

COMPUTER INFORMATION SYSTEMS: An Introduction

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COMPUTER INFORMATION SYSTEMS: An Introduction

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A DYNAMIC FIELD

The computer field has grown into an industry with an estimated \$900 billion in annual revenues. Millions of people are already employed in interesting computer occupations, with tens of thousands of new computer professionals being employed each year. Demonstrating the size and dynamic nature of the computer field is an annual convention, the National Computer Conference, that attracts thousands of exhibitors and almost 100,000 visitors. This page and the five that follow depict some of the excitement of the computer industry, as reflected in the National Computer Conference.

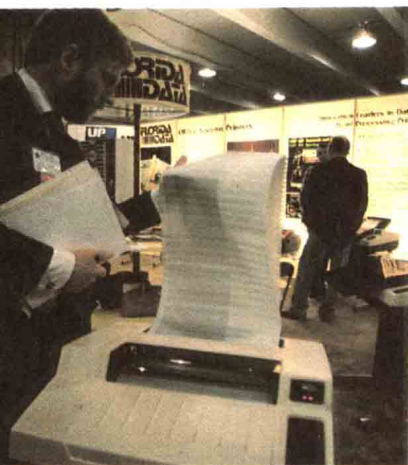


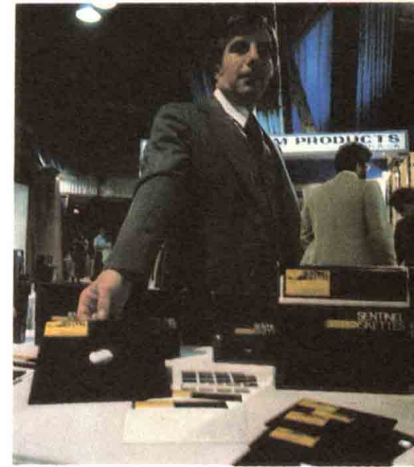
A busy time. On any of the four days of the National Computer Conference, thousands of new units of equipment or program packages are demonstrated for most of the 100,000 persons attending the meeting. Change is a natural part of life in the computer industry. Many of the changes involving use of computers are initiated at this conference. In the bottom photo, an avid computer futurist previews career opportunities.





Computers at work are a highlight of the National Computer Conference. On the facing page, top photo, the system being demonstrated automatically converts numeric values to graphic displays. At bottom left, additional graphic display capabilities are shown as a computer translates marketing information into a geographically divided map. The photo at bottom right demonstrates the use of a computerized electronic blackboard by conference participants who are geographically distant from each other to stay on top of important discussions. In the top photo on this page, a friendly robot proves adept at computer sales. At bottom left on this page, business executives preview displays developed by a newly introduced computer system.

