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Management Information Systems, the author believes, were set up to supplant accounting as the major reporting system in business. But the traditional MIS has many drawbacks. He suggests a controlled information system, in which accountants would have a distinct role—

ACCOUNTING'S NEW ROLE IN COMPUTER-BASED INFORMATION SYSTEMS

by Surendra P. Agrawal

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THE NEED and importance of an information system in a business organization requires no emphasis here. Timely information is needed by various company members for decision making and operations within the organization, as well as by many external parties; the system develops and communicates this information to the various users.

Traditionally, accounting has been the only, or major, information system in business organizations; but in recent years, many businesses have set up computer-based management information systems (MIS) as an alternative to accounting information systems. Although accountants often are associated with MIS development and operation, generally no specialized

function is assigned to them in these systems. The growing use of MIS, therefore, is a matter of grave concern to the future of accounting, particularly management accounting, as a distinct discipline. In order to continue to render useful services to management in the modern environment, accountants must, of necessity, find a role in computer-based information systems that they can perform effectively and usefully as specialists in their own right. This, in turn, presupposes the adoption of a model of such systems which would require the specification of that role.

Need to develop a new model

Management information systems are replacing accounting systems

because accounting has not kept pace with the informational requirements of various users, particularly members of modern management. The following appear to be the reasons for this situation:

1—The scope of traditional accounting is limited primarily to reliable financial information, whereas management also needs other types of information: non-financial aspects of personnel, marketing, production, research and development, and economic environment.

2—Developments in the management sciences have encouraged the use of highly sophisticated quantitative information which can be produced by various mathematical and statistical methods. Accountants have not been able to adopt

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and integrate these techniques within their accounting model.

3—The actual information needs of users are not known with any precision. Accountants are acutely aware of this problem, and have been making constant progress in ascertaining such needs and making appropriate modifications in accounting. They cannot, however, match the enthusiasm of the systems experts in this regard, who have been known (in the past, at least) to promise the provision of all the needed information.

The establishment of an MIS eliminates some of the shortcomings of accounting. But a survey of the numerous empirical and other studies reported in the literature shows that expectations concerning MIS have been only partially realized in most organizations, and that it has not been possible to utilize in full the potential of the computer. The more significant deficiencies of MIS pointed out by these studies are mentioned below:

Overabundance of irrelevant information—In many organizations, managers suffer from an information overload. They must spend a great deal of time separating the relevant from the irrelevant.¹

1—Ackoff, Russell L., "Management Misinformation Systems," *Management Science*, December, 1967.

Communication gap between experts in the systems area and users of information—This deficiency has attracted the attention of the largest number of researchers, and is at the root of many other problems. The communication gap exists not merely between experts in the systems area and users of information, but also among the various categories of such experts.²

Inadequate understanding of information needs—Systems specialists are often unaware of the exact needs of management,³ and, hence, the information supplied is not tailored to the user's needs. This situation may arise because of either or both of the following reasons: (a) Systems specialists fail to ascertain such needs. They often emphasize what the users ought to need rather than what they actually need, and tend to disregard non-quantitative aspects of information. (b) Decision makers are unable to specify their exact requirements. In many cases, managers cannot identify the important variables involved in decision making and cannot reduce the decision

2—Stuart, Walter J., "An Experiment in DP Management—Revisited," *Datamation*, November, 1969.

3—Gallagher, James D., *Management Information Systems and the Computer*, AMA Research Study #51, New York, American Management Association, 1961, p. 13.

process to quantitative expressions.⁴

Incompatibility of sophisticated information and management capabilities—An important part of the output of an MIS consists of highly sophisticated information. The operations research specialists involved in the development of the information processing formulations are trained to avoid suboptimization and, hence, create "grand schemes." But management is frequently not able to use such analyses.⁵

Exclusion of judgmental factors—A computer can develop information only in accordance with un-

4—Schoderbek, Peter P., and Stephen E. Schoderbek, "Integrated Information Systems—Shadow or Substance," *Management Adviser*, November-December, 1971.

