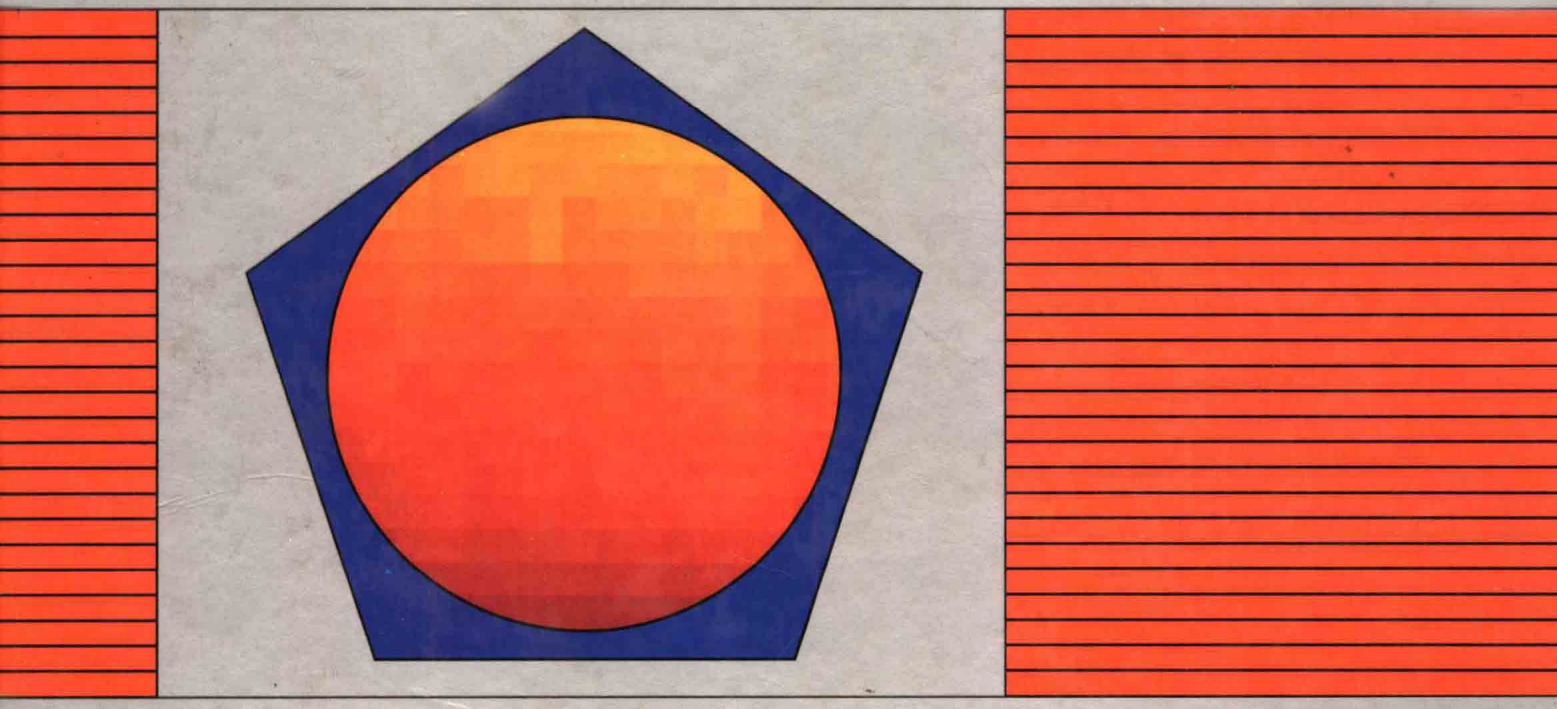


BUSINESS COMPUTER SYSTEMS

AN INTRODUCTION

THIRD EDITION

DAVID M. KROENKE

KATHLEEN A. DOLAN

BUSINESS COMPUTER SYSTEMS

AN INTRODUCTION

THIRD EDITION

DAVID M. KROENKE

KATHLEEN A. DOLAN

MP *Mitchell Publishing, Inc.*
Innovators in Computer Education
915 River Street • Santa Cruz, California 95060
(800) 435-2665 • In California (408) 425-3851

