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# Computer applications to accounting operation; Computer research studies, 3

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*Computer Applications to  
Accounting Operations*



PREPARED BY THE SYSTEM DEVELOPMENT CORPORATION  
FOR THE AMERICAN INSTITUTE OF CPAs

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## *Foreword*

In June 1965, the American Institute of Certified Public Accountants engaged the System Development Corporation, Santa Monica, California to undertake a six-month research program on the impact of computers on the public accounting profession.

Part of the program included the preparation of research studies. This booklet is the third in a series presenting the results of such studies.

The research studies were prepared by, and represent the findings and conclusions of, the System Development Corporation. Accordingly, they do not present the views or an official position of the American Institute of Certified Public Accountants. They are being published only for the information of the Institute membership.

JOHN L. CAREY  
*Executive Director*

March 1966

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## I.

### *Introduction*

This study is part of a series of documents exploring the impact of electronic data processing on the accounting profession. It deals specifically with the computer applications which have been developed for accounting operations. Although this paper is designed as an integral part of the over-all Computer Research and Education Program report, it can be considered independently as a source of information on accountant-oriented software.

## II.

### *Purpose of Study*

With the increased use of computers and electronic data processing techniques in areas of accounting and business operations, the need has arisen for a general description of the type of computer programs available and the functions they can perform for a CPA. Without this information a CPA must read and search through volumes of literature before he can obtain a well-rounded picture of the capabilities presently available.



## COMPUTER RESEARCH STUDIES

The data obtained from the AICPA 1965 EDP Survey indicated that almost 11 per cent of the responding firms sampled currently have a library of computer programs and that 28 per cent of the responding firms are planning to produce computer programs. The interest of CPA firms in computer software has been clearly established.

The primary emphasis of this study is on the descriptions of functions which are performed by computers, rather than the programs themselves. In an attempt to simplify the organization of the paper, the discussion of the results of the study is divided into two major areas:

The first is a general discussion of capabilities as they relate to types of accounting functions: basic accounting, taxes, auditing, and management services. Several accounting functions properly fall into more than one of these categories, and in most cases this is pointed out in the text. This is presented in Section V, Part A.

The second area discusses the sources of these capabilities and is subdivided accordingly: from a data processing agency, from computer manufacturers and user's groups, and through the programming efforts of the CPA or CPA firm. This is presented in Section V, Part B.

Supporting material from which much of this paper was drawn is found in the case studies which are in the Appendices.

### III.

#### *Procedure for the Study*

##### *A. Sources of Data*

Data was collected from four principal sources: CPA firms which use EDP, service agencies, computer manufacturers which

have libraries of accounting applications programs, and current literature on the subject.

### B. *Method of Data Collection*

The agencies interviewed were selected on the basis of their lengthy experience with EDP, the types of services produced, and accessibility from an interviewing standpoint. Since a limited number of sources could be examined for this study, no attempt could be made to select a statistically representative group. Rather, selections were made in an attempt to cover as many types and sources of capabilities as possible.

For each case study found in the Appendices, an informed representative of the agency was personally interviewed, and the written report of the firm's activities was later verified.

## IV.

### *Definition of Terms*

Part of the difficulty people have in understanding data processing stems from an unfamiliarity with computer jargon. The problem is heightened by the fact that several ambiguous terms are used to describe important areas of EDP. For these reasons a few terms and distinctions between terms will be explained.

#### A. *Hardware vs. Software*

The term hardware usually refers to a computer and its related equipment such as paper and magnetic tape units, punched card readers, on-line printers, and storage devices. Software, on the

other hand, is the converse of hardware. It refers to anything related to a computer that is not hardware (such as procedural documents, operating instructions, training and maintenance manuals), although it is more commonly used to mean computer programs.

## B. *Program vs. System*

In several contacts with CPAs, it was discovered that a wide range of definitions was being used for the word program. Some thought a program was the initial paperwork necessary to prepare a client's data for data processing operations. Others thought they were programming each time they sent a job to the computer to be operated. Although a universal definition is difficult, we can define a program as an ordered series of instructions, written in some language, which operates on a computer to perform a function. By this definition, preparing client data for a computer is more properly called preparation of data.

In general discussions of EDP, the terms program and system are often used interchangeably. A single definition of system is also difficult, but for the purpose of this study, it means the interaction of one or more programs and human actions which perform a function. Thus, a "payroll system" might consist of the manual preparation of weekly employee data, keypunching and verification of input cards, the operation of a program on a computer, and the utilization of the computer outputs such as paychecks. The "payroll program" is one component of this system.

On a higher level of data processing, "system" is used to refer to the complex interaction of several groups of programs which are relatively independent of manual operations once they are initiated. However, this definition is not applicable to the discussion in this paper.

## C. *EDP vs. EAM*

Electronic Data Processing (EDP) equipment is another name for a computer and its associated peripheral equipment, i.e., memory and processing units, printer, punched and magnetic

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tape devices, etc. Electronic Accounting Machines (EAM) refers to that set of punched card equipment which includes sorters, collators, and tabulators. The thing that distinguishes a computer from an accounting machine is that a program can be stored and operated by a computer. Accounting machines, on the other hand, have prewired programs or plug-boards which control their operation.

### D. *Computerized vs. Noncomputerized*

Throughout the discussion comparisons are made between the processing of data using a computer as opposed to processing in the "usual" method. The method usually employed by a firm is considered to be a noncomputerized system and can include any combination of the following:

1. Entirely manual calculations
2. Use of desk calculators
3. Use of larger EAM machines

A computerized system is one in which most of the processing of data is accomplished by a computer. Note that even the computer-based operation may require several hours of manual and EAM data preparation for every few minutes of computer processing. Nevertheless, a distinction is made between these two types of data processing through the use of words such as EAM vs. EDP, or nonautomated vs. automated systems.

### E. *Service Agency vs. CPA Firm Doing EDP on Referral*

The term *service agency* refers to the general category of organizations which perform one or more aspect of a data processing operation for a prearranged fee or time charge. The service may include the design of a complete data processing system, coding a program or the periodic operation of programs on their computers. A major portion of these agencies has a staff of systems analysts, programmers and salesmen in order to do business with any type of customer that needs their service: businessmen, engineers, accountants, managers, etc. These agencies are often large and well organized and may be affiliated with a computer manufacturer. Another category of agencies has de-

veloped through banks which have acquired EDP equipment and are using the computer time as a profitable additional source of income.

On the other hand, several CPA firms have acquired EDP equipment to serve their own clients as well as to make their capabilities available to other accountants on referral. Some of the services they provide may be similar to those of general service agencies but they are properly considered as a unique and separate kind of operation.

### F. CPAs, Clients, and Service Agencies

There are several different kinds of relationships that exist among CPAs, their clients, and service agencies:

1. The CPA may use an agency to process data which he collects from his client. The agency would then return its processed output to the CPA who, in turn, presents it to his client. See Figure 1.
2. The CPA may make arrangements for an agency to perform a service for his client. Once having arranged the service, data collected by the CPA may go directly to the agency which, in turn, sends its processed outputs directly to the client. See Figure 2.
3. The CPA may be performing write-up or management services for a client who uses a service agency for payroll, inventories, or other functions. In this case the client receives data from the service agency and passes it on to the CPA so that he can perform his analysis of the data. See Figure 3.
4. In an audit situation, a CPA may have a client who uses a service agency for several of its business operations. In order to audit this client, the CPA may find it necessary to check both his client's data and procedures and also those of the agency. See Figure 4.

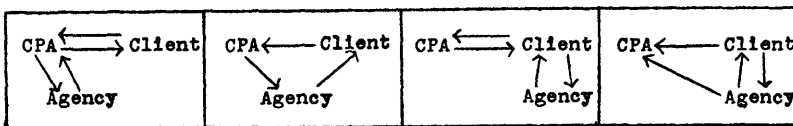


Figure 1

Figure 2

Figure 3

Figure 4

## V.

*Results of the Study*

The findings and conclusions which resulted from the study are presented in this section. Part A discusses the areas where EDP has been applied, and Part B describes the sources of the EDP capabilities.

*A. Accounting Areas Where EDP Procedures Have Been Applied*

Representatives of computer manufacturing firms and service agencies readily admit that they have been trying to get more EDP clients from the small businesses in the country. The large corporations have generally recognized the advantages and capabilities of computers, but the small firms still represent a large untapped market for EDP services. Since most EDP equipment is still far too expensive for these smaller firms, relatively inexpensive preprogrammed services have found some success in attracting these low-budget customers. The computer industry recognizes that the CPA, as an important advisor to businessmen, must be sold on the use of EDP techniques. For this reason, several accountant-oriented services have come into existence, and CPAs are being urged by the computer industry to learn more about EDP. The degree to which CPAs working in different areas of accounting have thus far involved themselves with EDP is briefly discussed.

*1. Basic Accounting Work*

Many data processing services have been offered to CPAs in the area of basic accounting (commonly referred to as write-up work). These have become available primarily through service agencies. Functions such as: (1) recording transactions and events, (2) posting of journal entries, (3) preparation of financial statements, (4) purchase and sales records, (5) accounts receivable, and (6) departmental

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accounting are all available as computerized systems and use of these systems is gaining in popularity among accountants. These EDP functions are basically the same as those performed manually by CPAs and their staffs.