5—Vandell, Robert F., "Management Evolution in the Quantitative World," *Harvard Business Review*, January-February, 1970.



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equivocal instructions. Information processing techniques that require the use of undocumented judgment or interpretations are, therefore, excluded from an MIS.⁶

Lack of flexibility in MIS—A large computer project is a one-time job. New programs may, of course, be added with comparative ease; but making changes in the existing interrelated programs used in the MIS would involve a complex operation. Hence, an MIS often lacks flexibility and is difficult to change.⁷

Inadequate control over input—Although the control of input data is one of the most critical areas in MIS, usually this is given less thought than computer programs. This situation arises because of (a) the attitude that a poor method of creating input will work, (b) the fact that source materials are created in areas outside the MIS, and (c) the tendency to believe the "world ends at the door of the computer room."⁸ MIS specialists consider the data input as "given," and hence inadequate attention is paid to its control.

From the foregoing discussion it would appear that neither accounting nor MIS has been able to adequately achieve the purpose of an information system, and a need exists to develop an improved model to do so.

The controlled system

A review of the basic deficiencies of accounting and management information systems suggests that a good information system should possess the following features:

(a) It should have control over its input so that it would accept only the data needed to develop the required information, and would keep in touch with new

types of data available, so as to develop the capability to utilize the same.

(b) It should have the capability to produce various types of information using whatever processing techniques are called for. In particular, it should be able to utilize both quantitative and qualitative inputs, and make use both of human judgment and the vast computational capability provided by computers in the processing thereof.

(c) It should keep in constant touch with the needs of various users and try to supply the required information.

(d) It should have adequate flexibility and provision for ongoing developmental research.

A general model, called the "controlled information system," is developed here to incorporate these features.

The controlled information system will consist of four subsystems that are assigned specific functions and responsibilities, as follows:

Input subsystem—Functions of this subsystem will be to accept all data that meet appropriate standards relating to their usability, authorization, and reliability. It may also make feedback to the developmental subsystem when necessary for proper utilization of available data. These functions may require exercise of subjective judgment by the person in charge of the subsystem, particularly when dealing with new types of data which have not been previously available. Some of the data entered into the system may be found to be unusable, and may, therefore, be subsequently expunged.

Processing subsystem—This will be divided into two sections, one using the computer for storage, retrieval, and manipulation of data, and the other carrying out these tasks manually. The computer will primarily deal with quantitative information in accordance with detailed programs.⁹ Other types of

data and processing will be handled by individuals who may or may not utilize various types of other mechanical aids. Both sections will follow standardized procedures or guidelines. The outputs of the two sections must be combined, which may be done by manual input into the computer, and the information may then be considered ready for reporting to users. The processing programs and guidelines are laid down when the system is originally set up, and subsequently are added to, or modified by, the developmental subsystem with which there would be frequent interaction for this purpose. As far as possible, the processing should be done in an integrated manner, modular programming should be adopted, and the techniques used should be compatible with the needs and understanding of users. In order to be helpful in problem solving at the higher levels of management, the processing may include such advanced techniques as model building and simulation.

Output subsystem—This subsystem is responsible for enforcing appropriate standards in the output of the system. Such standards should ensure that information of the correct reliability level is supplied to a particular user or for a particular purpose, that only the information actually needed is reported, and that only properly authorized information is communicated to people who are entitled to receive it. However, it would be extremely difficult to achieve the ideal of providing custom-made information for each individual decision maker and for each individual decision. To the extent that information reporting is not standardized and users have made no specification of their informational requirements, the person in charge of this subsystem would need to use his judgment to determine what information should be provided to whom.

He may also help the developmental subsystem by providing feedback about information actually needed but not being supplied, information being provided but not

6—Long, Charles L., "Needed: A New Profession," *Journal of Systems Management*, June, 1971.

7—Toan, Arthur B., Jr., "MIS—A Status Report on the Concept and Its Implementation," *The Journal of Accountancy*, June, 1970.

8—Rubin, Martin L., *Handbook of Data Processing Management*, Princeton, Auerbach Publishers, 1971, Vol. 4, p. 1.