Dedication to Quality Publishing: All employees of Mitchell Publishing, Inc.
Sponsoring Editor: Erika Berg
Director of Product Development: Raleigh Wilson
Production Management: Richard Mason, Bookman Productions
Interior and Cover Design: Janet Bollow
Composition: Skillful Means Press
Printing: R.R. Donnelley and Sons Company

Mitchell Publishing, Inc.
Innovations in Computer Education
915 River Street
Santa Cruz, California 95060
(800) 435-2665; in California, (408) 425-3851

LIBRARY OF CONGRESS CATALOG NUMBER
86 - 82005

ISBN 0 - 394 - 39055 - 5

Printed in the United States of America

10 9 8 7 6 5 4 3 2

The five color sections in this book are unique. Many computer textbooks today are full of color photographs. This new edition of Business Computer Systems also contains exciting color photos. However, what makes these photos unique is the way in which they are presented.

Each of the more than 200 color photos was carefully selected to illustrate the content of five essays — essays written on topics of special interest and importance for today's introductory computer student. The five photo essays are intended to be both instructional and entertaining. The photo essays conclude with review questions and enhance the content covered in the text. They may be used in any order or as optional assignments.

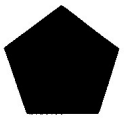
HARDWARE: More and More for Less and Less This photo essay presents today's computer hardware (input, processing, output, and storage) in an easily understandable format. The differences between microcomputers, minicomputers, and mainframes are emphasized with a wealth of examples and applications from the business world.

MICROCOMPUTERS: How to Be a Smart Shopper This extension of chapters 5 and 6 is not only interesting; it is practical. This photo essay introduces a small legal firm that is learning how best to select its own microcomputer hardware and software, and to develop a cost-effective system. Also featured are tips on how to select a printer, how to care for your disks and disk drives, how to select a service person, and how to choose a computer store.

THE CHIP: The Heart of the Computer The mystery surrounding the silicon chip is here imaginatively unraveled by a simple, straightforward explanation, accompanied by a wealth of colorful illustrations and photographs by award-winning National Geographic photographer, Chuck O'Rear.

COMPUTERS IN SOCIETY: More Uses, More Users, More Questions This photo essay examines many interesting computer applications and asks the reader to think about their impact — both good and bad — on society.

BUSINESS COMPUTER GRAPHICS: Persuasive Power at Your Fingertips Business computer graphics is one of the most exciting and explored areas in today's computer industry, and this photo essay illustrates why. Featured here are the reasons for the growing fascination for computer graphics, hardware and software requirements, color tips, objectives of presentation graphics, and practical applications.



A NOTE ON CURRICULUM STANDARDS

In recent years many concerned educators have devoted considerable time to defining curriculum standards for the subject of information systems. Such standards are both very important and exceedingly difficult to keep current for a subject that is always changing with new technology. Several associations have done an outstanding job in formulating these standards, however, and this book was developed to conform with and support those efforts.

DPMA This text provides source material for all of the suggested topics in course CIS-1 of the Data Processing Management Association Education Foundation Model Curriculum for Undergraduate Computer Information Systems. The structure of this text follows the association's recommendation that the purpose of CIS-1 is to "place emphasis on computer requirements in organizations, history, hardware functions, programming, systems development, and computer operations."

ACM This text also recognizes the philosophy stated in the Association for Computing Machinery 1981 Information Systems Curriculum Report, and supports the opinion that "the demand for personnel having a combination of technical and organizational skills is relatively much greater than the demand for solely technical skills."

AACSB Additionally, this book follows the guidelines set out by the American Assembly of Collegiate Schools of Business, which suggest that students obtain a basic understanding of "management information systems including computer applications."

Both the authors and publisher of this text believe in the necessity for and importance of these standards, and continue to support and work with the many dedicated professionals involved in this important task.

Few introductory computer texts have successfully negotiated three editions. The rapid rate of change in information systems technology and methodology necessitates such drastic changes in coverage that most texts cannot withstand the adaptation required to keep them current and relevant.

In planning the third edition of *Business Computer Systems,* we wanted to maintain the fundamental philosophy and structure that users of the first two editions have found interesting and useful for their students. At the same time, we wanted to revise and add new material to make the book reflect information systems *today.* We wanted to help students become knowledgeable end-users — to give them a basic understanding of how computer systems are applied to meet business needs.

