TECHNICAL PLANNING IN MOBILE APPLICATION TESTING

AASHUTOSH TRIVEDI*

**Vellore Institute of Technology, Vellore, Tamil Nadu 632014*

Abstract: In 2009, worldwide mobile app downloads amounted to approximately 2.52 billion and are expected to reach 268.69 billion in 2017.Mobile applications either of android or IOS have become the best medium of interaction for consumers and businesses worldwide. A strong mobile app development strategy along with testing of all aspects is the groundwork of any successful mobile app. Various devices with platform diversity, operating systems and application's updates release cycles, sometimes lack of advanced testing tools and the variation in network connectivity options poses challenges in application testing environment and if not considered properly results in excessive cost and missing deadlines. A mobile application testing strategy includes device hardware specification like RAM, processor speed etc, optimized selection of all target devices, testing on cloud servers, network connectivity and combination of automated tools like Appium, Calabash along with manual testing techniques to cover both functional and nonfunctional testing. This paper will discuss planning of various components for effective mobile testing.

Keywords : Testing, Quality Assurance, Mobile Application, Android Apps, IOS Apps, Cloud Testing, Testing Challenge

1. Introduction

With the age of digitization, there is exponential growth of mobile applications according to various needs of consumers over last few year. Developers need to ensure their every applications have high quality graphics, high functionality with quick responses to have customer satisfaction with high revenue generation.

Testing applications on mobile devices is more challenging and more complex than testing web or desktop apps due to different range of mobile devices with different sizes of screen size and diverse hardware configurations, wide varieties of mobile devices, different mobile operating systems like android, IOS, Symbian, different versions of same operating systems like for android marshmallow, kitkat etc ,for IOS , ios8,ios9and different mobile network operators like CDMA, GSM,LTE frequent updates of mobile apps.

Important elements to consider for effective mobile application testing-

1. Test Automation Tool-Select a test automation tool to check normal features and maximize the use of automation to check boundary cases.

2.Target device selection-Use a mix of emulators and physical devices with different OS versions and screen resolutions.

3.Network Connectivity-Use network simulations tools to test on various network speed,bandwidths variations, and latency changes.

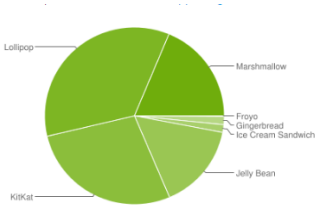
4.App based Testing -Test application with different types of functional, nonfunctional, performance, security tests

2. The Challenge of Testing Applications

The majority of desktop applications are made on Windows or Mackintosh platform with almost same version. But for mobile there are varieties of platform.

For example Android,

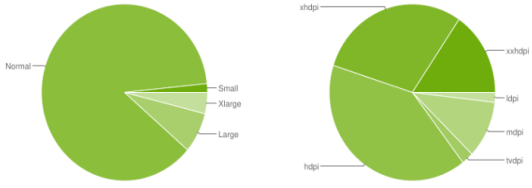
Version	Codename	API	Distribution
2.2	Froyo	8	0.1%
2.3.3 - 2.3.7	Gingerbread	10	1.5%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	1.4%
4.1.x	Jelly Bean	16	5.6%
4.2.x		17	7.7%
4.3		18	2.3%
4.4	KitKat	19	27.7%
5.0	Lollipop	21	13.1%
5.1		22	21.9%
6.0	Marshmallow	23	18.7%



Data collected during a 7-day period ending on September 5, 2016.

Wide varieties of form factors like phone, tablets along with combination of screen size and density adds another layer of complexity while developing mobile apps.For example in Android,

	ldpi	mdpi	tvdpi	hdpi	xhdpi	xxhdpi	Total
Small	1.6%						1.6%
Normal		3.5%	0.2%	39.5%	28.4%	15.5%	87.1%
Large	0.2%	4.1%	2.1%	0.5%	0.5%		7.4%
Xlarge		2.9%		0.3%	0.7%		3.9%
Total	1.8%	10.5%	2.3%	40.3%	29.6%	15.5%	



Data collected during a 7-day period ending on September 5, 2016.

Mobile apps operate in a unique environment where application behavior can be affected by alerts and notifications, changes in Network conditions (bandwidth change, dropped connections), as well as touch screen responsiveness. This frequent changing environment requires extra testing to ensure acceptable application behavior in real world conditions.

Mobile Applications need to be upgraded frequently because users expect quick response for fixing bugs or feature upgrades to increase functionality of app. After adding major or minor frequent updates in mobile, testing is required to check remaining features and compatibility of application with current OS.

Mobile application is represented by the huge number of mobile networks. At the moment there are more than 400 Mobile Network Operators in the world, using different network standards and different kinds of network infrastructure.

3. Dimensions of Mobile Application Testing-

3.1Usability Testing

Testing to make sure that mobile app is easy to use with overall satisfaction, efficiency and effectiveness of user.

3.2Functional Testing

Functional testing ensures that the application is working as per the requirements with user interaction testing and call flows inside the applications.

3.3 Performance Testing

Testing the application under certain conditions such as low battery, bad network coverage, low available memory, changing connections from 2G to 3G or Wi-Fi, hotspot creation, simultaneous access to application's server by several users, UI responsiveness, process flow complete time, and peak load performance.