It is often difficult to make a clear distinction between basic accounting work and management services performed through the use of EDP. The reason for this lies in the fact that once a set of data has been organized and stored for one purpose, the same data can be very easily reassembled for other uses by a computer program. This capability of retrieving and organizing information can be a valuable aid to management. This capability has already been used to expand the basic accounting function, since it provides an excellent base from which detailed studies can be made of a client's business operation. Many CPAs feel that, at this point, write-up work ends and management services begin.

### 2. *Tax Work*

There are two general areas of tax work to which EDP has been applied.

The first is in the calculation and printing of income tax returns. Like the basic accounting functions, tax return preparation using an EDP service does not do anything more than is presently performed manually through the diligent and time-consuming efforts of a CPA and his staff. Entries on the return which require judicious decisions, such as depreciation, are not generally calculated by EDP systems but are left for the accountant to decide. Also, some special types of tax forms may not be handled at all. In spite of these limitations, a large percentage of the returns handled by accountants can be computer processed.

A second area where EDP is assisting accountants in tax work is in the preparation of analyses and comparisons for tax administration. This is usually considered to be similar to an Internal Revenue Service review. The computer is used to assist the tax analyst in the examination and comparison of present data with past tax returns.

### 3. *Auditing*

If a CPA's client does not use EDP to process and maintain his financial data, the CPA will probably not use EDP to

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audit his books. However, if a client does maintain an automated system, auditors have sometimes found it advantageous to employ some kind of EDP procedure to trace individual items in the records and to check the entire processing system. There seem to be many different views on the degree to which a CPA must use EDP to audit EDP. However, one point is becoming increasingly clear: Where a client's data is maintained on EDP equipment, the audit can be made more effectively and easily if the auditor has a general knowledge of data processing as well as specific information about a client's installation and operation.

There are four basic approaches to auditing a client's data when he has an EDP installation. These approaches are listed below in the order of increasing EDP knowledgeability on the part of the auditor. They also reflect an increasing degree of independence of the auditor from the client's system. Just as is necessary for the auditing of a conventional client, all of these approaches may also require the checking of the client's operating procedures, separation of duties, internal and external controls, and the competence of personnel.

The general approaches to auditing EDP are:

- a. Conventional audit trail procedures using printed listings produced by the computer
- b. Use of test data having predetermined solutions to check the output of a client's computer programs
- c. Modification of the client's computer program to assist the auditor
- d. Writing of original computer programs to assist the auditor

Using a computer program to perform selected auditing procedures can significantly reduce the time it takes to perform the audit and increase its effectiveness as well. However, the preparation and maintenance of computer programs do take some time. Writing original audit programs also gives the auditor the opportunity to check what, in his opinion, the system should do, rather than what it does.

In some ways, auditing EDP presents new problems. Many business firms having a computer installation maintain a



sizeable staff of systems analysts, computer programmers, and computer operators; these firms may possess magnetic tape libraries which contain not only the records of the company's finances, inventory, personnel, and payroll but also the programs which process these tapes on the computer; they have procedures which regulate all of the functions performed in the computer facility; and finally, they have an organization in which the responsibilities of each member of the computer installation are managed. How does an auditor approach this situation where a group of programmers (who may know next to nothing about accounting) are responsible for writing and maintaining the programs whose operation he must audit? The specifications for programs may be written by a systems analyst in language understandable to the auditor, but the program will necessarily be written in a computer language which may not be readily understood by a CPA.

4. *Management Services*

The application of EDP to management services has both improved and expanded the kind of service provided by CPAs to their clients. Several of these services are briefly discussed.

- a. As was pointed out earlier, what was previously a simple write-up account for a CPA can become an important advisory assignment for him if the client's data is processed through a service agency. As in most types of management service functions, the identification of areas requiring investigation, the interpretation of data, and the giving of advice to the client are all the responsibility of the CPA and generally cannot be automated. However, if the CPA sees a need for detailed analyses of costs, market activities, production, sales, inventory, or any other aspect of the client's business operations, he will find that the use of EDP will greatly assist him in his work.
- b. A very wide area of service which the CPA provides is in evaluating and improving his client's accounting and business operations. The CPA's knowledge of EDP applications to business is a vital part of this service. There is almost no limit to the possible applications of EDP

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to the business world. Literally hundreds of general headings are listed in literature and include such functions as:

- (1) Payroll preparation and distribution timekeeping
- (2) Personnel record keeping
- (3) Inventory and stock purchase control
- (4) Production control and scheduling
- (5) Sales analysis
- (6) Construction or general work scheduling using a PERT or critical path network
- (7) Cost and general accounting

In all of these functions, the application of computers can result in significant improvements. The advantages, cost, and complexity of each application can be difficult for a businessman to identify and he is looking more and more to his accountant for advice.

- c. In addition to applications of EDP to business, clients are also looking to their CPA for advice on which make, model, and size computer best fits their needs, whether to buy or rent a computer, and whether to use a service agency or develop their own EDP capability. These questions are not unreasonable, and the CPA should either have the answers or know where to get them.
- d. A different level of service than those just mentioned is that of operations research. This is a relatively new field which uses mathematical tools to assist management in making decisions which involve more factors than can be dealt with through normal human reasoning. Although usually considered a capability offered only by the larger CPA firms, its use can have a great impact on the operation of almost any size business enterprise and should not be discounted by CPAs.

### *B. How to Get a Data Processing Capability*

The following is an analysis of the experiences of several CPA firms which have grappled with EDP. Their experiences, along with information obtained from hardware manufacturers and service agencies, form a reasonably accurate picture of how ac-

accountants have found their way in the EDP software market. It should be noted that, in the discussion that follows, there is no direct mention of "how a CPA gets an EDP consultant capability." Obviously, to perform a role as an EDP consultant, an accountant requires depth in data processing that comes only with training and experience. Many of the firms which have become knowledgeable in the area have done so entirely by their own experience since they did not have access to the experience of other accountants in the field.

The following sections discuss several functions performed on EDP, some of which are not necessarily used by accountants directly but rather by their clients (such as a payroll system or a critical path scheduling program). Knowing that these programs exist, their advantages and disadvantages, their benefits and costs, are all part of the knowledge possessed by EDP consultants. It is for this purpose that much of this information is included.

### 1. *Available Through Service Agencies*

For the accounting firm which has had little or no contact with EDP, the capabilities offered by a service agency are often a good starting point. The purpose of such service agencies is to provide a capability to its customers, either by designing and developing a special program or by making one available which it already has in its program library. Most agencies provide both types of service. The simpler or more standardized a capability is, the more it is likely that an agency has it in its library. Standardized programs which handle accounts receivable, for example, have been written and are available from several agencies. On the other hand, several specialized accounts receivable programs have been written to meet a particular client's needs. The cost of the specialized programs will no doubt reflect the additional design, programming, and testing effort which went into its development.

Another difference to be noted among service agencies is that some are managed by men with an accounting background. This can result in easier communication with computer personnel and a better understanding of the accountant's needs, with the net result of more effective and meaningful service. Some CPAs prefer dealing with accountant-oriented service agencies, feeling they may thus reduce the possibility of compromising their client's data security.

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### a. *Functions Performed*

Depending on the agency contacted, the kind of service available ranges from preprogrammed basic accounting functions all the way to a complete business processing system tailor-made to specifications. The following types of generalized, preprogrammed functions are available from service agencies:

- (1) Preparation of financial statements on a monthly, quarterly, or other periodic basis. This is a basic service offered directly to CPAs which could involve the following: For each of his clients whose data he processes through the agency, the CPA prepares a chart of accounts. Then, periodically, he gathers his client's data and transfers it to punched paper tape which he checks and then sends to the agency for processing. By return mail he receives a computer-produced balance sheet, income statement, and associated ledgers and journals which have been automatically posted. Some variations and additions to this capability might include:
  - (a) A reduced (and therefore cheaper) version for the CPA's smaller clients
  - (b) A version for larger clients who have a bookkeeper capable of completing journals
  - (c) A version which handles a once-a-year client to assist in his tax preparation
  - (d) A version which prepares comparative statements
  - (e) Provision for handling subsidiary ledgers
  - (f) Maintenance of accounts receivable ledger
- (2) A payroll system giving details and summaries by employee as well as tax information
- (3) Cost, sales, and budget analysis programs
- (4) Special industry accounting packages which are bookkeeping systems oriented to particular types of business
- (5) Preparation of income tax returns

Since the features included in these preprogrammed capabilities are limited to those most often requested, special problems and more sophisticated operations are necessarily omitted. To a firm which needs these features,

custom-designed versions of the above programs can be well worth the additional cost.

There are several other functions provided by service agencies which are not generally available except as custom-designed programs for a particular client and are, by and large, management service functions. Some examples of such functions might include:

- (1) Inventory and purchase management
- (2) Forecasting of sales, inventory, or production
- (3) File maintenance
- (4) Market analysis

**b. Cost**

The cost of using service agencies varies considerably. Preprogrammed functions are relatively inexpensive to use, since their developmental costs are usually spread over several users. The charge to a CPA is usually determined by a fixed price for a given function. Additional charges are usually necessary for setting up a new client, using optional features, or for a large volume of data. Generally, CPAs have offset the cost of using a service agency by reducing their clerical staff, using the time saved to provide clients with more services, or by getting more clients. The use of such service frequently requires that the CPA also rent or purchase some kind of punched paper tape or punched card equipment.

