

Table of Contents

CHAPTER 1	Web-Based Systems	1
	The Web	1
	Web Applications	2
	Let's Introduce a Case Study	3
	Are WebApps Really Computer Software?	4
	Are the Attributes of WebApps Different from the Attributes of Conventional Software?	4
	What Categories Are Encountered as a WebApp Evolves?	7
	WebApps—A Philosophical View	10
CHAPTER 2	Web Engineering	12
	What Is Web Engineering?	12
	What Is Meant by Agile?	12
	What Is a WebE Framework?	13
	What Principles Should You Follow as You Adapt the Framework?	15
	Is There Any Merit in an Old-School Approach?	16
	The Components of Web Engineering	16
	How Does Software Engineering Come into Play?	17
	Why Is WebE Process Agility So Important?	18
	What WebE Methods Reside within the Process Framework?	19
	Isn't Web Engineering All about Tools and Technology?	19
	Web Engineering Best Practices	21
	Where We've Been . . . Where We're Going	23
CHAPTER 3	A Web Engineering Process	24
	Defining the Framework	24
	Incremental Process Flow	27
	How Are Framework Activities Conducted?	28
	How Is the Framework Refined?	30
	Generic Actions and Tasks for the WebE Framework	32
	How Should the Communication Activity Be Refined?	32
	What Tasks Are Required to Develop an Increment Plan?	33
	What Is Modeling?	35
	What Analysis Modeling Tasks Can Be Applied?	35
	What Are the Elements of a Design Model?	37
	What Design Modeling Tasks Can Be Applied?	38
	What Construction Tasks Should Be Applied?	40
	How Is a WebApp Increment Deployed?	41
	Umbrella Activities	42
	How Should a WebE Team Manage Change?	42
	How Is the Quality of an Increment Ensured?	43
	How Is Risk Managed?	43
	How Should the Work Be Managed?	44
	Where We've Been . . . Where We're Going	44

CHAPTER 4	Communication	46
	The Communication Activity	46
	Formulation	47
	Who Should We Communicate With?	48
	What Techniques Can You Use for Communication?	48
	Won't There Be Different Viewpoints?	49
	What Questions Should We Ask?	49
	How Do We Encourage Collaboration?	51
	Elicitation	53
	What Happens Before an Elicitation Session?	53
	How Do Stakeholders Prepare?	54
	What Tasks Are Performed During an Elicitation Session?	55
	What Are the User Categories for the WebApp?	56
	How Are Content and Functional Requirements Identified?	57
	How Are Constraints and Performance Issues Isolated?	58
	What Are Usage Scenarios?	58
	What Are Use Cases?	60
	How Is a Use Case Created?	60
	Identifying WebApp Increments	65
	Negotiation	67
	Where We've Been . . . Where We're Going	68
CHAPTER 5	Planning	70
	Understanding Scope	70
	What Communication Work Products Are Relevant?	71
	What if Further Details Are Required to Understand the Increment?	71
	What if Gaps Still Exist in Your Understanding?	73
	Refining Framework Activities	73
	What Actions and Tasks Are Required?	74
	What Work Products Will Be Produced?	76
	What Is the Appropriate Way to Assess Quality?	77
	How Should Change Be Managed?	78
	Building a WebE Team	79
	How Do We Recognize a "Good" WebE Team?	79
	Why Don't Teams Jell and What Can Be Done to Help?	80
	Can a WebE Team Manage Itself?	81
	How Do We Build a Successful Team?	82
	What Are the Characteristics of a Good Team Leader?	83
	Managing Risk	84
	How Do We Identify Risks?	84
	How Do We Evaluate Risks?	85
	How Do We Develop Contingency Plans?	86
	Developing a Schedule	88
	What Is Macroscopic Scheduling?	88
	What Is Increment Scheduling?	89
	How Do We Estimate Effort and Time?	91
	How Do We Represent Task Interdependencies?	93

