to the independent auditor, the internal auditor is not concerned with the attestation of financial statements, and as an employee of the company lacks the independence of the public accountant. The internal auditor is primarily concerned with evaluating the accuracy and effectiveness of the records, controls, and operations, as a service to management.

Internal control as defined in Section 320 of the Codification of Statements on Auditing Standards, "The Auditor's Study and Evaluation of Internal Control", includes both administrative and accounting control. The section concludes that accounting control is within the scope of the study and evaluation of internal control contemplated by generally accepted auditing standards, while administrative control is not.

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<sup>1</sup> Study Group on Computer Control And Audit Guidelines, Computer Audit Guidelines, Toronto, Canada: The Canadian Institute of Chartered Accountants, 1975, p. 154.

Accounting control comprises the plan of organization and the procedures and records that are concerned with the safeguarding of assets and the reliability of financial records and consequently are designed to provide reasonable assurance that:

- a. Transactions are executed in accordance with management's general or specific authorization.
- b. Transactions are recorded as necessary (1) to permit preparation of financial statements in conformity with generally accepted accounting principles or any other criteria applicable to such statements and (2) to maintain accountability for assets.
- c. Access to assets is permitted only in accordance with management's authorization.
- d. The recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any differences.<sup>1</sup>

These concepts apply to manual and mechanical as well as electronic data processing systems. The method of data processing used does not affect the basic concepts of accounting control, because these concepts are expressed in terms of objectives. However, it may have an affect on the organization and the procedures required to accomplish these objectives.

#### CHANGES IN TRADITIONAL AUDIT TECHNIQUES BROUGHT ABOUT BY THE USE OF COMPUTERS

"As previously indicated, computers and their related equipment, such as key punches and transmission equipment,

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 58.

have not in any significant way altered established accounting theory as it relates to the kind of data or the manner in which such data are to be organized for reporting purposes. But the computer has substantially altered the methods by which that theory is put into practice."<sup>1</sup>

Many control procedures in computer systems do not leave the documentary evidence of performance that would be left with a manual system and may require different tests of compliance. There has also been a change in the recording media used in computer systems from that used in manual systems. Many records are now stored in machine-readable formats as opposed to visible hard copies and cannot be read without the use of the computer.

Computerization, in certain cases, has eliminated the advantages of "separation of duties" as a means of minimizing the possibility of an employee performing incompatible functions. As set forth in Section 320.36 of the Codification of Statements on Auditing Standards, "Segregation of Functions",

Incompatible functions for accounting control purposes are those that place any person in a position both to perpetrate and to conceal errors or irregularities in the normal course of his duties. Many EDP systems not

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<sup>1</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 3-4.

only process accounting data but also include procedures for detecting errors and irregularities and for providing specific authorization for certain kinds of transactions. Since the procedures may be combined, incompatible functions may be more likely to combine in an EDP activity than in a manual activity.<sup>1</sup>

In order to maintain adequate accounting controls in an EDP system, compensating controls must be implemented. Examples of such controls are: limit tests, logical tests, validity tests, control totals, independent document counts and control over access to EDP equipment and computer files.

The introduction of data processing equipment has also caused an increase in the volume of transactions processed. This increase in volume however, has been gained at the expense of the close scrutiny available in a manual system, which aids in the detection of errors before they enter the processing cycle.

#### IMPACT OF COMPUTERS ON AUDITING OBJECTIVES AND PROCEDURES

The use of computers by an increasing number of organizations has had a noticeable impact on the auditing profession.

The growth of use of electronic data processing (EDP) in business has had the greatest impact on the public accounting profession than any other event in its history. As more and more clients maintain their financial records on EDP systems, the auditor finds it

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 61.

necessary to consider and to utilize computers in performing many of his audit procedures.<sup>1</sup>

The existence of the computer can influence the conduct of the audit in many ways. Jancura and Berger have listed the basic goals of any audit, whether it be a manual or an automated system.

1. Gaining an understanding of the system.
2. Reviewing the adequacy of the controls to ensure completeness and accuracy of the recording and processing of accounting data.
3. Confirming that the system and related controls are functioning as described.
4. Performing additional testing of the closing balances. In determining the scope of such additional work, the auditor would normally take into consideration his evaluation of the effectiveness of the system and its controls.<sup>2</sup>

It is likely that the use of a computerized system will have an effect on each of these steps. For example, a computer based system employs significantly different internal control techniques than are found in a manual system. The auditor's review and evaluation of internal control must include the controls present in the computer system which form part of the overall system of internal control. Since the evaluation of internal control plays an important role in the audit, it is

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<sup>1</sup> Albert P. Ameiss and Nicholas A. Kargas, Accountant's Desk Handbook, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1977, p. 345.

<sup>2</sup> Elise G. Jancura and Arnold H. Berger, Computers: Auditing and Control, Philadelphia: Auerbach Publishers Inc., 1973, p. 281.



safe to assume that these different control techniques may require the use of different review and testing techniques by the auditor.

It must be recognized, however, that the change in auditing procedures varies with the complexity of the computer system. The more complex the system, the greater the change. At times it is possible to determine this factor by the size of the system. The auditor, however, must be aware that size alone cannot be used as the ultimate guide. The auditor must examine the applications which are processed by the system. While a larger system is more powerful and has a greater capacity than a smaller system, it is not always more complex. Management may be using a large system to process very simple applications, or conversely, a very small system to process very complex applications.

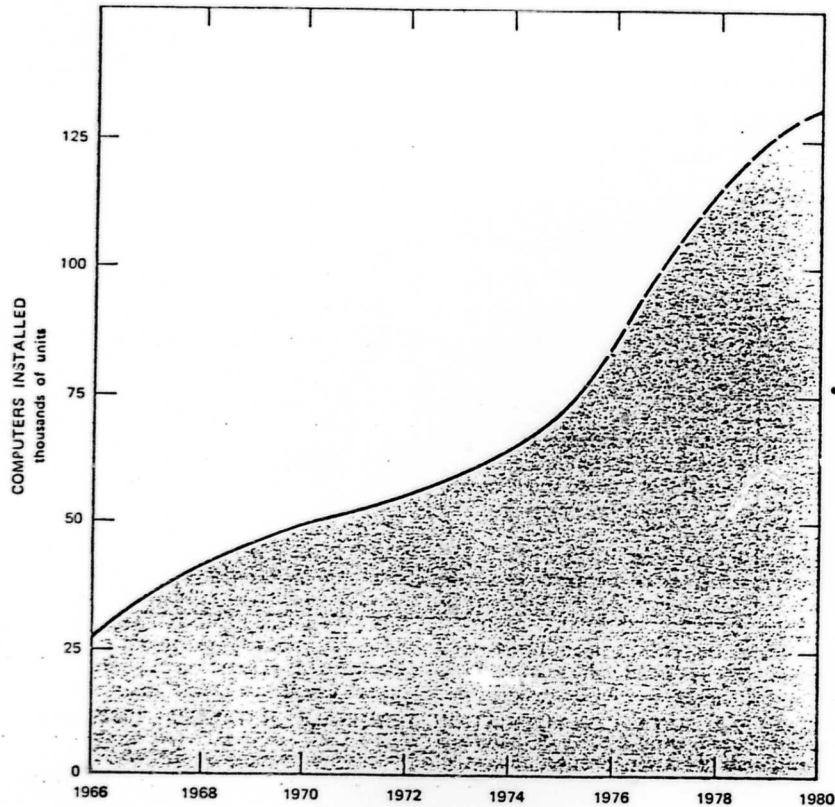
#### CONTINUED GROWTH OF COMPUTER SYSTEMS

At one time, it was felt that the computer would not have a widespread effect on the auditing profession. It is now evident that computer installations have grown not only in number but in scope. Applications range from the automation of individual data processing tasks, such as payroll preparation, to the development of completely integrated management information systems.

The growth of the data processing industry has been remarkable, and continues to be unabated. The impact of computers on public accounting can be appreciated by noting the dramatic growth of computer installations for the period 1964 - 1977 (FIGURE 1).

Along with the increase in the number of computer installations, there has been a decrease in the cost of equipment. As a result, it may now be said that every large business and most medium-sized businesses are using a computer, to some extent, in their operations. Computers are available on a leased or purchased basis, and range from desk-type electronic calculators to large-scale internally programmed machines. Small businesses may also obtain computer data processing services through service centers, which provide you with a complete service, including programming; or on a time sharing basis, with an input/output device located at the user's premise.

"As data processing operations assume greater significance in the overall operations 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 of clients dictates the need for a greater



SOURCE: International Data Corporation.

FIGURE 1 GENERAL-PURPOSE COMPUTER SYSTEMS INSTALLED, 1966-1980 (U.S.)<sup>1</sup>

<sup>1</sup> Stanford Research Institute, Systems Auditability & Control Audit Practices, Altamonte Springs, Florida: The Institute of Internal Auditors, Inc., 1977, p. 13.

involvement and expertise by the auditor."<sup>1</sup>

#### IMPACT OF COMPUTERS ON DATA PROCESSING CONTROLS

As was previously stated, the use of computers has introduced new control elements and procedures. These changes in control may be classified as:

- 1) New controls necessary with the automation of processing.
- 2) Controls which substitute for those controls that were based on human judgement and division of duties.<sup>2</sup>

The auditor in determining the scope of his examination must determine if proper controls exist over the equipment, and if proper compensatory controls exist in the processing cycle.

#### EXAMINATION OF COMPUTER PROCESSED RECORDS

In addition to evaluating the system of control, the auditor must evaluate the reasonableness of the records produced by the system. Historically all records and documents were readable by the auditor. In an EDP system, part of the output is usually in machine-readable form, such as cards,

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<sup>1</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 1.

<sup>2</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute Of Certified Public Accountants, Inc., 1979, pp. 4-5.

tapes or disks. To the extent that the output is printed, traditional auditing techniques may be used. Where the output is machine-readable, the auditor may either use the computer to test the records or have the output converted into readable printout.

#### OPPORTUNITIES PRESENTED BY THE COMPUTER

The computer itself can be used to carry out a number of audit procedures. The advantages of speed, reliability, and storage capacity that make computers so valuable for processing data also make them convenient tools for the auditor. The specific procedures which lend themselves to such automation will be discussed in a later chapter. It should be pointed out now, however, that "the opportunity for computerization depends to some extent on the auditor's ability to examine the attest function and in specific situations, to separate activity which is structured, objective and explicit from that which is unstructured and subjective. The elements in the former segments are receptive to computer programming."<sup>1</sup>

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<sup>1</sup> Elise G. Jancura and Arnold H. Berger, Computers: Auditing and Control, Philadelphia: Auerbach Publishers, Inc., 1973, p. 20.

The computer's capacity to scan files completely, quickly and accurately, has also contributed to the application of statistical sampling techniques in auditing.

In order for the auditor to determine if it will be of value to use the computer, he will have to make a cost-benefit analysis, by comparing the effectiveness and cost of the computer procedure versus the effectiveness and cost of the manual procedures. Generally it is not necessary or economical to use the computer to test simple data processing systems.

