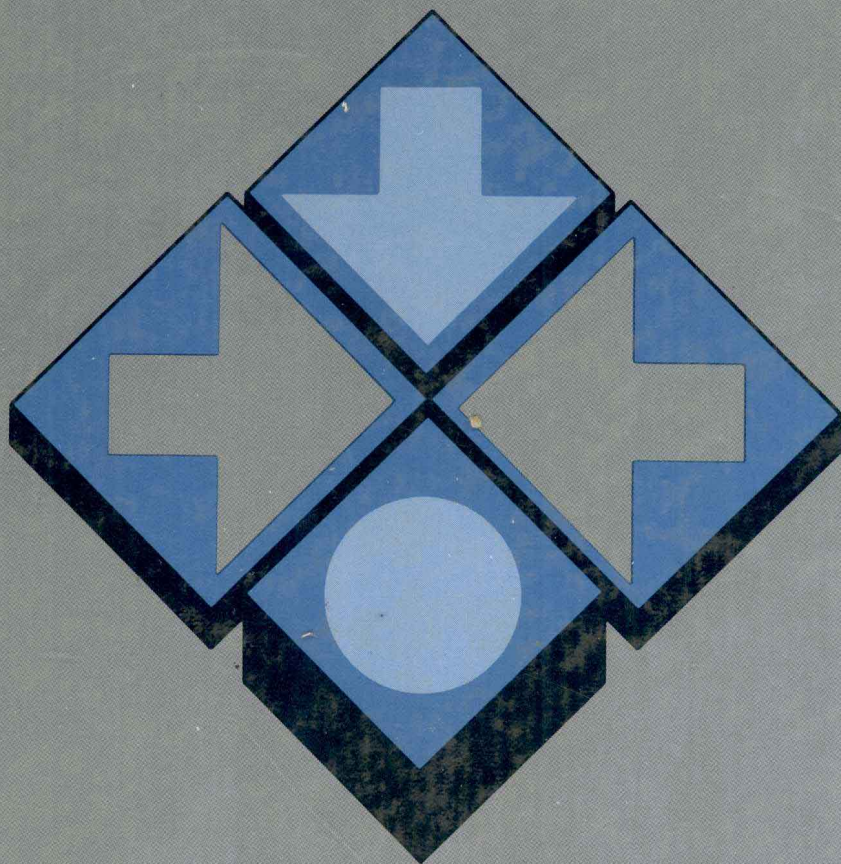# Information Systems for Modern Management

third edition

Robert G. Murdick / Joel E. Ross / James R. Claggett

Information Systems for Modern Management

ROBERT G. MURDICK
JOEL E. ROSS

Department of Management and Marketing
Florida Atlantic University

JAMES R. CLAGGETT

International Business Machines
Armonk, New York

Management theory and practice have undergone radical changes in the past two decades; these changes will inevitably continue and even accelerate. It is no longer enough that managers be skilled in a functional specialty such as engineering or marketing and that they understand the traditional functions of planning, organizing, and controlling. Something more is needed: the systems approach to management, coupled with the ability to participate in the design and utilization of computer-based information systems. Indeed, the systems approach is the new philosophy of managerial life. We are now in the "age of systems."

There are a number of books available on the individual topics of (a) management and organization, (b) computers, (c) information, and (d) the systems approach. However, none have combined and blended these topics into a set of related concepts, a unified body of knowledge and practice. This is the ambitious aim of our book. We hope it will provide a more up-to-date and integrated treatment of organization and management, as well as emphasize the utilization of management information systems to improve the art of managing.

One objective is to get practicing managers and students of management to "think systems." If we can take the mystery out of computer-based information systems for them, they should be better prepared to become involved in the effective design and use of those systems. Such involvement is essential for the manager of the 1980s!

For the computer specialist, the information-systems specialist, or the student of computer systems, the objective is to improve the utility of the systems they design. We make the unequivocal point that such systems must always be designed from the point of view of the manager-user and not that of the specialist. In order to achieve this perspective, the information-systems specialist must understand management, management decision making, and the role of systems design in improving the management process.

