



# Agile Software Requirements

*Lean Requirements Practices for Teams, Programs, and the Enterprise*

---

**Dean Leffingwell**

Foreword by **Don Reinertsen**

Agile Software Development Series

---

Alistair Cockburn and Jim Highsmith,  
Series Editors

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and the publisher was aware of a trademark claim, the designations have been printed with initial capital letters or in all capitals.

The author and publisher have taken care in the preparation of this book, but make no expressed or implied warranty of any kind and assume no responsibility for errors or omissions. No liability is assumed for incidental or consequential damages in connection with or arising out of the use of the information or programs contained herein.

The publisher offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales, which may include electronic versions and/or custom covers and content particular to your business, training goals, marketing focus, and branding interests. For more information, please contact:

U.S. Corporate and Government Sales  
(800) 382-3419  
corpsales@pearsontechgroup.com

For sales outside the United States, please contact:

International Sales  
international@pearson.com

Visit us on the Web: [informit.com/aw](http://informit.com/aw)

*Library of Congress Cataloging-in-Publication Data*

Leffingwell, Dean.

Agile software requirements : lean requirements practices for teams, programs, and the enterprise / Dean Leffingwell.

p. cm.

Includes bibliographical references and index.

ISBN-13: 978-0-321-63584-6 (hardcover : alk. paper)

ISBN-10: 0-321-63584-1 (hardcover : alk. paper)

1. Agile software development. I. Title.

QA76.76.D47L4386 2011

005.1—dc22

2010041221

Copyright © 2011 Pearson Education, Inc.

All rights reserved. Printed in the United States of America. This publication is protected by copyright, and permission must be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or likewise. For information regarding permissions, write to:

Pearson Education, Inc.  
Rights and Contracts Department  
501 Boylston Street, Suite 900  
Boston, MA 02116  
Fax: (617) 671-3447

ISBN-13: 978-0-321-63584-6

ISBN-10: 0-321-63584-1

Text printed in the United States on recycled paper at Courier in Westford, Massachusetts.

First printing, December 2010

*This page intentionally left blank*

# CONTENTS

<b>Foreword</b>	<b>xxiii</b>
<b>Preface</b>	<b>xxvii</b>
<b>Acknowledgments</b>	<b>xxxiii</b>
<b>About the Author</b>	<b>xxxv</b>

<b>Part I</b>	<b>Overview: The Big Picture</b>	<b>1</b>
---------------	----------------------------------	----------

<b>Chapter 1</b>	A Brief History of Software Requirements Methods	3
	Software Requirements in Context: Decades of Advancing Software Process Models	3
	Predictive, Waterfall-Like Processes	5
	Problems with the Model	6
	Requirements in the Waterfall Model: The Iron Triangle	6
	And Yet, the Waterfall Model Is Still Amongst Us	8
	Iterative and Incremental Processes	9
	Spiral Model	10
	Rapid Application Development	10
	Rational Unified Process	11
	Requirements in Iterative Processes	11
	Adaptive (Agile) Processes	12
	The Agile Manifesto	12
	Extreme Programming (XP)	14
	Scrum	15



Requirements Management in Agile Is Fundamentally Different	16
Goodbye Iron Triangle	16
Agile Optimizes ROI Through Incremental Value Delivery	17
Enterprise-Scale Adaptive Processes	19
Introduction to Lean Software	20
The House of Lean Software	20
A Systems View of Software Requirements	27
Kanban: Another Software Method Emerges	28
Summary	28
<b>Chapter 2</b> The Big Picture of Agile Requirements	31
The Big Picture Explained	32
Big-Picture Highlights	33
Big Picture: Team Level	34
The Agile Team	34
Roles in the Agile Team	36
Iterations	36
User Stories and the Team Backlog	37
Big Picture: Program Level	38
Releases and Potentially Shippable Increments	39
Vision, Features, and the Program Backlog	40
Release Planning	41
The Roadmap	41
Product Management	42
Big-Picture Elements: Portfolio Level	43
Investment Themes	43
Epics and the Portfolio Backlog	43
Architectural Runway	44
Summary	45
<b>Chapter 3</b> Agile Requirements for the Team	47
Introduction to the Team Level	47
Why the Discussion on Teams?	47
Eliminating the Functional Silos	50
Agile Team Roles and Responsibilities	50
Product Owner	51
Scrum Master/Agile Master	51
Developers	52
Testers	53
Other Team/Program Roles	54
User Stories and the Team Backlog	55

---

Backlog	55
User Stories	56
User Story Basics	57
Tasks	57
Acceptance Tests	58
Unit Tests	60
Real Quality in Real Time	60
Summary	61
<b>Chapter 4</b> Agile Requirements for the Program	63
Introduction to the Program Level	63
Organizing Agile Teams at Scale	64
Feature and Component Teams	65
The System Team	71
The Release Management Team	73
Product Management	74
Vision	74
Features	75
New Features Build the Program Backlog	76
Testing Features	77
Nonfunctional Requirements	77
Nonfunctional Requirements as Backlog Constraints	78
Testing Nonfunctional Requirements	79
The Agile Release Train	80
Releases and Potentially Shippable Increments	80
Release Planning	80
Roadmap	81
Summary	82
<b>Chapter 5</b> Agile Requirements for the Portfolio	83
Introduction to the Portfolio Level	83
Investment Themes	84
Portfolio Management Team	85
Epics and the Portfolio Backlog	85
Portfolio Backlog	86
Epics, Features, and Stories	87
Architectural Runway and Architectural Epics	88
Implementing Architectural Epics	89
Architectural Runway: Portfolio, Program, and Project	90
Summary	91
Summary of the Full, Enterprise Requirements Information Model	91

<b>Interlude</b>	Case Study: Tendril Platform	93
	Background for the Case Study	93
	System Context Diagram	95

## **Part II Agile Requirements for the Team 97**

<b>Chapter 6</b>	User Stories	99
	Introduction	99
	User Story Overview	100
	User Stories Help Bridge the Developer–Customer Communication Gap	101
	User Stories Are Not Requirements	101
	User Story Form	102
	Card, Conversation, and Confirmation	102
	User Story Voice	103
	User Story Detail	104
	User Story Acceptance Criteria	104
	INVEST in Good User Stories	105
	Independent	106
	Negotiable ... and Negotiated	107
	Valuable	107
	Estimable	108
	Small	109
	Testable	111
	Splitting User Stories	111
	Spikes	114
	Technical Spikes and Functional Spikes	114
	Guidelines for Spikes	115
	Story Modeling with Index Cards	116
	Summary	117
<b>Chapter 7</b>	Stakeholders, User Personas, and User Experiences	119
	Stakeholders	119
	System Stakeholders	120
	Project Stakeholders	120
	Voice of the Stakeholder: Product Owner	120
	Levels of Stakeholder Involvement	121
	Building Stakeholder Trust	122
	Stakeholder Interactions	122

---

Identifying Stakeholders	122
Identifying Project Stakeholders	123
Identifying System Stakeholders	124
Classifying System Stakeholders	125
Understanding System Stakeholder Needs	125
Stakeholder/Product Owner Team?	126
User Personas	126
Primary and Secondary User Personas	127
Finding Personas with User Story Role Modeling	127
Agile and User Experience Development	129
The User Experience Problem	129
Low-Fidelity Options for User Interface Development	130
User Experience Story Spikes	130
Centralized User Experience Development	131
Distributed, Governed User Experience Development Model	131
Summary	133
<b>Chapter 8</b> Agile Estimating and Velocity	135
Introduction	135
There's a Method to This Madness	135
The Goal Is the Same: More Reliable Estimates	136
Why Estimate? The Business Value of Estimating	137
Estimating Scope with Story Points	138
Understanding Story Points: An Exercise	138
Exercise Part 1: Relative Estimating	138
Exercise Part 2: Estimating Real Work with Planning Poker	139
How Much Time Should We Spend Estimating?	142
A Parable of Estimating Caution: A Story within a Story	144
Distributed Estimating with Online Planning Poker	144
An Alternate Technique: Tabletop Relative Estimation	145
From Scope Estimates to Team Velocity	146
Exercise Part 3: Establishing Velocity	146
Caveats on the Relative Estimating Model	147
Another Parable: Increasing Velocity, Be Careful	
What You Ask For	148
From Velocity to Schedule and Cost	148
Estimating Schedule	149
Estimating Cost	149
Estimating with Ideal Developer Days	149
A Hybrid Model	151
Normalizing Velocity	152
Summary	152

<b>Chapter 9</b>	Iterating, Backlog, Throughput, and Kanban	155
	Iterating: The Heartbeat of Agility	155
	Iteration Length	156
	Iteration Pattern: Plan, Execute, Review, and Retrospective	157
	Team Backlog	157
	Planning the Iteration	158
	Iteration Commitment	159
	Executing the Iteration	164
	Tracking and Adjustment	164
	Review and Retrospective	167
	Feature Preview	169
	Backlog, Lean, and Throughput	169
	Backlog Maturity, Lean, and Little's Law	170
	A Blog Story: Is That Well-Formed Product Backlog Decreasing Your Team's Agility?	170
	Little's Law and an Agile Team's Backlog	171
	Applying Little's Law to Increase Agility and Decrease Time to Market	172
	Readers React	176
	Managing Throughput by Controlling Backlog Queue Length	177
	Software Kanban Systems	179
	Kanban System Properties	179
	Classes of Service in Kanban	180
	Summary	180
<b>Chapter 10</b>	Acceptance Testing	183
	Why Write About Testing in an Agile Requirements Book?	183
	Agile Testing Overview	184
	What Is Acceptance Testing?	187
	Story Acceptance Tests	187
	Characteristics of Good Story Acceptance Tests	188
	They Test Good User Stories	188
	They Are Relatively Unambiguous and Test All the Scenarios	189
	They Persist	190
	Acceptance Test-Driven Development	190
	Acceptance Test Template	192
	Automated Acceptance Testing	193
	Automated Acceptance Testing Example: The FIT Approach	194
	Unit and Component Testing	196
	Unit Testing	196
	Component Testing	198
	Summary	199

---

<b>Chapter 11</b>	Role of the Product Owner	201
	Is This a New Role?	201
	Perspectives on Dual Roles of Product Owner and Product Manager	202
	The Name Game: Experimenting with the Product Owner Role/Title	206
	Our Conclusion: Apply the Dual Roles	207
	Responsibilities of the Product Owner in the Enterprise	207
	Managing the Backlog	208
	Just-in-Time Story Elaboration	211
	Driving the Iteration	212
	The Problem of Technical Debt and the Value Stream	216
	Co-planning the Release	217
	Five Essential Attributes of a Good Product Owner	218
	Collaboration with Product Managers	220
	Product Owner Bottlenecks: Part-Time Product Owners, Product Owner Proxies, Product Owner Teams	221
	Product Owner Proxies	221
	Product Owner Teams	221
	Seeding the Product Owner Role in the Enterprise	222
	TradeStation Technologies	222
	CSG Systems	223
	Symbian Software Limited	223
	Discount Tire	224
	Summary	224
<b>Chapter 12</b>	Requirements Discovery Toolkit	227
	The Requirements Workshop	228
	Preparing for the Workshop	229
	Setting the Agenda	231
	Running the Workshop	232
	Brainstorming	232
	Idea Generation	233
	Idea Reduction	235
	Idea Prioritization	236
	Interviews and Questionnaires	237
	Context-Free Questions	238
	Solutions-Context Questions	238
	The Moment of Truth: The Interview	239
	Compiling the Needs Data	239
	A Note on Questionnaires	240
	User Experience Mock-Ups	241

Forming a Product Council	243
Competitive Analysis	244
Customer Change Request Systems	245
Defect Logs	246
Use-Case Modeling	247
Summary	247

## **Part III Agile Requirements for the Program 249**

<b>Chapter 13</b> Vision, Features, and Roadmap	251
Vision	251
Expressing the Vision	252
A Vision Document	252
The Advanced Data Sheet Approach	253
The Preliminary Press Release Approach	254
The “Feature Backlog with Briefing” Approach	255
Communicating Nonfunctional Requirements (System Qualities)	255
Features	255
Expressing Features in User Voice Form	257
Estimating Features	257
Estimating Effort	258
Estimating Cost	259
Estimating Development Time	260
Testing Features	260
Prioritizing Features	261
Value/Effort as an ROI Proxy: A First Approximation	262
What’s Wrong with Our Value/Effort ROI Proxy?	262
Prioritizing Features Based on the Cost of Delay	263
Introducing Cost of Delay (CoD)	263
Estimating the Cost of Delay	266
Feature Prioritization Evaluation Matrix	267
All Prioritizations Are Local and Temporal	268
Achieving Differential Value: The Kano Model of Customer Satisfaction	269
The Roadmap	271
On Confidence and Commitments for Release Next, Next +1, and More	273
Summary	273

---

<b>Chapter 14</b>	Role of the Product Manager	275
	Product Manager, Business Analyst?	276
	Responsibilities of the Product Manager in a Product Company	276
	Business Responsibilities of the Role in the IT/IS Shop	278
	Responsibility Summary	279
	Phases of Product Management Disillusionment in the Pre-Agile Enterprise	280
	Phase 1: Unbridled Enthusiasm	281
	Phase 2: False Sense of Security	281
	Phase 3: Rude Awakening	281
	Phase 4: Resetting Expectations	282
	Phase 5: The Season of Perpetual Mistrust	282
	Exiting the Season of Perpetual Mistrust	282
	Evolving Product Management in the Agile Enterprise	283
	Understanding Customer Need	284
	Documenting Requirements	284
	Scheduling	285
	Prioritizing Requirements	285
	Validating Requirements	286
	Managing Change	286
	Assessing Status	287
	Responsibilities of the Agile Product Manager	287
	Own the Vision and Release Backlog	288
	Managing Release Content	290
	Maintaining the Roadmap	295
	Building an Effective Product Manager/Product Owner Team	295
	Summary	297
<b>Chapter 15</b>	The Agile Release Train	299
	Introduction to the Agile Release Train	300
	Rationale for the Agile Release Train	301
	Principles of the Agile Release Train	303
	Driving Strategic Alignment	304
	Institutionalizing Product Development Flow	305
	Designing the Agile Release Train	308
	Planning the Release	308
	Release Objectives	308
	Tracking and Managing the Release	309
	Release Retrospective	310



Measuring Release Predictability	310
Release Objectives Process Control Band	312
Releasing	313
Releasing on the ART Cadence	313
Releasing Less Frequently Than the ART Cadence	314
Releasing More Frequently Than the ART Cadence	316
Summary	317
<b>Chapter 16</b> Release Planning	319
Preparing for Release Planning	319
Release Planning Domain	320
Planning Attendance	320
Release Planning Facilitator	320
Release Planning Checklist	321
Release Planning Narrative, Day 1	322
Opening	323
Business Context	323
Solution Vision	324
Architecture Vision	324
Team Planning Breakouts	325
Draft Plan Review	327
Managers' Review and Problem Solving Meeting	328
Release Planning Narrative, Day 2	328
Opening	330
Planning Adjustments: A United Front	330
Planning Continues: Team Planning Breakouts Session II	330
Establishing Release Objectives	330
Final Release Plans Review	332
Addressing Risks and Impediments	333
The Commitment	334
Planning Retrospective	335
Final Instructions to Teams	336
Stretch Goals	336
Summary	338
<b>Chapter 17</b> Nonfunctional Requirements	339
Modeling Nonfunctional Requirements	340
Expressing Nonfunctional Requirements as User Stories	342
Exploring Nonfunctional Requirements	342
Usability	343
Reliability	344

