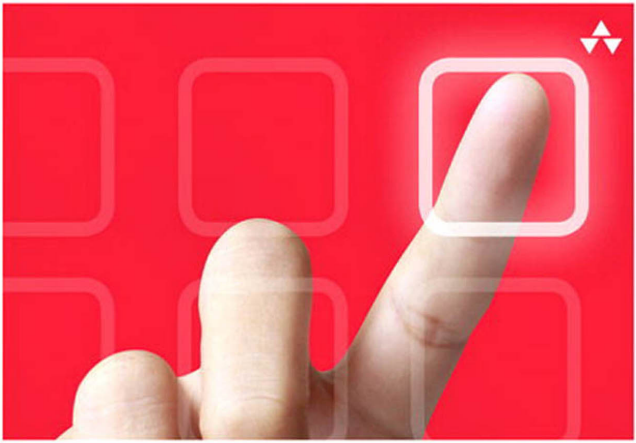

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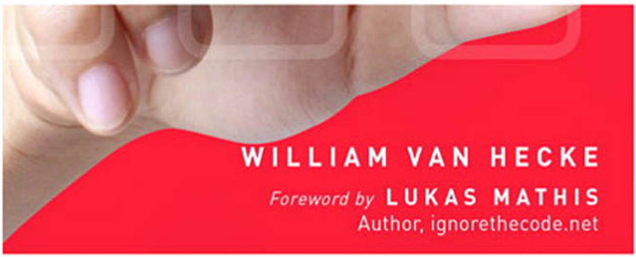

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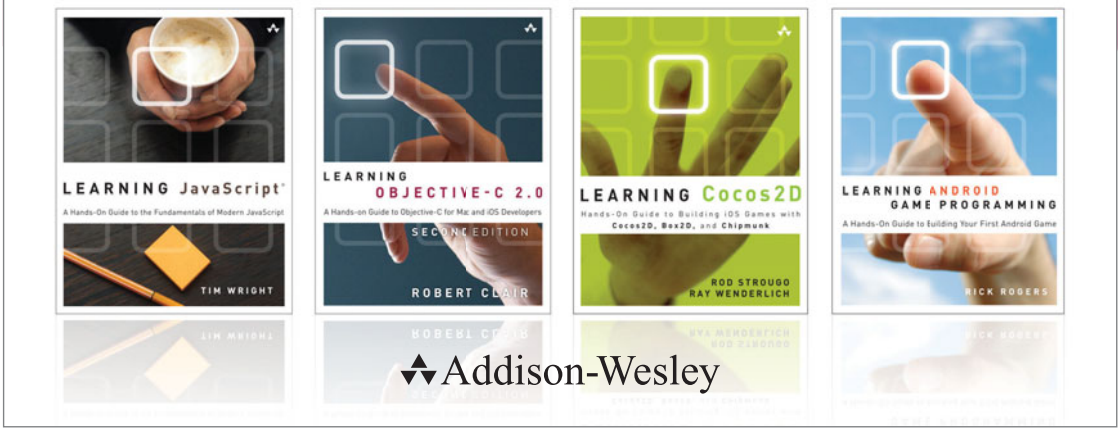

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Learning iOS Design

A Hands-On Guide for Programmers and Designers

William Van Hecke

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Contents at a Glance

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Foreword

When Apple introduced Mac OS X, Mac users' feelings were ambivalent. Sure, this looked like a fantastic operating system, but a huge part of what made the Mac unique was its software. Photoshop, Illustrator, Claris Works, MacPaint—these were the reasons we used Macs. And with Mac OS X, all of these applications effectively stopped working. There were few native applications for Mac OS X, and fewer still that weren't horrible.

There was, however, one company that consistently developed fantastic software for Mac OS X right from the start. And they kept doing it. For the last decade, The Omni Group has been a sure bet for quality products. Applications like OmniGraffle combine ease of use and sheer power in a way that is unique, yet feels completely natural. On the one hand, these applications are incredibly accessible. It takes very little to create fantastic output. On the other hand, they have great depth. Recently, the Omni Group has expanded their reach to iOS, and they've done something almost nobody else outside of Apple has achieved: they've brought their applications to the iPad in a way that makes them feel native to these portable touchscreen devices, but doesn't diminish their power and depth.

I'm probably not the only designer who has more than once looked at applications like OmniOutliner, OmniGraffle, or the somewhat exorbitantly named OmniGraphSketcher and wondered to themselves: How do they do it? How do these people consistently create software that seems to effortlessly present incredibly powerful features in a way that is easily accessible, and a pleasure to use? And even more puzzling, how do they manage to achieve this feat on iOS, a platform famous for its abundance of shallow, poorly designed, one-trick-pony, cash-grab apps?

Well, today's your lucky day, because you're holding the answer to this question in your hands. My friend Bill, who wrote this book, happens to be Omni's User Experience Lead. And he's lifting his kilt, just for you.

I first consciously heard of Bill when he became Internet-famous for talking about Omni's 1:1 replicas of iPads made from wood, cardboard, Plexiglas, and 3-D-printed parts. Who would want to make 1:1 replicas of iPads? Well, Apple had announced the iPad, but had not yet started shipping it. Having already started designing apps for the iPad, Bill's team needed to get an idea for how these apps would feel on an actual device. At this point, less dedicated people would just postpone the whole thing for a few months. But not Bill's team. They went ahead and made their own iPads.

Most UX designers eventually manage to come up with a design that works well. It's this kind of relentless dedication to detail, this kind of work ethic, though, that is

the difference between a designer who can come up with a good design, and one who will come up with a mind-blowingly awesome design.

But there's something else that makes Bill unique among his peers. Any designer will tell you that their goal is to make the product they're working on beautiful and easy to use and efficient and pleasant. But Bill goes one step further. His goal isn't just to make apps user-friendly, but to touch the user's soul, to help people make more beautiful things, be more successful, and be happier. In one of his presentations, he recounts how one man converted his classic VW Beetle into an electric car with the help of OmniGraffle. To Bill, that's the ultimate goal. Software design isn't just about making an application easy to use, it's about making the application have a positive impact on people's lives. It's about helping people be better.

This book contains everything you need to know to create awesome, life-altering applications, just like Omni's. While it's targeted at iOS designers, you're going to learn a lot from reading this book regardless of the platform you design for. I pride myself on knowing a lot about design, but when reading this book, I probably didn't encounter a single page that didn't offer at least one interesting idea, new concept, or clever design technique. From learning how to make your application more forgiving to a section on how pricing influences how people perceive your app (yep, its price is part of the app's design), you're in for a treat.

Even better, this book doesn't just offer invaluable content that will forever change the way you design applications, it's also written in a way that prevents you from putting it down. So grab a hot cup of cocoa, put on your favorite music, and settle down into your most comfortable chair, my friend, because you'll be sitting here, staring at this book, for quite a while.

Enjoy it.

—Lukas Mathis, ignorethecode.net; author of *Designed for Use: Create Usable Interfaces for Applications and the Web* (Pragmatic Bookshelf, 2011)
March 2013

Preface

Hello

It took a while for the world to notice, but design really matters.

A perfect story of the power of design can be found by traveling back to April 2007 to eavesdrop on a chat with Microsoft CEO Steve Ballmer. Apple's Steve Jobs had announced the iPhone that January, and everyone had had a good while to process the announcement and decide what they thought of it. Ballmer, in an interview with *USA Today,* opined on the iPhone's chances to make a dent in the well-populated smartphone market: "There's no chance that the iPhone is going to get any significant market share. No chance."

I'm not normally one to indulge in schadenfreude, but the wrongness of that prediction is too illuminating to ignore. iPhone went on to become an icon that redefined the public's concept of what a mobile phone is, and nearly every "smartphone" on the market takes inspiration from it. Its sibling, iPad, finally popularized the stagnant tablet concept and is on its way to replacing the traditional desktop or notebook computer for millions. iPhone and iPad each own about half of the market share of their respective markets. The App Store model has redefined the way people buy software and has paid out more than $7 billion to third-party developers. As of the beginning of 2013, nearly half a billion iOS devices have been sold.

Why? How did iOS become so successful? What did Ballmer and the rest of the early-2007 iPhone scoffers miss? Ask any authority who followed the story closely to pick one word to describe Apple's advantage, and they'll say *design*. (Some cynics might say *marketing,* but they're wrong.)

iOS is arguably the first technology platform to truly put design first. Instead of the puffed-up and bulleted feature lists, the contortions to accommodate legacy systems, the assumptions about how a phone was supposed to look or behave, and the obsession with being the first to the market, iPhone prioritized beauty, responsiveness, and fun. (And anything that Apple couldn't get just right was omitted until they could.) This view of design is about creating happiness, about cultivating a relationship with the user, about imagining the most positive *user experience* possible and then doing whatever it takes to produce that imagined outcome.

You could almost say that iPhone refused to compromise on its user experience. But as this book argues, all designs are compromises. Surely, countless tradeoffs and tough decisions were made in the process of bringing iOS into being. But what's important is

that wherever possible, those compromises erred on the side of paying attention to detail, abandoning conventional wisdom, and putting in more work to make users happier.

Not solely because of Apple and iOS, but in large part, the world is learning that design counts. It's getting harder to compete without good design. It's harder to find good designers than it is to find good engineers (and that itself is pretty hard). Well-designed software really can improve people's lives, help them be more productive, and yes, make them happy. This book aims to give you the practices, examples, and advice you need to make it happen yourself.

You're a Designer

Design is deciding how a thing should be. In every act of design, that decision-making is done to accommodate constraints and to satisfy the needs of some audience or "user." The needs are paramount, because an artifact that doesn't do anything useful for anyone is more a piece of art than a design. And the constraints are your friends, because they narrow the space of possibilities, making your job much more approachable. Almost everything you think about and do as a designer can be narrowed down to these concepts: How are you serving the needs of the user? How are you working within the constraints?

Everything artificial was designed by someone. Most of the time you don't think about the people who decided how the things around us should be: the height of a chair's seat, the shape of a battery charger, the hem of a blanket. That blissful ignorance is the goal of many designers. If people don't think about the design of an object, the designer has probably done a fantastic job. More than two thousand years ago, Ovid said it like this: *Si latet, ars prodest*. If the art is concealed, it succeeds. That's one to print and hang on your wall.