**c. Advantages**

- (1) The use of service agencies can relieve the staff of a CPA firm of many time-consuming calculations.
- (2) The use of an agency may enable the CPA's staff to present detailed information breakdowns of a client's data which are often far too laborious and costly to perform in the usual manner.
- (3) With the exception of possibly acquiring one small piece of equipment, there is usually little investment required other than the time it takes to learn the necessary operations.
- (4) If the service is found to be uneconomical, equipment rentals can be terminated and the previous client-handling procedures can be resumed. (Agencies frequently recommend that the original method

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of handling a client should be maintained in parallel with the EDP system for a short time until initial skepticism and misunderstanding are overcome.)

- (5) As a rule, service agencies provide a CPA with an EDP capability at a relatively low cost as compared with what he might pay to develop the same capability himself.
- (6) They allow the CPA to become acquainted with data processing with a minimum commitment on his part. There is also no need for the CPA to invest in expensive equipment, to acquire and train personnel or to wait a long time before obtaining benefits.
- (7) Most service agency procedures for handling the data of a CPA's client identify the client only by a code number in order to maintain the security of the data.
- (8) Serving a CPA's client through an agency can lead to an expansion of the services provided by the CPA to his clients.
- (9) CPA use of service agencies has been favorably accepted by the CPA's clients.

### d. *Disadvantages*

- (1) Use of a service agency introduces a third party into the CPA's dealings with his client. This may have the following disadvantages:
  - (a) In some cases clients of the CPA submit or receive data directly through the agency. This may run counter to what the accountant feels is a desirable relationship to maintain with his client.
  - (b) Records are usually maintained by the service agency which represent a cumulative history of a client's data. These are used to prepare comparative financial statements, to perform tax analyses, or any of several other management services. Unless duplicate records are maintained by the CPA, he must rely on the agency for proper maintenance and protection of this valuable data.
  - (c) The fact that a client's data is in the hands of a

third party may be considered a violation of the CPA's code of ethics.

- (d) Unless checks are made on the completeness and accuracy of the outputs produced by the agencies, the CPA may not have the personal assurance he gets when the work is done in his own office by his staff.
- (2) Computers do make mistakes, and when they do, it may be difficult to detect and correct them unless adequate checks and procedures are established to cope with them. For this reason, the CPA must perform his own checks on the data he submits and gets back from an agency. Furthermore, he should scrutinize, understand, and evaluate the internal checks of the agency, since much of their "automated" processing involves manual data preparation not unlike that of a CPA's own operations.
- (3) An additional cost is incurred by the CPA in order to deal with a service agency. In the case of relatively simple preprogrammed functions, the agency charges can be accurately estimated. However, for custom-designed programs, the cost of development and operation of a special computer application may be underestimated at the start and increase unexpectedly. Programmers very often underestimate the time it takes to write and test a program.
- (4) Another factor in relation to cost is that the price an agency places on the development of the exact program specified by the CPA may be uneconomical. The CPA then has to choose between a different (perhaps noncomputerized) solution to the problem or to compromise some of the requirements in order to simplify (and thus reduce the cost) of the desired computer program.
- (5) A final point can be taken in either of two ways. The use of a service agency demands several rigid steps in the preparation and organization of data. This is undesirable to the CPA when he wants to make changes, corrections, or special considerations for a particular client. On the other hand, it introduces an element of organization which can be an aid to a CPA's internal operation.

2. *Available from a Hardware Manufacturer and User's Group*

The acquisition of programs directly from a hardware manufacturer presupposes a very important step on the part of the CPA; that is, the purchase or rental of the hardware itself. Once the equipment is obtained, the manufacturers provide varying degrees of assistance to the customer in the form of technical advice and programs. There are two broad categories of programs which may be available from the manufacturers: programs which were developed internally by the manufacturer and those which were written by other customers who have made the programs available to the manufacturer for use by other customers.

Another source of programs is through user's groups. These organizations, which are composed of individuals and firms who own or rent a particular make and model of computer, coordinate the exchange of programs and systems information among its members. Their purpose is to reduce redundant programming effort, and they often have a sizeable library of programs.

a. *Functions Performed*

All computer manufacturers provide their customers with some basic language processor and utility programs which are usually considered to be an integral part of the data processing installation. The language processors are used to convert programs written in some higher order language (such as Autocoder, COBOL, or FORTRAN) into instructions which are recognizable to the computer. The utility programs, on the other hand, provide several basic tools which are necessary to run a computer installation. Some examples are:

- (1) Diagnostic computer-tested programs
- (2) Report generators
- (3) Sort and merge programs
- (4) Magnetic tape copying programs
- (5) Memory print programs

Without these two groups of programs, it would indeed be difficult to get started on a computer.

Also available from manufacturers are many programs which are written for specific applications. The applications will of course vary from one computer to another,



but the following list gives a few examples which might be of interest to an accountant:

- (1) Inventory management programs
- (2) Retail accounts receivable systems
- (3) Proof and analysis programs for banks

The sales representative of any of the manufacturers will gladly provide a complete description of any programs which are available from his firm.

The programs that are available from user's groups are similar to those described above. However, they tend to apply more to scientific problems rather than to business applications. This is also true for programs supplied by the manufacturers. The manufacturer's sales representative is also a good source of information about user's groups.

b. *Cost*

Without exception, programs provided by manufacturers and user's groups are available without additional charge: the cost of their production is included in the hardware rental or other costs. Literature describing the programs is available and updated regularly. Procedures for obtaining programs usually involve no more than supplying the necessary magnetic tapes onto which they copy the program. Program card decks, user instruction manuals, and listings are also provided gratis.

c. *Advantages*

- (1) Programs available from manufacturers and user's groups provide the user with an operating system of programs and useful applications which are already tested and ready for use. Thus, the cost of development, coding, testing, and machine time are avoided.
- (2) Most manufacturers make every effort to provide complete and accurate documentation of their programs. This important component of program operation is often neglected, causing unnecessary confusion and waste of time by the user. Documentation, along with adequate maintenance of the program, is a vital consideration in evaluating the programs available from a manufacturer.
- (3) When properly written and documented, these pro-

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grams can form a useful point of departure for modification by a CPA's programming staff. A large number of these "programs" are more correctly called "subroutines" which are components of a program designed to perform specific technical calculations such as:

- (a) Solve a set of simultaneous linear equations
- (b) Calculate a trigonometric function
- (c) Sort a set of numbers
- (d) Perform an integration
- (e) Select a set of random numbers

Although most of these subroutines are mathematical, they are often applicable to business and accounting work and can be easily incorporated within a larger program.

- (4) These programs from manufacturers and users' groups often contain several modifications and practical improvements, since they are used over and over again for many different applications.

### d. *Disadvantages*

- (1) Programs from both manufacturers and users' groups are usually not generalized, but are designed for very specific applications which do not necessarily fit direct needs.
- (2) Since the CPA user has played no part in the development of these programs, they may have any of the following deficiencies:
  - (a) Poorly written
  - (b) Designed for a particular configuration of equipment which a CPA firm may not possess
  - (c) Uneconomical to operate
  - (d) May not be thoroughly checked out

### 3. *Produced by the CPA Himself*

A CPA firm which produces its own programs does not necessarily have its own computers. Several CPA firms use their client's computers: others rent computers from service agencies. Many business firms which own computers rent their machines to other firms when not in use, and service agencies and manufacturers welcome any user who wants to rent

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“time” on any of their machines. Note that renting time requires the user to pay only a fixed fee per unit of time. He is not concerned with the complexities of computer rental (from the manufacturer), maintenance, malfunctions, plant facilities, and all the other problems associated with having an “in-house” computer.

Regardless of the source or location of the computer, CPAs have taken significant steps in the production of their own computer programs.

### a. *Functions Performed*

Naturally, the programs produced by CPA firms will vary from one firm to the next. Some CPAs try to produce generalized programs which can be used, perhaps with some minor modifications, for more than one client and thus reduce the total developmental costs. Most CPA firms have found this relatively difficult to do and tend more towards some degree of customization of programs for each client. This attitude of the CPA contrasts with that of the service agencies where programs are designed more for general marketability rather than for specific client needs.

- (1) There is some similarity among the computer applications produced for clients by CPA firms which write their own programs. The following list contains some of those which are more common:
  - (a) Preparation of financial statements, general ledgers, and associated reports
  - (b) Budget and sales analysis
  - (c) General payroll management and check preparation
  - (d) Personnel analysis
  - (e) Accounts receivable and payable
  - (f) Job cost calculations
  - (g) Inventory control
  - (h) Income tax analysis and form preparation
  - (i) Production control
  - (j) Check or sales register

It should be emphasized that these functions may require the writing of a separate program for each client, since one client's needs are usually different

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from those of other clients. Thus, a CPA firm might have ten different payroll programs for ten clients. The differences between these programs and the cost of their development will depend greatly on the degree of experience and internal organization of the CPA's staff.

