

Contents

| | |
|----------|---|
| 1 | Goal-Directed Product and Service Design 3 |
| | Digital Product and Service Design 4 |
| | Goal-Directed Design 6 |
| | Origins of Goal-Directed Design 6 |
| | Components of Goal-Directed Design 7 |
| | Summary 13 |
| 2 | Assembling the Team 15 |
| | The Design Team 16 |
| | Interaction designers 17 |
| | Visual interface designer 21 |
| | Industrial designer 22 |
| | Design team lead 24 |
| | Close Collaborators 25 |
| | Project owner 25 |
| | Design engineer 26 |
| | Business or systems analyst 27 |
| | Subject matter expert 28 |
| | Usability tester 28 |
| | Other Product Team Members 28 |
| | When You Don't Have the Ideal Team 29 |
| | Understaffed design team 29 |
| | No design engineers or subject matter experts 30 |
| | No clear project owner 30 |
| | Too many people in working meetings 31 |
| | Summary 32 |
| 3 | Project Planning 35 |
| | The Ideal Project Starting Point 36 |
| | Determining Your Project's Parameters 37 |
| | Revenue or cost focus 37 |
| | Desire to innovate 37 |
| | Length of time horizon 37 |
| | Understanding the problem before solving it 38 |
| | Willingness to invest 38 |
| | Risk factors 39 |

| | | |
|----|---|---|
| 1 | Developing the Project Plan 39 | Project Management for Stakeholder Interviews 85 |
| 2 | Sum Research 40 | When You Can't Interview Stakeholders 85 |
| 3 | Modeling and requirements definition 42 | Summary 85 |
| 4 | Framework definition 44 | Planning User Research 85 |
| 5 | Detailed design 46 | Identifying the Number and Type of Interviews 85 |
| 6 | Ongoing support 49 | Step 1: Identify likely users 85 |
| 7 | Summary 49 | Step 2: Determine the next step to interview 85 |
| 8 | Research Fundamentals 51 | Step 3: Identify key topics 85 |
| 9 | Benefits of Doing Research 52 | Step 4: Trim the sample and objectives 85 |
| 10 | Barriers to Doing Design Research 52 | Step 5: Adjust for on-site and boot interviews 85 |
| 11 | "It will cost too much and take too long." 52 | Introducing the Research Design Toolkit 85 |
| 12 | "We already did market research." 52 | Consumer devices and services 85 |
| 13 | "Our subject matter experts know the users." 54 | Business applications 85 |
| 14 | Components of Design Research 54 | Research and Selection 85 |
| 15 | User Research Methods 54 | Engaging sites 85 |
| 16 | Sum Usability testing 56 | Recruiting individuals 85 |
| 17 | Focus groups 56 | The interviewee 85 |
| 18 | Individual interviews 56 | Dealing with Challenges 85 |
| 19 | Direct observation 56 | Summary 85 |
| 20 | Combining observation and interviews 57 | |
| 21 | The Research Team 58 | |
| 22 | Essential Research Skills 59 | |
| 23 | Active listening 59 | |
| 24 | Capturing the data 62 | |
| 25 | Summary 63 | |
| 26 | Understanding the Business 65 | |
| 27 | Identifying Stakeholders and Scheduling Interviews 67 | What to do in user interviews 85 |
| 28 | Officially "Kicking Off" the Project 69 | Scheduling the need interview 85 |
| 29 | Conducting Stakeholder Interviews 70 | Getting stakeholders' introductions 85 |
| 30 | Getting started 70 | Establish interview topics 85 |
| 31 | Things to watch out for 71 | Preparing for the brief brief 85 |
| 32 | Topics applicable to most stakeholders 71 | Meeting up with interview 85 |
| 33 | Marketing stakeholders 73 | Dealing with difficult interviewees 85 |
| 34 | Engineering stakeholders 76 | Project Management for Interviews 85 |
| 35 | Sales stakeholders 77 | Between interviews 85 |
| 36 | Senior executives 78 | Selling issue 85 |
| 37 | Subject matter experts 79 | Team roles and responsibilities 85 |
| 38 | Other product team members 80 | Communication Outlets 85 |
| 39 | | Summary 85 |