If you've ever made something, then you're a designer. Ever built a couch fort? Arranged some flowers in a vase? Sketched a map for someone? Whether or not you thought very much about it, whether or not you followed well-researched principles, you designed that thing. That's design, with a lowercase *d*. You could take that approach to designing an iOS app, but the result isn't likely to be compelling. Books like this one aim to help you do Design with a capital *D*. That means absorbing and imagining as much as you can about how things could be better. It means making the smartest, most informed decisions possible about the needs and constraints involved. And it almost always means creating plans, sketches, and models along the way to a final product. The good news is that you can get there from here, one step at a time, always experimenting and learning as you go.

Meet the Book

This book introduces and explores the topic of designing iOS apps, even if you don't consider yourself a designer (yet). Even if you've never taken an art or design course, if you consider yourself to have more of an engineering or analytical mind than a

creative one, or if you're mystified by what actually goes on in the process of design, you're very welcome here.

At conferences, I've presented the topic of design to a largely engineering-minded audience. Lots of programmers know that they should care about design, but the practice of design seems from the outside to be mysterious or even arbitrary, leaving them disillusioned or apathetic about it. But after some demystification and conversation, some folks have told me that they finally get why design is important and how they can think about it systematically.

This book presents the art and science of design in an accessible, sensible way.

Part I: Turning Ideas into Software steps through the phases of design, turning a vague idea for an app into a fully fleshed-out design. It goes from outlines to sketches to wireframes to mockups and prototypes. Each step of the way, you'll find advice about how to think carefully, critically, and cleverly about your project. Each chapter concludes with exercises conceived to encourage you in planning the design of your own app. Part I includes the following seven chapters.

- **Chapter 1: The Outlines**—This is all about planning, writing things down, and making sense of your app idea. You'll learn about the ways you can use structured thinking and writing to figure out what your app is about and stay on track throughout the project.
- **Chapter 2: The Sketches**—Sketching is the central activity of design. It's all about getting ideas out there and seeing where they lead. You can never know the merits of an idea until it's on a page, a whiteboard, or a screen. This chapter will help you sketch with the right blend of adventurousness and discipline.
- **Chapter 3: Getting Familiar with iOS**—Understanding the constraints of the platform is crucial. iOS offers a versatile kit for building interfaces and experiences; you should know it well enough to decide when to take advantage of it and when to diverge from it.
- **Chapter 4: The Wireframes**—Eventually you need to turn your sketches into precise, screen-by-screen definitions of how the app should be organized. A wireframe is a document that specifies layout and navigation without getting bogged down in pixel-perfect styling just yet.
- **Chapter 5: The Mockups**—It's not the only concern of design by far, but it matters what your application looks like on the surface. In this chapter you'll break out the graphics apps and learn how to assemble beautiful assets into a convincing, pleasant whole.
- **Chapter 6: The Prototypes**—Sometimes a static drawing of an interface is not enough. You need to know how it behaves. This chapter is all about simulating and testing the interactions that make up your app.
- **Chapter 7: Going Cross-Platform**—Plenty of apps exist not as completely standalone experiences, but as parts of a multiplatform suite. This chapter explores the concerns you'll need to deal with if you want to build the same app

for more than one device. It uses an app that appears on iPhone, iPad, and Mac as a case study to illustrate how a single idea can wear three different interfaces.

Part II: Principles presents universal principles that apply to any design and that you should follow if you want to craft an effective app that people will appreciate and even love. To make sure your app works on every level, each chapter in this part is based on one of the three levels of cognition identified by psychologist Donald Norman. Many of these principles are applicable to all software design, but here they're tailored to the strengths and challenges of iOS. The exercises for each chapter present sample situations to help you learn how to apply each principle.

- **Chapter 8: The Graceful Interface**—This chapter examines the visceral level of cognition, which relates to the way people feel from instant to instant as they interact with software. It deals with things like touch input, timing, and feel. Most of the concerns here are subconscious. Users may not notice them, but they subtly affect how pleasant the software is to use.
- **Chapter 9: The Gracious Interface**—Here you'll learn about concerns at the behavioral level of cognition. That means how users make decisions moment to moment and how the app communicates possibilities and status. The chapter also discusses how the app can encourage a sense of adventure so that users feel welcome and safe as they explore its possibilities.
- **Chapter 10: The Whole Experience**—The biggest, vaguest, most intangible, and most important level of cognition is the reflective level. This chapter explains how people feel about your app in the long run: whether they rate it well, whether they recommend it to friends, whether they respect you as a developer, and whether they'd buy from you again. Happiness is the ultimate goal.

Part III: Finding Equilibrium is meant to function as a reference, inspiration, and exploratory guide to the various decision points you may encounter in designing an app. It embraces the concept that all designs are compromises and that many decisions have no single correct answer. This means that many answers to the same design problem can coexist, and every design, no matter how unfashionable or unsophisticated it seems, has something to teach (a fact that many critics seem to forget). You can look at each chapter's opposed approaches as a sort of slider control, with a continuum of answers between the extremes at either end. For each challenge, a smart designer like you should seek an answer that works best for your app's unique philosophy. Over time you may find yourself preferring one side of a given slider over the other. Maybe you like to err on the side of focused rather than versatile. Or perhaps you'd rather seek the Aristotelian golden mean, straight down the middle. That's great. That's what it means to have a style. Each type of decision is illustrated by examples of different solutions to the same problem, depending on the angle you prefer. The exercises encourage you to find your own favorite solution for a situation that may have several possible answers.

- **Chapter 11: Focused and Versatile**—One of the biggest decisions you need to make about your app is its scope. Do you want to do one thing flawlessly, or many things competently? What's feasible depends on the resources available and your ability to be aggressive about defining what you expect of the project.
- **Chapter 12: Quiet and Forthcoming**—When most people talk about a design being "simple," what they usually mean is that it's in good order and presents an understandable amount of information and control at once. In contrast, designs feel empowering when they simultaneously present as much as possible. This chapter describes how to control the apparent simplicity of your app from screen to screen, depending on the emotion you prefer to evoke.
- **Chapter 13: Friction and Guidance**—Part of the job of a software designer is to make many things possible, but also to gently guide people through an experience. This chapter is about the ways an interface puts down grooves that encourage a user to move this way or that way next, or slow down before taking the next step.
- **Chapter 14: Consistency and Specialization**—Differentiating yourself from the rest of the apps out there is both an advantage and a risk. When you think of well-designed apps, the examples that come readily to mind are the ones that break from convention and get away with it. But respecting the established guidelines is usually the wiser path. This chapter will help you decide when to stick to the script and when to diverge.
- **Chapter 15: Rich and Plain**—The visual styling of an app is the most conspicuous outward manifestation of its design. Independent of its functionality, your app can look extravagant or subdued, lifelike or digital. This chapter will help you tune the depth, color, and realism of your interface to set its tone and personality.

Meet the Web Site

The web site for this book is **http://learningiosdesign.com**. There, you will find resources such as the Photoshop and OmniGraffle source files for the examples given throughout the book. You can also offer feedback about the book and find updates of its content.

You and Your Team

You can follow this book as you work on your own app idea, especially by working through the practices described in Part I. Even if you don't yet have an app project, or if your app already exists and you want to revise it for a new version, you should be able to benefit from the book. Parts II and III are compatible with dipping into for inspiration or advice.

From time to time, the book may talk as if you are a designer working with a software engineer or a team of engineers. That of course doesn't need to be the case. Maybe you're one of that noble species, the lone programmer/designer hybrid. Maybe you're a product manager looking to understand design better. It doesn't really matter; whenever this book mentions "your engineers," it's fine if that means you!

Art/Science Duality

Design is full of what are called "wicked problems": they're difficult to define, they're impossible to come up with definitive answers to, and they're never finished. That's likely to spook some people, but it's also what makes design so much *fun*. You never know what you're going to get. There's always some way to improve on your work. Everything is a matter of taste, and yet some answers are unequivocally better than others. There's no recipe, and yet there are morsels of wisdom and inspiration to be found everywhere.

Design is an art. And it's a science. And it's neither. Steve Jobs liked to say that what Apple does falls "at the intersection of technology and liberal arts." You may find your team arguing about how to make a decision. One side is showing numbers; usability test metrics clearly indicate that design *A* is more efficient than design *B*. The other side is arguing that based on aesthetics, design *A* just doesn't *feel* right. Who wins? Maybe it's one of those two options; maybe it's a third, new option. Figuring it out is part of the thrill of design.

You could take a completely scientific approach, refusing to budge on anything until you've run a statistically significant study. You could also take a completely artistic approach, following your muse and composing your personal magnum opus in app form. But you won't get very far with either one alone—data and heart both matter.

Inspiration Is Everywhere

This book can give you specific advice on specific topics and situations that occur often in the work of designing apps for iOS. But your growth as a designer depends, more than anything else, on your willingness to absorb inspiration from around you. Pay attention to all kinds of design: graphics, interiors, architecture, games, anything. Read widely: psychology, art, history, biology, everything. The most seemingly irrelevant knowledge may end up informing your work as a designer someday, in some oblique way. If you do nothing else, use lots of well-regarded apps and think about what makes them successful. The more you examine and ponder great work of all kinds, the better you'll get at it yourself.

Again, growing as a designer is a lifelong journey, but here is a necessarily short list of reading material to get you started. Some of these books are mentioned again in the chapters where they're especially relevant.