- (2) Several programs have been written by CPA firms to assist in their own internal operations. The following are some examples:
  - (a) Client billing program
  - (b) Analysis of client accounts
  - (c) Summary of client use of computer time
  - (d) Payroll preparation
- (3) The CPA firm auditing a business which uses EDP equipment may find it advantageous, or perhaps necessary, to write programs to assist in the audit. If this is so, his program will probably operate on the client's own equipment. This may place an additional burden on the auditing staff. They will have to become familiar with several different makes and models of computers as well as different programming languages. This may sound like an impossible task for an auditing firm to undertake. However, in most cases the job is entirely feasible, especially if programs are written by the management services staff or with the assistance of client personnel.

A firm which performs audits does not suddenly find itself with several clients who have elaborate and different computer equipment. Sometimes the client considers the acquisition of equipment in consultation with his accountant. The auditor then follows and contributes to the orderly development of the system. He also learns to cope with the new problems he encounters with new techniques, not the least of which is writing and operating programs. Another factor which may simplify matters for the auditor is that most (but not all) of the business applications using EDP operate on relatively small or medium-sized computers. This has reduced the number of different computer models with which the CPA has had to deal.

Programs which are written or modified by CPAs for audit work tend to be more variable (and therefore less generalized) than for any of the other areas of accounting. At times the auditor will wish to simulate a function performed by his client on the computer. He may obtain a copy of the original program and revise it so that he can use it for an audit program. This kind of operation obviously cannot lead to generalization. No service agency has developed or to our knowledge is even considering a generalized program or program system for auditing. One firm's library of audit programs may be considerably different from that of any other firm. In addition, since businesses are far from having uniform data processing systems, almost every program that the audit staff writes must be custom made for each client. The following are examples of some general audit functions which have been programmed:

- (a) Random sampling and selection of items for audit examination
- (b) Checking of a client's materials and supplied transactions which are over a specific amount
- (c) Processing of client's operating expense data to calculate and compare monthly variations
- (d) Checking client's method of distributing labor, transportation, and other costs to various accounts
- (e) Checking a client's postings
- (f) Retrieving and printing data from client's punched card or magnetic tape files
- (g) Processing of client's monthly general ledger transactions

b. *Cost*

Just as the programming functions performed for general accounting and management services differ from those performed for auditing, the cost considerations are also different and are considered separately.

- (1) To a CPA the initial cost of getting a programming capability will necessarily be high. He must get adequate knowledge of data processing, the personnel

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who can design and write programs, and if he acquires a computer, all of the associated space, maintenance, and other operating needs. In addition, he must also have clients who need and want EDP assistance. The CPA firm which performs an accounting function directly for a client can charge a fee for the development and programming of a capability as well as the periodic use of the resulting programs. Estimates of the development cost of specialized programs were hard to get, but one CPA firm having a computer gave a range of from \$500 to \$3,000 for the production of one simple program.

- (2) CPA firms which audit the data of EDP clients have been most interested in the saving of audit time and the ability to do a better audit which may result from the use of computer programs. Usually, the decision to write an audit program is left entirely up to the CPA, with no pressure from the client. Rather, an auditor must decide whether the use of a computer can either save him time which he can then translate into a cost reduction or whether the usual way of performing the audit has shortcomings which can be overcome by some programming technique. In both cases the decision is made by the auditor for each of his clients.

### c. *Advantages*

The CPA firm which can do its own programming has several significant advantages:

- (1) The ability to develop computer programs is a valuable asset. In the years to come more and more businesses will use EDP equipment. Even the smallest firms which cannot afford to own or rent computers will be offered low-priced electronic data processing capabilities from the rapidly expanding service agencies. The CPA firm which is familiar with data processing will know how to advise and assist his clients when they begin to consider EDP.
- (2) Once a data processing staff has been acquired, the CPA firm is then capable of handling a much greater volume of work.
- (3) New programs can be written and modifications

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made to existing programs to suit individual client needs.

- (4) The CPA should have less of a problem communicating his needs to programmers and other EDP personnel, since they will be under his own supervision.
- (5) There will be no problem of client data security, since all data will be kept and maintained by the CPA.
- (6) Programs written by clients and manufacturers can be examined and evaluated by the CPA's own programming staff. This will tend to reduce the aura of the "giant brain" which has surrounded computers.

### d. *Disadvantages*

- (1) The relatively high costs of program design, coding, testing, and documenting will be incurred. How well and efficiently this is done will depend primarily on the quality and experience of personnel and how the CPA manages his computer operations.
- (2) If a computer is acquired, a whole range of new equipment-oriented problems and expenses will be encountered for:
  - (a) The setting up and maintenance of the facilities for housing and operating the equipment
  - (b) The volume of listing paper, magnetic tapes, and punched cards necessary as well as space for their storage
  - (c) The inefficient use of the computer's capabilities due to lack of knowledge or resistance to change on the part of the staff
  - (d) Idle time when the computer is not being used
  - (e) Investment in a plant which cannot be easily liquidated if the computer operation is found to be uneconomical
- (3) Serving clients on the CPA's own data processing equipment may conflict with certain aspects of the CPA Code of Professional Ethics.

### e. *Other Factors*

Programming languages can make the programmer's job much simpler or infinitely more difficult. Each computer

performs its functions using a set of basic machine instructions which are unique for every machine. A second level of languages exists which uses symbolic representations of the machine instructions. Most programs written by accountants are written in this level of language. There are still "higher order" languages which have been developed which resemble English language statements or mathematical formulas: FORTRAN and COBOL are examples. These languages have the additional advantage that they can be used with several different makes and models of computers. This eliminates the problem of having to learn several different programming languages. The use of these languages will no doubt enhance the use of computers by CPAs.

## VI.

### *Summary and Recommendations*

#### *A. The Present Use of EDP*

Throughout the course of this study, one basic fact was quite evident: A significant number of accounting functions being performed on EDP are basically no different from those functions that are currently performed manually by many a CPA and his staff. In other words, the computer has been regarded primarily as a means of speeding up the paper-handling process and reducing clerical costs. It performs a job faster, more accurately, and with fewer people. However, computer technology has already developed to the point where the functions that a computer can perform far exceed our ability to use them. The most significant need now is for the accounting profession to utilize EDP techniques and equipment for accounting functions which have not previously been practical.



## B. *The Trends*

If we must learn to crawl before we can walk, then the trends in the use of EDP applications look promising. All of the CPAs who were interviewed during the study were enthusiastic about their involvement with EDP. Those CPA firms which have acquired computers are planning to expand their facilities and to acquire newer equipment; those firms which have a programming staff are planning to enlarge their staff and to develop more programs; and the CPA firms which deal with service agencies are using more and more of the available capabilities for their clients. Service agencies and computer manufacturers are developing new programs for accounting applications and are setting up communication networks which will make more powerful computers available to small business throughout the country at very low cost.

This trend towards expansion of capabilities will increase as a greater number of CPAs become aware of the benefits of EDP.

## C. *Problem Areas*

Once the CPA does enter the area of EDP, he faces new problems which cannot be handled by previous techniques and rules of behavior. Some of these issues are currently plaguing the entire computer industry. Several CPA firms have not found satisfactory answers to problems such as:

1. The adequacy of traditional techniques when auditing a client who uses EDP.
2. The maintenance of client data security when using service agencies.
3. The question of ethics (particularly in the area of independence) when a CPA provides EDP services to clients.
4. The protection of a CPA firm's investment in a computer program which can be copied or stolen outright. A service agency may charge one client for the developmental cost of a unique program. Does this program (and the ideas and innovations which are incorporated within the program) now belong to the client? If so, what right does the service agency have to sell either the program or a modified version to another client?

5. The protection and control of programs and records within the EDP facility itself. What protection is there against a member of the EDP staff making modifications to magnetic tapes which contain records of his own earnings, or his department's accomplishments? Can such changes be detected by an auditor? What if this same person has access to the audit programs?
6. How can the CPA justify to his client the cost of acquiring or using EDP equipment?

Certainly the accounting profession cannot afford to ignore problems such as these, since CPAs are already encountering them in their work. The use of EDP by accountants can present almost unbelievable opportunities; however, there are some undeniable hazards.

#### *D. Recommendations*

In order to give guidance and assistance to members of the CPA profession in their dealings with EDP applications, the following recommendations are made:

1. The Institute should initiate studies designed to resolve the important problems that are currently faced by CPAs in their use of EDP applications.
2. The Institute should continue to encourage the professional development of the CPA practitioners as it relates to the utilization of EDP applications. This can be done by sponsoring more conferences and discussions among CPAs and by providing better means of exchanging experiences CPAs have had with EDP.

Conferences should be designed to bring accountants and EDP specialists together to study the problems of applying EDP to accounting and to provide opportunities for each of these groups to become more closely involved in each other's work.

There is a growing need for a "literature of experience" providing blow-by-blow accounts of how forward-looking CPA firms have resolved their difficulties in setting up and using automated information processing systems. Success stories alone are not enough. Unfortunately, it has always been diffi-

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cult to ferret out information about potentially useful ventures which have not succeeded.

