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The Forrester Wave™: Mobile Front-End Test Automation Tools, Q2 2016

Improve App Quality Fast By Automating Mobile Functional Testing

by John M. Wargo and Diego Lo Giudice
April 28, 2016 | Updated: May 2, 2016

Why Read This Report

In our 40-criteria evaluation of mobile front-end test automation tools, we identified the 10 most significant providers — Dynatrace, Experitest, Hewlett Packard Enterprise, Micro Focus, Perfecto Mobile, Sauce Labs, SmartBear, TestObject, TestPlant, and Xamarin. This report shows how each provider measures up and helps application development and delivery (AD&D) professionals make the right choice for their organization.

Key Takeaways

Dynatrace And Perfecto Mobile Lead The Pack
Forrester's research uncovered a market in which device cloud vendors Dynatrace and Perfecto Mobile lead the pack. Hewlett Packard Enterprise, Micro Focus, and TestPlant have offerings that are Strong Performers. Experitest, Sauce Labs, SmartBear, TestObject, and Xamarin offer contending solutions.

Testing Tools Help AD&D Pros Keep Up With The Pace Of Agile Delivery For Mobile Apps
Mobile front-end testing tools are important because more AD&D professionals see automated testing as a way to deliver higher-quality mobile apps more quickly. This market matters in large part due to the pressures Agile software development and frequent app releases place on testing teams.

Device Diversity And Test Variability Are Key Differentiators In Mobile Testing Tools
The most successful mobile apps are tested on many device models and under a variety of conditions. Knowing that an app runs on multiple devices is great, but AD&D pros must also understand how apps perform. Vendors that provide a flexible environment give their customers better understanding of application quality.

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Notes & Resources

Forrester conducted product evaluations of mobile front-end test automation tools from Dynatrace, Experitest, Hewlett Packard Enterprise, Micro Focus, Perfecto Mobile, Sauce Labs, SmartBear, TestObject, TestPlant, and Xamarin; we conducted strategy briefings and product demonstrations in February 2016.

Related Research Documents

The Forrester Wave™: Modern Application Functional Test Automation Tools, Q2 2015

Improving Mobile App Quality Testing

Vendor Landscape: Front-End Mobile Testing Tools

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Deliver Quality Mobile Moments Faster With Automated Mobile Testing

Customer-obsessed companies deliver apps fast and continuous updates even faster. The only bulletproof way to deliver faster is to introduce automation in the software development life cycle, which includes testing. In today's world of Agile sprints and continuous delivery, practices such as testing mobile apps on the devices that happen to be lying around, with a tester's fingers tapping away at screens, are gone. Testers can only keep up the pace using automated testing of an app's user interface (UI) and associated functionality.

Forrester defines mobile front-end testing as:

> *Validation of functional and nonfunctional components of a mobile application's user interface and local functionality.*

Front-End Mobile Testing's Biggest Challenges Are The Big Unknowns

There is much that testing teams cannot know about the environment in which an app will run. They won't know which devices the app will be used on, where the users will be when they use the app, the target device's network quality, or what else the device may be doing. Testers can make educated guesses about these variables, but the only way to know for sure is to validate as many options as possible before the app is delivered into the wild. Unfortunately, this creates an increasing level of complexity for the quality assurance (QA) department to address. Anticipating and mitigating the unknown means:

› **Testing an app on tens, hundreds, and even thousands of different devices.** A QA team could select a popular subset of the available devices and test the app on those devices, leaving possible bugs on obscure devices to be found by users. However, that approach runs the risk of alienating your best customers. Outside of the Apple ecosystem, device manufacturers differentiate themselves by putting features on devices such as new graphical environments and custom productivity apps. Don't assume an app works with all of them — test, test, and test some more, on as many devices as possible.

› **Testing for multiple releases of operating systems and target browsers.** Along with device diversity comes the need for operating system (OS) version and target environment diversity. Just because an app works on a specific device with the latest OS doesn't mean it will work on the same device with an older OS. A matrixed approach to device and OS diversity drives successful testing environments.

› **Validating app functionality and performance in diverse conditions.** Developers and testers may have cellular coverage on their personal devices, but most test devices and device labs are configured for Wi-Fi only. Using these devices doesn't accommodate the diverse network environments in which an app will operate. Additionally, other factors can affect an app's reliability or performance, such as other apps running on the device or processor and memory load.

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› **Dev teams operating at warp speed.** Continuous integration (CI) and continuous delivery mean that app testing is never completely finished. As soon as one set of tests finishes, another developer checks in code, and the test suite begins to execute all over again. On top of that, as developers add new features or change existing features, it will feel like test maintenance never ends.