---

Performance	345
Supportability (Maintainability)	345
Design Constraints	345
Persisting Nonfunctional Requirements	347
Testing Nonfunctional Requirements	348
Usability	350
Reliability	350
Security	351
Performance	352
Supportability and Design Constraints	352
Template for an NFR Specification	352
Summary	354
<b>Chapter 18</b> Requirements Analysis Toolkit	355
Activity Diagrams	357
Sample Reports	358
Pseudocode	358
Decision Tables and Decision Trees	359
Finite State Machines	361
Message Sequence Diagrams	364
Limitations of MSDs	364
Entity-Relationship Diagrams	365
Use-Case Modeling	366
Summary	366
<b>Chapter 19</b> Use Cases	367
The Problems with User Stories and Backlog Items	368
Five Good Reason to Still Use Use Cases	368
Use Case Basics	369
Use Case Actors	370
Use Case Structure	370
A Step-by-Step Guide to Building the Use Case Model	372
A Use Case Example	375
Applying Use Cases	377
Tips for Applying Use Cases in Agile	378
Use Cases in the Agile Requirements Information Model	378
Summary	379

<b>Part IV</b>	<b>Agile Requirements for the Portfolio</b>	<b>381</b>
<b>Chapter 20</b>	Agile Architecture	383
	Introduction to the Portfolio Level of the Big Picture	383
	Systems Architecture in Enterprise-Class Systems	384
	Does All Architecture Emerge in Agile?	385
	The Need for Intentional Architecture	386
	Business Drivers for Architectural Epics	387
	Role of the System Architect in the Agile Enterprise	388
	Eight Principles of Agile Architecture	390
	Principle #1: The Teams That Code the System Design the System	390
	Principle #2: Build the Simplest Architecture That Can Possibly Work	391
	Principle #3: When in Doubt, Code or Model It Out	392
	Principle #4: They Build It, They Test It	395
	Principle #5: The Bigger the System, the Longer the Runway	395
	Principle #6: System Architecture Is a Role Collaboration	396
	Principle #7: There Is No Monopoly on Innovation	397
	Principle #8: Implement Architectural <i>Flow</i>	399
	Implementing Architectural Epics	399
	Case A: Big, but Incremental; the System Always Runs	400
	Case B: Big, but Not Entirely Incremental; the System Takes an Occasional Break	401
	Case C: Really Big and Not Incremental; the System Runs When Needed; Do No Harm	402
	Splitting Architecture Epics	403
	Summary	405
<b>Chapter 21</b>	Rearchitecting with Flow	407
	Architectural Epic Kanban System	408
	Objectives of the Kanban System	408
	Overview of the Architectural Epic Kanban System	409
	Queue Descriptions	410
	Architecture Epic State Descriptions	411
	1. The Funnel: Problem/Solution Needs Identification	412
	Sources of New Architectural Epics	413
	Activities: Ranking the Epic	414
	Work-in-Process Limits	415
	Decision Authority	415

2. Backlog	415
Activities: Cadence-Based Review, Discussion, and Peer Rating	415
Prioritization and Rating System	417
Weighted Rating and Decision Criteria	417
Pull from Transition to Analysis	418
Work-in-Process Limits	418
3. Analysis	418
Activities	418
Collaboration with Development	419
Collaboration with the Business: Solution Management, Product Management, Business Analysts	420
Work-in-Process Limits	420
Architectural Epic Business Case Template	420
Decision Authority	422
4. Implementation	423
Implementation Path A: Transition to Development	423
Implementation Path B: Create a New Team	424
Implementation Path C: Outsourced Development	425
Implementation Path D: Purchase a Solution	425
Work in Process Limits	426
Summary	427
<b>Chapter 22</b> Moving to Agile Portfolio Management	429
Portfolio Management	429
When Agile Teams Meet the PMO: Two Ships Pass in the Night	431
Legacy Mind-Sets Inhibit Enterprise Agility	432
The Problem Is Not “Theirs”; It Is “Ours”	432
Legacy Mind-Sets in Portfolio Management	433
Eight Recommendations for Moving to Agile Portfolio Management	436
Rethinking Investment Funding	436
Rethinking Change Management	440
Rethinking Governance and Oversight	442
Summary: On to Agile Portfolio Planning	447
<b>Chapter 23</b> Investment Themes, Epics, and Portfolio Planning	449
Investment Themes	450
Communicating Investment Themes	451
Why Investment Mix Rather Than Backlog Priority?	451
Epics	452
Subepics	453

Expressing Epics	453
Discriminating Epics, Features, and Stories	454
Types of Epics	456
Identifying and Prioritizing Business Epics: A Kanban System for Portfolio Planning	456
Overview	457
State Diagram View	458
The Funnel: Problem/Solution Needs Identification	459
Backlog	461
Analysis	463
Implementation	467
Summary	467
<b>Chapter 24</b> Conclusion	469
Further Information	470
<b>Appendix A</b> Context-Free Interview	471
<b>Appendix B</b> Vision Document Template	475
<b>Appendix C</b> Release Planning Readiness Checklist	485
<b>Appendix D</b> Agile Requirements Enterprise Backlog Meta-model	489
<b>Bibliography</b>	<b>491</b>
<b>Index</b>	<b>495</b>

## FOREWORD

---

**W**hy do product development projects miss their economic objectives? Studies show that 80 to 85 percent of project failures are due to incorrect requirements. Experienced developers know that managing requirements is a greater challenge than technical execution. And, although we have known this for decades, we really haven't gotten much better at it. Why? At first, we were functionally organized, so we simply displaced the problem outside the boundary of engineering—we blamed marketing and product management. Later, as we adopted cross-functional teams, we told these teams to listen to the voice of the customer and assumed that this would solve the problem.

It didn't. We never challenged the idea that it was feasible to develop valid requirements up front—we just told people to try harder. We just told them to pay more attention to what the customer was asking for. We ignored the fact that many customers don't know what they want. We ignored that fact that even when they know what they want, they can't describe it. We ignored the fact that even when they can describe it, they often describe a proposed solution rather than the real need. For example, customers told us that they wanted suitcases that were easy to carry, and asked us to make them lightweight. We did this, but they rejected our elegant designs and bought the heavier designs of our competitors—the ones with wheels on them!

The sad truth is that there is no one “voice of the customer.” It is a cacophony of voices asking for different things. Even at a single customer, we need to balance the needs of technical decision makers, end users, system operators, and financial decision makers. All of these actors weigh different attributes differently, and they change their weighting as they acquire more experience using the product. We also need to understand the needs of distributors, regulators, manufacturing, and field service. If we focus only on the user, we could miss what Dean calls the “nonfunctional requirements.”

And this problem is dynamic, not static. In the course of our development effort, the context constantly changes—competitors introduce new products and customer needs evolve. If it is not feasible to develop valid requirements before we begin design, what is our alternative? In my opinion, we should start with the belief that even the best requirements will contain major errors, and that these errors grow exponentially with time. This shifts our focus. Instead of believing that we are hearing a high-fidelity signal coming from the customer, we need to recognize that it is a noisy, low-fidelity signal—a signal that must be continually checked for errors. Rather than using heavy front-end investment to create perfect requirements, we invest in creating processes and infrastructure that can rapidly detect and correct poor fits between our solution and the customer’s evolving needs.

What better test for this alternative approach than the development of large systems? Many of the methods that work superbly on small projects break down on large ones. For example, in small systems, costs and benefits are typically local. System performance does not suffer when a team makes locally optimal decisions. This is not true for large systems where we must deal with economic effects that are dispersed physically, temporally, and organizationally.

We need better approaches to understanding and managing software requirements, and Dean provides them in this book. He draws ideas from three very useful intellectual pools: classical management practices, agile methods, and lean product development. By combining the strengths of these three approaches, he has produced something that works better than any one approach in isolation.

First, although it might be unfashionable to say this, classic management practices still offer us some very useful methods. Not all of our predecessors were stupid dolts, incapable of recognizing a working solution. For decades I have seen relatively simple concepts like technology and product roadmaps producing great results. They ensure that work on technology begins early enough to keep it off the critical path. They create strong logical links between technology efforts and the programs that they serve. We don’t need to blindly accept all traditional practices, but we’d be foolish to discard everything our predecessors already learned. Dean shows you how to apply some of these great ideas at the program and portfolio level.

Second, the agile community has developed a very powerful set of ideas that has already produced impressive results. These methods have grown rapidly for a very good reason—they work. Agile decomposes the large batches of the waterfall model into a series of time-boxed iterations. These smaller batches dramatically accelerate feedback, producing enormous benefits.

Since much of agile's success has occurred in smaller projects, it is natural to ask whether it is equally useful in large systems. While I deeply respect the value of agile methods, I think Dean is correct in recognizing that these methods must be extended to meet the needs of large system development. It is quite risky to assume that large system architectures will naturally emerge and that any shortcomings can be refactored away. For example, a naval warship is designed for a 30-year operating life. Good naval architects anticipate evolving threats, emerging technologies, and changing missions. We do not create such systems by letting architecture "emerge." Once we recognize the unique challenge of managing at the system level, we can start investing in the organizational infrastructure needed to meet this challenge. Dean shows you how to do this with agile method extensions such as architectural runways.

Dean also draws upon the ideas of what I call "second-generation lean product development." Many of the initial attempts to use lean in product development focused on ideas such as standardization of work and variability reduction. They lacked agile's intrinsic appreciation that developing great new solutions requires learning to thrive in the presence of uncertainty. These lean product development methods have now evolved, and the results are impressive. For example, today's "kanban" approaches are limiting WIP, accelerating feedback, and making flow visible to all participants. You can see the influence of these ideas on Dean's approaches at the program and portfolio levels. Dean has also recognized the importance of the new emphasis on economics. This emphasis helps us make better decisions and it enables us to explain our choices to management in terms they readily understand.

As you read this book, I suggest paying attention to several things. First, try to understand the reasons *why* certain of these approaches work, not just *what* they are. If you understand why things work, then you can more easily adapt them to your own unique context. Second, treat these ideas as a portfolio of useful patterns rather than a rigid set of practices that must be adopted as a group. This will reduce the batch size of your adoption process, produce less resistance, and provide faster results. Finally, as you use these ideas, strive for balance. You will have a natural tendency to prefer certain ideas—they address issues you feel are important, and they feel comfortable. You may have given other areas little attention for a long time. Often the areas that have received little attention hold great untapped opportunity.

—Don Reinertsen

*Author of The Principles of Product Development Flow:  
Second Generation Lean Product Development*



*This page intentionally left blank*

# PREFACE

---

## INTRODUCTION TO THE BOOK

In the past decade, the movement to lighter-weight and increasingly agile methods has been the most significant change to affect the software enterprise since the advent of the waterfall model in the 1970s. Originated by a variety of thought and practice leaders and proven in real-world, successful experiments, the methods have proven themselves to deliver outstanding benefits on the “big four” measures: productivity, quality, morale, and time to market.

In the past five years, the methods spread virally. Within the larger enterprise, the initiatives usually started out with individual teams adopting some or all of the practices espoused by the various methods, primarily XP, Scrum, Lean, Kanban (later), and various combinations and variants.

However, as the methods spread to the enterprise level, a number of extensions to the basic agile methods were necessary to address the larger process, organizational, application scope, and governance challenges of the larger enterprise.

Not the least of these is the challenge of agile requirements, which is the necessity to scale the basic, lightweight practices of team agile—product backlogs, user stories, and the like—to the needs of the enterprise’s *Program* and *Portfolio* levels. For example, agile development practices introduced, adopted, and extended the XP-originated “user story” as the primary currency for expressing application requirements. The just-in-time application of the user story provided a much leaner approach and helped eliminate many waterfall-like practices, such as imposing overly detailed and constraining requirements specifications on development teams.

However, as powerful as this innovative concept is, the user story by itself does not provide an adequate, nor sufficiently lean, construct for reasoning about investment,

system-level requirements, and acceptance testing across the larger software enterprise's project Team, Program, and Portfolio organizational levels. That is the purpose of this book.

This book describes an agile requirements artifact model, corresponding practices, suggested roles, and an organizational model that provides a quintessentially lean and agile requirements subset for the agile project teams that write and test the code. Yet this model also scales to the full needs of the largest software enterprise.

## **WHY WRITE THIS BOOK?**

In 2000, after about 25 years of managing software development as an entrepreneur and executive, along with my coauthor Don Widrig, I published my first book: *Managing Software Requirements: A Unified Approach*. In 2003, we updated the book with a second edition: *Managing Software Requirements: A Use Case Approach*. These are considered to be definitive texts on managing application requirements—a lot of copies were sold, and the books have been translated into five languages. More importantly, many individuals, teams, and companies told me that these works helped them achieve better software outcomes. That was always the goal.

In the following years, I turned my attention to agile development methods. I continue to be more and more impressed with the power of these innovative methods, the quality and productivity results they delivered, and the way in which they reenergized and empowered software teams. Though the methods were developed and proven in small team environments, the challenges of building software at scale is a more fascinating puzzle—part science, part art, part engineering, part organizational psychology. As a result, I became engaged in helping a number of larger enterprises in adopting and adapting these methods in projects affecting hundreds—and then thousands—of software practitioners. Fortunately, with some extensions, the methods did scale to the challenge. Based on these experiences, in 2007 I published *Scaling Software Agility: Best Practices for Large Enterprises*, a book designed to help larger enterprises achieve the benefits of agile development.

*Scaling Software Agility* took a broad view of software methods and didn't focus much on software requirements. Even though the management of requirements continued to be a struggle for many agile teams, there were bigger organizational and cultural challenges, as well as a number of emerging agile technical practices, that needed to be addressed.

In the past couple of years, the movement to lean thinking in software development captured my interest, in part because I have some background in lean manufacturing

from earlier days. Generally, lean provides a comprehensive, deeply principled, rigorous, and mathematical framework for reasoning about product development economics and the increasingly important subset, software development.

So, my thinking, along with that of many others, evolved further. Many of us started to see agile development, especially agile at scale, as a “software instance of lean.” In addition, lean scales beyond the software development labs and provides tools to address changes in other departments such as deployment, IT, distribution, and program and portfolio management. Simply put, lean provides a broader framework for organizational change, and it helps us address these larger challenges. I’m a big fan of lean thinking.

At its core, lean focuses on the value stream and provides philosophies, principles, and tools to continually decrease time to market, enhance value delivery, and eliminate waste and delays. As enterprises head down the lean path, it is again beneficial to focus on optimizing the understanding and implementation of software requirements, because they are the unique carriers—or at least the best proxy—for that value stream.

Lean thinking brings us full circle. Once again, it is useful to focus on requirements management practices in our agile—and increasingly lean—software development paradigm. That’s why I wrote this book.