- 3. The Institute should study those areas of accounting in which the use of computers can extend the CPAs' powers of analysis beyond their present limitations as, for example, the application of operations research techniques to complex business problems. It is in these areas that farsighted CPAs are focusing their attention.**

## ***Appendix 1***

### ***Case Study—CPA Firm A***

#### **I.**

#### ***Description of Firm A***

Firm A is located in northern New Jersey. It owns no computer; however, it serves between 25 and 30 clients using a service agency and for this purpose owns a punch tape adding machine. Firm A has two CPAs and three staff accountants. The three staff members use the service agency basically for write-up work.

Although all of their EDP work is done through the agency, Firm A is using only those programs involving accounting functions.

#### **II.**

#### ***Motivation for Using EDP***

Three years ago Firm A was approached by other CPA firms in an effort to start a service agency or EDP cooperative. Firm A decided

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not to join but got in touch with another CPA firm which was already using an EDP system. This other CPA firm was using a service agency and was very satisfied with this service. One staff member of Firm A tried putting his own clients on EDP through the service agency and was very successful. Firm A then decided to establish direct contact with the agency and since that time has been very satisfied with the service.

Firm A had some contact with hardware manufacturers, but due to a lack of information and follow-up from the manufacturers, Firm A lost contact.

### III.

#### *EDP Functions Used by Firm A*

The following accounting documents are prepared using the service agency:

1. Cash receipts journal
2. Cash disbursement journal
3. Sales distribution
4. Purchases
5. General ledger
6. Profit and loss statement containing year to date totals and current balance
7. Balance sheet statements containing year to date totals and net change if desired
8. Departmentalized listings
9. One-time numerical analyses for year end tax clients
10. Ten-column journal for cash receipts and disbursements

Accounts receivable aging schedules are done manually by the firm although the agency provides this service.

## IV.

### *Benefits from EDP*

- A. Firm A has found that using the service agency saves about 50 per cent of its manual account processing time. An average account would take approximately seven or eight hours to process manually each month. Using the agency, the manual work is cut to four hours. When this time is equated to manpower costs, there seems to be a 25 to 30 per cent saving. The cost of having the required processing and printing of journals by the agency is about \$13 for a typical client on the custom program, and about \$5 on the small client program for one month's processing. Firm A gets approximately two- or three-day responses on the data they send to the agency.
  
- B. In the noncomputerized system, when all of the data for a client's weekly or monthly account is gathered, the staff of Firm A must still do all the calculations and computations in order to prepare the reports necessary to complete the job. Sometimes they collect the data and postpone the calculations until they have more time. This does not happen when Firm A is using the service agency, since once the data is collected in the proper form, it is sent directly to the agency, and the computer does all of the calculations.
  
- C. At the end of each year, it is no longer necessary to manually close out a ledger or reopen a new one. The data processing facility handles this automatically.
  
- D. Internal Revenue people have examined some of the statements prepared by the agency and are very pleased with the system.

V.

*Other Comments*

- A. Since Firm A puts all of its write-up clients on the EDP system, clients are not asked whether or not they want to be on the system. If a client wants statements which are different from those provided by the service, Firm A would prepare a typewritten statement in the required format. However, Firm A has not received any complaints from its clients about the statements printed by the computer.
  
- B. Firm A plans to get comparative analyses of sales and accounts receivable, and also plans to do job costing, sales analysis, and payroll, all of which are currently available from the agency. A further function of the agency which Firm A will use is a program which will assist in the preparation of tax returns. This program is not currently available but should be soon. Since a great deal of the data for a client currently exists at the agency facility, very little extra effort would have to be expended to use the program.
  
- C. A different tax preparation service (for individual returns) has been investigated by Firm A and has been found to be too expensive and to provide very little service. It would still be necessary to prepare estimated income forms. Firm A feels that the data required for input to this service is no easier than to fill out the income tax form directly.
  
- D. Firm A has only been using the service agency since late last year and the programs available from the service bureau have apparently been very thoroughly checked out. Few errors in the programming have been encountered. However, on the one occasion when there seemed to be an error of this sort, the agency immediately made corrections and resubmitted the entire job in one day. Errors which are made by Firm A also get prompt action. They are charged a nominal fee for correcting errors which are detected after the data has been processed. The agency's programs also contain procedures designed to catch illogical combinations of data.

## ***Appendix 2***

### ***Case Study—CPA Firm B***

#### **I.**

#### ***Description of Firm B***

CPA Firm B is located in northern New Jersey. It consists of six partners who are CPAs, 18 staff members who do audit work, and five girls performing clerical duties. Firm B does some write-up work but primarily performs management services and auditing. Firm B employs no programmers and possesses no internal program library.

#### **II.**

#### ***Motivation for Involvement in EDP***

About four years ago, Firm B found that some of its clients had reached a volume of accounting, payroll, and recordkeeping activity



which could best be handled on some kind of electronic data processing equipment. However, the clients couldn't afford their own equipment. In finding solutions to this sort of problem, Firm B began its involvement in several aspects of data processing with the result that:

1. A small accounting machine was purchased.
2. Two of the partners became familiar with EDP.
3. The firm began using a service agency and later contacted another CPA firm which owns a computer and does EDP work on referral.
4. Extensive use was made of EDP techniques for both internal operations (for Firm B) and external (client) services.

### III.

#### *EDP Functions Used by Firm B*

There are five broad categories of work in which Firm B is involved with EDP equipment:

1. *General business analysis, management services, and write-up work* using a service agency. Firm B has been very happy with this service during the past four years. Firm B expends from \$800 to \$900 a month with the service agency in performing the following functions:
  - a. Preparation of general ledgers and financial statements
  - b. Use of the one-time numeric program to obtain once-a-year reports
  - c. Handling of accounts receivable
  - d. Calculation of job costs for contractors

Firm B may use the service agency's payroll service to replace its own noncomputerized client payroll operation

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2. *Use of Firm B's own small accounting machine* for the following functions:
  - a. Payroll for accounting clients as well as for some nonaccounting customers
  - b. Inventory recordkeeping
  - c. Municipal tax billings
  - d. Handling of accounts payable vouchers
  
3. *Consulting service for customers* who are not familiar with EDP equipment. Firm B has found that for simple accounting jobs, a service like the one they now receive through the agency (mentioned above in section 1) is economical and easy to use. Although customizing is not the rule at their service agency, special arrangements have been made even with them so that a larger client of Firm B can prepare and submit punched cards directly, thus saving the time and cost of paper tape to punched card conversion and checking. For firms having more complex requirements, Firm B feels that custom-made programs are again more economical and less costly when obtained by referral to an accountant-oriented CPA firm having a computer. The "do-it-yourself" approach involves too great an investment in equipment, software, personnel, and time to be feasible for most of Firm B's customers.

Firm B has also had contact with several hardware manufacturers and general service agencies. Firm B's opinion of the service and assistance they offer is not too favorable. Hardware manufacturers were characterized by their usual talk of "how nice it will be" sometime in the future, rather than how nicely their service operates now. With the exception of tax preparation work, general service agencies not run by accountants and specializing in accounting work are not able to adequately serve the accountants' needs.

4. *Processing of income tax returns* using a tax preparation agency. Last year, Firm B completed about 400 returns using this service. Firm B was very satisfied with the results and intends to do so again this coming tax season. The amount of clerical and stenographic work in the office was reduced to such an extent that, for the first time, Firm B had no overtime during the tax period and was able to use the

time saved on other clients. No objections were made by any of Firm B's clients when told that their returns would be computer processed, and in 70 per cent of the cases, the additional cost of using the service was included in the fee.

5. *Limited use of municipal clients' equipment* to prepare name lists for auditing in connection with confirmation and circularization procedures required by the Department of Local Government

#### IV.

#### *Other Comments*

- A. On the question of client-data security, Firm B feels that no compromise is made in the use of EDP equipment and services, especially when dealing through a firm which is managed by a CPA.
- B. Since none of Firm B's audit clients own EDP equipment, Firm B is not presently involved in testing computer programs, preparing test decks, etc. However, at least one client is considering such a purchase, and Firm B will no doubt have to re-evaluate and change its audit policies to handle this client. With its present knowledge of EDP, Firm B is confident that it can cope with such changes.
- C. An accounting machine (which is a little larger than Firm B's present equipment) is on order, but there are no immediate plans or expectations of acquiring any additional equipment.
- D. Members of Firm B have on several occasions attended courses and seminars on various aspects of EDP. For the small CPA firm, Firm B expressed the opinion that the time required to learn about EDP is too long for a CPA to take away from his practice. A solution to this dilemma was not offered.

## *Appendix 3*

### *Case Study—CPA Firm C*

#### **I.**

#### *Description of Firm C*

Firm C is located in East Central United States. It has acquired a computer which has a 4K memory and performs input and output functions only by means of punched cards. The monthly rental is \$2,300. Firm C has seven partners, eight staff accountants, and between 15 and 20 support personnel. This latter figure includes programmers and hardware support personnel. Firm C is rapidly growing: One year ago the total number of personnel was 17. Firm C is situated in a highly competitive area where there are between twenty-five and thirty computer installations. A programming supervisor oversees both the programming and computer operation at Firm C.

