BUSINESS COMPUTER SYSTEMS

AN INTRODUCTION

FOURTH EDITION



FOURTH EDITION

BUSINESS COMPUTER SYSTEMS

AN INTRODUCTION

David M. Kroenke

Kathleen A. Dolan



Mitchell McGRAW-HILL

New York St. Louis San Francisco Auckland Hamburg Lisbon London Madrid Mexico Milan Montreal New Delhi Oklahoma City Paris San Juan SãoPaulo Singapore Sydney Tokyo Toronto Watsonville

BUSINESS COMPUTER SYSTEMS: An Introduction, 4th Edition

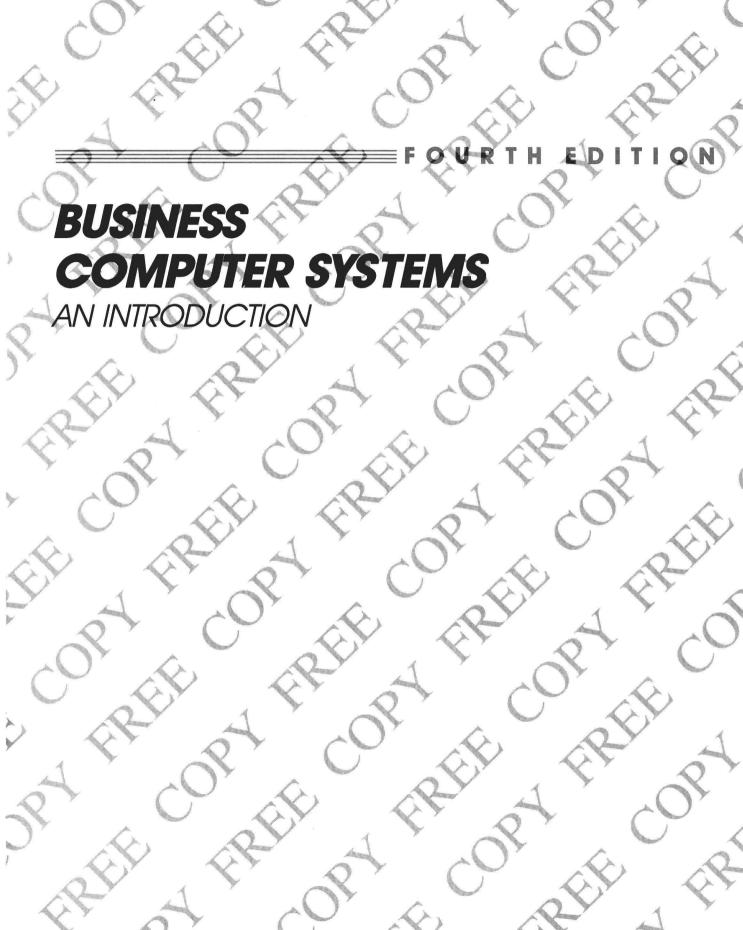
Copyright © 1990, by McGraw-Hill, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a data base or retrieval system, without the prior written permission of the publisher.

1 2 3 4 5 6 7 8 9 0 DOW DOW 9 5 4 3 2 1 0

ISBN: 0-07-035604-1

The sponsoring editor was Erika Berg.
The designer was John Edeen.
The production manager was Betty Drury.
The cover design was by John Edeen.
The production was supervised by Greg Hubit.
Graphic Typesetting Service was the typesetter.
R. R. Donnelley & Sons Company was the printer and binder.

Library of Congress Card Catalog No.: 89-62071



THE MITCHELL/McGRAW-HILL TITLES IN INFORMATION SYSTEMS

Systems Development: A Practical Approach AMADIO

558072-1

Systems Development Projects 540813-9 AMADIO/AMADIO

DAVIS/OLSON Management Information Systems: Conceptual Foundations, Structure, and Development, 2/e

015828-2

GRAUER/SUGRUE Microcomputer Applications, 2/e 024142-

Guide to IFPS, 2/e 024394-8 GRAY Guide to IFPS/Personal 831426-7

GREMILLION/ Computers and Information Systems in Business:

PYBURN An Introduction 051007-5

Information Systems Analysis and Design, 2/e KOZAR

056236-9

KROENKE Management Information Systems 557997-9

(accompanied by KROENKE Project Casebook to Accompany Management Information Systems)

Business Computer Systems: An Introduction, KROENKE/DOLAN

4/e 035604-1 (accompanied by DOLAN/PITTER

Using Application Software in Business)

