

Web

Application Design Handbook

Best Practices for Web-Based

Software

Susan FOWLER Victor STANWICK



CONTENTS

Preface xxiii	
Answering Questions xxiii Trust What You Already Know xxiv	
Predicting the Future xxiv	
A Short History of Visualization xxv	
Visuals Provide More Context xxvi	
Visuals Encourage Pattern Recognition xxvii	
Visuals Speed Up Decisions xxviii	
Acknowledgments xxix	
CHAPTER 1	
What is a Web Application?	
What's the Difference Between a Web Page and a Web Application?	1
What Difference Does the Platform Make? 4	
Technical Note: Pros and Cons of Web Application Coding Systems	9
The Tentative Answer 12	
Where Does My Program Fit? 13	
What Is the Nature of the Relationship? 13	
What Is the Conversation Like? 17	
What Is the Nature of the Interaction? 17	
What Are the Technical Requirements? 17	
How Often Is It Used? 18	
What Is the Expected Response Time (or the Perceived Distance)?	18
Are These Interactions in Real Time? 19	
How Much Help Will the Users Need? 19	
What Is the Interaction Style? 19	
What Should It Look Like? 20	

21

Does It Follow Any Standards?

How Intense Is This Interaction? 22	
What Should This Application Look Like?	22

CHAPTER 2

The Draweer Framework

THE Drowser Framework 25
Browser Window: A Conceptual Model 25
Parts of a Browser Window 26
Technical Note: Preventing Downloads 27
Parts of the Content Area 27
A Note About Navigation 29
Make Home Easy to Find 29
Put Local Navigation on the Left 30
Put Site-Wide Navigation on the Top 32
Repeat Links on the Bottom 33
Try Putting Advertising Banners in More Than One Spot
Overall Design Issues 34
Consider User Roles 34
Size Windows Correctly 35
Make Pages Printable 39
Technical Note: If You Must Use Tables 39
Use the Right Colors 40
Make Sure the Application Can Be Localized 41
Make Sure Pages Are Accessible 46
Technical Note: How to Create Bread Crumbs 50

50

Technical Note: How to Create the Window-Size Markers

Technical Note: Use CSS to Format Pages Correctly

34

54

CHAPTER 3

Data Input: Forms 59

Use Standard Separators

51

Code Sample

Conceptual Model: Lists vs. Objects 59	
Data-Input Forms: The Basics 60	
Use Fields to Collect Free-Form Information	62
Know the Various Field Types 62	
Standard Field, Defined 62	
General Design Guidelines 62	
Make Entry Areas the Right Size 63	

Don't Make Users Format Text 64
Provide Keyboard as Well as Mouse Navigation 65
Retain Cut, Copy, and Paste 65
Label Fields Correctly 66
How to Label Data-Input Forms 66
How to Label e-Commerce Forms 66
Accommodate Less Experienced Users 68
Use Different Labeling Strategies for International Forms 69
Make Sure Labels Are Correctly Tied to Their Fields 69
How to Group Fields 70
Complexity is Not Necessarily Bad 71
Offer Automated Entry Fields 72
How to Show Protected Fields 73
Required Field, Defined 76
Use Required Fields Sparingly 76
How to Indicate a Required Field 77
Offer Defaults Whenever Possible 78
How Not to Indicate a Required Field 80
How to Provide Feedback for Required Fields 80
Prevent Input Errors With Dropdown Lists 83
When to Use Dropdown Lists 83
Check Your Lists for Typos and Other Errors 84
Put Lists in Order 85
When to Use Regular Lists Rather Than Dropdown Lists 85
Prevent Input Errors With Checkboxes 86
Checkbox Groups: Doing the Numbers 90
Be Careful How You Toggle 90
Use Opposites Only 90
Don't Use Negatives (You'll Create a Double Negative by Mistake) 91
Prevent Input Errors With Radio Buttons 91
"I Want Nothing!" 92
Make Your Checkboxes and Radio Buttons More Accessible 92
When to Use Tabs Instead of Pages 94
Guidelines for Tabs 95
When to Use Popups 96
Use Popups to Offer Information 97
Follow These Popup Guidelines 98
Stay on Top 99
Three Traditional Popup Buttons 100
Use Standard Button order 100

