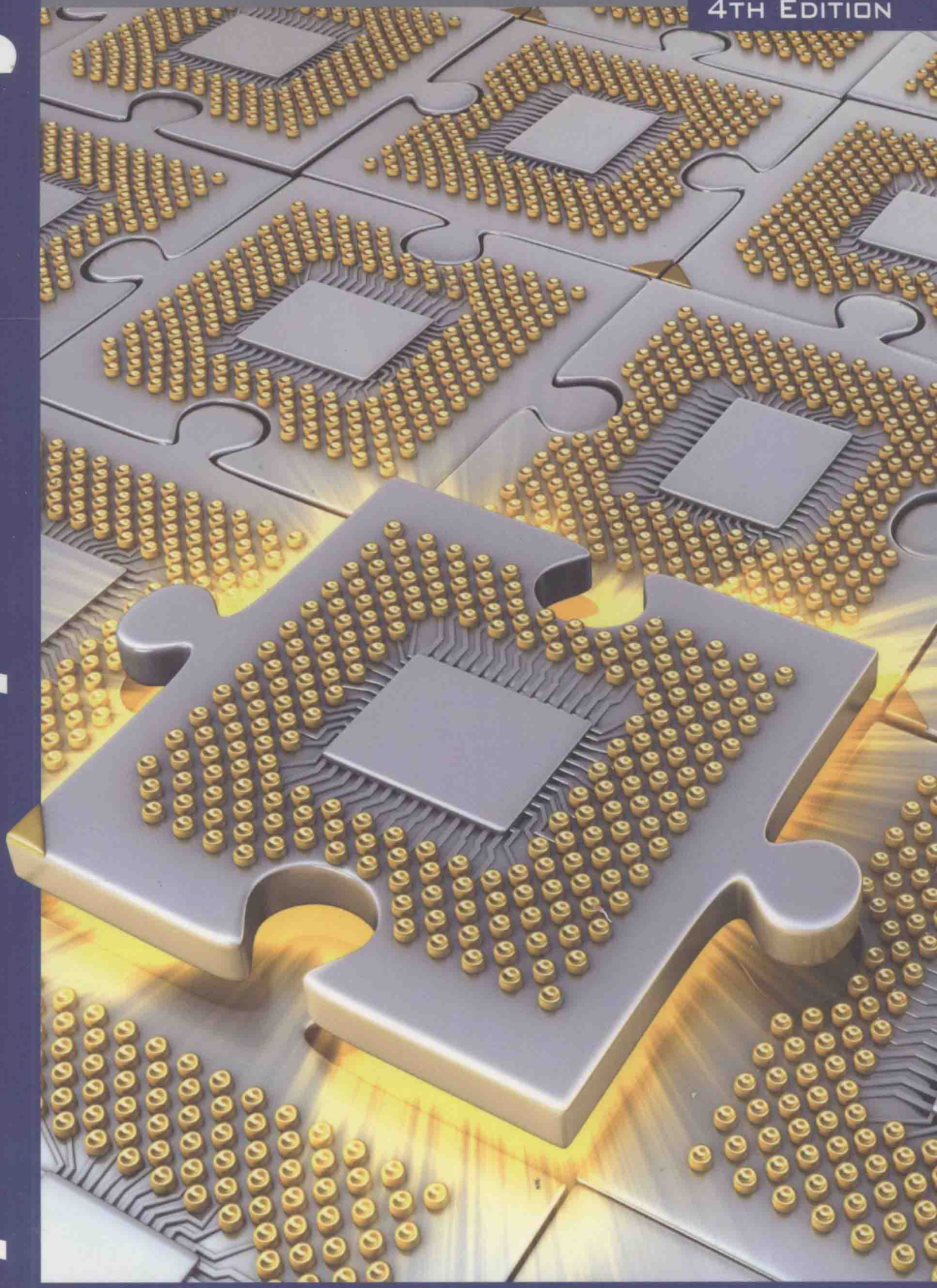
Systems Analysis and Design

INTERNATIONAL STUDENT VERSION

4TH EDITION



ALAN DENNIS • BARBARA HALEY WIXOM • ROBERTA M. ROTH

SYSTEMS ANALYSIS AND DESIGN

Fourth Edition

International Student Version

ALAN DENNIS

Indiana University

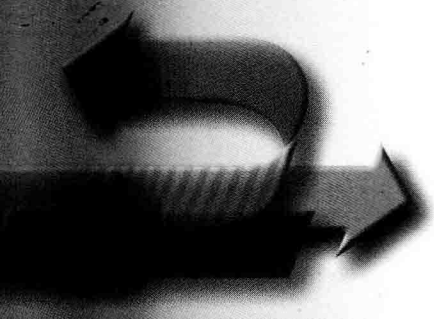
BARBARA HALEY WIXOM

University of Virginia

ROBERTA M. ROTH

University of Northern Iowa

常州大学山书馆
藏书章



WILEY

John Wiley & Sons, Inc.

CREDITS

Copyright © 2010 John Wiley & Sons (Asia) Pte Ltd

Cover image from © Konstantin Inozemtsev/iStockphoto

All rights reserved. This book is authorized for sale in Europe, Asia, Africa and the Middle East only and may not be exported outside of these territories. Exportation from or importation of this book to another region without the Publisher's authorization is illegal and is a violation of the Publisher's rights. The Publisher may take legal action to enforce its rights. The Publisher may recover damages and costs, including but not limited to lost profits and attorney's fees, in the event legal action is required.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, website www.copyright.com. Requests to the Publisher for permission should be addressed to the Permission Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, website http://www.wiley.com/go/permissions.

ISBN-13 978-0-470-40031-9

Printed in Asia
10 9 8 7 6 5 4 3 2 1

To Alec

To Chris, Haley, and Hannah

In memory of my mother, and, as always, to Rich and the boys

PREFACE

PURPOSE OF THIS BOOK

Systems Analysis and Design (SAD) is an exciting, active field in which analysts continually learn new techniques and approaches to develop systems more effectively and efficiently. However, there is a core set of skills that all analysts need to know no matter what approach or methodology is used. All information systems projects move through the four phases of planning, analysis, design, and implementation; all projects require analysts to gather requirements, model the business needs, and create blueprints for how the system should be built; and all projects require an understanding of organizational behavior concepts like change management and team building.