LIEBOWITZ An Introduction to Expert Systems 554252-8 LUCAS

Information Systems Concepts for Management,

4/e 038971-3

LUCAS The Analysis, Design, and Implementation of

Information Systems, 3/e 038929-2

Computer Hardware, System Software, and LUCE

Architecture 557772-0

MUNSHI Management Information Systems: Cases in

Action 044026-3

PARKER Management Information Systems: Strategy and

Action 048542-9

ROHM/STEWART Essentials of Information Systems 555448-8 RUTH/RUTH

Developing Expert Systems Using 1st-CLASS

556432-7

Computers Today, 3/e 054850-4 w/BASIC 054847-1 SANDERS

SENN Analysis and Design of Information Systems,

2/e 056236-9

SPRAGUE/RUTH Using Expert Systems Using EXSYS 556430-0 STAMPER/PRICE

Database Design and Management: An Applied

Approach 557994-X Computers! 2/e 557974-X

TRAINOR/ KRASNEWICH

The Support Package

Using Application Software in Business: VP-Planner PLUS, dBASE III PLUS, and WordPerfect 4.2, by Kathleen Dolan and Keiko Pitter

This manual combines Pitter's popular step-by-step tutorials with Dolan's real-world scenarios from *Business Computer Systems*, 4th Edition. Students learn how to use the most popular commercial packages to increase their productivity. A data disk is included. The educational version of all three packages is available either shrinkwrapped with the manual or as a master from which to make copies for student use.

Other Application Software Manuals

A wealth of other lab manuals—with or without software—covering full-power commercial, limited commercial, or full-power shareware is available shrink-wrapped with the text at a discounted package price.

Student Study Guide/Casebook, by Diana Stark

Over the past three editions, this popular supplement has been required by more than 50 percent of the schools using the text.

Instructor's Guide, by David Kroenke and Kathleen Dolan

Complete with detailed lecture outlines, a summary of changes to ease the transition from the third to the fourth edition, sample course syllabi, teaching tips for part-time instructors and TAs, and "emergency lectures," this comprehensive manual was written entirely by the authors of the text.

Computerized Test Bank

Class-tested and -developed over three editions, this test generator gives instructors the power to add, delete, or modify more than 1,500 true/false, multiple-choice, and fill-in-the-blank questions. Also available in printed form.

Color Transparencies and Black and White Masters

Two sets of transparencies accompany the text: a set of masters based on text figures and a set of full-color transparencies designed to enhance the text with original art.

Broadcast-Quality Videotapes

Computers at Work has been revised to illustrate the most current computer concepts and applications. Thirteen documentary-style videotapes are included. Ask about our Adopter's Policy.

Preface to the Instructor

The introductory computer information systems course can be one of the most difficult courses to teach. For one reason, students' expectations often are different from our own. The difference results, in part, from another challenge in teaching this course. Students usually have little real-world business experience. Thus, they do not yet appreciate, firsthand, the need for information systems and the problems that poorly developed systems can create.

RESPONDING TO THE CHALLENGES

We have found a number of strategies effective in responding to the challenges facing introductory information systems instructors.

A Conceptual Framework

First, we take the bull by the horns and demonstrate from the beginning of the text to the end that a computer information system consists of five components: hardware, software, data, procedures, and personnel. This five-component model, which has been the backbone of each edition of this text, illustrates to students that data, procedures, and personnel—the components most often overshadowed by hardware and programs—are often the source of information systems problems in the business world.

Personal to Multiuser Information Systems

Second, we think it is important to meet students at their level of expectation and then expand the discussion to ours. Since many students expect this course to be a microcomputer applications course, we begin with personal computer applications. We capture the students' attention with the concepts that they expect, then gradually broaden the concepts to multiuser information systems.

Real-World Examples

Third, we believe it is essential to illustrate the use of information systems in practical settings. Without real-world applications, students learn only isolated terms and concepts, and rarely learn what to do with that information once the course is over. Thus, this text includes

many short vignettes written to illustrate why and how users and organizations employ information systems technology. These examples do not assume any previous business experience.

Why? What? How?

In light of these challenges and because the introductory course threatens to become a thousand loose definitions heading in many different directions, we balance coverage of the *what* with the *why* and the *how*. For instance, *why* is a database management system needed to improve the productivity of an individual user or organization? *What* are the components of a local area network? *How* is a spreadsheet designed, a desktop publishing package purchased, any other type of information system developed?

