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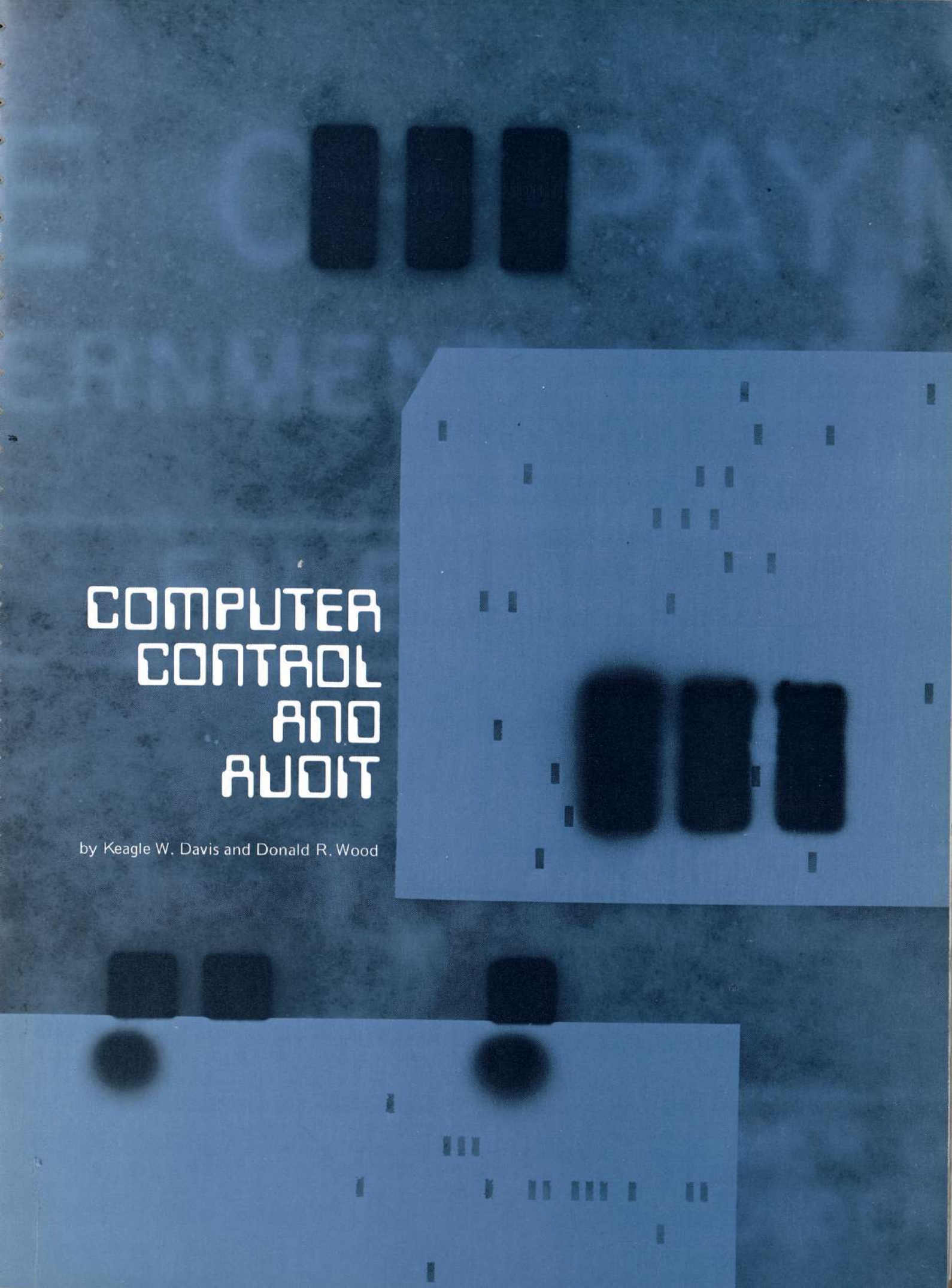

COMPUTER CONTROL AND AUDIT

by Keagle W. Davis and Donald R. Wood

Auditors are developing considerable experience with computers through the successful use of general-purpose audit software. Audit software packages like STRATA, developed by Touche Ross & Co., have introduced a capability for them to use computers personally and directly in the performance of auditing procedures.

The articles which follow deal with an evolving step in this increasingly close relationship. They are taken from a forthcoming book in the Touche Ross Management Series entitled *Computer Control and Auditing.*

This book on controls and auditing techniques reflects the fact that the profession is now ready for the next step—the refinement and development of new standard techniques and programs for examining and dealing with computers as a normal part of the auditor's function.