#### SUMMARY

The independent auditor as opposed to the internal auditor must study and evaluate the system of internal control to determine the extent of subsequent tests which must be performed in order to express an opinion on the financial statements. The trend toward automated systems has produced a noticeable change in internal control techniques, which in turn has caused a change in auditing procedures. The computer, if used properly, is a useful audit tool which may save the auditor much valuable time.

## CHAPTER IV

### BASIC COMPUTER CONCEPTS

#### WHAT IS ELECTRONIC DATA PROCESSING

A data processing (DP) system is made up of people, equipment and procedures that process data through a series of planned operations and actions, to achieve a desired result. An electronic data processing (EDP) system is simply a data processing system which utilizes a computer. The most important difference between DP and EDP systems is the ability of the computer to carryout coded instructions placed in the computer prior to the processing of data. This capability enables the computer to perform a series of operations without human intervention. The computer facilitates the processing of data at greater speeds and with a higher degree of accuracy. It also provides management with a greater quantity of more timely information at a lower cost.

#### ELECTRONIC DATA PROCESSING SYSTEM CONFIGURATIONS

There are four types of EDP system configurations: a card system, a tape system, a direct-access system, and a teleprocessing system. Systems can be configured with elements from all four types. A card system uses punched cards

as an input and storage medium, and involves sequential processing. Such a system is normally used in small companies or where computer applications are limited. A card system consists of four components: a card reader, a card punch, a printer, and a central processing unit.

When a card system is outgrown it is either replaced or supplemented with a tape, telecommunication, or direct-access system. A tape system uses magnetic tapes as its primary input and output. Like a card system, it involves sequential processing. A tape system consists of a card reader, a card punch, a printer, a central processing unit, and several tape drives.

In direct-access systems the primary input/output devices are magnetic disks and magnetic drums. A disk system might consist of a card reader, a card punch, a printer, a central processing unit, and several disk drives. Unlike the card and tape system, the direct-access system, as its name implies, may access records directly. A teleprocessing system places the means for input and output under the control of the user, making the system more flexible.

#### ELECTRONIC COMPUTER HARDWARE

Hardware and software are two segments of a computer system. Hardware consists of all the physical equipment, such as card readers, printers and keypunches. Software



consists of all the nonhardware elements, such as programs and documentation.

Each computer system has as a minimum an input device, a central processing unit (CPU), and an output device. FIGURE 2-1 illustrates the principle components of any computer system.

#### Input/output Devices

Input devices are used to read data and programs into the central processing unit of the computer; output devices are used to extract data from the CPU into an external medium. Certain devices can both input data into, as well as output data from, the CPU of the computer. For example, the card reader/card punch, tape reader/tape punch, magnetic tape drive, and cathode ray tube (CRT).

The punch card reader senses the pattern of holes in each card and converts the pattern into impulses via a cable to the central processor. Under the control of the central processor, output data may be punched into cards by an automatic card punch device. This form of output is quite common in accounting systems due to the frequent use of turnaround documents in billing and other accounting applications.<sup>1</sup>

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<sup>1</sup> Barry E. Cushing, Accounting Information Systems and Business Organizations, Reading, Massachusetts: Addison-Wesley Publishing Company, 1978, p. 136.

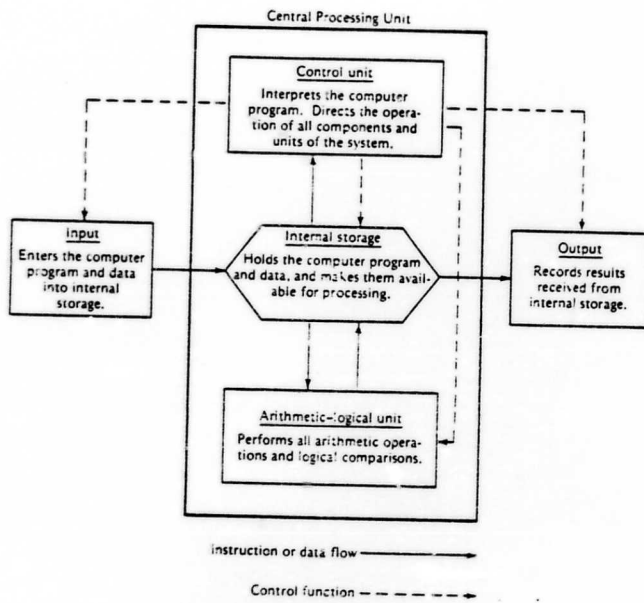


FIGURE 2-1 COMPONENTS OF A COMPUTER SYSTEM.<sup>1</sup>

<sup>1</sup> Andreas S. Philippakis and Leonard J. Kazmier, Information Systems Through Cobol, New York: McGraw-Hill Book Company, 1974, p. 46.

The paper tape reader/tape punch operates in a similar manner to the card reader/card punch however, the punched input or output is on a continuous reel of paper tape instead of on punched cards.

The magnetic tape drive is used for input from and output onto magnetic tape. Data are represented on magnetic tape by means of magnetic bits. The magnetization of a bit is analogous to the presence of a hole in a punched card.

The cathode ray tube facilitates human interaction in data analysis. Data is input directly into the computer via an online keyboard. The input and output on a CRT terminal appear on a screen similar to a television. If the output is desired in a permanent form, a hard copy unit may be attached to the terminal to produce a paper copy of the data on the screen.

A device used solely for computer output is the printer. There are two basic categories, impact printers and nonimpact printers. Nonimpact printers use a variety of technologies, including xerography, thermal printing on heat sensitized paper, electrostatic printing and photosensitive printing.<sup>1</sup>

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<sup>1</sup> Ibid., p. 138.

### The Central Processing Unit

The central processing unit controls and supervises the entire EDP system. The CPU has three main components: (1) the control unit, which interprets and initiates execution of program instructions; (2) the arithmetic and logic unit, which performs calculations and logical operations on data; and (3) memory, which stores program instructions and data until they are needed.<sup>1</sup>

It was previously stated that when data and programs are input into the computer, they are read into the CPU. Actually they are read into internal storage, sometimes referred to as memory or main storage, of the CPU. The programs are then transmitted to the control unit, where they become the basis for directing and coordinating all EDP system operations. The data is transmitted to the arithmetic and logic unit, which performs calculations and comparisons with the data and then transmits the calculations and comparisons back to internal storage where they may be retrieved by the various output devices.

In some large systems, main storage must be augmented by an auxiliary storage unit. The type of unit will vary with the application and the time required to process the transactions; it may be a direct-access device, such as a disk, or a

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<sup>1</sup> Ibid., p. 95.

sequential device, such as a tape drive. Regardless of which type is used, all information to and from the auxiliary unit must pass through main storage for processing.

#### ELECTRONIC COMPUTER SOFTWARE

The term software refers primarily to computer programs but also includes other nonhardware elements, such as program documentation and operating manuals. As mentioned previously the distinguishing characteristic of an EDP system is the stored program. "A program is a set of instructions that directs the computer in the performance of a data processing task."<sup>1</sup> "A computer language is a set of characters, words, and syntactic rules that can be used to write a computer program."<sup>2</sup>

Every computer has its own language. These languages, referred to as machine languages, are machine dependent. Early computer programming was almost exclusively machine-language programming. Programming in machine language is a very tedious and time consuming process and is no longer common. Most programming is now done in either a symbolic or a procedure oriented language.

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<sup>1</sup> Andreas S. Philippakis and Leonard J. Kazmier, Information Systems Through Cobol, McGraw-Hill Book Company, 1974, p. 57.

<sup>2</sup> Ibid., p. 57.

Symbolic languages use mnemonic codes to represent machine instructions. A symbolic language program, called a source program, must be translated to a machine language program, called an object program, in order to be executed by the computer. This conversion is accomplished by a special program called an assembler.

Programs may also be written in a procedure oriented language. Unlike the symbolic and machine languages, the procedure oriented language is not machine dependent. It therefore focuses on the data processing procedures to be accomplished, rather than the coding requirements of particular machines. A single instruction may represent a detailed set of machine language instructions. As a result, the procedure oriented language is much easier to use. The procedure oriented language must also be converted to machine language. The compiler program performs this conversion.

Procedure oriented languages, also known as high-level languages, require little knowledge of specific computer functions on the part of the user. This characteristic makes the computer accessible to many non-computer experts, and ideal for auditors.

#### PROGRAMMING A COMPUTER

Programming may be defined as "the process of preparing a set of computer instructions for accomplishing a

data processing task or solving a problem."<sup>1</sup> The programmer is not responsible for deciding what data processing operations should be accomplished. This is usually decided by the systems analyst. Once the systems analyst has defined the specifications and obtained management's approval, it is the programmer's responsibility to write a program to meet the specifications.

The programmer performs four steps in sequence to complete the programming assignment.

- 1) Planning and flowcharting a computer program
- 2) Coding a computer program
- 3) Testing and debugging a computer program
- 4) Documenting a computer program <sup>2</sup>

The programmer must plan the execution of the program step by step, and then graphically depict each step in a program flowchart. The program flowchart can then be used as a basis for coding the program. Once the program has been written, the programmer must check it for any errors; this process is called debugging. Since it is not likely that all possible errors will be detected by the programmer, it is necessary to test the program by reading it into the computer.

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<sup>1</sup> Barry E. Cushing, Accounting Information Systems and Business Organizations, Reading, Massachuset: Addison-Wesley Publishing Company, 1978, p. 163.

<sup>2</sup> Beryl Robichaud, Eugene Muscat and Alix-Marie Hall, Introduction to Data Processing, McGraw-Hill, Inc., 1977, p. 146.

After all errors have been corrected, the programmer must document both general and specific information concerning the program. Documentation is a very important part of every system.

#### BATCH PROCESSING WITH SEQUENTIAL ACCESS FILE STORAGE

Batch processing is used by those businesses which have a high volume of output. The transactions are accumulated in batches which are processed at given time intervals or after the batch reaches a certain size. Batch totals of dollar amounts and other important data items are prepared to facilitate subsequent tracing and correction of errors.

Sequential batch processing is used when the file medium is punched cards, or magnetic tape. When using sequential access file storage, in order to read each record only once, the transactions must be sorted into the same sequence as the master file.

#### BATCH PROCESSING WITH DIRECT ACCESS FILE STORAGE

The most popular direct access storage device is the disk. When using direct access file storage it is not necessary to sort the transactions, and methods more advanced than batch processing may be used. However, in some cases batch processing is faster and less costly.



There is one significant difference between updating a master file stored on tape and updating one stored on disk. As can be seen by examining FIGURE 2-2 and 2-3, when a tape file is updated, you are left with both the old version and the new version. When a disk file is updated, each record is read into the CPU, updated, and written back onto the same disk, thereby erasing the old version. This type of updating is called destructive updating. Since the previous generation of data is destroyed, additional procedures must be performed to create an audit trail which will allow the auditor to reconstruct the data when necessary.

The most common approach, a dump, consists of making periodic copies of the entire master file. When using this method, all of the transactions used in updating the master file since the last dump must be retained in order to reconstruct the file. The alternative approach uses a logging device to record all changes to the master file. A written record is kept of the transactions and the master record before and after the updating.

