Software Development and Mobile Devices

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Abstract— **This paper explores the software development aspect for mobile devices while highlighting the various issues and challenges faced by the developers. An overview of the history of mobile phone applications is provided prior to analyzing these multifaceted issues.**

Index Terms— **Software, phone, application, Software development**

I. INTRODUCTION

Over the last few decades, mobile devices have made the transformation from functional devices to iconic fashion statements and at the present, these devices have become an integral component of each's lifestyle. The current interest shown by the general populous towards mobile devices, particularly smartphones, has grown widely out of proportion. The sales figures of the latest smartphones by Apple Inc. for instance is a startling eye-opener where millions of devices were sold out within a mere couple of weeks, generating multiple billion dollars' worths of profit for the company [1]. Although this achievement is blindly credited to Apple Inc. alone, the role played by the mobile software developer is the vital component behind these sales figures.

However, the development of software for mobile devices is a difficult task for many reasons. Although almost every major smartphone manufacturer has now opened up online retail stores for developers to sell their apps, the task continues to be challenging with high rates of failure due to multiple reasons.

II. THE HISTORY OF MOBILE APPLICATIONS

The first mobile phone app can be dated back to 1983, the first mobile phone itself, the Motorola DynaTAC 8000X. This mobile phone featured a built-in app for organizing contacts within the phone memory. Obviously, neither this nor any of the other myriad early devices had support for third-party apps. Those days, and well into the 1990s, all companies such as Motorola and Nokia, tried to keep all information related to their handsets a secret. In fact, these early devices catered to the requirements correctly, and users did not even feel that third party apps should be featured in these devices at all [2].

The iPhone that revolutionized the smartphone industry was introduced in 2007 and was officially released without support for third party app development. The iOS developer community, which is the largest software development community for mobile devices today, originated with a few people who gained illegal access to the phone operating

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system (through a process known as jailbreaking) to customize it. Apple Inc. quickly identified this community along with the potential it held and established a platform for the developers to develop third party apps for all the iOS enabled devices. It was available for users from 2008.

The introduction of the Android OS in the year 2008 by Google Inc. pushed the worldwide community towards understanding the real potential of a mobile device [3]. Both iOS and Android OS app stores boast of having millions of third-party apps that are available for users to download [4]. For the next six years, a few operating systems have entered the smartphone market, but none has been capable of shattering the dominance of iOS and Android OS devices. The closest rival to these two operating systems at the moment is Windows Mobile OS by Microsoft [5].

III. CURRENT APPROACH TOWARDS MOBILE APPLICATION DEVELOPMENT

Although almost all smartphone platforms provide intensive guidelines and tutorials in app development, research has yielded that very few developers utilize these systems. When comparing with software development for desktop or laptop platforms such as Windows and Mac OS, the software development process is quite complicated. This is probably due to the size variations of these two types of software. Research has shown that majority of the apps available in both Apple app-store and the Google play store have sources shorter than a few thousand lines of codes [6].

IV. SOME ISSUE WITH SOFTWARE DEVELOPMENT FOR MOBILE DEVICES

Entry Barriers

Many developers are already involved in the app development industry, and some developers are extremely wealthy companies with high-end marketing and advertising campaigns. These developers include EA games, Google Inc. and Ubisoft among many others. This means that even if a particular mobile app made by an individual is good, there is a noticeable chance that it will be overlooked by many users. Furthermore, this means that most of the good apps are already available in the market free of charge or to be purchased at a low price. A new developer will have to depend solely on in-app advertising funds to gain popularity and create a reputation for himself. This immediately raises the rate of failure at entry for the app development industry. However, an app developer can apparently join an already successful team and continue his work.

Catering to Multiple Platforms and Delivering Timely Updates

For an app to be immensely popular, the developers should develop it to suit each manufacturer's operating system. For some cases, this might mean that the app needs to be entirely redesigned. Another issue with this is that a single person will probably lack the expertise to develop apps that are

compatible with all platforms. While a well-established company can easily hire multiple groups of developers to cater to these requirements, an entry level company will have to rely on developing an app to work with a single ecosystem. If and when that app becomes a hit, and a substantial income is generated, it is possible to consider extensions. Many apps followed this pattern and have gained immense popularity over the years such as famous games (temple run, candy crush) as well as handy tools (Evernote).

