

Design standards-compliant  
web apps for the mobile web



Pro  
**iOS Web Design  
and Development**

HTML5, CSS3, and JavaScript with Safari

**Andrea Picchi**

Apress®

# Pro iOS Design and Development

HTML5, CSS3, and JavaScript with Safari



**Andrea Picchi**

Apress®

## **Pro iOS Web Design and Development: HTML5, CSS3, and JavaScript with Safari**

Copyright © 2011 by Andrea Picchi

All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system, without the prior written permission of the copyright owner and the publisher.

ISBN-13 (pbk): 978-1-4302-3246-9

ISBN-13 (electronic): 978-1-4302-3247-6

Trademarked names, logos, and images may appear in this book. Rather than use a trademark symbol with every occurrence of a trademarked name, logo, or image we use the names, logos, and images only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

The use in this publication of trade names, trademarks, service marks, and similar terms, even if they are not identified as such, is not to be taken as an expression of opinion as to whether or not they are subject to proprietary rights.

President and Publisher: Paul Manning

Lead Editor: Steve Anglin

Development Editor: Matthew Moodie

Technical Reviewer: Daniel Paterson

Editorial Board: Steve Anglin, Mark Beckner, Ewan Buckingham, Gary Cornell,

Morgan Engel, Jonathan Gennick, Jonathan Hassell, Robert Hutchinson,

Michelle Lowman, James Markham, Matthew Moodie, Jeff Olson, Jeffrey Pepper,

Douglas Pundick, Ben Renow-Clarke, Dominic Shakeshaft, Gwenan Spearing,

Matt Wade, Tom Welsh

Coordinating Editor: Adam Heath

Copy Editor: Ginny Munroe

Compositor: MacPS, LLC

Indexer: BIM Indexing & Proofreading Services

Artist: SPi Global

Cover Designer: Anna Ishchenko

Distributed to the book trade worldwide by Springer Science+Business Media, LLC., 233 Spring Street, 6th Floor, New York, NY 10013. Phone 1-800-SPRINGER, fax (201) 348-4505, e-mail [orders-ny@springer-sbm.com](mailto:orders-ny@springer-sbm.com), or visit [www.springeronline.com](http://www.springeronline.com).

For information on translations, please e-mail [rights@apress.com](mailto:rights@apress.com), or visit [www.apress.com](http://www.apress.com).

Apress and friends of ED books may be purchased in bulk for academic, corporate, or promotional use. eBook versions and licenses are also available for most titles. For more information, reference our Special Bulk Sales–eBook Licensing web page at [www.apress.com/bulk-sales](http://www.apress.com/bulk-sales).

The information in this book is distributed on an “as is” basis, without warranty. Although every precaution has been taken in the preparation of this work, neither the author(s) nor Apress shall have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the information contained in this work.

The source code for this book is available to readers at [www.apress.com](http://www.apress.com). You will need to answer questions pertaining to this book in order to successfully download the code.

*To my parents, Gianni and Carla, for their endless support.*

*To my fiancée and “Mia Principessa,” Simona, source of strength, love, and will.*

*—Andrea Picchi*

---

# Contents at a Glance

<b>Contents</b> .....	<b>v</b>
<b>About the Author</b> .....	<b>xi</b>
<b>About the Technical Reviewer</b> .....	<b>xii</b>
<b>Acknowledgments</b> .....	<b>xiii</b>
<b>Preface</b> .....	<b>xiv</b>
<b>Introduction</b> .....	<b>xxv</b>
■ <b>Chapter 1: Think Mobile Touch</b> .....	<b>1</b>
■ <b>Chapter 2: Agile Project Building for iOS Devices</b> .....	<b>9</b>
■ <b>Chapter 3: Web Development for iOS Devices</b> .....	<b>51</b>
■ <b>Chapter 4: User Interface Design for iOS Devices</b> .....	<b>121</b>
■ <b>Chapter 5: iPhone UI Design: Think Simple</b> .....	<b>179</b>
■ <b>Chapter 6: iPad UI Design: Think Inverted</b> .....	<b>203</b>
■ <b>Chapter 7: Web Standards for WebKit: Maximizing Mobile Safari</b> .....	<b>243</b>
■ <b>Chapter 8: Native iOS Environment Development</b> .....	<b>319</b>
■ <b>Chapter 9: Native iOS Design Implementation</b> .....	<b>347</b>
■ <b>Chapter 10: Optimizing iOS WebApps</b> .....	<b>361</b>
■ <b>Chapter 11: Testing iOS WebApps</b> .....	<b>389</b>
■ <b>Chapter 12: Maximizing the Market for iOS WebApps</b> .....	<b>413</b>
■ <b>Chapter 13: Looking Beyond the Mobile Web to Ubiquitous Computing</b> .....	<b>427</b>
<b>Index</b> .....	<b>437</b>

---

# Contents

<b>Contents at a Glance</b> .....	<b>iv</b>
<b>About the Author</b> .....	<b>xi</b>
<b>About the Technical Reviewer</b> .....	<b>xii</b>
<b>Acknowledgments</b> .....	<b>xiii</b>
<b>Preface</b> .....	<b>xiv</b>
<b>Introduction</b> .....	<b>xxv</b>
<b>■ Chapter 1: Think Mobile Touch</b> .....	<b>1</b>
Why the Mobile Web? .....	1
From Desktop to Mobile.....	2
Mobile Market.....	4
Why Mobile Now? .....	5
A Mobile-Oriented Approach.....	6
Mobile-Oriented Guidelines .....	6
Apple’s Mobile Hardware.....	8
Summary .....	8
<b>Agile Project Building for iOS Devices</b> .....	<b>9</b>
Implementing a Mobile Information Architecture .....	9
What Is Information Architecture and Why Is It Important? .....	10
Abiding by the Golden Rules of Mobile Strategy.....	21
Content-Out Approach .....	22
Representing an Information Architecture with a Site Map.....	23
Sketching an Information Architecture with Wireframes.....	26
Visualizing Interactions Through Prototypes.....	28
Systematic Approach to Mobile Design .....	31
Accessibility in Apple Devices .....	32
Usability in iOS Devices .....	36
iPhone Page Model .....	40
iPhone User Interface.....	41
iPad Block Model .....	44
iPad User Interface .....	47
Tools for Apple Mobile Design .....	49
Summary .....	50

