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Mobile Application Testing Summary

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Mobile Application Testing Challenges

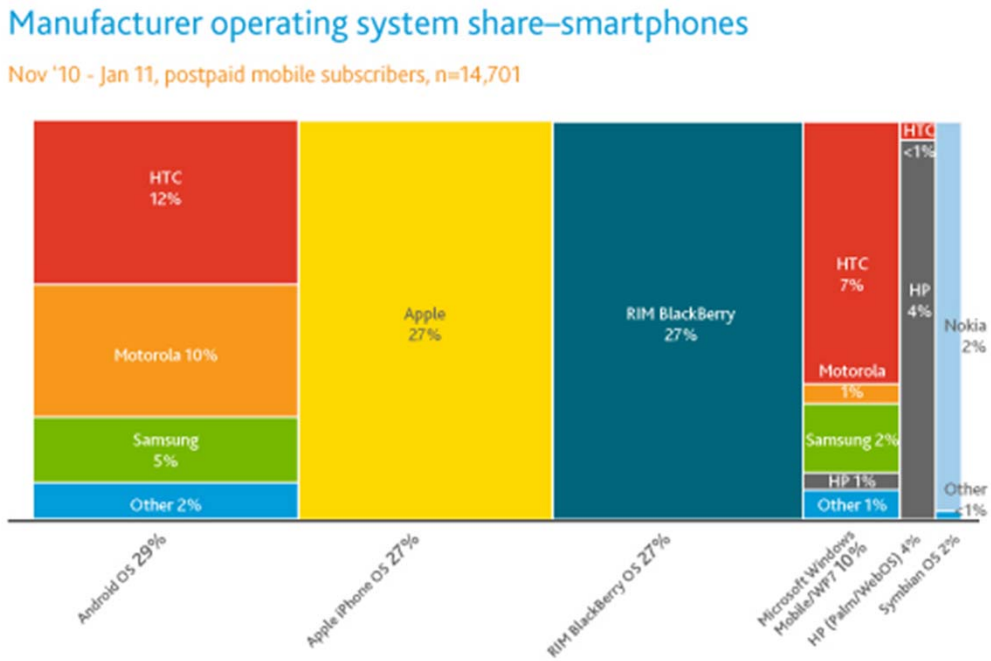
- **Unique challenges with mobile applications; device compatibility, OS compatibility, UI compatibility, browser compatibility (mobile web aps), network, etc.**
  - Closed Systems – Device, OS, network, etc. are specified; controlled platform and straight forward testing strategy
  - Open Systems – Application can be installed across a variety of devices, OSs, networks, etc.; many combinations and the most challenging testing strategy: many device types, rapid upgrading of OSs, more than 40 mobile browsers, over 400 network operators

Mobile Application Testing Challenges

- **For Open Systems, different techniques and methods can be used in testing**
  - Understand the OS, device and network landscape for the intended user base of the application before testing
  - Conduct testing in an uncontrolled, real-word environment, as well as in a controlled, simulated environment
  - An optimal strategy will combine different testing options both manual and automated, that together provide the best overall result to balance tradeoffs between cost and time-to-market, while assuring the highest quality

Mobile Application Testing

Mobile Applications Platform Landscape



Source: The Nielsen Company.

nielsen

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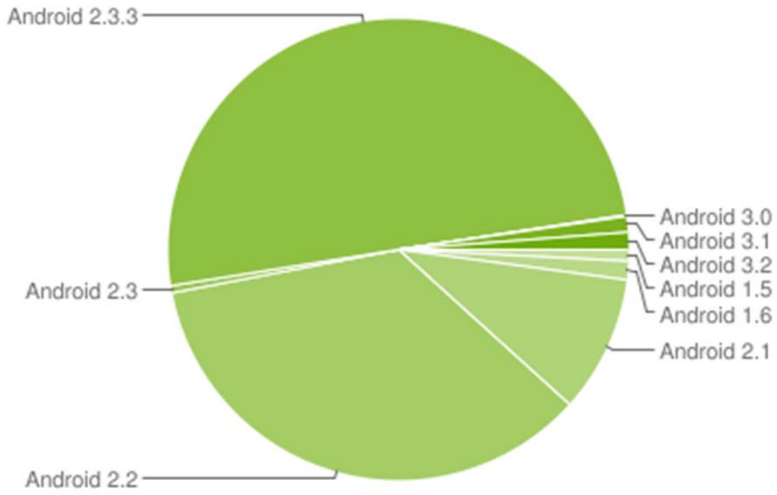
Mobile Applications Platform Landscape: Android OS Usage Share by Version