#### ON-LINE PROCESSING

The time requirements of a real-time system generally result in a system that is much more complex than that of batch processing. In an on-line processing system, individual transactions are processed as they occur as opposed to accumu-

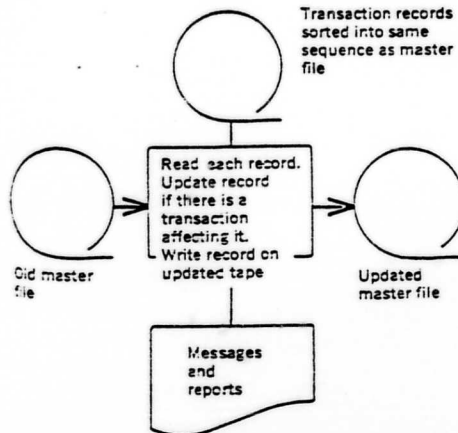


FIGURE 2-2

Batch-sequential data processing using sequential access storage (magnetic tape) <sup>1</sup>

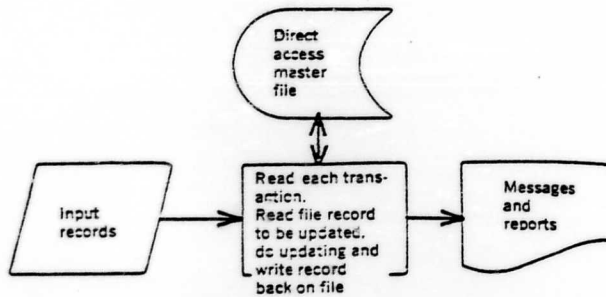


FIGURE 2-3

Data processing using direct access storage <sup>2</sup>

<sup>1</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 255.

<sup>2</sup> *ibid.*, p. 256.

lating them in batches. On-line processing requires that data files be maintained on direct-access storage devices.

"The on-line real-time system is an advanced type of on-line system in which transactions and inquiries are recorded and processed as soon as they are received. The results of the processing of a transaction are achieved so fast that they can themselves influence the transaction."<sup>1</sup>

On-line updating of files provides the advantage that all records are up-to-date at all times. The decision of whether on-line or batch processing is appropriate for a particular application must be made on an individual basis.

#### FLOWCHARTING

"A flowchart is a diagram that shows the structure and general sequence of operations of a program or process by means of symbols and interconnecting lines which represent operations, data flow, and equipment."<sup>2</sup> It is convenient to separate flowcharts into system flowcharts, program flowcharts and documentation flowcharts.

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<sup>1</sup> Gordon B. Davis, Auditing & EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 256.

<sup>2</sup> W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing CO., 1977, p. 257.

"A systems flowchart attempts to document the over-all collection of manual and computer procedures applied to a collection, transcription, manipulation and reporting of data."<sup>1</sup> The systems flowchart plays an important role in the evaluation of existing systems and the design of new systems. FIGURE 2-4 illustrates the specialized set of symbols used for systems flowcharts. The symbols are used to represent equipment as well as data processing operations.

"A program flowchart, or block diagram, illustrates the sequence of logical operations performed by a computer executing a program."<sup>2</sup> Program flowcharts may be subdivided into general and detailed flowcharts, also called macro and micro flowcharts. The general flowchart represents the major processing steps rather than the individual instructions. The detailed flowchart expands each processing step into detailed machine instructions. A programmer will usually use the detailed flowchart to write a program. The program flowchart also has a set of specialized symbols. These symbols are explained in FIGURE 2-5.

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<sup>1</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 134.

<sup>2</sup> Barry E. Cushing, Accounting Information Systems and Business Organizations, Reading, Massachuset: Addison-Wesley Publishing Company, 1978, p. 169.

"A documentation flowchart is a diagram illustrating the flow of documentation relating to a particular transaction through an organization."<sup>1</sup> The documentation flowchart gives you an insight into the formal organization network. The symbols used for the documentation flowchart and their meanings are depicted in FIGURE 2-5. From an audit view point, the systems flowchart is of more value than the program or documentation flowcharts. The systems flowchart is useful in documenting the client's system in the audit working papers.

#### THE NEED FOR FLOWCHARTING

The second standard of field work states:

There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.<sup>2</sup>

Section 320.50 of the Codification of Statements on Auditing Standards, "Scope of Study", states that:

The study to be made as the basis for the evaluation of internal control includes two phases:  
(a) knowledge and understanding of the procedures and methods prescribed and (b) a reasonable degree

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<sup>1</sup> Ibid., p. 281.

<sup>2</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York, New York: American Institute of Certified Public Accountants, 1979, p. 7.

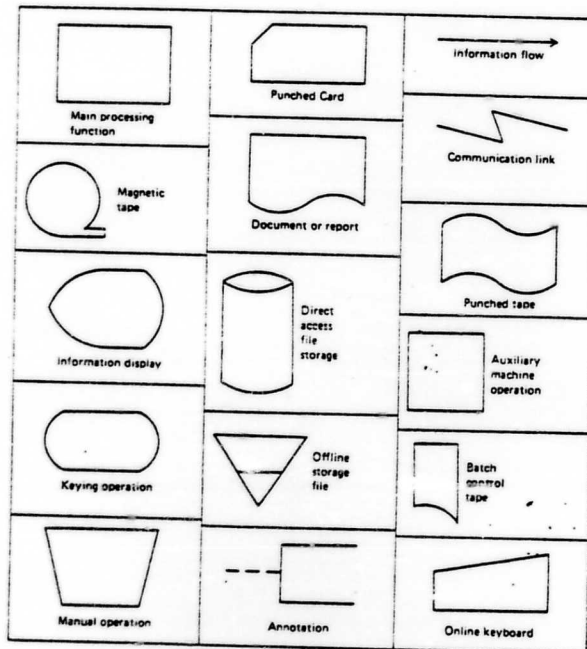


FIG. 2-4 Symbols for systems flowcharting. <sup>1</sup>

<sup>1</sup> Barry E. Cushing, Accounting Information Systems and Business Organizations, Reading Massachusetts: Addison-Wesley Publishing Company, 1978, p. 147.

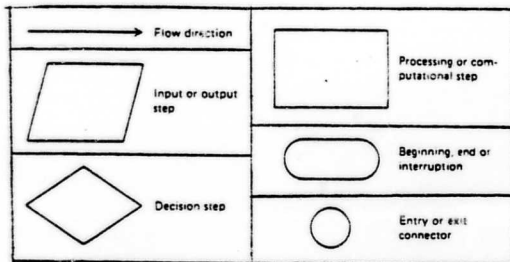


FIG. 2-5 Program flowchart symbols. <sup>1</sup>

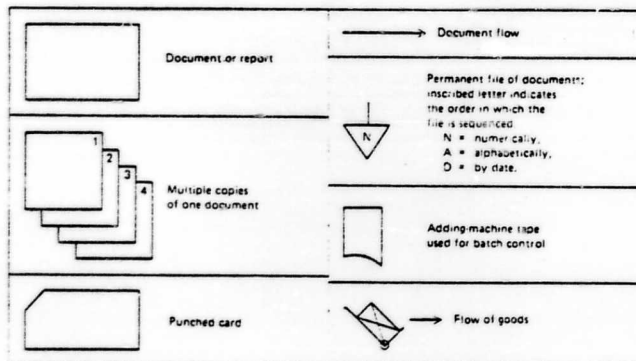


FIG. 2-6 Symbols for document flowcharting. <sup>2</sup>

<sup>1</sup> Ibid., p. 170.

<sup>2</sup> Ibid., p. 282.

of assurance that they are in use and are operating as planned.<sup>1</sup>

In order to determine the extent of the test to be performed during the audit, the auditor must gain an understanding of the procedures and methods employed by the organization. One step towards gathering this information is a review of the internal documentation. Since much of a systems documentation is now in the form of flowcharts, it is vital that the auditor possess an understanding of flowcharting.

Once the auditor has gained an understanding of the system, it is necessary that the understanding be recorded in the working papers. The auditor may either prepare a written narrative or a flowchart. It has been said that flowcharting has several advantages over a narrative description of a system.

- 1) It is much easier to use in describing a system of any size and complexity.
- 2) It is much easier to use in recording changes in the system.
- 3) It is easier to use in analyzing the system since the charts show the flow of data through the system and provide an easy means of spotting weaknesses or areas where improvements could be made.
- 4) Typically it is the method used by the client's EDP personnel to document and represent the system being reviewed by the auditor.<sup>2</sup>

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<sup>1</sup> Ibid., p. 65.

<sup>2</sup> W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, p.31.



### AUTOMATIC FLOWCHARTING

Since flowcharting is such a valuable tool, programs have been developed which automatically produce flowcharts from the program source deck. The use of flowcharting software saves time and eliminates many of the errors introduced in manual flowcharting. Even more important, it provides the auditor with current flowcharts. Whenever a change is made within the system, the flowcharting program may be run to produce an updated version of the flowchart. This capability is extremely important, since manual flowcharts are seldom up-to-date.

### SUMMARY

This chapter has introduced several fundamental EDP concepts. The distinguishing factor of an EDP system is the ability of the computer to carryout coded instructions placed in the computer prior to processing, without human intervention. There are four types of EDP system configurations: a card system, a tape system, a direct-access system and a teleprocessing system. Each system consists of hardware and software elements. The hardware of a computer system, as a minimum consists of an input device, a CPU and an output device. The software includes programs, documentation, operational manuals and other nonhardware elements.

A distinction was also made between batch processing and on-line processing. Batch processing is used by those businesses which have a high volume of output, while on-line processing is used by those businesses which need immediate information and/or updating.

## CHAPTER V

## AUDITING IN A COMPUTERIZED ENVIRONMENT

AUDITING WITH VERSUS AUDITING WITHOUT THE  
USE OF THE COMPUTER

"Al: too often one hears comments that auditing 'around' the computer is bad and auditing 'through' is good. What nonsense! nothing is inherently right or wrong in either approach."<sup>1</sup> The use of the terms "around" and "through" has caused substantial confusion. To some auditing "around" implies that the auditor does not need an understanding of the computer, and may totally ignore it during the audit. To others, auditing "around" implies that the auditor does possess a detailed knowledge of the system and programs but chooses not to use the computer as an audit tool. To avoid such confusion many are now replacing the terms "around" and "through" the computer with the terms "with" and "without" the use of the computer.

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<sup>1</sup> Elise G. Jancura, Computers: Auditing and Control, 2d ed., New York: Petrocelli/Charter, 1977, p. 286.

#### AUDITING WITHOUT THE USE OF THE COMPUTER

This approach has been favored by many auditors, because it does not require any technical knowledge of the computer or its related equipment and procedures. It allows the auditor to use the familiar audit techniques used in non-EDP systems.