9—Some nonquantitative data may also be processed by the computer, particularly for storage, indexing, and retrieval.

used, and changes in information needs.

Developmental subsystem – This subsystem will also be divided into two sections. One will receive and interpret feedback from the other subsystems as well as from users of information. The second section will carry out research and develop or modify procedures and guidelines used by the processing subsystem. The techniques of research may include operations research methodology. Additions or modifications may be made after a proper study of technical feasibility and a cost/benefit analysis. Such an analysis may either be a study of the total cost and total benefits of the system, or an incremental analysis of any proposed changes.

Exhibit 1, at the right, contains a diagram of the controlled information system and shows the interrelationships of its subsystems and their sections.

Distinct new entity

The controlled information system is distinct both from accounting and MIS. It differs from accounting primarily in that it is capable of supplying all types of information needed by various users, including highly-sophisticated quantitative information. It differs from MIS because it utilizes and provides both quantitative and qualitative information, has flexibility in processing techniques, and exercises continuous human control over its input and output. Furthermore, it has explicit provision for utilizing feedback and developmental research. The principal advantages of this model may be summarized as follows:

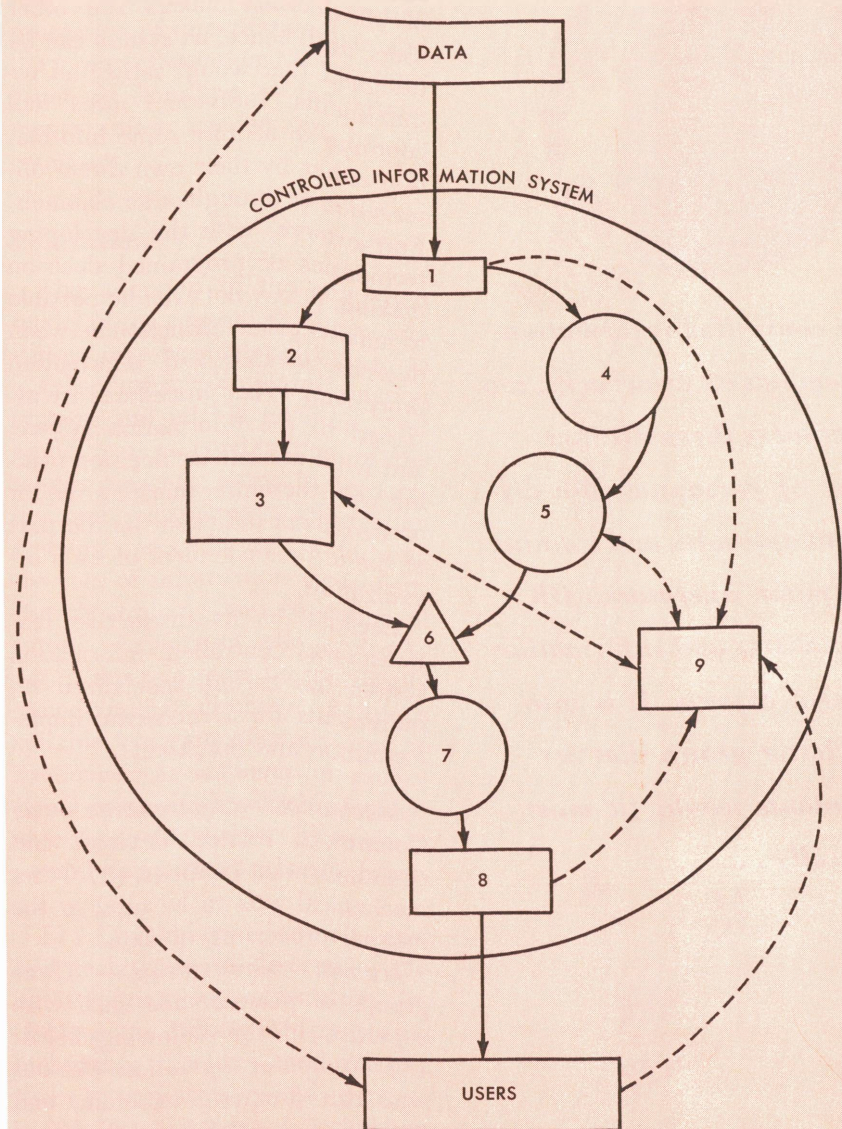
(1) It has the capability to develop various types of information, such as financial, nonfinancial, quantitative, nonquantitative, internal, external, past, present, and projected.

