

HENRY C. LUCAS, JR.

INFORMATION SYSTEMS CONCEPTS FOR MANAGEMENT

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To Jonathan and Scott

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INFORMATION SYSTEMS CONCEPTS FOR MANAGEMENT, 4th EDITION

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PREFACE

TO THE STUDENT

Information technology is pervasive in modern organizations—from the largest manufacturing firms to your corner drugstore. The stakes are high as businesses confronted with global competition strive to succeed. Some organizations will flourish; others will fail. Increasingly, those that succeed in the future will understand how to use and manage information technology to their advantage.

The purpose of *Information Systems Concepts for Management, Fourth Edition* is to help you learn enough about the technology to play an active role in the design, use, and management of information systems. You will learn how creative organizations have integrated technology with their corporate strategy and surpassed the competition to maintain an advantage.

Information systems surround you—on your campus and in local businesses. When you order merchandise over the telephone, chances are your sales representative is using an information system to check inventory and to trigger the shipment of your goods. When you use an automatic teller machine, make an airline reservation, or rent a car, information technology is working for you again.

Once you have completed this course, look through a newspaper or business publication. You will be surprised at your understanding of many of the issues raised in articles dealing with information technology.

You also will learn how to exploit the technology to enhance your professional and personal productivity. Information technology is a tool. It enables you to redesign the organization, change the firm's relationship with customers and suppliers, and alter communications patterns in the firm. Technology is a variable that you as a manager will be able to manipulate to effect significant improvements in what the organization and its employees can accomplish.

In sum, this text is designed to prepare you for the important managerial role of managing information technology, to give you and your company a competitive edge.

TO THE INSTRUCTOR

This book is designed for business students with no particular background in information systems. The primary goal is to help prepare students to assume an active and significant role in the design, use, and management of information systems. The approach evolved through extensive efforts to create a required course that would meet this goal for all M.B.A. candidates at the Leonard N. Stern School of Business at New York University.

THE OBJECTIVES OF THIS TEXT

During the past 5 to 10 years, organizations have distributed the responsibility for technology to all levels of management and to different geographic locations. As a result, managers from supervisor to CEO encounter information technology on a daily basis. Some managers choose not to take advantage of the technology; all must make decisions about how the technology is used.

Organizations have the opportunity to become more efficient and competitive; skilled and creative managers are required to accomplish these goals. Today's M.B.A.s need the knowledge and confidence to deal with issues related to technology; they must apply technology aggressively if they are to compete successfully in our global economy.

One of the most important parts of using the technology is the design of information systems. Much of the distribution of technology to end users has resulted from the proliferation of microcomputers. While there are many uses for the personal computer, organizations still rely on large, multiuser systems that often cut across the boundaries of the organization and may even affect external organizations.

The design of multiuser applications is much more complex than the design of a microcomputer system for an individual user. Many more people are involved in the process, each with unique and often conflicting needs and expectations.

Recent graduates are likely to find themselves on design teams for multiuser systems. Thus, it is critical that a course in information systems prepare students to play an active role in the development of new applications that will affect their productivity and their company's competitiveness.

Often the most enjoyable task for students encountering information technology for the first time is learning how to use a microcomputer system. Even if a student has experience with electronic spreadsheets, personal databases, and word processors, the first course in information systems should introduce ways these tools can be used to solve business problems, enhance managerial decision making, and increase productivity.

In addition to developing useful skills, working with a microcomputer motivates students to learn about all aspects of the related technology. Students who complete the course with a basic knowledge of how to use a micro will be more open to the possibilities the technology has for increasing their productivity.

Based on the discussion above, this book is designed to help students meet these three major objectives:

- to understand the emerging technological issues facing management so that students can effectively manage information systems in organizations;
- to play an active role in the analysis, design, and implementation of multiuser systems that will meet the information needs of the organization; and
- **3.** to learn how to use a microcomputer system effectively to enhance managerial problem solving, decision making, and productivity.

ORGANIZATION

The text is organized into six major parts to help students meet these objectives:

Part One

The Role of Managers in Information Systems. The purpose of Part One is to emphasize to students the value of information as a corporate asset and illustrate the myriad information systems applications they will face as graduates.