| | | | | |
|---|--|-----|--|-----|
| 1 | Project Management for Stakeholder Interviews | 82 | Developing the Project Plan | 82 |
| | When You Can't Interview Stakeholders | 83 | Research | 83 |
| | Summary | 83 | Methodology and Interviewer Definition | 83 |
| 2 | Planning User Research | 85 | Framework | 85 |
| | Identifying the Number and Type of Interviewees | 85 | Design | 85 |
| | Step 1: Identify likely roles | 86 | Summary | 86 |
| | Step 2: Determine the base number of interviewees per role | 87 | | |
| | Step 3: Multiply for important factors | 90 | Research Fundamentals | 90 |
| | Step 4: Trim the sample and incorporate other factors | 94 | Benefits of Doing Research | 94 |
| | Step 5: Adjust for no-shows and poor interviews | 98 | Games of Good Design | 98 |
| 3 | Introducing the Practice Design Problems | 98 | It Will Cost You Money and Time to Do It Right | 98 |
| | Consumer device and service: LocalGuide | 98 | We Already Did Most of the Research | 98 |
| | Business application: Room Finder | 99 | Our Solutions Were Objects from the Past | 99 |
| 4 | Recruiting and Scheduling | 100 | Components of Design Research | 100 |
| | Enterprise site visits | 101 | User Research Methods | 101 |
| | Recruiting individuals | 104 | Usability Testing | 104 |
| | The interview schedule | 109 | Focus Groups | 109 |
| 5 | Dealing with Challenges | 110 | Individual Interviews | 110 |
| | Summary | 111 | Direct Observation | 111 |
| 6 | Understanding Potential Users and Customers | 113 | Comparing Approaches and Interviewers | 113 |
| | Interviewing Customers in a Business Environment | 113 | The Research Team | 113 |
| | Useful questions for customers | 115 | Executive Research | 115 |
| | What not to do when interviewing customers | 117 | Active Listening | 117 |
| 7 | Interviewing and Observing Prospective Users | 118 | Comparing the Two | 118 |
| | The interview setting | 118 | Summary | 118 |
| | Essential techniques | 118 | | |
| | What not to do in user interviews | 123 | Understanding the Business | 123 |
| | Structuring the user interview | 124 | Interviewing Stakeholders and Sectors | 124 |
| | Getting started: introductions | 124 | Off-the-Shelf Interview | 124 |
| | Essential interview topics | 128 | Comparing Stakeholder Interviews | 128 |
| | Observation and the guided tour | 142 | Getting Started | 128 |
| | Wrapping up the interview | 146 | Topics of Interest | 146 |
| | Dealing with challenging interview circumstances | 146 | Marketing Stakeholders | 146 |
| 8 | Project Management for Interviews | 151 | Engaging Stakeholders | 151 |
| | Between interviews | 151 | Scaling Stakeholders | 151 |
| | Staying sane | 152 | Senior Executives | 152 |
| | Team roles and responsibilities | 152 | Stakeholder Expenses | 152 |
| | Communicating outside the team | 152 | Other Budget Team Members | 152 |
| | Summary | 153 | | |