- *Universal Principles of Design* by William Lidwell, Kritina Holden, and Jill Butler—A delightful collection of 125 concepts that apply to all categories of design. Very compatible with flipping through for quick inspiration.
- *The Elements of Typographic Style* by Robert Bringhurst—One of the most carefully built, wisdom-packed books of all time. Yes, Bringhurst will make you knowledgeable about type, but he will also inspire you with his methodical, tasteful approach to design in general.
- *Visual Explanations: Images and Quantities, Evidence and Narrative* by Edward Tufte—Or any of his four main books, really. Tufte tends to lean toward information design for print, but the principles he espouses should be useful to anyone who has any interest in making things understandable and beautiful.
- *Designing Interactions* by Bill Moggridge—This book is a collection of captivating interviews (included on DVD) from original Macintosh software lead Bill Atkinson to legendary game designer Will Wright.
- *Sketching User Experiences: Getting the Design Right and the Right Design* by Bill Buxton—Much of the reverence that technology designers have for the practice of sketching can be credited to Buxton. Sketching is good for your brain and good for your work.
- *The Design of Everyday Things* by Donald Norman—A classic that has stood the test of time. This book pioneered the dissatisfaction with poorly designed experiences and set the stage for a generation of designers to make the world a more agreeable place to live in.
- *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests* by Jeffrey Rubin and Dana Chisnell—If you're interested in the scientific side of design, this is an excellent walkthrough of the procedures and principles of collecting data from a sample of the target audience using your app.
- "The Nature of Design Practice and Implications for Interaction Design Research" by Erik Stolterman—A brief academic paper, chock full of references to other influential papers, about what design really is and how to deal with its complexity.
- *Basic Visual Concepts and Principles: For Artists, Architects and Designers* by Charles Wallschlaeger and Cynthia Busic-Snyder—A solid grounding in perception and the construction of visuals.
- *Revolution in the Valley: The Insanely Great Story of How the Mac Was Made* by Andy Hertzfeld—This book is a treasure trove of firsthand anecdotes about the culture and creativity surrounding the development of the original Macintosh. If it doesn't get you excited about making technology, nothing will.
- *How the Mind Works* by Steven Pinker—A comprehensive tour of what we understand so far about human psychology. Not directly related to software design, but a surprising source of insight into how people think and why design principles work the way they do.

- *Thinking, Fast and Slow* by Daniel Kahneman—An up-to-date psychology book about how people pay attention, judge situations, and make decisions. Another surprisingly enlightening read for science-minded designers.

And here are a couple of things that aren't books.

- "Inventing on Principle"—A one-hour talk by Bret Victor, interaction designer for iPad (among many other impressive accomplishments). Victor has among the most thoughtful and inspirational minds in technology design, and this talk is a fantastic place to start learning from him. This is the sort of talk you'll want to come back to once a year or so.
- Ideo Method Cards—A deck of cards from the legendary product design firm Ideo. Each card describes a "user-centered" practice that can be of use to designers working through an interesting problem. You can casually flip through the deck for ideas, assemble a mini-deck for a given project, or make up your own ways of getting the most out of them.
- Oblique Strategies—A set of cards, each bearing an enigmatic phrase meant to motivate and give direction to a person facing a creative problem. They were originally created by Brian Eno and Peter Schmidt for musicians, but creative people of all kinds have since found them useful for breaking through difficulty. The cards themselves are rare, but plenty of web- and app-based editions are available.

I found these resources helpful. Hopefully some of them will be at home in your own garden of influences and inspirations.

Now…let's make some software.

Acknowledgments

Turns out writing a book is hard! Mountains of thanks go out to all these people for making it possible.

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It seems as if every book's acknowledgments page mentions family members' patience; now I understand why. Copious gratitude and love to my wife, Hiroko, for her steadfast patience and support. Ultimately, everything is thanks to her.

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About the Author

Since 2004, **William Van Hecke** has been User Experience Lead at the Omni Group, one of the world's most accomplished and affable Mac and iOS developers. Bill got his start designing software by reverse-engineering his older brother's text adventures in MS Basic on the Macintosh Plus, and then graduated to creating HyperCard games to mail to his cousins on floppy disk.

Bill's primary hobby is hobby-collecting: reading fiction and science; playing bass guitar; appreciating, translating, and developing niche video games; studying the Japanese language; mastering tabletop gaming; and exploring 3-D modeling. You can find Bill on Twitter, prattling on about these topics and more (@fet).

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4

The Wireframes

In the grand hierarchy of pictures of imaginary software, wireframes exist somewhere between sketches and mockups. Their purpose is to nail down the details that sketches leave out: what exactly exists on each screen and how it all fits together—the *geography* of an app. A sketch is casual and usually disposable; you might attach a sketch to a design document as a reminder of the conversation that led to a decision, but the sketch probably doesn't represent a definitive understanding of how the software should end up. Wireframes, on the other hand, document some details of how the app should be built. (See Figure 4.1 for an illustration of the difference.)

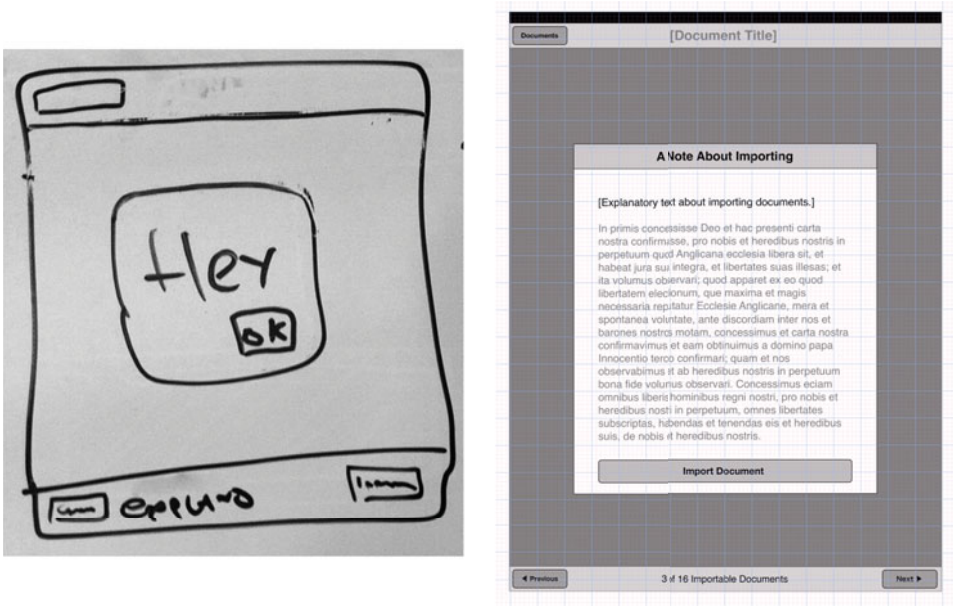

Figure 4.1 A sketch (left) becomes a wireframe, gaining detail about the screen elements and their layout.

The distinction is not always black and white. Some wireframes are kind of sketchy, and some sketches are kind of wireframey. But generally speaking, wireframes have the following unique characteristics as compared with other types of software design images.

- A wireframe includes all the elements that should go on the final screen; a sketch probably omits some.
- A wireframe delineates the type, position, and size of elements to a reasonably final degree; a sketch can drastically distort them.
- A wireframe doesn't specify an exact, pixel-perfect rendering of what elements should look like; that's what mockups are for. Instead, it uses a minimal rendering—usually plain, flat shapes, lines, and text.
- A wireframe may give some indication of the relative visual weight of elements on the screen, usually by differences in shading.

A wireframe may or may not be interactive; if it is, it's also a prototype.

Thinking in Screens

iOS apps are made of **screens.** Sure, they also include animations, audio cues, notifications, and other bits that can't be represented by static screens. And some apps do a lot of work behind the scenes that never becomes visible. But the basic constituent unit of any app, from a user's perspective, is the screen. The login screen, the home screen, the item detail screen, the archive screen, the user info screen, the settings screen, the share screen—these are the places users visit as they journey around your app. Each screen might have a number of states it can be in as well as a number of elements it might display depending on the situation.

Many **interface screens** are bigger than the physical size of the **hardware display** they appear on and can be scrolled or zoomed around. Don't confuse these different types of screens. (In this book, "screen" always means a place in the app, and not the glass on the front of the device.) On iPad, popovers give you a roughly iPhone-sized mini-display within a display, which can move between its own set of screens. All these screens and the states they move through are the skeleton of an app; you need to get them right to get the app right. (By now, it's normal if "screen" no longer looks like a word to you.)

Thanks to outlining, sketching, meeting, arguing, and deep thinking, you've got a good idea of all the screens that need to go into your app, and it's time to plot out precisely what each one should contain and how it should be organized. You need wireframing. Making yourself draw out every button, switch, field, and label will almost certainly raise some questions.

- How are we going to fit all six of these features onto one toolbar?
- Should this feature really be exposed at this point in the app?

- Do we want to present this option up front, or tuck it away somewhere else?
- Is this the right place to diverge from Apple's guidelines and precedents?
- Should these controls really be separate, or can we combine them?
- Oh dear, what have we gotten ourselves into? Is this even the app we should be making?

And so on. That's fine! That is part of the process. You might need to do more sketching or hold discussions to figure out how you want to answer those questions. Part III of this book is all about finding your own answers to those questions that don't have definitive solutions, so you may want to peruse it when you run into one. Get excited: this step—figuring out how you want to answer the questions that come up during wireframing—is when you develop the unique personality of your app.

Thinking in Points

We're used to dealing with pixels when measuring interface elements. And for a couple of years, only two sets of pixel dimensions mattered to iOS designers: the iPhone (at 320×480) and the iPad (at 768×1,024). As of the introduction of the iPhone 4 and the third-generation iPad, you now need to think about both standard and Retina resolutions, for both device families. Thankfully, the Retina resolutions are evenly divisible by the standard ones: one standard pixel split in half, in both dimensions, produces four Retina pixels. So you can simply multiply pixel distances by 2 and carry on.

But for the most part, you shouldn't be thinking in pixels until you get to the mockup stage and start creating production graphics. For wireframes, you should be thinking in points. The **point** comes from typography and publishing, where it has held a variety of values over the centuries but which finally settled at $\frac{1}{72}$ inches, the "PostScript point." The Apple point, though, is a new unit that indicates a resolution-independent distance on the display. On a standard-resolution display, 1 point equals 1 pixel; on a Retina display, 1 point equals 2 pixels. (See Figure 4.2.)

The important thing to remember is that you shouldn't take the presence of more pixels to mean you can increase information density. Retina displays are not for cramming numerous comically tiny elements onto a single screen. Rather, they're for increasing the *fidelity* of the same old identically sized elements. So Retina displays shouldn't even affect your wireframing process. Carry on designing for a screen that's 320×480 or 768×1,024, and enjoy the extra sharpness and fidelity you'll get if it appears on a Retina display.

