Mobile Application Testing and Challenges

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Abstract: ***Mobile app testing is a process of testing applications developed for hand held devices. It is the process of checking the application for functionality, usability and performance issues. Mobile app testing is different from testing of desktop applications, as apart from regular functional and UI requirements we also have to consider factors like device hardware, screen size, platform, connectivity issues and many more. This paper gives basic idea for mobile apps testing and their challenges in future.***

Keywords: mobile devices, mobile apps, Mobile Application Testing, Automation testing, Mobile application test cycle, Fuctionality and performance testing, interrupts, memory leakage and installation testing.

1. Introduction

1.1 WHO Needs Mobile Application Testing?

Mobile app testing services are for individuals and companies involved in mobile applications development. We have seen a rapid improvement in cellular technology in recent years in terms of smart phones. It simply opened the new ways for software development companies to develop different kinds of mobile applications fit for the end users' needs. Being a mobile applications development individual or company, you need mobile application testing to make it sure that your developed app is mature enough to meet the end users' requirements. Mobile app testing from qualified and experts' personals will assure that developed application is with no more functional and usability issues. Mobile app loads properly and there are no performance issues that an end user can face [4]

1.2 When Mobile Application Testing is Necessary?

Testing early is always the right choice to develop a bug free application. The moment you are finished with coding a mobile application, you need to consult the mobile application testing company to check and fix developed mobile app for all possible issues an end user can face. These testing companies will give you a hand in creating a bug free application that supports the latest hardware and assure maximum hardware compatibility [6] Despite of that entire mobile app testing will get maximum return on investment when there are positive reviews from customers on uploaded app store [4]

2. Mobile Application Testing

Mobile application testing is a process by which application software developed for hand held mobile devices is tested for its functionality, usability and consistency. Mobile applications either come pre-installed or can be installed from mobile software distribution platforms. Mobile devices have witnessed a phenomenal growth in the past few years. A study conducted by the Yankee Group. Predicts the generation of $4.2 billion in revenue by 2013 through 7 billion U.S. Smartphone app downloads [3]

2.1 Variety of Mobile Devices

Mobile devices differ in screen sizes, input methods (QWERTY, touch, normal) with different hardware capabilities. [3]

2.2 Diversity in Mobile Platforms / OS

There are different Mobile Operating Systems in the market. The major ones are Android, IOS, BREW, BREWMP, Symbian, Windows 7.5 Mango, and Blackberry (RIM). Each operating system has its own limitations. Testing a single application across multiple devices running on the same platform and every platform poses a unique challenge for testers [3]

2.3 Mobile network operators

There are over 400 mobile network operators in the world [2] out of which some are CDMA, some GSM, whereas others use less common network standards like FOMA, and TD-SCDMA. Each network operator uses a different kind network infrastructure and this limits the flow of information [3]

2.4 Scripting

The variety of devices makes executing the test script (Scripting) a key challenge. As devices differ in keystrokes, input methods, menu structure and display properties single script does not function on every device [3]

3. Types of Mobile Application Testing

3.1. Functional Testing

Functional testing ensures that the application is working as per the requirements. Most of the test conducted for this is driven by the user interface and call flows [3]

3.2. Laboratory Testing

Laboratory testing, usually carried out by network carriers, is done by simulating the complete wireless network. This test is performed to find out any glitches when a mobile application uses voice and/or data connection to perform some functions [3]

3.3. Performance Testing

This testing process is undertaken to check the performance and behavior of the application under certain conditions such as low battery, bad network coverage, low available memory, simultaneous access to application's server by several users and other conditions. Performance of an application can be affected from two sides: application's

server side and client's side. Performance testing is carried out to check both [3]

3.4. Memory Leakage Testing

Memory leakage happens when a computer program or application is unable to manage the memory it is allocated resulting in poor performance of the application and the overall slowdown of the system. As mobile devices have significant constraints of available memory, memory leakage testing is crucial for the proper functioning of an application [4]

3.5. Interrupt Testing

An application while functioning may face several interruptions like incoming calls or network coverage outage and recovery. The different types of interruptions are:

1) Incoming and Outgoing SMS and MMS
2) Incoming and Outgoing calls
3) Incoming Notifications
4) Battery Removal
5) Cable Insertion and Removal for data transfer
6) Network outage and recovery
7) Media Player on/off
8) Device Power cycle

An application should be able to handle these interruptions by going into a suspended state and resuming afterwards [3]

3.6. Usability Testing

Usability testing is carried out to verify if the application is achieving its goals and getting a favorable response from users. This is important as the usability of an application is its key to commercial success [3]

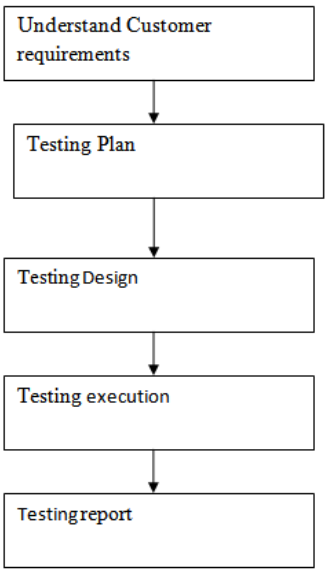
3.7. Installation Testing

Certain mobile applications come pre-installed on the device whereas others have to be installed from the store. Installation testing verifies that the installation process goes smoothly without the user having to face any difficulty. This testing process covers installation, updating and uninstalling of an application [3]