How to Do Dates, Addresses, and Other Standard Input 101
Dates: Use Calendar Popups and a Day-Month-Year Format 101
What Are the Standard Elements of Names and Addresses? 102
Numbers Are Handled Differently in Different Cultures 103
Credit Card Numbers Are the Same, Except When They're Different
Guidelines for Buttons 106
Use Buttons to Do Things, Use Links to Jump to Other Web Pages 106
How to Size Buttons 106
Set Buttons Off from Fields 107
Repeat Command Buttons at Top and Bottom 108
Be Careful Where You Put the Buttons on Tabs and Frames 109
Capture Multiple Button Presses 109
You Don't Really Need "Reset," Do You? 111
Include a "Find" Button 112
When Losing Input Is Dangerous, Strip Out the Browser Controls 113
Considering Offering Different Levels of Save 115
When to Validate Input 115
Mosaic Pages: Syndication and Links 116
What If Part of Your Application Is Someone Else's Application? 116
When to Warn That a Jump Is Imminent 116
Consider Using Flash to Simplify the Interaction 117
How to be Helpful 118
CHAPTER 4
Data Input: Lists 123
A Simple List 123
List on the Left, Object on the Right 125
Use Split Windows for Navigation as Well as for Lists 125
Consider Heterogeneous Windows 126
Use Lists for Parts of an Object 127
Consider Using Pictures 127
Potential Problems with the List-Object Strategy 129
How to Select the Right List-Object Strategy 130
How to Select and Open Objects from Lists 132
Selecting Multiple Rows 133
How to Change Objects from Lists 135
How to Change Objects from Lists 133 How to Show Actions 136
Where to Put the Actions 138
Use Popups for Secondary Data 139
Ο ε ε οραφε τοι σεσοπααι γ το αια 133

Data Retrieval: Search 141
Searching: Doing the Numbers 141
Search Is Important 141
Internet Searching Is Different from Database Searching 142
Most Searches Are Simple 142
Many Users Make Mistakes 143
Searches Are Shallow (but Don't Have to Be) 143
To Summarize 143
Simple Search: Good for Uncomplicated Retrievals 144
Catch User Errors and Work Around Them 144
Remember the Search 146
Advanced Search: Good for Experienced Users 148
How to Connect Multiple Criteria 149
What If Users Want to Wildcard the Entire Field 150
What Does AND Mean? 151
Don't Make Me Choose 151
I Want None of That 153
Now I Want the Opposite 154
How to Offer Help Politely 154
Complex Search: Good for Difficult Queries 157
Use Progressive Disclosure to Avoid Overwhelming Searchers 157
Who Should See What, or How to Deal with Security 158
You May Need to Provide a Complete View of the Database 160
Results of a Search 161
Provide Feedback 164
What to Do When You Retrieve Too Many Records 164
Watch Out for Slow Performance When Internationalizing 166
Be Careful with Error Messages 168
Should You Offer Wildcards? 170
CHAPTER 6
Data Retrieval: Filtering and Browsing 173

Use Filtering to Control Overloads
Filters Can Be Dangerous
174
Where to Put the Filter
175
How to Save the Filter
177

Use Browsing When the Query Is Fuzzy 177
Make the Most of People's Spatial Abilities 178
Maintain an Overview with Fish-Eye Lenses 179
Provide Database Overviews 182
Clustering and Concept Mapping Are Good for Visual
Thinkers 183
Use Expanded Thumbnails to Make Information Pop Out 183
Offer Better Information by Providing Ratings 184
How to Index and Find Graphical Objects 193
CHAPTER 7
Data Output: Reports 199
Let Users Print Ad Hoc Queries 200
Ad Hoc Reports: Not Just Screenshots 201
Start Database Designs from Reports 201
Aren't We Trying to Get Rid of Paper? 203
Heavy Lifting: Management Reports 203
Home Grown or Store Bought? 205
Should This Be a Summary or a Detailed Report? 207
Should This Be a Comparison? 207
Defining Management Reports 208
Collect Requirements from Old Reports 209
Check for Data That Aren't from the Database 209
Rules for Headers 210
Rules for Footers 211
Rules for the Report's Body 212
Make Sure That Column Headings Are Clear 212
Make Sure the Report Shows Units of Measurement 213
Use the Right Fonts 214
How to Separate Rows Visually without Cluttering the Screen 215
What to Do If the Report Is Too Wide 218
Make Reports Work with Screen-Reading Software 219
Break Up Pages Logically 220
Report Parameters Tell People How the Report Was Created 222