WHAT'S NEW IN THE FOURTH EDITION?

The major difference between the fourth edition and prior editions of **Business Computer Systems** is the shift in emphasis from computer specialists to end users. Previous editions emphasized large-scale systems, and responded to the needs of students who would become programmers or systems analysts. The fourth edition responds to the needs of today's students, tomorrow's users. To accomplish this goal, we have:

- Adopted an end-user perspective to emphasize how information systems technology can and should be employed by end users to increase productivity, solve business problems, and make decisions.
- **Consolidated** into a new Chapter 2 what today's students need to know about the **five components** of every user's computer system: hardware, programs, data, procedures, and personnel.
- Progressed from personal information systems (Part II) to multiuser information systems (Part III); that is, we have built on the students' level of experience to illustrate the various roles played by users in the development and use of systems.
- Added a new Part II (Chapters 4-8) on the concepts and applications of spreadsheets, graphics, databases, word processing, and desktop publishing, equipping students to use these productivity tools to solve problems.
- Replaced the coverage of sequential and direct access file processing, and changed the orientation of the database coverage to become more relevant and useful to end users.
- Broken down the coverage of **systems development** into two chapters, to differentiate between what users need to know about their role in developing each personal information system (Chapter 8) and multiuser information systems (Chapter 12).
- Added current coverage of these increasingly important topics: ethics, hypermedia, OS/2, networking, expert systems, AI, proto-

- typing, CASE tools, 4GLs, end-user computing, and information centers.
- Completely rewritten the Microsoft BASIC programming appendix, stepping students through seven hands-on lessons, from loading BASIC to arrays.

FULL-COLOR PHOTO ESSAYS

Full-color photo essays, popular in the previous editions of *Business Computer Systems*, are designed to graphically illustrate topics of emerging importance in the information systems industry. This edition includes five photo essays:

- Computer Systems Extending Human Capabilities... depicts some of the many ways that computer systems have extended the range of human intellect—in space, in science, in medicine, in education, with artificial intelligence, and in the arts.
- Hardware: More and More for Less and Less... shows hardware devices that students are most likely to encounter in personal, departmental, and multiuser environments.
- The Chip: The Heart of the Computer... tours a semiconductor factory and shows how the chip is developed—from silicon rocks to finished computer.
- Communicating with Computer Systems... illustrates the role of information systems in facilitating communication, human-tohuman as well as computer-to-computer. Includes graphics, telecommunications, and international business.
- Information Systems for a Competitive Advantage... shows ways information systems enable users and organizations to develop, produce, and deliver better products. Includes product marketing, conceptualization, design, manufacturing, and customer support.

USING APPLICATION SOFTWARE?

An application software manual has been specially designed to accompany *Business Computer Systems*. *Using Application Software in Business*, by Keiko Pitter and Kathleen Dolan, is a step-by-step, hands-on tutorial for the educational versions of three of the most popular commercial packages: VP-Planner Plus, a Lotus "clone"; dBASE III PLUS; and WordPerfect 4.2.

Included with the manual is a disk containing data from scenerios in this text. Hands-on exercises, practice sessions, and projects in the manual cast students as end users. Using the accompanying packages to solve real-world problems posed in the text—such as changing spreadsheet figures and evaluating the results—gives students an opportunity to integrate and apply concepts in a business setting and increase their productivity.

EXTENSIVE SUPPORT PACKAGE

A variety of supporting materials is available, including:

- Using Application Software in Business, by Kathleen Dolan and Keiko Pitter with data disk.
- Educational version of VP-Planner Plus, dBASE III PLUS, and WordPerfect 4.2 (four disks).
- Many other tutorial manuals—with or without software, for fullpower commercial, limited commercial, or full-power "shareware."
- Student Study Guide/Casebook, by Diana Stark. Over the past three editions, this popular supplement has been ordered by 50 percent of adopters.
- Instructor's Manual, by David Kroenke and Kathleen Dolan. Includes lecture outlines, a summary of changes to ease the transition from the third to the fourth edition, teaching tips, answers to review questions, guidelines for using Using Application Software in Business with the text.
- Color transparencies and black and white masters.
- *Test Bank*, printed and on disk with computer test generator.
- Thirteen documentary-style, broadcast-quality videotapes.

