It includes the procedures, methods, and programs provided with the system and the manufacturers' support needed during the pre-installation, installation, and post-installation phases. All of these necessary and important features are provided with the IBM 7070 Data Processing System.

Specifically, they are:

**Balance System:** The high speed of computing and internal flow of data are balanced by high-speed tape units, rapid access storage in the disk files, and high-speed card readers and punches.

**Maximum Utilization:** Automatic priority processing allows efficient time-sharing and multiprogramming abilities for input, output, tape, disk file, and inquiry operations.

**Building Blocks:** A variety of units in varying capacities permit custom-made systems with the ability to grow as the user's needs are increased.

**Application Range:** The 7070 can handle a wide range of applications, including batch processing, in-line processing, and computing. It covers the area of medium-to-large-scale systems.

**Transistors:** Solid-state components offer such advantages as high reliability and reduced requirements for floor space, electric power, and air conditioning.

**Access and Use of Storage:** Each word in core storage can be used for a program step, input or output. Scatter read and gather write minimizes the need for additional steps which arrange data or assemble them for tape operations.

**Simultaneous Operations:** Transferring data to and from the system can be overlapped with computing operations.

**Fully Alphabetic:** A complete 80-column card can be read in or punched for any combination of numeric and alphabetic data.

**Programming Logic:** Field definition, 99 index words, single address instruction, and many other factors contribute to direct and simple programming logic.

**Variable-Length Records:** Full flexibility in handling grouped records of variable length on tape is provided automatically by the scatter read and gather write feature and automatic zero elimination.

**Reliability:** Complete checking both of input, output, internal operations, and tape and disk storage insure the ultimate in performance.

**Programming Systems:** Assembly programs and a number of other library routines assist in the planning and programming.

**Programming Testing:** Programs can be tested prior to delivery permitting full operation immediately after installation.

**IBM Services:** IBM offers training, planning and programming assistance, customer engineering, and other services. These are the vital steps necessary to insure that the man-machine-methods team is complete and will function properly.

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**An Organizational Approach to the Development of an Integrated Data-Processing Plan**

GEORGE J. FLEMING†

The dictionary defines organization in four ways. One of these definitions is: "The way a thing's parts are arranged to work together," and this is the one that most nearly describes the subject.

The term integrated data processing has various meanings. Although originally used to describe common-language machine procedure it has gradually been extended to include all phases of the processing of data and is often used to describe the wedding of two or more data systems. For the purposes of this paper, the broader definition will be used.

The reasons for which data are processed may be categorized as follows:

1) Top-level management reports.
2) Middle-management reports.
3) Functional reports.
4) First-level management and operating reports.

Although these categories are a bit arbitrary, they are a useful classification for establishing the requirements of an integrated system. Each of these categories competes with the other for data and each has the following characteristics:

1) Requirement for data and supporting records.
2) Cycles on which they are produced.
3) The degree of accuracy that needs to be maintained.
4) Manner or method of presentation.

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The degree to which each category is compatible to mechanization varies as does the method of collecting, controlling, transporting, transcribing and processing of the data.

Top-level reports are usually prepared by a skilled staff from data already processed and recorded. They often reflect the considered judgment of the staff and may be accompanied by documents that serve to analyze and evaluate the results they reflect. The volume of data required is relatively small, although data may be collected from many sources. These reports are usually produced on a monthly or longer cycle and the degree of accuracy required is often exacting. Current data-processing techniques are not usually adaptable to these reports.

Middle-management reports are also generally compiled from data that have been summarized and recorded for other purposes. The interests in this category are as wide as the data-collection and processing systems will permit. Requirements range from the critical to the superficial and the pressures that can be brought to bear are considerable. The cycles vary from weekly to monthly and the volumes of data required can be tremendous. The degree of accuracy is high and methods of presentation are complex.

