

COMPUTER CENTER OPERATIONS

Wagner • Crawford • Gruver



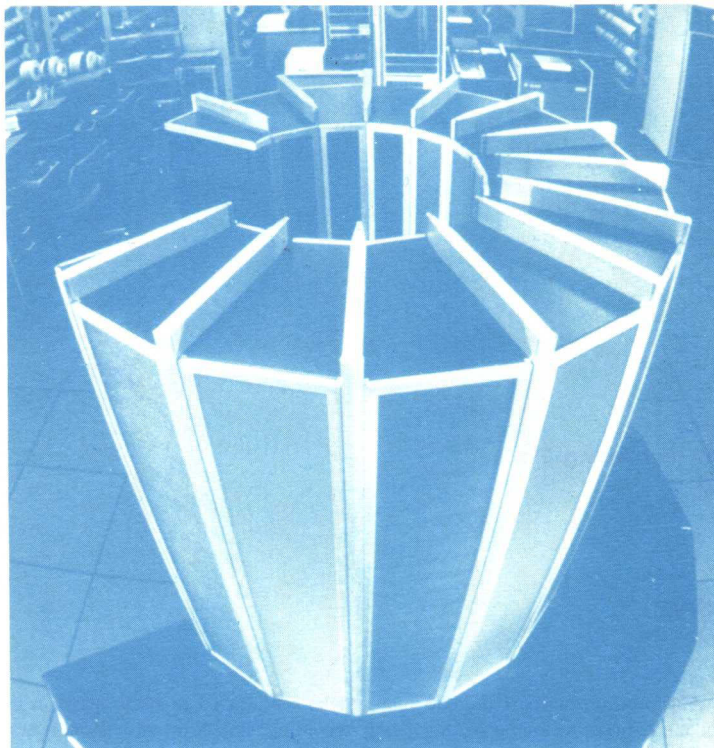
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COMPUTER CENTER

OPERATIONS



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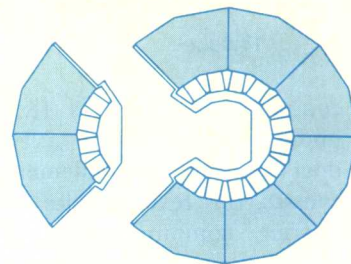
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PREFACE



NEED FOR THIS TEXT

Computers have become a vital part of the operation of most businesses and industries. The expanded use of computers in society has increased the number of employment opportunities available to individuals with some computer-related experience or training. Not only is computer education and training required as a prerequisite for most positions in the computer field, but a basic understanding of computers is becoming a preferred qualification for employment in many other areas as well.

Although more and more educational programs include computer literacy courses, little emphasis is usually given to the typical computer center and its day-to-day operations. This is true even of programs designed to train computer programmers and systems analysts. As a result, few people seem to appreciate the factors that are important to the smooth operation of a computer center. Also, the basic tasks and responsibilities of the people who work in a computer center are not generally understood. This is unfortunate because those people who interact with computer center personnel could work more effectively if they were more familiar with computer center functions. This is particularly true for the developers of computer information systems since they design the systems that computer center personnel must operate.

Another unfortunate result of the lack of knowledge about computer center operations relates to career opportunities. Many of the positions within a computer center could be filled by high school graduates who have completed some on-the-job training. However, since few people are aware of these positions, they do not seek them out and may, therefore, overlook excellent employment opportunities.

GENERAL CONTENT

Computer Center Operations has been written to fill a void in the materials available for computer-related education and training. It is designed to provide general knowledge about the major functions of the operations department of a computer center. Emphasis is given to the tasks associated

with data entry, data control, peripheral equipment operation, console operation, data storage and retrieval, report distribution, and job scheduling. Emphasis is also given to how all of these functions are integrated to form a well-controlled, smoothly running operation. Also included are the topics of small business computers, office automation, and employment opportunities in the computer field.

For several reasons, this text is unique among those dealing with computer center operations. One primary reason is that its coverage is much more comprehensive than most others now available. Also, the material is presented in an introductory manner so that a minimum of prior knowledge about data processing is required. One of the chief advantages of this text is its concentration on general operating procedures. Every attempt has been made to avoid presenting details of specific makes and models of equipment or procedures unique to one organization.

USES FOR THIS TEXT

Because of its emphasis on general operating procedures, *Computer Center Operations* is a very versatile text for incorporation into educational programs dealing with computers. It can be used either as the foundation for extensive training in computer center operations or as a supplement to existing courses.