3.4 Network Testing

Working under all types of network(2G, 3G, 4G, WIFI, hotspots) and impact of connectivity issue on application

3.5 Security Testing

Data retention on device and security while transmitting data to other device or web server

3.6Compatibility Testing

Testing of the application in different mobiles devices, screen sizes, browsers, and OS versions according to the requirements and backward compatibility

3.7 Interrupt Testing

Application should be able to suspend and resume afterwards after interrupts like Incoming and Outgoing calls ,Incoming and Outgoing SMS, Incoming Notifications, Cable Insertion and Removal for data transfer, Network outage and recovery.

3.8Operational Testing

Recovery and backups plan testing if battery goes down, phone crashes or data loss while upgrading the application from market store.

3.9Installation Testing

It ensures installation of application from store or APK file goes smoothly without any problem. It also covers updating and uninstalling testing of application.

4. Mobile Application Testing Strategy

Various elements for an effective mobile application strategy are discussed here to ensure quality assurance along with customer goals and satisfaction, business expectations, and industry best practices.

4.1 Mobile Device Selection

Important factors which requires consideration during device selections are

A) OS Version: testing your mobile app on all stable OS versions.

For IOS devices, previous experience shows that 90% of IOS devices can be expected to be upgraded to the last major version (see http://david-smith.org/iosversionstats/).

For Android devices, OS versions provided by Google on

https://developer.android.com/about/dashboards/index.htmlcan be used to get right mix of android OS versions.

B) Form Factor: if the app is compatible with Smartphone's and tablets, test for form factors.

C) Screen Resolution: use a mix of different screens to test by size and resolution.

4.2 Emulators vs. Real Device

Predominantly in opening stage of development, software inbuilt device emulators are extremely useful because they assist efficient and rapid testing for basic functionality testing as they provide excellent option for network bypass with virtual phone environment.
Real devices testing is essential to understand application behavior like touch responses, multiple networks, stability and different battery states of device. It is about using mix of emulators and real devices to get best results rapidly and efficiently.

4.3 Mobile Application Testing on Cloud

Cloud offers Web-based access to large pool of real handsets and device connected to live networks spread globally, providing enterprises with end-to-end control for manual and automated testing practices.

Some of its advantages are-

A) Highly synchronized and pre-configured architecture to test across large matrix of devices which improves quality of tests with increased test coverage in minimum time.

B)A cloud-based testing environment provides real-time testing results, which means defects can be identified while tests are running.

C) Parallel Execution enables to run same tests on multiple mobile devices of all combinations of sizes ,versions ,operating systems all at the same time.

D) There are no additional needs to server configurations, licensing, advanced testing tools, and testing resources.
E)Cloud based automation tool has minimal capital expenditure with much faster deployment as it is very much pay per use service.

4.4 Network Connectivity

Almost all applications depend on network connectivity to work correctly. In test environment Wi-Fi can be easily set up and can be cost effective.
There is multitude of network simulation tools available which are cost effective such as TCSWANem to test mobile apps against network speeds, bandwidth options (2G, 3G, 4G) with bandwidth variations and connectivity issues.

4.5 Manual vs. Automated Testing

Automated testing provides a mechanism to consistently repeat a test procedure several times and verify application results. It becomes easy for verifying application compatibility with newly released operating systems and validating backward compatibility during application upgrades.
Manual testing to test various events which may occur when application is being executed like incoming calls, low battery, SMSs, alerts. They are also necessary for location based and voice related apps

4.6 Mobile App Security Testing

It needs to check if application storing or transmitting payment information or credit card details, secure network protocols, if application uses device-id as identifier, or if application uses certificates, user authentications in app .Application should encrypt username and password when authenticating the user over a network.

5. Conclusion

This paper has tried to cover some aspects of mobile application testing and challenges faced while testing followed by testing strategies.
Despite that, the mere occurrence of a testing strategy does not ensure the mobile application's quality and performance. Anideal selection of mobile devices and right mix of simulators and physical devices

can maximize test coverage without need to test every feature on each device. Use of Wi-Fi networks with network simulation tools can reduce cost and complexity of testing.
Using benefits of virtualization, a cloud based mobile application testing strategy can be potential solution which can offer a feasible and viable solution in minimum time with maximum devices for agile development businesses.
While using automation tool, factors like multiplatform support, script reusability, source code changes, and test work flow should be taken into account.
Combining above mobile testing strategies with traditional practices can effectively address mobile app testing challenges and develop product bug and error free.

6. Acknowledgement

Work is performed under Prof R.Manjula of VIT University,Vellore.

7. Website References

[1].Challenges of Mobile App Testing-http://blog.testlio.com/post/6-key-challenges-of-mobile-app-testing

[2]Popular Cloud-Based Mobile Application Testing Tools - http://www.rapidvaluesolutions.com/popular-cloud-based-mobile-application-testing-tools/

[3] Manual Testing - http://www.softwaretestinghelp.com/category/manual-testing/

[4]Deployment, Testing, and Metrics -https://developer.xamarin.com/guides/android/deployment,_testing,_and_metrics/"

[5] Building Effective Unit Tests | Android Developers -https://developer.android.com/training/testing/unit-testing/index.html

[6] Android Devices Types- https://developer.android.com/training/index.html

[7]https://en.wikipedia.org/wiki/Mobile_application_testing

[8] https://axelerant.com/7-ways-win-mobile-application-testing/

[9]https://www.netsolutionsindia.com/blog/5-testing-strategies-for-building-successful-mobile-apps/

[10]https://www.linkedin.com/pulse/20140618084615-208738378-challenges-in-mobile-application-testing

[11]https://intensetesting.wordpress.com/2014/03/19/5-essential-guidelines-for-effective-mobile-application-testing/