



INFORMATION SYSTEMS
CONCEPTS FOR MANAGEMENT

THIRD EDITION

HENRY C. LUCAS, JR.

McGraw-Hill Series
In Management
Information Systems

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THIRD EDITION

Henry C. Lucas, Jr.

Graduate School of Business Administration
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To Jonathan

PREFACE

The purpose of this book is to help students of management learn the concepts of computer-based information systems. Managers allocate resources to the development and operation of computer-based systems and often use systems themselves. Managers make critical decisions about information systems: How can we use information processing strategically? What applications areas are to be emphasized? What should a plan for information processing in the organization contain? Which specific alternative for a proposed system will be implemented? What equipment should the organization acquire? How should one charge for and monitor information processing?

Many managers are users of information systems and work directly with computer input and output: they may also supervise people who work with microcomputers and information systems. These individuals come in contact with colleagues in the computer department, and the information services department reports to a manager in the organization.

Thus, the modern manager is confronted with many information-systems-related decisions and must understand issues in the management of information systems. This text is written from the perspective of the student who will be a user of information systems: It is not intended for the student who specializes in computer-based systems.

The text has been developed from M.B.A. and executive courses at Stanford and New York University. The students viewed these courses as their only exposure to computer-based information systems. One of the main goals of the book, therefore, is to help students majoring in such functional areas as finance, accounting, or marketing learn to make intelligent decisions about information systems and computers. No background on the part of the student is assumed, though it is helpful to provide some hands on computing experience with the

course. For example, at NYU students have completed a proficiency course prior to taking the course using this text. The proficiency exercise shows how to use a time-sharing terminal and editor and run several packages.

We have had great success including work on a microcomputer in the course using this text. Students find the hands on work with the computer compensates for the abstract nature of discussions about information systems. They also learn something concrete and immediately applicable through exposure to a microcomputer and spreadsheet package. It appears that actually using a computer helps motivate the students for discussions like those about hardware and software.

To facilitate instruction in this course, NYU has installed several classrooms which feature personal computers, terminals and videotape players in a console that is connected to a large-screen projector. It is possible to play videotapes and to demonstrate some of the hardware and software in class. For example, in the classes on files and database management systems, the instructor in class can use a microcomputer database system to create an application in class and to process retrievals, all in about ten minutes of time.

Specific questions and problems may be found at the end of each chapter along with key words and recommended readings. Throughout the chapters themselves there is a series of management problems. These problems describe a situation in brief and ask the reader to suggest a solution. The management problems attempt to illustrate how the material in each chapter relates to a managerially oriented decision. The problems should help the student appreciate that a manager needs to have some grasp of technical issues in order to make decisions about information systems.

This edition also contains a series of brief applications descriptions. These examples show the variety of ways computer-based systems have been used to support decision, control the organization, and process transactions. The applications are intended to help the student become more creative in using information systems for problem solving.

The ultimate goal of the book, then, is to help the reader use information technology to become a more effective manager and decisionmaker.

I am indebted to my students and colleagues whose suggestions have helped shape the contents of the book, in particular to Nicholas Markoff and Jack Baroudi who conducted some of the research required to revise the original edition. Professor Jon Turner provided a number of useful suggestions from his experience using the text. I also wish to thank the following reviewers for their constructive comments: Alan Humphrey, University of Rhode Island; Dr. Ernest Kallman, Bentley College; Dr. James Kraushaur, University of Vermont; Stuart Miller, Vanderbilt University; and Roger Alan Pick, University of Wisconsin. Most important, I acknowledge the invaluable support of my wife, Ellen. She continues to provide insightful editorial advice on the manuscript while creating an environment which makes the development of the text possible.

Henry C. Lucas, Jr.

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Some of the material on managerial activities, computer files, vendor selection, systems analysis and design, project management, conversion and installation of systems, social issues, and the Hardserve example is taken from my earlier McGraw-Hill book, *The Analysis, Design, and Implementation of Information Systems* (3d ed.). Interested readers should consult this text for more details.

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PART ONE

MANAGERS AND INFORMATION

In the first part of the text, we introduce the concept of information and define an information system. What is the nature of information? How are data interpreted by each individual and organization to become information? We examine decision making in some detail because one objective of an information system is to provide information to support decision making. Emphasis is placed on distinguishing among different types of decisions and their information requirements. With this background, we can examine frameworks for information systems—frameworks that provide a conceptual model to aid in the design of systems. Part One concludes with a scenario showing the wide variety of computer-based information systems existing today.

OVERVIEW

THREE MAJOR TRENDS

THE HISTORICAL EVOLUTION OF COMPUTERS

INFORMATION SYSTEMS

PERSONAL COMPUTING

THE ORGANIZATION AS AN INFORMATION PROCESSING
ENTITY

THE INTERDISCIPLINARY NATURE OF THE FIELD

PREVIEW

KEY WORDS

RECOMMENDED READINGS

DISCUSSION QUESTIONS

THE INFORMATION SYSTEMS FIELD

CHAPTER ISSUES

- What information is critical for the organization?
- What are the key decision areas for users and management involvement in information systems activities?