<b>Web Development for iOS Devices .....</b>	<b>51</b>
Web Development Tools .....	52
Development Frameworks .....	52
Mobile Web Site .....	60
Mobile Applications .....	60
Web Development Model .....	61
Web Development Model: Pros and Cons .....	62
Four Different Approaches to a WebApp .....	66
WebApp and Native App: What Makes the Difference for the User .....	69
Web Standards: HTML, CSS, and JavaScript .....	73
Browser Support for Standards: WebKit and Safari .....	106
SDK Development Model .....	115
Apple’s Objective-C, Cocoa Touch, and Xtools Model .....	115
Hi, I’m a Mac .....	118
Tools and Frameworks for Apple Mobile Development .....	119
Summary .....	120
<b>User Interface Design for iOS Devices .....</b>	<b>121</b>
User Interface Design .....	121
What Is an Interface? .....	123
Everything Is an Interface .....	125
Negative Space .....	130
Color Psychology .....	138
The Interface Hierarchy .....	147
Reading Patterns .....	148
The User Interface Design Process .....	157
iPhone and iPad Compatible User Interface Design .....	160
Research .....	161
Structure .....	164
Aesthetic .....	167
Interaction .....	168
Deliverables .....	170
iPad Native-Like User Interface Design .....	170
Research .....	170
Structure .....	171
Aesthetic .....	172
Interaction .....	173
Deliverables .....	173
iPhone Native-Like User Interface Design .....	173
Research .....	174
Structure .....	174
Aesthetic .....	176
Interaction .....	176
Deliverable .....	177
Tools for User Interface Design .....	177
Summary .....	178
<b>iPhone UI Design: Think Simple .....</b>	<b>179</b>
User Interface Sketching .....	179

Think Simple .....	180
The iPhone is an On-the-Go Device .....	180
The Essence of the iPhone Page Model .....	180
iPhone Limitations .....	181
The Nature of Users' Cognitive Resources .....	181
Anatomy of Sketching .....	181
Design Using Tools .....	184
Explore the Balsamiq Mockups Interface .....	185
Represent Connections .....	187
Designing with Adobe Fireworks .....	188
Creating a Canvas .....	189
Organize Levels .....	191
Layout Design .....	192
Interface Design .....	193
Reuse Design .....	198
Tools for User Interface Design .....	201
Summary .....	201
<b>iPad UI Design: Think Inverted .....</b>	<b>203</b>
User Interface Sketching .....	203
Think Inverted .....	204
Inverted Simplicity .....	205
Remove and Prioritize .....	206
Hide and Shape .....	207
Shrink and Group .....	209
Key Points of the Simplicity-Complexity Paradox .....	210
Sketching the UI .....	210
Design Using Tools .....	213
Design with Adobe Fireworks .....	219
iPad-Compatible Version .....	220
iPad Native-Like Version .....	233
Summary .....	242
<b>Web Standards for WebKit: Maximizing Mobile Safari .....</b>	<b>243</b>
Comparing iPhone and iPad for Web Presentation .....	244
HTML5 .....	244
HTML5 Markup Syntax .....	244
HTML5 Re-Definitions .....	246
HTML5 Semantics .....	246
HTML5 Media .....	249
CSS3 .....	272
Prefixes .....	273
Rounded Borders .....	274
Border Images .....	274
Gradients .....	275
Box Sizing .....	276
Box Shadow .....	277
Outline .....	278
Background Size .....	278

Background Origin .....	279
Multiple Backgrounds .....	279
Text Shadow .....	280
Text Overflow .....	281
Word Wrapping .....	281
Web Fonts .....	282
Tap Highlight.....	282
Multiple Columns .....	283
Spanning Columns .....	284
Transitions .....	284
Transforms.....	285
Animation.....	286
Keyframes.....	289
Reflections .....	289
Javascript .....	290
Adding Javascript to a Webpage .....	292
Javascript Structure .....	293
Data Categories .....	293
Reserved Words.....	295
Variables .....	296
Operators .....	298
Conditional Statements.....	300
Loop Statements.....	302
Functions .....	303
Variable Scope .....	304
Arrays.....	305
Strings .....	307
Objects.....	308
BOM (Browser Object Model).....	309
DOM (Document Object Model).....	310
Compare DOM and HTML Structure.....	312
Working with DOM .....	314
Some Javascript Best Practices .....	316
Resource on Web Standards.....	317
Summary .....	318
<b>Native iOS Environment Development .....</b>	<b>319</b>
Setting up the Environment .....	319
Defining Viewport .....	321
Full-Screen Mode Application.....	323
Adding the Springboard Icon .....	324
Application Startup Image .....	325
Application Redirecting.....	326
Setting up the Head Section .....	327
Native Link Emulation .....	328
Native Text Emulation .....	328
Native Element Emulation.....	329
Native Scrolling Emulation.....	330
Native iOS Service Interaction .....	330

The Phone Application .....	330
The Mail Application .....	331
The SMS Application .....	332
The Maps Application .....	332
Touch Events and Gesture Interactions .....	334
Touch Event Paradigm: Touch Is Not a Click .....	334
Native and Customized Touch Event Handler .....	339
Create Touchable Design Elements .....	340
Orientation Change Event .....	340
Orientation Change Media Query .....	342
Expand a Framework for iOS .....	343
Resources for Coding.....	345
Summary .....	345
<b>Native iOS Design Implementation .....</b>	<b>347</b>
iPhone Page Model Implementation .....	347
Implement the Native-Like Page Structure.....	347
iPhone Native Interface Emulation.....	348
The Top Bar Section.....	349
The Page Title Element .....	350
The Breadcrumb Bar .....	352
The Hero Content Area.....	353
The Menu Area.....	356
The Footer Section.....	358
Summary .....	360
<b>Optimizing iOS WebApps .....</b>	<b>361</b>
iPad and iPhone Compatibility .....	361
Performance Optimization .....	361
Code Optimization.....	362
Image Optimization .....	366
Application Compressing .....	369
Usability Optimization .....	371
Offline WebApp .....	375
The Manifest File .....	375
Mobile SEO.....	378
Anatomy of a Search Engine.....	379
Search Engine Oriented Design .....	380
Resource on Optimization and SEO .....	387
Summary .....	388
<b>Testing iOS WebApps.....</b>	<b>389</b>
Web Development Lifecycles.....	389
Web Application Testing .....	390
Agile Tests .....	391
Heat Map Tests .....	393
Organizing a Test.....	394
Creating Use-Cases .....	394
Creating the Assets.....	398
Performing a Test .....	400

