Learning Mobile App Development: A Hands-on Guide to Building Apps with iOS and Android, Edition 2.0

By Jakob Iversen & Michael Eierman

Preliminary Edition 2.0 Preface

Welcome to mobile application development!

Developing apps can be fun and is potentially lucrative, but is also quickly becoming a core skill in the information technology field. Businesses are increasingly looking to mobile apps to enhance their relationships with their customers and improve their internal processes. They need individuals skilled in developing the mobile apps that support these initiatives.

This book is intended to be an introduction to mobile app development. After you successfully complete the book you will have the basic skills to develop both Android and iPhone/iPad apps. The book walks you from the creation of an app through the publication of the app to its intended audience on both platforms. We (the authors) have been teaching technology for many years at the collegiate level and directly to professionals and strongly believe that the only way to learn a technology is to actually use it. That is why the book is structured as a series of tutorials that focus on actually building a complete app on both platforms.

While the book is an introduction, it does cover many of the unique features of the mobile platforms that make apps a technology that offers new capabilities that businesses may use to enrich or augment their operations. The features covered in the book include using the device's ability to determine its location, using hardware sensors and device components in apps, and mapping.

If you have suggestions, bug fixes, corrections, or anything else you'd like to contribute to a future edition, please contact us at jhiversen@gmail.com or michael.eierman@gmail.com. We appreciate any and all feedback that helps make this a better book.

—Jakob Iversen & Michael Eierman, September 2013

What's New in Second Edition

Since writing the first edition of this book in 2013, the world of mobile development has changed drastically. Google released Android Studio in December 2014 to replace Eclipse as the primary development environment for Android apps. Meanwhile, Apple released Swift in June 2014 as the primary programming language for iOS development. In this edition of the book, we have completely rewritten all the development chapters to cover these changes.

The second edition is completely revised and updated to cover Android Studio and Swift. In addition, we also introduce AutoLayout for managing layout of iOS apps.

The general chapters (1, 2, 15, and 16) have been edited and updated with additional examples and reflecting changes to the mobile development landscape over the last three years.

Appendix A has been eliminated as the installation and setup process for Android development has been greatly simplified.

Appendix B has been eliminated as the process for using physical iOS devices to test apps has been simplified and streamlined. It is now covered at the end of chapter 9.

Appendix C now covers both Swift and Objective-C.

What You'll Need

You can begin learning mobile application development with very little investment. However, you will need a few things. The following list covers the basics of what you need for Android programming:

- Android Studio—You can download Android Studio from Google (https://developer.android.com/studio). It is available for Windows, Mac, and Linux platforms. The book was written based on version 2.2 of Android Studio.

- **An Android device**—This is not necessary for purely learning but if you plan on releasing your apps to the public you really should test them on at least one device. The more different types of devices, the better because Android on different manufacturer's devices can sometimes behave in different manners. Certain features covered in Chapter 7 and 8 can only be fully tested in a physical device.

- **Familiarity with Java**—Android apps are programmed using the Java programming language. You should be able to program in Java. At a minimum you should have programming in some object based programming language such as C# or C++ so that you can more easily pick up Java.

The following list covers the basics of what you need for iPhone/iPad programming:

- **A Mac running macOS Sierra 10.12 or OS X El Capitan 10.11.5 or later** — iPhone/iPad programming can only be done on a Mac. That Mac should have a fair amount of disk space available and a significant amount of RAM so you don't have to spend as much time waiting for things to compile and execute.

- **Xcode** —Xcode is an IDE provided by Apple available from Apple's iOS Dev Center (http://developer.apple.com/ios). Xcode is free but limits how many physical devices you can test your apps on. If you want to distribute your apps you must sign up as a registered developer ($99/year for individuals, $299/year for enterprise developers). If you are a teacher at the university level, your university can sign up for the University Program (https://developer.apple.com/programs/ios/university/). This will allow you and your students to test apps on actual devices but does not allow public distribution of the apps you create. If you are a student at a university, check with your computer science or information systems department to see if they have signed up for this program. The book was written based on Xcode 8 (iOS 10).