This book captures the dynamic aspects of the field by keeping students focused on doing SAD while presenting the core set of skills that we feel every systems analyst needs to know today and in the future. This book builds on our professional experience as systems analysts and on our experience in teaching SAD in the classroom.

This book will be of particular interest to instructors who have students do a major project as part of their course. Each chapter describes one part of the process, provides clear explanations on how to do it, gives a detailed example, and then has exercises for the students to practice. In this way, students can leave the course with experience that will form a rich foundation for further work as a systems analyst.

OUTSTANDING FEATURES

A Focus on Doing SAD

The goal of this book is to enable students to do SAD—not just read about it, but understand the issues so that they can actually analyze and design systems. The book introduces each major technique, explains what it is, explains how to do it, presents an example, and provides opportunities for students to practice before they do it in a real-world project. After reading each chapter, the student will be able to perform that step in the system development life cycle (SDLC) process.

此为试读,需要完整PDF请访问: www.ertongbook.com

Rich Examples of Success and Failure

The book includes a running case about a fictitious company called Tune Source. Each chapter shows how the concepts are applied in situations at Tune Source. Unlike running cases in other books, this text focuses examples on planning, managing, and executing the activities described in the chapter, rather than on detailed dialogue between fictitious actors. In this way, the running case serves as a template that students can apply to their own work. Each chapter also includes numerous Concepts in Action boxes that describe how real companies succeeded—and failed—in performing the activities in the chapter. Many of these examples are drawn from our own experiences as systems analysts.

