Less Casses and the Userthas Wasself eath with Athen Masself eath and a note note and as I Foreword xix Here: When to hinder with Thesenstant Usersfered Cestsfered with at nearly year. Preface xxi Definition: Are Use Cases Functional Csoudrements? 65 441 magazines PART I INTRODUCTION Object-Oriented Analysis and Design 3 Notation: What are Three Common Use What Will You Learn? Is it Useful? 3 Lazample: Process Sale, Fully Dressedt The Most Important Learning Goal? 6 What do the Sections Mean? 921 What is Analysis and Design? 6 Notation: Are Therwillian Puran What is Object-Oriented Analysis and Design? 7 Guideline: Write in an Eas A Short Example 8 Guideline: Write Terse Use Cases What is the UML? 11 Condeline: Write Black-Box Use Cases 81 Visual Modeling is a Good Thing 14 Guidelme: Take an Actor and Actel Go History 15 Chidenna Huw to Find Use Cases 82 Recommended Resources 16 Guideline: What Testa Can Help Fund Lize Iterative, Evolutionary, and Agile 17 What is the UP? Are Other Methods Complementary? 18 What is Iterative and Evolutionary Development? 19 What About the Waterfall Lifecycle? 23 How to do Iterative and Evolutionary Analysis and Design? 25 What is Risk-Driven and Client-Driven Iterative Planning? 27 What are Agile Methods and Attitudes? 27 What is Agile Modeling? 30 Other Requirements 101 What is an Agile UP? 31 How Complete are these Lunampies? Are There Other Critical UP Practices? 33 What are the UP Phases? 33 What are the UP Disciplines? 34 How to Customize the Process? The UP Development Case 37 You Know You Didn't Understand Iterative Development or the UP When... 38 History 39 Are Contracte Laurel 188 Recommended Resources 40 Case Studies 41 What is and isn't Covered in the Case Studies? 41 Case Study Strategy: Iterative Development + Iterative Learning 43 Case One: The NextGen POS System 43 Case Two: The Monopoly Game System 44 PART II INCEPTION PART III ELABORATION ITERATION I Inception is Not the Requirements Phase 47 What is Inception? 48 Regardon I Requirements and Emphasis: Core How Long is Inception? 49 What Artifacts May Start in Inception? 49

- Stematicscandidate Castachida of wold - burth

You Know You Didn't Understand Inception When... 51

How Much UML During Inception? 51

Evolutionary Requirements 53 5

Definition: Requirements 54 Evolutionary vs. Waterfall Requirements 54

What are Skillful Means to Find Requirements? 56

What are the Types and Categories of Requirements? 56

How are Requirements Organized in UP Artifacts? 58

Does the Book Contain Examples of These Artifacts? 58

Recommended Resources 59

Use Cases 61

Foreword xix

PART I INTRODUCTION

Land beinger U-residO

Prelace xxi

Definition: What are Actors, Scenarios, and Use Cases? 63

Notation: What are Three Common Use Case Formats? 66

Definition: Are Use Cases Functional Requirements?

Definition: What are Three Kinds of Actors? 66

Use Cases and the Use-Case Model 64

Motivation: Why Use Cases? 64

Example 63

Example: Process Sale, Fully Dressed Style 67 What do the Sections Mean? 72 Notation: Are There Other Formats? A Two-Column Variation Guideline: Write in an Essential UI-Free Style 80 A Short Example Guideline: Write Terse Use Cases 81 Guideline: Write Black-Box Use Cases 81 Guideline: Take an Actor and Actor-Goal Perspective Guideline: How to Find Use Cases 82 Guideline: What Tests Can Help Find Useful Use Cases? 87 Tisacolulova evitstoll Applying UML: Use Case Diagrams 89 Applying UML: Activity Diagrams 92 Motivation: Other Benefits of Use Cases? Requirements in Context 92 Example: Monopoly Game 93 Process: How to Work With Use Cases in Iterative Methods? 95 History 99 Recommended Resources 99 What is Agile Modeling? 30 Other Requirements 101 How Complete are these Examples? 102 Guideline: Should We Analyze These Thoroughly During Inception? 102 Guideline: Should These Artifacts be at the Project Website? 103 NextGen Example: (Partial) Supplementary Specification 104 Commentary: Supplementary Specification 107 NextGen Example: (Partial) Vision 109 Commentary: Vision 111 NextGen Example: A (Partial) Glossary 115 Commentary: Glossary (Data Dictionary) 115 NextGen Example: Business Rules (Domain Rules) 116 Commentary: Domain Rules 117 Process: Evolutionary Requirements in Iterative Methods 118 Recommended Resources 119 PART III ELABORATION ITERATION 1 — BASICS Iteration 1—Basics 123 8 Iteration 1 Requirements and Emphasis: Core OOA/D Skills 124 Process: Inception and Elaboration 126 What Artifacts May Start in Incept Process: Planning the Next Iteration 130 You Know You Didn't Understand in Domain Models 131 9 How Much UML During Inception? 51 Example 133 Evolutionary Recurrents What is a Domain Model? 134 Definition: Exequirements Motivation: Why Create a Domain Model? 137 Hyologlay vs. Watarial Guideline: How to Create a Domain Model? 139 Guideline: How to Find Conceptual Classes? 139