	Managing Quality	94
	What Quality Assurance Mechanisms Can the Team Use?	95
	What Are the Mechanics of a Pair Walkthrough?	95
	What Are the Mechanics of a Team Walkthrough?	96
	Do Criteria for Quality Exist for WebApps?	97
	Managing Change	98
	How Should Criticality and Impact of a Change Be Assessed?	99
	When Do We Delay Making the Change?	99
	Should Changes Be Made to All Related Work Products?	102
	Tracking the Project	103
	Are There Any Macroscopic Indicators of Progress Problems?	103
	What Criteria Are Used to Track Progress?	104
	Outsourcing WebE Work	104
	How Do We Initiate an Outsourced Project?	105
	How Do We Select Candidate Outsourcing Vendors?	106
	How Can We Assess the Validity of Price Quotes and the Reliability of Estimates?	106
	What Level of Project Management Will Be Needed?	106
	How Do We Assess the Schedule and Manage Scope?	107
	Where We've Been . . . Where We're Going	107
CHAPTER 6	The Modeling Activity	109
	Modeling as a Concept	110
	How Do We Judge the Usefulness of a Model?	110
	Can Models Be Used to Understand Business Constraints?	111
	The Models We Create	112
	What Does the Process Tell Us About Modeling?	113
	What Does the WebApp Tell Us About Modeling?	113
	Modeling Frameworks	114
	Is There a Modeling Framework for the Web?	115
	How Does Modeling Relate to the WebE Process?	116
	Modeling Languages	119
	What Capabilities Should Exist to Model Functionality?	120
	What Capabilities Should Exist to Model Information Content?	121
	What Generic Capabilities Should Exist in a Modeling Language?	122
	Existing Modeling Approaches	124
	Where We've Been . . . Where We're Going	126
CHAPTER 7	Analysis Modeling for WebApps	129
	Understanding Analysis in the Context of WebE	129
	How Much Analysis Is Enough?	130
	Can We Analyze Using a Prototype?	130
	Is Analysis Distinct from Design?	132
	Analysis Modeling for WebApps	133
	What Are the Inputs to Analysis Modeling?	133

	What Are the Outputs from Analysis?	135
	What Analysis Tasks Can and Should We Carry Out?	135
	What Tools Can We Use to Help Us Model?	136
	How Do We Decide Whether Modeling Is Necessary and Which Approach Is Best?	136
	Understanding the Users	138
	Why Is It Necessary to Revisit the User Hierarchy?	139
	Do We Apply Usage Scenarios As Is?	141
	The Content Model	144
	What Are the Structural Elements of the Content Model?	144
	What Is an Information Exchange and How Is It Represented?	145
	How Are Content Objects Defined?	146
	Is There a Simple Way to Depict Content Relationships and Content Hierarchy?	150
	How Do We Select and Represent Analysis Classes for WebApps?	151
	The Interaction Model	152
	Where Do Use Cases Come into Play?	152
	What Are Sequence Diagrams and When Should They Be Developed?	153
	How Do State Diagrams Represent the Behavior of a WebApp?	154
	Do We Really Need Use Cases, Sequence Diagrams, and State Diagrams to Fully Describe the Interaction Model?	154
	Why Is It a Good Idea to Build an Interface Prototype?	155
	The Functional Model	156
	The Configuration Model	158
	Relationship-Navigation Analysis	159
	How Do We Establish Relationships Between Content Objects and Functionality?	160
	How Do We Analyze Navigational Requirements?	161
	Where We've Been . . . Where We're Going	163
CHAPTER 8	WebApp Design	165
	Design for WebApps	165
	What Does a WebApp Designer Need to Know?	166
	What Is Logical Design?	167
	What Is Physical Design?	167
	What Information Is Created as a Consequence of Design?	168
	Design Goals	168
	Design and WebApp Quality	171
	How Do Users Perceive Quality?	171
	Is There a User-Centric Model for Assessing Design Quality?	172
	What Is a Quality Framework?	175
	Is There a Way to Assess Content Quality?	178
	Is There a Single Quality Checklist I Can Use?	178
	The Design Process	180
	What Are the Elements of WebApp Design?	180