- **An iOS device**—As with Android, this is not necessary for learning how to program an iOS app but is important for testing apps that you wish to release to the public. Additionally, some features of iOS programming cannot be tested on the simulator. Chapter 9, "Using Xcode for iOS Development" has more details on what is needed to be able to test your apps on a physical iOS device.

- **Knowledge of Swift**—Two programming languages can be used to develop iOS apps – Swift and Objective-C. Since 2014, Swift has become Apple's recommended programming language. It is a modern and powerful object-oriented language with a simple syntax. Appendix C contains an introduction to Swift and Objective-C that will help you learn what is needed to be successful with iOS development.

Your Roadmap to Android/iOS Development

This book is intended as an introduction to mobile development for both Android and iOS. While the book provides everything you need to know to begin creating apps on both platforms, it is not intended to be a comprehensive work on the subject. The book assumes programming knowledge. At a minimum you should have taken at least one college-level programming class in an object-oriented programming language such as Java, C# or Python. Mobile development introduces issues and concerns not associated with traditional development, but at its core requires the ability to program. Experience with an Integrated Development Environment (IDE) is a plus. This book will help you learn the Android Studio and Xcode IDEs but if you have some understanding and experience prior to working through this book it will ease your learning curve.

As a beginner's book, that should be enough to successfully work through the tutorials. However, to truly master Android and iOS development there is no substitute for designing

and implementing your own app. For this you will likely need some reference books. Below is a list of books we have found helpful in our app development efforts. Of course, if all else fails…Google It! And then you'll likely end up with the good folks at StackOverflow.com, which has quickly become a trusted source for answers to programming questions.

How This Book Is Organized

This book guides you through the development of mobile applications on both Android and iOS. The book focuses on building a single, complete app on both platforms from beginning to publication. The book is meant for the beginner but goes in enough depth that you could move into developing your own apps upon completion of the book. The philosophy embedded in the book's approach is that the best way to learn to develop is to develop! While the book begins with Android development, the reader could choose to begin with iOS without any problem or setback in understanding. However, we do suggest that you read Chapter 2 "App Design Issues and Considerations" before beginning either platform. After that you can choose either chapters 3-8 on Android or chapters 9-14 on iOS. You could even switch back and forth between the platforms, reading first the introduction to Android in chapter 3, then the introduction to iOS in chapter 9, and then continue switching back and forth between the platforms.

Here's brief look at the book's contents:

Part I, "Overview of Mobile App Development"

- **Chapter 1, "Why Mobile Apps?"**—Mobile apps are a potentially disruptive technology—technology that changes the way business works. This chapter explores the potential impact of mobile technology and discusses how apps can and do change the way organizations do business.
- **Chapter 2, "App Design Issues and Considerations"**—Mobile technology has different capabilities and limitations than more traditional computing platforms. This chapter discusses many of the design issues associated with app development.

Part II, "Developing the Android App"

- **Chapter 3, "Using Android Studio for Android Development"**—Eclipse is an open source development environment commonly used for Android development. Chapter 3 shows how to use Eclipse to build a simple "Hello World" app. The chapter is your first hands-on look at app development.
- **Chapter 4, "Android Navigation and Interface Design"**—The limited amount of "real estate" on a mobile device typically requires multiple screens to build a complete app. This chapter introduces how you program movement between screens in Android. The chapter goes in depth on how a user interface is coded in Android where the number of screen sizes that your app has to accommodate is relatively large.

- **Chapter 5, "Persistent Data in Android"**—Business runs on data. An app has to be able to make sure important data is preserved. This chapter explores two types of data persistence methods in Android: the persistence of large and complex data in a relational database using SQLite and simple data persistence through `SharedPreferences`.