An additional objective of the book is to help close the communication gap that separates the manager from the computer specialist. This gap undeniably exists and is the direct cause of the gross underutilization of the vast majority of computer installations. The reasons are readily apparent. Managers either are too

busy, uninterested, or unwilling to take the time to raise their understanding to a level necessary for direct involvement. This book should bring them to that minimum level. Information-systems specialists, on the other hand, are more often engrossed in the special nature of the system. That it should be designed for the requirements of the manager-user is not necessarily uppermost in their minds. In other words, if left to their own devices, they design a system that ignores reality. This book can direct them to new and vastly more profitable areas of application.

NEW ORGANIZATION

This third edition has been prepared for two reasons. First, we wanted to take advantage of the valuable feedback received from students, professors, and managers who have used this book. Second, we needed to reflect the changed relationship between the firm and the computer. A few years ago, only large companies could afford computerized management information systems. Now, solutions employing small computers are within the reach of every business (and will soon touch the lives of every individual).

The organization of this third edition has been directed toward capturing and holding the attention of both the practitioner and pragmatic student. Additional practical and specific material has been provided. Part I presents the underlying concepts for understanding management, systems, the computer and databases, and management information systems. Part II discusses strategic and project planning for management information systems, followed by an operational approach to design, implementation, evaluation, and maintenance of an MIS. There is also a review of potholes to avoid on the MIS development highway. Part III offers conceptual and theoretical ideas on systems, control, information feedback and feedforward, and modeling. Instructors may wish to omit this part for an undergraduate course.

While keeping the best of the case studies from the second edition, a couple of new ones have been added. The "Johnson Enterprises" case study accompanies the student through several chapters, applying the concepts learned in each chapter. This case culminates in a decision problem: choose a small computer solution to the firm's management information system needs.

As before, we realize that any attempt to cover all aspects of MIS in less than several dozen volumes leads to criticisms of superficiality. Our object, however, is to provide a range of introductory *practical* and *conceptual* material which is suitable to the heterogeneous MIS courses taught in collegiate schools of business.

ACKNOWLEDGMENTS

We are grateful to our colleagues who provided many helpful suggestions and to Robert M. Manente of IBM, who made this revision possible by his support of

James Claggett during the critical phases of this project. We also wish to thank the companies and their representatives who so kindly allowed us to reprint their material.

The authors' wives, Emily Murdick, Carol Ross, and Sue Ellen Claggett, deserve special mention for their production assistance and support during the preparation of the manuscript. In addition, Geri Ekeroth cheerfully provided typing assistance whenever needed.

Robert G. Murdick
Joel E. Ross

Boca Raton, Florida

James R. Claggett

Armonk, New York

Contents

PART II
PLANNING FOR, DESIGNING, AND IMPLEMENTING THE MIS

PART III
ADVANCED CONCEPTS

PART IV
CASE STUDIES

Information Systems
for Modern Management

1

```
                                        ┌──────────────┐
                                        │  Complexity  │
                                        │      of      │
                                        │   Business   │
                                        └──────────────┘
                                               ╱╲
                                              ╱  ╲
                                             ╱    ╲
┌──────────┐         ┌──────────────┐       ╱      ╲
│   MIS    │─────────│   What is    │──────╱        ╲
│ Defined  │         │   Systems    │      ╲        ╱
└──────────┘         │  Approach?   │       ╲      ╱
                     └──────────────┘        ╲    ╱
                                              ╲  ╱
                                               ╲╱
                                        ┌──────────────┐
                                        │  Complexity  │
                                        │      of      │
                                        │  Management  │
                                        └──────────────┘
```