"Basically the approach of auditing 'around' the computer is based on the premise that the techniques and procedures employed in processing the data are unimportant so long as the results produced can be traced back to the input and the input can be proven to be valid. It assumes that tests comparing selected audited input and output will prove the reliability of the internal controls in effect within the system."<sup>1</sup>

#### WHEN TO AUDIT WITHOUT USING THE COMPUTER

The data processing systems which may be audited without the use of the computer are usually batch-processed, or batch-controlled systems having detailed audit trails - this type of system is characterized by:

- 1) The collection of transactions in batches to be sorted and processed sequentially against a master

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<sup>1</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 190.

file (this process normally involves the development of batch totals to control the movement of data within the system).

2) The recording of transactions manually, followed by conversion to machine readable form.

3) The production of numerous printouts (often at each processing run).<sup>1</sup>

If these conditions are met, auditing without the use of the computer, may prove to be satisfactory and more economical than auditing with the computer. However, the system's input and output must be adequately documented, and the auditor must test the input and output to determine the quality of the processing.

Auditing without the use of the computer is inappropriate, where the major portion of a system of internal control is embodied in the computer program, or where accounting information is wedded to operation information in a computer program that is too complex to permit identification of inputs and outputs in a straight forward manner.<sup>2</sup>

"The disadvantages of auditing a computer-based system without using the computer are (1) the fact that the auditor may neglect to use the capabilities of the computer to assist in the audit and (2) the fact that the audit may be difficult to implement if the system is quite complicated or has no well-defined visible audit trail."<sup>3</sup>

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<sup>1</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 134.

<sup>2</sup> Elise G. Jancura, Computers: Auditing and Control, New York: Petrocelli/Charter, 1977, p. 241.

<sup>3</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 137.

AUDITING WITH THE USE OF THE COMPUTER

In the past, the portion of the processing procedure that was entrusted to the system was small and straightforward. The risk involved in auditing without using the computer therefore, was small. However, as the scope of mechanization expands and the computer performs more complex functions, the risk involved increases. As a result, a form of "leap-frogging" is taking place. In other words, to assume that the intervening procedures are satisfactory simply because of tests performed on the input and the output data, seems to contradict sound auditing principles.<sup>1</sup>

We should then improve the methods of testing by auditing "with" rather than "without" the use of the computer. It too requires verification of source data, but from that point on it emphasizes review and testing of processing procedures. In addition to the detailed review of procedures and related internal controls, this approach consists of tests to determine that the procedures and controls are in fact in operation. The basic premise here is that the results can be accepted if input and processing are to be proper.<sup>2</sup> Since computers are reliable and consistent tools

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<sup>1</sup> Wayne S. Boutell, Auditing With the Computer, Berkely, California: University of California Press, 1965, pp. 8-9.

<sup>2</sup> Elise G. Jancura and Arnold H. Berger, Computers: Auditing and Control, Philadelphia: Auerbach Publishers Inc., 1973 p. 300.

this approach emphasizes testing of the system rather than testing of the records produced by the system.

Using the computer can provide two potential benefits to the auditor. First, it can allow him to minimize the amount of time spent on the routine clerical and nonjudgemental aspects of auditing. Second, it can help the auditor gain a greater assurance of the reliability of the financial statements by allowing him to extend the scope of his examination and increase the number of items tested by substituting the computer's speed of information retrieval and calculation for the more expensive and scarce time of audit personnel.<sup>1</sup>

#### USES OF COMPUTER PROGRAMS IN AUDITING

The auditing process is usually benefited by the use of the computer where there is a large volume of data or many repetitive calculations.

A computer program can be used for any computational or comparison task for which quantitative criteria can be established. Examples of such tasks are:

- 1) Testing extensions and footings
- 2) Selecting and printing confirmation requests
- 3) Examining records for quality (completeness, consistency, invalid conditions, etc.)
- 4) Summarizing data and performing analyses useful to the auditor.
- 5) selecting and printing audit samples
- 6) Comparing duplicate data (maintained in separate files) for correctness and consistency.
- 7) Comparing audit data with company records.<sup>2</sup>

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<sup>1</sup> Elise G. Jancura, Computers: Auditing and Control, New York: Petrocelli/Charter, 1977, p. 297.

<sup>2</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants Inc., 1979. pp. 185-186.

It is evident that the speed and accuracy of the computer makes it a very powerful and useful audit tool. The use of computer-assisted audit techniques allows the auditor to perform the necessary audit procedures more efficiently and in most cases to test larger samples than would be economically feasible in a manual environment. "Certainly, at a minimum, the computer should remove the restrictions previously imposed by the amount of clerical work provided - but even further, the computer should open up additional analytical opportunities."<sup>1</sup>

#### OBTAINING A COMPUTER-AUDIT PROGRAM

There are several ways the auditor may obtain an audit program. The auditor may either write the program himself, use a program written by the client, use a generalized audit program, or obtain a program from a software house.

"If data of audit interest is being processed on a computer, either in-house or outside, the auditor should always consider using the computer as an audit tool in auditing such data."<sup>2</sup> Before obtaining a computer-audit program

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<sup>1</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 204.

<sup>2</sup> Study Group of Computer Control and Audit Guidelines, Computer Audit Guidelines, Toronto, Canada: The Canadian Institute of Chartered Accountants, 1975, p. 249.



however, a cost-benefit analysis should be made to determine if the benefit derived from the use of the computer outweighs any increase in cost.

#### Generalized Audit Programs

The use of generalized audit programs has gained great momentum in the past few years. There are many audit functions which change very little from client to client and lend themselves very well to generalized audit programs. Most of the generalized programs available today are of three types:

- 1) Those designed for a specific industry application such as brokerages or banking utilizing a standardized packaged set of audit programs.
- 2) Generalized packages using a higher level audit "language" in which the audit programs are written for the specific data files to be examined.
- 3) Generalized packages in which the programs are standard and the data files to be examined are modified or adapted so that the programs can be used with them.<sup>1</sup>

The benefits derived from using generalized audit programs are as follows:

- 1) The language used in the programs is familiar to the auditor.
- 2) The audit package may be hardware independent.
- 3) The audit package permits the auditor to independently analyze a computer application system file.
- 4) The computer can be used effectively and efficiently in the execution of the audit procedure without the need for extensive training of audit personnel.

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<sup>1</sup> Ibid., p. 250.

- 5) The computer can be used as an audit tool with minimum dependence upon data processing personnel.
- 6) Audit procedures can be easily change to accommodate to changing operating conditions without time-consuming and costly computer program modifications.
- 7) Changes in data processing applications and file structures are easily accommodated without extensive computer program modifications.
- 8) Complex statistical and mathematical routines are available that are thoroughly tested and proved to be accurate.
- 9) One generalized audit software package can be used for many computer application systems. This eliminates the need to use customized and dissimilar audit software packages developed for individual computer application systems.<sup>1</sup>

We must realize, that the use of generalized programs does not rule out completely the need to write specific programs. In certain instances, for example, in the case of smaller equipment, non-compatible systems, and non-generalized audit tasks, the generalized program will not be applicable.

#### Programs Written By Or Under The Supervision Of The Auditor

The auditor may write his own program. This approach requires a good knowledge of data processing and competence in programming. One of the recommendations made by the American Institute of Certified Public Accountants in discussing the common body of knowledge for CPA's entering the profession is that the CPA should have a working knowledge of at least

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<sup>1</sup> Stanford Research Institute, Systems Auditability & Control Audit Practices, Altamonte Springs, Florida: The Institute of Internal Auditors, Inc., 1977, pp. 143-144.

one computer language and sufficient understanding of information systems so that he should be in a position to design a simple information system, program it, and proceed to debug and test it. Thus the auditor should be capable of writing programs appropriate to his needs.<sup>1</sup>

The auditor may also engage an outside programmer or one of the client's programmers to write the program. If this is the case, the auditor must supply the programmer with the specifications and play an active role in testing and debugging the program in order to determine the validity of the program. In addition, where an employee of the client is engaged to write the program, the auditor must be certain that the employee selected to write the audit program is not the same individual who wrote the original program.

#### Programs Written By The Client

Very often the analysis desired by the auditor is useful to the client as well, and the client will either have the program written or will write a program to perform the desired function. An example of programs needed by both the auditor and the client, are programs that analyze accounts receivable or programs that analyze inventory turnover

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<sup>1</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 210.

and obsolescence.

When using programs written by the client the auditor must assure himself that the program functions as desired.

The extent of testing would depend, of course, on how much the auditor can rely on the controls over programs and operations installed with the system. As a general rule the auditor should, at a minimum, obtain and review the program documentation and run book, and should perform tests that demonstrate that the program correctly performs the required functions.<sup>1</sup>

The auditor must also assure himself that the program used in the analysis is the program that was used during the testing.

#### Programs Available From Computer Manufacturers Or Software Houses

Frequently, installations have as part of their library, a large number of general-purpose utility programs. Since these programs are obtained from computer manufacturers or software houses, independent third parties, the auditor ordinarily need not test the programs. The auditor should be aware however, that some installations do modify the programs and should check for this possibility.

The auditor may obtain information as a by-product of the client's normal operations by using these general-purpose utility programs. However, the auditor must first familiarize himself with the programs and the operating environment

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<sup>1</sup> W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, p. 134.

in which they are implemented. Frequently some of the facilities built into the vendor's programming systems can be used to provide additional tests. Thus, for example, the systems management facilities of an operating system that log timing and exception messages during the operating activities of the operating system or the automatic check-pointing and logging facilities of an information management system can provide a source of extremely useful information to the auditor.<sup>1</sup>

#### ADVANCED PROGRAM TECHNIQUES

The computer if used properly may be an extremely useful auditing tool. There are a multitude of techniques available to the auditor. For example, test data, parallel simulation, mapping, and tracing. These and other techniques will be discussed in this section.

##### Test Data

This technique is used to determine if valid transactions are processed correctly, and invalid transactions are detected during the processing cycle. "'Test data' is a set of transactions processed by the auditor to test the programmed controls and procedural operations of the client's com-

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<sup>1</sup> Ibid., p. 213.

puterized applications."<sup>1</sup> The auditor, based on his understanding of the client's system, develops predetermined processing results. These results are compared to the actual results from the tests to determine if the program and its related controls are operating effectively. "The most significant shortcoming of test data is that it tests only preconceived situations and may incorporate the same oversights that existed in the documentation of the application program."<sup>2</sup>

The test data method is most probably applicable under the following circumstances:

1. A significant part of the system of internal control is embodied in the computer program.
2. There are gaps in the audit trail, making it difficult or impractical to trace input to output or to verify calculations. This situation is possible in simple applications as well as in complex integrated systems.
3. The volume of records is so large that it may be more economical and more effective to use test data methods (and related procedures) instead of manual testing methods.<sup>3</sup>

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<sup>1</sup> American Institute of Certified Public Accountants, "Computer-Assisted Audit Techniques," Audit and Accounting Guide, American Institute of Certified Public Accountants, Inc., 1979, p. 38.

<sup>2</sup> Ibid., p. 39.

<sup>3</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 161.

Integrated Test Facility (ITF)

This technique differs from the test data method in that it processes the test transactions together with the production transactions. "ITF uses a fictitious or dummy entity (e.g., a false department or a dummy vendor) within the framework of the regular application processing function. The auditor can select the transactions or processing functions to be examined, and then apply the transactions to the fictitious entity during the normal processing cycle, along with the regular transactions."<sup>1</sup> When using this method, the auditor must at one point remove the test transactions. The auditor may either use a special program which filters out the test transactions during processing, or allow the test transactions to flow through the entire cycle and prepare adjusting entries.