The need to present data that are meaningful in a manner that requires minimum analysis is important as is careful disciplining of the requirements. Generally these requirements are adaptable to mechanization.

The functional reports include payrolls, inventories, production control, and other similar types of data processing that service the many functions of the company. The processing of large amounts of data collected from many sources is a major characteristic. The reporting cycle is most often weekly and the work usually involves the maintaining and updating of records. The degree of accuracy required is high as accumulative errors may lead to considerable distortion.

The cooperation of many departments is usually required in order to combine families of associated processing into functional applications. An example of such a combination is the labor handling function which would include data processing required for the personnel, timekeeping, payroll, accounting, treasury, and labor relations departments. Another example is the material handling function which might include some data-handling problems that originate in the purchasing, receiving, storing, accounts payable and manufacturing areas of the company.

These processes are highly compatible to machines, and are generally the forte of the data-processing service center. Most of the applications being processed on electronic data-processing equipment are, at least for the moment, in these functional reporting areas. The new data available to middle management are largely a by-product of these processes.

First-level management and operating reports are often the stepchild of our modern high-speed data-processing systems.

The operating levels of management need reports that reflect yesterday’s results the first thing this morning. The need for corrective action is urgent and must be taken immediately if it is to be effective. The report formats must be easily understood by many people and the contents flagged so that a cursory scanning of the detail will reveal troubled areas. The volume of data required is often large, as these reports are prepared for the control of detailed operations. A relatively low level of accuracy may be tolerated. A daily cycle and simplicity of format are the important considerations. Data collected in or close to the area being served are normally the source of these reports.

Format, collection systems and methods need to be individually tailored to the department served as the manufacturing or service processes they are designed to control usually differ within each department.

The data-processing center is rarely equipped with either the machines or manpower to cope with this category of reporting. Yet, the data needed for these reports are usually the same data that are required for the functional reporting category.

In order to promote efficient, practical, and economical integrated processing, the data-processing center must maintain an influential position regarding the determination of data-handling procedures within the company. The quality and cost of data processing for the functional and middle-management categories of reporting will be dependent on the center’s success in establishing informational pipelines into all departments and the development of uniform and standardized methods of operation. The center will need to maintain staffs of intelligent personnel trained in data-processing methods in order to set up and operate the sophisticated procedures that will be required.

Experience indicates that even this is not enough. Only when machine techniques are combined with practical operating experience can integrated results be successfully achieved. The establishment of informational pipelines is only useful when they can be carefully maintained and vigilantly guarded. Sophisticated procedure may be satisfactory for the highly-skilled machine technician but breaks down rapidly when entrusted to less-informed employees.

It appears that we may have reached an impasse on our trail towards the integration of data processing.

The requirements of the data-processing center are, in many respects, in conflict with aspirations of the department being served. The forcing of informational pipelines and procedural restriction on other departments tends to create awkward human relations problems.

The various departments in need of “on the spot” reporting to keep their first-line management informed will be inclined to develop their own methods which will
compete for data and make standardizing of data-handling procedures difficult. Arranging these parts to work together is a challenging problem.

The proposed solution is not an easy way out. However, where the suggested type of organization has been established by managers who were aware of the many incompatible aspects of the problem and who have had a sincere desire to promote efficient methods of data processing, it has been quite successful.

The proposed plan assumes the following:

1) A centralized concept of data processing has been established, at least for the use of major equipment items.
2) Integration of the various data processes is considered advisable.
3) The central data service is equipped to take proper care of most of the functional and management reporting and record-keeping requirements.
4) The center reports to a level of management that is influential in all departments of the organization.
5) A capable staff of analysts and programmers is available.
6) Initial applications on major equipment have been satisfactorily installed.

The major feature of the proposed organizational plan is an outside (of the center) operation designed to provide individual service to the using departments and provide for the informational pipelines required by the department. Another way of describing these service groups would be branch or satellite data-processing operations.