- **Chapter 6, "Lists in Android: Navigation and Information Display"**—Chapter 6 introduces a structure ubiquitous in mobile computing—the list. Lists display data in a scrollable table format and can be used to "drill down" for more information or to open new screens. This chapter explains how to implement a list in an Android app.

- **Chapter 7, "Maps and Location in Android"**—Displaying information on a map can be a very effective way to communicate information to an app user. This chapter examines implementing Google Maps in an app and also demonstrates how to capture the device's current location.

- **Chapter 8, "Access to Hardware and Sensors in Android"**—Mobile devices come equipped with a number of hardware features that can enhance an app's functionality. The code required to access and use these features is discussed in this chapter.

Part III, "Developing the iOS App"

- **Chapter 9, "Using Xcode for iOS Development"**—Chapter 9 begins the books discussion of iOS. Xcode is the development environment used to develop iPhone and iPad apps. Xcode and iOS development is introduced by guiding you through the implementation of a simple "Hello World" app. This chapter also covers how to register and use physical devices for testing.

- **Chapter 10, "iOS Navigation and Interface Design"**—Just as in Android, interface design and navigation between screens are important concepts to master in mobile development. This chapter guides you through the development of a Storyboard for app navigation and demonstrates how to use Xcode's Interface Builder to implement a user interface.

- **Chapter 11, "Persistent Data in iOS"**—Many of the same data persistence features available in Android are also present in iOS. One primary difference is that the database feature of iOS is implemented through a wrapper kit called Core Data. Core data enables the updating and querying of an underlying SQLite database.

- **Chapter 12, "Tables in iOS: Navigation and Information Display"**—Tables in iOS provide the same type of information presentation format as Lists in Android. Tables display data in a scrollable table format and can be used to "drill down" for more information or to open new screens. Chapter 12 describes how to implement this very important mobile computing concept.

- **Chapter 13, "Maps and Location in iOS"**— Chapter 13 covers the implementation of maps and capturing device location information on an iOS device. It is analogous to the Android chapter on maps and location.

- **Chapter 14, "Access to Hardware and Sensors in iOS"**—This chapter demonstrates the techniques used to access hardware features of the device. It covers many of the same sensors and hardware features covered in the Android chapters on the topic.

Part IV, "Business Issues"

- **Chapter 15, "Monetizing Apps"**—One of the reasons many people consider getting in mobile application development is to make money. Both Android and Apple provide a marketplace for apps that has a wide reach. This chapter discusses various approaches to making money from your apps and briefly discusses organization of your app development business.

- **Chapter 16, "Publishing Apps"**—Once you have developed an app, you'll likely want to make that app available to its intended audience. This chapter discusses publishing apps on Google Play and The App Store as well as distribution of corporate apps that are not intended for the public at-large.

Appendices

- **Appendix A, "Introduction to Swift and Objective-C"**—This appendix provides a brief tutorial on both the Swift and Objective-C languages.

About the Sample Code

The sample code for this book is organized by chapter. Chapters 3 and 9 contain a single "Hello World" app in Android and iOS respectively. Chapters 4 through 8 build a complete Android contact list app and Chapters 10 through 14 build the same contact list app in iOS. Each chapter folder contains the code for the completed app up to that point. For example, at the end of Chapter 7 the code will include the code developed for chapters 4, 5, 6, and 7. The exception to this single completed app per folder model is in chapters 7 and 13. These chapters demonstrate several different approaches to getting location information on the mobile device. Each technique has a folder with the complete app that demonstrates the technique. If a book chapter requires any image resources you will find those images in the respective chapter.

Getting the Sample Code

You'll find the source code for this book at https://github.com/LearningMobile/BookApps2E on the open-source GitHub hosting site. There, you find a chapter-by-chapter collection of source code that provides working examples of the material covered in this book.
You can download this book's source code using the git version control system. The Github site includes Git clients for both Mac and Windows. Xcode and Android Studio also include Git support.

Contacting the Authors

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About the Authors

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