Paper Prototype .....	401
Electronic Prototype.....	403
Evaluating a Test .....	404
Variables and Feedback to Evaluate .....	405
Number of Touches.....	405
Number of Mistakes.....	406
Estimated Time of Arrival.....	406
Collecting Feedback.....	407
Evaluation Techniques .....	409
Resources on Testing .....	412
Summary .....	412
<b>Maximizing the Market for iOS WebApps .....</b>	<b>413</b>
Use Your Mobile Strategy .....	413
How to Promote Your WebApp.....	414
Use Beta Invitation Testers .....	414
Use Press Releases.....	415
Create a WebApp Web Site .....	415
Use E-mail Marketing .....	417
Create YouTube Video Tutorials .....	418
Submit to Apple WebApp Portal .....	419
Submit to Other WebApp Portals .....	420
Use the Virality of Social Networks.....	422
Monetizing a WebApp .....	424
Resources on WebApp Market.....	425
Summary .....	426
<b>Looking Beyond the Mobile Web to Ubiquitous Computing .....</b>	<b>427</b>
The Explosion of Mobile Devices, Wireless, and Cellular Communications .....	427
Next-Generation User Experience with Touchscreen and Multitouch Technology .....	428
New Technology, New Usability, and New Opportunity .....	429
How the Multitouch-Screen Revolution Will Change Next-Generation Computing .....	430
From Domestic to Ubiquitous Computing and Ambient Intelligence.....	432
Resources for Telecommunication and Ubiquitous Computing .....	434
Summary .....	434
<b>Index .....</b>	<b>437</b>

---

# About the Author



With a background in psychology (University of Padova) and computer science (University of Pisa), **Andrea Picchi** started designing WebApps for the new Apple device in 2007 when the first iPhone was launched on the market. After the first release of the Apple SDK in 2008, he started developing Native Apps using Objective-C.

He also worked with the SimBin Development Team AB on the videogame RACE07—The Official WTCC Game project—and supported the group’s iPhone iUI Developers, iPhoneWebDev and iPhone Application Development course at Stanford University.

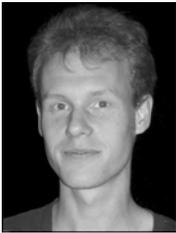
In recent years, Andrea Picchi has spoken at many important conferences around Europe, twice at the WhyMCA Mobile Developer Conference with a talk on “The Cognitive Paradigm of Touch-Screen Devices” and another on “A Cognitive Approach to the User-Centered Design for Mobile Design and Development.” He also spoke at IASummit with a speech on “Cognitive Design and Optimization of Touch-Screen Interfaces” and at UXConference with a speech on “Cognitive Optimization of Mobile Touch Contexts.”

In 2011 he also started to teach “iOS WebApps” in a course also available on iTunesU and “Mobile Device Development” in a first-level Master, both organized by the Computer Science Department of the University of Pisa.

Today, as a mobile project manager, his priority has been to implement a cognitive approach to touch-screen interface design in both mobile and ubiquitous computing contexts. He also continues his work designing and developing for iOS with both the web model (using HTML5, CSS3, JavaScript) and SDK model (using Cocoa-Touch in Objective-C).

---

# About the Technical Reviewer



**Daniel Paterson** has a master's degree in comparative literature, and he penned a memoir on integrating literary theory into fictional works, taking novels by Umberto Eco, Milan Kundera, and David Lodge as examples. After his university years, Daniel entered web development and joined Newsweb/Lagardère Active in April 2009. Passionate about the Web as about many other things, he enjoys every opportunity to work on interesting projects and to develop his skills.

---

# Acknowledgments

This book could not have been written without the fine folks at Apress.

Steve Anglin, who started everything rolling by contacting me and offering this great opportunity. Thanks, Steve. Adam Heath, who managed the project, and Kelly Moritz, who organized my schedule and deadlines. The development editor, Matthew Moodie, and the technical reviewer, Daniel Paterson, who drew on their experience to show me how to turn something good into something great.

A very special thanks to Carl Willat and Clay Andres.

Carl Willat worked with me on the project from day one. Carl read and reviewed everything I wrote in this book and helped me to explain all my ideas in more elegant and correct form.

Clay Andres's unique combination of charisma, deep knowledge, and professionalism inspires everyone around him. Clay is able to look beyond ordinary ways of thinking and see the shortest path for bringing a project to success. I can't image a better editorial director for any author.

Finally, thanks to my parents, Gianni and Carla, for their endless support and to my fiancée, Simona, for faithfully supporting me in all the bad and good moments and for being the center of everything that has value in my life.

—Andrea Picchi

---

# Preface

*“A journey of a thousand miles begins with a single step . . .”*

—Lao-Tzu

## Mobile Device Evolution

These are exciting times for those who live and work with technology every day, whether they are young people who have been using technology since birth, or, like many others, have had to adapt to it.

It is an exciting moment because in recent years there is no other example of technology that has changed our lives so dramatically as has the evolution of the mobile device.

Since in knowing the past you'll be more prepared to understand the present and help create the future, in this book we'll precede our discussion of how to get there with a short history of smartphones, with our beloved iPhone or iPad in hand.

## Humble Beginnings: The Early Mobile Web

Everything started in 1908, when Nathan B. Stubblefield of Murray, Kentucky was issued the first USpatent for a wireless telephone.

Forty years later, the zero generation (0G) of mobile telephones was introduced. Mostly used as car phones, they were meant to connect mobile users in cars to the fixed public telephone network.

The zero generation was not officially categorized as mobile device technology since it did not support the automatic change of channel frequency during calls (Handover), which would allow the user to move from one cell (the present-day radio base station covered area) to another.