3.8. Certification Testing

To get a certificate of compliance, each mobile device needs to be tested against the guidelines set by different mobile platforms [3]

4. Mobile Apps Testing Cycle



Some key points to consider are:

4.1 Environment

Here we need to consider the targeted devices where our application will run. We need to incorporate nuances such as building test plans for the DUTs (device under test). This includes considering that the periodic OS updates do not alter app functionalities [1]

4.2 Application under Test

Depending on the organization's needs, a decision must be made as a team on whether to create native, web or hybrid apps. QA should be involved at the start of the decision. Creating test cases for each of the approaches varies significantly depending on the complexity of the application [1]

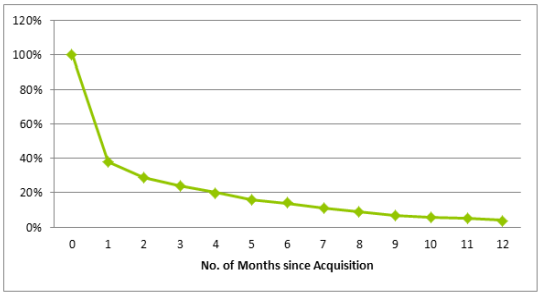
4.3 Automation

Although still in its nascent phase from a mobile testing perspective, automation is catching up. The approaches towards automation remain the same; however the tool landscape has still not matured in comparison to desktop apps. Most tools are OS-specific and, as a result, it is difficult to reuse tests across multiple OS. Moreover, most automation test tools favor web-based apps. E.g. Selenium has a dedicated SDK only for Android [1]

5. Challenges in Mobile App Testing

It's been clear for a while that mobile devices are the current market players, even more so that some experts have been counting on them to take over the PCs and Desktops in near future. But as with any emerging technology, developing and implementing mobile applications can pose a number of unique challenges. Mobile applications, although have limited computing resources, are often built to be as agile and reliable as PC-based applications. In order to meet the challenge, mobile application testing has evolved as a

separate stream of testing. [6] By missing the major user characterizations, mobile application lose the "gloss" within first couple of months and therefore, user retention period for mobile applications is very low, only around 10% users are found still using the same mobile application after six months of its download



Mobile application user retention over period

Many people have pointed fingers at many aspects and loop holes in mobile app testing, some of which are mentioned below [3]

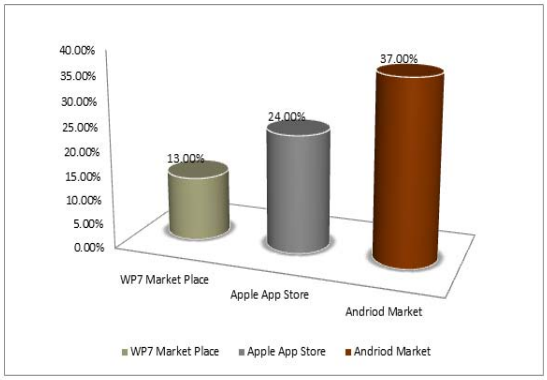
The major challenge in Mobile App Testing is the multiplicity of mobile devices with different capabilities, features and restrictions. Devices may have different technical capabilities such as amount of available memory, screen resolution, screen orientation and size of the display, network connectivity options, support for different standards and interfaces [3]

Many mobile solutions involve a significant hardware element in addition to the PDA, such as scanners, mobile telephony, GPS and position based devices, telemetry, etc… These extra hardware elements place additional demands on the tester, particularly in terms of isolating a bug to hardware or software.

Mobile applications are often intended to be used by people with no technical or IT background; such as meter readers, milkmen, insurance sales people; on devices that have small screens, and no or awkward keyboards. Good usability testing, carried out in conjunction with key users, in their own environment, is essential [3]

There are multiple operating systems that are prevalent in the mobile space like Symbian, Android, iPhone OS, Windows, Linux, Blackberry OS, palm OS, Brew, etc. Each of the operating systems can have further versions for different types of devices which make platform testing complex and further challenging. Another challenge is that the developers need to focus on developing applications that are easy to use on a mobile and consume less power [3]

The Most important aspect that our analysis, development and testing teams often miss is that mobile application development takes a lot less time duration then mobile application testing, compared to the conventional model where application analysis & development takes more time precedence over testing. We therefore, deliberately tend to give less time for testing which might result in the application starting to lose out to competition over time. Due to this misunderstanding and thus improper testing strategy in mobile application; growing number of mobile applications are being taken off-app store every month, just in September 2011 alone following stats were witnessed [5]



Percentage of applications taken off the stores

6. Conclusion and Future Work

We can design and develops better quality of mobile apps by testing each aspect of mobile apps such as functionality, usability and consistency. These trends shows, that we can never use the same testing methodologies as we have been using on the conventional web and desktop applications, we have to devise a new strategy and methodology, which is going to take into account what actually is the mobile world, what it constitutes of and the adjustments it calls for in our conventional testing patterns and strategies.

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He received B.E in information technology from Shivaji University in 2011 and also pursuing M.E in Solapur University. My areas of interest are machine learning, artificial intelligence and latest mobile technologies.