This text is an excellent basic text for courses or programs designed to train computer center operations employees. By supplementing this text with additional laboratory work or on-the-job exercises, participants are able to gain the specific training required to be productive immediately upon entering a computer center.

As a supplement to computer literacy courses, *Computer Center Operations* provides considerable enrichment for those who are likely to interact with the computer center where they become employed. It also acquaints them with some additional choices for possible employment.

Computer Center Operations can also be used to supplement courses or programs designed to train systems development personnel and managers in a computer center. As a supplement to introductory

computer courses, this text provides a thorough understanding of how a typical computer center operates. As a supplement to systems analysis courses, this text provides an understanding of how existing computerized systems utilize computer center resources. As a supplement to systems design courses, this text provides additional background concerning the advantages and disadvantages of various choices concerning the capabilities of computer center facilities and personnel. As a supplement to courses in computer center management, this text provides valuable information about controlling and integrating computer center operations as well as insight into the management of personnel and facilities.

OBJECTIVES OF THIS TEXT

1. To provide students with a foundation for additional education and training in computer operations, computer programming, and systems analysis.
2. To provide students with an understanding of how a computer center is organized and how it functions.
3. To illustrate the flow of data into, within, and out of a computer center.
4. To give students an understanding of various controls that are used to protect a company's data and information systems.
5. To provide students with an understanding of how computers are changing the role of the office worker.
6. To give students a thorough understanding of the role each area and department plays within the computer information systems division of a company.
7. To provide students with the knowledge and background necessary to qualify for one of the entry-level positions discussed in this text.
8. To acquaint students with various career paths in the area of computer center operations.
9. To provide students with a job-search strategy.

SPECIFIC CONTENT

The material included in *Computer Center Operations* is presented in a step-by-step, easy to follow manner. Although many readers of this text may have a fundamental understanding of computers—through experience or the completion of typical introductory computer courses—computer terms are defined in context the first time they are

used. General concepts relating to each topic are stressed, rather than the specifics associated with one type of hardware or system. It is believed that by understanding the basic concepts, readers will be able to function successfully in most computer centers with very little on-the-job training, regardless of the hardware or system being used.

The organization of a traditional computer information systems division is described in Chapter 1. The role of each department within the division and the responsibilities of each person, by job title, are discussed briefly to provide the reader with an overview of a computer center. This overview provides an understanding of how each computer center activity relates to other activities.

Because all data processing begins with data entry, this process is described in Chapter 2. Various input media, such as punched cards, magnetic tapes, magnetic disks, and diskettes, are described in this chapter. In addition to the data entry process used with the various media, the data verification process for each is also discussed. The purpose and function of the data entry process and the duties and responsibilities of the data entry operator are emphasized, rather than the mechanics of operating a particular machine.

A very vital part of computer information systems, security and controls, is discussed in Chapter 3. The discussion of controls in this chapter is not limited to the accuracy of input data. Although it is well known that incorrect data produce incorrect results, there are many other potential risks that must be considered. Controls to protect a company's data resources from natural disasters, fraud, equipment failures, and many other potential risks are discussed, stressing the purpose and application of each type of control.

Chapters 4 and 5 describe the duties and responsibilities of the peripheral equipment operator and the console operator. Although the duties discussed in these chapters may be performed by the same person in a small computer center, they are so diverse and important that the discussion has been divided into two chapters according to the traditional division of duties in a large computer center.

The role and responsibilities of the data librarian are discussed in Chapter 6. This chapter stresses the importance of the position that the data librarian plays in supporting computer operations activities. In addition to the traditional activities associated with storing and retrieving data files for use in computer applications, file maintenance, file certification, disaster recovery, and other duties of the data librarian are included.

Prior to leaving the computer center, most computer output is checked and prepared for distri-

bution. The activities associated with report distribution and control are described in Chapter 7. The purpose and operation of many of the machines used in report distribution are described. Some of the forms and control procedures associated with the various methods of report distribution are also explained. In addition, the topics of data retention schedules, data file archiving, and disposal methods for obsolete reports are included.

Once a good understanding of each of the operational departments in computer information systems has been developed, effective scheduling can take place. Chapter 8 emphasizes the effective use and scheduling of computer center resources. Methods for balancing the work load in a computer center are stressed throughout the chapter.

Chapter 9 provides an in-depth look at how all of the functions of computer center operations are integrated. The flow of data through a computer center is discussed in detail.

