

Dennis • Wixom • Roth



Systems Analysis & Design

THIRD EDITION

CONTENTS

Preface

xiii

CHAPTER 1 INTRODUCTION TO SYSTEMS ANALYSIS AND DESIGN

1

Introduction	2
The Systems Development Life Cycle	4
<i>Planning</i>	6
<i>Analysis</i>	6
<i>Design</i>	7
<i>Implementation</i>	7
Systems Development Methodologies	8
<i>Structured Design</i>	10
<i>Rapid Application Development (RAD)</i>	12
<i>Agile Development</i>	16
<i>Selecting the Appropriate Development Methodology</i>	18
Project Team Skills and Roles	20
<i>Business Analyst</i>	21
<i>Systems Analyst</i>	22
<i>Infrastructure Analyst</i>	22
<i>Change Management Analyst</i>	22
<i>Project Manager</i>	23
Summary	23

PART ONE PLANNING PHASE

29

CHAPTER 2 PROJECT INITIATION

31

Introduction	32
Project Identification	33
<i>System Request</i>	35
<i>Applying the Concepts at CD Selections</i>	36
Feasibility Analysis	39
<i>Technical Feasibility</i>	39
<i>Economic Feasibility</i>	40

<i>Organizational Feasibility</i>	46
<i>Applying the Concepts at CD Selections</i>	49
Project Selection	52
<i>Applying the Concepts at CD Selections</i>	53
Summary	55

CHAPTER 3 PROJECT MANAGEMENT

61

Introduction	62
Identifying Project Size	62
<i>Function Point Approach</i>	64
Creating and Managing the Workplan	70
<i>Identify Tasks</i>	70
<i>The Project Workplan</i>	72
<i>Gantt Chart</i>	72
<i>PERT Chart</i>	74
<i>Refining Estimates</i>	75
<i>Scope Management</i>	77
<i>Timeboxing</i>	78
Staffing the Project	79
<i>Staffing Plan</i>	79
<i>Motivation</i>	82
<i>Handling Conflict</i>	83
Coordinating Project Activities	84
<i>CASE Tools</i>	84
<i>Standards</i>	85
<i>Documentation</i>	86
<i>Managing Risk</i>	87
Applying the Concepts at CD Selections	89
<i>Staffing the Project</i>	92
<i>Coordinating Project Activities</i>	93
Summary	93

PART TWO ANALYSIS PHASE

99

CHAPTER 4 REQUIREMENTS DETERMINATION

101

Introduction	102
Requirements Determination	103
<i>What is a Requirement?</i>	103
<i>Requirements Definition</i>	106
<i>Determining Requirements</i>	107
<i>Creating the Requirements Definition</i>	108
Requirements Analysis Techniques	108
<i>Business Process Automation</i>	109
<i>Business Process Improvement</i>	110
<i>Business Process Reengineering</i>	113
<i>Comparing Analysis Techniques</i>	114

Requirements-Gathering Techniques	116
<i>Requirements-Gathering in Practice</i>	117
Interviews	118
Joint Application Development (JAD)	125
Questionnaires	128
Document Analysis	131
Observation	133
Selecting the Appropriate Techniques	134
Applying the Concepts at CD Selections	136
Requirements Analysis Techniques	136
Requirements-Gathering Techniques	136
Requirements Definition	137
System Proposal	138
Summary	139

CHAPTER 5 USE CASE ANALYSIS

143

Introduction	148
Use Cases	149
<i>Elements of a Use Case</i>	149
<i>Building Use Cases</i>	151
Applying the Concepts at CD Selections	155
<i>Identifying the Major Use Cases</i>	155
<i>Identifying the Major Steps for Each Use Case</i>	158
<i>Identifying the Elements within Steps</i>	162
<i>Confirming the Use Case</i>	162
<i>Revising the Requirements Definition</i>	166
Summary	166