Let us join American Airlines flight 98 as plane #308 taxis into takeoff position on the runway at San Francisco International Airport. The pilot receives clearance from the control tower and advances the throttles. The jet roars down the runway and becomes airborne. Soon the flight attendants are serving breakfast.

Friends meeting us at the flight's destination in Dallas phone a toll-free number to see if the plane will be on time. They are informed of the estimated arrival time for Flight 98 at the gate in Dallas; the same information is visible to anyone in the airport on television monitors.

The plane lands at the posted time, we meet friends and continue into Dallas for a meeting. It is another uneventful flight like thousands of others every day. It all sounds routine, but this flight could not have taken place without a vast array of computer systems that support airline operations.

To start with, a computer system contains the entire history, maintenance record, flight times, and destinations of every plane in the American fleet. Every two weeks, the system adjusts American's flight schedules and matches the available planes to the most appropriate routes.

Several weeks before the flight, when we called to make a reservation, the Sabre reservations system showed the agent on the telephone what seats were available on flight 98. The computer system kept a record of our reservation, home phone number, method of payment, and itinerary for continuing or return flights.

Before the nose wheel was retracted after takeoff, a computer on plane 308 sent a cryptic departure message to a computer in Tulsa. The Tulsa computer looked up the plane's flight plan and the weather in route, and sent commands to the terminal television monitors in Dallas and Boston (the second stop on flight 98) to display the arrival time. The Tulsa computer also acknowledged that it had received the plane's message by sending a return message to flight 98's onboard computer.

To increase operational efficiencies, a computer keeps track of fuel prices at various locations and computes the cost of taking on extra fuel at cheaper cities to avoid buying fuel at more expensive locations. The computer also tracks the amount of fuel used by each of the airline's 4000 pilots. In the case of flight 98, a computer told the captain that he would need only 95 percent of his engines' total 96,000 pounds of thrust to take off in the 51°F weather. The computer also suggested that the flight would make better time at 41,000 feet instead of the planned 37,000 feet.

Back in the office a few days later, you turn to your workstation, a personal computer connected to a corporate computer network. The first action of the day is to check the mail. You turn on the computer and sign on to the mail system over the network; the mail system happens to reside on a large, mainframe computer in a nearby city. Using the system you are able to read messages, reply to them, and forward messages to another individual.

Next, you run a word processing program using only the local workstation to revise a report that needs a little more work before publication. Using the capabilities of the package, it is possible to move sentences and paragraphs, insert and delete words and lines, and add entire sections to the document. When it is completed, you run the spelling checker program to make a last check for typographical errors. Finally, you send the document over the network to a colleague 1500 miles away in a matter of seconds.

Before heading for the cafeteria and morning coffee, you run a spreadsheet program to check once again the budget for your department. The program makes it easy for you to compare budgets from the past year and to look for variances. You can make changes in budget categories and quickly see their impact on the total budget figure for the department.

With these and the other functions provided by your workstation, you are able to be far more productive than your predecessor "knowledge workers" of a decade or two ago. The local processing power of the workstation combined with the power of the computers in the communications network represents a capital investment to improve the productivity of individuals whose jobs primarily involve processing information, a group that constitutes more than 50 percent of the United States work force.

Airlines and workstations are only two examples. During the past three decades, the number of computer-based information systems in private- and public-sector organizations has grown exponentially. A new computer products and services industry has developed to supply the tools necessary to build computer-based information systems. A substantial number of individuals who design, build, and operate computer-based information systems now classify themselves as computer professionals.

Although a large number of people are employed to design and operate information systems, many more individuals are involved as users or “consumers” of information systems. Users include individuals from a broad spectrum of occupations, ranging from workers in a factory to the top management of a corporation. Use of an information system includes the receipt of a report, the submission of input for a system, and the operation of a terminal, personal computer, or a similar activity. In addition to work experiences with computer-based information systems, most individuals encounter these systems in other activities. Credit card users, travelers making reservations, social security recipients, and many others confront computer-based systems directly or indirectly.

In today’s complex society, a knowledge of computer-based information systems is vital for an educated individual, particularly for the professional manager. It has been estimated that one-third to one-half of the current gross national product of the United States is currently attributable to the production and distribution of information. The computer industry itself is forecast to reach a trillion dollars a year in sales by the end of the century. This trend is a departure from a traditional economy based on the production and distribution of tangible goods; the United States is in an “information age.” For most organizations—in the future, if not already—the determining factor in competition will be the processing and analysis of information.

OVERVIEW

The purpose of this book is to present the concepts and issues necessary for the reader to understand and work successfully with computer-based information systems. The goal of the text is to help the reader develop sufficient knowledge to make intelligent decisions about these systems. Our perspective is that of the manager and user of information systems, not that of the computer professional. However, we shall discuss some topics of interest to computer professionals to gain an understanding of crucial issues in the field.

Table 1-1 contains the key areas for management attention to information processing activities in an organization. There are three main groups to consider in reviewing these activities: managers, users, and the staff of the information services department. It is difficult to distinguish between managers and users since the groups overlap. For our purposes, managers are those executives in the firm who make key decisions and allocate resources. Users, on the other hand, have daily contact with information systems and work with input, output, and/or