Furthermore, the mobile phone manufacturers tend to deliver updates to their operating systems regularly, which means that the app developers will have to deliver app updates to avoid their apps from being outdated [7]. Besides the compatibility requirement, there is also a mental requirement from the user's point of view, where if an app does not get regular updates, the user might think that the development team has given up on the app. This is obviously a negative reaction that needs to be countered.

Interaction with Sensors

Another significant feature of software development for mobile devices is the capability to interact with sensors. While this may be considered an advantage in some cases, it is also a challenge for a developer. Desktop software usually has no requirement to interact with specific sensors such as accelerometers and gyro sensors. In fact, handling sensor information was originally considered a hardware development problem. For an example, all mobile applications need to be sensitive to the orientation of which the user is holding the phone to utilize the screen maximally, and this information is usually available via the accelerometer.

A. Interaction with unprecedented software

Another issue in software development for mobile devices is the requirement to interact with multiple applications. For instance, it may be required to use the phone keyboard within the app to enter some information. Due to the availability of multiple third-party keyboards, the app developer must be cautious to make sure that regardless of the keyboard used by the user, the app works flawlessly. This compatibility needs to be checked regularly, and if needed, the app needs to be updated to counter possible issues.

Designing Compatible User Interfaces

Designing user interfaces to work with multiple screen sizes and resolutions is another challenging task for the developer. A few years ago, a mobile phone with VGA resolution was considered the state of the art. Today, the top mobile phones support 4K HD resolutions and display sizes range from about 3" to 6". Tablet devices, on the other hand, pose even a bigger difficulty with screen sizes ranging from 7" to 13". While it is possible to say that a given app only works with one class of devices, it will certainly interfere with the popularity of the app. Due to the multiple app reviewers on traditional media, such as YouTube, it is possible that, if the app is even moderately famous, its flaws will be discussed extensively, and this will once again hinder the popularity of the app.

Designing good user interfaces is a challenge regardless of the software medium. An app is no different, in fact, due to the fierce competition, it is important to make sure that the user interface is straightforward and attractive so as to extend the user base.

Designing the App to be Cross-Compatible with Multiple Vendors

One major challenge faced by mobile device app developers, particularly for Android, is to make sure that the app can work across all available devices. Apple and Windows devices are manufactured by a single company and usually, testing and debugging is straightforward. However, due to the customizations brought forth by manufacturers such as Samsung (TouchWiz UI), HTC and Sony, it is difficult to ensure that all apps work reliably on all platforms [6]. The developer has to check the app in almost all popular devices before release.

B. Security Requirements

Ensuring the security of devices is also a major concern among the smartphone manufactures. Several examples can be provided where the lack of security ended up in major chaos to the users. With the introduction of payment systems and the fact that these devices contain personal information requires the devices to be secure in all cases. The introduction of third party software threatens the security of these devices. This is the reason all mobile device manufacturers request users only to download apps from their markets and nowhere else. Due to this requirement, before an app being placed in the market, the developer must adhere to all the security constrains enforced by the manufacturer [8]. These security requirements use technologies such as ASLR, NX, ProPolicem OpenBSD do malloc, OpenBSD call among many others. However, discussing these features individually is out of scope for this paper.

C. Resource Management

Resource management is always a challenge in software development. In desktop applications, the challenge is usually in memory and thread management. However, the story is entirely different in mobile devices since the developer must ensure that the limited battery life is also well preserved. Battery life is not only a problem for third party apps, in fact, one of the major selling points of the Android version 4.4 (KitKat) is that it uses fewer resources than the previous versions. If an app causes the phone battery to drain considerably, users will just uninstall it from their phone [6].

V. SOLUTIONS PROVIDED BY SMARTPHONE MANUFACTURES

The Apple iOS Dev Center provides an SDK titled 'Xcode' that is bundled with an emulator capable of testing the app at each stage of development [9]. Similarly, the Google ADT bundle has an Android Emulator as well [10]. Microsoft has a modified Visual Studio environment available to be downloaded through the Windows Marketplace [11]. The interesting point is that all the manufacturers provide the SDKs without levying a charge on the developer. In fact, Google Inc. develops a specialized line of Android smartphones specifically catered to the developer community (Nexus). Open source platforms, such as PhoneGap, are available to developers who wish to develop an app that can be used across multiple platforms [12]

VI. CONCLUSION

Software development for Mobile Devices is a diversified and extensive topic and needs to be discussed over a wider scope. The purpose of this paper is to highlight a few issues that software developers face when developing apps for the

present smartphone arena. It is also highlighted that all smartphone manufacturers have invested heavily towards helping users to overcome all these issues.

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