| | | | |
|-----------|---|-----------------------|--|
| 8 | Example Interview 155 | and Other Methods 326 | Creating Personas 343 |
| | Summary 181 | | Step 1. Divide interviewee by role 11 approaches 344 |
| 9 | Other Sources of Information and Inspiration 183 | | Step 2. Identify patterns and themes 345 |
| | When You Have Less Time 183 | | Step 3. Map interviewee 346 |
| | When You Have More Time 184 | | Step 4. Identify patterns 347 |
| | Supplemental Research Methods 185 | | Step 5. Classify differences 348 |
| | Public-space observation 185 | | Step 6. RII in other persona 349 |
| | Mystery shopper 187 | | Step 7. Group and prioritize needs 350 |
| | Diaries 188 | | Step 8. Develop the interviewee 351 |
| | Surveys 188 | | Available from 352 |
| | Web analytics and customer support data 193 | | When Time is Limited: Provisional Persona 353 |
| | Focus groups 194 | | Personas 354 |
| | Card sorting 196 | | Project Management for Creating Personas 355 |
| | Competitive products and services 197 | | Summary 356 |
| | Literature and media 198 | | |
| | Summary 199 | | |
| 10 | Making Sense of Your Data: Modeling 201 | | |
| | Synthesizing Stakeholder Findings 202 | | Reducing Redundancy 360 |
| | Topics to cover 202 | | Reducing Redundancy 360 |
| | Handling controversy 203 | | Reducing Effective Redundancy 360 |
| | Preparing to communicate stakeholder findings 206 | | Sources of Redundancy 360 |
| | Analyzing Customer and User Data 207 | | Types of Redundancy 360 |
| | Qualitative analysis 207 | | The Process for Generating Redundancy 360 |
| | Quantitative analysis 217 | | Bringing 360 |
| | Explanations and relationships 222 | | Scenarios 360 |
| | Risks and opportunities 224 | | Why Use Scenarios 360 |
| | Preparing to communicate your user findings 224 | | How Cost-Effective Scenarios 360 |
| | Project Management during Modeling 225 | | Creating Effective Context Scenarios 360 |
| | Summary 226 | | Extrapolating Redundancy from Scenarios 360 |
| 11 | Personas 229 | | Other Redundancy from Personas 360 |
| | Definition and Uses 229 | | Personas 360 |
| | What personas are good for 231 | | Modeling 360 |
| | Why personas work 234 | | Evaluating 360 |
| | What personas are not 236 | | Hi-level and low-level 360 |
| | How many personas do I need? 238 | | Skills and Knowledge 360 |
| | How often do I need to create personas? 239 | | Goals 360 |
| | Personas who aren't users 240 | | |

| | | |
|--|-----------------------------------|---|
| Creating Personas 242 | Stakeholder interviews 242 | Example interview 243 |
| Step 1. Divide interviewees by role, if appropriate 244 | | Summary 245 |
| Step 2. Identify behavioral and demographic variables 247 | | Other sources of information 247 |
| Step 3. Map interviewees to variables 252 | | What You Have Time 248 |
| Step 4. Identify patterns 256 | | Supplementary 248 |
| Step 5. Define goals 265 | of interviewees 256 | Public-space 248 |
| Step 6. Clarify distinctions and add detail 268 | | Maya's 248 |
| Step 7. Fill in other persona types as needed 275 | | Diaries 248 |
| Step 8. Group and prioritize user personas 276 | | Surveys 248 |
| Step 9. Develop the narrative and other communication 279 | | Web surveys and collector 248 |
| Validating your personas 292 | | Focus groups 248 |

When Time Is Limited: Provisional Personas **294**

Persona Pitfalls **295**

Project Management for Creating Personas **296**

Summary **297**

Defining Requirements **299**

The Problems with Requirements **299**

Requirements cannot be “gathered” **299**

Requirements are not features **300**

Requirements are not specifications **301**

Generating Effective Requirements **302**

Sources of requirements **302**

Types of requirements **302**

The process for generating requirements **304**

Brainstorming **308**

Scenarios **308**

Why use scenarios? **309**

How Goal-Directed scenarios differ from similar tools **309**

Crafting effective context scenarios **311**

Extracting requirements from scenarios **322**

Other Requirements from User Personas **326**

Mental models **326**

Environments **326**

Physical and cognitive characteristics **327**

Skills and knowledge **327**

Goals **327**

Summary **333**

Interviews and questionnaires **325**

Communicating outside the team **325**

Summary **333**

| | |
|---|-----|
| Requirements from Business and Other Needs | 328 |
| Customer persona goals | 329 |
| Stakeholders | 329 |
| Lawyers and regulations | 330 |
| Competitors and media | 330 |
| Accessibility | 330 |
| Sustainability | 330 |
| Experience Attributes | 331 |
| Step 1: Compile desirable qualities from research | 334 |
| Step 2: Group related qualities into clusters | 335 |
| Step 3: Refine and filter clusters | 336 |
| Step 4: Optimize terms to guide visual decisions | 337 |
| Step 5: Choose the best term from each cluster | 338 |
| Step 6: Describe and optimize relationships | 339 |
| Step 7: Develop additional communication tools | 341 |
| Project Management for Developing Requirements | 347 |
| Summary | 349 |