We quickly realized that the revision was a test of the very philosophy we have been espousing! Since the first edition we have been saying that if we organize our teaching around fundamental concepts, students will be able to adapt to changes in technology long after they have taken the course. If that's true, then the structure of this book, which is based on these concepts, should be flexible enough to accept the addition of new technology.

We believe that this edition bears out this philosophy. We have added new technology while retaining the book's conceptual design. The three conceptual frameworks that have consistently differentiated *Business Computer Systems* from other introductory computer texts, and have made each edition a success, are as follows:

1. The Five-Component Model
2. The Systems Development Process
3. Systems Concepts

TEACHING FUNDAMENTALS

We believe that students should have a broad background in the application of systems technology to the business environment. In particular, students graduating from this course should be able to answer the following questions based on our three conceptual frameworks:

1. The Five-Component Model: What is an information system?
2. The Systems Development Process: How are information systems developed?

3. Systems Concepts: What are the basic types of information systems?

We believe this text will successfully prepare the student to answer each of these questions. Let's now see how.

What Is an Information System?

An information system is more than just a computer with a program. As we explained in the first two editions of this book, an information system consists of five components: hardware, programs, data, procedures, and people. These five components interact to satisfy a set of user needs.

Many teachers have praised the effectiveness of this conceptual framework. They say it provides a structure for students to organize their learning. It enables them to tie together the many facts, concepts, and developments that are part of the dynamic field of business computer systems. Whenever students encounter a new piece of technology, they will know to ask: What hardware is required? What programs? How is the data organized? Which procedures will be required? Who will be needed? Such a discipline is simple and enduring. Students can benefit from it throughout their professional lives.

This text begins with three short cases. These cases illustrate the need for users to know about information systems. Two of the cases have successful outcomes because the key decision makers knew fundamental concepts. The third has an unhappy outcome because the key people lacked such knowledge.

The Five-Component Model was presented in one chapter in previous editions. In the third edition we have recognized the vital importance of *data* as a corporate asset. Thus, after introducing the Model we devote the major part of chapter 2 to one of the five components: data. In chapter 3 we focus on the four remaining components: hardware, software, procedures, and people. The concepts in both chapters are illustrated with an application familiar to all students: class enrollment.

How Are Information Systems Developed?

We view all students as future end-users. In many colleges, the introductory computer course is the only computer course that non-computer majors take; this may be their only opportunity to learn how computer systems should be developed. This knowledge is important not because these students will develop small microcomputer systems of their own, but rather because as end-users they will invariably participate in the development of computer systems, whether they realize this fact or not.

An introduction to systems development is critical for future end-users. Without an early exposure to this topic, majors are too likely to conclude that hardware or programming have more importance in systems development than they do. Students need to see the "systems" forest before they plunge into the "programming" or "application software" trees.

The single chapter on systems development in the second edition has been overhauled and now occupies two full chapters, chapters 5 and 6. Chapter 5 discusses the concepts, goals, steps, and tools used in systems development. Alternatives to traditional design techniques, such as prototypes and data flow diagrams, are presented here.

Chapter 6 illustrates systems development with a case study that does not presuppose that programs will be written in-house. Further, special considerations for microcomputer-based systems are included. The purpose of the case is to add interest and meaning to the systems development process.

Systems development concepts continue to be reinforced in chapters 7 and 8. Although these chapters specifically address sequential and direct access file processing, they do so in the context of systems development activity.

What Are the Basic Types of Information Systems?

Even in the age of the microcomputer it is important to teach students all the fundamental types of systems. The fact that the microcomputer has gained unprecedented popularity does not mean that systems that are prevalent on mini- and mainframe computers can or should be ignored. In fact, as microcomputer operating systems become more sophisticated, such knowledge will become valuable even to micro-computer users.

Thus, the fundamental types of systems are presented chapter by chapter in the following sequence:

- Chapter 7 Sequential File Processing
- Chapter 8 Direct Access File Processing
- Chapter 9 Database Processing
- Chapter 10 Teleprocessing & Distributed Processing Systems
- Chapter 11 Management Information & Decision-Support Systems

This organization is unique for an introductory computer text. Most introductory computer textbooks focus first on hardware, then on software, and so on. In this book you will not find a chapter on hardware, as such. Unlike most books, *Business Computer Systems* does not discuss each of the components in isolation. Instead, the material is covered by data organization. It is presented in the context of various types of systems.