**Figure 1.** *The zerogeneration: Mobile car phone (1960s)*

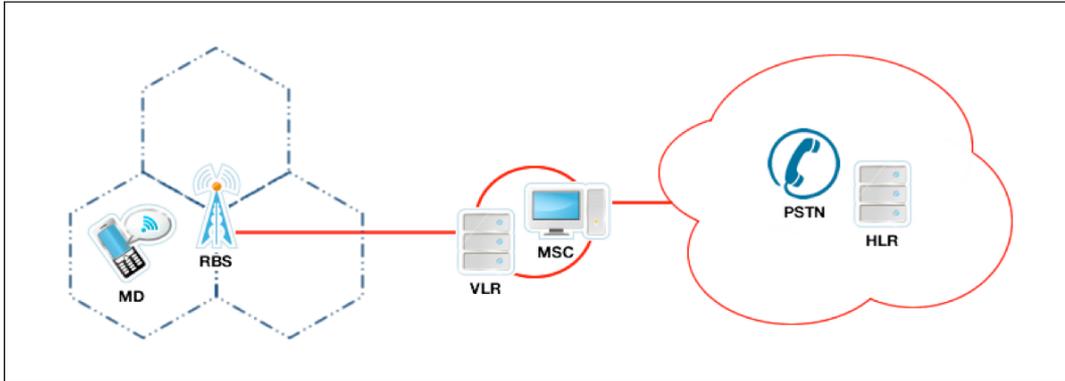
In the 1960s, a new full-duplex VHF/UHF radio system launched by Bell Systems, and subsequently improved by AT&T, called “Improved Mobile Telephone Service” (IMTS), brought many improvements, such as direct dialing rather than connection through an operator, and higher bandwidth.

The first-generation (1G) *cellular systems*, developed between the late 1960s and the early 1970s, were analog, and still based on IMTS technology. The systems were “cellular” because coverage areas were split into smaller hexagonal areas called “cells,” each of which were served by a low-power transmitter and receiver.

**NOTE:** A cellular system is a radio network made up of a number of radio cells, each served by at least one fixed-location transceiver (device that is both a transmitter and receiver) known as a base station. These cells cover different areas and combine to provide radio transmission over a wider range than that of one cell.

The simple structure of the cellular *mobile-radio network* consists of the following:

- PSTN: Public switched telephone network
- HLR: Home location register
- MSC: Mobile switching center
- VLR: Visitor location register
- RBS: Radio base station



**Figure 2.** The common (and simple) PCS (Personal Communication Service) network architecture

The 1G analog systems for mobile communications saw two key improvements during 1070s: the invention of the *microprocessor*, and the digitization of the control link between the mobile phone and the cell site.

**NOTE:** A microprocessor incorporates most or all of the functions of a computer’s central processing unit (CPU) on a single integrated circuit (IC or microchip).

In 1973 Dr. Martin Cooper at Motorola invented the first modern portable handset. Legend has it that his first call was to his rival Joel Engel, head of research at Bell Labs, giving him the news about how the competition between them had turned out.

The first commercial handheld cellular phone was launched by Motorola only ten years later in 1983 and called DynaTAC. This brick-like phone had a weight of 28 ounces (0.8Kg) and a price of “only” \$4,000.

**HISTORICAL NOTE:** Martin Cooper, the inventor of world’s first cellular phone, the Motorola DynaTAC, first had the idea from watching Captain James T. Kirk talk over his communicator in the famous *Star Trek* TV series in the 1960s.

In today’s world, talking on the go seems normal, but back in the early 1960s when *Star Trek* was first aired, most people’s phones worked only with cords.

## Expanding Mobile’s Reach: GSM Device

The second generation (2G) of digital cellular systems was first developed at the end of the 1980s. These systems digitized not only the control link but also the voice signal.

The new systems provided better quality and higher capacity at a lower cost to consumers. GSM (Global System for Mobile Communication, originally Groupe Special Mobile) was the first commercially operated digital system using *TDMA protocol* (time division multiple access) for its channel access method.

**NOTE:** A channel access method allows several terminals connected to the same multi-point transmission medium to transmit over and receive to share its capacity.

Fundamental forms of *channel access schemes* are as follows:

- FDMA: Frequency division multiple access
- TDMA: Time division multiple access
- CDMA: Code division multiple access
- SDMA: Space division multiple access

GSM networks pioneered low-cost implementation of the “Short Message Service” (SMS), also known as text messaging, which has since been supported on other mobile phone standards as well. The new GSM standard also includes a worldwide emergency telephone number feature. This three-digit number is localized, and some countries have a different emergency number for each of their various emergency services. A few common numbers are 112, 999, and 911.

In the 1990s, along with the new way of transmitting information, a new generation of small 100–200g handheld devices started replacing the brick-sized phones. This change was made possible thanks to technological advancements that included smaller batteries and more energy-efficient electronics. The 1990s were the glory years of Motorola, Inc. and its famous MicroTAC phone, which was released in 1989 and remained a status symbol for almost a decade.

In 1997, the GSM system was extended with a packet data capability by the new GPRS (general packet radio service), and again in 1999 with a higher-speed data transmission protocol called EDGE (Enhanced Data Rates for GSM Evolution). Those two new versions of GSM protocol were called 2.5G and 2.75G networks, respectively.

In the same year, Nokia launched 7110, the first terminal with WAP (Wireless Application Protocol), which for the first time permitted Internet access directly from the phone. “A small step for a protocol but a giant leap for mankind.”

**NOTE:** WAP 1.0 standard, released in 1998, describes a complete software stack for mobile Internet access. Nokia was also a co-founding member of the WAP standard.

A WAP browser provides all the basic service of a computer-based web browser but is simplified to operate within the restrictions of a mobile phone. Users can connect to WAP sites written in or dynamically converted to WML (Wireless Markup Language) and access them via the WAP browser.

After having released its first phone in 1992 (the Nokia 1011), in the 2000s Nokia took control of the mobile devices market from Motorola and, with 1.2 billion phones in use and more than 806 different devices made and sold, still leads it today.