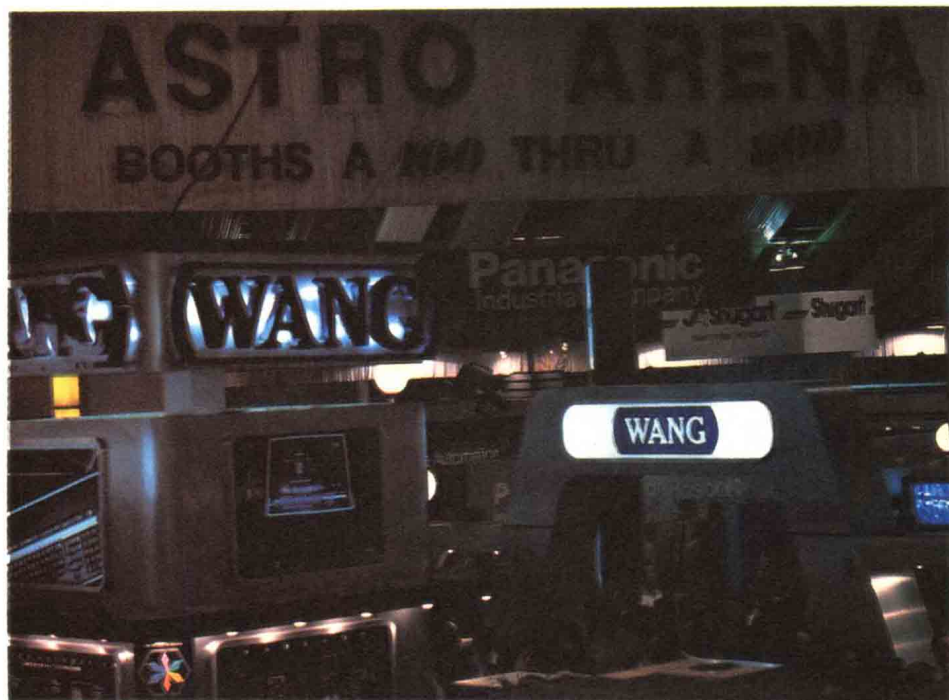




New equipment introduced at the National Computer Conference covers many needs and opportunities. On the facing page, top left, a visitor checks performance of a new printing terminal that can be linked into computer systems. At bottom left is a demonstration of the use of computers for information support of multilocation meetings, a technique called teleconferencing. The top right photo on the facing page shows displays from a system that can deliver results in letters and numbers or in pictures. At bottom left on the facing page is a demonstration of telephone instruments that can be used with computers. On this page, at left, an exhibitor explains the features of independently manufactured keyboards that can be used within computer terminals. At right, above, the display features a product line of flexible, or "floppy," diskettes that can be used to store data on microcomputers or on computer terminals.



Windows into a world of information are provided by easy-to-use computer terminals like those shown in the top photo. In the photo above, the word "new" stands out in this exhibit, as it does in many others at the National Computer Conference. Newness is critically important in computer exhibits. At right, a high-level view of exhibits demonstrates how elaborate some equipment displays become at the conference.



PREFACE

A SPECIAL PERSPECTIVE

This book, in part, represents an implementation of the *Model Curriculum for Undergraduate Computer Information Systems Education* of the Data Processing Management Association-Education Foundation (DPMA-EF). Specifically, the content of this work meets or exceeds the content in the suggested outline for course CIS-1—*Introduction to Computer-Based Systems*.

Correspondence between this book and the course specifications is assured by the fact that the text was developed under the auspices of and in close coordination with the Board of Regents of the DPMA-EF. In addition, all three of the authors of this text played key roles in the development of the Model Curriculum. (For more about the Model Curriculum and its development, see the accompanying *Series Introduction*.)

An enlightened user or a well-trained application programmer/analyst makes a special type of contribution to the development or implementation of a computer information system. Such an individual has the necessary prerequisites, including mastery of structured techniques for the design and programming of business-application systems. In addition, a person trained under the CIS approach should have the interpersonal skills, organizational knowledge, and other background to qualify him or her as a business problem

solver. Such a person has a systems-oriented perspective in viewing the value and the useful potential of computers.

It is a widely accepted truism that computers are tools for business problem solving. Of course, computers serve other functions as well. Computers are essential to the work of scientists, engineers, and, of course, mathematicians. All these areas of computer applications are specialties in themselves. Some education programs attempt to cover the entire scope of computer applications. Others minimize concern with applications and place heavy emphasis on the computer itself, focusing on building expertise in computing machinery and system software. All these approaches are valid. Many areas of specialization are open and many types of specialists are needed—including persons schooled to meet the special challenges connected with development of business-oriented computer information systems and application programs.

This is the special perspective of the *Model Curriculum for Undergraduate Computer Information Systems Education* and of this book. Focus is upon the computer as a tool for business operations, management, and planning. Computers are valued for their capabilities rather than for their circuitry or complexities. The CIS introductory course—and this book—are about information systems for business. Within this context, computers are indispensable tools. Thus, emphasis is on the results delivered by computers, not upon computing machinery. Students learn enough about computers to apply them. This can be—and is—done without getting inside the machines or diagnosing their circuits.