The subject is discussed here at an overview level.

Problems of Control

Need for Control. Imagine a company somehow losing all of its negotiable assets. Clearly, this would be a major loss. But it would not be anywhere near as bad a catastrophe as if the same company lost all of its EDP-related information files and all of its data-processing capabilities.

In effect, we are approaching the time when such data files and related computer programs *are* the company. We are reaching this critical point without sufficient recognition of the problems or risks involved. Management people everywhere recognize and deal with risks associated with cash and negotiable securities. But the greater risks associated with information files and data-processing capabilities are still to be recognized in many companies. Consider, for example, the impact of total loss of all of a company's customer files and accounts-receivable records. Bankruptcy might well ensue.

Data-processing times and techniques have changed. But in many organizations controls have remained static. It must be recognized that outdated controls are non-existent controls. The prospect of loss of assets to a point of virtually total business discontinuity is not a figment of imagination. It is a real threat.

Concern should be expressed through control and custody measures which recognize that data-processing files and information-processing procedures are vital assets. Concern for control should expand as the trend continues toward integrating applications and files across organizational and geographic boundaries. It has become typical for a computer system to serve multiple users and consolidate files for multiple applications. This type of integration, for instance, might find a single file of sales and inventory records being used by marketing, billing, credit, collection, and distribution departments. Company operations, resources, and management capabilities become increasingly dependent upon the caliber of controls used in the planning, design, development, implementation, and operation of such data-processing systems.

A company using an integrated information system operates under a threat of organizational amnesia. The implied threat is to the identity of the company and to its ability to continue operating. This threat generates a critical need for control and protection against disaster in the EDP area.

DATA PROCESSING TREND

The threat of loss of control over information assets results from an evolutionary trend in business data processing. An understanding of this trend should be established before probing further into the control problems and their logical solution.

Changes in control requirements have followed changes in computer technology. The presence of a computer itself does not automatically signal a control problem. Rather, concerns for control grow with the increasing complexity and integration of computer processing and files.

In the early days of data processing, individual departments were usually both sources and users of data. The handling of volumes of paperwork provided an understanding of reliability and limitations of processing systems. Similarly, the proximity of individual users to others associated with manual processing and controls over data provided informal capabilities for resolving exceptions and problems.

The early buildup of computer installations typically did not change the relationship of the user with his data. Rather, the buildup concentrated hardware and technical staffs in computer centers. Computerized data files did expand. Gradually, there was some integrated use of files. However, the files were largely oriented to individual users who often maintained their own manual records as backup for those in the computer center. The attention of most data-processing organizations was drawn more toward the technical aspects of computers than toward control requirements and their emerging problems. This was a natural result of such developments as the following:

- A continuing stream of new generations of computer hardware, or equipment, was introduced.
- New generations of programing languages for coding instructions for computer processing were also developed.
- Increasingly sophisticated "supervisor" software was developed to perform repetitive computer-operating functions previously executed manually.
- The learning curve for developing systems for large-scale computers was still at a low point.

When third-generation computers were installed in the late sixties, most computer staffs had improved their abilities to handle technical changes and were starting to develop more complex and integrated systems.

Significant efficiencies result from the integration of files—not only in the use of computer facilities, but also in the use of the information itself. In addition to the advantages of using the same data many times, there are benefits also in the ability to interrelate data previously maintained in independent files. It represents a massive step forward in the sophistication of computerized logic. Data utilization had, for many years, been restricted to the capacity of individual punched cards. This limitation has been replaced by virtually unlimited arrays of data.

The advantage lies not only in putting together multiple files, but in the joining of previously separate thought processes. The resulting single chain of processing represents the real power of the computer. This linking of files and logic from multiple applications, together with changing sources of data entry, challenges established techniques for control of business computer systems.

With increased frequency, elements of data are being entered into computers at their earliest and most efficient points. Often the sources entering the data are not direct users of the data. The more data terminals and remote entry points a system acquires, the greater the centralization of information custody. Inevitably, the introduction of high capacity computer file devices, and the accompanying development of software for data base management, have permitted and facilitated data consolidation. These new units of equipment and their associated technology improve the economics of large, integrated files. The availability of equipment also leads to the development of new skills. This in turn has strong impact upon the feasibility and economics of file integration and expansion. Inevitably, file integration will continue to expand; data bases will be larger.