**Figure 3.** *The 2G generation: GSM devices (1990s)*

## Another Step Forward: UMTS Device

The third-generation (3G) systems promised faster communications services, including voice, fax, and Internet anytime and anywhere, with seamless global roaming. 3G technologies were an answer to the International Telecommunications Union's IMT-2000 specification and were originally supposed to be a single, unified, worldwide standard, but in practice the 3G world has been split into three camps: *UMTS*, *CDMA2000*, and *TD-SCDMA*.

**NOTE:** The UMTS standards are as follows:

- **UMTS:** Based on W-CDMA technology, it is the solution generally preferred by countries using GSM, centered in Europe. UMTS is managed by the 3GPP organization also responsible for GSM, GPRS, and EDGE.
- **CDMA2000:** This is an outgrowth of the earlier 2G CDMA standard IS-95. CDMA2000's primary proponents are outside the GSM zone in the Americas, Japan, and Korea. It is managed by 3GPP2, which is separate and independent from UMTS's 3GPP.
- **TD-SCDMA:** This technology is being developed in the People's Republic of China by the companies Datang and Siemens.

The first (pre-commercial) *3G network* was developed in Japan in 2001 and supported 144 Kbits of bandwidth with high-speed movement (e.g., vehicles), 384 Kbits (e.g., on campus), and 2 Mbits for stationary use (e.g., in-building).

**NOTE:** 3G systems are intended to provide a global mobility with a wide range of services including telephony, paging, messaging, Internet, and broadband data. The simple structure of the 3G network consists of the following:

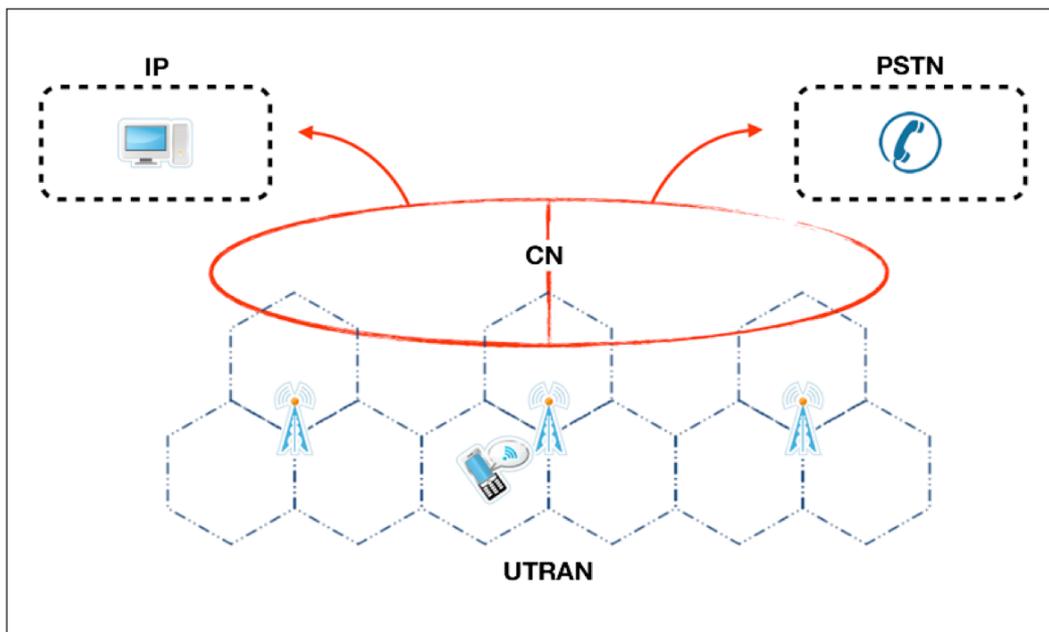
IP: IP-based network

PSTN: Public switched telephone network

CN: Core network

UTRAN: UMTS Terrestrial Radio Access Network

VLR: Visitor location register



**Figure 4.** The common (and simple) PCS (Personal Communication Service) network architecture

The last evolution of 3G protocol is the HSDPA (high speed downlink packet access), developed in 2005 and called 3.5G. 3.5G is a packet-based protocol data service in W-CDMA downlink with data transmission up to 8–10 Mbits.

## Expanding Mobile Capabilities: Smartphones

The first *smartphone* was called Simon and was designed by IBM in 1992 and shown as a concept product that year at COMODEX (Computer Dealer’s Exhibition), the computer industry trade show held in Las Vegas.

Simon was released to the public in 1993 and sold by BellSouth. Besides being a mobile phone, it also contained a calendar, address book, world clock, calculator, notepad, games, and mail and fax capabilities.

The next attempt was in 1996 by Nokia, with its mobile device called “Communicator.” This distinctive palmtop computer-style smartphone was the result of a collaborative effort with

Hewlett-Packard, combining an early successful and expansive HP personal digital assistant (PDA) with Nokia’s bestselling phone around that time. The Nokia 9000 Communicator was the first true smartphone, with an operating system called GEOS 3.0.

The Ericsson R380, released in 2000, was the first phone sold as a “smartphone” and the world’s first touch-screen phone. The R380 had the usual PDA functions and a large touch-screen combined with an innovative flip so it could also be used as normal phone. It was also the first commercially available Symbian OS (5.0) phone. However, it could not run native third-party applications.



**Figure 5.** *The 3G generation: Smartphones (2000s)*

**NOTE:** There is no industry standard definition of a smartphone, but we can see it as a “mobile phone offering advanced capabilities that runs complete operating system software providing a standardized interface and platform for application developers.”

Source: SmartphoneAppsPedia

In 2002, Handspring released the Palm OS Treo smartphone, utilizing a full keyboard that combined wireless web browsing, e-mail, calendar, and contact organizer with mobile third-party applications that could be downloaded or synced with a computer.

Also in 2002, RIM released the BlackBerry, which was the first smartphone optimized for wireless e-mail use. By December 2009, it had achieved a total customer base of 32 million subscribers.

## Redefining Mobile’s Reach: The Next-Generation Protocols

The fourth-generation (4G) system is a successor to 3G and aims to provide a wide range of data rates up to ultra-broadband (gigabit speed) Internet access to mobile as well as stationary users. The name of this new project is LTE (Long Term Evolution) and is a set of enhancements to the UMTS (Universal Mobile Telecommunications Systems) architecture.