Incorporation of Object-Oriented Concepts and Techniques

The field is moving toward object-oriented concepts and techniques, both through UML 2.0, the new standard for object-oriented analysts and design, as well as by gradually incorporating object-oriented concepts into traditional techniques. We have taken two approaches to incorporating object-oriented analysis and design into the book. First, we have integrated several object-oriented concepts into our discussion of traditional techniques, although this may not be noticed by the students because few concepts are explicitly labeled as object-oriented concepts. For example, we include the development of use cases as the first step in process modeling (i.e., data flow diagramming) in Chapter 4, and the use (and reuse) of standard interface templates and use scenarios for interface design in Chapter 9.

Second, and more obvious to students, we include a final chapter on the major elements of UML 2.0 that can be used as an introduction to object-oriented analysts and design. This chapter can be used at the end of a course—while students are busy working on projects—or can be introduced after or instead of Chapters 5 and 6.

Real-World Focus

The skills that students learn in a systems analysis and design course should mirror the work that they ultimately will do in real organizations. We have tried to make this book as "real" as possible by building extensively on our experience as professional systems analysts for organizations such as IBM, the U.S. Department of Defense, and the Australian Army. We have also worked with diverse industry advisory boards of IS professionals and consultants in developing the book and have incorporated their stories, feedback, and advice throughout. Many students who use this book will eventually apply the skills on the job in a business environment, and we believe that they will have a competitive edge by understanding what successful practitioners feel is relevant in the real world.

Project Approach

We have presented the topics in this book in the SDLC order in which an analyst encounters them in a typical project. Although the presentation necessarily is linear (because students have to learn concepts in the way in which they build on each other), we emphasize the iterative, complex nature of SAD as the book unfolds. The presentation of the material should align well with courses that encourage students to work on projects, because it presents topics as students need to apply them.

Graphic Organization

The underlying metaphor for the book is doing SAD through a project. We have tried to emphasize this graphically throughout the book so that students can better understand how the major elements in the SDLC are related to each other. First, at the start of every major phase of the system development life cycle, we present a graphic illustration showing the major deliverables that will be developed and added to the "project binder" during that phase. Second, at the start of each chapter, we present a checklist of key tasks or activities that will be performed to produce the deliverables associated with this chapter. These graphic elements—the binder of deliverables tied to each phase and the task checklist tied to each chapter—can help students better understand how the tasks, deliverables, and phases are related to and flow from one to another.

Finally, we have highlighted important practical aspects throughout the book by marking boxes and illustrations with a "push pin." These topics are particularly important in the practical day-to-day life of systems analysts and are the kind of topics that junior analysts should pull out of the book and post on the bulletin board in their office to help them avoid costly mistakes

WHAT'S NEW IN THE FOURTH EDITION

The fourth edition contains several important enhancements, including a new running case, new examples, many new Concepts in Action, and some reorganized material.

Part 1, Planning, has been substantially reorganized and streamlined. Students are introduced to project initiation immediately in the first chapter. The Tune Source running case is launched in Chapter 1 so that students can be involved in a project context from the outset of the book. The topic of project selection has been enhanced with a discussion of project portfolio management. The discussion of SDLC methodologies has been updated and shifted to Chapter 2. In this way, the review of alternative methodologies is placed within the context of planning a project and selecting the best methodology for it. Finally, some of the more technical concepts associated with economic feasibility financial calculations, function point analysis, and project management techniques have been moved to chapter appendices. This keeps the material available for those instructors who choose to include it, but streamlines the main chapter content for those instructors who exclude these topics due to time constraints.

In Part 2, Analysis, a new additional example case, Holiday Travel Vehicles, is introduced to provide additional illustrations of concepts, techniques, and deliverables. The topic of requirements determination is enhanced by a sample interview transcript that provides the basis for new requirements in the Holiday Travel Vehicles case. The discussion of data model normalization has been moved to a chapter appendix. Completed use cases, process models, and data models are included for both the Tune Source case and the Holiday Travel Vehicle cases, providing more extensive examples and illustrations for students and instructors.

Part 3, Design, includes some updated material on the use of packaged software and the use of offshore outsourcing. The n-tiered client-server architecture is explained through an e-commerce illustration. The role of external security requirements and standards is introduced as well. User interface examples and illustrations all have

been updated to use Web-based forms or (Visual Basic) Windows-based forms to better reflect the environment with which students will be involved.