Under these emerging concepts, a data base is viewed ideally as an interrelated collection of all data relevant to a company's operations and planning. Realistically, the further a company moves toward implementing such a concept, the greater becomes the delegation of custody and maintenance of files. The broader also will be the need for new techniques and points of control over the processing of transactions and the security of information stored. This need for formal control will continue to extend to all users of information systems as well as to the data-processing facility itself.

THE NEW LOOK IN CONTROL

Although these developments have not changed the concepts of control, traditional techniques for the control and protection of a company's information assets

simply no longer apply. A manager making a decision on the basis of information initiated and processed by others has a valid point when he says he cannot be solely responsible for results when he does not control accuracy or reliability of his information sources. But the answer does not lie in absolving the manager. Rather, it becomes necessary to expand his scope. He must take prudent steps to exercise responsibilities which remain his despite any information-processing changes. An inventory manager who has delegated his file custody to a data processing department must recognize that he is still responsible for the usefulness and reliability of the data.

Similarly, a group that supplies data used by others must be held responsible and accountable for the accuracy and reliability of their performance.

The responsibilities and techniques for coping with this new situation must be based on an understanding of the basic nature of changes and realities of controls in an EDP environment.

THE CHANGED NATURE OF CONTROL

An understanding of principles and techniques for control in an EDP environment begins with recognition of—and plans for dealing with—two separate elements:

- Custody of information assets
- Controls over processing.

The earlier reference to the consequences of complete loss of EDP files illustrates the nature and magnitude of the custody problem in the EDP area. The operating manager who turns over his records and files to the EDP department is delegating responsibility for their care and protection.

The difference is that data processing assets are dynamic—are used actively. Therefore, exposure to catastrophe is significantly greater than for negotiable assets. The effectiveness of protective measures applied to the maintenance of these assets should be in keeping with the extent of exposure involved.

Controls over the processing of information undergo parallel changes in location and emphasis. The user of information no longer has the depth of involvement associated with the processing of data or the understanding of its origins and limitations. Where he places this degree of reliance on integrated computer files and processing, a prudent user should assure himself that formal, visible, compensating control techniques are employed at new control points.

Under an EDP system, processing is done in a department and by people who lack this degree of first-hand involvement in the use of data. Further, most processing is done by machines. Logic capabilities are limited to specific measures established by persons involved in system design and programing.

Thus, in highly integrated systems, data processing takes on a significantly different aspect. A whole new environment is created.

CONTROL RESPONSIBILITIES

In such circumstances, information-system controls become an important, growing area of risk management in most companies using computer systems. Basic decisions are much like those that managers are already making, such as whether to self-insure risks or to have them underwritten by outside carriers.

Example: A large transportation company has 1,500 vehicles operating individually on widely dispersed routes. In this situation, the company is usually better served through a significant degree of self-insurance. Risks are widely spread and the likelihood of a major disaster is minor.

But if all 1,500 of the vehicles operated in one city or were stored at one location, a different insurance strategy would be advisable. Such a concentration of assets increases the risk and potential loss from natural or accidental disaster sufficiently to warrant changed controls and insurance coverage.

Where files and records are maintained in separate locations, the likelihood of a major disaster is much lower than with a highly centralized system where data are processed and stored primarily in one computer center. The greater the scope of the records entrusted to a data-processing department, the more valuable they are to management. It is also more difficult to reconstruct lost or destroyed files and thus greater risk is involved.

Insurance companies providing business interruption policies recognize this situation. They base premiums on the extent to which a company has developed comprehensive, formal planning such as the following:

- Backup facilities should be available with compatible equipment to which processing can be shifted if service is interrupted on a company's own computer facilities.
- Copies of files on computer tapes or discs—together with supporting documentation—should be

stored in separate, protected locations so files can be reconstructed if active copies are destroyed.

- Plans and equipment should be established for the restarting of service following any type of interruption the company may suffer.

Increasingly, managers are realizing that this caliber of planning is a necessity for business survival. In delegating control and security responsibilities for information systems, three levels of responsibility can be identified as follows:

- System users
- Data processing management
- Auditors.

The way EDP systems are developed and applied must reflect an awareness of these changed requirements. Users must be responsible for stating their information and control requirements clearly. EDP people should then be responsible for incorporating these controls in computer processing routines. Documented evidence should exist to satisfy both user and auditor that controls exist and are being applied.

Responsibilities of Users. As an information system becomes increasingly centralized, the user gives up, and the data processing department acquires — a greater degree of information-file custody. In considering control responsibilities, it is important to recognize that there are marked differences between physical custody and control over accuracy and reliability.

