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Business Information Processing Systems

1968

C. ORVILLE ELLIOTT, Ph.D., C.P.A., C.D.P.

*Professor and Chairman, Department of
Accountancy and Quantitative Studies
School of Business
Western Illinois University*

ROBERT S. WASLEY, Ph.D.

*Professor of Accounting
School of Business
University of Colorado*



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BUSINESS INFORMATION PROCESSING SYSTEMS

*IRWIN SERIES IN QUANTITATIVE
ANALYSIS FOR BUSINESS*

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To Our Patient Wives

Helene *and* Helen

Preface

THE IDEAS and data here provided are designed to serve as a presentation of the information processing systems in use in business firms today. It is recommended that the reader should have as background either some business experience or, at least, the equivalence of a one-semester course in accounting before approaching this area of study. Some realization of the flow of data and a knowledge of business terminology are necessary prerequisites.

Our greatest desire is to provide an overall acquaintanceship with the business information processing systems in use today. To achieve this end we have provided:

- Fundamentals basic to the processing of data;

- The special and sometimes technical terminology used in conjunction with information processing;

- Processing systems available and the equipment to implement these systems;

- How the data produced by these systems may be utilized by management in performing the management function;

- The control functions available and necessary to protect the assets of the firm and to assure the proper presentation of financial data, all emphasized throughout in terms of the specific information processing system being discussed; and

- Particular problems which may present themselves when a change of systems is contemplated, and some approaches to be utilized in avoiding or solving these problems.

Only such an overall acquaintanceship can provide the background necessary for an understanding of the problems to be faced—and solved—in organizing, defining, implementing, and utilizing a modern information processing system. How one of the most important, and quite often least understood, factors to be considered in such a system is the human element of the firm, which must be so molded as to provide a cohesive relationship among these human factors, the work they perform, and the equipment they utilize. This is important in every system but an absolute must in the developing integrated systems involving innovation in the gathering, processing, and utilization of data in what may eventually evolve into the so-called total system.

We feel that knowledge and understanding remove fear and doubt concerning the "mysteries" of, particularly, the electronic computer. We have shown that, regardless of the information processing system considered, the same fundamentals are common to all and the logical patterns to be followed in the processing procedures are identical in each, whether it be a manual, mechanical, electromechanical, or electronic system. It is only in the equipment used, the functions performed by the given equipment units, and the speed and accuracy available through the use of equipment that these systems differ.

An attempt has been made to present the different areas covered in a manner which will permit considerable flexibility in their use. Part of this flexibility is in that some chapters—and even some areas—may be omitted without disrupting the pattern of the material presented. Such omission may be desirable where emphasis is desired on information concerning either the punched card or the computer. Each of these areas is written so that the individual, depending on his background and interest, may use the material provided as a springboard for more advanced study. An annotated bibliography is included at the end of each chapter to provide reference to other information sources.

Chapters 1 through 4 introduce the data (and their source) necessary to manage business resources and show how devices have developed, over time, to permit evolving data processing techniques to meet the demands of ever increasing volume until today we have modern information and control systems based on fundamental data processing functions.

Chapter 5 discusses the fundamental concepts of how techniques, utilizing symbols associated with flowcharting, can be used to present pictorially the flow of data and to document the related forms containing the data. These techniques used in flowcharting are most important; not only do they acquaint the reader with ideas associated with the flow of data, from its origination to finished report form, but they also assist in organizing his thinking preparatory to writing programs acceptable to given computer systems.

Chapter 6 reviews the application of manual and mechanical methods which may be utilized in the processing of data. Some of the more commonly found techniques and equipment available for these processing systems are presented.

Chapters 7 through 9 introduce and expand upon the punched card systems available to process data. The material on the punched card itself is equally as applicable to the computer system as to the punched card system, as it serves as one of the major types of computer input. In the balance of this area, stress is placed on the use of the punched card system in a business environment, the problems of its utilization, and what is to be gained by using it. Typical punched card equipment is

included in this discussion as an adjunct to explaining the functions performed in these systems.

Chapters 10 through 21 are all specifically computer oriented. The first three of these chapters trace the computer from the first known such device through the development of the modern computer and its fairly recent usage in business information processing. The organization of the computer and its components stresses the relationship of the various codes used in the operation of these units. The advantages and disadvantages of the various input, output, and storage units available are discussed in conjunction with the functions they perform, their speeds, and, where applicable, their capacities.