Throughout the book, the Concepts in Action material has been substantially revised and replaced with current examples and illustrations. Chapter references to outside sources have been updated to current resources wherever possible.

ORGANIZATION OF THIS BOOK

This book is organized by the phases of the systems development life cycle (SDLC). Each chapter has been written to teach students specific tasks that analysts need to accomplish over the course of a project, and the deliverables that will be produced from the tasks. As students complete the book, tasks will be "checked off" and deliverables will be completed and filed in a project binder. Along the way, students will be reminded of their progress by road maps that indicate where their current task fits into the larger context of SAD.

Part 1 covers the first phase of the SDLC, the planning phase. Chapter 1 introduces the SDLC, the roles and skills needed for a project team, project initiation, the systems request, and feasibility analysis. Chapter 2 discusses project selection, the selection of an SDLC methodology for the project, and project management, with emphasis on the work plan, staffing plan, project charter, risk assessment, and tools used to help manage and control the project.

Part 2 presents techniques needed during the analysis phase. In Chapter 3, students are introduced to requirements determination and are taught a variety of analysis techniques to help with business process automation, business process improvement, and business process reengineering. Chapter 4 focuses on use cases, Chapter 5 covers process models, and Chapter 6 explains data models and normalization.

The Design Phase is covered in Part 3 of the textbook. In Chapter 7, students create an alternative matrix that compares custom, packaged, and outsourcing alternatives. Chapter 8 focuses on designing the system architecture, which includes the architecture design, hardware/software specification, and security plan. Chapter 9 focuses on the user interface and presents interface design; in this chapter, students learn how to create use scenarios, the interface structure diagram, interface standards, and interface prototypes. Finally, data storage design and program design are discussed in Chapters 10 and 11, which contain information regarding the data storage design, the program structure chart, and program specifications.

The implementation phase is presented in Chapters 12 and 13. Chapter 12 focuses on system construction, and students learn how to build and test the system. It includes information about the test plan and user documentation. Conversion is covered in Chapter 13, where students learn about the conversion plan, the change management plan, the support plan, and the project assessment.

Chapter 14 provides a background of object orientation and explains several key object concepts supported by the standard set of object-modeling techniques used by systems analysts and developers. Then, we explain how to draw four of the most effective models in UML: the use case diagram, the sequence diagram, the class diagram, and the behavioral state machine diagram.

SUPPLEMENTS
www.wiley.com/go/global/dennis
<http://www.wiley.com/go/global/dennis>

Online Instructors Manual

The instructors manual provides resources to support the instructor both in and out of the classroom:

- Short experiential exercises can be used to help students experience and understand key topics in each chapter.
- Short stories have been provided by people working in both corporate and consulting environments for instructors to insert into lectures to make concepts more colorful and real.
- Additional mini-cases for every chapter allow students to perform some of the key concepts that were learned in the chapter.
- Answers to end-of-chapter questions and exercises are provided.

Online Instructor's Resources

- PowerPoint slides are provided that instructors can tailor to their classroom needs and that students can use to guide their reading and studying activities.

Student Web Site

- Web Resources provide instructors and students with Web links to resources that reinforce the major concepts in each chapter. See http://www.wiley.com/go/global/dennis.
- Web Quizzes help students prepare for class tests.

Project Management Software

A 60-day trial edition of Microsoft Project can be purchased with the textbook. Note that Microsoft has changed their policy and no longer offers the 120-day trial previously available. Contact your local Wiley sales representative for details.

Another option now available to education institutions adopting this Wiley textbook. is a free 3-year membership to the MSDN Academic Alliance. The MSDN AA is designed to provide the easiest and most inexpensive way for academic departments to make the latest Microsoft software available in labs, classrooms, and on student and instructor PCs.