ACKNOWLEDGMENTS

We gratefully acknowledge the assistance of many people in the development of this text. First and foremost, we are grateful for the support and guidance of Erika Berg, who has been an editor and supporter of this text for many years. We also appreciate the hard work of Raleigh Wilson, Marianne Taflinger, Denise Nickeson, and Rich DeVitto, also of Mitchell Publishing, who helped us publish this edition.

Comments and suggestions for changes in this edition were received from many people. We would like to thank the following:

William Amadio. Rider College

Gary Armstrong, Shippensburg University

Tonya Barrier, University of Texas at Arlington

Bill Barth, Cayuga Community College

Eli Boyd Cohen, **Bradley University**

Caroline Curtis, Lorain County Community College

Jay Davis.

John DeNisco, **Buffalo State College**

Dennis Emmerich. Community College of Aurora

Lucian Endicott, Jr., Central Texas College

Paul Fitzer. Central State University

Barry Floyd, New York University

Michael Gourey. Central State University

Michael Graves, Portland Community College

DeVry Institute of Technology

Richard Hatch,

San Diego State University

Roger Hayen,

Central Michigan University

C. Brian Honess,

University of South Carolina at

Columbia

Gary Huston,

Arizona State University

Peter Irwin,

Richland College

S. W. Joshi,

Slippery Rock University

Jerry Joyce,

Keene State College

John Krobock,

Sacramento State University

Thom Luce, Ohio University

Gerald Mackey,

Georgia Institute of Technology

Charles McNichols,

Florida Institute of Technology

Carolyn Meinhardt

Dick Meyer,

Hartnell College

R. Nickerson, San Francisco State University

John Palipchak,

Pennsylvania State University

Keiko Pitter.

Truckee Meadows Community

College

R. K. Raja,

University of Texas at Arlington

Eugene Rathswohl,

Shippensburg University

Ted Robinson,

Central Texas College

John Schillak.

University of Wisconsin at

Eau Claire

Leonard Schwab,

California State University at

Hayward

Noel Smith,

University of Texas at Arlington

David Stamper,

University of Northern Colorado

Margaret Thomas, Ohio University

Diane Visor.

Central State University

Steve Watson,

Washington State University

David Whitney,

San Francisco State University

Samual Wiley,

LaSalle University

Ken Wilson,

Algonquin College

Jim Wood,

University of Texas at Arlington

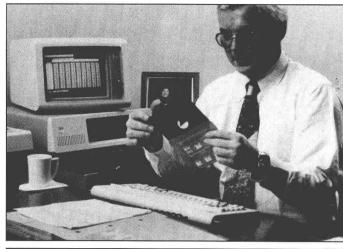
David M. Kroenke Seattle, Washington

Kathleen A. Dolan Vernon, Connecticut

BUSINESS COMPUTER SYSTEMS

AN INTRODUCTION











			X A Common of the common of th	
1				
			Anna	
		4		A A
		The state of the s		
Brief Contents				
	ART ONE Foundation	ons of Business Computer	200	
	CHAPTER 1	Using Business Computers to I	4	
	PHOTO ESSAY CHAPTER 2	Computer Systems Extend Hur The Components of a Busines	man Capabilities	
	PHOTO ESSAY CHAPTER 3	Hardware: More and More for Survey of Business Computer S		
P	RTTWO Personal	Information Systems 9	9	
	CHAPTER 4 CHAPTER 5	An Introduction to Personal Int Electronic Spreadsheet Applic		
C Q Y	CHAPTER 6 CHAPTER 7	Personal Database Application Word Processing and Desktop	ons 163	
	PHOTO ESSAY CHAPTER 8	The Chip: The Heart of the Co Developing Personal Informat	mputer	
			259	
	CHAPTER 9	Teleprocessing Systems and L	ocal Area Networks 261	
	PHOTO ESSAY CHAPTER 10	Communicating with Compu Shared Data Systems and Data Information Systems and Man	tabase Processing 297	
And the second	CHAPTER 11 PHOTO ESSAY CHAPTER 12	ALC: A CONTRACT OF THE PARTY OF	Competitive Advantage	
PA	RT FOUR Special 7		norr dysicirila	
	MODULE A	History of Information Systems)a
	MODULE B MODULE C	Numeric Representation and Computer Crime, Control, an		29
	APPENDIX	BASIC Programming 465		A STATE OF THE STA
	CREDITS 4	492	A STATE OF THE STA	
0) ()	GLOSSARY	494	And A	
	INDEX 50	5		
Day 1				
1 0)				
	The same of the sa	2	The second second	
VI		() ()	and have been determined to	

Complete Contents

PART ONE

Foundations of Business Computer Systems

CHAPTER 1

Using Business Computers to Increase Productivity 3

Jenson-Kehrwald Company 4

The Order Process 5

The Design Process

What Are the Components of an Information System?