Optical Measurements

For wireframing, you'll need to use an app that can lay out objects on a canvas, and you'll need to be able to measure their positions and their relationships to each other

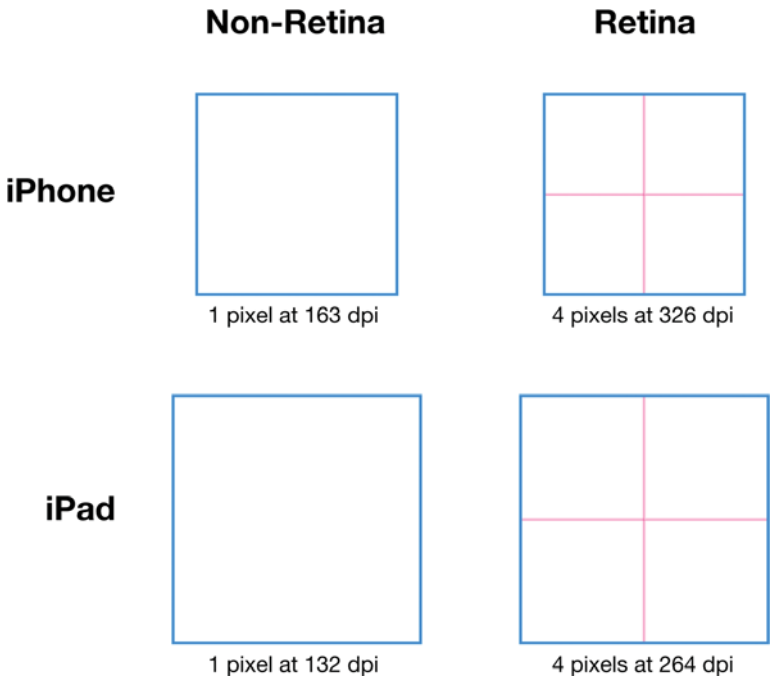

Figure 4.2 The meaning of 1 point on the four iOS displays. The size of a point can vary and can consist of 1 or 4 pixels.

very precisely. But the measurements reported by Xcode and by various graphics apps for a given object are sometimes at odds with each other, and are often at odds with what your eyes actually see. This is because the actual *visual* edges of a given object don't necessarily coincide with the bounds of that object as understood by the app displaying it. Objects have whitespace inside, or shadow effects dangling off of them, or text ascenders and descenders, or other accoutrements that make it hard for the software to know where the theoretical thing, as seen by a human, begins and ends.

Bounds and Optical Edges Are Sometimes Equal

Sometimes, of course, the visual edges of an object *do* correspond with its bounds as understood by the software drawing it. That's the case for a rectangle without any of those accoutrements like extra whitespace or shadows. For those objects, you can rely on the measurements reported by the software.

To plan clean, professional layouts, you need to think optically and measure sizes and distances optically. This often means ignoring what OmniGraffle, Photoshop, Fireworks, and Xcode say about where things are and how big they are. Instead, use the following techniques—and your eyes.

First, you need to know where to measure from. This is getting a bit into mockup territory, because you're going to see examples that include final effects. You aren't supposed to be worrying concretely about production graphics at this point, but you need to know about these techniques while you're wireframing.

Measuring Text Optically

Measuring text horizontally is easy: just look at the left- or rightmost point that's mostly opaque. If there's a faint column of antialiased pixels or a few pixels protruding from a round character shape (like an O), you can ignore them and move on to the heavily filled pixels.

Effectively every typeface—and certainly Helvetica Neue, the standard font on iOS—has its weight vertically delineated by its baseline and its cap height.

- The **baseline** is the horizontal line that the bottoms of most letters sit upon. (The curves of rounded letters go below it just a bit, and the descenders of certain letters protrude down beyond it.)
- The **cap height** is the line that the capital letters reach up to. (Some lowercase letters also reach it.)

These two lines delineate the vertical bounds of text for the purposes of optically aligning and measuring distances between elements. (See Figure 4.3.) Yes, this means that the descent of letters like y and p, and the ascent of letters like Å and Ž, may protrude outside the visual weight of the text and into the margins around it. Generous margins should more than accommodate that. Tons of apps get this wrong, either by including the descent or excluding the cap height in the weight of a text element. You can do better.

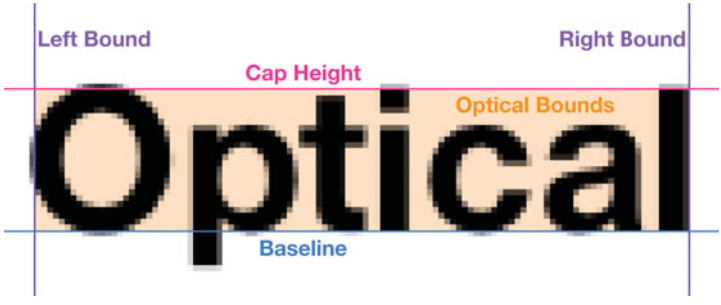

Figure 4.3 Measuring text optically. The shaded area represents the bounds of the text for the purposes of positioning and balance. Rounded shapes and faint antialiasing can protrude slightly.

Measuring Images and Controls Optically

Any control or image should have some sort of contrasting border or edge that defines its optical boundary. (If the edges seem to blur into the surface that the element is resting on, then you have a contrast problem. See Chapter 5 for more about contrast.) The boundary where the dark object transitions to the light background, or vice versa, is the optical boundary of the object. (See Figure 4.4.)

Where to Measure From

Some designers measure from the inside of the boundary; others measure from the outside. Is the edge of a table cell defined by the last white pixel inside, or the last gray pixel of the border? It doesn't matter which you pick, as long as you're consistent.

Techniques for Measuring

When you need an exact pixel measurement, here are some ways you can get it.

- **Zoom in really close**—On your Mac, go to the Accessibility pane of System Preferences and turn on the systemwide zoom. Turn off image smoothing, because you want to see those pixels nice and chunky. Now you can use the keyboard commands or the modified scroll gesture to zoom way the heck in on your designs and count the pixels yourself. Lots of times this is the quickest way to check on very small distances, but it gets tedious and error-prone at around 16 pixels. On iOS, the accessibility zoom always has blurry smoothing applied—you can't turn it off. You can work around that limitation with the app Screenshot Journal, which is intended for designers and developers, so it has a nice, chunky zoom.

Figure 4.4 Measuring controls optically. In this example, the outside of the stroke is considered to define the bounds of the button. Note that the underhighlight for the etched effect is not part of the bounds.

- **Guides and grids**—Any decent diagramming or graphics app should offer manual guides and customizable grids that you can use to draw laser-straight lines across your canvas. These are an excellent way to make sure objects are aligned and spaced evenly.
- **Standalone measurement tools**—Expect to run into lots of situations when you need to get the exact dimensions of an element in the iOS simulator or your wireframes, align two distant objects, or perform some other feat of precision. A standalone screen measurement tool (independent of your graphics app) is invaluable. You aren't likely to do better than the Iconfactory's xScope, a suite of tools for measuring, scrutinizing, and previewing pixels; it works like the guides and grids mentioned earlier, but for your whole screen rather than within a certain app.
- **Ruler objects**—Another option is to prepare precisely sized ruler objects inside your graphics app of choice, and keep them on a layer that you can unhide when you need to check a size or distance. These objects should be ones that you know are the same size optically and are shown in the app's logic—such as a plain, filled rectangle with no outer stroke—so that you can rely on the sizes reported by the app.

Tools for Wireframing

When it comes to sketching tools, you want anything that helps you get ideas out as quickly and roughly as possible. But for wireframes, precision is paramount. Theoretically you could do wireframes on graph paper, if you have an unusually steady hand, a mathematical mind, and a superb eraser. But you're almost certainly best served by a desktop software tool. You should choose something that lets you nudge objects pixel by pixel, measure exact distances, and quickly make adjustments to get your positioning and dimensions just right. This book doesn't rely on a specific piece of software, but among your options are OmniGraffle, Fireworks, Illustrator, Photoshop, Axure, and Balsamiq.

Designing in Xcode

Some designers use Xcode itself for interface design, which has the benefit that you can use the resulting product in the actual app. But it works great only as long as you stick strictly to stock, standard controls and elements. You'll miss out on custom elements, annotations, layers, and the rest of the graphical and logical benefits offered by a proper graphic design app. Once you have the hang of designing in design software, it'll save you much more time and effort than designing in Xcode.

Here are some crucial features to look for in your wireframing tools.

- **Layers**—One of the best skills you can have for building good wireframes is layer management. Be fastidious about keeping related elements together on layers, and name your layers descriptively; an orderly layer structure will serve you well. You can use layer visibility to compare alternative approaches to the same problem. You can also describe several states of a screen on just one canvas; popovers, sheets, alerts, and so on can each live on their own layer for easy showing and hiding. Some apps (like Photoshop) let you save layer comps that remember the visibility of each layer, or (like OmniGraffle) share layers across canvases.
- **Grids**—Get used to using the grid to position objects exactly where you want them. For initial layout, a good grid setting is 44 pixels with 11 subdivisions, resulting in 4-pixel squares. The major grid lines help you see the minimum 44-point-square tap target, and the minor grid lines give you some fine movement, 4 pixels at a time, without getting too fiddly. You may occasionally need to bump the subdivisions to 44 or 22 for a moment to move elements just a pixel or two. Even if you want maximum precision, leave the subdivisions at 1 pixel to prevent yourself from accidentally placing an object between pixel boundaries. A design document showing objects off the pixel grid looks cheap and mushy.
- **Styles**—Over time, you're bound to develop your own tastes and practices for wireframe creation. But it's good to keep in mind that you have options. The term "wireframe" of course comes from the classic outlines-only style of drawing interface elements, which looks precise like a blueprint and cares very little about the eventual appearance of each element. If you want to be a bit more detailed, you can use shading—monochrome or a very limited color palette is best—to indicate the relative visual weight or the semantic grouping of elements. Going in the opposite direction, you could even make your wireframes look intentionally slightly sketchy, just to communicate clearly that they're not finalized. (See Figure 4.5 for some wireframing styles.)
- **Dimension lines**—If you're passing your designs off to be implemented, and especially if you aren't going to have a mockup step between the wireframes and the implementation, it's helpful to include dimension lines between elements to make sizes and distances explicit. Some tools (like OmniGraffle) can even automatically calculate and display the length of a line. Put dimension lines on their own layer so that you can show them when they're needed and hide them otherwise.
- **Templates and stencils**—Whatever your graphics app of choice, you can find prepopulated templates and stencils full of wireframing components for common iOS screens and controls. Assuming that the resources you use are accurate, you can save a lot of time and effort in creating elements that are the correct dimensions. Or you can always create your own internal suite of stencils that fit the way you design so that you don't have to re-create every object every time.