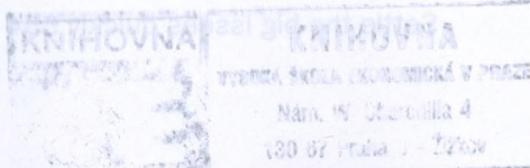
13

Putting It All Together: The User and Domain Analysis 351

| | |
|--|-----|
| Typical Structure | 352 |
| Introduction of the project parameters | 353 |
| Research activities: what you did | 354 |
| Research findings: what you learned | 356 |
| Personas | 360 |
| Context scenarios | 362 |
| Requirements | 362 |
| Next steps | 363 |
| Developing an Effective Document | 365 |
| Developing an Effective Presentation | 366 |
| Conducting the Meeting | 368 |
| Before the meeting | 368 |
| Delivering the presentation and leading the discussion | 368 |
| Project Management for Developing the U&DA | 375 |
| Summary | 375 |

| | | |
|-----------|--|---|
| 14 | Framework Definition: Visualizing Solutions 377 | Requirements from business 377 |
| | Essential Principles of Framework Definition 378 | Customer personas 378 |
| | Consider the whole system at once 378 | Stakeholders 378 |
| | Learn by sketching and failing 379 | Frameworks and technologies 379 |
| | Focus on structure, not details 381 | Complexities and members 380 |
| | Design for the long term 382 | Accessibility 380 |
| | Process Overview for Framework Definition 383 | Generalizability 380 |
| | Process for design on a novel platform 384 | Excellence attributes 381 |
| | Process for design on a known platform 384 | Step 1: Compose design briefs 381 |
| | Process for designing services 385 | Step 2: Group design directions 381 |
| | Project Management for Framework Definition 385 | Step 3: Rotate and filter options 382 |
| | How many directions to explore 385 | Step 4: Optimize future of blueprints 382 |
| | Planning your time 386 | Step 5: Choose the best from each 382 |
| | Essential Skills for Framework Definition 390 | Step 6: Develop communication 383 |
| | Sketching and storyboarding 390 | Project Management for development 383 |
| | Collaboration 393 | Summary 383 |
| | Capturing what happens in meetings 399 | |
| | Summary 403 | |
| 15 | Principles and Patterns for Framework Design 405 | Principles 405 |
| | The Importance of Context 405 | Importance of context 405 |
| | Principles for Form and Behavior 406 | Importance of context 405 |
| | Design values 407 | Personas 406 |
| | Minimizing unnecessary work 410 | Personas 406 |
| | Patterns for Form and Behavior 413 | Context scenarios 406 |
| | Organizing objects and activities 413 | Relationships 406 |
| | Combinations of patterns 421 | Next steps 406 |
| | Organizing by nouns or verbs 421 | Developing an effective document 406 |
| | Additional ways to manage real estate 421 | Developing an effective presentation 406 |
| | Summary 423 | Developing the message 406 |
| 16 | Designing the Form Factor and Interaction Framework 425 | Designing the interface 425 |
| | IxDG and IxDS: Define Data Object Types and Relationships 428 | Design management 425 |
| | Full Design Team: Define Possible Functional Elements 433 | Summary 425 |
| | Functional elements in product design 435 | |
| | Functional elements in service design 436 | |
| | Making decisions 437 | |