#### **II.**

#### *Motivation for Using EDP*

In 1959 Firm C was primarily involved in income tax work but also had a considerable amount of write-up and audit work. Firm C did

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not want to be burdened with the write-up work and decided to acquire EAM equipment in March 1960. At the time, between 30 and 35 write-up accounts were served by Firm C for which they produced general ledger, income tax statements, and balance sheets. Another incentive for using EDP was provided by a general insurance agency which was using a service agency in a nearby town. This insurance agency indicated that if Firm C got an EAM machine, the insurance agency would give its work to Firm C. The income from this agency would cover approximately half the cost of the installation, so Firm C decided to take the gamble and hired a key-punch operator. One of the partners went to a school run by the manufacturer to learn keypunching and wiring. At that time Firm C was comprised of two partners, a staff assistant, a bookkeeper, a secretary, and the keypunch operator.

Firm C found that its write-up work immediately increased. Several larger clients were soon acquired because Firm C had accounting equipment for billing, inventory control, and sales analysis. The first big client was a retail clothing store for which Firm C performed the following services: sales analysis, computation of salesmen's commissions, departmentalized listing, and an annual audit. The client was pleased. His income increased due to better reports and he became Firm C's best salesman.

Thereafter, Firm C got many inquiries regarding specialized jobs in sales analysis, inventory, and payroll. Firm C purchased a calculator to perform this service. It was used to compute percentages on the financial statements. Firm C then acquired a collator and another keypunch. By 1963, its accounting equipment was running between 16 and 17 hours a day. The burden on this equipment was too great. Firm C decided to acquire a computer instead of increasing the amount of EAM equipment, even though the EAM equipment was much cheaper. Firm C ordered its computer in 1964, and it was delivered late last year.

Prior to delivery, Firm C spent the summer and fall of 1964 lining up jobs which could be performed so that, when the computer arrived, they were ready to begin operations on an extensive scale. The original keypunch girl was trained in programming and took over the running of the installation. It soon became apparent that, due to the great increase in work volume and complex nature of the work, Firm C would need more people. Early in 1965, the data processing shop was reorganized: more personnel were provided, and a systems engineer was brought in to supervise the work. Currently, the computer facility runs for about twelve hours a day.

### III.

#### *Program Development*

Firm C has recently been reducing its library of 130 programs by generalizing several of the programs written originally for specific clients. One recently completed generalized program has replaced five existing special purpose programs. The library has been cut to 110 active programs through generalization, and an effort is still under way to cut this library even further and increase the range of application for each program.

Firm C uses a "system" approach in which several programs and operator actions interact to reach a final goal. This approach was initiated when a client who had attended a management training course desired more meaningful management reports and asked Firm C to install a management information system for him. Firm C established a standard cost system which included inventory controls and reports, financial accounting, personnel analysis, budgets, and prior reports. These reports are so interrelated as to provide a meaningful management tool. The client maintains a keypunch machine at his place of business and produces the inputs which are sent to Firm C for the total systems processing. Firm C has decided to provide this service to other small businesses.

### IV.

#### *Functions Performed Using EDP*

- A. Among the generalized services performed by Firm C using EDP are:
  - 1. A *general payroll* with a standardized check format which is used by many small clients.

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2. A *general ledger* used by almost all of Firm C's clients.
  3. A *generalized balance sheet and income statement* program. This program is now being extended to provide departmentalized reports.
  4. A *check register* program and a bank reconciliation program have been generalized. These are utility-type programs which use control cards to specify the desired format.
  5. A *debt collection analysis* program which was written for several debt collection agencies. It computes both the commission for each collector and the amount owed by each debtor. It keeps a record of whether or not the debtor has made a payment and removes the debtor from the file when the final payment has been made.
- B. Several other programs which are now written for specialized use will also be generalized. They include:
1. Ledger distribution.
  2. Accounts payable.
  3. Accounts receivable. This program includes aging invoices, billing, and statement writing.
  4. Sales analysis.
  5. Budget performance analysis. This program computes the percentage of sales by region and salesman and computes variances. The report would contain monthly and year-to-date figures.
  6. Payroll account. Firm C plans to establish a single bank account for many of its clients. Each business will be billed for the total amount of its payroll which Firm C has computed. Checks will be printed and drawn from this single bank account by Firm C for each employee of each of the businesses. Naturally, data processing will be used in this function.
- C. Several programs have been developed for Firm C's own internal management, and Firm C has been very pleased with them. They include:
1. A client billing record. The calculations by accountants, time

spent on each client's account, and the hourly rate are used to determine the fee charged to the clients.

2. Client analysis. This is a billing aid that computes and ages accounts receivable.
3. Data processing record. This program is used in conjunction with every other program in the library. During its operation, each program counts the number of inputs and outputs it processes and computes the cost to the client for this run using billing standards. Each program punches an accounting card at the end of its operation. At the end of each month, these accounting cards are fed to the data processing record program which produces a listing of the computer time to be charged to each of Firm C's clients. This program has eliminated all the guesswork in data processing timekeeping.

## V.

### *Program Production and Development*

Firm C has very rigid steps in producing a new program. They are outlined as follows:

1. Define the problem.
2. Design the system.
3. Determine the program specifications. This includes a flow diagram.
4. Produce a block diagram of the operating procedures.
5. Code and punch the program.
6. Test the program. (No centralized testing has been specified.)

The accountant, the systems manager, and the programmer all take part in the above steps. Firm C feels that there are three major aspects



to effective EDP management: adequate documentation, proper scheduling, and production supervision. It costs Firm C between \$500 and \$3,000 to produce a new computer program. This includes the cost of development, personnel time, and documentation. An estimated \$100 to \$500 a year is spent by Firm C to maintain each program.

## VI.

### *Program Documentation Procedure*

Firm C feels that adequate documentation must be produced due to personnel turnover and modification requirements. The documentation maintained by the firm consists of the following:

1. Operating procedures. These include a flow chart of the man-machine interaction required and the setup procedures.
2. I/O layout forms. These include samples of the desired printed outputs and the input card formats.
3. Block diagrams. These are produced during initial program production and are not maintained.
4. Listings of the final program.
5. Samples of the output.
6. Documented change sheets. These sheets are filled out every time a program is modified. They include a description of the change, the programmer who produced it, the accountant who requested it, and a listing of all the program documentation. The programmer must check off any documentation which has been affected by this change. Currently about 20 per cent of the program documentation has been completed. Continued documentation is proceeding as a very high priority job.

## VII.

### *Other Comments*

Firm C has made a large investment in its program library and would not consider releasing it to other CPAs in general, especially to a local group with which it is in competition. However, Firm C would be very happy to exchange these programs with other CPA firms and would particularly like to acquire a suitable tax program. Several CPA firms have been contacted by Firm C in regard to technical sessions on the types of programs which have been written.

Firm C intends to add still another programmer to its staff and also intends to acquire a new computer in 1966. Firm C is now leaning toward a machine with disc capability. A random access storage media is felt to be necessary because Firm C is currently handling 2½ million cards per year, although on each inventory and payroll job only a very small percentage of the data is changed.

## *Appendix 4*

### *Case Study—CPA Firm D*

#### I.

#### *Description of Firm D*

Firm D is located in New York City and is of medium size, having fewer than 50 partners and employees. The firm owns no computer but performs audit work using clients' computers. Although few of the clients have data processing (about eight), these clients account for a large portion of Firm D's billings. The clients use several types and makes of computers. Certain of the clients are members of a group which uses a larger-sized computer. Firm D has about 50 auditing programs, including a number with generally similar functions but written to fit the requirements of different clients. Most of these programs are for card-oriented applications and all but one were produced in-house.

None of the firm's personnel has programming as a major duty, although several have attended programming classes offered by manufacturers. All programs to date have been written incidental to audit or consulting engagements. Other men have had or are undergoing programming training or basic computer systems in accordance with Firm D's policy of developing a general familiarity with computer methods and capabilities.

## II.

### *Motivation for Using EDP*

In the mid-1950's some of Firm D's clients began to use a computer and members of Firm D learned data processing in order to audit those clients. Later, the firm was asked to coordinate the installation of another data processing system. Another client, having a computer installation, asked Firm D to assist in the change-over to a different make computer. One CPA at Firm D received training on the new computer and performed audit functions for that client.

Although the largest clients use computers, the firm was not forced to use EDP in its audit work since the audits could still be done manually using computer printouts provided by the clients' systems. However, Firm D saw that EDP audit procedures could reduce the over-all cost and time of an audit and at the same time increase the size of the sample. The following example was given:

Under the manual system, approximately 200 tests of a certain kind might require a number of hours. Using EDP, thousands of tests of the same and other kinds might be made in only an hour of the auditor's time plus an hour or two of the client's computer room time.

These programs have not been sold or rented to other CPAs since each is written for a single client who has the proper equipment and bookkeeping system.

## III.

### *Program Production and Development*

To a great extent, each of Firm D's auditors in charge of a client examination makes his own decision whether certain parts of an

audit should be done through data processing. The auditor analyzes the problem and decides whether data processing can reduce the audit time or cost to the client or whether it can do a better audit job. The judgment of individual auditors in charge is supplemented by intercommunication and centralized review and comparisons. In some cases in which the auditor in charge is not trained in EDP procedures, applications are suggested and developed by others in the Firm. Once an auditor decides to put a certain part of a client's audit on data processing, he or one of his assistants writes a computer program. The checkout functions are left entirely to the auditor as Firm D has no formal policy on what steps are to be taken in checkout.