Example: Find and Draw Conceptual Classes 143

Guideline: Agile Modeling—Sketching a Class Diagram 144

Guideline: Agile Modeling—Maintain the Model in a Tool? 144

Guideline: Report Objects—Include 'Receipt' in the Model? 145

Guideline: Think Like a Mapmaker; Use Domain Terms 145

On to Object Denign 213 Guideline: How to Model the Unreal World? 146 Guideline: A Common Mistake with Attributes vs. Classes 146 Guideline: When to Model with 'Description' Classes? 147 How Mach Time Spenbillrawing Associations 149 Example: Associations in the Domain Models 156 Attributes 158 Example: Attributes in the Domain Models 166 Ubil. Interaction Diagrams 221 Conclusion: Is the Domain Model Correct? 168 Process: Iterative and Evolutionary Domain Modeling 169 Recommended Resources 170 Common LIMIL Salkeracolom Shagerann Nutations System Sequence Diagrams 173 10 Hasic Sequence Diagram Notation 227 Example: NextGen SSD 175 What are System Sequence Diagrams? 176 Motivation: Why Draw an SSD? 176 Applying UML: Sequence Diagrams 177 What is the Relationship Between SSDs and Use Cases? 177 Definition: Classifior How to Name System Events and Operations? 178 How to Model SSDs Involving Other External Systems? 178 Note Symbols: Notes, What SSD Information to Place in the Glossary? 179 Example: Monopoly SSD 179 Process: Iterative and Evolutionary SSDs 180 History and Recommended Resources 180 Operation Contracts 181 11 Example 183 Dependency 260 Definition: What are the Sections of a Contract? 183 Definition: What is a System Operation? 183 Composition Over Aggregation Definition: Postconditions 184 Example: enterItem Postconditions 187 Guideline: Should We Update the Domain Model? 188 Association Class 288 Guideline: When Are Contracts Useful? 188 Guideline: How to Create and Write Contracts 189 Example: NextGen POS Contracts 190 User-Defined Compartment Constitutes Example: Monopoly Contracts 191 Applying UML: Operations, Contracts, and the OCL 191 Process: Operation Contracts Within the UP 193 History 193 Recommended Resources 194 Requirements to Design—Iteratively 195 12 Iteratively Do the Right Thing, Do the Thing Right 196 Provoking Early Change 196 Didn't All That Analysis and Modeling Take Weeks To Do? 196 Logical Architecture and UML Package Diagrams 197 13 Example 199 Where are We New? 281 What is the Logical Architecture? And Layers? 199 What Layers are the Focus in the Case Studies? 200 What is Software Architecture? 200 Applying UML: Package Diagrams 201 Guideline: Design with Layers 202 Guideline: The Model-View Separation Principle 209 What's the Connection Between SSDs, System Operations, and Layers? 210 Example: NextGen Logical Architecture and Package Diagram 211 Example: Monopoly Logical Architecture? 212

	Recommended Resources 212
14	On to Object Design 213
	Agile Modeling and Lightweight UML Drawing 214
	UML CASE Tools 215
	How Much Time Spent Drawing UML Before Coding? 215
	Designing Objects: What are Static and Dynamic Modeling? 216
	The Importance of Object Design Skill over UML Notation Skill 217
	Other Object Design Techniques: CRC Cards 218
15	TTREE T T.
15	C 1.C D. 000
	Novice UML Modelers Don't Pay Enough Attention to Interaction Diagrams! 225
	C TIMI I D' N' 000
	Basic Sequence Diagram Notation 227
10	Basic Communication Diagram Notation 240
16	UML Class Diagrams 249
	Applying UML: Common Class Diagram Notation 250
	Definition: Design Class Diagram 251
	Definition: Classifier 251
	Ways to Show UML Attributes: Attribute Text and Association Lines 252
	Note Symbols: Notes, Comments, Constraints, and Method Bodies 256
	Operations and Methods 256
	Keywords 258
	Stereotypes, Profiles, and Tags 259
	UML Properties and Property Strings 260
	Generalization, Abstract Classes, Abstract Operations 260
	Dependency 260
	Interfaces 263
	Composition Over Aggregation 264
	Constraints 265
	Qualified Association 265
	THE PROPERTY OF THE PROPERTY O
	Template Classes and Interfaces 267
	User-Defined Compartments 268
	Active Class 269
4-	What's the Relationship Between Interaction and Class Diagrams? 269
17	GRASP: Designing Objects with Responsibilities 271
	UML versus Design Principles 272
	Object Design: Example Inputs, Activities, and Outputs 272
	Responsibilities and Responsibility-Driven Design 276
	GRASP: A Methodical Approach to Basic OO Design 277
	What's the Connection Between Responsibilities, GRASP, and UML Diagrams? 277
	What are Patterns? 278
	Where are We Now? 281
	A Short Example of Object Design with GRASP 281
	Applying GRASP to Object Design 291
	Creator 291
	Information Expert (or Expert) 294
	Low Coupling 299
	Controller 302
	High Cohesion 314
	Recommended Resources 319
18	Object Design Examples with GRASP 321
	Color Dong I I I I I I I I I I I I I I I I I I I