CHAPTER 6 PROCESS MODELING

171

Introduction	172
Data Flow Diagrams	172
<i>Reading Data Flow Diagrams</i>	172
<i>Elements of Data Flow Diagrams</i>	174
<i>Using Data Flow Diagrams to Define Business Processes</i>	176
<i>Process Descriptions</i>	180
Creating Data Flow Diagrams	180
<i>Creating the Context Diagram</i>	182
<i>Creating Data Flow Diagram Fragments</i>	182
<i>Creating the Level 0 Flow Diagram</i>	184
<i>Creating Level 1 Data Flow Diagrams (and Below)</i>	185
<i>Validating the Data Flow Diagrams</i>	188
Applying the Concepts at CD Selections	191
<i>Creating the Context Diagram</i>	192
<i>Creating Data Flow Diagram Fragments</i>	192
<i>Creating the Level 0 Data Flow Diagram</i>	193
<i>Creating Level 1 Data Flow Diagrams (and Below)</i>	194
<i>Validating the Data Flow Diagrams</i>	198

Summary	198
Appendix A: Process Modeling at Custom MetalWorks	202

CHAPTER 7 DATA MODELING

211

Introduction	212
The Entity Relationship Diagram	212
<i>Reading an Entity Relationship Diagram</i>	213
<i>Elements of an Entity Relationship Diagram</i>	214
<i>The Data Dictionary and Metadata</i>	219
Creating an Entity Relationship Diagram	220
<i>Building Entity Relationship Diagrams</i>	221
<i>Advanced Syntax</i>	224
<i>Applying the Concepts at CD Selections</i>	227
Validating and ERD	230
<i>Design Guidelines</i>	230
<i>Normalization</i>	233
<i>Balancing Entity Relationship Diagrams with Data Flow Diagrams</i>	238
Summary	240
Appendix A: Data Modeling at Custom MetalWorks	245

PART THREE DESIGN PHASE

251

CHAPTER 8 MOVING INTO DESIGN

255

Introduction	254
Transition from Requirements to Design	254
System Acquisition Strategies	257
<i>Custom Development</i>	257
<i>Packaged Software</i>	258
<i>Outsourcing</i>	260
Influences on Acquisition Strategy	261
<i>Business Need</i>	262
<i>In-house Experience</i>	262
<i>Project Skills</i>	263
<i>Project Management</i>	263
<i>Time Frame</i>	264
Selecting an Acquisition Strategy	264
<i>Alternative Matrix</i>	265
<i>Applying the Concepts at CD Selections</i>	267
Summary	269

CHAPTER 9 ARCHITECTURE DESIGN

273

Introduction	274
Elements of an Architecture Design	274
<i>Architectural Components</i>	274
<i>Server-Based Architectures</i>	275

<i>Client-Based Architectures</i>	275
<i>Client-Server Architectures</i>	276
<i>Client-Server Tiers</i>	278
<i>Comparing Architecture Options</i>	280
Creating an Architecture Design	282
<i>Operational Requirements</i>	283
<i>Performance Requirements</i>	284
<i>Security Requirements</i>	286
<i>Cultural and Political Requirements</i>	291
<i>Designing the Architecture</i>	293
Hardware and Software Specification	295
Applying the Concepts at CD Selections	297
<i>Creating an Architecture Design</i>	297
<i>Hardware and Software Specification</i>	300
Summary	300

CHAPTER 10 USER INTERFACE DESIGN

305

Introduction	306
Principles for User Interface Design	306
<i>Layout</i>	307
<i>Content Awareness</i>	309
<i>Aesthetics</i>	311
<i>User Experience</i>	313
<i>Consistency</i>	314
<i>Minimize User Effort</i>	314
User Interface Design Process	315
<i>Use Scenario Development</i>	316
<i>Interface Structure Design</i>	317
<i>Interface Standards Design</i>	319
<i>Interface Design Prototyping</i>	321
<i>Interface Evaluation</i>	323
Navigation Design	325
<i>Basic Principles</i>	325
<i>Types of Navigation Controls</i>	326
<i>Messages</i>	330
Input Design	331
<i>Basic Principles</i>	331
<i>Types of Inputs</i>	334
<i>Input Validation</i>	334
Output Design	337
<i>Basic Principles</i>	337
<i>Types of Outputs</i>	340
<i>Media</i>	340
Applying the Concepts at CD Selections	342
<i>Use Scenario Development</i>	342
<i>Interface Structure Design</i>	342
<i>Interface Standards Design</i>	346

<i>Interface Template Design</i>	346
<i>Design Prototyping</i>	347
<i>Interface Evaluation</i>	348
Summary	348