Data Output: Printed Forms 223
Make Changes Hard to Do 224 What Size and Shape Is the Paper? 226 Designing a Form 227
Who Are You, And Why Are You Sending Me Things? Form Headers
Contain Corporate Identity Information 229
Technical Note: Do You Really Want to Embed Fonts in
Web Pages? 230
Put Page Numbers in the Footers 231 Put the Important Information in the Body 231
Email or Post Forms Online 232
Similar of Four forms of thire 252
CHAPTER 9
Interacting With Output 237
Designing the Formatting Window 237
Generating Output 239
Selecting Records for the Report or Set of Forms 240
Scheduling Reports 242
Manipulating Reports 244
Ways to Sort Columns 244
Ways to Change Column Order 248
Saving Output 250 Print for the File Folder 250
Archive Output 251
Save the Criteria for Formats and Output Generation 251
Save Old Data 252
Communication and Distribution 252
Use Email 252
Distribute Information About Access 253
Distribute Knowledge, Not Just Data 253
Export to Text Files 253
Export to Data Files 255

While Generating the Report 261	
When Displaying the Report 262	
CHAPTER 10	
Designing Graphs and Charts 265	
Will This Data Make a Good Graph? 267 Data Rectangles Hold the Information 267 Use Grids If the Data May Be Hard to Read 267 Axes Show the Variables 270 Scales Show Units of Measurement 283 Labels Provide Overall Meaning 293 How to Use and Choose Symbols on Line and Scatterplot Graphs How to Separate Multiple Datasets on Line and Bar Graphs 3 Interactive Methods for Separating Multiple Datasets 307 Use 3D Effects Sparingly 321	297 301
Graph Types Based On Use 325	
Simple Comparisons 325 Bar Chart 325 Horizontal Bar Chart 326 Clustered Bar Chart 327 Zero-Line Bar Chart 328 Pictorial Bar Chart 328 Pareto Diagrams Are Not Bar Charts 328 Changes Over Time 331 Line Graph 331 High/Low/Close 332 Candle Chart 333 Statistical Analysis 334 Histogram 334 Rules for Formatting Histograms 334	
Frequency Polygon 337	

"Printer-Friendly" Versions

260 Before Starting the Report

Solutions

What To Do If There Are Too Many Records in the Report

260

260

Stem-and-Leaf Graphs 339
Scatterplot 340
Bubble Chart 340
Proportion 343
Area Charts 344
Area Charts Are Cumulative 344
Pie Chart 347
Rules for Formatting Pie Charts 348
Donut Chart Variation 350
Segmented Bar Chart 350
Horizontal Segmented Bar Chart 350
Paired Horizontal or Vertical Bar Chart 351
Zero-Line Bar Chart 351
AUA DEFE AS
CHAPTER 12
Designing Diagrams 357
When to Use Diagrams 357
Designing Diagram Software 357
Parts of a Diagram Window 359
Parts of Diagrams 360
Creating Diagrams 371
Provide a Drawing Area 372
Provide a Palette 374
Provide Tools and Commands 382
Let Users Redisplay Diagrams Whenever They Need to 383
Rules for Saving Diagrams 383
Showing Diagrams 383
Provide Filtering Options 384
Provide Panning 384
Provide Zooming 385
Overviews Provide Context 390
Make Diagrams Come Alive 397

Make Diagrams Come Alive 397
Technical Note: Watch Out for the Programming and Networking Aspects of

"Real Programmers, Usability Engineers, Systems Analysts, et Cetera, Don't

Pyramid Histogram

Technical Note: How to Print Large Graphics 408
Technical Note: How to Create a Grayscale Chart 412

403

Graphical Displays

Do Graphics"

Treemaps

450

Diagram Types 413

Cause-and-Effect Diagrams 413 Primary Symbols **Engineering and Scientific Diagrams** 414 Cross Section 415 Cutaway View 415 Elevation View 416 Exploded View 416 Line Drawing 419 Photographs 420 Plan View 423 Schematic 423 Flowcharts 428 Primary Symbols 428 Network Diagrams 429 Primary Symbols 429 Organization Charts 429 Primary Symbols 431 Create Live Organization Charts 432 Don't Restrict Yourself to Hierarchies: The Anti-org Chart 433 Other Hierarchical Charts 434 Software Design Diagrams Data-Flow Diagram 436 Primary Symbols 437 Entity-Relationship Diagram 439 Primary Symbols 440 Variations 440 State-Transition Diagram Primary Symbols 442 Time-and-Activity Charts Primary Symbols Variations 446 Provide Text Versions Create Live Time-and-Activity Charts 450