(2) It has the capability to communicate information in accordance with the actual requirements of various users.

(3) It possesses flexibility, that

EXHIBIT I

Model of Controlled Information System



Legend:

- | | |
|---|---|
| 1. Standards for Input | 5. Computer Processing (storage, retrieval, manipulation) |
| 2. Data for Manual Processing | 6. Combination |
| 3. Manual Processing (storage, retrieval, manipulation) | 7. Information Available for Reporting |
| 4. Data for Computer Processing | 8. Standards for Output |
| | 9. Development (feedback and research) |

is, ability to change in keeping with changing needs and environment.

(4) It has technical and economic feasibility at all times.

However, the controlled information system also has its limitations. In view of the constantly changing environment it will never be possible to make an accurate prediction of the total informational needs of all decision makers and other users, and, hence, no system can be designed that would satisfy all requirements. Individual users will continue to acquire some information either by their own direct observation or through other channels. Furthermore, with the developing techniques of programmed decision making, it may not even be possible to make a clear distinction between decision making and information processing. What procedures are assigned to the information system, and what are left for decision making will, therefore, remain a matter of significant judgment on the part of the top management of each organization.

Because of its distinctive features, the controlled information system has certain specialized requirements for a successful implementation and operation:

Mechanical requirements – (a) Computers, related devices, and communication facilities. (b) Other mechanical aids to be used in the manual processing of data.

Human requirements – Three groups of persons, one each with expertise in the following fields: (a) Computer operation—Persons who can program, maintain, and operate the computer and related devices, and who can manage the data base and the programs and routines library. (b) Operations research (OR)—Persons who can develop and improve information processing formulations. Though OR experts specialize primarily in mathematical and statistical techniques, this area is interdisciplinary in nature and help would be needed from various other experts also. (c) Information control—Persons who can control the input and

output of the system, carry out manual processing of data, and receive and interpret the feedback. This is a new area of specialization and accountants may wish to prepare themselves to carry out these tasks.

Information controllers

Accountants traditionally have performed tasks similar to those included in information control, and they have developed skills in these areas. No other discipline seems to be better suited to assume the role of information controllers.

Accountants have extensive training and background in data collection. Both quantitative and qualitative data are used in accounting, and the preparation of financial statements must always leave a trail of competent evidence. Similarly, accountants historically have processed data manually, using compatible mechanical devices as and when they became available, and have to make frequent use of judgment in such processing. They also are used to combining various types of information, for example, supplementing financial information by legal or contractual information, or qualifying quantitative information with non-quantitative information. To control output, information supplied by the accounting system must meet certain standards (though there is no unanimity of opinion as to what precisely these standards are or should be). Furthermore, accountants are “accustomed to situations in which no specific requests for information are made, and in which responsibility for generalizations about the more important needs of users must be assumed jointly by the accountant and the entity whose activities are being reported upon.”¹⁰

10—American Accounting Association, Committee to Prepare a Statement of Basic Accounting Theory, *A Statement of Basic Accounting Theory*, Evanston, American Accounting Association, 1966, p. 22.

The controlled information system has its drawbacks, too. It requires three distinct types of personnel with different aptitudes and training: computer operators; OR specialists; and information control experts. It is into the latter group that accountants would fit most logically . . .

The foregoing discussion is not intended to imply that present-day accountants already are well prepared to perform the role of information controllers. The principal limitation of accountants is the scope of accounting information. They would need to expand their interest from financial information to all types of data and information used in business organizations.

This would require a substantial change in the training and education of future accountants who aspire to work as information controllers. It is suggested, therefore, that "information control" be considered as an additional branch of accounting. It is expected that this branch would gain importance with the increasing use of computers for information processing.