	What is a Use Case Realization? 322	
	Artifact Comments 324	
	What's Next? 327	
	Use Case Realizations for the NextGen Iteration 327	
	Use Case Realizations for the Monopoly Iteration 349	
	Process: Iterative and Evolutionary Object Design 360	
	Summary 502	
19	Designing for Visibility 363	
	Visibility Between Objects 363	
	What is Visibility? 364 Mapping Designs to Code 369	
20	mapping Designs to Code out	
	Frogramming and iterative, Evolutionary Development 570	
	Mapping Designs to Code 371  Creating Class Definitions from DCDs 371	
	Creating Class Definitions from DCDs 371  Creating Methods from Interaction Diagrams 372	
	Collection Classes in Code 374	
	Exceptions and Error Handling 374	
	Defining the Sale.makeLineItem Method 375	
	Order of Implementation 375	88
	Test-Driven or Test-First Development 376	
	Summary of Manning Designs to Code 376	
	Introduction to the NextGen POS Program Solution 377	
	Introduction to the Monopoly Program Solution 380	
21	Test-Driven Development and Refactoring 385	
	Test-Driven Development 386	
	Refactoring 389	
	Recommended Resources 393	
22	IIMI. Tools and IIMI, as Bluenrint, 395	
	Forward, Reverse, and Round-Trip Engineering 396	
	What is a Common Report of Valuable Features? 396	
	What to Look For in a Tool? 397	
	If Sketching UML, How to Update the Diagrams After Coding? 397	
	Recommended Resources 398	
PART	IV ELABORATION ITERATION 2 — MORE PATTERNS	
23	Iteration 2—More Patterns 401	
20	From Iteration 1 to 2 402	
	Iteration-2 Requirements and Emphasis: Object Design and Patterns 403	
24	Quick Analysis Update 407	
	Case Study: NextGen POS 407	
	Case Study: Monopoly 409	
25	GRASP: More Objects with Responsibilities 413	
	Polymorphism 414	
	Pure Fabrication 421	
	Indirection 420	
	Protected Variations 427	
26	Applying GoF Design Patterns 435 Adapter (GoF) 436	
	Some GRASP Principles as a Generalization of Other Patterns 438	
	"Analysis" Discoveries During Design: Domain Model 440	
	Factory 440	
	Singleton (GoF) 442	
	Conclusion of the External Services with Varying Interfaces Problem 446 Strategy (GoF) 447	

Composite (GoF) and Other Design Principles 452

	Facade (GoF) 461
	Observer/Publish-Subscribe/Delegation Event Model (GoF) 463
	Conclusion 471
	Recommended Resources 471
DADT	V ELABORATION ITERATION 3 — INTERMEDIATE TOPICS
FARI	
27	Iteration 3—Intermediate Topics 475
	NextGen POS 476
	Monopoly 476
28	UML Activity Diagrams and Modeling 477  Example 477
	TT 4 A 1 A 4: '4 D' 9 470
	More UML Activity Diagram Notation 481 Guidelines 482
	TO 1 DI LO A L' L' D'
	D 4 1' '1 D' 100
29	TIMIT Chata Mashina Diamana and Madalina 405
23	Example 196
	Definitions: Events States and Transitions 486
	How to Apply State Machine Diagrams? 487
	More UML State Machine Diagram Notation 489
	Example: III Marriagtion Modeling with State Machines 100
	Example: Of Navigation Modeling with State Machines 490  Example: NextGen Use Case State Machine Diagram 491
	D
	D 1.1.D 400
30	D 1 1' II C 100
	Relating Use Cases 493  The include Relationship 494
	Terminology: Concrete, Abstract, Base, and Addition Use Cases 497
	The extend Relationship 497
	The generalize Relationship 499
	Use Case Diagrams 499
31	Domain Model Refinement, 501
	New Concepts for the NextGen Domain Model 502
	Generalization 503
	Defining Conceptual Superclasses and Subclasses 505
	When to Define a Conceptual Subclass? 508
	When to Define a Conceptual Superclass? 510
	NextGen POS Conceptual Class Hierarchies 510
	Abstract Conceptual Classes 513
	Modeling Changing States 515
	Class Hierarchies and Inheritance in Software 516
	Association Classes 516
	Aggregation and Composition 519
	Time Intervals and Product Prices—Fixing an Iteration 1 "Error" 521
	Association Role Names 522
	Roles as Concepts versus Roles in Associations 523
	Derived Elements 524
	Qualified Associations 525
	Reflexive Associations 526
	Using Packages to Organize the Domain Model 526
	Example: Manapoly Domain Model Refinemente 539
	Example. Monopoly Domain Model Refinements 552