The Meaning and Role of Management Information Systems

```
                        ┌──────────────┐
                        │  MIS in the  │
                        │ Organization │
                        └──────────────┘

┌──────────────┐                          ┌──────────────┐
│ Reasons for  │                          │ Meaning and  │
│   Systems    │                          │   Role of    │
│  Approach    │                          │     MIS      │
└──────────────┘                          └──────────────┘

                        ┌──────────────┐
                        │   Manager    │
                        │     of       │
                        │  Tomorrow    │
                        └──────────────┘
```
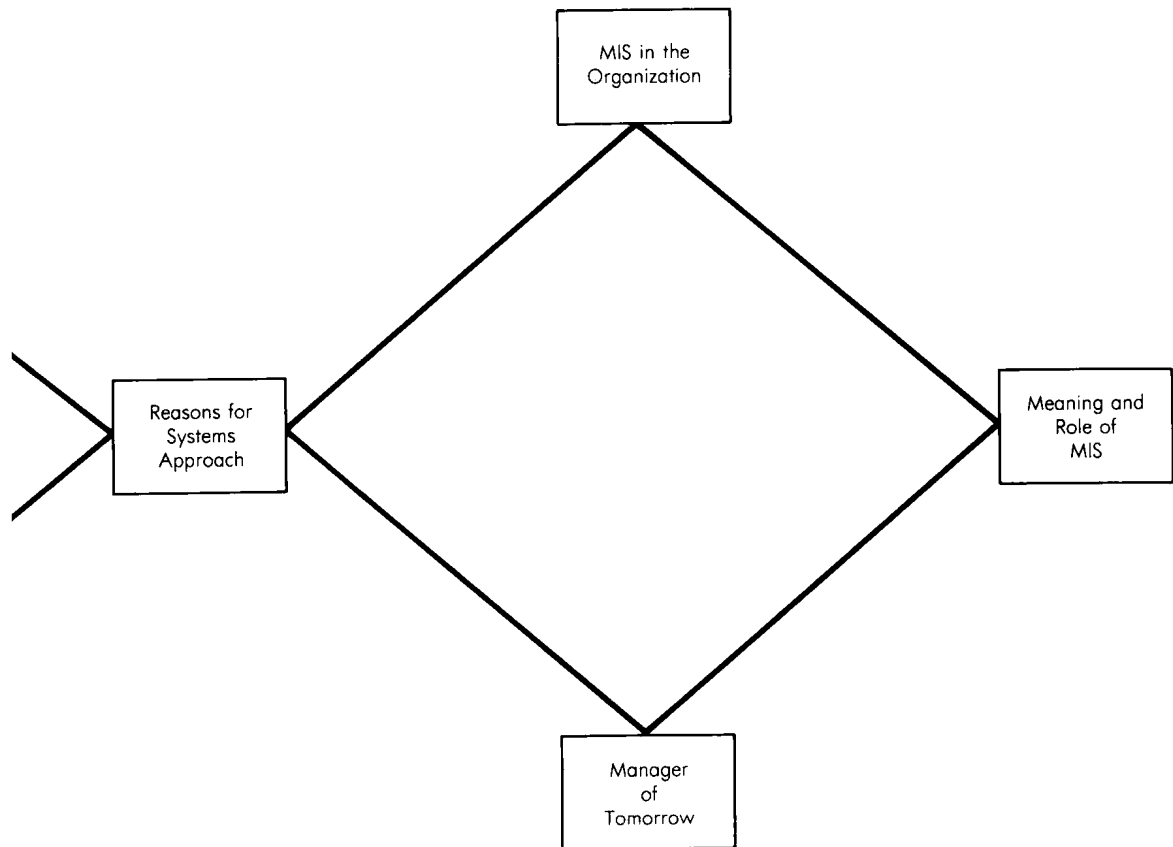
Item: In 1983 over 80 percent of colleges of business accredited by the American Association of Collegiate Schools of Business offered a degree program or major emphasis in information systems or planned to implement such a program within the next three years.

Item: More than half of all employed Americans now earn their living as "knowledge workers," exchanging various kinds of information.

Item: In 1982 alone more than 100 companies sold almost 3 million personal computers.

Item: Some 16,000 software programs are available for the Apple personal computer.

These headlines are interesting and fairly descriptive of the explosion in computer use during the very recent past. But what does it mean in terms of today's student of management information systems and today's practicing manager? Very simply, it probably means that managers who do not have the ability to use the computer will become organizationally dysfunctional, or worse, useless as decision makers.

Several years ago the consulting firm of Booz, Allen, and Hamilton conducted a comprehensive study surrounding computer usage and concluded that modern-generation equipment was being used for first-generation systems design. At about the same time another respected consulting organization, McKinsey & Company, concluded that "In terms of technical achievement, the computer revolution in the U.S. has been outrunning all expectations. In terms of economic payoff on new applications, it has rapidly lost momentum."

