

## Review Analysis of Automated Mobile Application Testing

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**Abstract**— Software testing is essential and important task to validate & verify software correctness and completeness. Before the product is being released to customer, set of activities are carried out with the intent of finding errors. Testing of mobile application involves additional testing from the viewpoint of its usability and consistency. The mobile app testing demands stepwise & orderly detection of specific classes of errors with less amount of time & efforts. Choosing best suited testing techniques for individual mobile applications is an art. As testing is also used to evaluate software quality, choosing a test strategy for mobile app becomes significant. This paper reviews various aspects of mobile app testing covering automated testing, testing tools and challenges. It also provides direction for selecting the best strategy for mobile app testing.

**Keywords**— *Testing, Mobile Apps, Manual, Automated, Quality.*

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### I. INTRODUCTION

The conventional role of mobile phone was simple communications medium which now a days is an essential multipurpose personal gadget. The number of smart phone users worldwide has already surpassed two billion in line with prediction done in [1]. In recent years, the growth of mobile applications has increased with the tremendous acceptance of smart phones, tablets & other electronic gadgets.

Smart devices are becoming key intermediate between the consumer & business universally. Mobile applications are becoming driving force for this communication. Mobile applications have kept business operations at the tip of fingers, influencing business decisions. Here comes the gigantic question- What makes a mobile app compelling enough to influence consumer behaviors and make them engage with your brand and products?

A well-built approach for mobile app development is the foundation of any successful mobile app, but there's one important component in app development that guarantees that your mobile app gather round customer expectations and business goals – Mobile Application Testing Strategy. [1]

Developing a new product has become more challenging for hardware manufactures & application developers as technology advances & proliferation of devices across different operating systems (Windows, Apple iOS, Android) & platforms. Mobile applications needs to be tested across cross platforms & networks for vendor peace of mind [2] as shown in Figure.1 which depicts the test life cycle for mobile applications developed using cross platform.

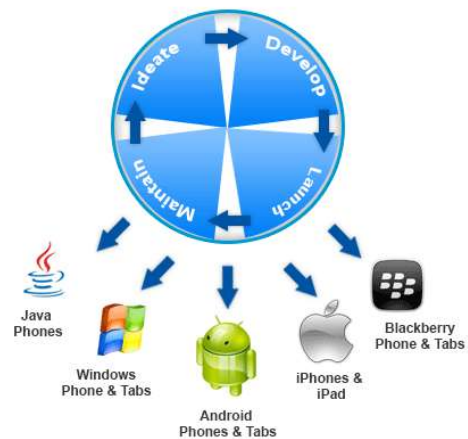


Fig.1 Mobile test automation [2]

Even though mobile development cycles are short, it is necessary to quality-test applications across operating systems, device platforms and networks in order to ensure long-term success in a highly fragmented and competitive global market. Besides nonfunctional testing which includes security, adaptability and usability is as vital as functional testing.

To improve product quality, effective testing is needed which will help device makers & developers to collect appropriate metrics. In view of the complexities, it is necessary to automate the mobile testing to improve efficiency. [3]

To save on time & reduce the quality assurance efforts a well-orchestrated automation strategy is must. An attempt has been made in this paper to identify issues & challenges for automated testing and suggest best automated test strategy.

Rest of the paper is organized as follows: Section II explains the need of mobile test automation. Section III lists

different types of challenges involved in mobile app test automation. Section IV highlights selection criteria to choose between wide varieties of automation tools available. Section V suggests the strategy and concludes the paper.

## II. AUTOMATED MOBILE APP TESTING

Nowadays mobile apps are more polished and requirement for functional testing is notably increased. To handle this, apart from manual testing, there is a need for new alternatives to be considered. Highly effective approach is automated testing for quality assurance that can offer considerable business returns, if executed by using the right tools, architecture and handling cross-platform challenges. [4].

Mobile apps are of mainly three types.

- **Native:** Apps which have binary executable files which can be downloaded directly are known as Native apps.
- **Hybrid:** The hybrid approach combines native development with web technology.
- **Mobile web Apps:** Runs in the mobile device’s web browser and each may have its own features and quirks

Some specific types of testing also need to be automated:

- **Structural challenges:** Mapping mobile testing toolsets into on hand IT systems is a critical hurdle.
- **Network testing:** Tested in a geographically dispersed environment to account for a mixture of network types.
- **Cross-platform compatibility testing:** Necessitated by the large number of growing platforms & handsets.

## Mechanism for Mobile Apps Test Automation.

Following are three ways in which a mobile Web site can be automated:

- **Simulator/Device -based automation:** Involves tools in a test environment and controls simulators/ devices to automate testing using open-source tools such as Selenium. Browsers & simulators with web driver are best suited.
- **Cloud-based automation:** Cloud-based automated solutions are highly effective as they are offered as a unified package. [6]
- **User agent-based automation:** This approach influences user agent add-ons that come with popular browsers such as Mozilla Firefox and Google Chrome. The user agents facilitate the definite Web content that would be displayed on the device onto a regular desktop browser. The functionality can be automated by using popular tools such as QTP, Selenium or RFT — each of which supports all desktop browsers.