The rationale for this approach is that each chapter presents a complete, integrated system. With this organization students learn, for example, not only what a disk drive is, but also how a direct access system can be utilized to satisfy information needs. We have used this organization because it has enabled thousands of students to relate technology to systems, and systems, in turn, to information needs in a better way.

THE THIRD EDITION: WHAT'S NEW?

Microcomputer Coverage

The single most significant change in this edition concerns the coverage of microcomputers. Since most students will encounter micros daily, we have integrated and expanded the coverage of micros and their hardware, software, acquisition, and uses. Our goal is to illustrate the impact of this tool called a microcomputer on business and the end-user.

In most cases we are not concerned with micros in isolation, but rather as components of information systems. Again, we focus on concepts and processes so that our discussion will continue to serve the student irrespective of what next year's microcomputer looks like.

In Module B we deal exclusively with micros. We present concepts pertaining to the three most popular types of microcomputer applications:

1. Word Processing
2. Electronic Spreadsheets
3. Database Management

Even though this module is concerned with micros, we have broadened the presentation by discussing these applications in a generic sense. We define the characteristics of each of these applications and describe features and functions that software should have. Through a wide range of applications, we also illustrate how these kinds of software can be used as personal productivity tools.

If you would like to use the conceptual material in this text as a "springboard" to hands-on instruction of specific packages, call Mitchell Publishing at (800) 435–2665. They have an array of tutorial lab manuals covering commercial packages, shareware, and educational software.

Management Information and Decision-Support Systems

The second most obvious change in this edition has been the addition of a chapter on MIS/DSS. As microcomputers proliferate, as end-user interfaces become easier to use and understand, as program genera-

tors and other productivity tools become more common, and as the general level of sophistication in the end-user community increases, more and more attention will be focused on the use of computers in the decision-making process. Therefore, students should be exposed to the management process and potential applications of computer technology in management.

However, this is easier said than done. Most students have trouble relating to basic business operations, let alone to the more sophisticated and airy dimensions of management tactics and strategy. Therefore, we have kept the discussion simple and down-to-earth. Concepts are illustrated in the context of a straightforward case that is introduced early in the text.

Expert Systems

Expert systems, or knowledge-based systems, are a branch of artificial intelligence that has come to have significance for business. The core of such a system is the ability to *infer*. This ability is new to business information systems, and so we believe that it is important to introduce it to students today. Thus, a discussion of expert/knowledge-based systems has become a special feature of the MIS/DSS chapter in the third edition.

Communications and Local-Area Networks

We have consolidated the chapters on teleprocessing and distributed data processing from the second edition. At the same time, we have illustrated the growing importance of local-area networks. Since many end-users procure and install LANs themselves, students need to be exposed to the fundamental concepts. Thus, we have added a major section to the teleprocessing chapter on this topic.

End-User Database Systems

It is becoming clear that databases can be designed to match the end-user's view of the business environment. Our new database chapter, chapter 9, reflects these changes in industry.

Systems Development

Kathleen Dolan was selected as a co-author of *Business Computer Systems* because of her expertise in the area of systems development. Kathy has experience as a systems analyst, teacher, and consultant in both education and industry. Users of the second edition will observe Kathy's contribution to the discussions of systems development in chapters 5 and 6.

The single chapter on systems development in the second edition has been overhauled and now occupies two full chapters. The first one, chapter 5, discusses the concepts, goals, steps, and tools used in systems development. Also featured here is coverage of end-user programming, prototyping, dataflow diagrams, data dictionaries, and structure charts. Then, in chapter 6 the systems development process is brought to life with a case study.

Modern Programming Modules

Users will also find that Kathy has completely reworked and modernized the programming modules, modules F, G, and H. The approach taken in these modules is unique. The emphasis is on problem-solving. The sample programs are broken down into several mini-programs, or modules. Each module is presented and explained as if it were a tiny program itself. Teaching this process illustrates that regardless of the size and complexity of a program, it can be broken down into small, easily understandable units.

BUILDING ON THE STRENGTH OF PAST EDITIONS

While adding new features and benefits to the third edition, we have maintained those aspects of the previous editions that users found most effective. Earlier, we discussed the primary features, namely the Five-Component Model, the Systems Development Process, and Systems Concepts. In addition, we have retained several other features.