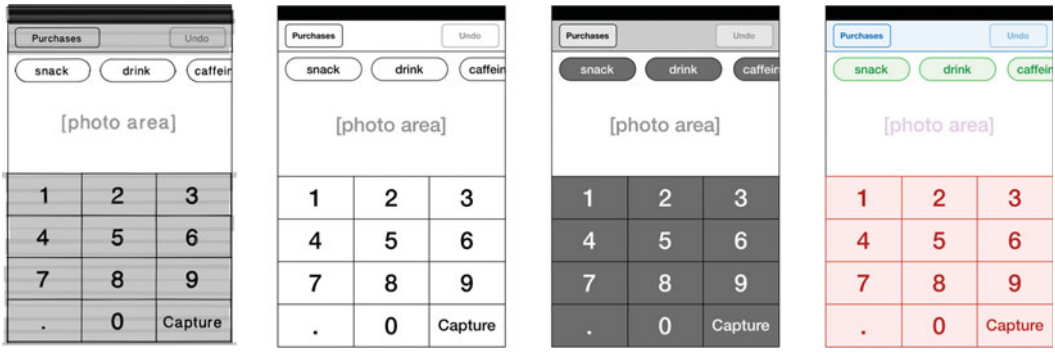

Figure 4.5 Several wireframing styles. Left to right: slightly sketchy, with the precise dimensions not yet nailed down; bare wires, to avoid suggesting any visual treatments; shaded, for suggesting relative visual weight; color-coded, for easy recognition of groups of elements.

Principles of Layout

Before we get into the specifics of laying out iOS screens, it's helpful to learn (or review) some basic principles. As you lay out each screen, you should be thinking about what the placement and relationships of the elements communicate to users. There's no single canonical process for turning a set of requirements into a "correct" layout. But the principles discussed here will guide you as you experiment with layout possibilities and try to find a balance between the needs and constraints of the design.

Much of this section is based on the rudiments of Gestalt psychology—a theoretical framework that has a lot to say about how human beings perceive things. It's been highly influential in visual design. It tends to show up in art school curricula, and a century after its founding it is even useful for laying out iOS app screens. You could spend a lot of time studying Gestalt theory. If this sort of thing is interesting to you, check the reading list in the Inspiration Is Everywhere section of the Preface.

Unity Is the Goal

The following principles are aimed toward the creation of **unity** in your layout. In a unified design, every component seems to be just where it needs to be. Nothing extraneous is present. Nothing feels uncomfortable or haphazard. Each part makes sense on its own and contributes to a whole that makes sense, too. And if all is well, users don't notice this unity. Unless they're familiar with design and they're looking at the screen with a critical eye, most people don't realize what is pleasant about a layout. They just happily proceed to use it. If pressed, they might be able to say that it seems "clean" or "professional." But if the app falls short of achieving unity, people *will*

notice. Customers can spot a disjointed layout from a mile away, and they recognize it as a warning sign that the developer hasn't put enough care and time into polishing the product.

How well an app is laid out is related to, but is not the same as, how well rendered it is graphically. That's another test for your layout to pass, and you'll get to that in Chapter 5, The Mockups. For now, focus on constructing good bones so that you can layer on the appealing styling later.

Read on for the principles. When you carefully consider all of them and get them working harmoniously, you'll achieve unity. Most of the principles probably seem obvious on their own, but it's surprising how easy it is to neglect them if they're not near the front of your consciousness. And it's the combination of them that creates a magical, ineffable sense of good design. If a design seems "off" somehow, it's probably time to run through this list and see which principle is being violated.

Visual Weight

Each element in a layout possesses some amount of **visual weight** relative to the others and to the layout as a whole. This weight affects how readily the element is noticed by the eye, how important it seems, and how it affects the balance of the layout. Visual weight is determined mainly by multiplying the following two attributes.

- **Size**—The bigger an element is, the more visual weight it carries.
- **Background contrast**—The more an element stands out from the background, the more visual weight it carries.

It's easy for a new designer to think that size is the only attribute that contributes to visual weight, neglecting the role of contrast. But the relationship between size and contrast means you can have elements that are different sizes but feel equally weighty, or elements that are the same size but seem to carry different weights. (See Figure 4.6 for an illustration.)

The final contrast depends largely on the visual treatment you end up giving the element in the mockup phase. But you should consider now the amount of contrast you intend to give the element so that you can weigh that against its size. For now, while wireframing, you can indicate contrast roughly by filling objects with three shades of gray to represent light, medium, and dark elements and areas.

For instance, suppose your app has a crucial button that you want to make particularly large for easy tapping. Giving it the same style as all your other buttons, while also making it much bigger, would result in an uncomfortably heavy button. It would far outweigh everything else on the screen. But if during the wireframing phase you indicate that it should be given a low-contrast treatment, you can then plan on styling it accordingly during mockups.

Or you may have a button that you need to keep small, for space reasons or even to minimize accidental taps. To keep it from getting lost among the other elements on the screen, you can increase its contrast with the background. A fine example of this

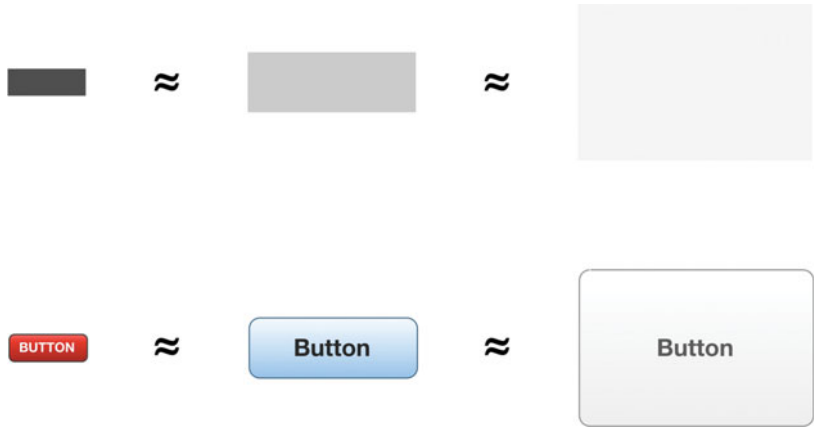

Figure 4.6 Objects of different sizes can have equivalent visual weights, as shown here with abstract wireframe objects (top row) and then again with visual treatments (bottom row).

is the purchase button in the App Store. It's actually smaller than the recommended minimum tap target size, because it's important to avoid accidental taps. But its heavy, high-contrast treatment makes its importance apparent.

Similarity and Distinction

Similar objects seem related, and dissimilar objects seem different. It seems banal to even write down. But there it is, because it's crucial to remember it as you design. When you're weighing your options for which element to use, where to place it, or how to size and orient it, compare it to existing elements on the same screen. Its similarity or dissimilarity to the other elements can tip the scale. Consider what their level of similarity says about the on-screen elements.

If you offer five similarly styled toolbar buttons, for example, a user expects them to be roughly equivalent. It's safe to assume that they are all actions that can be taken on whatever is currently visible in the content area, and that they're about equally likely to be used. Identically styled items listed in a table view are seen as peers—none particularly more important than another.

Any dissimilarities you introduce should have meaning. People tend to look for a reason when something is not like the things around it. The Done or Save button that concludes a modal view tends to be blue. Some apps give a distinctive size or style to a single toolbar button or tab to indicate that it is somehow more important than the rest. The Delete Contact button in the Contacts app lives among flat, white table views, but it's presented in a unique shiny red style to call out its distinct (and destructive) purpose.

Proximity and Distance

Objects that are close together seem related, and objects that are far apart seem different. This fact works along with similarity and distinction to determine how the eye groups things. The closer two things are in space, the more strongly their similarity links them, and vice versa.

When elements have similar purposes or meanings, put them close together. In many cases, such as in grouped table views, you can actually stick them together, sharing a border, with no space or separation between them. Or if you have two elements you need to separate conceptually, try putting some space or some sort of visual separator between them.

The grouped table views in the various screens of the Settings app are the prototypical example of using grouping and separation to associate and disassociate elements. Notice that they bear group labels only when necessary; often, the cells in each group do a fine job of explaining what the group is for. Really, the whole Settings app is a gold mine of admirably clever problem solving through layout.

Alignment

Most objects on a screen should align with something else on the screen. That is, if you draw an imaginary straight line along the edge or center of an object and continue it across the screen, the line should coincide with the edges or centers of other objects rather than miss them. (See Figure 4.7.) Look at any clean design, and you're bound to find that objects are rarely just a bit out of alignment. Either they're perfectly aligned, or they're far enough out of alignment that it's obvious the misalignment is intentional.

Alignment and Interface Layers

There's one major exception to the rule that objects should align, and it has to do with interface layers (which are not necessarily the same as the layers feature in graphics software). The Thinking in Layers section later in this chapter explains how to use interface layers to conceptually separate chunks of your interface. To reinforce the distinction, it's good for objects on different interface layers to be slightly out of alignment with each other. Notice that in Apple apps, the side margins in a navigation bar don't align with the side margins in the content area. The narrower margins in the navigation bar layer subtly suggest that it's a different interface layer that "contains" the content area layer.

Here are some tips for keeping elements aligned.

- **Edge alignment**—Aim to edge-align as many as possible of rectilinear (box-like) objects in your design: buttons, tables, square icons, and so on. For similar

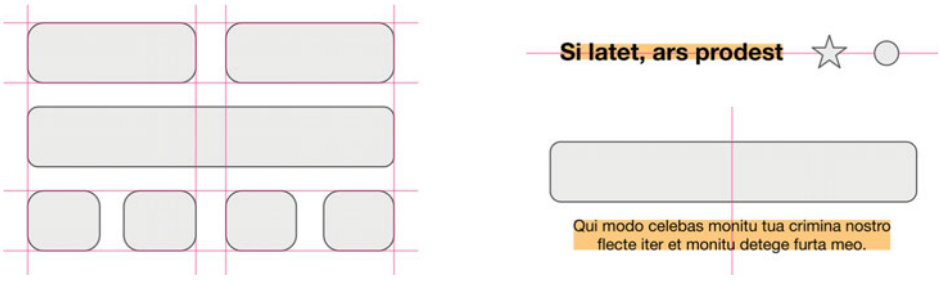

Figure 4.7 Edge alignment and center alignment. Pink lines show alignment; orange areas show the optical bounds of text elements.

objects in close proximity, edge alignment reinforces their relationship. If objects are farther apart, or less similar, then their edge alignment simply looks nice; it doesn't suggest a strong relationship.