## Automation Framework

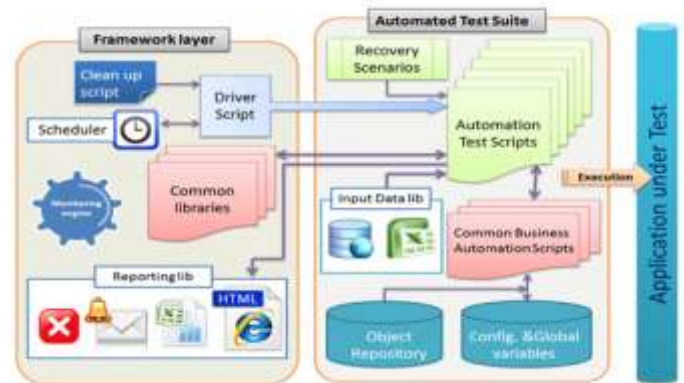


Fig 3. Automation Framework [7]

Figure 3 shows the functioning of the Test Automation Framework

## III. MOBILE AUTOMATION-CHALLENGES

‘Do we need test automation?’ In some cases, the challenges are more important than the benefits. To identify the right testing strategy for automation is crucial. Automation reduces test execution effort by automatically executing the test cases. To execute the test case automatically, we need to create the automation scripts using a suitable tool. The prime challenge is to choose the Right tool for test automation. Based on research, there is no single tool which fits all applications [8]. Before we finalize the automation tool, we need to consider the ease of use of tool, cost, support, application technology, custom controls used. The following challenges are important in case of automation.

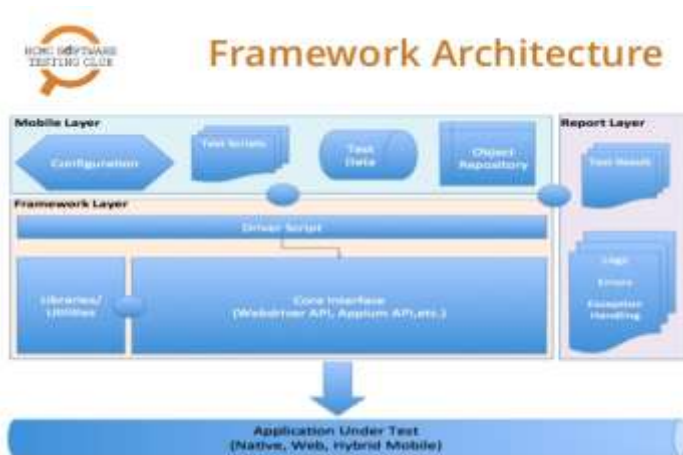


Fig 2. Framework Architecture for Mobile app [5]

Figure 2 articulates the framework for mobile application which can be tested under diversified operating systems & with various web browsers.

**Hardware Challenges:**

- Restrictions of mobile memory size/processing speed.
- Limitation in device communication protocols (e.g., HTTP/WAP).

**Diversification in devices:**

- Many browsers & platforms.
- Devices with diverse application run times.

**Network Challenges:**

- Various network operators with tailored network features.
- Several network types (e.g., CDMA/GSM/Wi-Fi/Wi-Max).
- Issues in speed across dissimilar networks/ locations.

**Challenges while executing the test cases**

Executing a test on versatile device platforms & browsers is large hence a challenging task. [11] For this let us assume a test case which needs to be executed on five different mobile platforms (Windows / Android / iOS / Blackberry & Symbian OS). For successful testing of this test case, it has to be run on 10 different combinations & 13 different devices. Creating a design matrix for this range is time consuming & difficult.



**IV. MOBILE APPLICATION TESTING TOOLS SELECTION CRITERIA**

There are number of successful techniques which make testing application on mobile devices more efficient & effective. It's necessary to confirm functional & non-functional combination of mobile applications on mobile automation. Use of emulators, variety of OS, browsers are basic criteria for mobile application testing and the unique types of testing required for GUI, field and interruption testing. Following principles must be considered when automation tool is being selected for mobile app.