| | |
|---|--|
| Full Design Team: Define Possible Platforms 438 | Developing the Design Language 18 |
| Input and output methods 441 | The Process of Developing the Design Language 18 |
| Other form factor considerations 443 | Focus for Implementation 19 |
| Full Team: Brainstorm with Sketches 443 | Determining how many iterations are needed 19 |
| Brainstorming for software on a fixed platform 445 | Determining Which Iterations 19 |
| Brainstorming for services and new platforms 445 | Deciding Which Iterations 19 |
| ID: Refine the Form Factor 449 | Adjusting for context as needed 19 |
| IxDG and IxDs: Define the Interaction Framework 450 | Begin to refine the attributes 19 |
| Develop a first draft of the framework 450 | Adjust for secondary attributes 19 |
| How to approach specific design situations 464 | Review, iterate, and refine 19 |
| Full Design Team: Iterate Form and Behavior Together 471 | Examples: Executive Telephones 20 |
| Typical Challenges in Designing the Framework 472 | Project Management 20 |
| Project Management for Defining Platforms and Frameworks 473 | Summary 20 |
| Internal design team check-ins 473 | Bringing Stakeholders and Developers 20 |
| Project owner, SME, and design engineer review 474 | Meeting Design 20 |
| User feedback 476 | Reviewing the Goal 21 |
| Summary 477 | Reviewing Stakeholders and Developers 21 |
| 17 Principles and Patterns in Design Language 479 | Reviewing the Goal 21 |
| General Principles 479 | Reviewing Stakeholders and Developers 21 |
| Visual information + context = meaning 480 | Introducing the Principles 479 |
| Visually communicate what elements do 480 | Visuals 479 |
| Have a purpose for every element and a reason for every decision 481 | Reviewing key responses and behaviors 479 |
| Repeat elements for unity 482 | Introducing the Principles 479 |
| Be decisive, but use the smallest effective difference 483 | Visuals 479 |
| Patterns and Principles for Specific Elements 484 | Introducing the Principles 479 |
| Color 484 | Managing Your Time and Prioritizing 484 |
| Size 488 | Countering the Meaning 484 |
| Shape 489 | Measuring the Impact 484 |
| Line weight and style 489 | Facilitating Decision Making and Providing Guidance 484 |
| Type 491 | Summary 484 |
| Texture 491 | Summary 484 |
| Images 491 | Design Design: Making Your Ideas Real 485 |
| Materials and manufacturing 492 | Designing Principles of Design 485 |
| Signature elements 493 | Collaborate, Communicate, Co-Develop 485 |
| Summary 494 | Design of Complex Ideas 485 |
| Accomplishing the goal 494 | Designing a Second Time 485 |
| The last step: Something 494 | Design for the Shorter Time Horizon 485 |
| Summary 495 | Design for the Shorter Time Horizon 485 |