My hope is that the book will help the individual software practitioner, project team, program, and enterprise adopt and adapt agile and lean practices, deliver better solutions to their users and stakeholders, and thereby achieve the personal and business benefits that success engenders. After all, you can never be too rich or too lean.

## **HOW TO READ THIS BOOK**

With this book, I’m hoping to tell a somewhat complex story—how to address the challenge of managing software requirements in an agile enterprise that may employ just a few developers building a single product to those employing hundreds or even thousands of software practitioners building systems of previously unseen complexity—in a practical, straightforward, and understandable manner.

To do so, the book is written in four parts, the last three of which are dedicated to describing specific agile requirement practices at increasing levels of sophistication and scale.

## **Part I, Overview: The Big Picture of Agile Requirements in the Enterprise**

In Part I, we describe an overall process model intended to communicate the “Big Picture” of how to apply agile requirements practices at the project Team, Program, and Portfolio levels.

We provide a brief history of software methods, describing the evolution from water-fall through iterative and incremental development, to agile and lean. We describe the big picture of agile requirements—an organization, requirements, and process model that works for the team and yet scales to the full needs of the enterprise.

We then provide an overview of the model and illustrate how it can be applied in agile requirements for the team, agile requirements for the program, and agile requirements for the portfolio.

*If you need an introduction and orientation to the concepts, terms, and general practices of managing agile requirements, this part is intended to stand alone.*

## **Part II, Agile Requirements for the Team**

In Part II, we describe a simple yet comprehensive model for managing requirements for agile project teams. This portion of the model is designed to be as light-weight as possible, quintessentially agile, and to not encumber the agile teams with any unnecessary complexity and overhead. We introduce the agile team, user stories, stakeholders, users and user personas, iterating, agile estimating and velocity, acceptance testing, the role of the product owner, and, finally, methods for discovering requirements.

*If your teams are using agile, this comprehensive, explanatory guide to applying agile requirements is intended for you.*

## **Part III, Agile Requirements for the Program**

Part III is intended for those involved in building more complex systems that often require the cooperation of a number of agile teams. We expand the picture and introduce additional requirements artifacts, roles, organizational constructs, and effective practices designed for this purpose. We describe Vision, product and system features, the product Roadmap, the role of the product manager, the Agile Release Train, release planning, nonfunctional requirements, techniques for requirements analysis, and use cases.

---

*If you are a developer, tester, manager, team lead, QA, architect, project or program manager, or development director/executive involved in building systems of this scope, this part is intended for you.*

## **Part IV, Agile Requirements for the Portfolio**

In Part IV, we describe the final, *Portfolio* level, of requirements practices. This level is intended to guide enterprises building ever-larger systems of systems, application suites, and product portfolios. These often require the coordination and cooperation of large numbers (20 or 50 or 100 or more) of agile project teams. We introduce additional requirements artifacts, roles, organizational constructs, and practices designed for this purpose. We describe the role that larger-scale, intentional, system-level architectures play in agile development. We introduce a kanban system for reasoning about how to evolve and, when necessary, rearchitect, such systems in an agile manner. We also describe some of the legacy thinking in portfolio and project management and give some suggestions as to what to do about it. We conclude with a chapter describing investment themes, epics, and, finally, one of the ultimate objectives—agile portfolio planning.

*If you are a program manager, development director, system architect, executive, or portfolio manager or planner who is involved in managing investments for a portfolio of products, systems, software services, or IT applications, this part is intended for you.*

*This page intentionally left blank*

# THE BIG PICTURE OF AGILE REQUIREMENTS

*This would all be a lot easier to understand if you could just draw me a picture.*

—Anonymous senior executive

Effectively implementing a new set of lean and agile requirements principles and practices in a project team, program, or enterprise is no small feat. Even the language is different and seemingly odd (user stories, sprints, velocity, story points, epics, backlog?). In addition, further “leaning” the organization often requires eliminating or reducing requirements specifications, design specifications, stage-gated governance models (with incumbent requirements reviews), sign-offs (with incumbent delays...), implementing work-in-process limits (which may seem counterproductive to those who measure “utilization”), and so on. So, there will likely be many challenges.

Even for the fully committed, it can take six months to a year to introduce and implement the basic practices and even more time to achieve the multiples of productivity and quality results that pay the ultimate dividends in customer satisfaction, revenue, or market share. To achieve these benefits, we must change many things, including virtually all of our former requirements management practices. However, many of the existing required artifacts, milestones, and so on, serve as safeguards to “help” avoid the types of project problems that software has often experienced. So, we have a dilemma—how do we practice this new high-wire act without a safety net, when the safety net itself is a big part of the problem?

Fortunately, we are now at the point in time where a number of organizations have made the transition before us and some common patterns for lean and agile software process success have started to emerge. In our discussions with teams, managers, and executives during this transition, we often struggled to find a language for discussion, a set of abstractions, and an appropriate graphic that we could use to quickly describe “what your enterprise would look like and how it would work after such an agile transformation.”

To do so, we need to be able to describe the new software development and delivery process mechanisms, the new teams and organizational units, and some of the roles key individuals play in the new agile paradigm. In addition, any such *Big Picture*



should highlight the requirements practices of the model, because those artifacts are the proxy for the value stream.

Eventually, and with help from others, we arrived at something that worked reasonably well for its purpose.<sup>1</sup> We call it the *Agile Enterprise Big Picture*, and it appears in Figure 2–1.

### THE BIG PICTURE EXPLAINED

In this chapter, we’ll explain the Big Picture in a summary format intended to provide the reader with a quick gestalt of this new, agile, leaner, and yet fully scalable software requirements model.

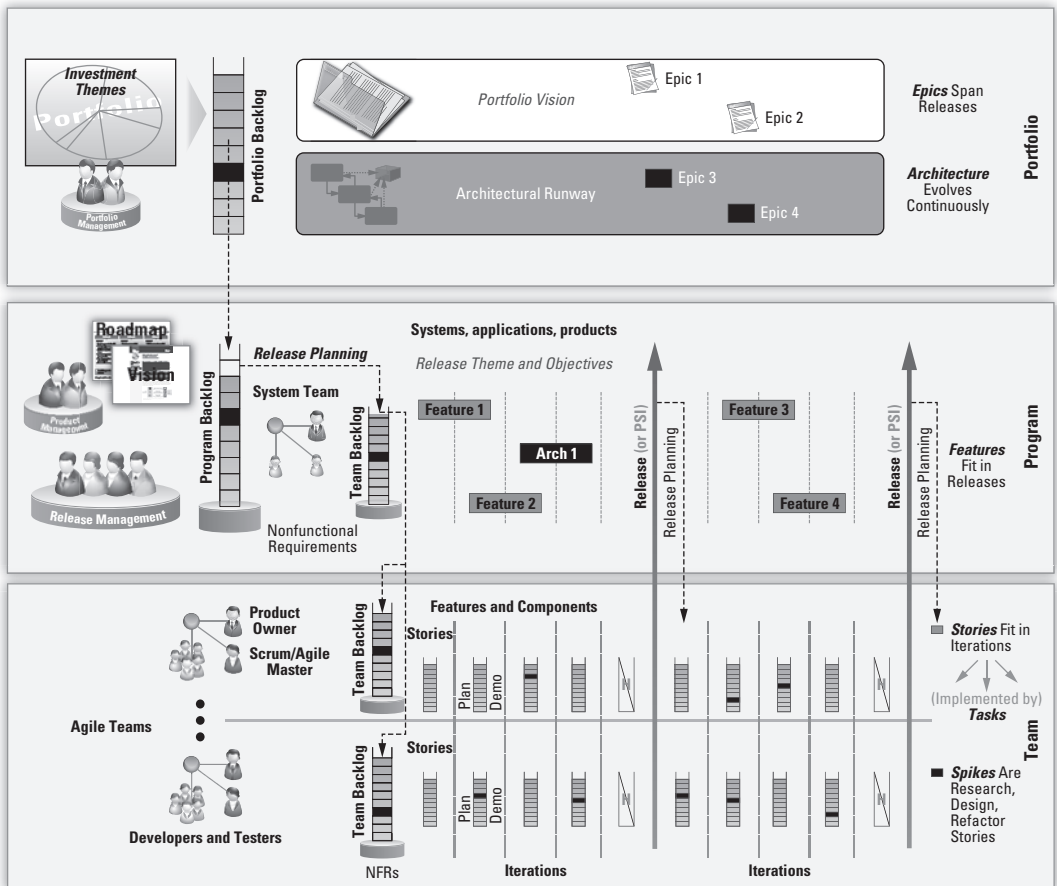


Figure 2–1 The Agile Enterprise Big Picture

1. Special thanks to Matthew Balchin and others at Symbian Software, Ltd., and Juha-Markus Aalto of Nokia Corporation.

In the remaining chapters of Part I of this book, we'll describe the basic big-picture requirements management practices for the individual *Team*, *Program*, and *Portfolio* levels. In Parts II, III, and IV, we'll further elaborate on the requirements management artifacts, roles, and activities at a level of detail suitable for implementation and action.

## Big-Picture Highlights

Because this picture serves as both the organizational and process model for our agile requirements practices, we'll have time throughout this book to explore its many nuances. However, from an overview perspective, the following highlights emerge.

### The Team Level

At the *Team level*, agile teams of  $7 \pm 2$  team members define, build, and test *user stories* in a series of *iterations* and *releases*. In the smallest enterprise, there may be only a few such teams. In larger enterprises, groups, or *pods*, of agile teams work together to support building up larger functionality into complete products, features, architectural components, subsystems, and so on. The responsibility for managing the *backlog* of user stories and other things the team needs to do belongs to the team's *product owner*.

### The Program Level

At the *Program level*, the development of larger-scale systems functionality is accomplished via multiple teams in a synchronized *Agile Release Train* (ART). The ART is a standard cadence of timeboxed iterations and milestones that are date- and quality-fixed, but scope is variable (no iron triangle). The ART produces *releases* or *potentially shippable increments* (PSIs) at frequent, typically fixed, 60- to 120-day time boundaries. These evaluable increments can be released to the customer, or not, depending on the customer's capacity to absorb new product as well as external events that can drive timing.

We'll use the generic *product manager* label as the title for those who are responsible for defining the features of the system at this level, though we'll also see that many other titles can be applied to this role.

### The Portfolio Level

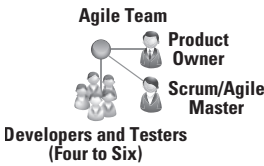
At the *Portfolio level*, we'll talk about a mix of *investment themes* that are used to drive the investment priorities for the enterprise. We'll use that construct to assure that the work being performed is the work necessary for the enterprise to deliver on its chosen business strategy. Investment themes drive the portfolio vision, which will be expressed in as a series of larger, *epic*-scale initiatives, which will be allocated to various release trains over time.

In the rest of this chapter, we'll walk through the various elements of the Big Picture to describe how it works. While we'll highlight the requirements value delivery stream, we'll also expose the rest of the picture including the roles, teams, and processes that are necessary to deliver value. In this way, we'll provide a systemic view of our *lean and agile requirements process that works for teams and yet scales to the full needs of the enterprise*.

## BIG PICTURE: TEAM LEVEL

Figure 2–2 summarizes the Team level of the Big Picture.

### The Agile Team



The “front line” of software development consists of some number of *agile teams* that implement and test code and collaborate on building the larger system. It's appropriate to start with the team, because in agile, the *team is the thing*, because they write and test all the code that delivers value to the end user. Since it's an agile team, each has a maximum of seven to nine members and includes all the roles necessary to define/build/test<sup>2</sup> the software for their *feature or component*. The roles include a Scrum/Agile Master, product owner, and a small team of dedicated developers, testers and (ideally) test automation experts, and maybe a tech lead.

In its daily work, the team is supported by architects, external QA resources, documentation specialists, database specialists, source code management (SCM)/build/infrastructure support personnel, internal IT, and whoever else it takes such that the core team is fully capable of *defining, developing, testing, and delivering working and tested* software into the system baseline.

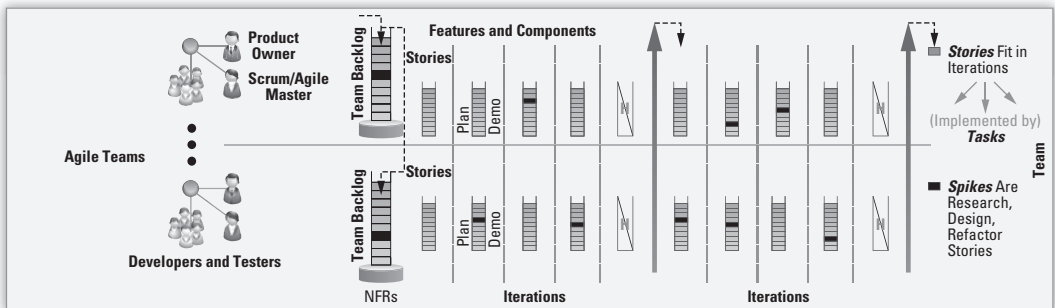


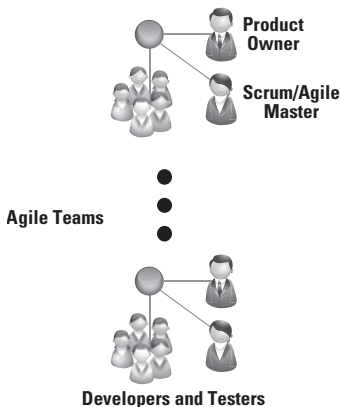
Figure 2–2 Team level of the Big Picture

2. See Chapter 6 of *Scaling Software Agility: Best Practices for Large Enterprises* [Leffingwell 2007].

Since testing software is integral to value delivery (teams get *no* credit for untested code), testers are integral to the team. Often the testers are logically part of the QA organization but are physically assigned and dedicated to an agile team. In this matrix fashion, their primary allegiance is to the team, but as members of the QA organization, they can leverage other QA teammates and managers for skills development, automation expertise, and any specialty testing capabilities that may be necessary at the system level. In any case, it must be clear that the agile team itself is responsible for the quality of their work product and that responsibility cannot be delegated (or abrogated!) to any other organization, in or out of house.

Teams are typically organized to deliver software *features or components*. Most enterprises will have a mix of both types—some *component teams* focused on shared infrastructure, subsystems, and persistent, service-oriented architectural components and some *feature teams* focused on vertical, user-facing, value-delivery initiatives. Agile teams are self-organizing and reorganize when necessary based on the work in the program backlog. Over time, the makeup of the teams themselves is more dynamic than static—static enough to “norm, storm, and perform”<sup>3</sup> for reasonable periods of time and dynamic enough to flex to the organization’s changing priorities.

### Pods of Agile Teams



In addition, within the larger enterprise, there are typically some number (three to ten) or so of such teams that cooperate to build a larger feature, system, or subsystem (the *program* domain in the Big Picture). Although this isn’t a hard or fast rule, experience has shown that even for *very* large systems, the logical partitions defined by system or product family architecture tend to cause “pods” of developers to be organized around the various implementation domains. This implies that perhaps 50 to 100 people must intensely collaborate on building their “next bigger thing” in the hierarchy, which we’ll call a *program*. As we’ll discover later, this is also about the maximum size for face-to-face, collaborative *release planning*.