Chapter 13 describes the concepts related to integrated information systems techniques, planning requirements, common-machine languages and associated equipment. These concepts also include those related to communication, on-line real-time, and time-sharing systems.

A discussion of the control function, and its close relationship to the audit trail and audit requirements, in Chapter 14 reemphasizes the need for adequate controls to be built into every system. The controls available in the many forms of input, processing, programmed, and output controls, are defined or discussed as to their nature and usage.

Chapters 15 through 17 provide a background in the development of software and the newly emerging techniques of multiprogramming and multiprocessing and their associated executive programs. The FORTRAN and COBOL programming languages are presented in separate chapters in a form permitting the reader to grasp some idea of the intricacies, the terminology, and techniques of the languages, as well as providing illustrative applications.

Chapter 18 illustrates, through a variety of specific applications at various levels of sophistication, management's use of the computer as it relates to the information processing system.

The remaining three chapters present most of the problems which confront management when indications develop in the firm which suggest that a systems change may be necessary to provide management with timely data. Specific and alternative approaches are provided which may be utilized in avoiding or solving the many problems which arise in any justification study or, when feasible, in converting to a new business information processing system.

Appendix A includes a pictorial and summary review of selected major computing systems and includes most of the electronic business information processing systems currently available.

Appendix B, a glossary, provides a ready reference to definitions of the many specialized terms found in the text.

It must be recognized in an undertaking of this magnitude that the authors are greatly indebted to many individuals for their suggestions,

help, and encouragement. To each of them we wish to acknowledge this indebtedness and to extend our appreciation; but, especially, we thank Mrs. Ferrol L. Cramer, Daniel Grant, Konrad Kubin, and James Fischer for their aid in manuscript preparation.

Professor Robert B. Fetter, consulting editor of the Irwin Series in Quantitative Analysis for Business; Harry H. Bingham of Richard D. Irwin, Inc.; and the Irwin copy editors have all been most cooperative in suggesting organizational and writing style improvements.

Many of the changes in this revised edition were made as a result of a survey completed by a number of educators currently using this book in the classroom and for these suggestions we are most appreciative.

We are particularly indebted to all the major equipment manufacturers, and their local representatives, for their cooperation in furnishing data in general and on their equipment in particular, and for permission to use their illustrations. Each firm contacted cooperated fully to the extent asked.

April, 1968

C. ORVILLE ELLIOTT
ROBERT S. WASLEY

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CHAPTER 1

Statistical Data for Managing Business Resources

AS FAR BACK as Assyrian and Babylonian history, we have indisputable evidence of commercial transactions. A large part of commerce centered in the temples. The scribes, who were the chief accounting officers recorded all receipts and disbursements of property belonging to the local temple, the "corporate clearinghouse" of these early times. It is evident that even credit existed on an extensive scale.

The surviving facts which these early scribes recorded are meager, but they were none the less important to the people of that time. As trade and commerce expanded, the records of these business ventures also became more detailed and extensive. This dual development was brought about through the increased interest and concern in the outcome of business ventures by different groups of people; owners, as well as the taxing authorities, had a vested interest in the venture, and it was important that adequate facts surrounding the venture were made known.

WHAT ARE STATISTICAL DATA?

What are the characteristics of these facts which are of such concern to so many different organizational units and groups of people? According to Eric L. Kohler, the word "data" means "facts."¹ He goes on to say that a "statistic is any numerical measure of a physical or economic condition

¹ Eric L. Kohler, *A Dictionary for Accountants* (3d ed.; Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963), p. 158.

or activity, as a wage, a national income total, or a summation of assets."²

One could conclude, therefore, that statistical data are numeric facts which arise in the conduct of economic as well as physical activities. For example, the U.S. government has systems for collecting data relative to the output of the nation. It is from data supplied by these systems that the gross national product (GNP) figures are derived on an annual basis.

With the present armed conflict in Vietnam, the armed services have a tremendous data handling problem. They have had to devise systems which will make the right authorities—at the right times—aware of the manpower supply, by technical specialty, available for combat. They must also provide for adequate supplies of food, equipment, ammunition, etc., to be ready at the right place at the right time. This system must supply the right information to the Defense Department in Washington so that the necessary men and materiel are provided the battlefield commanders in Vietnam when they are needed.

All cities depend upon data, in part at least, to operate. Each year, when the budget for the city is prepared, the revenue envisioned in the budget is predicated upon anticipated tax receipts. These estimates are based on statistical facts accumulated in previous years. The planned expenditures of the city (streets, parks, police force, water, etc.) are based upon educated estimates, made in the form of numeric facts, of costs.