- **Center alignment**—For rectilinear objects, this design is weaker and more prone to messiness than edge alignment. But it's excellent for irregular shapes, like blobs of text or bare graphics. For example, borderless toolbar buttons are usually aligned to their vertical center rather than edge-aligned, because each one has its own unique shape. Similarly, text that doesn't live in a box is often center-aligned. The title in a navigation bar is usually centered on the screen horizontally and centered in the bar vertically.
- **Aligning text**—Generally, text wants to align to other text more than it wants to align to boxes. You might at first think that a table view label should be left-aligned with the table border. But it looks much more at peace when it's left-aligned with the text *inside* the table. To vertically align different-sized pieces of text, the traditional approach is to ground them by making them share the same baseline; otherwise, both pieces of text will seem to be floating uncomfortably in space. If the two pieces of text are of very different sizes, though, then center-aligning to the vertical weight works better.
- **The guide test**—This is the quickest, most straightforward way to check the alignment of a layout and then fix it. Put the layout on the canvas of a graphics app that supports manual guides (straight lines that span the whole canvas). For every visual edge you see, add a guide. The edges of aligned objects can share a guide, but misaligned objects get their own guides. When you're finished, the guides express the visual logic of your layout, whether it's neat and sensible or a chaotic mess. From there you can adjust elements and remove guides until you have the most elegant layout that still supports the needs of the design. (See Figure 4.8 for a before-and-after example.)

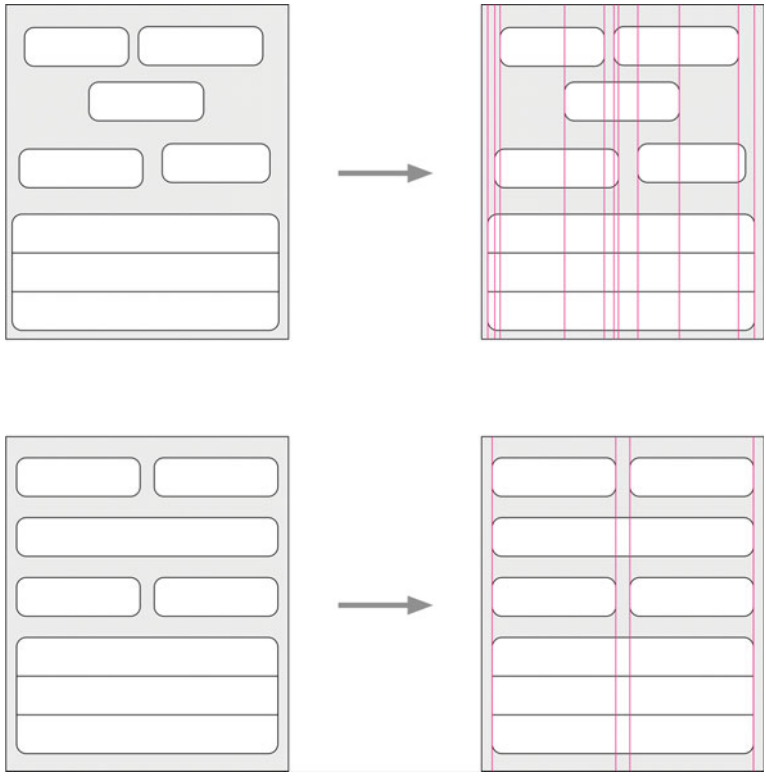

Figure 4.8 Applying the guide test to a particularly heinous layout (top), and then to a repaired version of the same layout (bottom). Only the guides for horizontal alignment are shown.

Rhythm

A good sense of **visual rhythm** is usually a cumulative effect of your spacing, alignment, and balance. But you can take an extra measure to ensure that the sizes and distances you choose are harmonious: use a scale. A **scale** is a preset list of measurements for you to rely on rather than choose an arbitrary value every time you need to position or size something. When the same harmonious numbers keep appearing throughout a design, it lends a sense of unity and order. (See Figure 4.9 for scales in use.)

Here are two scales that work well for iOS designs; you can pick one of these or invent your own.

- **Basic scale: 10, 20, 44—**For almost any design, you can get away with using this simplified scale. You use 10 points for a "normal" distance—for separating controls from each other, from labels, and from the edges of the screen or the view that contains them. Use 20 points when you need extra separation, as for groups

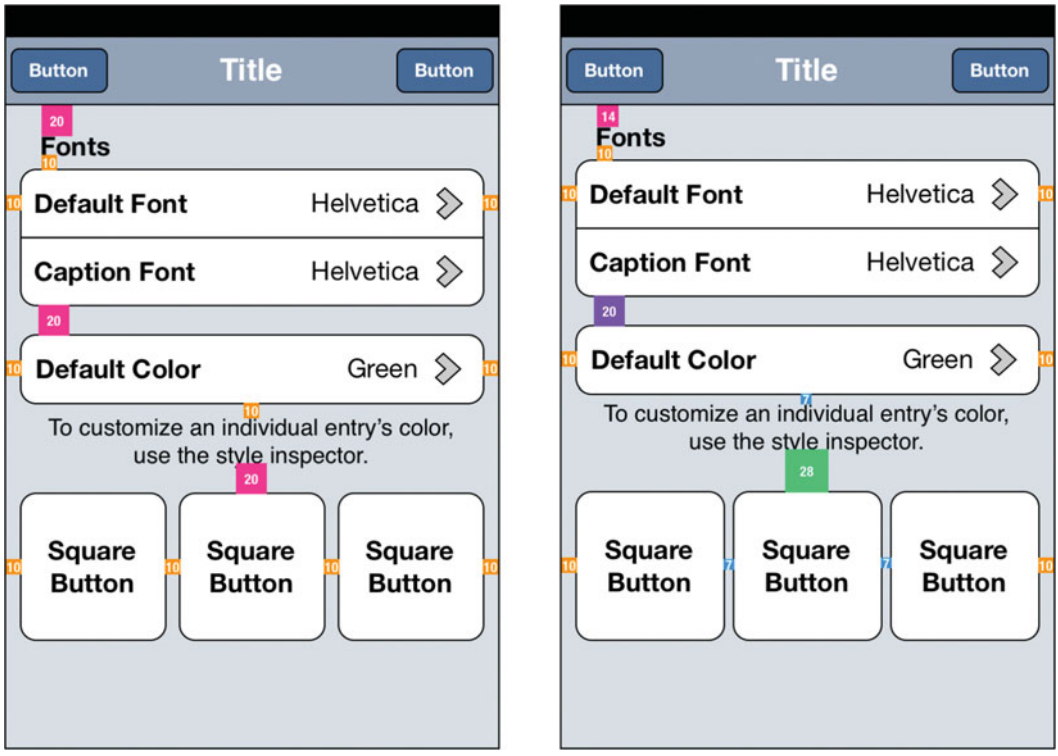

Figure 4.9 Basic-scale (left) and modular-scale (right) variants of a single design

of unrelated controls. Many standard iOS controls (such as table cells and toolbars) are 44 points; if you need much bigger spaces, using multiples of 44 when possible will coordinate well with them. You may need to use some other sizes on an ad hoc basis—for instance, a 52-point-tall table cell for holding a lot of text. That's fine! But don't also create 50- and 54-point-tall cells that will clash with it.

- **Modular scale: 7, 10, 14, 20, 28, 40, 56, 80…—**A modular scale is based on iterated multiplication by some number. In this case it's √2, which results in a doubling every two iterations. You can get very involved with choosing a ratio and devising a scheme for how you use each step in the scale; ventures like this are part of the endlessly rewarding pursuit of design. If you enjoy this sort of thing and want to learn more, pick up *The Elements of Typographic Style* by Robert Bringhurst. If not, there's no shame in using the basic scale.

The guide test described earlier is also good at uncovering awkward rhythms. If the distances between the guides seem to vary willy-nilly instead of falling into a sensible pattern, you need to make some adjustments.

Margin and Padding

Layouts look more modern, more pleasant, and more approachable when they employ healthy amounts of empty space. **Margin** is the amount of space afforded around an object. For boxlike objects with borders and content, such as a table cell or a button with a text label, **padding** is the amount of space afforded from the border to the content.

On iOS, users expect a certain amount of breathing room for elements, and when it's not there the app feels cramped, cheap, and uncouth. Scrolling is almost free, cognitively and ergonomically speaking, so there is little downside to giving content more space.

Don't Trust Xcode's Guides

Xcode's automatic positioning guides do try to help with layout, but you can't rely solely on them. They're more than happy to blindly suggest positions and spacing that make no sense, given what the layout actually looks like. Remember, optical measurements are what counts, and not the bounds of objects in Interface Builder. Over time, you may develop a reflex of letting Xcode place an object wherever it wants and then adding or subtracting a certain amount of space that you know to be correct for your design.

For margins, you can rely on a scale, as described earlier; put 10 points around everything, and you're in pretty good shape. To make sure you provide adequate padding, though, it's up to you to be vigilant. There isn't a strict algorithm for figuring out how much padding to afford a given bit of content. But a few guidelines can take you a long way. Most of these are based on the cap height of the text involved; that's the height of an ordinary capital letter like "E."

- For a single line of text in a box, give about 100% of the cap height as vertical padding. (See Figure 4.10 for illustrations of text and image padding.)
- For multiple lines of text in a single box, give 50% to 100% of the cap height of the biggest text as vertical padding.
- Generally, the horizontal padding should be between 50% and 100% of the cap height of the biggest text. Once you have your vertical padding as recommended earlier, you can apply a similar amount as horizontal padding.
- Objects that are edge-aligned with each other, especially horizontally, should also edge-align their text by having equal horizontal padding. (Even though the cells in Figure 4.10 have different top and bottom padding, they have the same side padding.)
- Images inside of boxes (such as toolbar buttons) can generally stand having a bit less padding than text. Aim for between 25% and 50% of the height or width of the image.