"Although an ITF is an excellent tool to evaluate and verify computer program controls and processing, it provides limited evidence of the accuracy or completeness of input data or master file information."<sup>2</sup> "The primary reason for the use of ITF is that the whole system can be tested, the

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<sup>1</sup> Stanford Research Institute, Systems Auditability & Control Audit Practices, Altamonte Springs, Florida: The Institute of Internal Auditors, Inc., 1977, p. 119.

<sup>2</sup> Ibid., p. 123.

manual procedures as well as EDP."<sup>1</sup>

#### Parallel Simulation

Parallel simulation differs from both the ITF and the test data method in that it uses live data rather than test data. Simulation programs are written by the auditor. These programs are usually a simplified version of the application program used by the client. They contain only those functions which are relevant to the specific audit objectives. The simulation program and the application program are run against the same master files, with the same data. The results are then compared to validate the specific application program functions.

#### Tracing

"Tracing is a technique in which an auditor follows the processing steps performed by a computer program for a given transaction."<sup>2</sup> This is identical to the audit technique used in a manual environment, where the auditor follows a transaction from the beginning to the end of a cycle.

Normally the auditor will use tracing software. These programs produce a listing of the instructions that

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<sup>1</sup> American Institute of Certified Public Accountants, "Computer-Assisted Audit Techniques, "Audit and Accounting Guide, American Institute of Certified Public Accountants, Inc., 1979, p. 48.

<sup>2</sup> Ibid., pp. 52-53.



were executed and the sequence in which they were executed during the processing of a specific transaction. Tracing is a costly technique because of the computer time and auditor time required. Its use should be restricted to those cases where the auditor feels it is necessary to determine that the logic in a program is correct.

#### Mapping

"Mapping is a technique to assess the extent of system testing and to identify specific program logic that has not been tested."<sup>1</sup> This technique assists the auditor in discovering unauthorized program segments. "The number of executions for a particular step can also be compared to counts of input records to verify that programs are operating correctly."<sup>2</sup>

#### Extended Records

In most computerized systems, the audit trail is incomplete. "This incompleteness is caused by an unwillingness to expend the funds to maintain all the audit-trail data or by not thinking through what is needed for audit-trail purposes."<sup>3</sup>

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<sup>1</sup> Stanford Research Institute, Systems Auditability & Control Audit Practices, Altamonte Springs, Florida: The Institute of Internal Auditors, Inc., 1977, p. 159.

<sup>2</sup> Ibid.

<sup>3</sup> W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, pp. 212-213.

The extended record technique provides a complete audit trail by appending any data that affects a transaction to the computer record.

There are three main benefits derived from the use of the extended record technique.

1. The auditors are involved in specifying audit trails, which brings their expertise into ensuring comprehensive audit trails.
2. A complete audit trail exists in one extended record.
3. Complete historic data covering different accounting periods are available for analysis by various departments within an organization.<sup>1</sup>

#### THE AUDIT TRAIL

The introduction of computerized record-keeping, in some cases, has altered the audit trail, by eliminating the source documents used in a manual system. In such cases, techniques must be devised to create substitute trails.

The audit trail is a means of identifying the actions taken in processing input data or in preparing an output such that data on a source document can be traced back to the source items from which it is derived. Note that the audit trail can also be termed an inquiry or a management trail because it is used as a reference trail for internal operations and management as well as for audit tests.<sup>2</sup>

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<sup>1</sup> Stanford Research Institute, Systems Auditability & Control Audit Practices, Altamonte Springs, Florida: The Institute of Internal Auditors, Inc., 1977, p. 140.

<sup>2</sup> Auditing Advanced EDP Systems Task Force, "Management, Control and Audit of Advanced EDP Systems," Computer Services Guidelines, American Institute of Certified Public Accountants, Inc., 1977, p. 36.

LEGAL REQUIREMENTS FOR AUDIT TRAILS

There exist legal requirements which dictate the need to maintain audit trails, especially in automated data processing systems. Section 6001 of the Internal Revenue Code of 1954 states:

Every person liable for any tax imposed by this title or for the collection thereof, shall keep such records, render such statements, make such returns, and comply with such rules and regulations as the Secretary or delegate may from time to time prescribe.<sup>1</sup>

Section 2 of Revenue Procedure 64-12 states,

The inherent nature of ADP is such that it may not be possible to trace transactions from source documents to end results or to reconstruct a given account unless the system is designed to provide audit trails.<sup>2</sup>

Revenue Procedure 64-12 was then modified by Revenue Ruling 71-20, to include machine-readable data within the definition of "records".

It is held that punched cards, magnetic tapes, disks, and other machine-sensible data media used for recording, consolidating, and summarizing accounting transactions and records within the meaning of section 6001 of the Code and section 1.6001-1 of the regulations

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<sup>1</sup> Prentice-Hall, Complete Internal Revenue Code of 1954, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1979, p. 26385.

<sup>2</sup> Treasury Department, Internal Revenue Service, Revenue Procedure 64-12, Internal Revenue Bulletin, Cumulative Bulletin 1964-1, Washington: U.S. Government Printing Office, 1964, p. 672.

are required to be retained so long as the contents may become material in the administration of any internal revenue law.<sup>1</sup>

In order to comply with the above legal requirements in a computerized environment, alternative audit trails must be produced.

#### ELECTRONIC DATA PROCESSING SYSTEMS AND THE AUDIT TRAIL

A problem frequently encountered when using advanced systems, is the potential loss of the traditional audit trail, in other words, the absence of hard copy source documents. At times, transactions are first recorded on a traditional source document and then transcribed into machine-readable form. However this is a relatively time consuming and error prone process and has triggered a move towards the elimination of source documents. In order to preserve the audit trail, a hard copy may be produced during the processing stage by attaching a printer/typewriter capability to the computer terminal.

Most computerized systems eliminate the traditional journal and ledger. When computerized records are updated, an historical account of the changes or postings is not usually kept. To replace the traditional journal it is neces-

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<sup>1</sup> Treasury Department, Internal Revenue Service, Revenue Ruling 71-20, Internal Revenue Cumulative Bulletin 197-1, Washington: U.S. Government Printing Office, 1971, p. 392.

sary that a list of all transactions be prepared; to replace the ledger, a log of all changes to each account must be prepared.

While the form of the audit trail may change substantially, there is no reason why the audit trail should disappear or become unusable. If careful thought is given to the needs for audit trails at the time the system is being designed, they can be implemented in the system. In most instances the introduction of sufficient controls and records to provide an adequate audit trail benefits far more than the auditor. Usually the same techniques that provide an adequate audit trail for the auditor's purposes are equally valuable to the installation for its own control and/or reconstruction purposes.<sup>1</sup>

#### GUIDELINES FOR THE DESIGN OF AUDIT TRAILS

The AICPA has defined the following guidelines for the design of audit trails.

1. For all transactions affecting the financial statements there must be a means for establishing the account to which the transaction is posted.
2. For all accounts reflected in the financial statements there must be a means for tracing the summary amount back to the individual transaction elements.
3. For all transactions and accounts drawing a large number of inquiries, regular provision should be made to supply the records necessary for answering the inquiries.
4. For all transactions and accounts not typically subject to inquiries there must be a means for tracing, even though regular provisions are not made.<sup>2</sup>

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<sup>1</sup> Elise G. Jancura, "Electronic Data Processing The Computer & the Audit Trail," The Woman CPA, Vol 39, No. 1 (January 1977), p. 20.

<sup>2</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 123.

SUMMARY

The auditor must analyze his client's system to determine if the audit should or should not be performed with the use of the computer. If it is decided that the computer will be used as an audit tool, the auditor must obtain a computer-audit program. He may either write the program himself, use a program written by the client, use a generalized audit program, or obtain a program from a software house. The computer performs many tests faster and more accurately. Techniques such as test data, parallel simulation, tracing, ITF, mapping, and extended records may be used.

## CHAPTER VI

### THE EFFECT OF ELECTRONIC DATA

#### PROCESSING ON CONTROL

#### GENERAL FRAMEWORK OF INTERNAL CONTROL

The American Institute of Certified Public accountants has defined internal control as:

The plan of organization and all of the coordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency, and encourage adherence to prescribed managerial policies.<sup>1</sup>

Internal control includes both accounting and administrative controls. Administrative controls deal with management's decision process, and are usually the concern of the internal auditor. Accounting controls, deal with the safeguarding of assets and the reliability of financial records, and are usually the concern of the independent, or external, auditor.

Management is responsible for the development and maintenance of accounting and administrative controls. As

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 53.

stated in paragraph 320.31, "Management Responsibility", of Statements on Auditing Standards,

The system of internal control should be under continuing supervision by management to determine that it is functioning as prescribed and is modified as appropriate for changes in conditions.<sup>1</sup>

#### THE PURPOSE OF EVALUATING INTERNAL CONTROL

The purpose of the auditor's study and evaluation of internal control is expressed by the second standard of field work.

There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.<sup>2</sup>

"The auditor identifies internal accounting controls upon which reliance can be placed as a basis for restricting substantive tests. The auditor then performs tests of compliance, which provide reasonable assurance that accounting control procedures are functioning as prescribed."<sup>3</sup> In an EDP environment, the auditor may use the computer to perform

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1 Ibid., p. 59.

2 Ibid., p. 7.

3 Auditing Advanced EDP Systems Task Force, "Management, Control and Audit of Advanced EDP Systems," Computer Services Guidelines, American Institute of Certified Public Accountants, Inc., 1977, p. 3.



tests of compliance. If the client's computer is used, the auditor should perform additional tests to assure himself of the integrity of the computer system.

#### IMPACT OF AUTOMATION ON CONTROL

As stated in paragraph 320.02 of Statements on Auditing Standards,

The increase use of computers for processing accounting and other business information has introduced additional problems in reviewing and evaluating internal control for audit purposes.<sup>1</sup>

The method of data processing does not affect the essential objectives of accounting control however, it may affect the procedures employed by the organization to accomplish these objectives. This in turn, will affect the procedures employed by the auditor in his study and evaluation of the system of internal control.

Electronic data processing systems tend to merge functions that are segregated in manual systems. It is not uncommon to have one program perform several functions which would be considered incompatible functions in a manual system. "Incompatible functions for accounting control purposes are

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 51.

those that place any person in a position both to perpetrate and to conceal errors or irregularities in the normal course of his duties."<sup>1</sup>

#### TYPES OF CONTROLS IN A COMPUTERIZED ENVIRONMENT

Controls in a computerized environment are of two types, general and application controls. General controls involve policy and procedures; application controls relate to processing activities.

#### General Controls

The important general control features in most EDP-based accounting systems are classified as follows:

1. Organization and operation controls.
2. Systems development and documentation controls.
3. Hardware and systems software controls.
4. Access controls.
5. Data and procedural controls.<sup>2</sup>

Organization and operation controls. As in non-EDP systems, adequate segregation of duties must be maintained to prevent any one person from performing incompatible duties. This

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<sup>1</sup> Ibid., p. 61.