The LTE specification provides downlink peak rates of at least 100 Mbits and an uplink of at least 50 Mbits with a RTT (round-trip time) of less than 10 ms.

But beyond these numbers, the most important point of the LTE draft is the “Persuasive Network” that describes an amorphous, and at present entirely hypothetical concept, where the user can be simultaneously connected to several wireless access technologies and can seamlessly move between them (vertical handoff). The access technologies can be Wi-Fi, UMTS, EDGE, or any other future access technology.

**NOTE:** Vertical handoff refers to a network node changing the type of connectivity it uses to access a supporting infrastructure, usually to support node mobility.

The 4G network will be based on OFDM (orthogonal frequency division multiplexing) protocol and will probably use smart antennas.

**NOTE:** Smart antennas are antenna arrays with smart signal processing algorithms used to identify spatial signal signatures such as the direction of arrival (DOA) of the signal and use them to track and locate the antenna beam on the mobile device.

The Mobile WiMAX (IEEE 802.16) mobile broadband access standard is also branded 4G and offers peak data rates of 128 Mbits downlink and 56 Mbits uplink.

## Advanced Human-Device Interaction: Touch-Screen Devices

On June 29, 2007, when the first iPhone was introduced at “MacWorld Conference and Expo” by Apple, the mobile market changed irreversibly. Increasing numbers of handsets with touch screens have started to appear on the market following the lead set by Apple’s iPhone.

The touch screen has gained popularity and become more common on handsets, helping to make the handsets more intuitive, pleasant, and efficient to use.

Handsets with intuitive user interface allowed quick and easy access to various applications and services. Alternatively many smartphones and high-end handsets with useful and innovative features have been commercial failures simply because their user interface was too complex and difficult for convenient use.

**NOTE:** A touch screen is an electronic visual display that can detect the presence and location of a touch (typically a finger or a pen) within the display area.

There are a few types of touch-screen technologies:

- Capacitive (used on iPhone)
- Resistive
- Surface acoustic wave
- Strain gauge
- Optical imaging
- Dispersive signal technology
- Acoustic pulse recognition
- Coded LCD on bidirectional screen

On November 11, 2008, HTC produced the “Touch HD,” a device with a much larger screen than its predecessors. This device, like all other HTC devices, runs Windows Mobile and the HTC proprietary user interface TouchFLO 3D.

On June 6, 2009, Palm released its Palm Pre, a smartphone with a multi-touch screen and a sliding QWERTY keyboard based on webOS, the new Linux-based operating system from Palm.

**HISTORICAL NOTE:** The QWERTY keyboard layout was devised and created in the early 1870s by Christopher Latham Sholes (1819–1890), a newspaper editor and printer who lived in Milwaukee, Wisconsin. This layout takes its name from the first six characters at the left of the keyboard’s top row.

Source: Wikipedia

On January 5, 2010, Google launched its “Nexus One,” a smartphone with touch-screen technology based on Android OS, Google’s open source mobile operating system. As with the Apple iPhone, the large capacitive touch screen is capable of handling multi-touch gestures.

Unfortunately for competing brands, Apple’s real secret was not just the touch screen, as many people thought, but what the iPhone was capable of achieving through touch-screen technology: a brand new user interface experience.

I say “unfortunately” because although any brand can make use of the latest advanced “projected capacitive” technology, not every brand has an operating system like iOS, for implementing all the services and killer applications that help make an iOS device unique.

That’s why, from an operative system point of view, Apple is at least a few years ahead of all other competitors, and that’s why one good development team, the people from Google, focused first of all on developing its Android OS and then later the Nexus Series smartphone.

**NOTE:** Later in this book, we will analyze how this technology changed the paradigm used for building every user interface dedicated to the mobile world. For now the key idea to remember is that the more complex the structure you need to implement, the simpler must be the interface design with which the user interacts.



**Figure 6.** Steve Jobs presenting the iPhone (2007) and introducing the iPad (2010)

On January 27, 2010, Apple launched the iPad to fill the gap between the iPhone and the MacBook. Apple iPad runs iOS 3.2 (called iPhone OS at the time), with a resolution of 1024x768 pixels and offers new native applications optimized for this new environment.

The iPad's screen is composed of a single piece of multi-touch glass, with no up or down, left or right. There is no single orientation, and therefore it can be positioned to fit the user's needs. That's really the big thing behind the Apple iPad, and that's why, if with the Apple iPhone we were able to achieve a new device experience, with the iPad we will be able to bring this experience to thousands of potential users who, until now, had never thought about having a "computer" in their lives.

**READING NOTE:** If you want to analyze how multi-touch technology will impact the desktop computer's future and how our lives will probably change in accordance with this revolution, jump to last chapter.

I like to think of the iPad as the Wii of the mobile ecosystem. The Nintendo Wii was criticized by the hardcore gamers, but what they didn't realize was that the Nintendo Wii was meant for everyone but them.