Because thousands of small business computer systems are being installed annually, Chapters 10 and 11 focus on the utilization of small computer systems in business. Chapter 10 reviews the operational characteristics of small computer systems which differ from those of larger computer systems. Chapter 11 reviews many of the ways in which office procedures are changing to take advantage of computer technology.

No text of an occupational nature would be complete without information on careers. Chapter

12 discusses the entry-level requirements, salaries, and career-advancement paths available in computer center operations. Resumes, letters of application, and interviewing techniques are also discussed in this chapter. Finally, tips on job-search techniques are provided to assist students in obtaining any of the entry-level positions discussed in this text.

TEACHING MATERIALS

At the end of each chapter, new terms, review questions, and exercises are included. The instructor's manual contains answers to the review questions for each chapter and solutions to the exercises. All of the exercises can be completed without the use of special equipment.

ACKNOWLEDGMENTS

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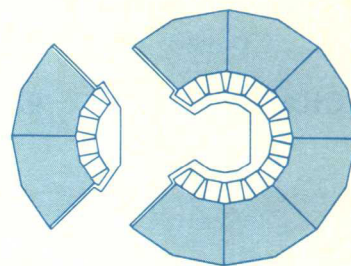
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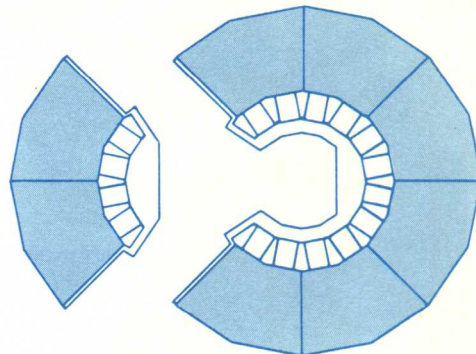


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CHAPTER 1

COMPUTER CENTER ORGANIZATION



LEARNING OBJECTIVES

Upon completion of this chapter, the student will be able to:

1. Define the new terms introduced.
2. Identify the three major departments in the information systems division.
3. Describe the responsibilities of each department or section in the information systems division.
4. Identify the responsibilities of each person (by title) in the information systems division.
5. Describe some of the factors leading to the present role and position of the computer center in a company today.
6. Identify the activities associated with problem solving using a computer.

INTRODUCTION

There have been very few developments in history that have had greater impact upon people and society in general than the computer. The introduction and use of the wheel, fire, electricity, the internal combustion engine, gun powder, atomic power, and other inventions have had tremendous influence on people and their attempt to improve the environment in which they live. The computer ranks with those discoveries and developments in

terms of historical importance.

Today people use the computer as a problem-solving tool in almost all occupations. The computer is being used in medicine, education, law enforcement, communications, space exploration, the military, sports, and areas of entertainment. It would be virtually impossible to develop a complete and accurate list of the way the computer is used because new uses of the computer are found almost daily. Refer to Figure 1-1 for examples of ways in which the computer is used in society. This book will

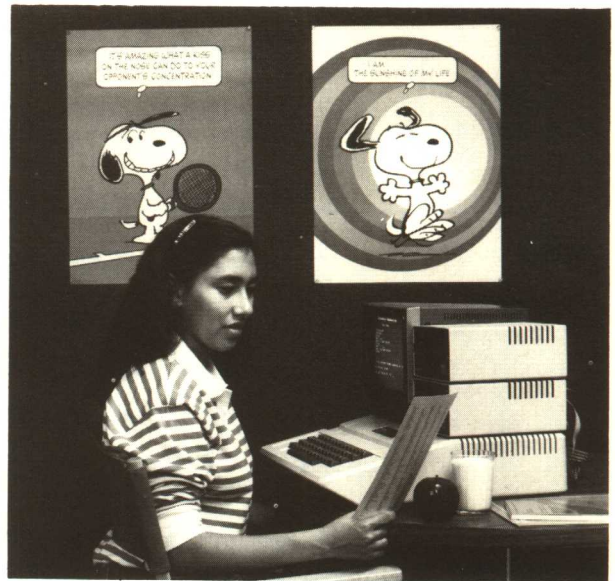
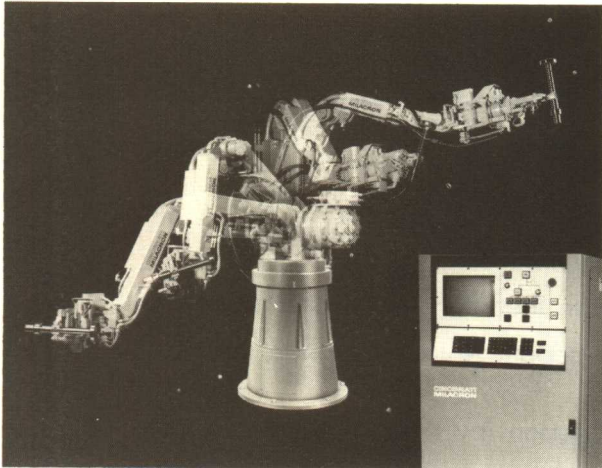


FIGURE 1-1. Computers at Work

concentrate on the activities of people who work in direct support of computer-related functions in a business environment.