	What Are the Characteristics of the Design Process?	183
	What Does an Incremental WebE Process Imply for the Design Activity?	184
	Initial Design of the Conceptual Architecture	185
	Initial Design of the Technical Architecture	188
	Where We've Been . . . Where We're Going	190
CHAPTER 9	Interaction Design	193
	Interface Design Principles and Guidelines	194
	What Principles Do We Apply to Design Effective Interfaces?	194
	What About Some Pragmatic Design Guidelines?	200
	Interface Design Workflow	200
	Interface Design Preliminaries	202
	How Do We Understand the Characteristics of WebApp Users?	203
	How Do We Elaborate the Content Objects That Are Identified?	204
	What Tasks Do the Users Perform?	206
	How Do We Elaborate the Tasks That Are Identified?	208
	How Do We Design for Different Users with Different Roles?	209
	How Is Content Integrated into the Interface Description?	211
	Interface Design Steps	212
	How Are Interface Objects and Actions Translated into a Layout?	212
	What About the Design of Navigation Mechanisms for the Interface?	215
	Why Is Interface Consistency So Important?	218
	Aesthetic Design	218
	How Do We Create an Aesthetically Pleasing Layout?	219
	What Leads to an Effective Graphic Design?	221
	Usability	222
	Design Issues	223
	What Factors Affect Response Time and What Can We Do to Improve It?	223
	How Should We Design "Help" Facilities?	224
	How Should the Interface Handle Errors?	225
	What Is "Accessibility" and How Does It Apply to Interface Design?	226
	What Is "Internationalization" and How Does It Apply to WebApps?	227
	Where We've Been . . . Where We're Going	228
CHAPTER 10	Information Design	230
	Information Architecture	231
	What Is an Information Architecture?	231
	What Are the Elements of an Information Architecture?	233

	What Are the Characteristics of a Good Information Architecture?	233
	How Do We Develop an Information Architecture?	236
	Organizing Content	237
	Structuring the Information Space	238
	What Information Structures Are Possible?	239
	What Makes a Good Structure?	242
	Blueprints: Adding Detail to a Structure	245
	What Form Does a Blueprint Take?	245
	Accessing Information	247
	How Do We Ensure That the User Understands the Context and Doesn't Get Lost?	247
	How Do We Help the User Move Through the Information Structure?	249
	What Guidelines Are Available for Implementing Searching Mechanisms?	250
	Can Searching Mechanisms Lead to Problems?	252
	Wireframe Models	252
	Navigation Design: Creating the Detailed Structure	254
	How Have Information Design and Navigation Design Models Evolved?	254
	How Is the RMM Model Used for Navigation Design?	256
	How Can WebML Be Used to Create a Navigation Design?	259
	Is It Possible to Create Models That Link Content and Functionality?	259
	Does the Structure of the Web Itself Have an Impact?	262
	Summarizing the Design Process	262
	Where We've Been . . . Where We're Going	265
CHAPTER 11	Functional Design	268
	WebApp Functionality	268
	The Nature of WebApp Functionality	269
	What Are Typical Examples of Functionality?	270
	Can Functionality Be Categorized?	270
	Is It Always Possible to Distinguish Between Information and Function?	272
	Functional Design in the Design Process	274
	What Are the Elements of a Functional Design Process?	274
	How Much Functional Design Is Enough?	276
	How Would Initial Functional Design Be Conducted for SafeHomeAssured.com?	277
	Functional Architecture	279
	What Does a Functional Architecture Look Like?	280
	How Do We Develop the Functional Architecture?	280
	What About Functionality for Exception Handling?	282
	Can Architectural Patterns Be Used During Functional Design?	284

	Detailed Functional Design	286
	How Can WAE Modeling Be Used for Detailed Design?	286
	Why Is WebML Appropriate for Workflow Modeling?	287
	State Modeling	291
	Where We've Been . . . Where We're Going	294
CHAPTER 12	Construction and Deployment	296
	Construction and Deployment within the WebE Process	297
	What Is the Interplay Between Construction and Deployment?	297
	What Role Do Deployment Environments Play?	299
	Construction	302
	Is There a Generic Set of Construction Tasks?	303
	What Is <i>Refactoring</i> and How Should It Be Applied?	303
	Construction Principles and Concepts	305
	Deployment	308
	Is There a Generic Set of Deployment Tasks?	308
	What Deployment Principles Should Guide the WebE Team?	309
	How Are Version Control and CMS Used?	311
	Construction and the Use of Components	312
	What Is a Generic Component?	313
	How Is an Object-Oriented Component Defined?	313
	How Is a Conventional Component Defined?	315
	What Are the Characteristics of a "Good" Component?	316
	Component-Level Design Guidelines	318
	Component Design Steps	320
	Where We've Been . . . Where We're Going	323
CHAPTER 13	Design Patterns	326
	Patterns: Understanding the Concept	326
	What Exactly Is a Pattern?	327
	What Does a Pattern Look Like?	328
	WebApp Patterns: Design Focus and Granularity	329
	How Is Design Focus Used to Identify Patterns?	329
	Why Is Granularity an Important Characteristic of a Pattern?	330
	Pattern Repositories	331
	What Is a Patterns Repository?	331
	What Patterns Sources Are Available for Web Engineers?	331
	Can a WebE Team Create Its Own Set of Patterns?	332
	How Do We Find and Use Patterns?	334
	Example Patterns	336
	Is It Possible to Define Patterns That Address Problems at the Business Level?	336
	Since Interaction Is Pervasive, There Must Be Many Interaction Patterns. True?	336
	What Navigation Patterns Are Available?	341
	Where Do Content and Presentation Patterns Fit In?	344
	Where We've Been . . . Where We're Going	347