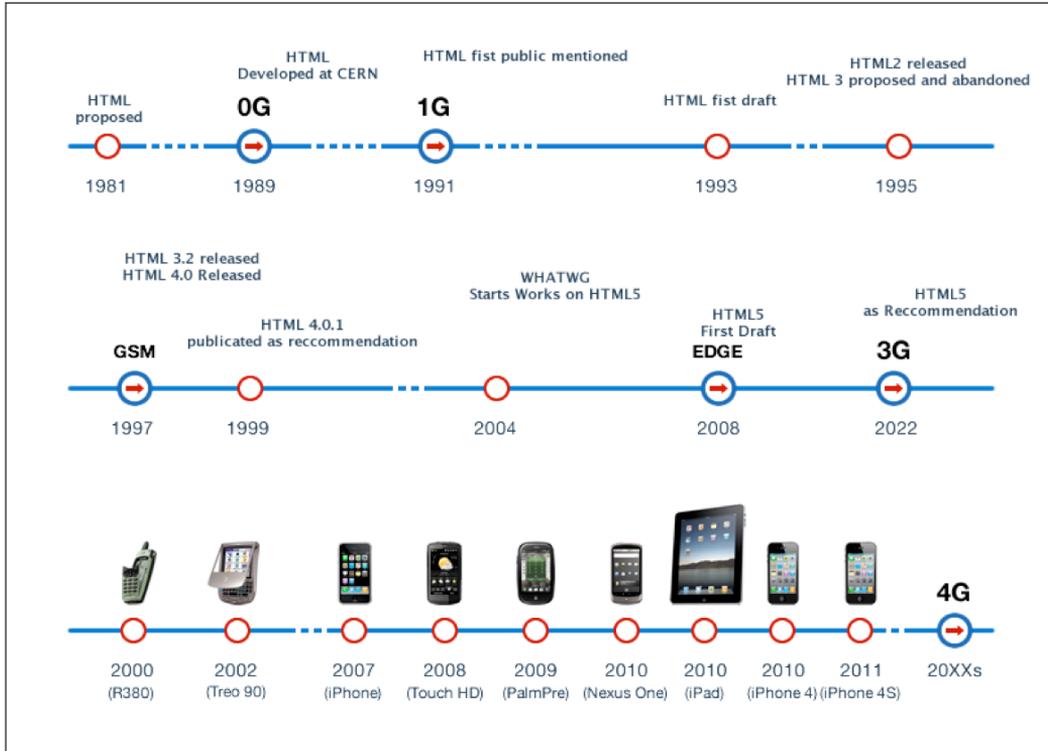
**CITATION:** "We all want things to be simpler, and now here is a simple thing. I think it will be a huge success."

Steve Wozniak, co-founder of Apple, Inc.

On June 7, 2010, Apple launched the latest version of the iPhone, called iPhone 4, and everything changed again. The iPhone 4 runs the fourth generation of the iPhone OS firmware, released initially on June 21, 2010 and renamed iOS 4. The new smartphone from Apple introduced FaceTime, the video calling feature, HD video recording, and Multitasking, where the user can use multiple applications at the same time.

**NOTE:** Multitasking and iOS5 run only on iPhone 4 S, iPhone 4, iPhone 3G S, iPad, and iPad2. The last firmware version for the iPhone 2G is 3.1.3, released on February 2, 2010, and for iPhone 3G it is 4.2.1, released on November 2010.

The iPhone 4 S and iPhone 4 have a 960 x 640 resolution based on the new retina display developed by Apple with 326 ppi. It's called retina display because it's beyond the retina capability of perceiving no more than 300 ppi.



**Figure 7. Mobile devices history timeline**

For this reason, thanks also to touch-screen technology, the future is full of opportunities for those who want to design and develop for iPhone and, even more, for iPad.

---

# Introduction

*“The only true voyage of discovery . . . would be not to visit strange lands but to possess other eyes . . .”*

—Marcel Proust

## Who Needs This Book

This book is for a designer and/or a developer who wants to start designing or developing iOS user interfaces or iOS WebApps (iPhone, iPod Touch, and iPad).

This book is written with simplicity in mind, and the goal is to bring you along in the entire process involved in designing and developing for Apple’s mobile devices, implementing a real use case called “The Store.”

You will design and develop using web standards like HTML5, CSS3, and JavaScript, and you will not need any of those skills for reading this book. We will use HTML5 and CSS3 from the basics. We will provide a JavaScript crash course and will also use a JavaScript Framework for making things easier and faster.

## What You Will Learn from This Book

We split this book into three logical parts in order to achieve a better learning-oriented path.

In **Part One**, we will introduce the foundations of designing and developing for the mobile web and then how to transcend them.

In **Chapter 1**, “Think Mobile Touch,” you will learn how to think in a mobile-oriented way, learning the mobile device’s evolution, analyzing Apple’s unique style.

In **Chapter 2**, “Agile Project Building for iOS Devices,” you will learn how to implement a mobile information architecture through steps from the basic strategies to sketching and prototyping. We will also show a systemic approach to iOS mobile design, introducing first the content-out approach and then the page models and user-interface models, including the new inverted approach used with the iPad. You will also see accessibility and usability in Apple devices.

In **Chapter 3**, “Web Development for iOS Devices,” you will learn how to use the web standards and some useful tools for developing your iOS WebApp faster and more easily. You will be introduced to the framework that we will use in our case study, and, analyzing both Native Apps and WebApps, you will see the differences between a web development model using web standards and the SDK development model using Cocoa Touch and Objective-C. You will also see the different levels of approach to designing and developing a WebApp.

**NOTE:** This book is focused on design and development for iOS, using web standards like HTML5, CSS3, and JavaScript; therefore we will not use Cocoa Touch Framework or the Object-C language in any of the projects of this book.

In **Part Two**, we will go deep into designing for iPhone and iPad, analyzing methodologies, best practices, and some useful tools for speeding up your workflow.

In **Chapter 4**, “User Interface Design for iOS Devices,” you will start the real iOS user interface design process for mobile, working with both iPhone and iPad devices, also introducing the concepts behind a cognitive approach to the iOS user interface design process. You will be introduced to the concepts of positive-negative and active-passive interface; you will see the laws of perception, the color psychology, and how to use the most common reading patterns in iOS design. In the end, we will analyze the single elements of the iPhone and iPad user interface.

In **Chapter 5**, “iPhone UI Design: Think Simple,” you will go deep into the iPhone user interface design process, and you will learn the concepts and rules of this particular way to design user interfaces. You will see how to start from the sketch phase, using pen and paper, and go to the design phase, using Adobe Fireworks, analyzing every single graphic element of our use case user interface.

In **Chapter 6**, “iPad UI Design: Think Inverted,” you will go deep into the iPad user interface design, and you will learn the concepts and rules of this particular way to design user interfaces. You will be introduced to the invert-simplicity concept, and you’ll see how to prioritize, shape, and group the iPad user interface elements. You will see the simplicity-complexity paradox keypoints, and you will see how to start from the sketch phase, using pen and paper, and go to the design phase, using Adobe Fireworks, analyzing every single graphic element of our use case user interface.

In **Part Three**, we will start to extend the web standards development for both iOS devices, iPhone and iPad.