These conclusions reflect the fact that for decades the focus on computer use has been on the machine itself rather than on the vastly more important dimension of application and software—the systems design capability—the "brainware" if you like. It is the purpose of this book to fill this gap by concentrating on the managerial applications of computer use—*management information systems.*

WHAT IS A MANAGEMENT
INFORMATION SYSTEM?

Despite the fact that the computer is nothing more than a tool for processing data, many managers view it as *the* central element in an information system. This attitude tends to overrate and distort the role of the computer. Its real role is to provide information for decisions and for planning and controlling operations.

Judging from the business press, the brave new world of *management information systems* (*MIS*) is upon us. There is hardly a business magazine today that does not contain articles on information systems, data banks, and related subjects. Despite this proliferation of books, articles, seminars, and courses surrounding this area, few efforts have managed to synthesize the separate subjects of *management, information, and systems* and to show how these are related to computers. This synthesis is a major goal of this book. Let us begin by defining the concept.

A Management Information System
Defined

Because this book is largely devoted to the design and utilization of computer-based information systems, it is appropriate to define clearly the term MIS.

MIS is not new; only its computerization is new. Before computers, MIS techniques existed to supply managers with the information that would permit them to plan and control operations. The computer has added one or more dimensions, such as speed, accuracy, and increased volumes of data, that permit the consideration of more alternatives in a decision.

The scope and purpose of MIS is better understood if each part of the term is defined. Thus,

```
                    ┌───────────┐
                    │   M–I–S   │
                    └─────┬─────┘
        ┌─────────────────┼─────────────────┐
┌───────────────┐  ┌───────────────┐  ┌───────────────┐
│  Management   │  │  Information   │  │    Systems    │
└───────────────┘  └───────────────┘  └───────────────┘
```
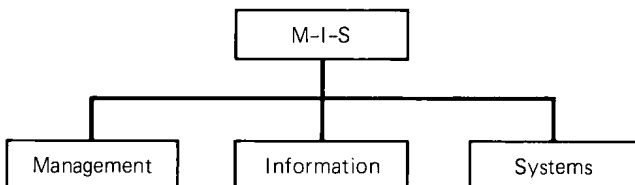
Management

Management has been defined in a variety of ways, but for our purposes it comprises the processes or activities that describe what managers do in the operation of their organization: plan, organize, initiate, and control operations. They *plan* by setting strategies and goals and selecting the best course of action to achieve the plan. They *organize* the tasks necessary for the operational plan,

set these tasks up into homogeneous groups, and assign authority delegation. They *control* the performance of the work by setting performance standards and avoiding deviations from standard.

Because *decision making* is such a fundamental prerequisite to each of the foregoing processes, the job of an MIS becomes that of *facilitating decisions* necessary for planning, organizing, and controlling the work and functions of the business.

Information

Data must be distinguished from *information*, and this distinction is clear and important for our purposes. Data are facts and figures that are not currently being used in a decision process and usually take the form of historical records that are recorded and filed without immediate intent to retrieve for decision making. An example would be any one of the supporting documents, ledgers, and so on that comprise the source material for profit and loss statements. Such material would only be of historical interest to an external auditor.

Information consists of data that have been retrieved, processed, or otherwise used for informative or inference purposes, argument, or as a basis for forecasting or decision making. An example here would also be any one of the supporting documents already mentioned, but in this case the data could be used by an internal auditor, the management services department of an external auditor, or internal management for profit planning and control or for other decision-making purposes.

Systems

A *system* can be described simply as a set of elements joined together for a common objective. A subsystem is part of a larger system with which we are concerned. *All* systems are parts of larger systems. For our purposes the organization is the system, and the parts (divisions, departments, functions, units, etc.) are the subsystems.