CHAPTER 14	Technologies and Tools	348
	General Issues	348
	How Does Separation of Concerns Impact Tools and Technologies?	349
	Which Technology—Open Source or Proprietary?	350
	What Is the Impact of Application Categories on WebE Technology?	351
	Implementation Tools and Technologies	352
	What Are Application Frameworks?	353
	How Are Content Management Systems and Version Control Technologies Applied?	354
	What If a Search Capability Must Be Provided with Our WebApp?	354
	Development Tools and Technologies	355
	Can I Acquire Tools That Will Help Me with the Modeling Activity?	355
	Are There Testing Tools That Focus Specifically on WebApps?	356
	Are There Tools That Can Assist with the Management of the WebE Process?	357
	Where We've Been . . . Where We're Going	358
CHAPTER 15	Testing WebApps	359
	Testing Concepts	359
	What Are the "Dimensions" of Quality?	360
	What Types of Errors Occur within a WebApp Environment?	361
	What Testing Strategy Should We Apply?	361
	How Much Test Planning Is Necessary?	362
	The Testing Process—An Overview	363
	Content Testing	367
	What Are the Objectives of Content Testing?	367
	How Is Database Testing Used to Validate Content?	368
	User Interface Testing	370
	Is There a Viable Interface Testing Strategy?	371
	How Do We Test Specific Interface Mechanisms?	371
	How Do We Test Interface Semantics?	374
	Usability Testing	375
	Compatibility Testing	378
	Component-Level Testing	379
	Navigation Testing	381
	How Do We Test Navigation Syntax?	381
	How Do We Test Navigation Semantics?	382
	Configuration Testing	384
	How Do We Test the Server Side?	385
	How Do We Test the Client Side?	386
	Security and Performance Testing	386

	How Do We Determine if the WebApp Is Secure?	387
	How Should We Test WebApp Performance?	389
	What Are the Objectives of Performance Testing?	390
	How Does Load Testing Assess Performance?	390
	How Does Stress Testing Assess Performance?	391
	Where We've Been . . . Where We're Going	396
CHAPTER 16	Change and Content Management	397
	Change	397
	What Are the Attributes of a "Change"?	398
	Why Are Changes Requested?	398
	What Elements of the WebApp Change?	399
	Change Management for Web Engineering	399
	Why Do We Need Change Management?	400
	What Issues Should We Consider?	400
	What Is the Basic Change Management Activity?	402
	How Should We Identify the Objects That Will Change?	402
	How Should We Control a Change That Is About to Be Made?	403
	How Do We Manage Different Versions of the WebApp or Its Components?	406
	How Can a WebE Team Ensure That a Change Has Been Properly Implemented?	407
	How Do We Let Stakeholders Know What Changes Have Been Made?	407
	Content Management	408
	How Is a Content Management System Used?	408
	What Are the Major Elements of a CMS?	409
	Criteria for Implementing a CMS	412
	How Does Volume Affect Content Management?	413
	Does the Population of Content Creators Have an Effect on CMS?	414
	How Does the Change Volume Affect the Formality of Change Management?	415
	How Does Publication Volume Affect Content Management Formality?	415
	Where We've Been . . . Where We're Going	419
CHAPTER 17	Future Directions	419
	The Changing Nature of the Web and WebApps	419
	How Will Delivery of Web-Based Content and Functionality Change?	420
	How Will WebApps Change?	420
	What Will Web Engineers Have to Do to Accommodate These Changes?	421
	Can the Web Serve as a Platform for Application Software?	422

Can the Future Web Be an OS?	423
How Will the "Semantic Web" Change Things?	424
Evolving Web Technologies and Web 2.0	425
What Is Web 2.0?	425
What Technologies Support Web 2.0?	427
What Are Some Key Issues That Should Be Considered as Technology Evolves?	431
What's Next for Web 2.0?	432
One View of the Future	433
The Changing Nature of Web Engineering	435