Of course, even that’s an oversimplification for a really large system, because there are likely to be a number of such *programs*, each contributing to the *portfolio* (product portfolio, application suite, systems of system).

3. See the Forming–Storming–Norming–Performing model of group development proposed by Bruce Tuckman at <http://en.wikipedia.org/wiki/Forming-storming-norming-performing>.

## Roles in the Agile Team

### Product Owner



Product Owner

As we have described, Scrum is the dominant agile method in use, and the product owner role is uniquely, if arbitrarily, defined therein. In Scrum, the product owner is responsible for determining and prioritizing user requirements and maintaining the product backlog. Moreover, even if a team is not using Scrum, it has been our experience that implementing the product owner role—as largely defined by Scrum—can deliver a real breakthrough in simplifying the team’s work and organizing the entire team around a single, prioritized backlog.

But the product owner’s responsibilities don’t end there. In support of Agile Manifesto principle #4—*Business people and developers must work together daily throughout the project*—the product owner is ideally co-located with the team and participates *daily* with the team and its activities.

### Scrum/Agile Master

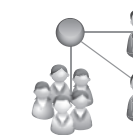


Scrum/Agile Master

For teams implementing Scrum, the Scrum Master is an important (though sometimes transitional<sup>4</sup>) role. The Scrum Master is the team-based management/leadership proxy whose role is to assist the team in its transition to the new method and continuously facilitate a team dynamic intended to maximize performance of the team.

In teams that do not adopt Scrum, a comparable leadership role typically falls to a team lead, an internal or external coach, or the team’s line manager. As their skills develop, many of these *Agile Masters* become future leaders by illustrating their ability to deliver user value and by driving continuously improving agile practices.

### Developers and Testers



Developers and Testers  
(Four to Six)

The rest of the core team includes the developers and testers who write and test the code. Since this is an agile team, the team size is typically limited to about three to four developers plus one to two testers, who are (ideally) co-located and work together to *define, build, test, and deliver* stories into the code baseline.

## Iterations

In agile development, new functionality is built in short timeboxed events called *iterations* (*sprints* in Scrum). In larger enterprises, agile teams typically adopt a

4. As the teams master the agile process, the role becomes less critical. Some very agile teams, even those who have adopted Scrum, no longer have a Scrum Master per se. Everybody knows the rules, and they are self-enforced.

standard iteration length and share start and stop boundaries so that code maturity is comparable at each iteration-boundary system integration point.

Each iteration represents a valuable increment of new functionality, accomplished via a constantly repeating standard pattern: *plan the iteration, build and test stories, demonstrate the new functionality to stakeholders, inspect and adapt, repeat.*

The iteration is the “heartbeat of agility” for the team, and teams are almost entirely focused on developing new functionality in these short timeboxes. In the Big Picture, the iteration lengths for all teams are the same since that is the simplest organizational and management model. Although there is no mandated length, most have converged on a recommended length of *two weeks*.

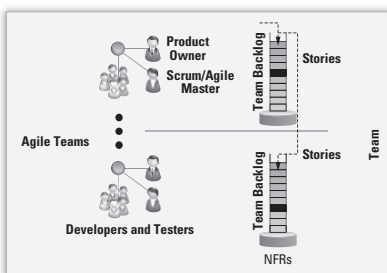
### Number of Iterations per “Release”

A series of iterations is used to aggregate larger, system-wide, functionality for release (or potential release) to the external users. In the Big Picture, we’ve illustrated four *development* iterations (indicated by a full iteration backlog) followed by one *hardening* (or stabilization) iteration (indicated by an empty backlog) prior to each release increment.

This pattern is arbitrary, and there is no fixed rule for how many times a team iterates prior to a *potentially shippable increment* (PSI). Many teams apply this model with four to five development iterations and one hardening iteration per release, creating a cadence of a potentially shippable increment about every 90 days. This is a fairly natural production rhythm that corresponds to a reasonable external release frequency for customers, and it also provides a nice quarterly planning cadence for the enterprise itself.

In any case, the length and number of iterations per release increment, and the decision as to when to actually release an increment, are left to the judgment of the enterprise.

### User Stories and the Team Backlog



*User stories* (*stories* for short) are the general-purpose agile substitute for what traditionally has been referred to as *software requirements* (the stuff in the middle of the iron triangle of Chapter 1).

Originally developed within the constructs of XP, user stories are now endemic to agile development in general and are typically taught in Scrum, XP, and most other agile implementations. In agile, *user stories are the primary objects that carry the customer’s requirements through the value stream—from needs analysis through code and implementation.*

As opposed to requirements (which by common definition represent something the system *must* do to fulfill a business need or contractual obligation), user stories are *brief statements of intent* that describe something the system *needs* to do for some *user*. As commonly taught, the user story often takes a standard user-voice form of the following:

As a <user role>, I can <activity> so that <business value>.

With this form, the team learns to focus on both the user's role and the business benefit that the new functionality provides. This construct is integral to agile's intense focus on value delivery.

### **Team Backlog**

The team's backlog (typically called a *project* or *product* backlog) consists of all the user stories the team has identified for implementation. Each team has its own backlog, which is maintained and prioritized by the team's product owner. Although there may be other things in the team's backlog as well—defects, refactors, infrastructure work, and so on—the yet-to-be-implemented user stories are the primary focus of the team.

Identifying, maintaining, prioritizing, scheduling, elaborating, implementing, testing, and accepting user stories is the primary requirements management process at work in the agile enterprise.

Therefore, we will spend much of the rest of this book further describing processes and practices around user stories.

### **Tasks**

For more detailed tracking of the activities involved in delivering stories, teams typically decompose stories into *tasks* that must be accomplished by individual team members in order to complete the story. Indeed, some agile training uses the task object as the basic estimating and tracking metaphor.

However, the iteration tracking focus should be at the story level, because this keeps the team focused on business value, rather than individual tasks. Tasks provide a micro-work breakdown structure that teams can use (or not) to facilitate coordinating, estimating, tracking status, and assigning individual responsibilities to help assure completion of the stories—and thereby—the iteration.

## **BIG PICTURE: PROGRAM LEVEL**

Figure 2–3 summarizes the Program level of the Big Picture.

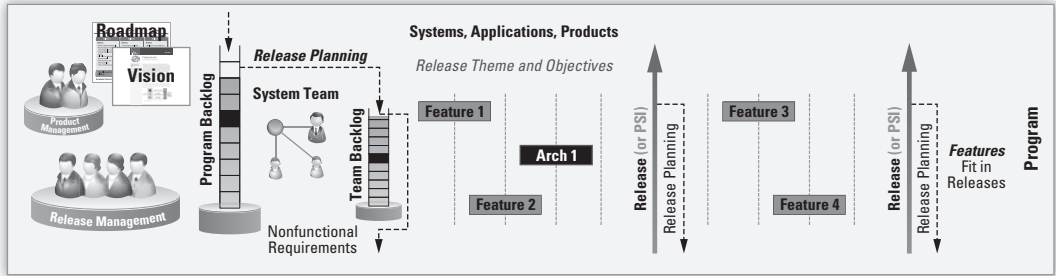
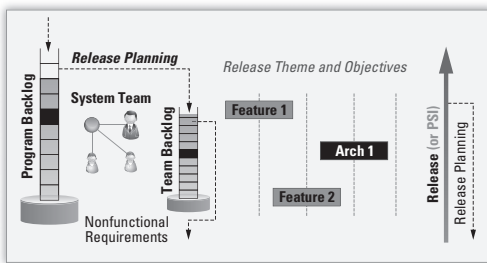


Figure 2-3 The Program level of the Big Picture

Here, we find additional organizational constructs, roles, processes, and requirements artifacts suited for building larger-scale systems, applications, products, and suites of products.

## Releases and Potentially Shippable Increments



Although the goal of every iteration is to produce a shippable increment of software, teams (especially larger-scale enterprise teams) find that it may simply not be practical or appropriate to ship an increment at each iteration boundary. For example, during the course of a series of iterations, the team may accumulate some *technical debt* that needs to be addressed before shipment. Technical debt may include things such as defects to be resolved, minor code refactoring,

deferred system-wide testing for performance, reliability, or standards compliance, or finalization of user documentation. *Hardening iterations* (indicated by an iteration with an empty backlog) are included in the Big Picture to provide the time necessary for these additional activities.

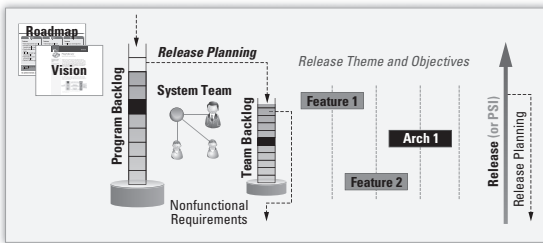
Moreover, there are legitimate business reasons why not every increment should be shipped to the customer. These include the following:

- Potential interference with a customer's licensing and service agreements
- Potential for customer overhead and business disruption for installation, user training, and so on
- Potential for disrupting customer's existing operations with minor regressions or defects



For these and other reasons, most programs aggregate a series of iterations into a potentially shippable increment, which can be released, or not, based on the then-current business context.

## Vision, Features, and the Program Backlog



Within the enterprise, the product management (or possibly program management or business analyst) function is primarily responsible for maintaining the Vision of the products, systems, or application in their domain of influence.

The Vision answers the big questions for the system, application, or product, including the following.

- What problem does this particular solution solve?
- What features and benefits does it provide?
- For whom does it provide it?
- What performance, reliability, and so on, does it deliver?
- What platforms, standards, applications, and so on, will it support?

### The Primary Content of the Vision Is a Set of Features

A Vision may be maintained in a document, in a backlog repository, or even in a simple briefing or presentation form. But no matter the form, the prime content of the Vision document is a prioritized set of *features* intended to deliver *benefits* to the users.

### Nonfunctional Requirements

In addition, the Vision must also contain the various nonfunctional requirements, such as reliability, accuracy, performance, quality, compatibility standards, and so on, that are necessary for the system to meet its objectives.

### Undelivered Features Fill the Program Backlog

In a manner similar to the team's backlog, which contains primarily *stories*, the program (or *release*) backlog contains the set of desired and prioritized *features* that have not yet been implemented. The program backlog may or may not also contain

estimates for the features. However, any estimates at this scale are coarse-grained and imprecise, which prevents any temptation to over-invest in inventory of too-early feature elaboration and estimation.

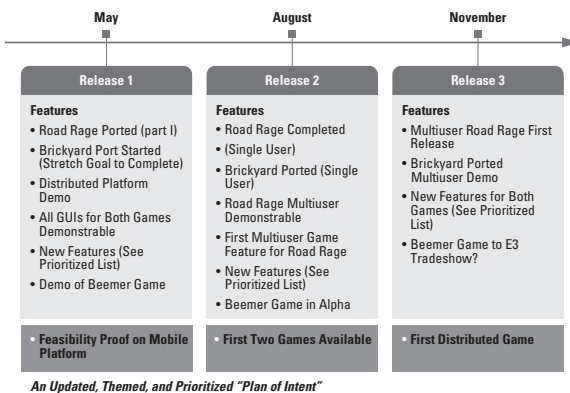
## Release Planning

In accordance with emerging agile enterprise practices, each release increment timebox has a kickoff release planning session that the enterprise uses to set the company context and to align the teams to common business objectives for the release. The input to the release planning session is the current Vision, along with a set of objectives and a desired, prioritized feature set for the upcoming release.

By breaking the features into stories and applying the agreed-to iteration cadence and knowledge of their velocity, the teams plan the release, typically in a group setting. During this process, the teams work out their interdependencies and design the release by laying stories into the iterations available within the PSI timebox. They also negotiate scope trade-offs with product management, using the physics of their known velocity and estimates for the new stories to determine what can and can't be done. In addition to the plan itself, another primary result of this process is a commitment to a set of release objectives, along with a prioritized feature set.

Thereafter, the teams endeavor to meet their commitment by satisfying the primary objectives of the release, even if it turns out that not every feature makes the deadline.

## The Roadmap

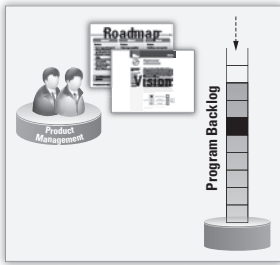


The results of release planning are used to update the (product or solution) *Roadmap*, which provides a sense of how the enterprise hopes to deliver increasing value over time.

The Roadmap consists of a series of planned release dates, each of which has a theme, a set of objectives, and a prioritized feature set. The “next” release on the Roadmap is *committed to the enterprise*, based on the work done in the most recent release planning session. Releases beyond the next one are not committed, and their scope is fuzzy at best.

The Roadmap, then, represents the enterprise’s current “plan of intent” for the next and future releases. However, it is subject to change—as development facts, business priorities, and customers need change—and therefore release plans beyond the next release should not generally be used to create any external commitments.

## Product Management



In agile, there can be a challenge with the apparently overlapping responsibilities of the *product manager* and the product owner. For example, in Scrum, the product owner is responsible for the following:

representing the interests of everyone with a stake in the resulting project . . . achieves initial and ongoing funding by creating the initial requirements, return on investment objectives, and release plans.<sup>5</sup>

In some smaller organizational contexts, that definition works adequately, and one or two product owners are all that are needed to define and prioritize software requirements. However, in the larger software enterprise, the set of responsibilities imbued in the Scrum product owner is more typically a much broader set of responsibilities shared between team and technology-based product owners and market or program-based *product managers*, who carry out their traditional responsibilities of both defining the product *and* presenting the solution to the marketplace.

However, we also note that the title of the person who plays this role may vary by industry segment, as shown in Table 2–1.

### Responsibilities of the Agile Product Manager in the Enterprise

No matter the title (we’ll continue to use *product manager* generically), when an agile transition is afoot, the person playing that role must fulfill the following primary responsibilities:

- Own the Vision and program (release) backlog
- Manage release content
- Maintain the product Roadmap
- Build an effective product manager/product owner team

5. [Schwaber 2007]

**Table 2–1** Product Manager Role May Have Different Titles

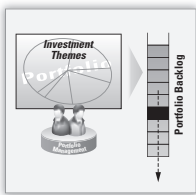
Industry Segment	Common Title for the Role
Information systems/information technology (IS/IT)	Business owner, business analyst, project or program manager
Embedded systems	Product, project, or program manager
Independent software vendor	Product manager

## BIG-PICTURE ELEMENTS: PORTFOLIO LEVEL

Figure 2–4 summarizes the Portfolio level of the Big Picture.

At the top of the Big Picture, we find the portfolio management function, which includes those individuals, teams, and organizations dedicated to managing the investments of the enterprise in accordance with the enterprise business strategy. We also find two new artifact types, *investment themes* and *epics*, which together create the *portfolio vision*.