<sup>2</sup> Computer Services Executive Committee, "The Auditor's Study and Evaluation of Internal Control in EDP systems," Audit and Accounting Guide, American Institute of Certified Public Accountants, Inc., 1979, p. 25.

segregation of duties must exist within the EDP department as well as between the EDP department and the users. There must also exist an adequate system of authorization to prevent the EDP department from initiating or authorizing transactions.

"As a rule, the EDP department should not originate or authorize transactions, perform the initial data preparation for transactions, have custody of or control over non-EDP assets, be responsible for establishing controls, or have the authority to originate master file changes."<sup>1</sup>

Systems development and documentation controls. When a new system is being established it is desirable to have an EDP-systems planning steering committee. The committee should establish guidelines for the development and implementation of systems projects and appropriate documentation.<sup>2</sup> Up-to-date documentation is an essential factor in maintaining control over the programs and procedures within an EDP system.

Hardware and systems software controls. Most hardware has the capability of detecting and recording hardware failures. By using these hardware controls effectively, many errors may be

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1 Ibid., 28.

2 W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, p. 76.

detected at an early stage, before a major system failure occurs. Controls must also exist over the systems software.

"There should be a formal procedure for requesting, authorizing, and approving all changes, to systems programs."<sup>1</sup>

Access controls. Access to program documentation, programs, data files and computer hardware should be limited to authorized personnel. Many organizations are now using libraries to restrict the access of program and data files. In order to prevent unauthorized use of computer hardware, physical security devices such as guards and locks are also used.

Data and procedural controls. A section independent of the operations, systems, and programming sections should act as a control between the users, and the EDP department. This section "should be responsible for receiving all data to be processed, for ensuring that all data are recorded, for following up on errors detected during processing to see that the transactions are corrected and resubmitted by the proper party, and for verifying the proper distribution of output."<sup>2</sup>

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<sup>1</sup> Computer Services Executive Committee. "The Auditor's Study and Evaluation of Internal Control in EDP Systems, Audit and Accounting Guide, American Institute of Certified Public Accountants, Inc., 1979, p. 38.

<sup>2</sup> Ibid., p. 43.

Control procedures must also be designed to protect programs, files and data from any accidental as well as intentional damage. "The best protection against total destruction of important files and programs is their duplication and storage in an area which would be unlikely to be affected by the same disaster affecting the computer room."<sup>1</sup> Moreover, a record reconstruction plan must be implemented. Such a plan allows the reconstruction of records when they have been destroyed or incorrectly updated.

#### Application Controls

"Application controls are designed to ensure that the recording, classifying, and summarizing of authorized transactions and the updating of master files will produce accurate and complete information on a timely basis."<sup>2</sup> The extent of application controls is dependent on the existence of general controls.

Input controls. The computer should be used as much as possible to authorize input. Data must be properly authorized before it may be converted to machine-sensible form. At

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<sup>1</sup> W. Thomas Porter and William E. Perry, EDP Controls and Auditing, Belmont, California: Wadsworth Publishing Co., 1977, p. 81.

<sup>2</sup> Ibid., p.88.

times, turn-around documents, which eliminate the need for data conversion, are used. An important aspect of input control is the validation of input. The primary validation techniques, for example, completeness tests, logical tests, and limit tests, have been incorporated within programs. Completeness tests check to see that the required amount of information has been input. Logical tests look for relationships between fields or portions of a record. Limit tests are used to determine if predetermined limits have been exceeded.

Processing controls. As defined in section 321.08b of Statements on Auditing Standards,

Processing controls are designed to provide reasonable assurance that electronic data processing has been performed as intended for the particular application; i.e., that all transactions are processed as authorized, that no authorized transactions are omitted, and that no unauthorized transactions are added.<sup>1</sup>

Record counts, hash totals and control totals may be used to detect loss or erroneous processing of data by comparing them to predetermined amounts. A record count is simply a count of the number of records within a file. A control total is the total of a quantity field. A hash total is the total of a

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 97.

nonquantity field. In addition, external and internal labels should be placed on files to prevent a program from processing the wrong file.

Output controls. As defined in section 321.08c, of Statements on Auditing Standards,

Output controls are designed to assure the accuracy of the processing results (such as account listings or displays, reports, magnetic files, invoices, or disbursement checks) and to assure that only authorized personnel receive the output.<sup>1</sup>

The output format must be checked, and control totals must be reconciled to predetermined totals. The correct output must be delivered to the appropriate department on a timely basis. Any rejected data must be routed to appropriate personnel, to be corrected and included in the next run.

#### CONTROL OF ONLINE-REAL-TIME SYSTEMS

The use of online-real-time (OLRT) systems, sometimes simply referred to as real-time systems, has increased in the past few years and will continue to increase. OLRT systems are more complex than conventional computer systems. They create additional control problems that must be considered by the auditor when evaluating the systems.

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<sup>1</sup> Ibid., p. 97.

### The Nature of Online-Real-Time Systems

"The online-real-time system is an advanced type of on-line system in which transactions and inquiries are recorded and processed as soon as they are received. The results of the processing of a transaction are achieved so fast that they can themselves influence the transaction."<sup>1</sup> OLRT systems have the potential to process updates and inquiries as well as initiate transactions.

The software and the hardware required for OLRT systems are more complex than that required for conventional systems. The software must perform a greater number of functions; the hardware must contain online file storage devices and terminals. The terminals may be located apart from the CPU. The data is transmitted to the CPU via communication lines. Techniques must be introduced to identify the user of the terminal, to limit the access to the files, and to control the transmission of the data from the remote location to the central location.

### Online-Real-Time System Problems

The very nature of OLRT systems causes control problems that are unique to such systems. Unlike batch-processing systems, where there is a large lapse between the initiation of a

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<sup>1</sup> Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 256.



transaction and its entrance into the processing cycle, OLRT systems process transactions as soon as they are received.

The inherent immediacy of both the input functions and the response of real-time systems eliminates many of the safeguards and checking activities that are possible in a batch-oriented system as the individual transactions are being collected for the batch prior to processing.<sup>1</sup>

In many OLRT systems, the terminal is used as a means of recording transactions and obtaining information. In order to protect against destruction of an audit trail a hard copy must be produced simultaneously with the recording process. This may be achieved by attaching a printer/typewriter capability to the terminal. If the OLRT system is simply an inquiry system, where there are no changes to the files, controls must be established over the use of the terminals and access to information.

It is evident that to audit advanced systems, the auditor must be knowledgeable of EDP systems and the necessary controls for such systems.

The potential complexity of these kinds of systems requires a great deal of knowledge and technical sophistication on the part of the auditor...<sup>2</sup>

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1 Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 240.

2 Ibid., p. 247.

### Data Security

The introduction of terminals and the maintenance of files on an online-basis, has complicated data security in OLRT systems. When files are maintained on an online-basis, the information may be accessed at all times. Therefore, controls must be implemented to prevent unauthorized individuals from obtaining access to such information.

The use of terminals has increased the number of entry points into the system. When remote terminals are used, the problem of physical control becomes that much more difficult. To limit the access of information, many techniques have been implemented that identify the user. The use of passwords is very common. But, passwords are usually not properly protected; at times they appear on the terminal itself or on a hard-copy. To eliminate the visibility of passwords, you may use unique characters that are not printed or displayed, or you may type over the password. Machine-readable keys and badges may also be used to identify the user. However, these can be lost or stolen and should be supplemented with passwords. A relatively new technique is the use of handprints. This is an extremely effective but costly control.

In addition to identifying the legitimate user, the system must control the information that is available to each.

Once the system has verified that the terminal user is authorized to gain access to the system, a

determination must be made as to what he is entitled to do. Authorization tables are developed which indicate whether the user is permitted to:

1. Read a file
2. Read a certain record(s)
3. Read certain portion(s) of a record
4. Update a file
5. Update certain records
6. Update certain portion(s) of a record
7. Only execute program(s)
8. Be able to dump program(s)<sup>1</sup>

"Another function that must be carefully controlled within the installation is the identification of those individuals who have the right to change the access authorizations within the system..."<sup>2</sup> It would be useless to develop a complex authorization table if adequate controls did not exist over the table itself.

#### Input Controls

As in all systems, controls should exist to ensure that all transactions are authorized, that all valid transactions are properly recorded and processed, and that all invalid transactions are detected. To ensure that the transmission of data is complete, beginning end-of-message indicators may be used. Where more than one message is transmitted, an end-of-transmission indicator is used. To deter-

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<sup>1</sup> Joseph J. Wasserman, "Data Security in an On-Line Computer Environment," The EDP Auditor, Fall, 1974, p. 16.

<sup>2</sup> Elise G. Jancura, Audit and Control of Computer Systems, New York: Petrocelli/Charter, 1974, p. 257.

mine the accuracy of the data, program checks may be built into the processing system. Logical relationships may be tested by comparing the transaction to the master file. Limit tests may be performed to determine the reasonableness of the transaction. Hardware character parity checking may also be used to check the accuracy of the transmission.

#### Processing Controls

"Processing controls are all those measures applied to activities of the installation to insure that data entered into the system are processed according to previously determined and approved specifications."<sup>1</sup> This would include procedures to determine the condition of the equipment, as well as the programs. All programs should be properly tested before they are placed in operation.

#### Recovery Procedures

Recovery procedures are essential in any system, to prevent the loss of data in the event of a systems failure. In an OLRT system, the complex combination of hardware and programming and the use of a data base complicate the process.

Checkpoint and restart procedures, which allow the computer operator to restart a program at an interim point rather

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<sup>1</sup> Ibid., p. 264.

than at the beginning, should be included with each program.

Sometimes the most difficult part of a restart procedure is determining exactly which part of the system has failed and the status of all of the concurrent activities occurring within the system.<sup>1</sup>

in those cases where immediate continuation is essential parallel systems may be used. This is an extremely expensive approach; it requires a duplication of the entire system.

#### SUMMARY

EDP has affected the procedures employed by the auditor in his study and evaluation of the system of internal control. Controls in a computerized environment are of two types, general and application controls. Each has been discussed in detail. The use of online-real-time systems has further complicated the picture. The introduction of terminals and the maintenance of files on an online-basis has created additional and unique problem areas for which controls must exist.

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<sup>1</sup> Ibid., p. 248.

## CHAPTER VII

### THE NEED FOR EDP SPECIALISTS

#### STATEMENT ON AUDITING STANDARDS NUMBER 3

Statement on Auditing Standards (SAS) No. 3, "The Effects of EDP on the Auditor's Study and Evaluation of Internal Control," published by the American Institute of Certified Public Accountants in 1974, requires the auditor to consider the effects of EDP in his study and evaluation of accounting control.

When EDP is used in significant accounting applications, the auditor should consider the EDP activity in his study and evaluation of accounting control.<sup>1</sup>

Accounting control consists of both general and application controls. General controls relate to all EDP activities while application controls relate to a specific accounting task.

#### THE ROLE OF THE EDP AUDITOR

The EDP auditor, as any auditor must adhere to the second standard of field work.