Designing Geographic Maps 453

When to Use Maps 453

Maps Are Data Made Visual 455

Use Vector Maps to Show Points, Lines, and Areas 457

Technical Note: Flash or SVG? 457

Use Raster Data for Continuous Images and Photos 463

Use Triangles to Analyze Surfaces 468

Data About Data: How Places Are Identified and Shown 472

Separate Information Using Layers 473

Get the Scales Right 476

Pinpoint Locations by Latitude and Longitude 479

Know Your Projections 485

Follow the Rules for Color On Maps 498

How False Colors Are Assigned on Satellite and Aerial Maps 498

Don't Overdo Color 500

Are Four Colors Enough? 501

Know Your Map Data 502

What Types of Data Do You Need? 502

How to Manage Map Error 504

CHAPTER 15

Interacting With Geographic Maps

Viewing Maps 515

Keys Tell Users Where They Are 515

To Maintain Trust, Provide Background Information 522

515

How to Show Errors 523

Acting On Maps 527

Let Users Change the Level of Detail 528

Use Aggregates to Manage Problems 530

CHAPTER 16

Types of Maps 535

Help Users Find Locations 535

On-the-Run Way-Finding: Simultaneous Localization and Mapping

D that detects the second	
Provide Methods, If Necessary, for Measuring Distances	537
Check Whether You Need to Offer Travel Times 538	
Overlay Information On Locations 539	
Show How Data Are Distributed Geographically 541	
Use Either of Two Methods to Show Data 542	
Statistical Maps Have Problems (But There Are	
Solutions) 542	
Use the Right Method for the Data 547	
Attach Data to Points When the Points Are Important	548
Show Distances When Distances Are Important 548	
Use Isolines to Show Bands of Data 549	
Distort Map Sizes to Show Relative Data Sizes 549	
Use 3D Steps to Indicate Data Sizes 549	
Use 3D Contours to Indicate Data Sizes 551	
Use Whatever Works 551	
Provide Decision Support and Analysis 552	
GIS/MLS 552	
Land Use 552	
Customer Relationship Management (CRM) 555	
APPENDIX A	

Web Application Design Worksheets 561

Page-to-Application Continuum 561 Look-An-Feel Continuum 562

APPENDIX B

Quality Testing 565

Accessibility 565 Internationalization 565 Data Input 566 Data Retrieval 568 Data Output 569 Graphs 570 Diagrams 570 Geographic Maps 571 Tests for Data 571

Usability Testing 573

Overall 573
Data Input 573
Data Retrieval 574
Data Output 574
Graphs 575
Diagrams 576
Geographic Maps 576

APPENDIX D

Design Checklists 583

Accessibility 583
Internationalization 584
Data Input 586
Data Output 586
Graphs 589
Diagrams 591
Geographic Maps 594

Glossary 597

References 601

Resources 611

Accessibility 611

Articles, Books, and White Papers 611

Color Vision 612

Effects of Aging 612

Equipment and Technologies 613

Software Platforms 613

Web Sites 613

Cascading Style Sheets 614

Web Sites 614

Books 615

Content Management Systems, Help, Error Management

Graphics and Cognitive Psychology 615
Internationalization 615
Articles, Newsletters, White Papers 615
Bibliographies 616
Books: Cultural Aspects of Internationalization 616
Books: Technical Aspects of Internationalization 617
Code Pages and Character Sets 617
Forums 617
Organizations 617
Quality and Usability Testing 618
Software and Data 618
Technical Documentation and Tutorials 618
Other 618
Web Application Framework 618
Books 618
Development (Not Look-and-Feel) Standards 619
Log File Analysis 619
Look-and-Feel Standards for Web Applications 620
Validators 620
Data Input 620
Auto-Fill 620
Auto-Complete 620
Data Capture 621
Date, Time, Address, and Number Standards and
Internationalization 621
Dropdown Type-Ahead 621
Flash for Input Forms 621
Input Form Design 622
Syndication and Cross-Site Interactions 622
Data Retrieval 622
Articles and Websites 622
Data Output 623
Formatting 623
Paper Sizes 623
T
Printing 623 Software Reporting & Document Management Packages 624
,
Output Forms, XML, and Business 624
Typefaces 624
Graphs and Charts 625 Data Scraping 625
Data Scraping 625

Software Packages 625 Statistical Analysis 626 Diagrams 626 Software and APIs 626 Cause-and-Effect Diagrams 626 Software Design Diagrams 626 Symbols and Standards Organization Charts Time-and-Activity Charts 628 Geographic Maps 628 General 628 Color Standards 628 Data Sources 629 Glossaries 629 Maps and Satellite Images 629 Online Newsletters and White Papers 629 Online Tutorials 630 Organizations 630 Projections 630 Software 630 Standards 631 Symbol Sets 631 Testing 632 Quality Testing 632 Usability Testing 632

Biographies 633