Part Two

Organizational Issues. Here we deal with the impact of information systems on the organization and how the firm can use technology as part of its strategy to gain a competitive advantage. This discussion of key managerial issues surrounding the technology and its application help motivate student learning.

Part Three

Information Technology. Important managerial decisions increasingly require an understanding of the technology. Therefore, graduates need to have knowledge of the hardware and software fundamentals. I have included in Part Three the technical information I consider most important and relevant to future managers.

Part Four

Systems Analysis and Design. Poorly designed systems are responsible for most information system problems. When information needs are not met, users are alienated and the value of the system diminishes. Part Four prepares graduates to participate in the development of multiuser systems and make an immediate contribution to their employer.

Part Five

New Directions in Systems. Part Five deals with alternatives to traditional transactions processing applications, such as decision support systems, end-user computing, expert systems, and artificial intelligence. An understanding of these emerging applications offers students great potential to enhance their organizations' competitiveness.

Part Six

Senior Management Concerns. At the end of the text, we return to the issues facing management today. Managers need to be concerned with security and control and how to achieve the maximum benefits possible for the firm's investment in technology. Part Six encourages students to evaluate the problems—and opportunities—that changing societal conditions and technological advances will create for their businesses.

| The table below | arrays our three of | bjectives agains | t the six majo | or parts of the text. |
|-----------------|---------------------|------------------|-----------------|-----------------------|
| | | -) | - trie obt mini | a parto or the text. |

| Part | | Manage Technology | Participate in Design | Use a Micro |
|-------|----------------------------------|----------------------|--------------------------|----------------|
| One | Managers and information systems | * | | |
| Two | Organizational issues | * | * | |
| Three | Information technology | * | * | * |
| Four | Systems analysis and design | * | * | |
| Five | New directions in systems | * | * | |
| Six | Management issues | * | | |

Note that the first objective—managing information technology—is a theme woven throughout every chapter in the text. In order to manage the technology effectively, students must understand its strategic significance and potential impact on the organization. In addition to these underlying organizational issues, managers must understand the related technical issues.

The second objective—participating in a systems analysis and design team—is supported by Parts Two, Three, Four, and Five. These parts of the book cover the fundamentals of systems development from a managerial perspective. Using the Simon Marshall case, which is integrated throughout the book, students complete the logical design of a system. This exercise forces students to confront the myriad decisions and trade-offs that constitute the design of a multiuser system and gain a "real world" understanding of what otherwise would remain abstract.

The third and final objective—using a microcomputer—is supported by Part Three on information technology. A series of problems based on the Simon Marshall case guide students through the fundamentals of microcomputer use. The problems are designed for use with Lotus 1-2-3 and dBASE III Plus.

LEARNING TOOLS FOR YOUR STUDENTS

The text has a number of features designed to facilitate student learning, including the following:

- Management Problems and Applications Briefs. Most chapters contain Management Problems and Applications Briefs. Management Problems are "minicases" for students to ponder alone or in groups; I know of one instructor who uses the problems to stimulate class discussion. Applications Briefs illustrate the many different ways information technology is used today. They are intended to help the student become more creative in discovering how to benefit from information systems.
- Chapter Projects. Each chapter contains a Chapter Project. The projects are designed to help students apply concepts discussed in the

• The Simon Marshall Case. Several of the chapter projects involve the Simon Marshall case. This case study introduces students to the use of Lotus 1-2-3 and dBASE III Plus. Hints for the solutions, the actual problems, and data for several of the assignments relating to Simon Marshall are contained on an available Problem Diskette. There is also one systems analysis and design problem for Simon Marshall that involves PCs, a server, a local area network, a mainframe data source, and a satellite distribution system. This assignment, carried out as a group project, helps students master the technical and design material in the text.

SUPPORTING MATERIALS

- **Software.** The Problem Diskette available with the *Instructor's Manual* contains problems for the Simon Marshall case as described above. The software is in the form of Lotus 1-2-3 and dBASE III Plus files. The diskette spares students the drudgery of entering data and frees them to focus on creating spreadsheets and relations. Solutions are found on a separate Instructor's Diskette.
- Instructor's Manual. The *Instructor's Manual* contains a course outline, teaching hints, and answers to selected questions. Also included are a discussion of all the Management Problems and sample course syllabi.