Whereas we have achieved a very high degree of automation and joining together of subsystems in scientific, mechanical, and factory manufacturing operations, we have barely scratched the surface of applying systems principles to organizational or business systems. The concept of synergism has not generally been applied to the business organization, particularly as it applies to the integration of the subsystems through information interchange. Marketing, operations, and finance are frequently on diverse paths and working at cross purposes. The systems concept of MIS is therefore one of optimizing the output of the organization by *connecting the operating subsystems through the medium of information exchange.*

> *The objective of an MIS is to provide information for decision making on planning, initiating, organizing, and controlling the operations of the subsystems of the firm and to provide a synergistic organization in the process.*

In summary, we are concerned with three systems: (1) that social system called *the organization,* (2) a *system of management* that is used in practice to improve the operations and productivity of the organization and its subsystems, and (3) the *management information system,* which provides the information for making decisions regarding the integration of the organization through the process of management.

NOTE ON DECISION SUPPORT SYSTEMS

Recently, the phrase *decision support systems* (DSS) has become popular. It is sometimes described as the next evolutionary step after management information systems (MIS). For this description to be valid, MIS must be defined narrowly as the automating of routine and structured tasks to support decision making. Although this is certainly one definition of the term MIS, we use a much broader definition in this book, one that encompasses current thought on DSS.

- MIS support decision making in both structured and unstructured problem environments.
- MIS support decision making at all levels of the organization.
- MIS are intended to be woven into the fabric of the organization, not standing alone.
- MIS support all aspects of the decision making process.
- MIS are made of people, computers, procedures, databases, interactive query facilities, and so on. They are intended to be evolutionary/adaptive and easy for people to use.

In other words, although we use the older term MIS, we have defined it broadly and it is a superset of current ideas on DSS.

WHAT IS THE SYSTEMS APPROACH?

The systems approach can be explained by describing *what it is not.* As one chief executive recently commented, "Marketing seems to be selling what can't be designed and what manufacturing can't produce and to customers that finance wouldn't approve anyway!" Imagine also these hypothetical but typical questions in a manufacturing organization that reflect nonintegration:

What has purchasing done with the parts for the rush order?
Why wasn't production notified of the changed sales forecast?
What is the impact on my operations of the change in prime rate?
Why is assembly working half-time while other departments are working overtime?

The systems approach in business was an idea born in the decade of the 1960s. The notion was one of *synergism*—the sum of the parts is greater than the whole—2 + 2 = 5—the output of the total organization can be enhanced if the component parts can be integrated. This concept was the rationale for the conglomerate form of organization—a concept that subsequently fell into disrepute because of widespread conglomerate near failure.

For our purposes the systems approach to management is designed to utilize scientific analysis in complex organizations for (1) developing and managing operating systems (e.g., money flows, personnel systems), and (2) designing information systems for decision making. The link between these two is obvious because the reason for *information systems* design is to assist in decision making regarding the management of *operating systems*.

A basic and fundamental notion of the systems approach to organization and management is the interrelationship of the parts or subsystems of the organization. The starting point of the approach is a set of objectives, and the focus is on the design of the whole as distinct from the design of components or subsystems. The *synergistic* characteristic of the systems approach cannot be overemphasized. In organizational and information systems design we want to achieve *synergism*, which is the simultaneous action of separate but interrelated parts that together produce a total effect greater than the sum of the individual parts. The result obtained by a team of 11 well-coached football players is greater than that achieved by 11 individual players "doing their own thing." The analogy for the business organization is clear. The MIS can go a long way toward achieving the integration we seek.

In the past, the effectiveness of business organizations has been somewhat less than optimum because managers failed to relate the parts or functions of the systems to each other and to the whole. The sales function was performed without a great deal of integration with design or production; production control was frequently not coordinated with financial or personnel planning; and the classic management information system was concerned largely with variance reporting on an historical basis and was constructed around the chart of accounts without too much regard for organizational information needs.

A basic tenet of systems theory is that every system is held together by information exchange. This is certainly true of the business system or the organizational system. Yet information systems and computers have not focused in on this essential characteristic or need for integration. The need, and the potential, for such integration through information can be demonstrated conceptually in Figure 1-1. The heavy solid line indicates classical authority relationships and the hierarchical structure of the typical organization. The dashed lines show the same organizational structure but with the parts joined together in a system by means of information flow.

Students of management, and business people, frequently express some criticism of an overemphasis on the systems approach. They say that it is nothing new, that managers have intuitively known of synergism and reckoned