There is to be a proper study and evaluation of the existing internal control as a basis for re-

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 96.

liance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.<sup>1</sup>

The study and evaluation of internal control tends to be more complex in a computerized environment. Many incompatible functions which were performed by separate individuals in a manual system are performed by a single program in a computerized system. A person who is in the position to make unapproved changes would in fact be performing incompatible functions. For this reason, strict control must exist over programs and files. In large organizations, libraries are used to restrict access to such files to authorized personnel. It is essential that the auditor be knowledgeable about EDP before attempting to audit within a computerized environment. Where real-time and data base systems are concerned, the auditor must possess technical knowledge beyond that required in batch-oriented systems.

There are many benefits to be derived from understanding EDP concepts. The computer is a valuable tool and its speed and accuracy may save the auditor time while increasing the scope of the examination. "After the auditor has sufficient EDP skills, the computer becomes a useful tool

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<sup>1</sup> Auditing Standards Board, Codification of Statements on Auditing Standards, New York: American Institute of Certified Public Accountants, Inc., 1979, p.7.

in the performance of financial and operational audits."<sup>1</sup>  
"The EDP auditor is limited only by his imagination and technical competence in the use of the computer as an audit tool."<sup>2</sup>

A number of writers have expressed their opinions on the role of the EDP auditor.

Our business is not to compete in the technical expertise with the EDP staff. Our expertise is control, and we view the computer, when properly used, as a highly sophisticated control tool. Our task is to review and evaluate the whole enterprise and more specifically EDP as it serves the whole.<sup>3</sup>

In my opinion, a fundamental which must be squarely faced is that to properly assess internal control in the EDP area, the auditors so engaged must have specialized knowledge or understanding of EDP systems and their controls.<sup>4</sup>

The audit of clients utilizing complex EDP applications now, more than ever, requires specialized EDP expertise.<sup>5</sup>

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<sup>1</sup> Roy C. Culberston, "How Computers Affect Auditing," The Internal Auditor, February, 1978, p. 57.

<sup>2</sup> Howard Friedman, "The EDP Audit Profession - Another Look," The EDP Auditor, Summer, 1974, p. 9.

<sup>3</sup> Cliffs Perkins, "EDP Auditors - Specialists in Controls," The EDP Auditor, Fall, 1974, p. 6.

<sup>4</sup> Paul N. Norris, "EDP Audit and Control: A Practitioner's Viewpoint," The EDP Auditor, Winter, 1976, p. 14.

<sup>5</sup> "Internal Control Review - Impact of SAS No. 3," The CPA Journal, Vol. 46, No. 9 (September, 1976), p. 87.



. . . it is extremely beneficial for the auditor to have a computer background, either by experience or education, when performing audits.<sup>1</sup>

Currently there is a gap between systems technology and audit procedures and techniques. Auditors will be required to place greater emphasis on current technology.<sup>2</sup>

The integration of business operations with the simultaneous collection, recording and updating of financial data is becoming increasingly more routine, requiring greater knowledge by the auditor and new thought regarding auditing, control and security. Conventional, after-the-fact testing is not sufficient to meet all audit requirements in such computerized environments.<sup>3</sup>

Large investments in data processing services and increased financial risk have increased the need for sound EDP auditing.<sup>4</sup>

I am convinced that the computer will have a significant, basic impact on the CPA, even in serving small clients. It is therefore in his best interest to manage promptly the changes in his education, training, and attitude that are required by this major technological development.<sup>5</sup>

Since most common financial systems are now computerized, the EDP auditor's expertise for evaluating internal controls and assisting in the verification of financial information is essential.<sup>6</sup>

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1 Roy Culberston, "How Computers Affect Auditing," The Internal Auditor, February, 1978, p. 56.

2 Elise G. Jancura, Computers: Auditing and Control, 2d ed., New York: Petrocelli/Charter, 1977, p. 33.

3 Howard Friedman, "The EDP Audit Profession - Another Look," The EDP Auditor, Summer, 1974, p. 8.

4 Stanley Barnes and Martin L. Bariff, "Professionalism and the EDP Auditor," The EDP Auditor, Winter, 1978, p. 4.

5 Elise G. Jancura and H. Berger, Computers: Auditing and Control, Philadelphia: Auerback Publishers Inc., 1973, p. 17.

6 Stanley Barnes and Martin L. Bariff, "Professionalism and the EDP Auditor," The EDP Auditor, Winter, 1978, p. 4.

Since computers are a significant element in the environment in which the auditor of today must operate, he has no choice but to recognize their existence. The effective auditor of computer systems must become "bilingual". The auditor who remains ignorant of the techniques for computer control and audit will soon become obsolete and capable of functioning only as a "manual audit specialist."<sup>1</sup>

A study was performed for the Institute of Internal Auditors by the Stanford Research Institute. They concluded that:

. . . greater involvement of the internal audit functions in all phases of data processing is absolutely necessary and proper in today's increasingly complex data processing environment.<sup>2</sup>

It is evident from the above statement that great concern has arisen over the EDP auditor's role. Over the past few years there has been an increasing demand for EDP auditors, and they have come from both the data processing and auditing professions. Individuals with experience in both fields are extremely scarce. For this reason, universities and continuing education programs within CPA firms must place a greater emphasis on EDP auditing.

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<sup>1</sup> Andrew F. Best, "Obsolescence: A Do-It-Yourself Game," The Internal Auditor, March/April, 1975, p. 43.

<sup>2</sup> William E. Perry and Perry Fitzgerald, "Designing for Auditability," Datamation, August, 1977, pp. 47&49.

WHAT THE AUDITOR SHOULD KNOW ABOUT EDP

In order to comply with SAS No. 3, when auditing in a computerized environment, the auditor must possess an understanding of the following EDP concepts.

1. EDP equipment and its capabilities
2. Characteristics of computer-based systems
3. Fundamentals of computer programming
4. Computer center operations
5. Organization and management of the data processing function
6. EDP documentation
7. Control in EDP systems
8. Auditing techniques not using the computer
9. Auditing techniques using the computer<sup>1</sup>

. . . casual observation reveals that those who do not thoroughly understand computers tend not to trust them and try to do their thinking around rather than through the computer."<sup>2</sup>

Although in the past few years, more attention has been directed toward this topic, it is evident that "the auditor's knowledge and participation in computer systems is still unsatisfactory".<sup>3</sup>

The demand is far exceeding the supply for competent EDP auditors and EDP audit management. Accordingly,

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1 Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 233.

2 Leonard W. Hein, Contemporary Accounting and the Computer, Belmont, California: Dickenson Publishing Company, Inc., 1969, p. 16.

3 Paul N. Norris, "EDP Auditing: A New Revolution," The EDP Auditor, Summer, 1976, pp. 13-14.

it behoves us to upgrade our knowledge and training on a continuing basis to stay abreast of change and meet these new expectations.<sup>1</sup>

A study was made by Michael J. Cerullo,<sup>2</sup> to determine the present computer knowledge of public accountants. By examining the results of this study (Table 1), one can see an inverse correlation between extent of knowledge and respondent's years of public accounting experience. The longer one is in practice, the less extensive is his knowledge in current areas. For this reason many states require professionals to complete continuing professional education courses each year.

#### THE COMMON BODY OF KNOWLEDGE

From the evident impact of computerized systems on the audit and control function, emerges a need for auditors trained in EDP techniques. The traditional role of the auditor no longer holds with advanced systems. Robert H. Roy and James H. MacNeil, in Horizons for a Professional, recommend that the following be required for all CPAs entering the profession.

1. The beginning CPA should have basic knowledge of at least one computer system
2. He should have working knowledge of at least one computer language

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1 Michael J. Cerullo, "Computer Knowledge and Expertise of Public Accountants," The National Public Accountant, December, 1977, p. 32.

2 Ibid., p. 34.

**TABLE 1**  
**COMPUTER AND RELATED KNOWLEDGE OF CPA's**<sup>1</sup>  
 (by years of experience)

Extent of Knowledge	AREA													
	COMPUTER AREAS:							COMPUTER RELATED AREAS:						
	Components of a computer system	Controls in a computer system	Designing computer based systems	Flowcharting	Use of test decks in auditing	Writing computer programs	Average	Auditing clients who use in-house computers	Auditing clients who use time-sharing service bureaus	Organization theory	Organizational impact of computers	Usage of time-sharing in public accounting	Average	Grand average
<b>Percentage of All Respondents</b>														
Expert	7	8	8	10	4	3	7	7	3	1	3	4	4	5
Good Working	14	13	7	11	8	6	10	17	17	10	12	7	13	12
Average	23	23	14	16	16	6	16	26	19	16	18	19	20	18
Slight	30	26	24	28	25	17	25	18	18	18	18	32	21	23
None	26	30	47	35	47	69	42	32	43	55	49	38	42	42
<b>Percentage of Respondents with Five Years or Less Experience</b>														
Expert	38	38	12	25	12	25	25	25	0	0	0	0	5	15
Good Working	25	50	38	23	25	12	29	12	12	37	25	25	22	26
Average	25	12	25	50	38	0	21	38	38	25	50	25	35	28
Slight	12	0	12	0	25	25	14	25	12	0	12	50	20	17
None	0	0	13	0	0	38	11	0	38	38	13	0	18	14
<b>Percentage of Respondents with Six to Ten Years Experience</b>														
Expert	23	27	18	27	18	9	20	23	14	5	14	18	15	17
Good Working	23	23	14	18	14	14	18	23	14	27	14	0	16	17
Average	18	9	18	14	18	5	11	9	14	9	23	41	19	15
Slight	18	23	18	18	27	27	23	27	24	23	32	23	26	25
None	18	18	32	23	23	45	26	18	34	36	17	18	24	26
<b>Percentage of Respondents with 11-20 Years Experience</b>														
Expert	8	10	11	12	2	2	10	5	2	5	3	0	3	7
Good Working	23	13	8	10	10	10	12	25	28	5	15	8	16	14
Average	23	31	7	17	18	4	13	36	18	20	15	18	21	17
Slight	33	31	30	37	34	16	29	20	16	16	21	41	23	26
None	14	15	44	24	36	68	36	14	36	54	46	33	37	36
<b>Percentage of Respondents with 21-30 Years Experience</b>														
Expert	1	1	2	2	2	0	1	3	0	0	0	2	1	1
Good Working	12	11	4	17	6	4	7	16	12	8	8	5	10	9
Average	20	23	16	19	18	4	17	27	17	15	20	18	19	18
Slight	37	24	27	25	24	18	26	14	23	17	13	29	19	22
None	30	41	51	43	50	74	49	40	48	60	59	46	51	50
<b>Percentage of Respondents with 30 or More Years Experience</b>														
Expert	0	3	3	3	0	0	1	3	3	0	0	0	1	1
Good Working	9	6	10	10	6	0	8	13	9	6	6	3	7	8
Average	19	19	10	6	6	9	11	9	16	6	19	10	12	12
Slight	25	26	20	32	13	13	22	22	13	18	19	32	21	22
None	47	46	57	48	75	78	58	53	59	70	56	55	59	57

<sup>1</sup> Michael, J. Cerullo, "Computer Knowledge and Expertise of Public Accountants," The National Public Accountant, December, 1977, p. 36.