Devices/Browsers	iOS Native 3,4&5	Android Native (2.1,2.2,2.3, 3.0,4.0)	Black berry Native 5.6,7,8 &9	Opera Mini	Sky Fire	Firefox 4	Firefox 5	Firefox 6	Dolphin	Opera Mobile 11.1
iphone3										
iphone4										
iphone5										
Nexus one										
Moto Droid										
Samung Captivate										
HTC Incredible										
NexusS										
Moto Droid X										
Curve 8330										
Tour 9630										
Bold 9650										
Bold 9000 Touch										

- Check proof of concept (PoC): Proof of concept is a realization of a certain method or idea to demonstrate its feasibility [12].
- Choose tool which runs on cross platforms, operating systems.
- Execute automation tool feasibility tests as mobile technologies and platforms vary.
- Choice of tools should support both platform simulators and devices.
- Target for automation in non-functional areas.
- Define the use of services (utilities) and reusable functions.
- As many projects are agile, check for opportunities for early automation.
- Mapping of test management tool and mobile application lifecycle management is an significant success feature for a tool.

Fig 4. Smartphone-based App: Sample Test Execution [9]

Figure 4 highlights how mobile application test cases can be accommodated in different operating systems.

Worthy nominees for mobile application automation test cases have business logic, data driven tests, functional flows. Some of the testing criteria which need to be considered are GUI & UI components, Smoke, Regression, Synchronization, Acceptance, Compatibility testing.



**V. CONCLUSIONS**

The testing strategies which are currently available should make enough arrangement for newly developed mobile application & their characteristics. Manual testing for mobile application will be expensive in terms of time & agility of application development life cycle. There are number of automation tools available for mobile application testing, out of which best suitable tool may be selected.

Fig.5 Smartphone Platforms and Browser Combinations [10]

Figure 5 simulates various operating systems on which mobile applications are made. All such applications need to be tested on diversified browsers for best test results.

While choosing Automation strategy, the key factor is to keep the cost low with considerable amount of efficiency, reliability and accuracy.

As mobiles are made & run on different frameworks & diversified operating systems, bugs need to be checked on all the levels which are part of mobile application development. [12]. The need for testing of all the layers which are part of development of application arises as various reports on testing clarifies the differences between operating systems & application failures. Testing with all possible permutations & combinations of layers with the help of automated testing tools is a must.

Cloud based testing strategies may also enable a distributed, cost effective way of testing mobile applications on a multitude of devices.

Traditionally tested mobile apps & automated testing of mobile apps are quite different as discussed above. Complexity increases with different features of devices, environment, tool sets and test coverage. It needs deep understanding & a tailored approach for well-unified automation strategy.

It can be concluded that by choosing right test automation strategy, opting suitable test case coverage, selecting the accurate tool sets and following the complete approach, goal for cost efficient testing may be achieved.

#### REFERENCES

- [1] <http://www.cognizant.com/InsightsWhitepapers/Selecting-the-Right-Mobile-Test-Automation-Strategy-Challenges-and-Principles.pdf>
- [2] C. Thompson, J. White, B. Dougherty, and D. C. Schmidt, "Optimizing mobile application performance with model—driven engineering," in Proceedings of the 7th IFIP WG 10.2 International Workshop on Software Technologies for Embedded and Ubiquitous Systems, ser. SEUS '09. Berlin, Heidelberg: Springer-Verlag, 2009, pp. 36–46. [Online]. Available: <http://dx.doi.org/10.1007/978-3-642-10265-3>
- [3] A. Schmidt, "Implicit human computer interaction through context," *Personal and Ubiquitous Computing*, pp. 191–199, 2000.
- [4] Wasserman, "Software Engineering Issues for Mobile Application Development," in Proceedings of the FSE/SDP workshop on Future of software engineering research, ser. FoSER '10. New York, NY, USA: ACM, 2010, pp. 397–400. [Online]. Available: <http://doi.acm.org/10.1145/1882362.1882443>
- [5] Gaurang Shah, Prayag Shah, and Rishikesh Muchhala, "Software Testing Automation using Appium" — IJCET (2014)
- [6] X. Wei, L. Gomez, I. Neamtii, and F. Michalis, "Malicious android applications in the enterprise: What do they do and how do we fix it?" in ICDE Workshop on Secure Data Management on Smartphones and Mobiles - SDMSM 2012.
- [7] Shiwangi Singh, Rucha Gadgil and Ayushi Chudgor, "Automated Testing of mobile applications using scripting
- [8] Leekraj Nagowah and Gayshree Sowamber, "A Novel Approach of Automation Testing on Mobile Devices"—IEEE (2012)
- [9] Hyungkeun Song, Seokmoon Ryoo, Jin Hyung Kin, "An Integrated Test Automation framework for testing on heterogeneous mobile platforms" – IEEE (2011)
- [10] Domenico Amalfitano, Anna Rita Fasolino, Portfirio Tramontana, "A GUI Crawling-based technique for Android mobile application Testing" – IEEE (2011)
- [11] Anuja Jain, Swarnalatha P, M R. Ghalib, S. Prabhu, "Web-Based Automation Testing Framework" – IJCA (2012)
- [12] Pallavi Raut, Satyaveer Tomar, "Android Mobile Automation Framework" – IJECS (2014)