

Contents

Part 1 Object-Oriented Analysis and Design and the Unified Process

1	Introduction	3
1.1	Introduction	3
1.2	Why UML and the Unified Process?	4
1.3	Why this Book?	5
1.4	Where to Get More Information	6
1.5	Where to Go Online	6
2	Object-Oriented Analysis and Design	7
2.1	Introduction	7
2.2	Object-Oriented Design Methods	7
2.3	Object-Oriented Analysis	7
2.4	The Booch Method	10
2.5	The Object Modeling Technique	11
2.6	The Objectory Method	13
2.7	The Fusion Method	14
2.8	The Unified Modeling Language	15
2.9	Summary	16
2.10	References	16
3	An Introduction to the UML and the Unified Process	19
3.1	Introduction	19
3.2	Unified Modeling Language	19
3.3	The Unified Process	23
3.4	Summary	34
4	Software Architecture and Object-Oriented Design	35
4.1	Software Architecture – the Very Idea	35
4.2	Software Patterns	45
4.3	Constructing the Architecture	46
4.4	Find Architecturally Significant Use Cases	47
4.5	Identify Key Classes	47
4.6	Breaking the System Into Subsystems	48
4.7	Identifying Concurrency and Active Classes	52
4.8	Managing Data Stores	54
4.9	Additional Architectural Concerns	55

4.10	Plan Incremental Build of Software	57
4.11	The Online ATM Architecture Design	57
4.12	References	61
5	Requirements Workflow: Use Case Analysis	63
5.1	Introduction	63
5.2	Requirements Workflow	63
5.3	Use Case Analysis	63
5.4	The Use Case Model	64
5.5	Use Case Diagrams	64
5.6	Actors	66
5.7	Use Cases	68
5.8	Refining Use Case Models	71
5.9	Additional Documents	71
5.10	Interface Descriptions	72
5.11	Online ATM Use Case Analysis	72
5.12	Structuring the Use Case Model	76
5.13	References	77
6	The Analysis Workflow: Finding the Entities	79
6.1	Introduction	79
6.2	Analysis Workflow Activities	80
6.3	The Analysis Model	81
6.4	Generating Analysis Classes	86
6.5	Generating Use Case Realizations	92
6.6	Identifying Attributes	92
6.7	Preparing a Data Dictionary	95
6.8	Identifying Associations	96
6.9	Identifying Inheritance	99
6.10	Grouping Analysis Classes Into Packages	102
6.11	Iterating and Refining the Model	104
6.12	Identify Common Special Requirements	105
7	The Design Workflow: System and Class Design	107
7.1	Introduction	107
7.2	Design Workflow Activities	107
7.3	Class Design Stage	109
7.4	The Design Model	110
7.5	Design Classes	110
7.6	Identifying and Refining Design Classes	115
7.7	Identifying Operations for the Online ATM System	121
7.8	Analysing Use Cases	123
7.9	Identifying Dynamic Behaviour	125
7.10	Statechart Diagrams	132
7.11	Associations	138
7.12	Identifying Interfaces	143
7.13	Identifying Inheritance	143

7.14	Remaining Steps	144
7.15	Applying the Remaining Steps to OBA	145
7.16	Iterating and Refining Model	146
7.17	References	147
8	Implementation Phase	149
8.1	Introduction	149
8.2	Implementation Workflow Artefacts	149
8.3	Implementation Workflow Activities	150
9	The Test Workflow: How it Relates to Use Cases	157
9.1	Introduction	157
9.2	The Purpose of the Workflow	157
9.3	Aims of Workflow	157
9.4	Test Workflow Activities	158
9.5	Summary	160
9.6	Reference	160
10	The Four Phases	161
10.1	Introduction	161
10.2	The Unified Process Structure	161
10.3	Relationship Between Phases and Iterations	162
10.4	Effort vs. Phases	165
10.5	Phases and Iterations	166
10.6	Phases and Cycles	167
11	Software Patterns	169
11.1	Introduction	169
11.2	The Motivation Behind Patterns	170
11.3	Documenting Patterns	170
11.4	When to Use Patterns	172
11.5	Strengths and Limitations of Design Patterns	172
11.6	An Example Pattern: Mediator	173
11.7	Summary	178
11.8	Further Reading	178
11.9	References	179
 Part 2 The Unified Process and the UML in the Real World		
12	The JDSync Case Study	183
12.1	Introduction	183
12.2	Problem Statement	183
12.3	The Requirements Workflow: Use Case Analysis	183
12.4	The Analysis Workflow	189
12.5	The Design Workflow	196
12.6	The Implementation Workflow	210
12.7	Summary	214

13	Are UML Designs Language-Independent?	217
13.1	Introduction	217
13.2	OOD Is Language-Independent – Right?	217
13.3	Questions to Consider	218
13.4	The Java Platform	218
13.5	Classes in the UML	219
13.6	Fields in the UML	219
13.7	Operations in the UML	220
13.8	Constructors	220
13.9	Packages in the UML	221
13.10	UML Interfaces	224
13.11	Templates	224
13.12	Associations	224
13.13	Multiplicity in the UML	226
13.14	Aggregation and Composition	227
13.15	Singleton Objects	227
13.16	Synchronous and Asynchronous Messages	228
13.17	From Code to the UML	229
13.18	Conclusions	230
14	Customizing the Unified Process for Short Time-Scale Projects	231
14.1	Introduction	231
14.2	Particular Problems of Small Projects	232
14.3	The Unified Process as a Framework	233
14.4	Adapting the Unified Process for a Small Project	239
14.5	The Modified Unified Process	240
14.6	Summary	241
14.7	Reference	242
15	Augmenting the Unified Process with Additional Techniques	243
15.1	Introduction	243
15.2	The Unified Process as a Framework	243
15.3	Class Identification	244
15.4	CRC: Class–Responsibility–Collaboration	246
15.5	What Is CRC?	246
15.6	Summary	249
15.7	References	249
16	Inheritance Considered Harmful!	251
16.1	Introduction	251
16.2	Inheritance	252
16.3	Drawbacks of Inheritance	254
16.4	Balancing Inheritance and Reuse	262
16.5	Compositional Reuse	264
16.7	Tool Support	268
16.8	Conclusions	269
16.9	References	269

Contents	xiii
Appendix A: The UML Notation	271
Index	277