3. He should be able to chart or diagram an information system of modest complexity
4. He should be able to design an information system, prepare a program for it, and carry their work through the stages of debugging and testing<sup>1</sup>

Scandals such as Equity Funding, led to an increased concern for improved EDP auditing skills. In 1978, the EDP Auditor's Foundation for Education and Research announced its Certified Data Processing Auditor (CDPA) program, which would occur in two phases.<sup>2</sup> Phase I consisted of issuance of CDPA certificates to individuals who met a professional experience provision and adopted the CDPA code of professional conduct. Phase II was introduced for those who did not meet the above requirements. This phase consisted of a formal examination. The American Institute of Certified Public Accountants has also shown a concern for this problem by including questions on information systems in the Auditing section of every CPA examination since 1969.<sup>3</sup>

#### SOURCES OF TRAINING

Once a common body of knowledge has been defined, it is important to establish how and where this knowledge may be

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1 Robert H. Roy and James H. MacNeil, Horizons of a Professional, New York: American Institute of Certified Public Accountants, Inc., 1966, p. 213.

2 Edith Myers, "Certified Auditing," Datamation, April, 1979, p. 72.

3 Richard S. Savich, "The Care and Feeding of an EDP Auditor," The EDP Auditor, Summer, 1974, p. 13.

obtained. The American Institute of Certified Public Accountants has defined the following sources of training:

1. Courses given by computer manufacturers
2. Courses given by colleges and universities
3. Courses given by local technical schools
4. Self-study and programmed learning
5. On-the-job learning
6. AICPA Professional Development courses
7. Seminar programs<sup>1</sup>

Computer manufacturers provide many well developed courses, however, they are usually not geared to the auditing profession. Many of the fundamental principles of EDP may be learned through self-instruction. When deciding among the above sources, it is important that the auditor evaluate the quality of the course material as well as that of the instructor.

#### SUMMARY

SAS No. 3 requires the auditor to consider the effects of EDP in his study and evaluation of accounting control. In order to comply with this statement, the auditor must possess adequate knowledge of EDP systems. Robert H. Roy and James H. MacNeil in Horizons for a Professional, recommend a common body of knowledge. In the past few years there has been a rise in the concern for EDP auditing. This is evidenced by the CDPA program which has been formed by the EDP Auditor's Foundation for Education and Research.

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1. Gordon B. Davis, Auditing and EDP, New York: American Institute of Certified Public Accountants, Inc., 1979, p. 236.

## CHAPTER VIII

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### SUMMARY

The purpose of this study was to determine the relationship of EDP to the auditing profession. In Chapter One, specific episodes in the evolution of the auditing profession were examined. Of special interest in this study, was the introduction of the computer into the business world during the 1950's. Although the use of computers has not altered accounting theory, it has altered the method by which this theory is put into practice. The growth of computer systems has changed the auditor's environment. The auditor must be aware of, understand, and be able to adapt to this automation in order to perform effectively and independently in an electronic data processing environment.

Chapter Two was dedicated to related literature. Various studies were found that discussed some aspect of electronic data processing and its relationship to the auditing profession. The majority of the studies concluded that the growth of EDP systems has created a need for EDP specialists, and that the computer is a very powerful and valuable audit tool.

Chapter Three contains an overview of the relationship



of EDP to the audit and control function. Presently there is a movement from manual systems to EDP systems. When auditing an EDP system, the auditor must consider and utilize the computer in performing many of the audit and control procedures. Historically all records and documents were readable by the auditor. In an EDP system, part of the output is usually in machine-readable form. To the extent that the output is printed, traditional auditing and control procedures may be used. Where the output is machine-readable, the auditor may either use the computer to test the records or have the output converted to readable printout. It must be recognized that the change in procedures varies with the complexity of the computer system. The more complex the system, the greater the change.

Chapter Four introduced several fundamental EDP concepts. The distinguishing factor of an EDP system is the ability of the computer to carryout coded instructions placed in the computer prior to processing, without human intervention. There are four types of EDP system configurations: a card system, a tape system, a direct-access system, and a teleprocessing system. Each system consists of hardware and software elements. Computer hardware consists of all the physical equipment. Each computer system, as a minimum, consists of the following components: an input device, a central processing unit, and an output device. The term software refers

primarily to computer programs but also includes other non-hardware elements, such as program documentation and operating manuals. It is essential that the auditor possess an understanding of these basic concepts, if he/she is to perform an audit in an EDP environment.

A distinction was made between batch processing and online processing systems. Batch processing is used by those businesses that have a high volume of output. The transactions are accumulated in batches that are processed at given intervals or after the batch reaches a certain size. Batch totals of dollar amounts and other important data items are prepared to facilitate subsequent tracing and correction of errors. On-line processing is used by those businesses which need immediate information and/or updating. The time requirements of an online-real-time system generally result in a system that is much more complex than that of batch processing. In an online-real-time system, individual transactions are processed as they occur as opposed to accumulating them in batches. On-line updating of files provides the advantage that all records are up-to-date at all times. The decision of whether on-line or batch processing is appropriate for a particular application must be made on an individual basis.

In Chapter Five a discussion was made of the various decisions that must be considered when auditing in a computerized environment. The auditor must first decide whether the audit will be performed with or without the use of the computer. Auditing without the use of the computer allows

the auditor to use familiar audit techniques. Auditing with the use of the computer allows the auditor to take advantage of the speed, reliability, and storage capacity of the computer. The auditing process is usually benefited by the use of the computer whenever there is a large volume of data or many repetitive calculations. The use of computer-assisted audit techniques allows the auditor to perform the necessary audit procedures more efficiently and in most cases to test larger samples than would be economically feasible in a manual system. The auditor must analyze the system and determine if the benefits of using the computer outweigh the additional cost. As the portion of the processing procedures that are entrusted to the system increases, the risk involved in auditing without the computer also increases.

When the auditor uses the computer as an audit tool he must obtain a computer-audit program. The auditor may either write the program himself, use a program written by the client, use a generalized audit program, or obtain a program from a software house. The computer, if used properly, may be an extremely useful tool; it performs many tests faster and more accurately. Techniques such as test data, parallel simulation, tracing, integrated test facility, and extended records may be used.

Chapter Six contains an analysis of electronic data

processing and its relationship to internal control. The method of data processing does not affect the essential objectives of accounting control however, the method used may affect the procedures employed by the organization to accomplish these objectives. This in turn, will affect the procedures employed by the auditor in his study and evaluation of the system of internal control.

Internal control includes both accounting and administrative controls. Administrative controls deal with management's decision process; accounting controls deal with the safeguarding of assets and the reliability of the financial records. Accounting controls in a computerized environment are of two types, general and application controls. General controls involve policy and procedures; application controls relate to processing activities.

Electronic data processing systems tend to merge functions that are segregated in manual systems. It is not uncommon to have one program perform several functions which would be considered incompatible functions in a manual system. The use of online-real-time systems creates additional control problems that must be considered by the auditor when evaluating the system. The introduction of terminals and the maintenance of files on an online-basis, has complicated data security in online-real-time systems. When files are maintained on an online-basis the information may be accessed

at all times. To limit the access of information, many techniques have been implemented that identify the user.

Chapter Seven, identifies the need for EDP specialists. Statement on Auditing Standards No. 3 requires the auditor consider the effects of EDP in his study and evaluation of accounting control, where EDP is used in significant accounting applications. Many authorities have also expressed their opinion on the need for EDP specialists. Over the past few years there has been an increasing demand for EDP specialists. They have come from both the data processing and auditing professions.

#### CONCLUSIONS

The use of electronic data processing is gaining greater acceptance by the business community. The decreasing cost of computer equipment and the introduction of time sharing has lead to a movement by many businesses from manual systems to EDP systems. This movement has expanded markedly the auditing process. When auditing in an EDP environment, the auditor not only must be familiar with accounting but he/she must possess a working knowledge of EDP principles. As more and more businesses turn to EDP systems and as these systems become more sophisticated, the risk of auditing without the use of the computer increases.

Historically all records and documents were readable

by the auditor. At present, many records are in machine-readable form and a major portion of the documentation is in flowchart form. It is vital that the auditor understand the system documentation in order to study and evaluate the system of internal control.

The objectives of the audit of an EDP system are the same as those of any other type of system: (1) review the system of internal control, (2) test the system to determine if controls are effective and (3) evaluate the records produced by the system. Traditional substantive testing procedures are applicable where the records are maintained in a hard copy form, such a printout. However, where the records are available only in machine-readable form, the auditor must use computer programs. The use of the computer provides the auditor with a more efficient method of performing many of the substantive testing procedures which are of a clerical nature. The auditor must also have a basic knowledge of at least one computer language, and be able to prepare a program, debug it and test it, in order to evaluate the client's programs and to effectively use the computer as a tool in performing the audit.

Where the auditor encounters systems more advanced than batch processing, such as online-real-time processing systems, additional modifications of review, compliance testing and substantive testing procedures may be necessary.

In the case of an online-real-time processing system, where the transactions and inquiries are processed as soon as they are received, the auditor must be aware of the additional security problems in order to effectively review the system of EDP controls. The introduction of new processing systems and procedures to process data and the concentration of duties in an EDP system requires strengthening of certain existing controls and an implementation of new controls.

The auditor who possesses an understanding of EDP principles will be in a better position to determine if the necessary control procedures are prescribed and followed satisfactorily and to assess the effect of any weaknesses in internal control. The auditor may then make the necessary recommendations to management to correct the existing weaknesses.

In the past relatively few auditors have received instructions in computer methods as part of their training. The accounting profession has not kept pace with the expansion of data processing and the introduction of new technology. For this reason, the present demand for EDP auditors far exceeds the supply. Where the system is small and straight forward, the risk of not having EDP auditors is small. However, as the system becomes more sophisticated, the risk of not having EDP auditors increases. The auditor who does not possess a good working knowledge of

EDP principles will not be able to serve his client effectively. The auditor of the future must be knowledgeable in both the EDP and accounting areas.

#### RECOMMENDATIONS

It is evident that EDP has had a significant impact on the auditing profession. In order for future auditors to perform effectively in an EDP environment, it is necessary that they obtain a good working knowledge of EDP auditing.

1. A movement towards greater awareness of EDP auditing should be at the initial stage of the auditor's career - the university. EDP auditing should be a required course for all students with a major in accounting. Future auditors must become familiar with EDP concepts at an early stage in order to overcome the phobia that surrounds computers.
2. Once the student enters into the auditing profession, continuing education courses should be implemented to expand on the basic EDP auditing concepts learned in the university. Mandatory core courses should exist, and taken by all auditors early in their career. More advanced courses should be available for those individuals who want to specialize in EDP auditing.
3. A study should be made to determine a more concrete "common body of knowledge". EDP auditors have come



from both the auditing and data processing professions. It is important that all EDP auditors have a common base to work from.

4. Auditing procedures should be examined to determine those procedures which may be standardized whenever an examination involves an EDP system.

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