### Investment Themes

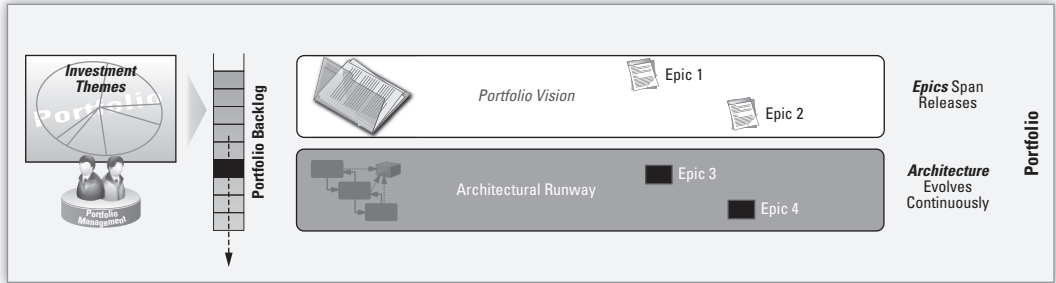


A set of *investment themes* establishes the relative investment objectives for the enterprise or business unit. These themes drive the vision for all programs, and new epics are derived from these themes. The derivation of these decisions is the responsibility of the portfolio managers, either line-of-business owners, product councils, or others who have fiduciary responsibilities to their stakeholders.

The result of the decision process is a set of themes—*key product value propositions that provide marketplace differentiation and competitive advantage*. Themes have a much longer life span than epics, and a set of themes may be largely unchanged for up to a year or more.

### Epics and the Portfolio Backlog

Epics represent the highest-level expression of a customer need. Epics are development initiatives that are intended to deliver the value of an investment theme and are identified, prioritized, estimated, and maintained in the *portfolio backlog*. Prior to release planning, epics are decomposed into specific features, which in turn are converted into more detailed stories for implementation.



**Figure 2-4** Portfolio level of the Big Picture

Epics may be expressed in bullet form, in user-voice story form, as a sentence or two, in video, in a prototype, or indeed in *any form* of expression suitable to express the intent of the product initiative. With epics, clearly, the objective is *strategic intent, not specificity*. In other words, the epic need only be described in detail sufficient to *initiate a further discussion* about what types of features an epic implies.

## Architectural Runway



In Chapter 1, we described how design (architecture) and requirements are simply two sides of the same coin—the “what” and the “how.” In this book, we’ll have time

to explore this topic in more detail, and we’ll provide some discriminators that help us think about the differences in architecture and requirements, as well as the commonalities. However, even though this book focuses on requirements, we can’t ignore architecture, because experience tells us that teams that build some amount of *architectural runway*, which is the ability to implement new features without excessive refactoring, will eventually emerge as the winners in the marketplace. So, any effective treatment of agile requirements must address the topic of architecture as well.

Therefore, system architecture is a first-class citizen of the Big Picture and is a routine portfolio investment consideration for the agile enterprise.

## **SUMMARY**

In this chapter, we introduced the Big Picture as the basic requirements artifact, process, and organizational model for managing software requirements in a lean and agile manner. For agile teams, the model uses the minimum number of artifacts, roles, and practices that are necessary for a team to be effective. However, the model expands as needed to the Program and Portfolio levels, in each case providing the leanest possible approach to managing software requirements, even as teams of teams build larger and larger systems of systems. In the next few chapters, we'll elaborate on each of these levels.

*This page intentionally left blank*

# INDEX

- A**
- Acceptable spikes, 115
- Acceptance criteria for user stories, 104–105
- Acceptance Test-Driven Development (ATDD), 173, 190–191
- Acceptance tests, 183
  - automated, 193–195
  - characteristics, 188–190
  - checklist, 192–193
  - component testing, 198
  - defining, 187
  - features, 77, 187
  - importance, 183–184
  - overview, 184–187
  - story, 187–190
  - teams for, 58–59
  - test-driven development, 190–191
  - tester responsibilities, 53
  - unit testing, 196–198
  - and user stories, 103
- Accepted risk category in release planning, 334
- Accuracy
  - estimate predictions, 136
  - in reliability, 344
  - in usability, 350
- Achievability in SMART acronym, 163
- Activities
  - in kanban system analysis, 463
  - RUP, 11
  - system stakeholder, 125
  - in user stories, 104
- Activity diagrams, 357
- Actors in use cases, 370–371, 373–374
- Adaptive processes, 12
  - Agile Manifesto, 12–14
  - enterprise-scale, 19
  - Extreme Programming, 14–15
  - requirements management, 16–19
  - Scrum, 15
- Agenda for requirements workshops, 231
- Aggregate behavior in use case modeling, 247
- Agile Estimating and Planning* (Cohn), 138, 262
- Agile Manifesto, 12–14, 23–24, 80–81
- Agile Masters, 36
- Agile Product Management with Scrum* (Pichler), 204
- Agile Release Train (ART), 33, 80–82, 299
  - decentralized rolling-wave planning, 445–446
  - designing, 308
  - introduction, 300–301
  - principles, 303–304
  - product development flow, 305–307
  - rationale, 301–303
  - releases, 290–291
    - frequency, 313–317
    - planning, 308–309
    - predictability, 310–313
    - retrospective, 310
    - tracking and managing, 309–310
    - strategic alignment, 304–305
- Agile Testing* (Crispin and Gregory), 185–186
- Agility
  - and legacy mind-sets, 432
  - Little’s law for, 172–175
- Alignment in Agile Release Train, 304–305
- Alternate flows in use cases, 375



- Alternate scenarios in use cases, 368, 371
  - Alternatives and Competition section in vision documents, 479
  - Amazon Architecture, 392–393
  - Analysis
    - kanban system, 411, 463–466
    - rearchitecting with flow, 418–422
    - requirements. *See* Requirements analysis
  - Analyst’s Summary for interviews, 240
  - Anderson, David, 179–180
  - Andres, Cynthia, 14
  - Annual funding, 440–441
  - Annual planning, 445–447
  - Applicable Standards section in vision documents, 482
  - Application standards, 346
  - Architects
    - kanban system analysis, 464
    - responsibilities, 54
    - system, 388–390
  - Architectural epics, 88–89, 384
    - analysis, 418–422
    - backlog, 415–418
    - business case templates, 420–421
    - business drivers for, 387–388
    - implementing, 89–90, 423–426
    - Kanban system objectives, 408–409
    - overview, 409–410
    - queue descriptions, 410–411
    - ranking, 414–415
    - sources, 413–414
    - splitting, 403–405
    - state descriptions, 411–412
    - systems architecture, 399–403
  - Architectural flow, 384, 399
  - Architectural governance, 386, 388
  - Architectural runways, 44, 88–91, 383, 395–396
  - Architectural work in process (AWIP), 408–409
  - Architecture
    - architectural flow principle, 399
    - architectural runway principle, 395–396
    - coding and modeling principle, 392–394
    - emergence of, 385–386
    - innovation principle, 397–399
    - portfolio level, 383–384
    - principles overview, 390
    - role collaboration principle, 396–397
    - simplicity principle, 391–392
    - splitting architecture epics, 403–405
    - systems, 384–390
    - team coding principle, 390–391
    - testing principle, 395
    - vision for, 324
  - ART. *See* Agile Release Train (ART)
  - Assessing release status, 287, 289
  - Assumptions and Dependencies section in vision documents, 481
  - ATDD (Acceptance Test-Driven Development), 173, 190–191
  - Attendance for release planning, 320
  - Attitudes of product managers, 280–283
  - Attributes of product owners, 218–220
  - Automated tests, 186, 193–195
  - Availability issues in reliability, 344
  - AWIP (architectural work in process), 408–409
- B**
- Backlogs, 33, 43, 383
    - benefits, 169–170
    - blog story, 170–171
    - as business drivers, 387
    - changing and eliminating, 178
    - epics, 85–87, 453, 461–463
    - features, 76, 255
    - investment themes in, 451–452
    - in iteration, 157–158, 169
    - kanban system, 411, 415–418, 461–463
    - Little’s law in, 171–175
    - meta-model, 489
    - nonfunctional requirements, 78–79, 341, 348
    - prioritizing, 209–211
    - problems with, 368
    - product development flow, 306

- product managers for, 289–290
  - product owners for, 208–211
  - program level, 40–41
  - reader reactions to, 176–177
  - rearchitecting with flow, 415–418
  - and throughput, 177
  - user stories in, 38, 55–56
- Baker, Steven, 432
- Balchin, Mathew, 224
- Bartleman, John, 222
- Basic features in Kano model, 270
- Basic flows in use cases, 371, 375
- Batch sizes
  - lean software, 26
  - Little's law, 109
  - product development flow, 306
  - user stories, 110–111
- Beck, Kent
  - simplicity, 392
  - TDD, 190
  - XP, 14, 100
- Beedle, Mike, 221
- Berra, Yogi, 47
- Best practices and standards, 346
- Beyond Budgeting: How Managers Can Break Free from the Annual Performance Trap*, 450
- Bias in interviews, 238
- Bibliography, 491–494
- Big, up-front design (BUFD) requirements, 11
- Big Picture, 31–32
  - highlights, 33–34
  - overview, 32–33
  - portfolio level, 43–44
  - program level, 38–43
  - team level, 34–38
- Big visible information radiator (BVIR), 164–165
- Black, Keith, 69, 222
- Black-box testing, 351–352
- Boehm, Barry, 10
- Bottom-up, team-based estimating, 259
- Brainstorming
  - idea generation, 233–234
  - idea prioritization, 236–237
  - idea reduction, 235–236
  - online, 237
  - requirements discovery, 232–237
- Breakouts in team planning, 325–327, 330
- Breaks in system building, 401–402
- Broad brushstroke iteration approach, 160–161
- Budgeting in investment themes, 450–451
- BUFD (big, up-front design) requirements, 11
- Build step in define/build/test sequence, 49
- Burndown charts
  - in iteration, 164
  - release, 309
  - task hours, 162
- Business Analysis Planning and Monitoring
  - knowledge area, product manager responsibilities in, 278
- Business analysts. *See also* Product managers
  - rearchitecting with flow analysis, 420
  - responsibilities, 201, 203, 276
- Business cases
  - epics, 464–466
  - investment funding, 438
  - kanban system rearchitecting with flow analysis, 420–421
  - in vision, 253
- Business context in release planning, 323–324
- Business drivers for architectural epics, 387–388
- Business epics, 89, 449–450, 452–453
  - backlog, 461–463
  - business case templates, 464–466
  - expressing, 453–454
  - vs. features and stories, 454–456
  - identifying and prioritizing, 456–467
  - kanban system, 456
  - ranking, 460
  - sources, 459–460
  - subepics, 453
  - types, 456

- Business-facing tests, 185
  - Business plans in investment funding, 438
  - Business rules in user story splitting
    - pattern, 112
  - Business sense of product owners, 219
  - Business systems analysts, 206
  - Business team collaboration for rearchitecting
    - with flow analysis, 420
  - Business value
    - in backlog ratings, 417, 462
    - of estimates, 137
    - for release objectives, 331–332
  - BVIR (big visible information radiator), 164–165
- C**
- Cadence
    - description, 26
    - product development flow, 307
  - Cadence-based reviews, 415–416, 461–463
  - Cadence calendars in iteration, 168
  - Calendars in iteration, 168, 215–216
  - Capacity in performance, 345
  - Cards
    - acceptance tests, 58–59
    - user stories, 102–103, 116–117, 211
  - Cargill, Tom, 339
  - Case studies. *See* Tendril case study
  - Centralized annual planning, 445–447
  - Centralized development in user experience, 131–132
  - Change management
    - portfolio management, 430
    - product managers for, 286
    - in requirements discovery, 245–246
    - rethinking, 440–442
  - Changing requirements, 16
  - Chaos report survey, 6
  - Chapman, Chris, 224
  - Chief engineer role in iteration, 161
  - Cho, Fuijo, 155
  - Classes of service
    - investment themes, 452
    - kanban system, 180
  - Classifying system stakeholders, 125
  - Clean Code: A Handbook of Agile Software Craftsmanship* (Martin), 346
  - Cleland-Huang, Jane, 262
  - Co-development and Alliances knowledge area, product manager responsibilities in, 277
  - Co-location of teams, 71
  - Co-planning releases, 217–218
  - Cockburn, Alistair, 367–369
  - CoD. *See* Cost of Delay (CoD)
  - Code
    - in architecture principles, 392–394
    - developer responsibilities, 52
    - team, 390–391
  - Cohn, Mike
    - Agile Estimating and Planning*, 138, 262
    - product owners, 219, 221
    - Scrum guidance, 205
    - Succeeding with Agile: Software Development Using Scrum*, 219
    - User Stories Applied*, 100, 103
  - Collaboration
    - kanban system analysis, 464
    - product owners, 220, 296–297
    - rearchitecting with flow analysis, 419–420
    - role collaboration principle, 396–397
  - Collective team judgment, 141
  - Collins, James, 449
  - Commercialization phase, product manager responsibilities in, 277
  - Commitment
    - estimates, 137
    - iteration, 159–163, 214
    - in release planning, 273, 292–293, 334–335
  - Common infrastructure as business driver, 388
  - Common usage model, 413

- Communication
    - investment themes, 451
    - product owner skills for, 219
    - with product owners, 294
    - for requirements analysis, 355–356
    - user stories for, 101
    - vision, 289
  - Competitive analysis
    - in requirements discovery, 244–245
    - in vision documents, 479
  - Complexity
    - story points, 138
    - in user stories, 110, 112
  - Component teams, 35, 65–66, 68–71
  - Component tests, 186, 198
  - Compound stories, 111–114
  - Conditions of satisfaction in user stories, 103
  - Confidence for releases, 273
  - Confirmation
    - acceptance tests, 59
    - user stories, 103, 211
  - Constraints
    - backlog. *See* Backlogs
    - nonfunctional requirements, 340–341, 345–347
    - WIP, 26
  - Construction phase in RUP, 11
  - Context
    - in release planning, 323–324
    - use cases for, 367
  - Context diagrams, 95
  - Context-free interviews, 238, 471–474
  - Continuous content delivery, 441–442
  - Continuous improvement, 24
  - Continuous integration, 72
  - Conversation
    - acceptance tests, 58
    - user stories, 103, 211
  - Cooper, Alan, 127
  - Cooper, James, 409
  - Corporate best practices and standards, 346
  - Cost and Pricing section in vision
    - documents, 481
  - Cost of Delay (CoD)
    - backlog ratings, 417
    - estimating, 266–267
    - introduction, 263–266
    - kanban system, 411
    - lean software, 25
  - Costs
    - as business driver, 388
    - business epic savings, 459
    - estimates, 137, 149, 259
    - predicting, 311
    - and queue size, 175
    - and velocity, 148
  - Costs per story point, 259
  - Cottmeyer, Mike, 69
  - Cranky Product Manager, 205
  - Crispin, Lisa, 183, 185–186, 192
  - Criteria for user stories, 104–105
  - Critical category in idea prioritization, 236–237
  - Critiquing products, acceptance tests for, 185
  - CSG Systems, 223
  - Cumulative voting in idea prioritization, 236
  - Cunningham, Ward, 119, 194, 391
  - Customer & Market Research knowledge area,
    - product manager responsibilities in, 277
  - Customer change request systems, 245–246
  - Customer needs, product managers for, 284
  - Customer satisfaction
    - Kano model of, 269–271
    - in requirements management, 16
- D**
- Daily stand-ups, 165
  - Data entry in user stories, 113
  - Data sheet approach for vision, 253–254
  - Data variations in user stories, 112
  - Data view in UML, 394
  - Dates, release, 271, 311