18

Developing the Design Language 497

The Process of Developing the Design Language 497

Look for inspiration 499

Determine how many directions to share 500

Determine what elements to represent 501

Decide what choices best represent primary attributes 502

Adjust for context as needed 502

Begin to render the studies 502

Adjust for secondary attributes as needed 503

Review, iterate, and finalize options to present 503

Example: NetApp 503

Example: Executive Telephone 509

Project Management for Design Language Exploration 513

Summary 513

19

Communicating the Framework and Design Language 515

Preparing Stakeholders for the Meeting 516

Crafting the Story 517

Project summary and expectations 519

Review key personas and requirements 519

Introduce the big ideas and major anatomy 521

Show how it works using scenario storyboards 529

Revisit anatomy in more detail 534

Describe how the design serves persona needs 536

Introduce the design language(s) 537

Discuss and get agreement on direction and next steps 541

Managing Your Time and Preparing for the Meeting 542

Conducting the Meeting 544

Presenting the material 544

Facilitating discussion and handling concerns 545

Summary 549

20

Detailed Design: Making Your Ideas Real 551

Essential Principles of Detailed Design 552

Collaborate, collaborate, collaborate 552

Drive to complete detail, but maintain a systems view 552

Touch everything a second time after it's documented 553

Design for the appropriate time horizon 554

Settle the big issues quickly 554

| | | |
|----|---|--|
| 21 | Consider the cost-benefit equation 555 | Design Details and Project Phases and Projects 555 |
| | Reinforce the experience attributes 556 | Develop the Interaction Details Round One 556 |
| | Process and Project Management for Detailed Design 556 | Supplementary Resources 556 |
| | Expanding the team 556 | Detailed design methods 556 |
| | Integration with engineering methods 557 | Additional iteration through individual 557 |
| | Typical detailed design tasks by role 560 | Detailing the Visual System 560 |
| | Drafting a work list and detailed project plan 563 | Incorporating safety features 563 |
| | Summary 569 | The visual system first draft: legible, clear, and consistent 569 |
| 22 | Detailed Design Principles and Patterns 571 | Counting the expansion and iteration 569 |
| | Principles: a Bit of Science, a Bit of Common Sense 571 | Principles, iteration, and the 571 |
| | Communicating Flow, Priority, and Relationships 573 | Sharing Images 573 |
| | Map visual flow to workflow 574 | Relating the form and materials 574 |
| | Align elements for readability and simplicity 575 | Relating color and shape to 575 |
| | Use visual properties to establish a clear hierarchy 576 | Abstraction models 576 |
| | Use visual properties to establish association 578 | Design Review and Collaboration 578 |
| | Communicating Data: Information Design 579 | Writing effective 579 |
| | Using Icons to Communicate about Objects and Tools 582 | With design guidelines 582 |
| | Making icons recognizable 582 | With other stakeholders 582 |
| | Making icons understandable 583 | Remote collaboration 583 |
| | A summary of useful icon guidelines 585 | Iteration After Feedback 585 |
| | Text and Type 586 | Common Challenges During Detailed Design 586 |
| | Type size 587 | How to fix it 587 |
| | Additional principles 587 | Unreadable or illegible 587 |
| | Widgets and Data Entry 588 | Spelling mistakes 588 |
| | Use widgets appropriate to the task and input method 588 | Poor user guides 588 |
| | Allow flexible input even in bounded widgets 592 | Confusing with a brand 592 |
| | Use custom controls only with good reason 592 | Inconsistent depth 592 |
| | Considerations for touch screens 593 | Putting user work in the wrong place 593 |
| | Managing Large Data Sets 594 | Summary 594 |
| | Search versus categories 594 | |
| | Detailed queries 595 | Evaluating Your Design 595 |
| | Audible and Speech Interfaces 596 | Myth, Myth, and Myth of Evaluation 596 |
| | Personality, emotion, and anthropomorphism 596 | Types of Evaluation 596 |
| | Minimizing frustration 598 | Focus groups 598 |
| | Products Involving Safety Concerns 600 | Expert review 598 |
| | Accessibility 602 | Usability testing 598 |
| | "That Little Extra Something" 602 | Comparative evaluations 598 |
| | Summary 603 | Summary 603 |

22

| | |
|---|-----|
| Detailed Design Process and Practices 605 | 605 |
| Evolving the Interaction Design: Round One 605 | 605 |
| Supplemental research 607 | 607 |
| Detailed design meetings 608 | 608 |
| Additional iteration through individual work 616 | 616 |
| Defining the Visual System: Round One 618 | 618 |
| Incorporating early stakeholder feedback 619 | 619 |
| The visual system first draft: archetype screens 619 | 619 |
| Continued expansion and evolution 632 | 632 |
| Personas, scenarios, and experience attributes 632 | 632 |
| Shared Image Files 633 | 633 |
| Evolving the Industrial Design 635 | 635 |
| Refining the form and materials 636 | 636 |
| Refining color and surface details 638 | 638 |
| Appearance models as design and communication tools 639 | 639 |
| Design Reviews and Collaboration 640 | 640 |
| Within the design team 640 | 640 |
| With design engineers, SMEs, and business analysts 642 | 642 |
| With other stakeholders 643 | 643 |
| Remote collaboration 643 | 643 |
| Iteration After Feedback 644 | 644 |
| Common Challenges During Detailed Design 644 | 644 |
| Framework flaws 644 | 644 |
| Unavailable or unhelpful SMEs or engineers 645 | 645 |
| Shifting assumptions and constraints 645 | 645 |
| Team member time management 645 | 645 |
| Consistency within a brand or product family 646 | 646 |
| Uneven depth 646 | 646 |
| Using later work to improve earlier work 647 | 647 |
| Summary 647 | 647 |
| Summary 647 | 647 |