Use of Vignettes

To some people technology is dry and boring. Nor does computer technology always relate to real-world situations. To add interest and facilitate the transfer of knowledge to business settings, this text contains many small cases and vignette applications. These stories illustrate the human aspects of developing and running business computer systems. They give students a chance to apply chapter material in solving actual business problems. In so doing, the stories illustrate how computers are used as tools and resources in today's competitive society.

Photo Essays

The third edition is enhanced by numerous photos, both in the body of the text and in these full-color photo essays:

1. Hardware: More and More for Less and Less

2. Microcomputers: How to Be a Smart Shopper
3. The Chip: The Heart of the Computer
4. Computers in Society: More Uses, More Users, and More Questions
5. Business Computer Graphics: Persuasive Power at Your Fingertips

These color inserts carefully combine text and photos to illustrate the uses of computers today and to stimulate students' interest and awareness.

Boxed Articles

Excerpts from business and computer magazine articles are organized into three categories—"Profiles," "Applications," and "Microcomputers"—and featured in each chapter. These boxes highlight contemporary, real-world applications of corresponding chapter topics. These supplemental readings add to the strong end-user orientation of the text. They help students understand how computer technology is used to solve problems, to increase productivity, and to gain a competitive edge.

Modular Approach

Introductory courses vary. Needs differ depending on the school, its location, the type of student, the teacher's approach, the surrounding business environment, and so forth. This text was organized in recognition of that fact; you will find eight independent modules in parts 4 and 5. These modules can be mixed and matched as you choose.

IN CONCLUSION

We believe that this text represents more than a third edition of a successful book. It represents the acceptance by thousands of teachers and students of the Five-Component Model as a valuable concept for understanding, and tool for teaching, the often difficult, complicated, dynamic material of an introductory computer course.

Our students benefit not from the bulk and detail of our knowledge but from grasping its essence. It is with lessons based upon simple and consistent concepts born of the breadth and depth of our own knowledge that our students are able to move forward to open new doors, explore new worlds, and surpass our own achievements.

SUPPORT PACKAGES

Business Computer Systems is supplemented by a complete range of ancillaries designed to help both the student and the instructor.

These ancillaries include the following:

1. Instructor's Guide
2. Student Study Guide/Casebook
3. Computerized Test Bank
4. Transparency Masters
5. Applications Software for the IBM PC for word processing (WordStar 3.3), electronic spreadsheets (SuperCalc 3.0), and databases (dBase III Plus sampler)
6. Supplemental Microcomputer Lab Manual to support the step-by-step, hands-on instruction of WordStar 3.3, SuperCalc 3.0, and dBase III Plus sampler
7. Seventeen broadcast-quality Videotapes.

PRINCIPAL ACKNOWLEDGMENTS

In a project such as this there are always a few people whose contributions make all the difference. We extend a very special thank you to Leonard Schwab of the California State University at Hayward, and to Penny Fanzone of Essex Community College. Their extensive reviews were instrumental in the development of this edition of *Business Computer Systems*. We are also grateful to Randy Skelding of the Digital Equipment Corporation and Henry Gettenberg of Computerland for their technical support.

ACKNOWLEDGMENTS

Thanks to the following people who have provided helpful comments and other assistance in the preparation of this edition.

Gary R. Armstrong
Shippensburg University

Jack D. Becker
University of Missouri

Patricia Boggs
Wright State University

Elias R. Callahan, Jr.
Mississippi State University

Larry Clark
Cayuga Community College

Marilyn J. Correa
Polk Community College

Caroline Curtis
Lorain County Community College

Joan Miley Danehy
State University New York, Morrisville

Dennis Emmerich
Community College of Aurora

William C. Fink
Lewis & Clark Community College

John H. Grose
Villanova University

Richard Hopeman
Villanova University

Bert Hurn
University of Missouri, Columbia

Peter L. Irwin
Richland College

Art Larson
University of Wisconsin, Whitewater

Olof Lundberg
University of New Orleans

Charles H. Mawhinney
Indiana University of Pennsylvania

Dick Meyer
Hartnell College

K. Mikan
University of Montevallo

John Palipchak
Pennsylvania State University

Earl J. Robinson
St. Joseph's University

S. G. Ryan
Baruch/CUNY

Tom Sarazen
Red Rocks Community College

G. E. Shaw
Macomb Community College

Erwin C. Vernon
Sinclair Community College

Tony Verstraete
Pennsylvania State University

Susan White
Catonsville Community College

Ken Wilson
Algonquin College