32	More SSDs and Contracts 535 NextGen POS 535
33	Architectural Analysis 541 Process: When Do We Start Architectural Analysis? 542
	Definition: Variation and Evolution Points 542
	Architectural Analysis 543
	Common Steps in Architectural Analysis 544
	The Science: Identification and Analysis of Architectural Factors 545
	Example: Partial NextGen POS Architectural Factor Table 548
	The Art: Resolution of Architectural Factors 549
	Summary of Themes in Architectural Analysis 556
	Process: Iterative Architecture in the UP 556
	D 1 1 D FF0
24	Recommended Resources 558  Logical Architecture Refinement 550
34	Logical Architecture Refinement 559  Example: NextGen Logical Architecture 560
	Collaborations with the Layers Pattern 565
	Other Layer Pattern Issues 571
	Model-View Separation and "Upward" Communication 576
	Recommended Resources 577
35	Package Design 579
33	Package Organization Guidelines 580
	Recommended Resources 586
36	More Object Design with GoF Patterns 587
00	Example: NextGen POS 588
	Failover to Local Services; Performance with Local Caching 588
	Handling Failure 593
	Failover to Local Services with a Proxy (GoF) 599
	Designing for Non-Functional or Quality Requirements 603
	Accessing External Physical Devices with Adapters 603
	Abstract Factory (GoF) for Families of Related Objects 605
	Handling Payments with Polymorphism and Do It Myself 608
	Evample: Monopoly 615
	Conclusion 618
37	Designing a Persistence Framework with Patterns 621
	The Problem: Persistent Objects 622
	The Solution: A Persistence Service from a Persistence Framework 623
	Frameworks 623
	Requirements for the Persistence Service and Framework 624
	Key Ideas 624
	Pattern: Representing Objects as Tables 625
	UML Data Modeling Profile 625
	Pattern: Object Identifier 626
	Accessing a Persistence Service with a Facade 627
	Mapping Objects: Database Mapper or Database Broker Pattern 628
	Framework Design with the Template Method Pattern 630
	Materialization with the Template Method Pattern 630
	O C . M M OOO
	Configuring Mappers with a MapperFactory 636  Pattern: Cache Management 637
	Consolidating and Hiding SQL Statements in One Class 637
	Transactional States and the State Pattern 638
	Designing a Transaction with the Command Pattern 641
	Lazy Materialization with a Virtual Proxy 643
	How to Represent Relationships in Tables 647

		PersistentObject Superclass and Separation of Concer	rns 648
		Unresolved Issues 648	
38	UML D	eployment and Component Diagrams 651 Deployment Diagrams 651	Architectural Analysisgolvalor Process: When Do We St.
		Component Diagrams 653	
39	Docume	enting Architecture: UML & the N+1 View Model The SAD and Its Architectural Views 656	1 655
		Notation: The Structure of a SAD 659	
		Example: A NextGen POS SAD 660	
		Example: A Jakarta Struts SAD 665	
		Process: Iterative Architectural Documentation 669	
		Recommended Resources 669	
D	VII 0	Stor to Apply Activity Disagrams? 475	
PART	VI SPEC	JAL TUPICS	
40	More or	How to Plan an Iteration? 674	gement 673
		DI 1 TI II 000	Other Layer Pattern Isst
		How to Plan Iterations with Use Cases and Scenarios	2 676
		The (In)Validity of Early Estimates 678	
		Organizing Project Artifacts 680 You Know You Didn't Understand Iterative Planning	
Dilli		Recommended Resources 681	MUNE UDIEU DENEM WITH AND
_	raphy 683	Partie New State Hundisch führe beim beim beim beim beim beim beim bei	
Glossa	,		
Index 6			
		ARTICLE AND CORRUPTION FOR BOARD AND AND AND AND AND AND AND ADDRESS OF THE PARTY O	
		Time Intervals and Profest Tribury Businessian addressing	ada allar noi hallaisanabl
			How to Reprosent Relation