ACKNOWLEDGMENTS

We extend our thanks to the many people who contributed to the preparation of this fourth and past editions. We are indebted to the staff at John Wiley & Sons for their support, including Beth Lang Golub, Executive Editor, Jen Devine, Associate Editor, Marie Guarascio, Editorial Assistant, Carly DeCandia, Marketing Manager, Trish McFadden, Senior Production Editor, Kevin Murphy, Senior Designer.

We would like to thank the following reviewers and focus-group participants for their helpful and insightful comments:

Murugan Anandarajan	*Drexel University*
Lawrence Andrew	*Western Illinois University*

John Baron	*University of Illinois, Ph.D. Student*
Meral Binbasioglu	*Hofstra University*
Thomas Case	*Georgia Southern University*
Manoj Choudhary	*DeVry Institute of Technology, Scarborough, California*
Subhasish Dasgupta	*George Washington University*
Mark Dishaw	*University of Wisconsin, Oshkosh*
Terri Fox	*Baylor University*
Raol Freeman	*California State University*
Mark N. Frolick	*University of Memphis*
Yvonne Galusha	*University of Iowa*
Candace Garrod	*Red Rocks Community College*
Rick Gibson	*American University*
Peter C. Johnson	*California State University, Sacramento*
Bill Hardgrave	*University of Arkansas*
Fred G. Harold	*Florida Atlantic University*
Jeffrey S. Harper	*Indiana State University*
Albert Harris	*Appalachian State University*
Monica C. Holmes	*Central Michigan University*
Rebecca Horner	*University of Virginia*
Adam Huarng	*California State University Los Angeles*
Bushan Kapoor	*California State University Fullerton*
Ron Kelly	*Nova Scotia Community College, Burridge Campus*
Deepak Khazanchi	*Northern Kentucky University*
Elizabeth Kiggins	*University of Indianapolis*
Chung S. Kim	*Southwest Missouri State University*
Angela Klein	*Park University*
Craig Knight	*University of South Florida Lakeland*
Chang Koh	*University of North Texas*
George M. Marakas	*University of Kansas*
Vicki McKinney	*University of Arkansas*
Eric Meier	*University of Virginia*
Michael Morris	*University of Virginia*
Fred Niederman	*Saint Louis University*
Maggie O'Hara	*East Carolina University*
Richard O'Lander	*St. John's University-St. Vincent's College*
Elizabeth Perry	*SUNY Binghamton*
Tom Pettay	*DeVry Institute of Technology, Columbus, Ohio*
Robin Poston	*The University of Memphis*
Alan M. Przyworski	*DeVry Institute of Technology, Decatur, Georgia*
Thomas C. Richards	*University of North Texas*
Cynthia Ruppel	*University of Toledo*
Nancy L. Russo	*Northern Illinois University*
Linda Salchenberger	*Loyola University, Chicago*
Susan Sampson	*Bellevue University*
Stephen L. Shih	*Southern Illinois University*
Ulrike Schultze	*Southern Methodist University*
Tony Scime	*State University of New York, College at Brockport*
Arnold Schron	*Baruch College*
John B. Schwartz	*University of Maryland, Baltimore County*
Ken Shumate	*Chapman University College*

Anne Marie Smith	*LaSalle University*
Ted Strickland	*University of Louisville*
James Suleiman	*University of Colorado, Colorado Springs*
Ron Thompson	*Wake Forest University*
Jonathan Trower	*Baylor University*
Duane P. Truex III	*Georgia State University*
William J. Vachula	*University of Pennsylvania*
David Vance	*Southern Illinois University*
Bruce White	*Quinnipiac University*
Rosann Webb Collins	*University of South Florida*
Vincent Yen	*Wright State University*

We would like to thank the many practioners from private practice, public organizations, and consulting firms for helping us add a real-world component to this project. A special remembrance goes to Matt Anderson from Accenture, who was a role model for all who knew him—who demonstrated excellence in systems analysis and design and in life in general. Thanks also to Bruce White of Quinnipiac University for his contribution in updating the Concepts in Action material.

Thanks also to our families and friends for their patience and support along the way, especially to Christopher, Haley, and Hannah Wixom; Alec Dennis; and Richard Jones.