NEW TO THE FOURTH EDITION

In general, the fourth edition of *Information Systems Concepts for Management* reflects current thinking about the role of information systems in management. Compared with the previous edition, the fourth edition contains less emphasis on the technical details and more on the managerial issues of MIS and state-of-the-art topics.

Specific changes include the following: Content from the old chapter on frameworks has been condensed and integrated throughout the text. Chapter 5 has been expanded to include more on the strategic uses of MIS. Part Three on information technology has been revised; technical details no longer relevant to users have been deleted. Chapter 10 on database management has been expanded with new material on relational systems.

In addition, Part Four on systems analysis and design has been updated to include alternatives to the traditional life cycle approach, including prototyping, CASE methodologies, and fourth-generation languages. The section in the previous edition devoted to examples of applications has been distributed to illustrate concepts throughout the text.

Part Five is new and covers the emerging areas of end-user computing, decision support systems, and expert systems. Chapter 21 in Part Six is also new; it concerns vital issues of managerial control in the organization and how control interacts with the technology.

CONCLUSION

The ultimate goal of the fourth edition is to help students understand and use information technology to become more effective managers—that is, to (1) manage information technology, (2) participate in systems analysis and design projects, and (3) gain competence (and confidence) as hands-on users of productivity tools.

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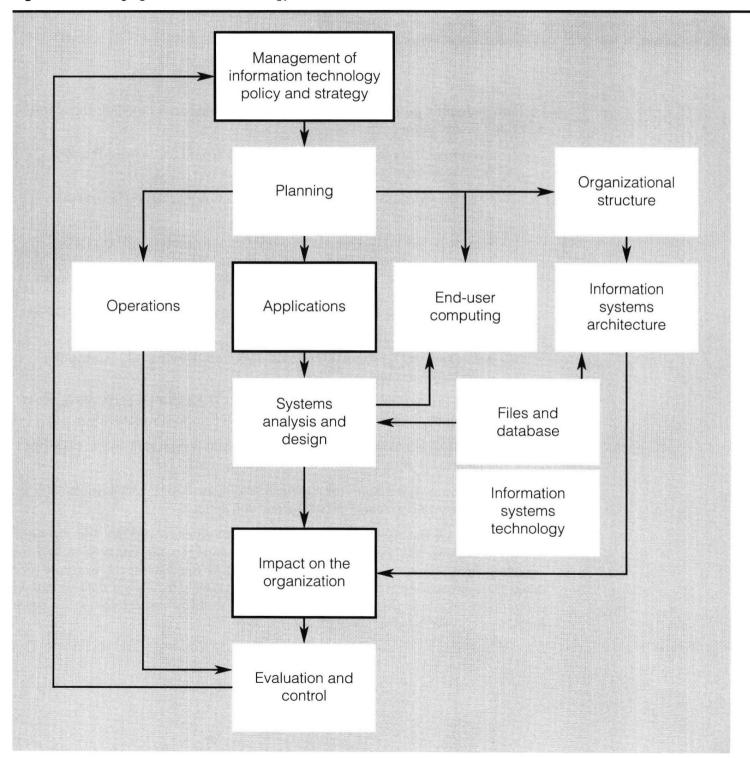
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Some of the material on managerial activities, computer files, vendor selection, systems analysis and design, project management, conversion and installation of systems, and social issues, as well as the Hardserve example, are taken from my earlier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

Figure 1 Managing Information Technology



THE ROLE OF MANAGERS IN INFORMATION SYSTEMS

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 individuals and organizations 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.

Figure 1 depicts the process of managing information technology. This figure will appear in each part of the text to provide an introduction to the topics covered in the corresponding chapters.

The figure shows that management must first determine a policy and strategy for information technology. Managers should develop a plan for systems. The plan is likely to suggest new structures for the organization; it should at least deal with how information services are to be organized. The plan will have an impact on the firm's operations; for example, a plan that includes electronic connections to customers will change the way orders are processed.

The plan will identify new applications areas for technology; that is, it will indicate new opportunities for the use of information technology. The plan may assign a high priority to applications that serve customers or to those that automate a factory. In today's environment, it is likely that the plan will contain ideas on how to support end-user computing, which involves users working with a computer to answer some of their own questions.