23

| | |
|-------------------------------------|-----|
| Evaluating Your Design 649 | 649 |
| Why, When, and What to Evaluate 649 | 649 |
| Types of Evaluation 650 | 650 |
| Focus groups 650 | 650 |
| Expert reviews 651 | 651 |
| Usability testing 652 | 652 |
| Comparative evaluations 656 | 656 |
| Summary 657 | 657 |
| Summary 657 | 657 |

24**Communicating Detailed Design 659**

- The Form and Behavior Specification **660**
 - Background **662**
 - Executive summary **662**
 - Personas and critical requirements **663**
 - Product or service overview **663**
 - Interaction framework overview **663**
 - Scenarios for each interface **665**
 - Overview and details for each screen or function **666**
 - Visual system or style guide **669**
 - Ways to expand or cut back: the F&BS as a product roadmap **674**
 - Qualities of an Effective Spec **675**

Prescriptive, not suggestive **675**

Clear and professional, not pretentious **676**

Unsurprising **676**

Persona-focused **676**

Standardized **677**

Effectively formatted **677**

Documentation Process and Practices **678**

Documenting as you go **679**

Managing images **680**

Technical review and document QA **680**

Documentation tools **680**

Presenting Detailed Design **681**

Structuring and delivering a stakeholder presentation **681**

Comprehensive walkthroughs **682**

Summary **683**

25**Supporting Implementation and Launch 685**

Supporting Software Construction **686**

Asset production **686**

Questions and reviews **687**

Supporting Hardware Manufacturing **688**

Common Challenges **688**

Specification as suggestion **688**

Insufficient engineering skills or resources **689**

Summary **691**

26**Implementing Design 691**

- Realizing Your Own Design Potential **693**
 - Background **693**
 - Adaptive design **693**
 - Being by the book **693**
 - digital artifacts **693**
 - Explaining design **693**
 - Experiencing design **693**
 - Evolving design **693**
 - Feedback **693**
 - Iteration **693**
 - Planning **693**
 - Prototyping **693**
 - Specifying **693**
 - Testing **693**
 - Tooling **693**
 - Using **693**

Prescriptive, not suggestive **693**

Clear and professional, not pretentious **696**

Unsurprising **696**

Persona-focused **696**

Standardized **697**

Effectively formatted **697**

Documentation Process and Practices **698**

Documenting as you go **698**

Managing images **699**

Technical review and document QA **699**

Documentation tools **699**

Presenting Detailed Design **700**

Structuring and delivering a stakeholder presentation **700**

Comprehensive walkthroughs **701**

Summary **703**

27**Implementation 703**

Supporting Software Construction **705**

Asset production **705**

Questions and reviews **705**

Supporting Hardware Manufacturing **706**

Common Challenges **706**

Specification as suggestion **706**

Insufficient engineering skills or resources **707**

Summary **709**

Improving Design Capabilities in Individuals and Organizations 693

Realizing Your Own Design Potential 693

Academic programs 695

Self-education 696

Experience and mentoring 697

Expanding Design's Role in an Organization 697

Characteristics of successful change efforts 698

Overcoming the sense of loss 699

Instigating change from the bottom (or the middle) 701

Concluding Thoughts 708

Industrial Design 630

Defining the form and materials 630

Defining color and surface profile 630

Appearance models as design and communication tools 630

Design Reviews and Collaboration 640

Within the design team 640

With design engineers, SMEs, and business analysts 640

With other stakeholders 643

Remote collaboration 643

Iteration After Feedback 644

Common Challenges During Detailed Design 646

Fragmented focus 646

Unavailable or unreliable SMEs or engineers 646

Shifting requirements 646

Team member time management 646

Consistency within a brand or product family 646

Design depth 646

Using later work to improve 646

Summary 647

Evaluating Your Design 649

Why, When, and What to Evaluate 649

Types of Evaluation 650

Focus groups 650

Expert review 651

Usability testing 652

Comparative evaluations 653

Summary 657