The satellite operation may be as large or small as required to provide for the needs of the department being served and may operate minor data-processing equipment. The equipment may range from paper-tape equipped adding machines, typewriters, and bookkeeping machines, to small punched-card installations or, where justified, small-scale electronic machines.

Normally, these satellite operations will be located in the using departments in order to establish an atmosphere conducive to the wedding of technical machine-processing skills with the departmental experience.

The supervisor of the satellite operator will report directly to the data-processing center. However, he will be dedicated to serving the department manager to whom he is assigned and must be approved by the department manager. It is expected that this operation will be staffed by a mixture of personnel drawn from both the data-processing center and the using departments.

The responsibility of this group will, in addition to serving the using department, also have the secondary responsibility for establishing and maintaining the pipelines necessary to provide the data-processing center with the data that are originated or perpetuated by the using department. It is further expected that as the satellite group acquires the proper skills they will assume an active role in preparing suggested methods and procedure for the approval of the department head and, when approved, assist in their implementation.

Although the size of the satellite operation and the manner in which it is equipped will vary with the needs of each department, the duties will remain the same. Implementing the plan will require a clear understanding of the objectives and duties of each satellite group. A letter or memo signed by the data-processing manager and the department head is suggested in order to be certain that the operating ground rules are firmly established. These rules may be expanded as the group gains familiarity with the area. However, the line of reporting must be to the data-processing center if maximum benefits are to be attained.

Organization within the data-processing center is flexible. However, as the number of satellite operations increases, it may be advisable to appoint a supervisor over these operations to insure that expected standards of service are maintained and to coordinate the procedural and data-flow activities.

Several problems in human relations are apparent in this proposal, such as the acceptance of the satellite operation into a department, the divided responsibilities of the supervisor, and the relationship between the department head and the data-processing manager. Difficulties may be expected in this regard, but experience indicates that wherever a sincere effort is made to overcome these difficulties, they are less serious than those generated by other types of organization. The proposal is often questioned from the standpoint of the utilization of equipment and manpower. This factor, if present at all, is normally offset by superior service rendered the using department. The data-processing center will benefit by receiving preprocessed data under carefully administered controls and in summarized form.

The most serious problem will prove to be in adequately manning the satellite operation with qualified personnel. Most often the success of this plan will be reflected in the ability of the appointed supervisor.

The establishment of these satellite data processing groups provides an organization which may well serve to overcome most of the day-to-day problems connected with integrated data processing. Its many benefits include:

1) Providing the using department with a specialized data-processing service. When properly equipped, this group can prepare records and reports tailored to the department's requirements without seriously interfering with the schedule of the central data service. It also provides a vital service to the data-processing center by maintaining surveil-
Developing a Long-Range Plan for Corporate Methods and the Dependence on Electronic Data Processing

NORMAN J. REAM†

INTRODUCTION

I HAVE been asked to speak to you on the subject of the impact of electronic data-processing innovations on corporate systems planning. This subject matter could be a recitation of how we have approached our planning effort at Lockheed followed by a recitation of how it has been adjusted from time to time by innovations announced by various manufacturers of electronic data processing equipment.

However, I feel that this subject can best be approached by first spelling out some of the major problems facing all industry, pointing out some areas that are lacking in development. Then I shall attempt to discuss what appears to be a logical approach to these difficult management problems, what contributions electronic data processing has made to date, and what contributions future innovations in electronic data processing will or will not make to the solution of this multitude of problems.

While my remarks are directed to a corporate administrative systems planning effort, we all realize that the subjects that are under discussion at this conference have broad social significance and we must stand ready to assume our responsibilities.

Our economic system is designed in a manner in which a majority of the decisions affecting it are made by thousands of independent managements. This is an advantage to our country and to industry, but it also poses heavy responsibilities on the shoulders of members of management. As Americans, we are convinced that this freedom of action awarded these managements will, when working within the proper social framework and business environment, result in the greatest good for our...