Why Use Information Systems? 8

PHOTO ESSAY Computer Systems Extend Human Capabilities

Using a Computer-Based System 10

How Are Information Systems Developed? 14

The Computerization Project 14

Plan of Action 17

The Luncheon 17

Multiuser Systems 17

1.1 Increasing Your Personal Productivity: Who Are the Power Users? 18

1.2 Increasing Your Personal Productivity: Ten Ways to Get Ahead Using Information Technology 20

Overview of the Text 21

Summary 21

Word List 22

Discussion Questions and Exercises 22

CHAPTER 2

The Components of a Business Computer System 23

The Five-Component Model 24

Hardware 24

Programs 25

Data 26

Procedures 27

Trained Personnel 27

Hardware 27

The Central Processing Unit 27

Input Devices 28

Output Devices 32

Storage Devices 3

Communications Devices 4

PHOTO ESSAY Hardware: More and More for Less and Less

Programs 42

System Programs 42 Application Programs Data 51 Types of Data 51 Computer Representation of Data File Storage Database Storage 56 Trained Personnel 57 Systems Analysts Programmers 57 Operations Personnel 58 Clientele 59 2.1 Increasing Your Personal Productivity: What Do You Do When the System Shuts Down? 60 Procedures 60 The Need for Procedures Documentation 62 Summary 63 63 Word List Discussion Questions and Exercises 64 **CHAPTER 3** Survey of Business Computer Systems 65 Transaction Processing Systems (TPSs) Architecture of a TPS An Example TPS: Hourly Payroll Characteristics of TPSs 72 Management Information Systems (MISs) Architecture of an MIS 74 An Example MIS Application Concerning Labor Effectiveness Decision Support Systems (DSSs) 78 Architecture of a DSS 78 Types of Decision Support Systems 79 Office Automation Systems (OASs) 83 OASs and New Human Capacities Architecture of an OAS 85 Executive Support Systems (ESSs) 86 Information Systems in the Functional Areas of Business 86 Information Systems in Accounting Information Systems in Finance Information Systems in Sales and Marketing 90 Information Systems in Manufacturing 92 94 Summary Word List 96 Discussion Questions and Exercises 96 **PART TWO Personal Information Systems** 99

CHAPTER 4

```
Why Use a Personal Information System? To Increase Productivity
What Are the Components of a Personal Information System?
   Hardware
   4.1 Increasing Your Personal Productivity: Did You Know?
   Programs 107
   4.2 Increasing Your Personal Productivity: How Computers Can Help You Solve
       Problems 111
   Data 113
   4.3 Increasing Your Personal Productivity: Just What Is Hypercard?
   Trained Personnel 115
   4.4 Increasing Your Personal Productivity: Backup Software:
       For the Moment After 117
   Procedures
How to Develop a Personal Information System
                                                      118
Summary
              119
Word List
             120
Discussion Questions and Exercises
                                         120
CHAPTER 5
Electronic Spreadsheet Applications
                                                  121
An Introduction to Spreadsheet Systems
                                              122
   What Is a Spreadsheet?
                         123
   What Is an Electronic Spreadsheet?
                                    124
   Why Use Spreadsheets in Business?
Inside an Electronic Spreadsheet
                                       136
   The Spreadsheet Screen 138
   Command Structure
   5.1 Increasing Your Personal Productivity: Tips for Better Spreadsheets
   5.2 Increasing Your Personal Productivity: Graphics Service Bureaus or In-House? 141
   Cell Entries 142
   Printing a Spreadsheet
                         143
   Macros 145
   Presentation Graphics 146
How to Develop a Spreadsheet Application
                                                   149
   Logical Design
                  149
   5.3 Increasing Your Personal Productivity: Spreadsheets Suffer from On-the-Fly Design
       and Misuse
   Physical Design
                   151
   Implementation
                   155
   Testing
Solving Problems with an Electronic Spreadsheet Program
                                                                   156
   The Problem
                156
   The Spreadsheet Solution
   Tracking Player Stats for the Season
```

161

Summary

Word List

160

Discussion Questions and Exercises

161