The Design of the Management Information System

by DON Q MATTHEWS
UNIVERSITY OF TULSA

REVISED EDITION


PETROCELLI/CHARTER

NEW YORK 1976

Printed in the United States of America

1 2 3 4 5 6 7 8 9 10

Library of Congress Cataloging in Publication Data

Matthews, Don Q
The Design of the management information system.

Includes bibliographies and index.
1. Management information systems. I. Title.
T58.6.M37 1976 658.4'032 76-24906
ISBN 0-88405-320-2

The Design of the Management Information System

Preface to the Second Edition

This edition of *The Design of the Management Information System* retains the concepts of managing information which were so well received in the original edition. New material has been provided in such increasingly important areas as system concepts, security, privacy, interactive systems, and others. In addition, several chapters have been rearranged as a result of experience in using the material in a variety of circumstances. Discussion topics and suggested readings have been added to each chapter. The intent of the book remains the same—to promote a better understanding of management information systems.

Preface

The management information system can potentially provide a significant new dimension in management practice. However, this potential can never be fully exploited until both the operating manager and the system analyst understand the nature of these systems and participate in establishing system objectives and basic system architecture. During the course of teaching computer science at the University of Tulsa, I have found an increasing need for a better understanding of management information systems, not only for business students but also for practicing managers and experienced computer analysts. This book is directed toward that need—an understanding of the design concepts and the problems associated with the amalgamation of management practice and computer science.

In actual practice it has been difficult to realize the full potential of the management information system. The design philosophies are quite different from either manual systems or conventional computer applications. The problems associated with managing the system development and the systen implementation are also unique. There is, however, an increas ing collection of design principles and administrative practices which apply to all types of organizations and to a broad range of management systems. This book does not attempt

to describe how a computer works or to define management. Rather, it attempts to describe how to devise computerized management systems which will achieve the objectives of the organization. This should provide a middle ground for the business managers as they become more concerned with computer systems and for system analysts as they become increasingly involved in complex integrated management problems.

The book is organized so it may be used for self-study or classroom instruction. The system life cycle is introduced early in the book, as an understanding of this provides an insight into the larger system which is essential to the understanding of many design problems. The later chapters are largely self-contained so that they may be selected to fit a specific course structure or may be utilized for reference.

Grateful acknowledgment is due many associates and students who helped formulate the concepts, principles, and practices discussed, particularly the original MCS team at American Airlines. With so many people simultaneously working in this relatively new field, it is difficult to acknowledge the assistance of each. I am, however, especially grateful for the enthusiasm and confidence of Professor Anne Morrow, without which this work would never have been attempted, and to my wife, Charlotte, and my daughters, Pam and Lisa, for their continued patience and support.

Contents

List of Illustrations

Part One

Systems Approach

1

Management and the Computer—An Overview

MODERN MANAGEMENT philosophies have become irreversibly intertwined with the computer. Organizational concepts, strategy, and decision making increasingly depend on a flow of information which can be generated only by the modern digital computer. There seems no end to the need for information about complex technology in a sophisticated society.

However, the computer is only a tool for advances in social and industrial organizations. The computer, despite its mystique, can do only what it has been instructed to do. The influence on society is the tasks for which we employ the computer—the systems which are devised by man to control his actions and their relationship with his fellow man. The computer has been the technological key to the exploitation of mathematical and scientific methodology in organizational operations. These techniques have been used to build increasingly sophisticated management systems which accurately and quickly evaluate alternatives, make decisions, and communicate information. The computer supplies the automation and speed characteristic of the systems, but beyond that it is rather incidental to the system design. It is the system itself which provides the means to achieve organizational objectives. Therefore, it must, of course, be tailored to the objectives and problems of the specific organization.

The need for information is universal. The computer terminal in the executive's office is no longer a prestige symbol but an essential work tool. The rapid availability of comprehensive and accurate information is changing many theories of organizational structure and operating practices. The impact of the computer on management in all segments of our society cannot be overemphasized.

MANAGEMENT SYSTEMS

The word "system" is common in contemporary vocabulary and is used in many fields to mean several things. We frequently hear such terms as "automation systems," "nervous systems," "social systems," "telephone systems," "weapons systems." In all these terms the word "system" does have some common connotations. One characteristic is the concept of a collection and orderly arrangement of elements or parts. A system is composed of a series or set of elements which are interconnected in such a manner that there is cooperation between the activities of the various elements, and this cooperation occurs according to some predetermined set of rules.

Business organizations have developed over a long period of time a variety of systems to provide for their survival in an increasingly complex society. There are accounting systems, production systems, inventory systems, quality systems, and many others. Each of these systems plays an important part in the planning, direction, and control of the organization—the management of the organization. These systems, however, are not at all independent; they must be coordinated and interrelated in many elaborate and subtle ways to contribute to the common objectives of the organization. In fact, the modern business organization can be said to be defined literally as a system of systems. The management system must therefore be viewed as the total of these individual systems, including their interacting mechanisms.

Either independently or collectively, these functional systems generally display all the characteristics classically as-