- Davis, Alan M., 361–362
- Dealing with Darwin* (Moore), 3
- Debt in iteration, 216–217
- Decentralized control, 27, 307
- Decentralized rolling-wave planning, 445–447
- Decision authority
  - business epics, 461
  - funnel queues, 415
  - kanban system analysis, 466
  - rearchitecting with flow analysis, 422
- Decision criteria in backlog ratings, 417, 462
- Decision-making workshops, 232
- Decision tables and decision trees, 359–361
- Decisiveness of product owners, 219
- Decreased complexity in user stories, 110
- Defect logs in requirements discovery, 246
- Defects
  - backlogs for, 208
  - in reliability, 344
- Define/build/test sequence, 49
- Defining features, 235–236
- Degradation modes in performance, 345
- Delay cost
  - backlog ratings, 417
  - estimating, 266–267
  - introduction, 263–266
  - kanban system, 411
  - lean software, 25
- Delighters in Kano model, 270
- Delivering releases, 293
- Deming, W. Edwards
  - process descriptions, 1
  - quotas, 97
  - system aim, 381
  - system contributions, 249
  - systems, 27
- Demonstrable spikes, 115
- Demonstration in iteration, 167
- Denne, Mark, 262
- Dependencies in user stories, 106, 110–111
- Deployment, program level, 64
- Deployment view in UML, 394
- Descriptions in use cases, 371
- Design constraints
  - nonfunctional requirements, 340, 345–347
  - testing, 352
- Detail in user stories, 104
- Developer-customer communication gap,
  - user stories for, 101
- Developer role and responsibilities, 36, 52
- Development
  - constraints on, 346
  - infrastructure building, 72–73
  - iterations, 37, 300
  - kanban system analysis, 464
  - product manager responsibilities, 276–277
  - releases, 314–316
- Development management needs, 124
- Development team
  - iteration planning meeting preparation
  - responsibilities, 159
  - rearchitecting with flow analysis, 419
- Development time estimates, 260
- Development WIP, 409
- Differential value in optimization, 269–271
- Discount Tire, 224
- Discovery-based models, 9, 11
- Discovery phase, product manager
  - responsibilities in, 276
- Disillusionment phases of product managers,
  - 280–283
- Disruptive technology for architectural epics, 413
- Distributed but governed user experience,
  - 131–133
- Distributed teams for iteration plans, 163
- Do no harm refactoring approach, 89
- Documentation Requirements section in vision documents, 483
- Documenting requirements, product managers for, 284
- Domains in release planning, 320
- Draft plan reviews for release planning,
  - 327–328

Drivers for architectural epics, 387–388  
Duplicate investment and architectural epics, 413  
Duplication of effort as business driver, 388

## E

Eclipse foundation, 11  
Economic view in product development flow, 25, 305  
Effort estimates, 258–259  
Elaboration phase in RUP, 11  
Elicitation knowledge area, product manager responsibilities in, 278  
Emotional response in usability, 350  
Energy independence case study. *See* Tendril case study  
Enterprise Analysis knowledge area, product manager responsibilities in, 279  
Enterprise-class systems, systems architecture in, 384–390  
Enterprise-scale adaptive processes, 19  
Entity-relationship diagrams (ERDs), 365  
Epics  
  architectural. *See* Architectural epics  
  business. *See* Business epics  
  and portfolio backlogs, 43, 85–87  
ERDs (entity-relationship diagrams), 365  
“Establishing an Agile Portfolio to Align IT Investments with Business Needs” (Baker), 432  
Estimable spikes, 115  
Estimating  
  business value of, 137  
  cautions, 144, 147  
  cost, 137, 149, 259  
  Cost of Delay, 266–267  
  development time, 260  
  effort, 258–259  
  features, 257–260  
  goals of, 136–137  
  hybrid models, 151–152

  with ideal developer days, 149–151  
  introduction, 135–136  
  in INVEST model, 108–109  
  investment funding, 439–440  
  with planning poker, 139–142, 144–145  
  relative, 138–139, 145–147, 258  
  schedules, 149  
  story points for, 138, 259  
  tabletop relative, 145–146  
  time devoted to, 142–144  
  velocity, 146–149  
Exception conditions in use cases, 375  
Exciters in Kano model, 270  
Execute phase in iteration, 157  
Executing iteration, 164, 214–215  
Executive stakeholders in kanban system analysis, 464  
Exemplary Use Cases section in vision documents, 482  
Existing product offerings, investment in, 85  
Exit conditions in use cases, 372, 375  
Expectations of system stakeholders, 125  
Expedite service class in kanban system, 180  
*Exploring Requirements: Quality Before Design* (Gause and Weinberg), 238  
Exponential effect on Lambda, 174  
External releases, 300  
Extreme Programming (XP), 14–15, 100

## F

Facilitation by product owners, 121  
Facilitators  
  release planning, 320–321  
  requirements workshops, 230–231  
Fact-based governance, 444–445  
False sense of security phase, product manager attitude in, 281  
Fawcett, Jennifer, 220, 296  
Feature prioritization evaluation matrix, 267–268  
Feature sets in planned release dates, 271

## Features

- acceptance tests, 77, 187
- vs. epics and stories, 454–456
- estimating, 257–260
- in iteration, 169
- overview, 255–257
- portfolio level, 87
- prioritizing, 261–271
- program level, 40–41
- teams, 34–35, 66–71, 75–77
- testing, 77, 260–261
- voice, 257

Feedback in product development flow,  
26–27, 307

Fibonacci estimating sequence, 110

Finding user personas, 127–129

Finite state machines (FSMs), 361–363

First degree system stakeholders, 125

FIT (Framework for Integrated Tests)  
method, 194–195

FitNesse component, 194

Fixed delivery dates in kanban system, 180

Fixed features in Roadmap, 272

Fixed requirements scope assumption, 7

## Flow

- architecture principle, 399
- events in use cases, 371, 374–375
- in kanban system, 179–180
- product development, 25–27, 305–307
- rearchitecting with flow. *See* Rearchitecting  
with flow

Follow-up in requirements workshops, 232

Forming-Storming-Norming-Performing  
model, 35

Fowler, Martin, 100

Framework for Integrated Tests (FIT)  
method, 194–195

FSMs (finite state machines), 361–363

Functional silos, 50

Functional spikes, 114–115

Functional tests, 186

## Functionality

- in FURPS acronym, 339
- predicting, 311

Funnel queues, 410, 412–415, 459–461

FURPS acronym, 339–340

Futures, investment in, 85

## G

Gat, Israel, 136, 429

Gause, Donald, 238

General availability firewalls, 316

Get it done belief in legacy mind-sets,  
434–436

Global optimization, 304

Global WIP, 409

Glossary section in vision documents, 483

## Goals

- of estimating, 136–137
- lean software, 22–23
- Scrum Masters/Agile Masters  
responsibilities, 52
- stretch, 336–337

*Good to Great* (Collins), 449

Gottesdiener, Ellen, 176

## Governance

- architectural, 386, 388
- portfolio management, 430
- rethinking, 442–447

Gregory, Janet, 183, 185–186, 192

Gross estimates, 258

Gross profit, 18

Grouping ideas, 235

*Guide to the Business Analysis Body of  
Knowledge*, 278

Gustafsson, Bjorn, 176

## H

Hackathons, 398–399

Hardening iterations, 37, 39, 300, 398

Help section in vision documents, 483

Hendrickson, Elizabeth, 194

High, Timothy, 388



- High Delay Cost First approach in Cost of Delay, 264–265
- Highsmith, Jim, 67
- History of software requirements methods, 3–5
  - adaptive processes, 12–19
  - iterative methods, 9–12
  - lean software, 20–28
  - waterfall software process model, 5–9
- Http Unit testing, 198
- Hybrid estimating model, 151–152
- I**
- Ideal developer days (IDDs), 149–151
- Ideas in brainstorming
  - generation, 233–234
  - prioritization, 236–237
  - reduction, 235–236
- Identifying
  - epics, 456–467
  - stakeholders, 122–125
- IIBA (International Institute of Business Analysts), 278
- Impediments
  - program level, 64
  - in release planning, 333–334
  - Scrum Masters/Agile Masters responsibilities, 52
- Implementation
  - architectural epics, 89–90
  - kanban system, 411, 467
  - rearchitecting with flow, 423–426
- Implementation view in UML, 394
- Implementing Lean Software* (Poppendieck and Poppendieck), 20
- Important category in idea prioritization, 236–237
- Imposed standards as constraints, 346–347
- Improvement
  - kanban system opportunities, 180
  - Scrum Masters/Agile Masters responsibilities, 52
- Inception phase in RUP, 11
- Increased throughput in user stories, 109–110
- Incremental delivery, 17, 444–445
- Incremental funding, 440–441
- Incremental system building, 400
- Independence in INVEST model, 106, 110–111
- Index cards for user stories, 116–117
- Infrastructure enablers, 384
- Infrastructure work, backlogs for, 208
- Initiative and queue size, 175
- Inmates are Running the Asylum, The* (Cooper), 127
- Innovation as business driver, 388
- Innovation principle, 397–399
- Installation section in vision documents, 482
- Installation Guides section in vision documents, 483
- Intangible service class in kanban system, 180
- Integration in product development flow, 307
- Intentional architecture, 386–387
- Interactions, stakeholder, 122
- Interface development in user experience, 130
- Internal releases, 300
- International Institute of Business Analysts (IIBA), 278
- Interviews in requirements discovery, 237–240
- Introduction section in vision documents, 477
- INVEST model attributes for user stories, 105
  - estimable, 108–109
  - independent, 106
  - negotiable, 107
  - small, 109–111
  - testable, 111
  - valuable, 107–108
- Investment funding
  - portfolio management, 430
  - rethinking, 436–440
- Investment themes, 33, 43, 383, 450–451
  - vs. backlogs, 451–452
  - communicating, 451
  - overview, 84



- Involvement levels of stakeholders, 121
- Iron triangle  
 eliminating in agile, 16  
 in iteration, 160  
 waterfall model, 6–8
- IS/IT shops, product manager responsibilities  
 in, 278–279
- Iteration, 9, 33, 155–156  
 backlogs for, 210  
 calendars in, 168, 215–216  
 commitment, 159–163, 214  
 demonstration, 167  
 demos, 294  
 executing, 164, 214–215  
 feature preview, 169  
 just-in-time story elaboration, 211–212  
 length, 156  
 pattern, 157  
 planning phase, 157–159, 163, 213–214  
 product owners driving of, 212–216  
 Rapid Application Development, 10  
 Rational Unified Process, 11  
 requirements, 11–12  
 retrospective, 157, 167, 215  
 reviews, 167, 215  
 spiral method, 10  
 team backlog in, 157–158  
 team level, 36–37  
 technical debt and value stream, 216–217  
 tracking and adjustment in, 164–167  
 unit testing in, 197–198
- J**
- Jeffries, Ron, 58, 102
- Just get it done belief, 434–436
- Just-in-time story elaboration, 211–212
- K**
- Kaizen, 24
- Kanban system, 28, 179, 408  
 analysis, 418–422, 463–466  
 architectural epics, 413–415  
 backlogs, 411, 415–418, 461–463  
 classes of service, 180  
 funnel queues, 412–415, 459–461  
 implementation, 411, 423–426, 467  
 objectives, 408–409  
 overview, 409–410, 457–458  
 portfolio planning, 456–467  
 properties, 179–180  
 queue descriptions, 410–411  
 state descriptions, 411–413  
 state diagram views, 458–459
- Kano, Noriaki, 269
- Kano model of customer satisfaction, 269–271
- Kay, Alan, 251
- Key product value propositions, 43
- Key User Needs section in vision  
 documents, 479
- Knowledge areas, product manager  
 responsibilities in, 277–279
- Knowledge in story points, 138
- Kolsky, Amir, 191
- Kouzina, Olga, 176
- Kroll, Per, 377
- Kruchten, Philippe, 393
- L**
- Labeling and Packaging section in vision  
 documents, 483
- Lambda in Little’s law, 172–173
- Larman, Craig, 19, 21–22, 67–68
- Last responsible moment (LRM), 253
- Lawrence, Richard, 111
- Leadership  
 in lean software, 24  
 product owners, 121
- Lean-Agile Software Development: Achieving  
 Enterprise Agility* (Shalloway), 20, 256
- Lean Software and Systems Consortium, 20
- Lean software overview, 20  
 continuous improvement, 24  
 house of, 20–22  
 kanban, 28

- management support, 24–25
  - product development flow, 25–27
  - respect for people, 23
  - sustainably delivering value fast goal, 22–23
  - systems view, 27
  - Lean Software Strategies* (Middleton and Sutton), 20
  - Leffingwell, Dean
    - acceptance tests, 183
    - features, 75
    - finite state machines, 362
    - Managing Software Requirements: A Use Case Approach*, 255, 340, 369
    - requirements vs. design, 385
    - Scaling Software Agility: Best Practices for Large Enterprises*, 16, 19, 65, 88, 387.
  - Legacy mind-sets in portfolio management, 432–436
  - Length of queue in backlog, 174–175
  - Length of time in queue in backlog ratings, 417
  - Licensing, Security, and Installation section in vision documents, 482
  - Lifecycle phases
    - product manager responsibilities in, 276–277
    - RUP, 11
  - Lightweight business cases
    - epics, 464–466
    - investment funding, 438
    - rearchitecting with flow analysis, 420–421
  - Limited WIP Society, 179
  - Linear effect on Lambda, 174
  - Linear features in Kano model, 270
  - Little's law
    - for agility and time to market, 172–175
    - in backlog, 171–175
    - batch size in, 109
    - in blog story, 170–171
    - queues, 26
    - reliability of, 177
  - Local optimization, 304
  - Local prioritizations of features, 268–269
  - Logical view in UML, 394
  - Logistics in requirements workshops, 229
  - Low-fidelity interface development, 130
  - LRM (last responsible moment), 253
  - Lulls in idea generation, 234
- ## M
- Maintainability in nonfunctional requirements, 345
  - Management support, 24–25
  - Managers' review meeting in release planning, 328
  - Managing Software Requirements: A Use Case Approach* (Leffingwell and Widrig), 255, 340, 369
  - Managing the Design Factory* (Reinertsen), 20
  - Marick, Brian, 185
  - Market/customer-facing product managers, 206
  - Market Demographics section in vision documents, 478
  - Marketing and ART cadence, 315–316
  - Marketing requirements documents (MRDs), 251–252, 281
  - Marketing stakeholder guidelines, 123
  - Martens, Ryan, 70, 390
  - Martin, James, 10
  - Martin, Robert, 110, 346
  - Mean time between failures (MTBF)
    - issues, 344
  - Mean time to repair (MTTR) issues, 344
  - Measurability in SMART acronym, 163
  - Measuring workflow in kanban system, 179–180
  - Meet-after boards in iteration, 166
  - Message sequence diagrams (MSDs), 364–365
  - Metrics review in iteration, 168
  - Middleton, Peter, 20
  - Milestones
    - legacy mind-sets, 434–436
    - rethinking, 444–445
  - Minimum guarantees in use cases, 372