In the experience of Firm D, it usually takes longer to produce a program than is expected. It appears to take about two weeks to develop an average computer program and occasionally development and additions stretch this out to a month.

All programs in Firm D's library were developed in support of their audit function, and programs are custom-made for a specific client's EDP facility and accounting system. Very little generalization has been provided in the auditing programs, because of the diversity of the clients' recordkeeping systems. Although the basic idea of an existing program is very often used in a new program for a different client, the firm has found that it takes more time to patch an existing program than to write each program completely. Clients are not charged separately for the development and production of the auditing programs, nor does Firm D set any direct cost to be recovered on any of its programming. This is exemplified in two ways:

1. While acting as a consultant for a client who was installing a data processing system, one of the senior auditors found that there were several programs which should be written and added to the client's library. The client did not have time or manpower to write these programs, so the auditor wrote them himself. No separate charge was made for writing these programs, but they were covered in the per diem consulting fee.
2. Certain programs have been written by Firm D to facilitate audits of clients' records. Firm D now allows the clients to use these programs for their own accounting purposes with no additional charge. The clients would eventually have written similar programs themselves but they would not have been equally satisfactory for the audit function.

## IV.

### *Program Documentation*

During the early part of September 1965, Firm D developed a list of all programs currently in use, including a brief description of each. Up until that time no formal unified list existed. A few of the programs are flow diagrammed, some have rough operating instructions, and some have job cards designed for their operation. The lack of documentation is the result of time and cost constraints and is recognized as a handicap to be corrected.

## V.

### *Method of Operation*

If possible, Firm D sends the programs and job instructions to a client's installation during working hours, and the client makes the runs on his own machine under the CPA's supervision. If it is impossible to use the computer during the daytime, one of the CPAs will perform the run at night on the client's computer. Clients are becoming reluctant to allow this because of the possibility of the computer breaking down and not being repaired in time for their normal daytime runs. If computer time becomes a problem, especially on the larger computers (which some of the clients are beginning to use), Firm D may drop some of its less important auditing programs and only run the major ones; however, it is possible that the larger computers will permit modifications of the programs that will accomplish present results in fewer runs.

All programs owned by the firm were developed within the firm ex-

cept for a single utility print program. No higher-level language, such as FORTRAN or COBOL, is used by the firm.

## VI.

### *Program Library*

The following is a list of several significant audit programs produced by Firm D. Note that many of the functions pertain to a particular type of business operation.

#### *A. Cumulative General Ledger Program*

Processes client's monthly general ledger transaction cards to print a cumulative general ledger. Prints monthly balances and various subtotals of transactions.

#### *B. Distribution Summary Program*

Processes client's monthly summary cards to print six-month summaries of account distribution of vouchers, payrolls, stores issues, and cash, with separate columns for each month, prior six months, and totals to date.

#### *C. General Ledger*

Checks footing of client's tape of general ledger entries. Prints balances of specified accounts. Accumulates and prints summaries of specified kinds of journal entries (about 12) by accounts and months.

#### *D. Construction Ledger*

Checks footing of client's tape of construction ledger entries and prints grand total.

E. *Reclassified Trial Balances*

Processes client's general ledger balance cards and auditor's reclassification cards to print a trial balance and reclassified balance sheet.

F. *Confirmation of Domestic and Commercial Accounts*

Searches client's accounts receivable cards and selects and prints list of accounts to be confirmed on the basis of amount of balances, delinquency, and random sampling. Does not print the confirmation requests themselves, which are sent with the bills.

G. *Confirmation of Domestic and Commercial Accounts*

This is a subroutine in a client's program which selects for confirmation all accounts with balances over a specified amount in specified areas. The principal function of the program is to total the accounts receivable master tape for reconciliation with the general ledger by the auditor and the client's internal auditors.

H. *Balancing of Customers' Accounts Receivable*

Processes client's control cards, without sorting, to summarize transactions by kind and ledger controls, and to test-check with detail cards summarized similarly.

I. *Summary of Delinquent Customers' Accounts*

Processes client's cards (ledger control cards and detail cards for large individual delinquencies) to print a summary of delinquent amounts by districts and ages of delinquency.

J. *Large Power Meter Reading Dates*

Summarizes client's billing cards for large power customers by dates of meter readings. Used to review effect of possible changes in meter reading dates.

K. *Payroll Distribution*

Simulates a client's program for distributing accumulated labor and transportation costs and fringe benefits to accounts on the basis of the client's hours distribution cards. Omits portions of the client's program (especially detailed output) not of interest



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to the auditor, and prints various control totals, including total charges to various general ledger accounts.

### L. *Payroll Accrual*

Simulates a client's program for accumulating labor and transportation costs by distribution groups and computing the accrual for incomplete pay periods. Omits portions of the client's program (especially card output) and prints various details and control totals.

### M. *Payroll*

Processes client's tape of year-to-date earnings to verify computation of social security taxes and to print out records of a specified number of employees for checking with personnel records.

### N. *Materials and Supplies*

Simulates a client's program which prices stores issues and updates stores balances for purchases, issues, and returns. Punches cards for various kinds of transactions to be investigated or tested by the auditor. Prints a list of balances to be test-checked with the client's records and various audit control totals, including net charges to various general ledger accounts.

### O. *Stores Balances*

Processes client's stores master tape to obtain total balances by storerooms and for the company.

### P. *Cash Disbursements*

Processes client's check cards to print and select those over a specified amount and summary-punches the totals by disbursement control groups. Processes summary-punched cards to reconcile with invoice register and cashbook.

### Q. *Summary of Vouchers*

Processes client's check cards and account distribution cards over specified amounts to print a summary of larger vouchers and the larger account distributions under each. Used for vouching accounts payable charges.

R. *Summary of Distributed Charges*

Processes client's account distribution cards of all kinds over specified amounts to print a summary of charges by account or work order number. Used to review charges to accounts.

S. *Payroll Distribution*

Lists client's payroll distribution cards over a specified amount in a sequence convenient for vouching.

T. *Operating Expense Summary*

Processes client's operating expense summary cards to print a condensed summary by major accounts in columnar form by months. Used for review of variations in monthly expenses.

U. *Employee Stock Purchase Plan*

Simulates a client's program introducing some audit tests and additional totals.

V. *Electric Plant Ledger*

Processes client's cards to list changes in electric plant alternatively (a) by work order and (b) by electric plant primary account. Used to test-check the postings to the client's records and to test the distribution of completed work orders.

W. *Construction Work in Progress Schedule*

Processes client's construction ledger balance cards and auditor's authorization cards to print a summary for a period, showing opening and closing balances, expenditures, transfers, amounts authorized and overexpended, etc.

X. *Generalized Reproduction*

Reproduces or gang punches decks of cards with offset reproduction, interspersed gang punching, etc. The program is governed by a control card and is used largely to prepare data cards for use with other programs.

Y. *Utility Print*

This is a modified version of a program obtained from others

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which employs one or two control cards to govern the format, control fields, accumulation fields, etc., which are printed. Used in miscellaneous audit procedures where lists or totals of client's cards are desired.

## VII.

### *Other Comments*

Firm D expects to expand its use of clients' computers in the conduct of audits by writing new programs or adapting old ones as necessary. The firm may, in the future, use a service bureau for one client who has no computer. The computer will be used to save repetitive typing each audit period, producing lists of securities currently held by the client for confirmation by the client's customers. Firm D may also apply data processing to its own payroll and billing procedures, but does not think it will acquire a computer of its own.

Until now, no consideration has been given by Firm D to the problem or benefits of releasing any of its programs. It might be interested in a library approach, or establish or join a cooperative made up of CPA firms. Releasing the programs to other accountants might be considered but they would charge for this unless done as part of a cooperative library. However, Firm D feels that none of the programs is generalized enough to be of much value to another CPA as ready-to-run programs. Also, the documentation is not yet good enough for release to others, even to serve as a basis for reprogramming.

Firm D mentioned that CPAs entering the field of data processing should be cognizant of the high turnover rate of machine equipment. This requires rewrites of programs. A firm should consider whether it can get an adequate return for any particular computer programs it writes before the computer is replaced.

## *Appendix 5*

### *Case Study—Service Agency A*

#### I.

#### *Description of Agency A*

The primary function of Agency A is to provide data processing service for accounting functions. Agency A has three main offices in the country. Since its service is by mail, Agency A has clients in almost every state. In addition, there are about 400 branches of the parent organization throughout the country which provide initial orientation with the service. Agency A's accounting service was developed and is currently being managed and marketed by CPAs. Agency A has about 1000 clients, 95 per cent of which are accounting practitioners (half of which are CPAs). The remainder are large business firms for which Agency A provides direct service. Through the CPAs Agency A serves about 10,000 businesses. The average CPA user has about 20 per cent of his clients using the service, though many have substantially more.