Alan Dennis
ardennis@indiana.edu

Barb Wixom
bwixom@mindspring.com

Robby Roth
Roberta.Roth@uni.edu

此为试读,需要完整PDF请访问: www.ertongbook.com

BRIEF CONTENTS

Preface v

PART ONE PLANNING PHASE 3

CHAPTER 1 INTRODUCTION 5
CHAPTER 2 PROJECT MANAGEMENT 41

PART TWO ANALYSIS PHASE 95

CHAPTER 3 REQUIREMENTS ANALYSIS 97
CHAPTER 4 USE CASES 143
CHAPTER 5 DATA FLOW DIAGRAMS 171
CHAPTER 6 ENTITY RELATIONSHIP DIAGRAMS 209

PART THREE DESIGN PHASE 245

CHAPTER 7 SYSTEM DESIGN 247
CHAPTER 8 APPLICATION ARCHITECTURE 269
CHAPTER 9 USER INTERFACES 301
CHAPTER 10 PROGRAM DESIGN 353
CHAPTER 11 DATA BASES 393

PART FOUR IMPLEMENTATION PHASE 431

CHAPTER 12 CONSTRUCTION 433
CHAPTER 13 INSTALLATION 459
CHAPTER 14 UNIFIED MODELING LANGUAGE 491

CONTENTS

Preface v

PART ONE PLANNING PHASE 3

CHAPTER 1 INTRODUCTION 5

Introduction 6
The Systems Analyst 8
Systems Analyst Skills 8
Systems Analyst Specialization 9
The Systems Development Life Cycle 10
Planning 12
Analysis 12
Design 13
Implementation 14
Project Identification and Initiation 14
System Request 16
Applying the Concepts at Tune Source 16
Feasibility Analysis 21
Technical Feasibility 22
Economic Feasibility 23
Organizational Feasibility 27
Applying the Concepts at Tune Source 30
Summary 32
Appendix 1A: Financial Concepts for Cost–Benefit Analysis 37
Appendix 1B: Detailed Economic Feasibility
Analysis for Tune Source 37

CHAPTER 2 PROJECT MANAGEMENT 41

Introduction 42
Project Selection 43
Applying the Concepts at Tune Source 44

Creating the Project Plan 47
Project Methodology Options 47
Selecting the Appropriate Development Methodology 54
Estimating the Project Time Frame 57
Developing the Work Plan 58
Staffing the Project 60
Staffing Plan 60
Coordinating Project Activities 66
Managing and Controlling the Project 69
Refining Estimates 70
Managing Scope 71
Timeboxing 73
Managing Risk 74
Applying the Concepts at Tune Source 76
Staffing the Project 77
Coordinating Project Activities 77
Summary 80
Appendix 2A: The Function Point Approach 85
Appendix 2B: Project Management Tools: The Gantt Chart and PERT Chart 90
Gantt Chart 90
PERT Chart 90

PART TWO ANALYSIS PHASE 95

CHAPTER 3 REQUIREMENTS ANALYSIS 97

Introduction 98
Requirements Determination 99
What Is a Requirement? 99
Requirements Definition 102
Determining Requirements 103
Creating the Requirements Definition 104
Requirements Analysis Techniques 105
Business Process Automation 106
Business Process Improvement 107
Business Process Reengineering 110
Comparing Analysis Techniques 112
Requirements-Gathering Techniques 113
Requirements-Gathering in Practice 113
Interviews 114
Joint Application Development (JAD) 121
Questionnaires 125
Document Analysis 127
Observation 128
Selecting the Appropriate Techniques 130
Applying the Concepts at Tune Source 132
Requirements Analysis Techniques 132
Requirements-Gathering Techniques 132

Requirements Definition 133
System Proposal 133
Summary 135

CHAPTER 4 USE CASES **143**

Introduction 144
Use Cases 145
Elements of a Use Case 145
Building Use Cases 148
Applying the Concepts at Tune Source 158
Identifying the Major Use Cases 158
Identifying the Major Steps for Each Use Case 162
Identifying the Elements Within Steps 162
Confirming the Use Case 164
Summary 166