Although computerized accounting applications continue to monopolize most of a computer's time, the percent of computer time required for this purpose has rapidly decreased. Accounting applications required almost 100 percent of the computer time in many companies a few years ago. The time required to do the same job today has decreased to a point where accounting only consumes approximately 50 percent of the total computer time in those same companies. This figure will probably continue to decline as computers become faster and more powerful and as other nonaccounting applications are developed and added.

THE ROLE OF THE INFORMATION SYSTEMS DIVISION

Most modern organizations are now using the computer to aid in the completion of a wide variety of tasks. This increased use of computers has helped to change the role of the computer center to one of a total information service function in many companies. This service function is designed to provide more accurate and timely information to help managers make better decisions. With the expanded role of the computer center, a change in name has taken place as well. Computer centers in large companies today are usually referred to as information systems divisions. The *information systems division* now provides the information required in many other areas in a company.

Some of the areas of a company that are now being serviced by the information systems division include marketing, manufacturing, and transportation. In the area of marketing, the computer is used to generate sales statistics, market forecasts, and market research. Another marketing application is illustrated in Figure 1-2, point-of-sale (POS) merchandising.

Manufacturing applications include computer-aided design, scheduling, and production control. The computer has made it possible to reduce the cost of manufacturing by eliminating many of the repetitive manual tasks involved in the assembly process. For example, computers assist in the control of temperatures in both the glass manufacturing process for the automobile industry and the welding process for automobile bodies. They also assist in the routing and scheduling of raw materials and finished goods within the manufacturing process.

The computer has become a problem-solving tool for many departments within large companies. This diversity has created further problems for man-

agement. When the computer was used primarily as an accounting machine, the accounting department manager was quite capable of making decisions regarding the priorities related to scheduling jobs. As additional nonaccounting applications were added, other managers in the company began to doubt the accounting manager's ability to be objective. They believed that a conflict of interest might exist. A great concern was expressed by the other managers that their work was being (or could be) assigned a much lower priority than was warranted as long as the scheduling and assignment of computer time was under the control of the accounting manager.

In addition to the problems related to this potential conflict of interest, other problems became apparent to top management. The most noticeable problem was increased costs. Expenses related to the ongoing operation of the computer had increased rapidly as more and more computer applications were developed and implemented. The costs associated with operating the information systems division soon reached or exceeded the operating expenses of any other single division, with the exception of manufacturing, within the company. The cost of personnel, supplies, and normal overhead for computer operations has exceeded the actual amount paid for monthly rent on the equipment. This can be very costly since some of the largest computers rent for approximately one quarter million dollars (\$250,000) per month.

Another problem that had to be faced by top management was the complexity of the computer system. Each new generation of computers offered greater capabilities to the user. These additional capabilities of the new computers were not, and in many instances are still not, being used fully. The rapid advancements in computer technology made it very difficult for managers to keep up to date. Therefore, much of the computer's real potential was never fully utilized.

In an attempt to solve these many diverse problems, the trend in business and industry has been to establish a new administrative position for the manager of computer-related activities. The new position is given a variety of titles, but the one used most frequently is director of information systems. The job description for this position, regardless of the title used, emphasizes that management skills and a background and thorough understanding of computers are usually prerequisites for the position. In many instances, this individual is at the vice-president or upper-management level within a company. See Figure 1-3.

The establishment of a separate information systems division (department) in a company has helped to provide the impetus necessary for the

computer to be recognized as an indispensable tool of the company. Divisional or departmental status has made it possible to utilize the computer's real potential by developing more integrated systems. In

addition, better service can be provided to all areas of a company because the information systems division's primary responsibility is to provide the information requirements of other divisions or departments.