It is still up to the data-processing user to conduct himself as a prudent businessman. The user must understand and specify what controls are necessary in the handling of transactions, the processing of data, and the availability of information output. The user must still understand the information-processing system at a logical level. But he should not be expected to become technically expert in the operation of computers. At a logic level, the user retains the responsibility to operate and test the controls necessary for delivery of a quality product.

Data-Processing Responsibilities. Data-processing management, in turn, is responsible for all custodial processes associated with handling, processing, storing, and output of data between receipt of input data and delivery of results to users. In meeting custody obligations, data-processing people should apply the same types and degrees of care expected of the treasurer in the handling of cash and negotiable securities.

In addition, the data-processing department has central, prime-contractor responsibilities in the area of technical design of systems. Data processors must determine that levels of service and control acceptable to users are specified and designed into systems. Trade-offs are made between manual and computerized systems on the basis of:

- Economies
- Compensating controls within computers to offset abridged manual procedures
- Company policy.

Quality assurance is an important responsibility assumed by data-processing management with centralization of processing and file custody. Achievement of quality results largely from the degree to which the data-processing department meets its obligations. Data processing is in a position to assure that control procedures meet the requirements of users, auditors, and other interested parties. Data processing is the only organization which can gear its operations to assure quality in information processing, because its control function is central.

Responsibilities of the Auditor. Increasingly, the scope and resources of the internal audit function extend beyond the financial audit to evaluating operational-system controls. The extent of internal audit duties will vary widely. The scope and resources of the internal auditor lie in the area of management prerogative. Thus, the internal audit function's contribution to meeting corporate objectives may be rewarded with a professional staff that is a strong supporting force for operating management. On the other hand, internal audit may be limited to an extension of the external financial audit. There may also be no internal audit function at all.

The responsibilities of an independent auditor—and his impact upon the controls of an information system—involve primarily those factors which may affect the reasonableness of financial statements. These include understanding, evaluating, and testing internal controls of systems to the extent necessary to render an opinion.

Thus, the normal scope of an independent audit has little impact on the design, implementation, or evaluation of controls of systems unrelated to financial statements. In some instances, practical independent audit procedures ignore data-processing operations which are vital to the day-to-day operations of a company.

Example: A company bases inventory values in its financial statements on a physical inventory taken at year-end. In this case, the auditor may best satisfy

his financial-audit objectives relating to inventories by concentrating on values of the physical counts. Thus, even if a company had an extensive, computerized, inventory-management system for its internal operations, the controls for this application might not be evaluated, tested, or relied upon by the auditor for year-end financial purposes. However, the reliability of the perpetual inventory system would be critically important to operating managers using this data in their day-to-day functions and decisions.

Despite such limitations, it should also be stressed that the concentration of data and processing power present important new dimensions of opportunity for the independent auditor. Wherever feasible, the auditor should use both the power of the computer and the comprehensiveness of its files to improve the quality and scope of his examination.

NEW DIMENSIONS IN AUDITING

As EDP systems expand in scope, EDP controls and opportunities become more critical to the audit function. Increasing emphasis can be expected on the development of formal procedures and techniques for the audit of computer systems. Three areas of future change within the auditing profession can be identified readily:

1. The auditor will become bilingual, developing a comprehension of terms and methods in EDP, as well as those in accounting.
2. Wide use will be made of the computer and general-purpose audit software as direct tools of the auditor in performing and improving his services.
3. Formal standards and procedures will be developed for the conduct of EDP-system audits. These will gain the same degree of acceptance as is currently enjoyed by the standards and procedures for the audit of conventional accounting systems.

Bilingual capabilities will enhance the auditor's independence. He will be free of the need for special interpreters—EDP technicians—for communication with computer systems and files. An accounting and auditing background will remain the common denominator of professional performance.

For most auditors, this bilingual skill need be acquired only at a comprehension level. Fluency will not be necessary because general-purpose audit software will make it possible for the auditor to communicate directly with the computer, largely in his own terms. Bilingual requirements, therefore, will be applied largely for understanding of—rather than assuming technical control over—processes, structure of files, and system restrictions and capabilities. General-purpose audit software systems will serve as tools with which auditors can both express and fill most of their requirements.

To illustrate, one audit software system, STRATA, gives the auditor direct access to the computer and the computer files. He can perform his own special analyses of files or tests of transactions with minimal entries on specification sheets. These entries involve only nominal use of technical terms. When these specifications are entered into a computer, programs are generated automatically. These computer-generated programs permit access to computer transactions and master-file data.