In **Chapter 7**, “Web Standards for WebKit: Maximizing Mobile Safari,” we will start comparing the iPhone and the iPad, and we will present pros and cons of hybrid and dedicated webpages. We will approach the web standards like HTML5, presenting the re-defined tags from HTML4 and the brand new ones like `<canvas>`, `<video>`, and `<audio>`, using these tags for adding features to our WebApp use case. We will approach CSS3 with all the new Level 3 properties, and JavaScript with a real crash course analyzing also the BOM (Browser Object Model) and the DOM (Document Object Model).

In **Chapter 8**, “Native iOS Environment Development,” you will learn how to develop a WebApp, emulating the iOS environment from the visual fundamentals, like going into full-screen mode, adding a springboard icon, or interacting with iOS services like the map, phone, SMS, or e-mail applications. You will be introduced to the touch event and gesture interaction in iOS devices, also seeing some examples of custom touch event handlers, including the orientation change event. In the end of the chapter, you will see how to expand the iOS Web Framework used for our use case.

In **Chapter 9**, “Native iOS Design Implementation,” we will work over the web concept and the code behind the iOS webpages. You will learn how to emulate the native iPhone interface, watching the code that, step by step, implements every single user interface element in your WebApp, or how to simulate the new iPad interface. In both cases, we will finish with a real case study.

In **Chapter 10**, “Optimizing iOS WebApp,” we will introduce how to optimize our WebApp or mobile webpage and all our assets used in our environment. You will learn how to optimize your WebApp performance minimizing bandwidth usage, how to optimize your WebApp code using web standards best practices, and how to compress your WebApp. You will also learn how to optimize the usability of your WebApp, addressing the most common usability problems that could affect your users. You will learn how to make your WebApp available offline, using the new HTML5 cache manifest feature, and in the last part of the chapter you will see how to use the new mobile SEO tools from Google and how to design your WebApp in a search engine-oriented way.

In **Chapter 11**, “Testing iOS WebApps,” you will see the web development lifecycle, and you will learn how to test your WebApp or mobile webpage for iPhone or iPad using an agile

approach. We will show how to choose the right test in order to save your budget, how to organize your test with Unified Modeling Language (UML), and how to evaluate your test's results in the right way. The chapter will end with some real examples.

In **Part Four**, we will examine the future of mobile web-based devices, how this revolution will change our daily lives, and how this technology will impact the future of desktop computers.

In **Chapter 12**, “Maximizing the Market for iOS WebApps,” we will show how to maximize the market for iOS WebApps. You will learn how to promote your WebApp using different approaches like beta testers. You will see how to submit your WebApp to the Apple WebApp Portal and to other third-party portals and how to use the virality of social networks to reach all your potential users. In the last part of the chapter, you will see some tools for monetizing your WebApp.

In **Chapter 13**, “Looking Beyond the Mobile Web to Ubiquitous Computing,” we will look behind the mobile web, discussing the explosion of mobile devices and wireless communications. We will also analyze the next-generation usability with multi-touch-screen technology, how the future will change for desktop computers, and how it will change our daily lives.

## Where Will the Journey Through This Book Take You?

Reading this book, you will master the entire design and development flow; you will have a complete overview of the entire workflow involved in design and development for iOS in the real world; you will know exactly “what to do and how to do it” as a designer and/or developer.

This book will give you a mobile-oriented mentality, a solid knowledge of Apple's mobile device features, and the knowledge of all web standards involved in the design and development process.

Mastering the concepts and techniques used in this book, you will take your first step as a designer and developer, and, at the end of this journey, you will be ready to start your own first mobile project on iOS.

## How Will You Get Started and Then How Will You Use What You've Learned?

The structure of this book is extremely learning-oriented because the entire book's structure is based on the real workflow used in design and development for iOS and implemented in this book on a real use case called “The Store.”

Reading each chapter, you will go through this workflow, and, besides learning the web standards, the specific techniques, the tools, and everything else you need for design and development, you will experience learning the real workflow path used in every mobile-oriented project.

# Think Mobile Touch

*“A small step for man, one giant leap for mankind...”*

—Neil Armstrong

These are exciting times for those who live and work with technology every day, whether they are young people who have used technology all their lives or they are like those who have adapted to it. These are exciting times because in recent years, no other example of technology has changed our lives so dramatically as the evolution of the mobile device.

In this book, you see how the mobile revolution has changed the way we develop applications and how touch screen technology brings new variables to the table. First, you learn how to use new touch design techniques to design a touch-based user interface. Then, you learn how to adapt the same touch-based design principles to the specific needs of the iPhone and iPad. We base our project on an agile version of the standard Information Architecture process for optimizing both user and single-developer (or small team) needs.

After the design phase, you learn how to implement the design in the development phase and how to use web standards and WebKit-based frameworks to achieve the project goals.

As a final step in the process, you learn how to test a mobile touch application and how to evaluate tests in a user-centered way before releasing the application through the Apple WebApp portal or other third-party portals.

## Why the Mobile Web?

A mobile market exists, it's growing day by day, and it's a revolution that impacts our way of life like few others. The question is, “Why should we invest time and resources in this market?”

## From Desktop to Mobile

The history of computing has had five main cycles according to Morgan Stanley (shown in Figure 1–1): mainframe computing (1960s), micro computing (1970s), personal computing (1980s), desktop Internet computing (1990s), and mobile Internet computing (2000s). Looking at the mobile Internet computing era, you can identify the reasons for this evolution.



**Figure 1–1.** *Technology cycles in computing history*

First, the new touch screen technology increases the interface’s usability while reducing the frustration of mobile web browsing. Second is the incredible evolution of social networks such as Facebook and Twitter. Third are the new VoIP services that stand as attractive alternatives to traditional 2G and 3G cellular communication, which has been the new cheap data plans local ISPs have offered in the last few years.

The iPhone is at the center of this process because it catalyzed these three factors (also pioneering some of them) and as you can see from Figure 1–2, it has gained and maintained its dominant position on the market month after month. This is another good reason for starting to design and develop for the iPhone and iPad today. The time invested learning a language such as Objective-C (for native applications) or web standards (for web applications) is surely worth the effort in a short period of time.