December, 2011 Google Research

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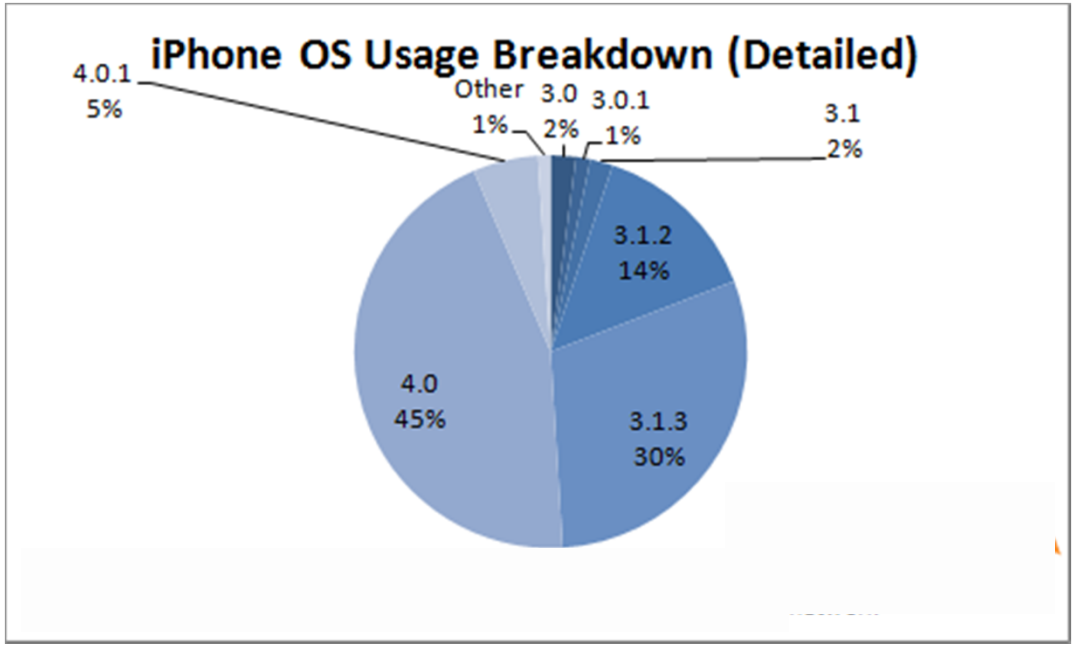
Mobile Applications Platform Landscape:
Apple iOS Usage Share by Version



March, 2011 Chitika Research

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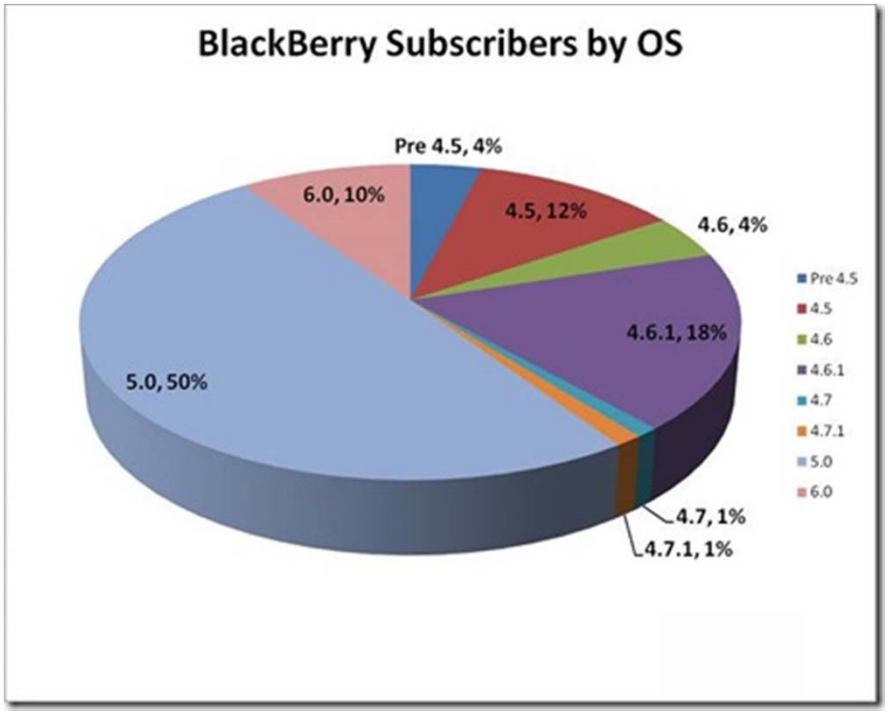
Mobile Applications Platform Landscape: Blackberry OS Usage Share by Version