For instance, they would allow independent, parallel processing of actual computer applications. By comparing results of STRATA computer runs with those of live runs using the same data, the auditor tests the processing related to his audit operation throughout the entire, live computer system, rather than just in individual application programs. Audit software allows the auditor to perform his tests at a logic level, using EDP skills acquired in one to two weeks of training.

As the auditor becomes increasingly involved in EDP, professional standards and techniques for planning and organizing EDP-system audits will continue to be introduced, revised, updated, and refined. Formal procedures, documentation standards, questionnaires, guidelines, and working tools will be unfolded—well into the foreseeable future. EDP audit techniques are and will continue to be in the mainstream of developments of the auditing profession.

It is important to put these relative requirements and obligations in perspective. Controls and security are now necessary at a level which transcends—by a great margin—the requirements of less than ten years ago. It is important for management to recognize the make-or-break consequences of information-system controls. Similarly, it is important for a professional auditor and systems analyst to recognize—and help management understand—these primary implications of control, rather than simply accepting past practices. ■

Auditing EDP Systems-an Overview

IMPACT OF EDP ON AUDIT ACTIVITIES

The total impact of EDP on the processing of financial data can be said to present both threats and opportunities to both the internal and independent auditor.Threats, or problems, experienced by the auditor with current EDP systems stem from the fact that changes of audit significance are occurring in EDP applications at a faster rate and are of a greater magnitude than changes previously experienced.

Substantial increases are taking place in both the number and sophistication of financially significant computer applications. In part, this results from continuing an established trend. Such material applications as invoicing, accounts receivable, inventory, accounts payable, and check disbursements have become EDP staples. Where these types of established applications have not already been added to computer systems, auditors can expect to see them converted as EDP priorities permit.

Three additional factors will play a major role in demanding an increasing level of the auditor's attention toward computers:

- The ability to combine, or integrate, previously independent applications into a continuous, uninterrupted computer flow, or data base, using only a few sets of interrelated computer files that cross both geographic and organizational boundaries.
- Logical processing on the computer is being expanded greatly beyond the record-keeping level to incorporate decisions and controls previously performed manually. Only exceptions will be directed for human scrutiny.
- Increasingly significant custodial responsibilities for the information assets of organizations are being delegated solely to EDP departments, with commensurate accompanying exposures.

A problem for the auditor lies in the amount of effort and skill required to keep up with change. A threat lies in the fact that if the auditor does not maintain current contact with changes control may be destroyed or diminished in the process of change.

But audit problems are balanced, in large measure, by compensating new opportunities to improve the auditor's services. These opportunities result from three current capabilities of sophisticated EDP systems:

- Increasing amounts and types of data are being concentrated in central locations convenient to the auditor.
- As users commit additional procedures and decisions to the computer, the explicit logic required for computer programing actually will help the auditor understand the organization's operations.
- The speed and facility with which processing and analysis can be done by computers will be an important factor in determining how the scope and economics of audit work can be enhanced.

In combination, these threats and opportunities require substantial increases in the thought and planning devoted to audit engagements.

AUDIT PLANNING

An audit of EDP systems requires much more than just rote reprocessing of prior audit steps. In all areas of the audit touched by the computer, the auditor should go through a thorough, total rethinking of audit scope and objectives. The auditor must reestablish in his own mind what his objectives are in view of changes in sys-

tems, environment, and the capabilities they afford him.

Audit Programs and Work Plans. Introduction or expansion of computer processing may not, however, require material changes in either the auditor's objectives, or the audit program. But if, in fact, control and reliability levels have changed with system revisions, or if new opportunities have resulted, the auditor must be ready to implement anywhere from minor to total changes in related sections of his audit program and procedures.

Planning for the audit of an EDP system will also call for substantial reevaluation of audit techniques, to select those that can most profitably be applied. The auditor must recognize the possibility that the operating environment of the systems he is examining may have gone through a major modification. Increasing amounts of logic and control may be resident in application programs or in procedures for a computer operations center.

A study of the extent of change in systems under examination should be made as an initial step in an auditor's review of internal control. This helps establish an understanding of what is taking place. It will also indicate whether traditional audit techniques are still viable, or if improved techniques will result in improved audit programs and results—or if a change in techniques will give improved meaning to audit objectives. (For a discussion of specific techniques appropriate in audit verifications through use of a computer see: Mair, William C., "New Techniques in Computer Program Verification," *Tempo,* Winter, 1971.)