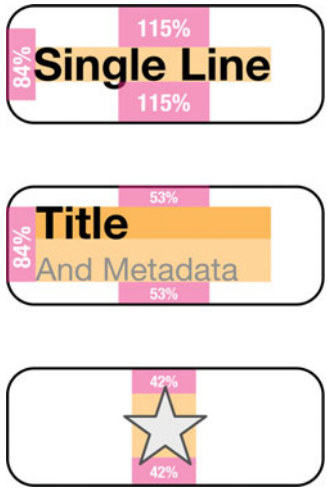

Figure 4.10 Padding examples for text, in percentages of the cap height) and an image (in percentage of the image height). Orange areas indicate optical bounds; note that the star's optical bounds don't reach all the way to the points, because the points contribute little to the visual weight of the overall shape.

Balance

Even if all the individual details in your layout are appropriately sized, aligned, and spaced, you still need to look at how the whole picture fits together. The main thing to keep in mind when thinking at this scale is **balance:** how the visual weight of the elements is distributed across the entirety of the screen.

A cheap way to get balance is by making your layout symmetrical. This approach is appropriate in a lot of cases, but it isn't the only way. One thing to watch out for is the tendency of the elements that balance each other to seem equivalent or in opposition to one another.

Another way to get balance is by carefully adjusting the visual weight of the elements. Adjust the size or the background contrast (described earlier) of elements to add or remove weight from an area of the screen. You may even subtly shift elements out of strict alignment or consume some of the space reserved for margins in order to achieve better balance. This approach takes a lot of experience and wisdom.

Thankfully, iOS apps can generally bear quite a bit of unbalance before they look bad from it. Vertical imbalance is usually fine, but try to avoid leaving one side of the screen empty while populating the other side.

Understatement

Use the minimum elements necessary to satisfy the needs of the design. In other words, never include anything that you don't need. This is the single most important

principle, and it probably seems the most obvious. But it's more subtle than it seems, and it's easy to violate without realizing it.

To separate controls, you usually need only take one step up on your distance scale. There's usually no need for a separator line. When you have two pieces of text separated by whitespace and using different styles, you don't also need to use punctuation or borders to set them apart. If you have buttons organized in a grid, you don't need to draw a border completely around each item; let them share borders like a table, and use the edge of the screen or view as a border, too. Or eliminate the borders if the buttons still end up looking tappable. (See Figure 4.11 for an application of understatement.)

Typography

Normally a design book would need a huge chapter dedicated to typography: how to use type effectively and how to avoid the common pitfalls that make type look amateurish. Luckily, iOS has done a lot of the work for you, making decent typography

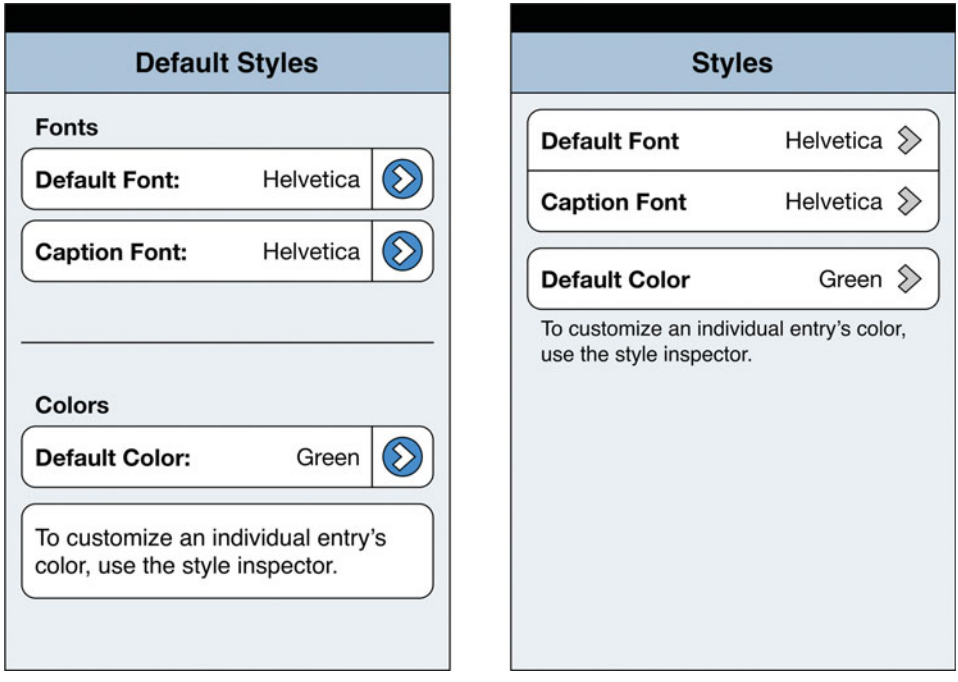

Figure 4.11 A needlessly fussy layout (left) and an understated version of the same screen (right).

easy and poor typography difficult. For most projects, you need only follow a few principles, listed here.

- Many of the principles described in this chapter apply to text as much as to other elements. Text should be balanced, aligned, understated, adequately padded, and so on. A modular scale, described earlier in this chapter, is wonderful for choosing text sizes. See the principles in this chapter that call out how they apply specifically to text.
- Almost all the time, the system font (Helvetica Neue on Retina displays, and Helvetica elsewhere) is all you need. It's a fantastic all-purpose font given the size and resolution of iOS displays, and it's so neutral that anything else tends to feel odd in an iOS interface. One exception arises when you want to put in a bit of branding by, say, using your logotype as a label on your home screen; that's fine, but use the system font everywhere else. The other exception is for long-form reading, spanning many screens' worth of text; in these cases it can be worth switching to a font specially designed for heavy reading; Georgia and Verdana are solid choices. (To learn about hunting down great fonts for inclusion in your app rather than using the iOS defaults, look up Marco Arment's "Introducing Instapaper 4.1 for iPhone, iPad" post on marco.org.)
- Use real characters, not ascii approximations. Habits from the early days of personal computing and the limitations of typical keyboards often keep people restricted to the meager ascii character set. Today's systems have a wealth of expressive characters available, thanks to the Unicode character set, but many people don't even know that there's a difference between, say, a proper apostrophe (') and a clumsy vertical tick ('). Use real quotation marks (“ ”) instead of neutral ones ("), use en- and em-dashes (– —) instead of double-hyphens (--), and use a real ellipsis (…) rather than three periods. All these characters can be typed with key combinations or copied from a lookup app like UnicodeChecker.
- There's no need to separate sentences with two spaces. It can be a hard habit to kick if you were raised to type this way, but it's just not necessary in the age of modern digital typography. One space is all you need; the carefully tuned fonts included with iOS know how to handle it.
- Generally, columns of the correct width (about wide enough to type the alphabet once or twice) are easier to read than too-wide ones (more than two alphabets wide) or very narrow ones (less than one alphabet wide). If you do have wide columns, you can make them easier to read by putting a bit more space between lines. Then it's easier for the eye to stay on track as it moves from the end of one line to the beginning of the next.
- On an iOS screen, it's rare that you'll have enough words per line to benefit from horizontal justification; instead it's likely to lead to unsightly and random-looking gaps between words. Left-alignment, with a ragged right edge, works well for paragraphs of content. Center-alignment is common for short, stand-alone explanatory blurbs of text that live outside of elements.

For advice beyond this, get hold of Robert Bringhurst's *The Elements of Typographic Style,* or the more adventurous *Thinking with Type* by Ellen Lupton, which are a thrill to read and will put you well on your way to becoming an expert.

Layout: A Place for Everything…

Now that you're familiar with the mechanics of placing elements together on a screen, it's time to think about *where* to put them. This section deals with the semantic (meaning-oriented) implications of how you arrange elements and how iOS helps you convey meaning through layout.

Content and Controls

Recognize the difference, and the relationship, between content and controls. **Content** is the actual stuff that users come to your app to see and manipulate: documents, images, web sites, media, text, and so on. **Controls,** then, are the administrative necessities (such as buttons and switches) that the user uses to tell the app what to do. The content is on the screen because the user wants to see it and work with it. The controls are on the screen because the app needs to get input from the user about how to behave.

This relationship should make it clear that content takes precedent whenever possible. The more you can pull your controls out of the way of your content, the better. That means either putting the controls on a visually distinct layer or presenting them in a temporary form such as a popover or a contextual menu.

Thinking in Layers

Most iOS apps involve some sort of layering, with the visual suggestion that the parts of the screen are actually different contiguous surfaces, each with its own independent position, and often overlapping in the imaginary dimension perpendicular to the screen (usually called the **z dimension**). This book calls these **interface layers** to differentiate them from the layers feature of graphics software. The most basic example of this concept is the way the content of an iPhone app scrolls around while the navigation bar and toolbar stay put. The content appears to be sliding around on its own layer behind the bars. Similarly, the sidebar of an iPad app is clearly its own layer by the way it scrolls independently of the main content area (or slides in from the side, in portrait orientation).

But independent scrolling isn't the only way you can distinguish interface layers. A conspicuous change in visual treatment can also signal a transition from one layer to another. The status bar, for instance, is usually styled differently from the app interface so that it seems more like part of the hardware device than part of the app. The same goes for the keyboard; users understand it as being different from the content area where they're using it to enter text.

The value of interface layers is both practical and conceptual. Practically, of course, it's good to be able to keep some things on the screen (like toolbar buttons) while

other things (like content) scroll around. Conceptually, layers can signal the purpose of elements and content. Whatever occupies the center of the screen gets the user's attention, whereas the controls in toolbars, sidebars, and navigation bars around the periphery tend to be more utilitarian, only there to serve a purpose ancillary to the main content. Layers help you avoid polluting the content area with controls and help users' brains understand what's safe to ignore when they're just interested in looking at the content.

Occasionally apps add even more interface layers. An example is the slide-out ruler in the app Pages, which provides further, optional controls related to styling. As you lay out a screen, think about how to make interface elements feel as if they exist in discrete, modular chunks, grouped and arranged meaningfully around the main content.

Controls in Content Areas

Every rule has exceptions. Even though you just learned that controls should be arranged in chunks around the content, sometimes it makes sense to put controls inline with the content. If a control is closely related to the content, and especially if space is tight in the designated control areas, it might make sense to put the control in with the content.