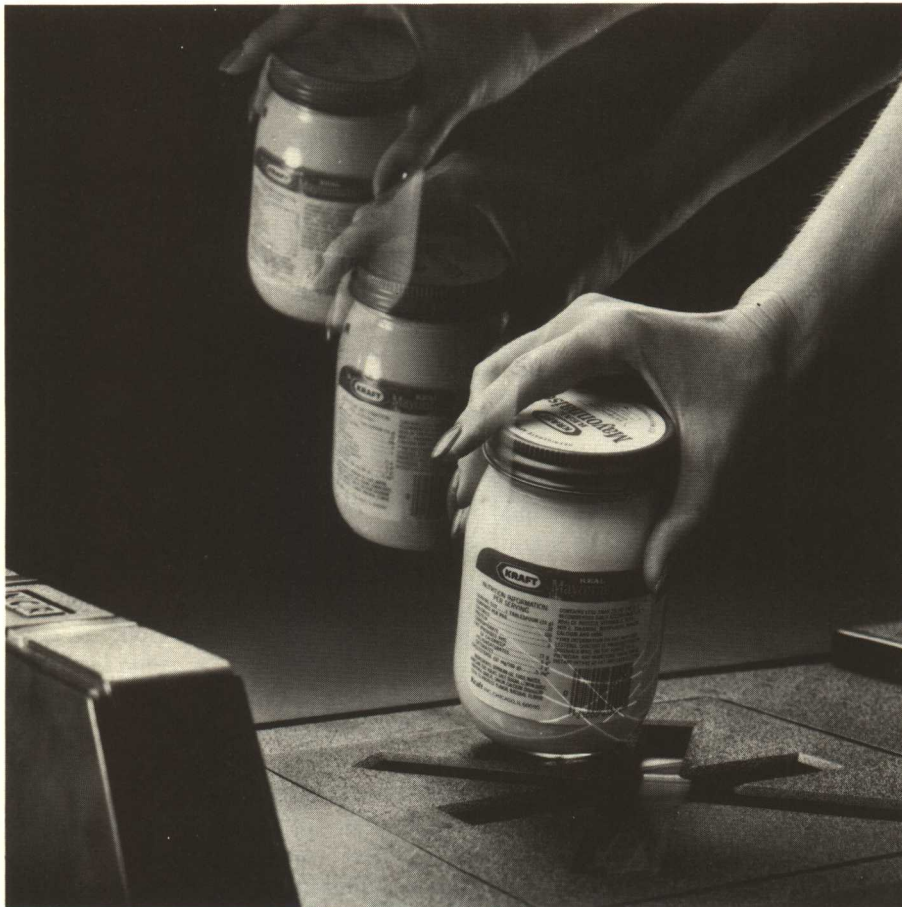


FIGURE 1-2. Point-of-Sale Terminal Reading Universal Product Code (UPC)

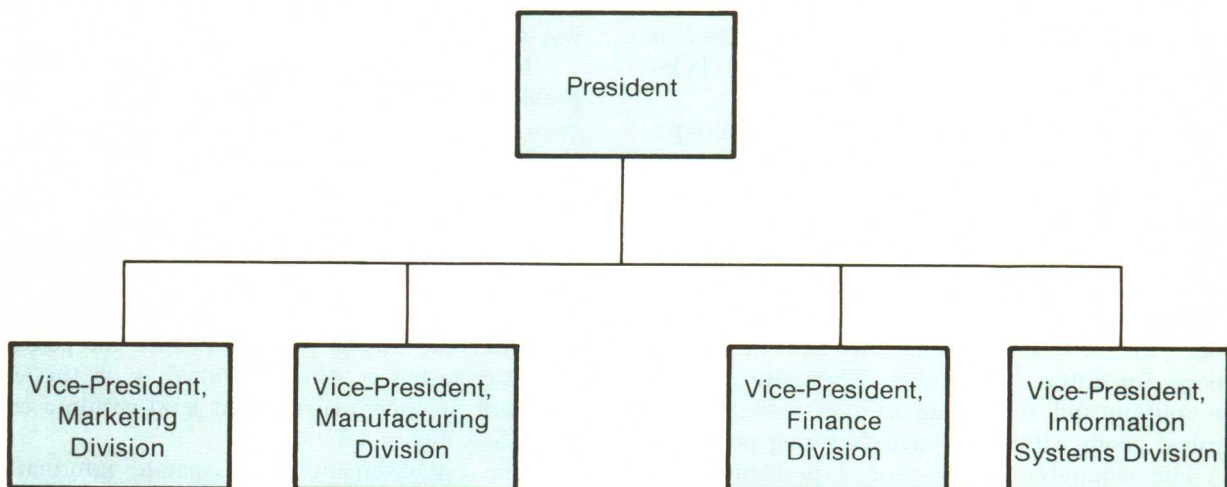


FIGURE 1-3. Organization Chart of a Typical Company Showing the Manager of the Computer Center at the Vice-President Level