The degree or trend of change in a company's systems will also serve to shape and guide the activities of internal auditors. Increasingly, the mission of the internal-audit function is going beyond the minimum bounds of financial control and extending into operational areas. Managers are realizing that their needs for control often go beyond the requirements for independent audit engagements. Internal auditors are being asked, for instance, to ascertain the reliability of operating data. This is generally outside the minimum scope of an independent auditor but it is often critical to management decision making.

As an extension of an auditor's programs and work plans, it may also be helpful, in an EDP environment, to apply a comprehensive questionnaire. Such an audit questionnaire would serve as a guideline—particularly in many medium-sized computer installations. It would aid the thoughtful reviewer by directing him to those areas requiring the greatest attention.

Evaluation of questionnaire responses, together with appropriate system documentation, could provide insight into the extent and type of tests desirable. Questionnaire results might also help determine whether other elements of the audit could be modified and performed more effectively or efficiently.

Around or Through the Computer? In the planning stages of an examination, a determination must be made on whether the audit work should be done by going around or going through the computer. The computer may have an impact upon the examination in either or both of the following ways:

- It may be employed as an audit tool, *i.e.,* the power of the computer may be harnessed and utilized via audit software to replace manually performed audit tasks with better, more efficient methods.
- Where controls material to an examination have already been imbedded in a computer application, computer procedures must be reviewed. This is the primary point to be addressed in the remainder of this presentation.

In the vast majority of cases, the auditor's decision on whether to use the computer in his examination depends upon the individual applications and the data available in computer files. Each application should be approached from a starting point of established audit criteria and values. The primary determination centers around whether the auditor can find sufficient evidence external to the computer or whether he finds that he must go into the computer files and processing logic to accomplish his objectives.

A key to a decision on whether to go through or around the computer also lies largely in the approach taken to audit performance. The auditor should approach EDP systems from his established position of strength and knowledge. Controls over information-processing applications are familiar to all trained auditors. Therefore, it takes comparatively little special knowledge or technical expertise to make this determination. It is primarily a matter of logic. The auditor, based on his review of each application, determines the time and other criteria involved in auditing around the computer—if this approach is, in fact, feasible. If auditing outside the computer is not feasible, of course, the question resolves itself.

If it is feasible to audit around the computer, the auditor should still consider the costs and effort needed to use the computer in his examination. The two ap-

proaches should be compared and the decision made in favor of quality and cost.

There will, of course, be places in which the comparison between external and computer auditing results in a tie. When this happens, it is preferable to decide in favor of the computer. This recommendation is based on the fact that the time has come when a premium is being placed upon EDP audit capabilities—just as management is placing a premium on investing in computer skills. Each unit of experience in EDP audit techniques adds measurably to the auditor's knowledge, and to his value as a professional operating in an increasingly EDP-oriented environment. It will become increasingly true that the more experience an auditor has with EDP techniques, the greater his personal and professional potential will be.

If, in fact, there is a tie, there is another reason for going through the computer. It is highly probable that next year it won't be a tie—and the auditor might as well stop avoiding the computer and begin using it. Any internal auditor in a company with significant applications on computer—or any external auditor with computer clients—who does not begin direct use of computers as soon as possible may well not be an auditor tomorrow.

Timing. Audit planning in an EDP environment also involves questions on how engagement activities are best performed. One such question deals with the timing of audit activities using computer files. Under manual accounting and auditing techniques, rigorous preplanning is not usually necessary. Documents are usually maintained in a form that meets traditional requirements for examination, before, at, or following year-end. If the auditor intends to use computer files, however, he now must conform to the operating and file-retention schedules of the installation. This is necessary because indefinite retention of computer files simply for audit is both a more explicit problem and a more costly function than maintaining paper records.

Thus, if an audit program establishes that a review should be performed on payroll records for July, and if this examination is to be performed with the aid of a computer, then it will probably be best to complete these audit activities in late July or early August. Otherwise, the auditor will have to make special provisions to have the appropriate records held beyond normal retention cycles. But, more typically, the auditor can and should conform his activities to that time when the EDP files he must examine exist and are normally available.

Location. Still another consideration that should guide the conduct of an audit lies in determining the locations at which examination activities should be performed. As computer systems become increasingly centralized and the location of processing and file custody shifts, the location of audit activities will be affected accordingly. The auditor should ask if changes in the application environment have led to changes in the location of the activities, documents, and files that he must examine.

In increasing numbers of cases, the auditor can anticipate that a major portion of his activities will shift from branch to central locations. In the past, branch audits were based upon the fact that the hard-copy records needed for the audit examination were maintained at decentralized locations—possibly *only* at decentralized locations. Thus, performance of an audit mandated field work at multiple locations.