CONTENT LEVEL

This text is designed to support a freshman/sophomore-level course. Therefore, it is designed so that it can be used effectively by students with no prior knowledge of or experience with computers or in the data processing field. All terms, including such basics as *computer*, *data*, and *system*, are defined in context at first use.

At the same time, however, this is an adult book. Because of its systems orientation, this text will maintain its relevance for students who may have been through high school programs in computer literacy or even in introductory courses in programming. From the first chapter on, emphasis on applications and on systems concepts provides new, challenging—but still fundamental—material.

Another indication of the use of a systems approach lies in the breadth of content of this text. In effect, this book provides an overview, or preview, of a complete CIS education. All aspects of the CIS field are touched upon at an introductory level. This sets the stage for participation in later courses, which cover individual segments of the CIS field in greater depth.

Content of this text is structured in four logically related parts, as described below.

I. Computers and Information

The systems perspective of this text is apparent right from the initial set of chapters. The computer is regarded as a vital tool and described accordingly. Emphasis, however, is on building an understanding of the need for all businesses—as well as for society at large—to process data and to produce and utilize the information that results.

Chapter 1 reviews the ubiquitous nature of computers throughout modern society. In an awareness-stimulating discussion, brief reviews are presented on the use of computers in applications as diverse as check processing in banks, sales recording in supermarkets, automatic functional controls for autos and appliances, and diagnosis and patient record keeping in health care.

In Chapter 2, the history of computing machinery and data processing systems is traced as an evolutionary process that has met human needs. Thus, historic background is unfolded in terms of a growing systemic need for data processing and information as societies have become more complex.

The data processing system is discussed in terms of generic need and basic requirements in Chapter 3. This presentation identifies the basic components of information systems and explains their interrelationships and dependencies. This is done at a general level, with emphasis on the fact that data can be and are processed in the same basic way with or without computers. The fundamental system functions identified in this chapter are then carried forward as a foundation for presentations on computer information systems in the two chapters that follow.

Chapter 4 is about one of the key elements of computer information systems—computer equipment. Computer configurations and devices are reviewed in terms of their processing functions and relationships—input, processing, output, and storage. Equipment descriptions are supported by extensive examples of applications.

The remaining resources of computer information systems in addition to computer hardware—software, data, people, and support—are covered in Chapter 5. Emphasis throughout this chapter is on the roles of and opportunities for people in CIS.

II. Putting Computers to Work

The second set of chapters within this text immerses students into a background of CIS applications and their development. These chapters are highlighted by an introduction to application programming that is unsurpassed, at this textbook level, for its conceptual soundness and overall thoroughness.

Chapter 6 overviews the CIS field. Students learn that *computer information systems* encompass three types of systems that have evolved to meet

business operating and management needs. Day-to-day business operations, including the processing and monitoring of transactions, are supported by *data processing (DP) systems*. Files produced by data processing systems, in turn, are applied to the ongoing management and control of businesses. These control functions and related decisions, in turn, are supported by *management information systems (MIS)*. An important feature of an MIS is exception reporting that focuses management attention on situations requiring corrective action. The final type of CIS is the *decision support system (DSS)* that uses files from other areas to project future business results. DSS outputs are used largely as planning tools.

The philosophies and methods used to analyze, design, and develop computer information systems are covered in Chapter 7. This presentation includes a summary of the same phased systems development life cycle employed as the basis for texts supporting the CIS-4 and CIS-5 Model Curriculum courses. Discussions emphasize an orientation toward the solution of business problems through CIS design. The role and skills of systems analysts are highlighted.

Chapter 8 covers a methodology for application program development. Emphasis is on structured methods that are applied before programs are coded. Thoughtful preparation is shown to lead to quality programs—and to minimizing the time spent on coding, testing, and debugging. Students are led through the development of a sample program, including coding in BASIC. Then they are given specifications for additional programs that can be assigned for student completion. (Appendix A extends the potential for instruction in programming. The Appendix provides examples of six additional programming applications, with graduated increases in complexity, as well as a choice of 18 assignable programming problems.)