THE ORGANIZATION OF THE INFORMATION SYSTEMS DIVISION

Computers must be given very specific instructions on how to do even the most simple tasks because they cannot think or reason. For that reason, specialists with many different qualifications and talents are required. Each specialist will perform one or more of the steps utilized in solving problems on a computer. Some of the problem-solving steps employed by computer specialists are as follows:

1. Determine which of the many tasks of a business can be done by a computer.
2. Determine the most appropriate sequence for computerizing the tasks.
3. Determine the individual steps necessary to accomplish a task.
4. Write the coded computer instructions to do what is desired.
5. Convert the instructions and data into an acceptable input medium for computer processing.
6. Load the instructions into the computer and process the data in order to prepare desired reports and update files.
7. Check the output reports for accuracy and prepare them for distribution.
8. Continue to monitor the above steps in an effort to utilize modern technology and meet the ever-changing needs of management.

The completion of the above tasks requires a great amount of effort on the part of each member of the staff. The various activities performed by this staff must be highly coordinated in order to be effective. The way the information systems division is organized plays an important role in providing this coordination. Figure 1-4 is an expanded version of the organization chart shown in Figure 1-3. Figure 1-4 illustrates a typical organizational structure of the information systems division in companies today. Notice that there are three major departments incorporated within the division. These three departments are systems development, technical support, and data processing (computer) operations. Each of these departments performs unique activities vital to the successful development and operation of the total information systems division.

The operation and management of a large computer center is a very expensive part of operating a business today. For that reason, many companies have established a special committee of individuals to evaluate and approve or disapprove all requests for projects requiring the utilization of computing resources. This group is frequently called the steering committee. The *steering committee* usually includes the top administrators of the company. These people are traditionally the vice-presidents of the company and the manager of the information systems division, even if that person does not hold the title of vice-president. In addition to approving