June, 2011 Chitika Research

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Mobile Application Testing

Testing Strategies, Plans and Documentation Guide the Process

- Test Strategy
- Test Plan
- Test Design Specification
- Test Cases
- Test Case Execution Summary Report

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Test Strategy is a high level document that defines “Testing Approach” to achieve testing objectives. Components of the document include: Approach, Risks, Contingencies & Recommendations, Testing Matrix, Defect Management Process and Resource Requirements (schedule, tools, roles & responsibilities).

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Test Plan specifies how testing will proceed from both a business and technical perspective. At a minimum, a Test Plan addresses dependencies and baseline assumptions (hardware, OS, service provider, etc.), testing approach, test types and testing activities.

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Test Design Specification outlines, defines and details the approach taken to perform mobile application testing. The objective is to identify user flows and annotations, features to be tested, test scenarios, acceptance and release criteria. Depending on the project, can be combined with Test Plan.

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Test Cases are derived from test scenarios identified in the Test Design Specification. They are a set of test actions, test data/user input data, execution conditions, and expected results developed to verify successful and acceptable implementation of the application requirements.

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Test Case Execution Summary Report provides information uncovered by the tests. The report is used to document the overall status of test execution including: proof of test execution (FDA regulated applications), test pass or fail status, defects identified, resolution of defects and any remaining open defects, regression testing results and overall testing effort conclusions.

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Testing Types, Techniques, Tools Used to Support Mobile Applications:

- Manual and Automated Testing
- Database Testing
- Compatibility Testing
- Functional Testing
- Interoperability Testing
- Mobile Analytics Testing
- Power Consumption Testing
- Usability Testing
- Security Testing
- Mobile Device Emulators

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Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Manual Testing**
  - Test scripts are executed by a tester using an actual device under various scenarios
  - The most labor intensive and time consuming technique but necessary for select, critical test cases
- **Automated Testing**
  - Test scripts are executed using emulator(s) and performance testing tool(s)
  - eggPlant is an example of a broad based QA automation testing tool that emulates mobile devices and automates the testing; eggPlant can be downloaded for the Windows or Mac platforms; interfaces with devices, device emulators and other tools to consolidate/complete the testing process

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Examples of Mobile Application Test Automation Tools

eggPlant	Robitium	Fone Monkey	Windows Mobile
eggPlant Server & Console ,Sensetalk Scripting	Robitium.Solo.jar 3.2	FoneMonkey Android FoneMonkey IOS5.5b FoneMonkey Console	Visual Studio 2010 Express
Mobile VNC Viewer & VNC Server	Eclipse 3.7	Eclipse, Xcode, AspectJ development Tool.	WP SDK
iPhone Simulator, Android Emulator, WP Emulator	Android Emulator 4.0.3	iPhone Simulator Android Emulator WP Emulator	Windows Phone Emulator
Android and iOS Devices, Windows Phone	Android Device	Android and iOS Devices	Windows Phone

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Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Database Testing**
  - Check for data integrity and errors while editing, deleting and modifying the forms and all other DB related information
  - Executed manually without use of tools

Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Compatibility Testing**
  - Assures the application works as intended with the selected device, operating system, screen size, display and internal hardware
  - Can be tested with automation, the following are example tools that simulate different devices, operating systems, screens, etc.:
    - iPHoney, a free iPhone simulator powered by Safari (used on a MAC OS platform only); iPad Peek, a free iPad simulator
    - Adobe Device Central CS5, supports the preview, test and delivery of mobile applications; available with the Adobe Creative Suite editions: Photoshop, Illustrator, Flash Professional, Dreamweaver After Effects and Fireworks.
    - DeviceAnywhere, supports automated testing that runs across multiple devices and multiple platforms/OS's
  - Use of manual testing and actual devices for the most critical systems is recommended

Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Functional Testing**
  - Includes the testing of controls, storage media handling options, and other operational aspects
  - Functionality testing for the mobile application is black-box testing and assures that the application functions per the business specifications
  - Executed manually without use of tools

Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Interoperability Testing**
  - Includes the testing of different functionalities within the device, for example;
    - Does iTunes end the play of music when launching the application under test?
    - What happens when a call is received and the application is being launched?
  - Can be tested with a combination of manual and automated test methods, but primarily executed using manual tests

Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Mobile Analytics Testing**
  - Test the correct implementation of analytics: verify page and link tags, redirects, page source and user attributes as well as data capture
  - Can be tested with automation, the following are example tools:
    - Charles Web Debugging Proxy to verify the page and link tags
    - Flurry Dashboard to validate the data was captured correctly, the dashboard view provides a snapshot of user metrics and usage
    - Performance Testing is used to load and stress test the mobile application and database servers; Empirix eTester to preform load and stress testing, eLoad Expert simulates concurrent users
    - Test performance under realistic conditions of wireless traffic and maximum user load

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Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Power Consumption / Battery Life Testing**
  - Testing uncovers defects related to battery drainage caused by the application (device settings can also drain battery life and may make it difficult to determine the cause of the drain), the following are examples of different methods to test power consumption:
    - iPhone, iPod & iPad settings are adjusted; screen brightness, minimize use of location services, turn off push notifications, turn off other downloaded applications, fetch new data less frequently and turn off push mail; run the application to determine the rate it took for the battery life to decrease (testing executed manually without any testing tools)
    - Nokia Energy Profiler is a stand-alone test and measurement application which lets you monitor the battery consumption on target device

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Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Usability Testing**
  - Used to verify mobile interface (UI), navigation, and intuitiveness of the application, as well as consistency, and soberness of color schemes
  - Executed manually without use of tools

Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

- **Security Testing**
  - Security issues include: sensitive data that may remain on handsets, or passwords that are displayed on the screen
  - Testing with automation is not feasible, what is required to be tested is the behavior of the actual handset and security designs vary among handsets – each device must be individually tested

Mobile Application Testing

Testing Types, Techniques, Tools Used to Support Mobile Applications:

➢ Mobile Device Emulators

- Android Emulator
- Blackberry Emulator
- Dot Mobi Emulator
- Firefox Mobile Emulator
- iPhone / iPad / iPod Touch Emulator
- LG Emulator
- Microsoft Devices Emulator
- Motorola Emulator
- Nokia Emulator
- Opera Mini Emulator
- Opera Mobile Emulator
- Samsung Java Emulator
- Samsung Platform Emulator
- Windows Mobile Emulator

Mobile Application Testing

Considerations for Mobile Medical / Health Applications

- The healthcare industry is moving from a system that delivers remedial care to one that focuses more on delivering preventive and pervasive care
- The FDA issued a draft guidance July, 2011 regarding how the agency intended to regulate mobile medical applications
  - The FDA intends to apply its regulatory oversight to “mobile medical apps,” defined as a mobile app that meets the definition of a “device” that either is used as an accessory to a regulated medical device, or transforms a mobile platform into a regulated medical device
  - The guidance lists certain apps that the FDA does not consider to be “mobile medical apps,” including “mobile apps that are solely used to log, record, track, evaluate, or make decisions or suggestions related to developing or maintaining general health and wellness
  - The distinction between mobile medical apps and health/wellness apps is not always clear; many existing applications fall in the gray zone
  - For those applications classified as a mobile medical app, the development and validation processes must adhere to the FDA guidelines for medical device software

Mobile Application Testing

Considerations for Mobile Medical / Health Applications

- The regulatory challenge for mobile medical apps can be met by:

1. Comprehensively define the intended use of the application and the regulatory classification; if in doubt, seek assistance from a qualified regulatory consultant or the FDA
2. Clearly aligning application development and V&V with the Regulatory Guidelines and Quality System Regulations
3. Using the best available technology and models to reduce risk around development

These three objectives help to ensure the quality, reliability, and patient safety of the application throughout development of the application

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Concluding Comments:

- Understand the OS/device landscape before testing; create a Device Platform Matrix to identify the critical OS/device platforms to test, use the 80/20 rule to cover most of the intended users and apply strong labeling for non-supported systems
- Plan test strategies across manual and automated approaches for efficient and high quality application delivery; include both real-world and simulate environments; combine manual testing, automated test scripts and a variety of tools/emulators to support the validation process
- Don't avoid real devices on a real network; source a vendor who provides access to remote, real devices on a "pay-as-you-go" basis to support real world testing
- To be cost effective, maximize the use of automation tools to help keep up with the rapidly changing mobile platform environment; combine the use of freeware as much as possible
- Review automation tools and emulators carefully to ensure the tools have the necessary diagnostics to support troubleshooting, high level scripting solutions to rerun test cases and change device profiles quickly, and the flexibility to test different network options.

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IT Development Partner offering an experienced team of technology professionals committed to *Advancing FDA regulated software development efficiency!*

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