However, under many centralized systems, remote or branch locations may serve only as data entry points, maintaining only authorizations for initiating computerized transactions. Any master files available at branches would be copies of data maintained centrally on the computer. Then only authorizations or physical assets critical to the performance of an audit need still be examined remotely.

It is possible to use the computer to apply additional, logical tests of records that go beyond the normal scope and capacity of visual scanning. The computer can also make the actual selection of input transactions to be checked back to initial authorizing documentation at branches. Where a computer system has been centralized, records covering a wide variety of locations can be tested at a central facility. In effect, the computer makes it possible to examine more records and locations centrally than would be feasible through field trips.

SEGMENTATION OF THE EDP AUDIT

In distinguishing between a logical and a technical approach to the audit of EDP systems, the auditor adopts techniques that call for segmenting his work into a series of manageable, possible steps. Separate consideration is given to the audit of:

- Applications
- The procedures within the computer installation itself
- System-development methods in use within the organization under audit.

Auditing Applications. The recommended approach to the audit of applications leans heavily toward a starting point using familiar, traditional audit techniques. In

the audit of applications, it is necessary to go only to a first, preliminary level of computer technology. Only limited technical training is necessary. This involves, generally, only a familiarity with data-processing terms and concepts and audit software.

In auditing applications, the auditor will begin to acquire a working understanding of terminology, concepts, equipment, software, and the environment involved in EDP systems. This gradually increasing familiarity will provide the basis for the next steps into the areas of computer-center operations and system development. The idea is for the auditor's awareness and appreciation of computer technology to be developed naturally, gradually, on the job.

Auditing Computer Centers. Under the segmented approach, the auditor builds on his experience with applications in developing a familiarity with computer centers. He gradually acquaints himself with such elements as:

- Data-control groups
- Library procedures
- Console operations
- Computer scheduling
- Production.

This process of transferring familiarity is not at all unusual for the professional auditor. A similar process takes place, for instance, when an auditor whose primary experience has been with manufacturing companies is assigned to an examination of a commercial bank. Terminologies and methodologies are strange. But his auditing experience, together with assignment under qualified supervision, gives him a basis of familiarity from which to expand.

The Auditor's Role in System Development. Participation in system-development activities follows naturally after experience with applications and computer-operations centers. By this time, the auditor is familiar with all the controls that should be incorporated in a viable system, with the needs of users, and with the relationships between user and EDP departments. The auditor has also familiarized himself with the standard documentation generated during system development.

With this background, the auditor can understand how quality and reliability are built into systems from their inception. He is able to take an active role in system projects, using his expertise to be sure that adequate controls are planned into applications during development. At this level, the auditor serves as a consultant, an important resource for a system-project team. Rather than being restricted to after-the-fact review, the auditor gains an opportunity to ensure that conrols and accountability are built into systems.

However, the auditor does not—and should not—assume any responsibility for the technical aspects of system development. Rather, he works on system projects in the capacity of a user and reviewer. The auditor's role is of special importance in this area since the prime objective of system development is to meet user needs. This is a sound process. It is healthy for users and EDP people alike to accustom themselves to thinking of the role of the auditor and the importance of accountability in systems being developed.

The auditor takes on some special responsibilities when he participates in system development. To the extent that the existing or proposed controls are not adequate, he must describe, clearly and logically, what features must be incorporated in a new system to meet the appropriate standards of:

- Control
- Quality
- Accountability.

The auditor must be able to describe these requirements so they are meaningful to and understood by systems analysts and EDP people, as well as user personnel. The auditor should seldom have to establish controls especially to meet audit requirements. Controls that meet user and EDP-operations standards should suffice for audit needs as well.

INTERRELATIONSHIP OF EDP AUDIT SEGMENTS

In the auditing of EDP systems, different relationships exist between learning and examination processes. In becoming familiar with audit procedures for EDP systems, the auditor's training and assignments will usually begin with control reviews of applications. Then, as he gains experience with applications, he will be assigned to review the EDP installation itself. Familiarity with the installation will then lead naturally to assignments associated with system development.

Within the structure of an actual audit engagement, however, work will tend to flow differently. During an audit, examination procedures should establish familiarity with controls and file-custody provisions within the EDP installation first. Then the auditor is in a position to identify which applications are being processed on computers, and which are sufficiently material to war-

rant audit attention. Thus, application reviews frequently follow reviews of the installation.

A review of the EDP installation also gives the auditor an opportunity to become familiar with overall procedures and plans. He understands what is happening currently and what changes are anticipated within the EDP department. This familiarity, in turn, provides a basis for audit reviews of controls within the system-development process in a company.