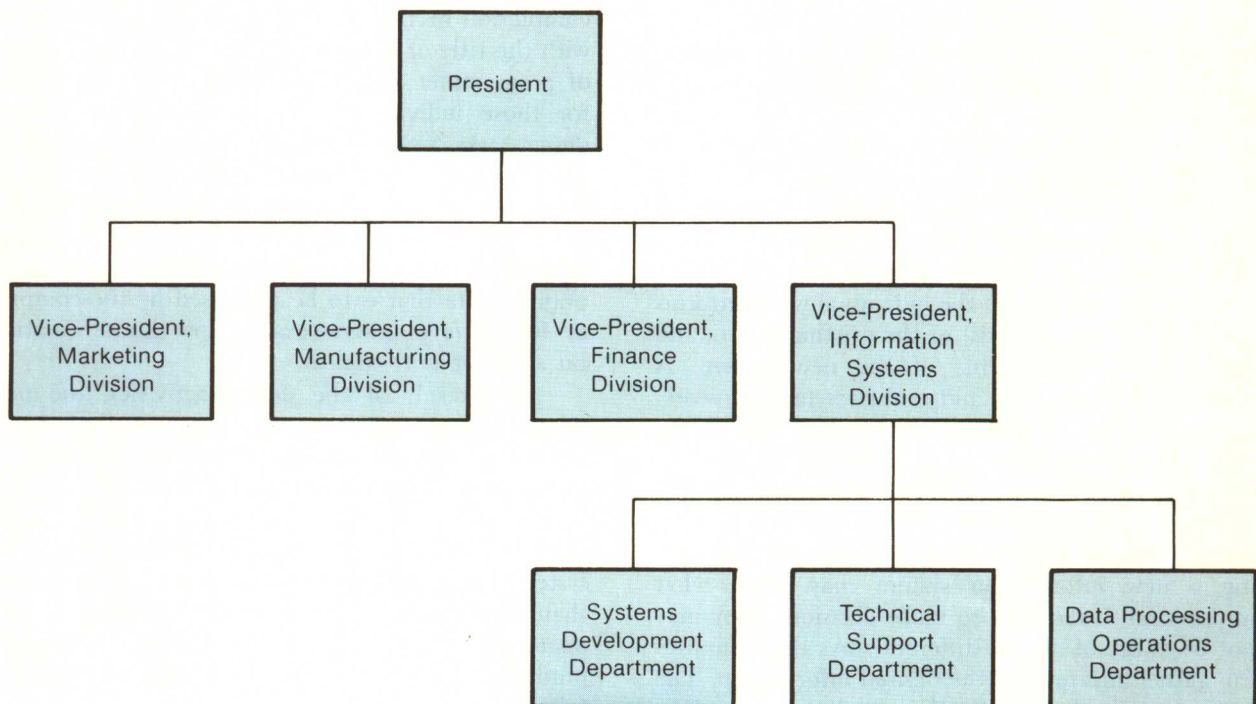


FIGURE 1-4. A Sample Organization Chart Showing the Information Systems Division

or rejecting requests for computer services, this committee has the responsibility for monitoring the progress of the design and development of all approved computer-related projects.

SYSTEMS DEVELOPMENT DEPARTMENT

The *systems development department* within the information systems division is responsible for the actual creation of the computer-based information systems used in the company. To be successful, it must be made up of individuals who have the capabilities and training necessary to perform the tasks associated with the various activities of the systems development process. There are many ways these individuals could be organized. Figure 1-5 illustrates one of the typical ways of organizing the personnel within the systems development department.

In Figure 1-5, four major sections of the systems development department are illustrated. The four sections are systems analysis and design, applications programming, systems/program maintenance, and systems documentation. Each of these sections has a supervisor with administrative responsibilities for those individuals working in that section.

Systems Analysis and Design Section

The *systems analysis and design section* employs professionals who can perform the analysis and design activities. Developing an information system is a complex operation which requires considerable time as well as the skills of several people. It is not unusual for several different systems to be in some phase of development at the same time. For that reason, it is common for one person to be assigned the responsibility of coordinating all activities associated with each project under development. This person is called the *project leader*. The project leader usually possesses successful development experience and proven managerial skills.

A *systems analyst* is the individual who performs the actual study (analysis) of the existing system and defines the requirements of the new system. A systems analyst gathers and evaluates facts by working with the manager and other personnel within the department or division being studied. This evaluation results in recommendations which include detailed specifications of what information is required to do the job. Although managers requesting a new information system may know what information is required to make decisions, they may not be aware of all the different ways the computer can gather and present the desired information. The systems analyst's expertise lies in determining how

the computer can best meet the manager's needs. Frequently, the systems analyst will propose several alternatives from which the manager can select the one which best meets the specific needs.

The detailed list of specifications that results from systems analysis is often referred to as a statement of user requirements. The *statement of user requirements* is a written report describing the new computer system in enough detail to provide systems designers, programmers, and other computer personnel with an understanding of what is needed by the user requesting the new system. In this context, the word *user* refers to any person who will use the results of the new computer system's information once it has been produced. The statement of user requirements becomes the basis for design and evaluation of the new system during the remainder of the development process.

Before the actual design of the new system begins, management will often review the statement of user requirements. In particular, the projected costs and expected benefits will be weighed. Based upon the ratio of costs to benefits, the decision to proceed with or terminate the systems design project is made. This is frequently referred to as a "go/no-go" decision. This evaluation and decision is made by the steering committee in companies where the committee has been established.

After the statement of user requirements has been reviewed and approved by the requesting manager and the steering committee, the systems design activity is undertaken. The systems analyst is frequently the person responsible for the successful completion of this step. It is rare to find someone with the title of systems designer. However, the title of programmer analyst has become rather common for those individuals who perform many systems design tasks. Some of the tasks include the design of source documents, report layouts, files, and data bases. In addition, equipment characteristics and processing requirements are determined. A *source document* is the form or medium that contains the original data that is to be processed by the computer. *Report layouts* show exactly how the information on a report is to appear.

As a result of the design activities, the new system is constructed in such a manner that it will fulfill the requirements specified in the statement of user requirements. The output produced by the new system must not only be accurate and timely, but be produced at a justifiable cost. For example, the new system must provide benefits equal to or greater than the cost of its development, installation, and operation. Four different products (outputs) are produced by the system design activity. They are as follows:

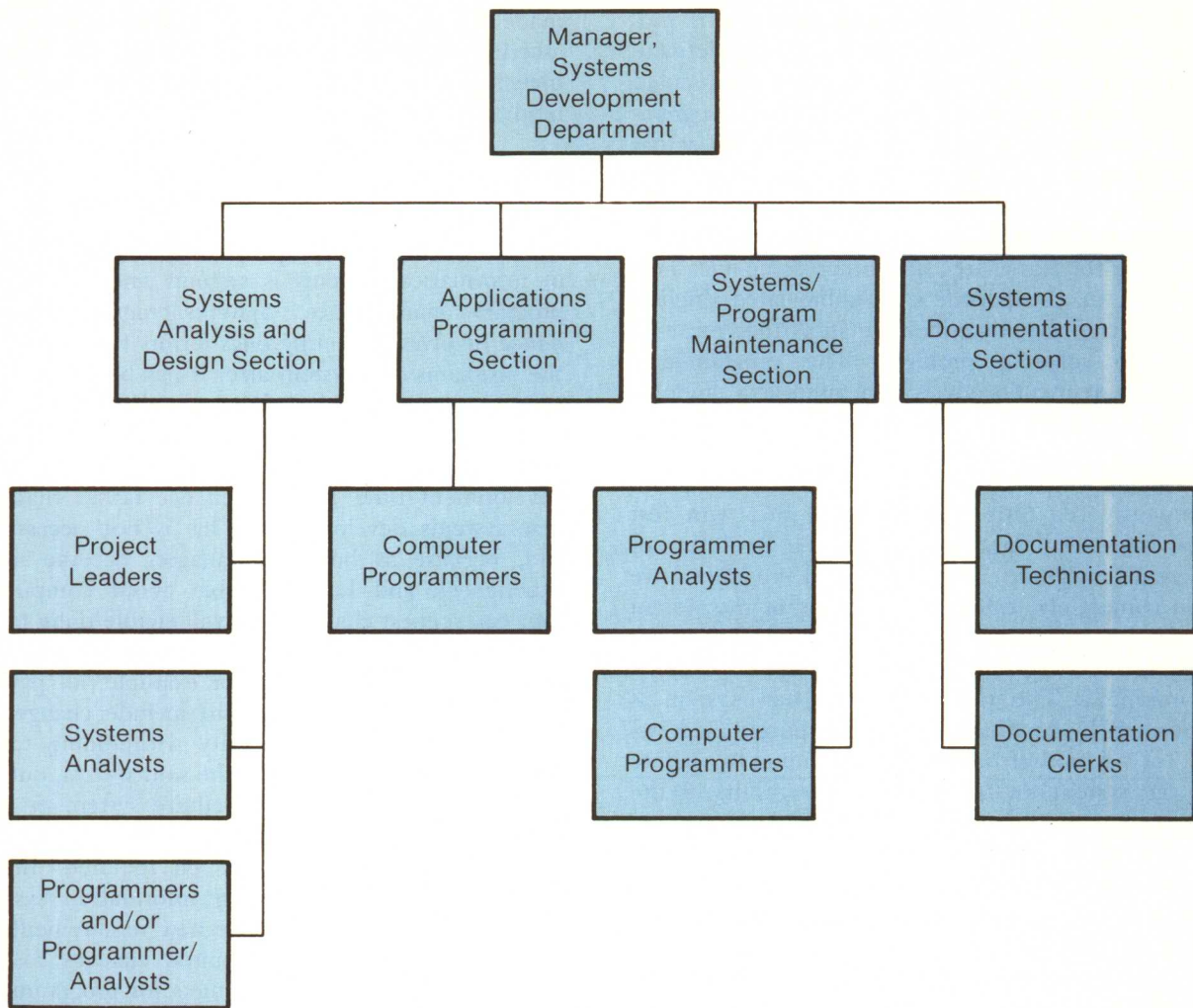


FIGURE 1-5. A Sample Organization Chart of the Systems Development Department

1. Specifications for any additional data processing equipment that may be required by the new system.
2. Specifications for the computer programs needed to process the system's data.
3. Operational procedures for the operations personnel in the computer center.
4. Documentation and operational procedures for use by the personnel in the division or department requesting the new system.

The actual costs involved with implementing a new computer-based information system can be predicted much more accurately after the systems design activity has been completed. Based upon the information available at that point, another management review and “go/no-go” decision is often made prior to continuing with the next step—application programming.

Because of the many different tasks performed by a systems analyst, special skills are required. A systems analyst must be skilled in gathering and evaluating information, problem solving, and human relations. An analyst should have a good understanding of business organizations, applications, and computer capabilities. In addition, communication skills (both written and oral) are valuable assets to a systems analyst.

Applications Programming Section

Applications programming is all the activities associated with creating a detailed set of computer instructions that enables the computer to produce the required results for a specific problem. The act of writing the actual instructions that the computer will follow is called *coding* or *programming*.