Minimum marketable feature (MMF) in  
    Kano model, 270–271

Mitigated risk category in release  
    planning, 334

Modeling principle in architecture, 392–394

Models in kanban system, 180

Monson-Haefel, Richard, 407

Moore, Geoffrey, 3

Motivation and queue size, 175

MRDs (marketing requirements documents),  
    251–252, 281

MSDs (message sequence diagrams), 364–365

MTBF (mean time between failures)  
    issues, 344

MTTR (mean time to repair) issues, 344

Mugridge, Rick, 194

Must-have features in Kano model, 270

**N**

Names in use cases, 370–371, 374

Needs  
    compiling, 239–240  
    product managers for, 284  
    stakeholders, 125–126

Negotiability of user stories, 107

Net ratings for backlogs, 462

New opportunities in business epics, 459

New products  
    as business drivers, 387  
    investment in, 85

Next + 1 releases, 273

*97 Things Every Software Architect Should  
    Know* (Monson-Haefel), 407

Nonfunctional requirements (NFRs), 77–78,  
    339–340  
    and backlogs, 78–79, 341, 348  
    constraints, 340–341, 345–347  
    examples, 342–343  
    modeling, 340–342  
    performance, 345  
    persistent, 347–348  
    program level, 40, 77–80

    reliability, 344  
    supportability, 345  
    templates, 352–354  
    testing, 79–80, 348–352  
    usability, 343–344  
    as user stories, 342  
    in vision, 255, 290

Nonfunctional Requirements section in  
    vision documents, 482

Normalizing velocity, 152

Number of iterations per release, 37

**O**

Objective-based commitment in iteration, 161

Objectives of releases, 292–293, 308–309,  
    312–313, 330–332

Ohno, Taiichi, 22, 319

On-site customers, 201

\$100 test, 236

Online brainstorming, 237

Online Help section in vision documents, 483

Opaque transparent firewalls, 316

Operations  
    guidelines, 123  
    user story splitting pattern, 113

Optimization, 269–271, 304

Order-taker mentality, 433–435

Out-of-the-box thinking in requirements  
    workshops, 230

Outlines in use case flows, 374–375

Outsourced development in rearchitecting  
    with flow implementation, 425

Oversight  
    portfolio management, 430  
    rethinking, 442–447

Owned risk category in release planning, 334

**P**

Parkolla, Mikko, 429–430

Partner stakeholders, 123

Partnerships in product manager/product  
    owner team, 296–297

- Paying down technical debt, 217
- Peer ratings for backlogs, 415–416, 461–463
- People, respect for, 23
- People, Teams, & Culture knowledge area, product manager responsibilities in, 277
- Performance
  - in FURPS acronym, 340
  - nonfunctional requirements, 345
  - testing, 352
- Perpetual Mistrust phase, product manager attitude in, 282–283
- Persistent acceptance tests, 190
- Persistent nonfunctional requirements, 347–348
- Personas, 126
  - finding, 127–129
  - primary and secondary, 127
- Phases of product manager disillusionment, 280–283
- Pichler, Roman, 204
- Planned release dates in Roadmap, 271
- Planning
  - centralized annual vs. decentralized rolling-wave, 445–447
  - investment funding, 439–440
  - in legacy mind-sets, 434–435
  - product development flow, 307
  - releases. *See* Release planning
- Planning phase in iteration, 157–159, 163, 213–214
- Planning poker, estimating with, 139–142, 144–145
- Plans of intent, 42, 272, 295
- PMBOK (Project Management Body of Knowledge), 442–443
- PMO (project management office), 85, 430–431
- Pods of agile teams, 33, 35
- Policies in kanban system, 180
- Poppendieck, Mary, 20, 22–23, 164
- Poppendieck, Tom, 20, 22–23, 164
- Portfolio backlogs, 383
  - as business drivers, 387
  - epics in, 43, 86–87, 453
  - product development flow, 306
- Portfolio level, 33–34
  - architectural runways, 88–91
  - backlogs, 86–87
  - epics, 85–91
  - features and stories, 87
  - introduction, 83–84, 383–384
  - investment themes, 84
  - portfolio management team, 85
  - summary, 43–44
- Portfolio management
  - change management, 440–442
  - epics identification and prioritization for, 456–467
  - governance and oversight, 442–447
  - investment funding, 436–440
  - legacy mind-sets, 432–436
  - overview, 429–431
  - project management office, 430–431
  - team decisions, 85
- Portfolio vision in business epics, 459
- Portfolio WIP, 409
- Potentially shippable increments (PSIs)
  - in ART, 80, 300–301, 314–317
  - program level, 33
  - in releases, 37, 39–40
  - in system building, 401–402
- PRDs (product requirements documents), 251–252, 281
- Preconditions in use cases, 372, 375
- Predictability of releases, 310–313
- Predictions in estimates, 136
- Predisposition in interviews, 238
- Preliminary press release approach in vision, 254
- Primary user personas, 127–128
- Principles of Agile Architecture, 390–399
- Principles of Product Development Flow* (Reinertsen), 20, 25, 262

- Prioritization
  - backlog ratings, 417, 462
  - backlogs, 209–211
  - epics, 456–467
  - estimates, 137
  - features, 261–271
  - ideas, 236–237
  - in iteration, 214
  - product managers for, 285
  - in Roadmap, 272
- Problem solving meeting in release
  - planning, 328
- Process control band, 312
- Process, Execution, Metrics knowledge area,
  - product manager responsibilities in, 277–278
- Process review in iteration, 168
- Process view in UML, 394
- Product backlogs, 38
- Product champions, 201
- Product companies, product manager
  - responsibilities in, 276–278
- Product councils in requirements discovery, 243–244
- Product Development and Management
  - Association, 276
- Product development flow, 25–27, 305–307
- Product Features section in vision
  - documents, 481
- Product Management and Product Owner Role in Large Scale Agile Software Development* (Parkolla), 429
- Product management in kanban system
  - analysis, 464
- Product managers, 33, 74, 275
  - change management, 286
  - customer needs, 284
  - documenting requirements, 284
  - evolution of, 283
  - phases of disillusionment, 280–283
  - prioritizing requirements, 285
  - product owner collaboration, 220, 295–297
  - program level, 42–43
  - rearchitecting with flow analysis, 420
  - release management, 290–294
  - responsibilities, 276–280, 286–287
  - Roadmap, 295
  - scheduling, 285
  - status assessment, 287
  - validating requirements, 286
  - vision, 288–290
- Product Overview section in vision
  - documents, 480
- Product owners, 33
  - attributes, 218–220
  - backlog management, 208–211
  - bottlenecks, 221
  - communication with, 294
  - CSG Systems, 223
  - description, 120
  - Discount Tire, 224
  - dual roles, 207
  - emergence of, 201–202
  - iteration driving, 212–216
  - iteration planning meeting preparation
    - responsibilities, 159
  - just-in-time story elaboration, 211–212
  - product manager collaboration, 220, 295–297
  - proxies, 221
  - release planning, 217–218
  - responsibilities, 51, 202–208
  - role/title, 206–207
  - roles, 36
  - Scrum, 15
  - Symbian Software, 223–224
  - teams, 221
  - technical debt and value stream, 216–217
  - TradeStation Technologies, 222–223
- Product Position Statement section in vision
  - documents, 480–481
- Product requirements documents (PRDs), 251–252, 281

- Product/technology councils in rearchitecting
    - with flow analysis, 422
  - Production requirements workshops, 232
  - Productivity in usability, 350
  - Program backlogs
    - features for, 76
    - product development flow, 306
  - Program level, 33
    - architectural epics, 90
    - ART, 80–82
    - introduction, 63–64
    - nonfunctional requirements, 77–80
    - product managers, 42–43
    - program managers, 275
    - release planning, 41
    - releases and PSIs, 39–40
    - Roadmap, 41–42, 64
    - summary, 38–39
    - teams. *See* Teams and team level
    - vision, features, and program backlog, 40–41
  - Programming support, acceptance tests
    - for, 185
  - Progress tracking in iteration, 164–167
  - Project backlogs, 38
  - Project-free, continuous content delivery, 441–442
  - Project Management Body of Knowledge (PMBOK), 442–443
  - Project management office (PMO), 85, 430–431
  - Project Management tool, iteration tracking
    - with, 166–167
  - Project plans in investment funding, 438
  - Project-specific information for requirements workshops, 230
  - Project stakeholders, 120
  - Proxies, product owner, 221
  - Pruning ideas, 235
  - Pseudocode, 358–359
  - PSIs (potentially shippable increments)
    - in ART, 80, 300–301, 314–317
    - program level, 33
    - in releases, 37, 39–40
    - in system building, 401–402
  - Purchased solutions for rearchitecting with
    - flow implementation, 425–426
- Q**
- Qualities, testing, 79–80, 186–187
  - Quality
    - agile, 17
    - predicting, 310–311
    - and queue size, 175
    - unit tests, 60
    - waterfall model, 8
  - Quality assurance
    - QA and deployment teams, 71
    - responsibilities, 54
    - system, 72
  - Quality Function Deployment technique, 245
  - Quality management at program level, 64
  - Quantitative review in iteration, 168
  - Questionnaires in requirements discovery, 240–241
  - Questions in interviews, 238–239
  - Queues. *See also* Backlogs
    - analysis, 418–422
    - backlog blog story, 170–171
    - funnel, 410, 412–415, 459–461
    - in kanban system, 410–411
    - lean software, 25–26
    - length, 174–175, 177
    - in product development flow, 306
- R**
- Rally Software Development, 90, 245–246
  - Ranking
    - architectural epics, 414–415
    - business epics, 460
  - Rapid Application Development (RAD), 10
  - Ratings for backlogs, 415–417, 461–463
  - Rational Unified Process (RUP), 11, 252–253, 367, 393
  - Realized features, 76
  - Rearchitecting system portions, 387

- Rearchitecting with flow, 407–408
  - analysis, 418–422
  - architectural epics, 413–415
  - backlogs, 415–418
  - funnel queues, 412–415
  - implementation, 423–426
  - kanban system, 408–412
- Recall in usability, 350
- Refactors, backlogs for, 208
- References section in vision documents, 478
- Refining use cases, 375
- Regulations as constraints, 346–347
- Reinertsen, Donald G.
  - on AWIP, 408
  - batch size, 299
  - Managing the Design Factory, 20
  - Principles of Product Development Flow, 20, 25, 262
  - prioritizing work, 263
  - on queues, 155, 175
- Relationships in use cases, 374
- Relative estimating, 138–139, 145–147, 258
- Release backlogs in product development
  - flow, 306
- Release levels, program managers at, 275
- Release management
  - product managers for, 290–294
  - program level, 64
- Release management teams (RMTs), 73–74, 294
- Release planning, 299
  - ART, 80–81, 308–309
  - attendance, 320
  - checklist, 321–322, 485–488
  - Day 1, 322–323
    - architecture vision, 324
    - business context, 323–324
    - draft plan reviews, 327–328
    - managers' review and problem solving meeting, 328
    - opening meeting, 323
    - team planning breakouts, 325–327
  - Day 2, 328–329
    - adjustments, 330
    - commitment, 334–335
    - final instructions to teams, 336
    - final review, 332–333
    - opening meeting, 330
    - release objectives, 330–332
    - retrospective, 335–336
    - risks and impediments, 333–334
    - solution vision, 324
    - team planning breakouts, 330
  - domains, 320
  - facilitators, 320–321
  - preparing for, 319
  - product manager role, 290–293
  - product owner role, 217–218
  - program level, 41
  - stretch goals, 336–337
- Release teams, 71
- Release train domains, 308
- Releases, 33, 39–40
  - ART. *See* Agile Release Train (ART)
  - commitment, 292–293
  - frequency, 313–317
  - managing, 309–310
  - objectives, 292–293, 308–309, 312–313, 330–332
  - planning. *See* Release planning
  - predictability, 310–313
  - PSIs, 80
  - retrospective, 310
  - Roadmap for, 273
  - tracking, 293–294, 309–310
- Relevancy in SMART acronym, 163
- Reliability
  - in FURPS acronym, 340
  - nonfunctional requirements, 344
  - testing, 350–351
- Reliable estimates, 136
- Reports, requirements analysis, 358
- Requirements
  - backlog meta-model, 489
  - nonfunctional. *See* Nonfunctional requirements (NFRs)
  - user stories as, 101–102



- Requirements analysis, 355–356
  - activity diagrams, 357
  - decision tables and decision trees, 359–361
  - entity-relationship diagrams, 365
  - finite state machines, 361–363
  - message sequence diagrams, 364–365
  - pseudocode, 358–359
  - sample reports, 358
  - use case modeling, 366
- Requirements Analysis knowledge area,
  - product manager responsibilities in, 279
- Requirements analysts, 206
- Requirements architects, 206
- Requirements discovery, 227–228
  - brainstorming, 232–237
  - competitive analysis, 244–245
  - customer change request systems, 245–246
  - defect logs, 246
  - interviews, 237–240
  - product councils, 243–244
  - questionnaires, 240–241
  - use case modeling, 247
  - user experience mock-ups, 241–243
  - workshops, 228–232
- Requirements Management and
  - Communication knowledge area,
    - product manager responsibilities in, 279
- Requirements view in UML, 393
- Research and development, 267
- Resetting expectations phase, product manager attitude in, 282
- Resolved risk category in release planning, 334
- Resource management at program level, 64
- Resource utilization in performance, 345
- Respect for people, 23
- Response time in performance, 345
- Responsibilities
  - product managers, 42–43, 276–280
  - product owners, 51, 202–208
  - teams, 50–54
- Resynchronization, 26
- Retrospective
  - iteration, 157, 167, 215
  - release planning, 335–336
  - releases, 310
- Return on investment (ROI)
  - incremental value delivery for, 17
  - for prioritizing features, 261–263
- Review in iteration, 157, 167, 215
- Risks and risk reduction
  - in backlog ratings, 417
  - backlogs for, 210
  - in Cost of Delay, 267
  - and queue size, 175
  - in release planning, 333–334
- RMT (release management team), 73–74, 294
- Roadmaps, 271–272
  - for architectural epics, 413
  - description, 81–82
  - product managers for, 295
  - program level, 41–42, 64
  - for releases, 273
- ROAM categories in release planning, 334
- ROI (return on investment)
  - incremental value delivery for, 17
  - for prioritizing features, 261–263
- Role collaboration principle
  - rearchitecting with flow analysis, 419–420
  - system architecture, 396–397
- Roles
  - product owners, 36, 207
  - teams, 36, 50–54
  - in user stories, 104
- Rolling-wave planning, 445–447
- Roof in lean software, 22–23
- Royce, Winston, 5–6
- Rude Awakening phase, product manager attitude in, 281
- Rules, responsibility for, 52
- Runways, architectural, 44, 88–91, 383, 395–396
- RUP (Rational Unified Process), 11, 252–253, 367, 393