## II.

### *Available Capabilities*

The primary service available through Agency A is the preparation of financial statements by means of punched paper tape inputs from its CPA users and the processing of the data on their data processing equipment. A more detailed list of capabilities follows:

1. Preparation of *financial statements*: balance sheet, income statement (current period and year-to-date), and comparative statements
2. Preparation of *general ledger* and *financial statements from journal totals* (say monthly) (for larger clients with book-keeper capable of completing journals)
3. Preparation of once-a-year ledger for tax reports
4. Handling of *small clients' accounting services*
5. Preparation of *ten-column journals* (usually cash receivables and cash disbursements), and *single-column journals*
6. Automatic *posting* of columnar journal totals to appropriate general ledger account numbers (according to client's chart of accounts)
7. Handling of *special applications* such as:
  - a. Branch or departmental accounting
  - b. Job cost accounting—for job-oriented costing problems such as for a builder or for internal cost accounting functions
  - c. Sales analysis involving major products or tax categories, as well as subcategories such as salesman, territory, and store number
  - d. Multicorporate accounting
8. Handling of *subsidiary ledger* accounts
9. Handling of complete *payroll records*: journals and quarterly earnings ledger by employee
10. Handling of accounts receivable customer statements and aged trial balance

Another service is available through Agency A for retail applications. A punched tape is produced by the cash register (point-of-sale input) which is submitted to an office of Agency A for processing. The service will handle a retail firm's accounts receivable records, sales analysis, and unit inventory control.

### III.

#### *Internal Processing Procedures*

Each CPA who uses Agency A possesses a punch paper tape adding machine. He uses this machine to prepare punched tape recordings of his customers' financial data. These paper tapes are mailed to an Agency A office along with instructions on the desired outputs. Tapes are usually completed within forty-eight hours, depending on the type of request. Within Agency A several checks are made on the accuracy of the data, and many of the steps involved in the processing are done by a large staff of trained personnel. A detailed breakdown of costs is available from Agency A.

### IV.

#### *Other Comments*

A. Agency A offers classes to accountants who wish to learn about EDP and the service available through Agency A. The classes

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are held regionally. They usually take two days with ten to 15 persons per class.

- B. The parent firm of Agency A is currently setting up a nationwide communication system which will offer its CPA clients and other small businesses an opportunity to use centrally located computers to perform their data processing functions. The three computer centers, which will be interconnected, will communicate with several collection centers via a data transmission network which is already in existence. These collection centers will be located in cities and communities where users of the system are located. The users, in turn, are linked to the collection centers by means of a punched paper tape reader or other one-way transmission device or a teletype device for two-way transmission.

The accounting service currently provided by Agency A will be available on this system. CPAs will then be able to submit their tape inputs directly from their office and, perhaps in the near future, receive their results on a printing device in their office. By using low-cost lines and night polling, the cost of the system should be very competitive. The opinion was expressed that, in the near future, several service agencies will be competing with each other in this area, offering a wide range of service and prices. By 1970 Agency A expects the market for this kind of business-oriented EDP service to be about 1½ billion dollars.

## ***Appendix 6***

### ***Case Study—Service Agency B***

#### **I.**

##### ***Description of Agency B***

There are about 70 branches of Agency B throughout the country. They provide their customers with programming capabilities for a wide variety of applications which were developed and improved over a period of years. The cost of developing these capabilities was possible only by making generalized programs which could be used by many customers.

#### **II.**

##### ***Available Capabilities***

- A. One programming package is currently available directly relating to the CPA; this is a small client accounting system which prepares the following reports:



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1. General ledger
2. Profit and loss statement
3. Balance sheet
4. Quarterly employee earnings and tax reports
5. Annual W-2 reports
6. Department or branch analysis

The CPA submits his client's data to Agency B via paper tape for monthly, quarterly, or yearly processing. There is approximately a 48-hour turn-around time. The charge for the service depends on the volume of data involved; however, over 90 per cent of the jobs are said to cost from \$5 to \$10 each time a function is performed.

B. The following is a description of some of the other capabilities available from Agency B which may be of interest to CPAs:

1. A payroll service.
2. A credit union accounting system
3. An insurance agency accounting service which is a bookkeeping service designed specifically for this type of business
4. An automobile dealer accounting service
5. A sales analysis system
6. An accounts receivable program
7. An inventory control system

## ***Appendix 7***

### ***Case Study—Tax Preparation Service***

#### **I.**

##### ***Description of Firm***

This tax service provides accountants with a computer-based system for calculating and printing individual income tax returns. The service is available by mail and has been in use throughout the country for two years. An estimated 1,200 firms are using the service. It is not available for direct individual use.

#### **II.**

##### ***Available Capabilities***

- A. The tax service is designed to assist the CPA in the following ways:

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1. Performing all calculations for:
    - a. FICA tax overwithheld.
    - b. Dividends received exclusion and credit.
    - c. Retirement income credit.
    - d. Foreign tax credit.
    - e. Investment tax credit.
    - f. Computation of the lowest tax, including alternative tax method for capital gains.
    - g. Taxable income after income averaging.
  2. Checking returns for missing information, such as name, address, social security number, occupation, and for unanswered questions regarding travel reimbursement, previously filed returns, etc.
  3. Checking for inconsistency of information. The computer will check for such inconsistencies as a single taxpayer's return showing a social security number for a wife or a rent schedule filed with no depreciation schedule attached, etc.
  4. Revealing areas for potential tax reduction, such as medical deductions for taxpayers over 65 years of age, retirement income eligibility, the comparative advantage of filing separate or joint returns, etc.
  5. Relieving the accountant of many clerical procedures involved in preparing returns.
- B. Many functions which require judicious decisions are left for the accountant such as:**
1. Handling of depreciation
  2. Applications of community property laws relating to capital loss on state returns
- C. The tax service does not process certain federal tax forms such as:**
1. Declaration of estimated tax
  2. Individual short form
  3. Partnership return
  4. Corporate returns
  5. Etc.

### III.

#### *Procedure for Using the Service*

Procedure for use of the tax service is as follows:

1. An accountant completes a group of forms for each client which covers all relevant taxpayer information.
2. The forms are sent to an office of the tax service where the data is checked, keypunched, and stored on magnetic tape.
3. The computer checks the data and calculates the return using several different methods, finally selecting the best method for the taxpayer.
4. A completed return is printed in triplicate along with all required schedules and attachments.
5. Filing instructions and an audit report for the accountant are also prepared.

Users of the tax service are charged a fee which ranges from \$5 to \$12 per return with the average running between \$6 and \$8 depending on the complexity, number of schedule, etc. Returns are completed within 48 hours of receipt.

## ***Appendix 8***

### ***Case Study—Manufacturer A***

#### **I.**

#### ***Description of Manufacturer A***

Manufacturer A is one of the major computer manufacturers with branch offices in all major cities and regions of the country. Manufacturer A produces a complete line of EDP as well as EAM equipment. It has developed a large and varied library of programs which are made available to customers who purchase or rent Manufacturer A's equipment.

#### **II.**

#### ***Available Capabilities***

Four categories of programs are available for each type of computer produced by Manufacturer A:

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1. Utility, compiler, and language processor programs which are written, documented, and maintained by Manufacturer A.
2. Specific applications programs which are also written, documented, and maintained by Manufacturer A.
3. Programs which are written by employees of Manufacturer A for other purposes but are made available for use by customers. These programs have had minimal field testing and documentation. They are generally well prepared, but Manufacturer A is not directly responsible for them.
4. Programs which are written and contributed by other customers. The operation of these programs is not guaranteed.

There are over 2,000 programs available in the third and fourth categories, most of which are highly specialized. Catalogs are published which list the names of all programs currently available. The catalogs briefly describe each program, state the computer configuration required for its operation, the number of magnetic tapes needed to copy the program, and the descriptive and technical support materials available with each program. Program specification and operation manuals provided with each program are generally very thorough. The following is a list of a few of the programs available from the second category (applications programs written by Manufacturer A):

1. Inventory management program and control techniques system for editing, file initialization, inventory estimation, and joint replenishment operations
2. Modular inventory management simulator—a management decision-making tool
3. Data analysis and reduction system—a statistical analysis and report generator
4. Motor freight revenue accounting system
5. Retail merchandise control program
6. Retail accounts receivable system—for medium-sized stores.
7. Chain and wholesale billing program—for inventory control and billing procedures
8. Retail accounts receivable program—for accounts receivable processing in a medium-sized store
9. PERT cost program—processes PERT networks with or without cost data

## ***Appendix 9***

### ***Case Study—Manufacturer B***

#### **I.**

#### ***Description of Manufacturer B***

Manufacturer B produces small-sized computers, accounting and office machines, and has several branch offices throughout the country.

#### **II.**

#### ***Available Capabilities***

An accounting service system has been designed and made available for one of Manufacturer B's computers. The significant features of the system are:

1. Prepares the following reports:
  - a. Journals

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- b. Financial statements
- c. Payroll accumulation with compensation records and tax data
2. Data input and storage from punched paper tape using punched tape adding machine
3. Complies with requirements of Internal Revenue Service
4. Compatible with other systems of Manufacturer B, such as payroll preparation and special industry processing

The accounting system is composed of the following major programs:

1. *Journal Distribution Program* which produces:
  - a. Cash receipts journal listing and cash disbursements journal listing
  - b. Journal summary
  - c. Total journal
2. *Financial Statement Program*—uses data accumulated in previous operations to produce:
  - a. General ledger
  - b. Balance sheet
  - c. Income statement
3. *Payroll Accumulation System* (optional) produces:
  - a. Payroll compensation record—complete summary of wages and deductions by employee
  - b. 941-A continuation sheet
  - c. Withholding tax statement—W-2 form and 1099 information form