The development of an information systems (IS) architecture is closely related to the structure of the organization. Will the firm use all one type of computer? Will its computers be networked? Who will manage individual computer installations, and who will authorize expenditures on systems?

The way the firm develops systems is by conducting systems analysis and design. The design of applications has an impact on end-user computing, since users will be trying to access data in a new system. The entire area of information systems technology, files, and databases supports the firm's information systems architecture and systems analysis and design.

The kinds of systems that are created and the architecture developed for them will have a dramatic impact on the organization. Firms that plan well and develop creative applications are likely to obtain many benefits from their efforts.

The final management activity is the evaluation and control of information technology in the organization. Does the organization obtain a return from its investment in the technology? Are information systems under management's control, or is the IS effort fragmented and uncoordinated? All of these aspects of the process of managing information technology are discussed in different parts of the text.

In this first part of the text, we discuss the nature of information and different types of applications. Our objective is to develop a common definition of an information system and a shared understanding of the nature of information and types of systems. We are also interested in the impact of the technology on the organization. This section of the text sets the stage for the rest of the book.

THE INFORMATION SYSTEMS FIELD

OUTLINE

Three Major Trends

The Evolution of Information Systems Management

Integrating Technology

What Is an Information System?

Personal Computing

The Organization as an Information Processing Entity

Information Resource Management

The Interdisciplinary Nature of the Field

A Preview of the Book

OBJECTIVES

1. Learning to manage information technology.

There are many different ways in which information technology benefits the organization; it contributes to routine operations and to corporate strategy. It enhances productivity and offers new and different ways to communicate. The tremendous variety of ways in which technology is applied presents a major management challenge.

2. Preparing to participate in systems analysis and design.

This chapter describes several different kinds of systems. It is important to develop an intuitive feeling for the nature of a system. Organizations depend on many different types of systems to function, and many of these applications involve computer-based systems.

3. Using a microcomputer.

Members at all levels of an organization use microcomputers to increase their personal productivity.

Let us begin by visiting the offices of RBX industries, located near Philadelphia. RBX is a precision manufacturing company that began operations in the 1920s. Our host is Steve Watkins, the firm's president.

"The major thing that has changed around here in the past few years is our use of technology," Steve comments. "We've always tried to be an industry leader by using new machines, but mostly that has involved production equipment—you know, drill presses, lathes, automated machine cells, and so on.

"Now it seems we're using more computers than anything else. We're now in the engineering offices. Everybody here has a workstation; each engineer uses the workstation to formulate designs and check tolerances. Julie, what are you doing now?"

"I'm having our computer-aided design software simulate the production of a machine part on the computer screen. The program actually checks tool paths to be sure the machines in the factory can make the piece the way I've designed it."

"What happens then?" asks Steve.

"When we're satisfied with the part, the computer generates the instructions needed for the machines to make it. If a change is ever needed, I've got the plans on a computer file and can alter them easily. It used to take days of drafting to modify or design something in the first place. Now we can turn things around in a short period of time."

Steve adds, "This kind of system has made us a lot more competitive because we can do things faster for customers. We're working on computer systems to control manufacturing completely. It's clear that our business has to be responsive; we can't count on making thousands of the same part without ever changing a setup. We've got computer systems that let us do economical runs of just a few items because the computer in the engineering department can give the computer running a machine cell unique instructions for each part."

Steve introduces us to Carole Lesher, vice president of administration. She describes what has happened to RBX administratively. "We're about as high-tech as you can be, especially considering that we began business with a group of used metal-working machines. To stay competitive, we've established electronic connections with most of our suppliers and customers. We try to avoid paper whenever we can; most orders now come to our system electronically. We do have some paper traveling with the assemblies, but that's about it.

"The big change came a few years ago when we set things up for customers to connect with our computer for entering orders. Once that was done, we began to ask our suppliers for the same privileges. Things happen a lot faster when orders arrive in seconds instead of days.

"Here, let me show you what else we're doing. On this screen you see our office support system; we use electronic mail extensively to communicate. All of our sales staff carry lap-top computers; they use them for sending mail and for making inquiries about different products. We opened a small plant in France last year, and we communicate a lot by electronic mail because of the time difference. In fact, we're looking at some conferencing systems to see if the technology will let us all meet together easily without someone flying across the Atlantic.