An Empirical Study of Mobile/Handheld App Development Using Android Platforms

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INTRODUCTION

When Apple launched its iPhones in 2007, they opened an App Store subsequently. They claimed the store has over 100 billion apps download, and has paid out more than $30 billion to developers since its inception. There were more than 1.5 million apps available in 2015 (TechCrunch, 2015). The highly popular iPhones help the sales and development of applications. On the other hand, the large number of apps helps the sales of iPhones too. It is a win-win situation for both of the Apple, Inc. and app developers. Witnessing the success of the App Store, other mobile operating system providers realized they might be left behind if they did not have this kind of stores for their operating systems. They set up their own app stores immediately. Some of the major stores are given in Table 1 (Hu, 2016). The highly popular apps create great opportunities for IT companies and workers. However, traditional desktop programmers have problems switching to handheld programming because it requires a different approach from desktop programming (Kiely, 2001). This chapter introduces essential technologies for mobile/handheld computing, so more IT workers can join the mobile trend of computing.

Desktop application developers use standard tools or software (such as C++ and Java compilers) to develop applications for different platforms (like Linux and Windows) with little or no changes. Unlike desktop application development, there are no widely accepted tools or software for mobile app development. For example, completely different approaches are required for Android and iOS app development. At the same time, mobile app development is much more complicated and platform-specific compared to desktop application development. This chapter introduces mobile app development by giving a simple Android application. Mobile developers can get a sense of mobile app development by reading this chapter and apply it to other platforms or further explore the Android app development.

The rest of this chapter is organized as follows. Section 2 gives background information about mobile/handheld computing, which includes a generic system structure of mobile handheld devices and client-side handheld computing. A variety of approaches is available for mobile app development. Sections 3 and 4 introduce the development using Android. Related tools and software for Android app development are introduced in Section 3. Section 4 explains a simple app development using Android. The example includes several XML and Java files and the Android Studio IDE (Integrated Development Environment) is used in the development. The final section summarizes this study.

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Table 1. Major mobile application stores (Hu, 2016)

Company		Mobile Application Store		
Name	**Major Mobile Products**	**Name**	**Major Operating Systems Supported**	**Launch Date**
Apple Inc.	Smartphone Mobile operating system	App Store	iOS	07/10/2008
Open Handset Alliance (Alphabet)	Mobile operating system	Google Play	Android	10/22/2008
Microsoft	Mobile operating system	Windows Phone Apps	Windows Phone	10/06/2009
Research In Motion	Smartphone Mobile operating system	BlackBerry World	BlackBerry OS	04/01/2009
Samsung	Smartphone	Samsung Apps	Android Windows Phone	09/14/2009
LG	Smartphone	LG Smart World	Android Windows Phone WebOS	
GetJar	None	GetJar	Almost all	xx/xx/2004
Opera	Mobile browser	Opera Mobile Store	Almost all	02/16/2009
Sony	Smartphone	Apps	Android Windows Phone	02/xx/2004

BACKGROUND

Handheld computing is the use of handheld devices like smart cellular phones to perform wireless, mobile, handheld operations such as browsing the mobile Web and finding the nearby gas stations. This section discusses two handheld computing subjects: mobile handheld devices and client-side handheld computing.

Mobile Handheld Devices

Mobile users perform mobile transactions using small wireless Internet-enabled devices, which come with several aliases such as handhelds, palms, PDAs, pocket PCs, and smartphones. To avoid any ambiguity, a general term, mobile handheld devices, is used in this article. Mobile handheld devices are small general-purpose, programmable, battery-powered computers, but they are different from desktop PCs, notebooks, or tablets due to the following two special features: small screen/body size and mobility.

Short battery life and limited network bandwidth, memory, processing power, and functionality are additional features, but these problems are gradually being solved as the technologies improve and new methods are constantly being introduced. Though the Wi-Fi and 4G networks and above go some way toward addressing the problem of limited bandwidth, the wireless bandwidth is always far below the bandwidth of wired networks. The small screen/body size restricts the input speed and convenience. Figure 1 shows a typical system structure for handheld devices, which includes the following six major components (Hu, Zuo, Chen, & Yang, 2010):

- **Mobile Operating Systems:** Simply adapting desktop operating systems for handheld devices has proved to be futile. A mobile operating system needs a completely new architecture and different features to provide adequate services for handheld devices. A generalized mobile operating system structure can be visualized as a six-layer stack: (i) applications, (ii) GUI, (iii) API framework, (iv) multimedia, communication infrastructure, and security, (v) com-