CHAPTER 11 PROGRAM DESIGN

357

Introduction	358
Moving from Logical to Physical Process Models	358
<i>The Physical Data Flow Diagram</i>	358
<i>Applying the Concepts at CD Selections</i>	362
Designing Programs	363
Structure Chart	366
Syntax	366
<i>Building the Structure Chart</i>	369
<i>Applying the Concepts at CD Selections</i>	372
<i>Design Guidelines</i>	376
Program Specification	382
Syntax	382
<i>Applying the Concepts at CD Selections</i>	385
Summary	388

CHAPTER 12 DATA STORAGE DESIGN

397

Introduction	398
Data Storage Formats	398
Files	399
Databases	401
<i>Selecting a Storage Format</i>	407
<i>Applying the Concepts at CD Selections</i>	409
Moving from Logical to Physical Data Models	410
<i>The Physical Entity Relationship Diagram</i>	410
<i>Revisiting the CRUD Matrix</i>	414
<i>Applying the Concepts at CD Selections</i>	414
Optimizing Data Storage	416
<i>Optimizing Storage Efficiency</i>	417
<i>Optimizing Access Speed</i>	419
<i>Estimating Storage Size</i>	424
<i>Applying the Concepts at CD Selections</i>	426
Summary	428

PART FOUR IMPLEMENTATION PHASE

435

CHAPTER 13 MOVING INTO IMPLEMENTATION

437

Introduction	438
Managing the Programming Process	438
<i>Assigning Programming Tasks</i>	438
<i>Coordinating Activities</i>	439

<i>Managing the Schedule</i>	440
Testing	441
<i>Test Planning</i>	442
<i>Unit Tests</i>	445
<i>Integration Tests</i>	445
<i>System Tests</i>	447
<i>Acceptance Tests</i>	447
Developing Documentation	447
<i>Types of Documentation</i>	449
<i>Designing Documentation Structure</i>	449
<i>Writing Documentation Topics</i>	451
<i>Identifying Navigation Terms</i>	452
Applying the Concepts at CD Selections	454
<i>Managing Programming</i>	454
<i>Testing</i>	454
<i>Developing User Documentation</i>	457
Summary	458

CHAPTER 14 TRANSITION TO THE NEW SYSTEM

463

Introduction	464
Making the Transition to the New System	464
The Migration Plan	465
<i>Selecting a Conversion Strategy</i>	466
<i>Preparing a Business Contingency Plan</i>	470
<i>Preparing the Technology</i>	472
<i>Preparing People for the New System</i>	473
<i>Understanding Resistance to Change</i>	473
<i>Revising Management Policies</i>	475
<i>Assessing Costs and Benefits</i>	476
<i>Motivating Adoption</i>	478
<i>Enabling Adoption: Training</i>	480
Postimplementation Activities	482
<i>System Support</i>	482
<i>System Maintenance</i>	483
<i>Project Assessment</i>	486
Applying the Concepts at CD Selections	488
<i>Implementation Process</i>	488
<i>Preparing the People</i>	489
<i>Postimplementation Activities</i>	489
Summary	489

CHAPTER 15 THE MOVEMENT TO OBJECTS

495

Introduction	496
Basic Characteristics of Object-Oriented Systems	497
<i>Classes and Objects</i>	497
<i>Methods and Messages</i>	498

<i>Encapsulation and Information Hiding</i>	498
<i>Inheritance</i>	499
<i>Polymorphism and Dynamic Binding</i>	500
Object-Oriented Systems Analysis and Design	502
<i>Use Case Driven</i>	502
<i>Architecture Centric</i>	503
<i>Iterative and Incremental</i>	503
<i>Benefits of Object-Oriented Systems Analysis and Design</i>	503
Unified Modeling Language Version 2.0	504
<i>The Rational Unified Process (RUP)</i>	506
<i>Four Fundamental UML Diagrams</i>	506
Use Case Diagram	507
<i>Elements of a Use Case Diagram</i>	509
<i>Creating a Use Case Diagram</i>	512
Class Diagram	514
<i>Elements of a Class Diagram</i>	515
<i>Simplifying Class Diagrams</i>	520
<i>Creating a Class Diagram</i>	521
Sequence Diagram	525
<i>Creating a Sequence Diagram</i>	526
Behavioral State Machine Diagram	529
<i>Elements of a Behavioral State Machine Diagram</i>	530
<i>Creating a Behavioral State Machine Diagram</i>	531
Summary	533