LEVELS OF AUDIT ACTIVITY

Within each of the three segments of EDP audits identified—applications, computer center operations, and system development—three different levels, or scopes, of audit concern can be identified:

- Controls
- Procedures adherence
- Operational auditing.

Audit techniques listed for the first two areas—control and procedures adherence—are closely akin to traditional tasks and methods with which most auditors are already familiar. In an EDP environment, the ease or difficulty of control and procedures-adherence audits relates directly to the degree to which system functions are covered explicitly in standards and documentation. The more rigorous the standards and documentation, the easier and faster it becomes for the auditor to identify and evaluate control points. Further, the better the standards and documentation, the more thorough a job the auditor can do in determining whether established procedures are being followed. Thus, the better the standards, the higher the quality of the audit.

In an EDP environment, the auditor must realize that, just as in the examination of traditional systems, he is responsible for understanding the basic purposes and results of the computer-center operations he is examining. He should hold himself responsible for continually seeking out new information sources and examination techniques.

The auditor can be expected to put his professional understanding and natural inquisitiveness together to play an active role in the area of operational auditing. This need holds particularly and increasingly true for internal auditors. In an EDP environment, the effective internal auditor acquires a scope that goes well beyond the limitations of the independent audit. If his function is used effectively, the internal auditor becomes a source of assurance that procedures and policies are continually evaluated, challenged, and improved.

IMPACT OF EDP ON AUDITORS

EDP will also have a significant effect on the professional makeup and the skills applied by the auditor. The traditional background and skills of the auditor will retain all of their conventional values and necessary roles. Impact areas and differences will lie primarily in added scope and skills.

For instance, the auditor associated with a company that makes significant use of computer systems should be expected to acquire a bilingual capability at a comprehension level. That is, he must be able to understand and interpret EDP terms and techniques for their audit significance. These necessary skills will be acquired over time by most auditors simply through the process of working and fulfilling their professional obligations in an EDP environment.

Increasingly, training programs conducted by specialized training organizations, accounting firms, the American Institute of Certified Public Accountants, and universities will also include content aimed at an indoctrination in business data-processing requirements and techniques. However, this will not change the native language or professional skills of the auditor. The auditor's continuing base will be in the area of accounting and management information—and its reliability.

The logical intent would be for all auditors engaged in an EDP environment to continue to direct their activities according to audit objectives, but to be able also to understand and apply computer terminology and techniques—normally and routinely.

While every auditor will not become an EDP technician, selected audit professionals will develop specialized skills in the EDP area. This is part of the same process which has seen individual auditors acquiring special skills in such areas as SEC filings, audit requirements of special industries, and so on.

EDP-Qualified College Graduates. Another impact of EDP on the practices of auditors will be felt through the background and skills brought into the profession by new college graduates. This is a still-developing factor in the auditing field. Through the sixties, most training in EDP skills offered by colleges was in the engineering or mathematical areas. The predominant programing language used in college courses was FORTRAN. This training provided little background applicable to the use of computers in accounting or auditing situations.

Increasingly, however, accounting graduates are coming out of colleges familiar with business data processing, with system-development concepts, with the use

of audit software, and with an understanding of the need for an application of controls within operational EDP systems processing financial data. Therefore, new college graduates can be expected to bring to the auditing profession greater understanding and application of EDP. College graduates entering the auditing profession with an EDP familiarity will be slow to adopt the detailed manual methods of traditional auditing. They will have an appreciation of the increased power and convenience inherent in performing audit functions on the computer.

These factors, inevitably, will create pressures on the generation of auditors who may be only slightly older than the college graduates launching their careers from a basis of EDP understanding. However, responsibility for the understanding and application of EDP techniques within the scope and objectives of an audit engagement lies with those responsible for these activities—supervisors, managers, and audit partners.

IMPACT ON TRAINING PROGRAMS

A final area of impact of EDP upon the auditor is in training. The auditor has a professional responsibility to maintain the current status of his knowledge and capabilities in matters relating to, among other subjects, the operation and understanding of information systems.

Where EDP is concerned, however, the need for training has an additional implication: The auditor who does not develop his EDP skills may find himself unable to give adequate consideration to new control problems or audit techniques if a company under examination is heavily computerized. Should this happen, the auditor would jeopardize his ability to meet his basic professional obligations.

Obviously, then, EDP understanding and the ability to apply EDP techniques to the performance of audit engagements have assumed the proportion of professional necessities for auditors.