- S**
- SaaS (software as a service) application, 90, 314
  - Sales stakeholder guidelines, 123
  - Sample reports in requirements analysis, 358
  - SATs (story acceptance tests), 187–190
  - Scalability in performance, 345
  - Scale, team organization at, 64
  - Scaling Lean and Agile Development* (Larman and Vodde), 19
  - Scaling Software Agility* (Leffingwell), 16, 19, 65, 88, 387
  - Scheduled features, 290
  - Schedules
    - estimating, 137, 149
    - myths, 135
    - product managers for, 285
    - and velocity, 148
  - Schwaber, Ken, 202, 221
  - Scope
    - in architectural epics, 384
    - in business epics, 453
    - of releases, 290
    - story points for, 138
    - in waterfall model, 7
  - Scotland, Karl, 176
  - Scrum/Agile Masters, 15, 34
    - responsibilities, 51–52
    - roles, 36
  - Scrum Alliance, 15
  - Scrum Certified Product Owner courses, 204
  - Scrum of Scrums planning checkpoints, 326–327
  - Scrum project management method, 15
    - product owners, 202–204
    - story of, 24
  - SDS (system design specification), 281
  - Second degree system stakeholders, 125
  - Secondary user personas, 127–128
  - Security
    - in reliability, 344
    - testing, 351–352
  - Security section in vision documents, 482
  - Security stakeholder guidelines, 124
  - Sense of balance in product manager/product owner teams, 296
  - Separation of development from releases and marketing, 315–316
  - Sequencing in prioritizing features, 262–263
  - Shakespeare, William, 63, 99, 135, 183, 201
  - Shalloway, Alan, 20, 256
  - Shortest Job First in Cost of Delay, 263–264
  - Silos, functional, 50
  - Simplicity in architecture, 391–392
  - Size
    - backlog ratings, 417
    - queue, 174–175
    - in user stories, 110–111
  - Sliger, Michele, 443
  - Small attribute in INVEST model, 109–111
  - SMART acronym, 162–163
  - Smart energy grids. *See* Tendril case study
  - Software as a service (SaaS) application, 90, 314
  - Software by Numbers* (Denne and Cleland-Huang), 262
  - Software kanban. *See* Kanban system
  - Software Project Manager's Bridge to Agility* (Sliger), 443
  - Software Requirements* (Wiegers), 262
  - Software requirements history, 3–5
    - adaptive processes, 12–19
    - iterative methods, 9–12
    - lean software, 20–28
    - waterfall software process model, 5–9
  - Software requirements specifications (SRSs), 251–252
  - Solely emergent architectures, 386
  - Solution Assessment and Validation
    - knowledge area, product manager responsibilities in, 279
  - Solution management, 276
    - kanban system analysis, 464
    - rearchitecting with flow analysis, 420

- Solution/product/technology-facing product owners, 206
- Solution vision in release planning, 324
- Solutions-context questions in interviews, 238–239
- Sources
  - architectural epics, 413–414
  - business epics, 459–460
- Special requirements in use cases, 372
- Specialist responsibilities, 54
- Specificity in SMART acronym, 163
- Spikes, 114
  - guidelines, 115–116
  - technical and functional, 114–115
  - user experience, 130
- Spiral model of development, 10
- Splitting
  - architecture epics, 403–405
  - user stories, 111–114
- Sponsor guidelines, 124
- Sprint status boards, 165
- Sprints, Scrum, 15, 36
- SRSs (software requirements specifications), 251–252
- Stakeholder/product owner teams, 126
- Stakeholders, 119
  - identifying, 122–125
  - interactions, 122
  - interviews, 237–238
  - involvement levels, 121
  - kanban system analysis, 464
  - product owners, 120
  - project, 120
  - requirements workshops, 229
  - system, 120
  - trust, 122
  - in use cases, 372
- Stakeholders section in vision documents, 480–481
- Standard service class in kanban system, 180
- Standards as constraints, 346–347
- Standish Group, 6
- Starbucks backlog blog story, 170–171
- State descriptions in kanban system, 411–413
- State diagram views, 458–459
- State transition diagrams, 362–363
- Statements of intent, 38
- Steering committees, 73
- Sterling, Chris, 177
- Stories
  - vs. features and epics, 454–456
  - just-in-time story elaboration, 211–212
  - portfolio level, 87
  - user. *See* User stories
- Story acceptance tests (SATs), 59, 187–190
- Story points, 138, 257, 259
- Story spikes in user experience, 130
- Story time in iteration, 169
- Strategic alignment in ART, 304–305
- Strategic intent in epics, 44
- Strategic investment themes, 450
- Strategy, Planning, and Decision Making
  - knowledge area, product manager responsibilities in, 277
- Strategic product themes, 450
- Stretch goals in release planning, 336–337
- Stretch objectives in iteration, 160
- Subepics, 453
- Subjective review in iteration, 168
- Subsystems in use cases, 368, 372
- Succeeding with Agile: Software Development Using Scrum* (Cohn), 219
- Success guarantees in use cases, 372
- Summary of Capabilities section in vision documents, 481
- Support stakeholder guidelines, 124
- Supportability
  - in FURPS acronym, 340
  - nonfunctional requirements, 345
  - testing, 352
- Supporting roles, 54
- Sustainably delivering value fast goal, 22–23
- Sutton, James, 20
- Symbian Software, 223–224

- Synchronization
    - lean software, 26
    - product development flow, 307
  - System acceptance tests, 186
  - System architecture, 383
  - System context diagrams, 95
  - System design specification (SDS), 281
  - System qualities
    - tests, 80, 186–187
    - user story splitting pattern, 113
    - in vision, 255
  - System Requirements section in vision
    - documents, 482
  - System stakeholders, 120
    - classifying, 125
    - identifying, 124
    - needs of, 125–126
  - System teams, 71–73
  - Systems architecture, 384–385
    - architectural epics, 387–388, 399–403
    - business drivers, 387–388
    - emergence of, 385–386
    - intentional, 386–387
    - system architect role, 388–390
  - Systems in use cases, 368, 370, 372
  - Systems view in lean software, 27
- T**
- Tabletop relative estimation, 145–147
  - Task-based commitment in iteration, 162–163
  - Tasks, team level, 38, 57–58
  - TDD (test-driven development), 60, 190–191
  - Team backlogs
    - in iteration, 157–158
    - product development flow, 306
    - user stories in, 38, 55–56
  - Team-based estimating, 259
  - Teams and team level
    - acceptance tests, 58–59
    - architectural epics, 90–91
    - coding by, 390–391
    - features, 34–35
    - and functional silos, 50
    - importance, 47–49
    - iterations, 36–37
    - overview, 34–35
    - planning breakouts, 325–327, 330
    - pods, 35
    - product owners, 221
    - program level
      - co-location, 71
      - component, 65–66, 68–71
      - features, 66–71, 75–77
      - organization at scale, 64
      - product management, 74
      - release management, 73–74
      - system, 71–73
      - vision, 74–75
    - rearchitecting with flow implementation,
      - 424, 426
    - roles and responsibilities, 33, 36, 50–54
    - tasks, 38, 57–58
    - user stories, 37–38, 56–57
  - Technical debt, 39
    - backlogs for, 208
    - iteration, 216–217
  - Technical foundation of product owners, 219
  - Technical spikes, 114–115
  - Technological changes as business driver, 387
  - Technology and Intellectual Property
    - knowledge area, product manager
    - responsibilities in, 277
  - Technology-facing tests, 185
  - Technology Roadmaps, 413
  - Templates
    - business cases, 420–421, 464–466
    - nonfunctional requirements, 352–354
    - vision documents, 475–477
  - Temporal prioritizations of features, 268–269
  - Tendril case study, 93
    - activity diagrams, 357
    - background, 93–94
    - sample reports, 358
    - system context diagrams, 95

- system stakeholders, 125–126
  - use case example, 375–377
  - user personas, 128–129
- Tendril end-to-end solution, 94
- Test-driven development (TDD), 60, 190–191
- Testability of user stories, 111
- Tester roles and responsibilities, 36, 53
- Testing principle in architecture, 395
- Tests
- acceptance. *See* Acceptance tests
  - in define/build/test sequence, 49
  - features, 77, 260–261
  - nonfunctional requirements, 79–80, 348–352
  - performance, 352
  - reliability, 350–351
  - security, 351–352
  - supportability and design constraints, 352
  - system-level, 72
  - system qualities, 80
  - teams, 58–60
  - usability, 350
  - user stories, 188–189
- Themes
- investment, 33, 43, 84, 383, 450–452
  - planned release dates, 271
- Third degree system stakeholders, 125
- Thomas, M., 7
- Throughput
- and backlog queue length, 177
  - in performance, 345
  - in user stories, 109–110
- Time
- in architectural epics, 384
  - in business epics, 453
- Time to market, Little's law for, 172–175
- Time value
- in backlog ratings, 417, 462
  - backlogs for, 210
  - in Cost of Delay, 267
- Timeboxed tasks in SMART acronym, 163
- Toyota Production System (TPS), 20
- Toyota Way, The* (Liker), 20
- Tracking
- in iteration, 164–167
  - releases, 293–294, 309–310
- TradeStation Securities trading system, 68–69
- TradeStation Technologies product owners, 222–223
- Training time, 343
- Transitions phase in RUP, 11
- Transparent firewalls, 316
- Trust
- product manager/product owner team, 296–297
  - in software development, 386
  - stakeholders, 122
- Trustworthiness of product owners, 219
- Tuckman, Bruce, 35
- Tyranny of the urgent iteration, 169
- U**
- UML (Unified Modeling Language), 393–394
- Unambiguous acceptance tests, 189
- Unbridled enthusiasm phase, product manager attitude in, 281
- Uncertainty
- in product development flow, 307
  - story points, 138
- Undelivered features, 40–41
- Unified Modeling Language (UML), 393–394
- Unit tests
- in agile testing matrix, 186
  - in iteration, 197–198
  - overview, 196–197
  - purpose, 60
- United management fronts for releases, 330
- Unscheduled features, 290
- Usability
- in FURPS acronym, 339
  - nonfunctional requirements, 343–344
  - testing, 350
- Use-case view in UML, 393

**Use cases**

- applying, 377–378
- basics, 369–370
- benefits, 368–369
- example, 375–377
- model building for, 372–375
- overview, 367–368
- requirements analysis, 366
- requirements discovery, 247
- requirements model, 378–379
- structure, 370–371
- user story splitting pattern, 113
- vision documents, 482

**Useful category in idea prioritization, 236–237****User Description section in vision**

- documents, 478–479

**User Environment section in vision**

- documents, 479

**User experience (UX) design, 129–130**

- centralized development, 131–132
- distributed but governed, 131–133
- interface development, 130
- story spikes, 130

**User experience mock-ups in requirements**

- discovery, 241–243

**User interaction, use cases for, 368****User interviews in requirements discovery,**

- 237–238

**User Manual section in vision documents, 483****User/Market Demographics section in vision**

- documents, 478

**User personas, 126**

- finding, 127–129
- primary and secondary, 127

**User Personas section in vision**

- documents, 478

**User stories, 33**

- acceptance criteria, 104–105
- backlogs for, 208
- basics, 57

- cards, conversation, and confirmation, 102–103, 116–117, 121

**detail, 104****for developer-customer communication**

- gap, 101

**introduction, 99–100****INVEST model, 105–111****nonfunctional requirements as, 342****overview, 100–101****problems with, 368****as requirements, 101–102****size and Lambda, 174****spikes, 114–116****splitting, 111–114****teams, 37–38, 56–57****testing, 188–189****for user personas, 127–129****voice, 103–104, 257*****User Stories Applied* (Cohn), 100, 103****User value**

- in architectural epics, 384
- in backlog ratings, 417
- backlogs for, 210
- in Cost of Delay, 266–267

**User voice**

- features, 257
- user stories, 103–104

**Utilization**

- in legacy mind-sets, 434–435
- in performance, 345

**V****Validating requirements, product managers for, 286****Value**

- in architectural epics, 384
- in backlog ratings, 417, 462
- in Cost of Delay, 266–267
- of estimates, 137
- in INVEST model, 107–108
- in prioritizing features, 269–271

- in release objectives, 331–332
  - in user stories, 104
- Value chain, 23
- Value/effort ROI proxy, 262
- Value stream in iteration, 216–217
- Variability
- lean software, 26
  - product development flow, 306
  - and queue size, 175
- Variable features in Roadmap, 272
- Velocity, 136
- establishing, 146–149
  - feature estimates, 257
  - increasing, 148
  - normalizing, 152
  - schedule and cost connections, 148
- Velocity-based commitment in iteration, 160–162
- Views in UML, 393–394
- Vision
- communicating, 289
  - data sheet approach, 253–254
  - feature backlog with briefing approach, 255
  - nonfunctional requirements, 255
  - overview, 251–252
  - portfolio, 459
  - preliminary press release approach, 254
  - product managers for, 288–290
  - program level, 40, 64
  - release planning, 324
  - teams, 74–75
  - vision documents, 252–253
- Vision document template, 475–477
- Assumptions and Dependencies section, 481
  - Documentation Requirements section, 483
  - Exemplary Use Cases section, 482
  - Glossary section, 483
  - Introduction section, 477
  - Nonfunctional Requirements section, 482
  - Product Features section, 481
  - Stakeholders section, 480–481
  - User Description section, 478–479
- Vodde, Bas, 19, 21–22, 67–68
- Vogels, Werner, 392
- Voice
- features, 257
  - user stories, 103–104
- Volume of story points, 138
- Von Neumann, John, 355
- ## W
- Wake, Bill
- INVEST acronym, 105
  - SMART acronym, 162–163
  - on user stories, 101
- Warm-up materials in requirements workshops, 230
- Waterfall model, 5–6
- current use, 8–9
  - problems, 6
  - requirements, 6–8
- Weighted Shortest Job First (WSJF)
- prioritization
  - backlog ratings, 417
  - in Cost of Delay, 265–267
  - epic ratings, 462
  - for features, 290
  - for requirements, 285
- Weinberg, Gerald, 238
- White-box testing, 351
- Widget engineering mind-set, 433–435
- Widrig, Don, 227
- acceptance tests, 183
  - Managing Software Requirements: A Use Case Approach*, 255, 340, 369
- Wieggers, Karl E., 262
- Wikis, 348
- Wireframe models, 242–243
- Work breakdown structure in investment funding, 439–440

- Work-in-process (WIP)
    - backlog ratings, 418, 463
    - business epics, 461
    - funnel queues, 415
    - in kanban system, 179, 464
    - lean software, 26
    - product development flow, 306–307
    - rearchitecting with flow, 420, 426
  - Work items, 56
  - Workflow
    - kanban system, 179–180
    - user story splitting pattern, 112
  - Working software in systems architecture, 386
  - Workshops, requirements, 228–232
  - Write-the-test-first approach, 111
  - Writing Effective Use Cases* (Cockburn), 369
  - WSJF. *See* Weighted Shortest Job First (WSJF) prioritization
- X**
- XML Unit testing, 198
  - XP (Extreme Programming), 14–15, 100
- Z**
- Zamora, Mauricio, 223, 390