The classic example of this is a "new item" placeholder presented as the last item in a table. If users tap it, a new item appears right in the tapped cell. Note that this approach doesn't guarantee that the new item button will always be visible on the screen; if you have a long list, it might be scrolled off the bottom. (Putting it at the top would be awkward because new items are usually added to the end of a list, not the beginning.)

The main challenge in presenting controls in the content area is making them look sufficiently distinctive to identify them as controls, without overpowering the precedence of the content. One minor styling difference, such as making text grayish-blue instead of black, is usually enough.

Information Density

Scrolling on iOS is cheap. The huge touch target, the simple gesture, the breezy inertial effect, and the viscerally satisfying animation make it one of the easiest things to do on an iOS device. So putting content "below the fold"—that is, beyond the first screenful of information (analogous to the fold in a paper newspaper)—is not nearly as strong a deemphasis as it was on the desktop in days of yore.

So calm any tendency you may have to cram as much data as possible onto a single screen. In some situations, an info-dense, dashboard-style, at-a-glance view is useful, but it's uncharacteristic of iOS apps. Even on a small screen, feel free to spread out your information as described earlier in the principles of layout. See more about information density in Chapter 12.

Dimensionality

Given the controls you have to lay out and the screen or view size you have to work with, it may seem reasonable to use a two-dimensional arrangement: a grid, a multi-column table, and so on. Especially on iPad, where you have a lot more screen space to work with than on iPhone, you might be tempted to get sideways. Be careful! iOS is generally a one-dimensional platform, because it's harder for users to decipher 2-D layouts.

- Most fundamentally, 1-D layouts are far easier for the human eye to scan and interpret. You can simply draw your eye down the list of available items until it arrives at the correct one. A 2-D layout instead encourages the eye to bounce around the screen haphazardly, unsure where to look next.
- Two-dimensional layouts suggest meaning that might not be there. Each column seems to have a purpose, so the eye looks for a way to group its items. The same goes for rows; anything adjacent appears to be adjacent for a reason, which your brain tries to find.
- Although traditional tables of data are common on the desktop, such as in Finder windows or the classic Mail message list, they are rare on iOS. Instead of laying out cells of data side by side, iOS more commonly provides a couple of important pieces of information, using a supplemental text style, arranged in the same cell as the main title. This makes for a sort of 1.5-dimensional layout, where the items are arranged in a linear list but each item contains information spread out horizontally and vertically. (The 1.5-D message list in Mail on iOS has even made its way to the Mail on OS X.)

Keep Widths Sensible

Especially if you stay one-dimensional, you might wonder how to keep your elements from being comically wide as they try to fill the width of an iPad display. In such cases, you should usually not have the entire width of the display to fill; elements usually appear in a popover, a sheet, a sidebar, or the content area next to a sidebar. But if you find yourself with a content area covering the entire screen anyway, use generous amounts of margin (balanced on both sides) to push the controls inward. That's better than having ridiculously sized elements that fill the space just because it's there. (The page sheet style of modal view, described in Chapter 3, does a good job of keeping things from getting too wide.)

Sometimes, though, going two-dimensional is a fine answer. After all, even the iOS home screen is a grid.

- Two-dimensional layouts work pretty well with instantly recognizable entities. A grid of big, simple, colorful icons should work great. But a grid of tiny text-labeled buttons is a hassle for the mind to process.

- The fewer items you have to lay out, the more likely they are to work in 2-D. A 2×3 grid of 120-point square icons can be understandable and comfortable to interact with. A 5×5 grid of 48-point square icons, though, would be a headache to parse.
- If you can establish a meaningful reason for the columns that helps the user identify the options, 2-D can be nice. Suppose you have three text-oriented options and three media-oriented options in a blogging app; separating them into two columns makes good sense.
- Two dimensions is more often appropriate for content than it is for controls. Don't be afraid to use a 2-D layout to present information if it makes the information clearer. Sometimes it makes perfect sense to lay out information spatially. And if a meaningful 2-D presentation already exists for the content at hand, as in a calendar, even better.

Orientation on iPhone

iPhone apps can be locked to a certain orientation (portrait or landscape), or they can adapt to either orientation. There are four basic options for dealing with device rotation.

- Locking your app to portrait orientation is understandable, but not ideal, for a typical app. If you have to pick an orientation to lock to, portrait is the one. That's the orientation of the iPhone home screen, and it's by far the most commonly used orientation in apps. iOS tends to stack UI elements vertically: navigation bars, toolbars, keyboards, and so on. So some apps are simply too hard to cram into the shorter vertical space of a landscape iPhone.
- Being locked to landscape orientation is odd. A few apps can get away with it because their interface is dependent on a unique and immutable composition of elements.
- Adapting one interface to either orientation is ideal. If you can do it without undertaking a drastic redesign of your entire interface, you should. Users appreciate being able to rotate the device to switch between seeing more items at once and seeing more detail about each item. Lots of people prefer the big keys on the landscape keyboard for typing-intensive tasks. You can even get away with a few rarely used screens being portrait-only, if you must.
- Occasionally, it makes sense to offer a different interface depending on the orientation. If you have two drastically different but comparably valuable ways of looking at the same information, an orientation change may be just the way to switch between them. That's especially true if the normal view wouldn't have benefited much from landscape anyway. But be careful with this approach. Plenty of users simply never think to rotate their phone in order to see something different. Some even keep their orientation locked all the time to avoid accidental rotation, because they never intentionally switch to landscape.

Consider the orientation handling of some of Apple's built-in and App Store apps.

- Clock is locked to portrait orientation, because switching to landscape wouldn't gain you much. The information in each item is narrow enough to be completely visible without needing more horizontal space; switching to landscape would merely reduce the number of items visible at once and would make the already sparse items look even more empty.
- GarageBand is locked to landscape orientation, an unorthodox choice. Of course, GarageBand has an unorthodox approach to its interface overall. It feels much more like a virtual hardware device, like an actual piece of recording equipment rather than a magical piece of software that can reconfigure its layout. It is already pushing hard on the boundaries of what a phone is expected to do; redesigning its painstakingly detailed and surprisingly complex interface to be orientation independent would have been prohibitively difficult, with little to be gained. If your app is as grand and complex as GarageBand, and as astoundingly useful, feel free to lock it to landscape.
- Mail adapts to both orientations, which is an easy choice because of its structure. For the most part, it's a flexible content area bounded by a navigation bar at the top and a toolbar at the bottom. When you rotate the device, the content resizes appropriately, and the bars get a bit taller or shorter. It's a small investment for a big payoff, considering how much reading and typing people do in the app.
- Calendar offers a different presentation in landscape mode: a sort of expanded version of its hour-by-hour day planner that spans multiple days and can be panned two-dimensionally. In this app, rotating the device is more like toggling a view setting than it is like simply adjusting the size of the "window."

Orientation on iPad

The question of how to deal with orientation is quite a bit simpler on iPad. The device is still easy to rotate, but it's not as easy and casual as rotating an iPhone. People tend to pick an orientation and stick with it for a long time as they work with various apps. The screen is spacious enough that as long as you design carefully, either orientation offers enough space to get things done. So it is much harder to get away with not offering the same interface in both orientations. For almost all apps, users expect the app to accommodate them and not to have to rotate the iPad to accommodate the app.

Being locked to either orientation requires a compelling reason. GarageBand and Keynote are both locked to landscape, because their interfaces are so specific to those screen dimensions that it would not make much sense to reinterpret them in portrait.

The Worst-Case Height-Compression Scenario

On both devices and in both orientations, it might seem as if you have plenty of vertical space to work with. But there's a horde of interface elements just waiting to stack

up and consume it. Whatever elements you're intentionally including in your design, make sure you consider the other elements that might invite themselves.

- Unless you're hiding the status bar because you have an especially immersive app, it'll always be there, eating up 20 points.
- On an iPhone in portrait mode, if a phone call, voice recording, or tethering session is in progress, then the status bar grows to be 40 points tall.
- On any screen that allows text entry, you must of course account for the keyboard (162 points on iPhone landscape, 216 points on iPhone portrait, 352 points on iPad landscape, and 264 points on iPad portrait). Screens that don't normally scroll may need to scroll when the keyboard is visible.
- Some languages, such as Japanese, also need a completion bar to support text input, so the space needed for the keyboard is actually taller than you think (36 points on iPhone, 54 points on iPad).
- Even if you're designing with the taller iPhone 5 in mind, with 568 points of height to work with, lots of people have older iPhones with only 480 points of height. Every screen you make should be great on the shorter display and even better on the new taller display. This may mean that less scrolling is necessary, or it could mean that screens designed to fill the display afford more space to each element. Wireframe for both heights.

For each screen you wireframe, plan how it will respond to having *all* the possible interface elements visible at once. If it can take all those elements and still have a reasonable amount of room for the content, then you know you're in good shape.

Summary

Wireframing is about figuring out which elements to use and where. It requires thinking in screens: how elements fit onto screens, how one screen flows into the next, and what variants and states of each screen exist. It also requires thinking in points: the dimensions of elements and their placement relative to the screen boundaries and the other elements. There are lots of tools for wireframing. Make sure you choose tools that help you draw precisely and measure accurately.

To get good at wireframing, you should be familiar with the fundamentals of layout, especially the goal of unity and the importance of understatement. These principles will serve you well elsewhere, too: on the desktop, on the web, in graphic design, and beyond. When it comes to iOS specifically, keep in mind the standards of layout that users expect from a well-made app.

The next stage of our journey is an exciting one. It's almost time to turn our modest, utilitarian skeleton of a design into a lovely, charming, production-grade mockup.

Exercises

The principles you've learned in this chapter should serve you well for building responsible, sturdy screens. Work through these exercises to get your own app into shape.

1. Based on reviewing the sketches you made of each screen and referring to your architecture outline, build a wireframe of each screen that includes every element just where it needs to be. Consider all the elements built in to iOS and the possibilities of custom controls. Consider what the positioning, grouping, and characteristics of the elements say about their meanings.
2. Critically scrutinize your wireframes, looking for any elements that are misaligned, unbalanced, or cramped. Use the guide test to bring all the elements into harmony as best you can.
3. Wireframe key screens in both orientations and with all the possible transitory elements visible. Make sure these changes don't cause the layout to break down.

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