Statistical data are of equal importance to the managers of modern business enterprises. On this point, Walter B. McFarland of the National Association of Accountants has the following to say:

Advances in management have been one of the significant characteristics of twentieth century industrial technology.

Practically all of these advances in management are founded upon the development of information systems which enable management to act intelligently rather than blindly. Since the economy in which we live measures economic resources in terms of money, accounting is the key element in management information systems. Without reliable financial information provided by the accountant, effective operation of any but a very small business is impossible.³

The statistical data which management needs on a current basis are of many different types. For example:

1. Amounts owed by customers.
2. The quantity of a certain item sold last week.
3. The size of garment sold to the last customer.
4. Amount of wages paid employees the last payday.

² *Ibid.*, p. 447.

³ Walter B. McFarland, *Concepts for Management Accounting* (New York: National Association of Accountants, August 1966), p. 1.

5. The sales tax collected and that owed to the state on the sales made last month.
6. An analysis of sales by territory, by product, for the last three years.

DEMAND FOR DATA

One of the first things to be considered in the study of data processing is *What brings about the need for data in business?* Actually, there are two broad categories of demand. These can roughly be classified as:

Those which originate *inside* the firm in connection with the daily operation of the business enterprise, and

Those which are *external* to the firm.

The internal need for data is usually that of management, which needs classified and summarized information for use in various types of analyses on a daily, weekly, or other cyclical basis. This information stems from the recording of daily transactions in a pattern which provides a historical, detailed record of the operation of the firm. From this historical record, information can be selected and accumulated as required to provide the reports used in making business decisions and in facilitating other management functions.

The external need for data normally fulfills some of the internal needs of the firm as well, but its requirements are normally not in the same form as data developed solely for internal use. Some examples of external demands for data are those for:

1. Customer invoices. Customers not only need to know the total amount they owe, they also want to know the quantity and description of what they have purchased.
2. Purchase orders and invoices. On any purchase order sent out, it is necessary to have a *precise description* of what is ordered, as well as quantity, price, size, or color information.
3. Creditors. They are usually most interested in the financial solvency of the business, indicating its ability to pay off its debts when they come due.
4. Potential investors (including stockholders). Their primary interest is in the continuing ability of the business to make an adequate return on the investment.
5. Governmental agencies. There are innumerable taxing and regulatory agencies which demand that data, prepared in a specified way, be submitted at periodic intervals.

Internal Need for Data

In the simplest form of business organizations—one person in business for himself—it might at first appear that an individual has little need for operational data because he can hold all the necessary facts in his head.

This is apt to be true as long as the size of his business and the number of his employees do not exceed the span of his personal control. As soon, however, as he feels that he must hire someone else to *assist* him in his management functions, and to whom he is planning to delegate certain responsibilities, his dependence upon statistical facts in his control function becomes paramount. At this point, also, the volume and variety of the daily transactions will have increased many times.

An important function of management is to decide upon courses of action that the business should follow. Some of these decisions must necessarily be made at frequent intervals; others need not be made as often.

SHORT-RUN DECISIONS. Facts are of vital importance in making all types of business decisions; however, typical examples of major decisions occur under the following circumstances:

1. The cost of making our product is too high. (*At what point, and why, did the costs become excessive?*)
2. Sales have been very good for the last month, and it is important to have the merchandise needed to fill the orders. (*What types of merchandise have been sold, and what quantities remain? Do we now need to order more?*)
3. Business has been good, with even better potential. (*Are we at the point where we can afford to add another salesman?*)
4. The firm is badly in need of cash to meet current operating expenses. (*What money is owed us, and when is it likely to be collected? What course of action should the business follow to provide the needed funds?*)
5. With the growth of the business, there are many new customers, most of whom are seeking credit. (*Which customers are good credit risks and which are not?*)

A business manager also has the problem of planning activities for the business one month, three months, or six months in advance. Once more, facts concerning the past are of vital importance in making decisions as to what should be done in the immediate future. An accurate knowledge of the past can materially influence decisions affecting future actions.

LONG-RUN DECISIONS. In the world of business we can measure the cost and the results of our activities because, for the most part, we are dealing with matters which are, or can be, expressed in terms of money. Thus a fairly precise measurement of the economic success of a business enterprise can be made. The basic economic motive behind the existence of business is the maximization of profit, or, to say it more precisely, the greatest return feasible on the capital invested in the business enterprise.

This means that a business must continuously strive in two directions: on the one hand, it must try to maximize its income through higher