New skills must be emphasized

To carry out this function successfully, accounting as a discipline of information control should include a study of the following:

(1) Information needs of decision makers and other users must be understood. This would involve a general familiarity with operations of the business, decision areas, decision-making processes, the effects of alternative methods of processing or presenting information on decisions, relationship of the reliability levels of information with its use, and the information required to be reported under various laws and authoritative rules and regulations.

(2) Data needed to develop various types of information should be learned. This would involve a general familiarity with techniques of processing data, knowledge of data sources within and outside the organization, and analysis of the reliability of various sources and of the data provided by them.

(3) Manual processing of data as it may be needed must be studied and combined with computer-processed information by manual input into the computer.

(4) Computers and operations

research are necessary up to a level sufficient to understand their potential limitations, and possible applications.

On the other hand, training and education which presently help accountants to carry out other functions should be deemphasized in the discipline of information control. This would include the routine processing of quantitative data and the noninformational functions (such as handling of tax assessments) often carried out by accountants.

Conclusions

The adoption of the suggested model of the controlled information system may be expected to lead to a fuller utilization of information systems and related facilities. This model uses a combination of the talents presently found in accounting and management information systems, accountants performing the role of information controllers. But the training and education of future accountants who aspire to act in this role must be specifically aimed in that direction. Before a suitable program of study can be introduced in academic or professional curricula, however, considerable research needs to be made in several areas, such as the following:

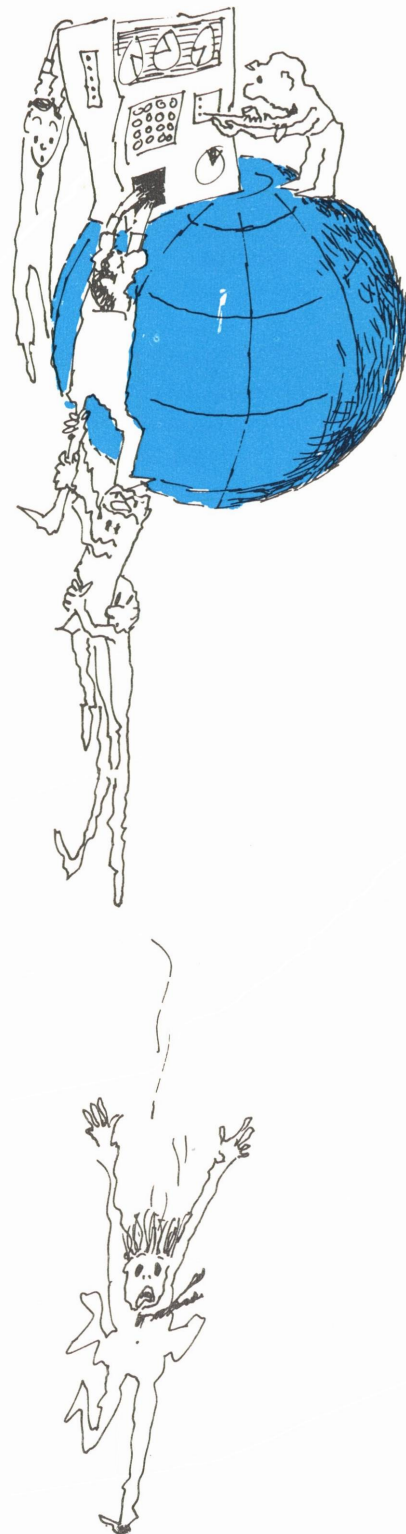
(1) Development of concepts and techniques to determine reliability of data and information (including the effects of processing techniques thereon), and relating them to various uses and users.

(2) Development of techniques to ascertain informational needs, and study of the behavioral aspects of information.

(3) Development of verification and authorization techniques for data and information.

(4) Development of concepts and techniques for carrying out cost/benefit analysis of information systems.

(5) Development of concepts and techniques to determine the desirability of programming particular decision models.



Many MIS people have the attitude that the "world ends" at the door of the computer room.