CHAPTER 5 DATA FLOW DIAGRAMS **171**

Introduction 172
Data Flow Diagrams 172
Reading Data Flow Diagrams 172
Elements of Data Flow Diagrams 175
Using Data Flow Diagrams to Define Business Processes 177
Process Descriptions 180
Creating Data Flow Diagrams 181
Creating the Context Diagram 182
Creating Data Flow Diagram Fragments 183
Creating the Level 0 Data Flow Diagram 185
Creating Level 1 Data Flow Diagrams (and Below) 188
Validating the Data Flow Diagrams 191
Applying the Concepts at Tune Source 195
Creating the Context Diagram 195
Creating Data Flow Diagram Fragments 195
Creating the Level 0 Data Flow Diagram 197
Creating Level 1 Data Flow Diagrams (and Below) 198
Validating the Data Flow Diagrams 201
Summary 202
Appendix 5A: Supplemental DFDs For Holiday Travel Vehicles 205

CHAPTER 6 ENTITY RELATIONSHIP DIAGRAMS **209**

Introduction 210
The Entity Relationship Diagram 210
Reading an Entity Relationship Diagram 211
Elements of an Entity Relationship Diagram 212
The Data Dictionary and Metadata 216

Creating an Entity Relationship Diagram 219
Building Entity Relationship Diagrams 219
Advanced Syntax 223
Applying the Concepts at Tune Source 224
Validating an ERD 228
Design Guidelines 228
Normalization 231
Balancing Entity Relationship Diagrams with Data Flow Diagrams 231
Summary 233
Appendix 6A: Normalizing the Data Model 238

PART THREE DESIGN PHASE 245

CHAPTER 7 SYSTEM DESIGN 247

Introduction 248
Transition from Requirements to Design 248
System Acquisition Strategies 251
Custom Development 251
Packaged Software 252
Outsourcing 254
Influences on the Acquisition Strategy 256
Business Need 256
In-House Experience 257
Project Skills 258
Project Management 258
Time Frame 259
Selecting an Acquisition Strategy 259
Alternative Matrix 260
Applying the Concepts at Tune Source 262
Summary 264

CHAPTER 8 APPLICATION ARCHITECTURE 269

Introduction 270
Elements of an Architecture Designe 270
Architectural Components 270
Server-Based Architectures 271
Client-Based Architectures 271
Client–Server Architectures 272
Client–Server Tiers 274
Comparing Architecture Options 275
Creating an Architecture Design 277
Operational Requirements 278
Performance Requirements 279
Security Requirements 281
Cultural and Political Requirements 286
Designing the Architecture 289
Hardware and Software Specification 291

Applying the Concepts at Tune Source 293
Creating an Architecture Design 293
Hardware and Software Specification 295
Summary 295

CHAPTER 9 USER INTERFACES **301**

Introduction 302
Principles for User Interface Design 302
Layout 303
Content Awareness 305
Aesthetics 307
User Experience 309
Consistency 310
Minimize User Effort 310
User Interface Design Process 311
Use Scenario Development 312
Interface Structure Design 313
Interface Standards Design 315
Interface Design Prototyping 317
Interface Evaluation 320
Navigation Design 322
Basic Principles 322
Types of Navigation Controls 323
Messages 326
Input Design 328
Basic Principles 329
Types of Inputs 331
Input Validation 333
Output Design 335
Basic Principles 335
Types of Outputs 336
Media 337
Applying the Concepts at Tune Source 339
Use Scenario Development 339
Interface Structure Design 339
Interface Standards Design 341
Interface Template Design 341
Design Prototyping 342
Interface Evaluation 343
Summary 345

CHAPTER 10 PROGRAM DESIGN **353**

Introduction 354
Moving from Logical to Physical Process Models 354
The Physical Data Flow Diagram 354
Applying the Concepts at Tune Source 357

此为试读,需要完整PDF请访问: www.ertongbook.com