A review of other programming languages is presented in Chapter 9. The same programming example presented in Chapter 8 is coded in several languages. Languages described include FORTRAN, COBOL, PL/1, RPG, BASIC, Pascal, and Ada.

III. Computers in Organizations

In the third group of chapters, emphasis is on the working world of business data processing. Topics center around requirements, expectations, and practical methods applied within working CIS shops.

Chapter 10 deals with the organizational considerations associated with computers in business. Topics encompass the positioning of computers within their overall organizations as well as options for the structuring of CIS departments themselves.

A review and analysis of services rendered by CIS departments to their customers (users) is presented in Chapter 11. The discussion centers around

practical adaptation of output devices and methods to specific application objectives.

Input functions and equipment applications are reviewed on the same practical basis in Chapter 12. The discussion includes the trade-off considerations that go into the selection of input techniques for computer-based business systems.

Chapter 13 deals with the realistic operational concerns and choices involved in the maintenance of files and in the selection and use of secondary storage devices. This chapter continues to provide practical dimensions for the earlier, theoretical content on systems and equipment.

Chapter 14 concludes this section of the book by providing a perspective on the interrelationships and trade-offs in hardware-software configurations. Also included is an overview of data communications that encompasses network configuration alternatives.

IV. Opportunities, Issues, and Trends

Two concluding chapters focus student attention on CIS developments and their own careers.

Chapter 15 is a review of CIS-related occupations and opportunities.

Trends and controversial issues that may reshape portions of the CIS field in the future are covered in Chapter 16.

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The more than 30,000 members of the Data Processing Management Association, the DPMA Education Foundation, and their enthusiastic officers and staff provided the support that has made possible both the Model Curriculum and the publishing program initiated by this book.

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Don Price was president of the DPMA Education Foundation during the period when the Model Curriculum was being formed. He was instrumental in securing funding and other support to make this effort possible. Later, Don Price was International President of DPMA when the Model Curriculum was published and the preparation of supporting texts was initiated.

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To assure the accuracy and appropriateness of the content of this text, a blue-ribbon group of reviewers was assembled. The careful readings and thoughtful comments of this group represented, cumulatively, an important contribution to the soundness of this text. Their contributions are acknowledged with sincere thanks:

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Designs for the cover and interior pages of this book were executed by Gary Palmatier.

Dedication

This text is dedicated to deepening the understanding of tomorrow's business leaders about computers and the vital role of computer information systems in modern business. This is achieved, in part, by integrating within the content of this book various examples of yesterday's and tomorrow's opportunities to unify information processing with the mainstream of business.



Network monitoring is an activity that symbolizes the approach taken in the preparation of this book. In a data communications network, skilled people at consoles keep up with the current activities at distant, network-connected points. Preparation of this book had a similar effect of forming an information network of knowledgeable, experienced people to help assure development of a high-quality, reliable product.

SERIES INTRODUCTION

This book has a special purpose to serve, a unique role to fill. It is part of a coordinated, purposeful education program aimed at helping college students to realize their full potential in computer-related careers while also improving the prospects of a computer-dependent society for acquiring badly needed skills.

Specifically, this book has been developed to be part of and to provide direct support for the *Model Curriculum for Undergraduate Computer Information System (CIS) Education* of the Data Processing Management Association-Education Foundation (DPMA-EF). The Model Curriculum provides guidelines for a complete, nationally recognized course of study leading to a baccalaureate degree in business with a CIS major.

The effort leading to development of the Model Curriculum began in 1979, when DPMA made funding available to support a joint academic-industry study project. Over a two-year period, the curriculum evolved through a series of efforts that included two national conferences, six regional conference/workshops, nationally distributed questionnaires, and a number of consultations with representatives from the computer, business, and education fields. The final curriculum was published and distributed in November, 1981.

The final curriculum, which has won wide acceptance, incorporates 15 courses in CIS areas and eight on general business topics. Of the CIS courses, seven make up a core program recommended for all students:

- CIS-1 Introduction to Computer-Based Systems
- CIS-2 Applications Program Development I
- CIS-3 Applications Program Development II