There's Only One Answer: Automate, Automate, Automate

To keep pace with today's high-speed delivery to create mobile-moment opportunities for your customers and business, mobile dev teams have only one choice: introduce automation in the delivery process and with it automation for testing.[1] Front-end mobile testing is only a subset of overall enterprise testing, since mobile apps are part of a broader business service that typically includes multiple applications and back-end services. However, front-end mobile developers and testers focus on developing and testing the functionality running on a mobile device. To test front-end mobile app functionality, they:

› **Use service virtualization to automate tests against back-end APIs.** Organizations that are on the digital transformation journey are increasingly providing APIs to their core back-end services to enable faster front-end development and provide open innovation opportunities to developer communities off of their platform. Other companies might link to their back-end systems through complex interfaces based on proprietary protocols and data formats. Service virtualization enables testers to simulate application and data behavior on both types of environments, providing request-response pairs that mobile front-end testers use to automate testing of the application.[2]

› **Leverage the cloud for heterogeneous and high-volume device automated testing.** Many companies interviewed look for cloud-based device testing capabilities because it's too complex and expensive to buy multiple devices and manage their life cycle. In addition, supporting multiple distributed teams is also a common requirement. Testing teams find they can more effectively deal with the complexity, heterogeneity, and high volume of testing by offering remote physical device management and testing capabilities in the cloud. Low-volume, localized teams with a focus on fewer platforms and device types are usually happy with on-premises solutions instead.

› **Use mobile UI recording and replay to automate front-end functional tests.** Contrary to web- or fat-client-based testing, teams can address localized functional testing on mobile devices with record and replay tools. These work if developers and testers have additional capabilities for testing all possible touch gestures that mobile phones allow as well as stress testing under specific conditions and constraints. This probably extends the viability of UI automation testing tools versus API testing on mobile devices.[3]

› **Leverage exploratory testing.** Despite the massive interest surrounding automation, most teams manually run 10% to 20% or more of test cases. However, the way Agile teams perform manual testing has changed compared with traditional testing. Teams don't define a detailed, upfront test plan because the user stories change frequently. So manual testing has to be more dynamic and less planned. Testers dynamically define exploratory testing sessions on an as-needed basis. Tools

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offer various capabilities to support exploratory testing, including session objective and scenario test definitions, UI recording, and, last but not least, software environment capture to quickly recreate bugs in the developers' IDE.[4]

Mobile Front-End Test Automation Tools Evaluation Overview

Development teams likely already have unit tests that test an app's core libraries and API testing that validates the functionality and performance of the services exposed from back-end systems of record and systems of engagement. What remains is the need to test functionality running on the mobile device, in automated fashion and on as many devices as possible. This report assesses the leading tools that provide both those capabilities.

To assess the state of the mobile front-end test automation tools market and see how the vendors stack up, Forrester evaluated the strengths and weaknesses of the top vendors and their products. For a more extensive market landscape, you can read our mobile vendor landscape report published earlier.[5] After examining past research, assessing user needs, and interviewing the vendors and other experts, we developed a comprehensive set of 40 evaluation criteria, which we grouped into three high-level buckets:

> **Current offering.** We evaluated each product against five main categories: 1) breadth of the operating environment; 2) specific mobile device testing capabilities, especially the presence and sophistication of cloud device labs; 3) richness of capabilities to create, define, and manage test cases; 4) sophistication of the test execution and automation environment, reporting and analytics, and orchestration of automation; and 5) integration of third-party nonfunctional testing tools or test data management tools as well IDEs and programming environments. All evaluated products were publicly available as of February 5, 2016.

> **Strategy.** In the strategy section, we analyzed each vendor's vision, comparing it with Forrester's framework of Agile, DevOps, and continuous delivery trends. We examined both the role and importance of testing, specifically that of mobile front-end testing in the vendor's vision. We also looked at each vendor's road map in terms of depth, breadth, sustainability, and alignment with the vision. We also emphasized valuable partnerships and systems integrator relationships.

> **Market presence.** We interviewed two customers of each vendor to gauge overall client satisfaction with the vendor's solution regarding installation, operation, education, documentation, product support, and responsiveness to feature requests. Other important criteria included marquee client reference accounts, company financial strength, and geographical presence as indicators of vendor and solution strength.

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Evaluated Vendors And Inclusion Criteria

Forrester included 10 vendors in the assessment: Dynatrace, Experitest, Hewlett Packard Enterprise (HPE), Micro Focus, Perfecto Mobile, Sauce Labs, SmartBear, TestObject, TestPlant, and Xamarin. Each of these vendors has:

› **Tools for executing mobile application front-end tests.** The solutions evaluated provide customers with an environment for creating and managing test scripts in addition to an environment for executing tests. The vendors selected for this assessment offer enterprise testing solutions that include mobile capabilities as well as mobile-first or mobile-only solutions.

› **Support for both web and native mobile application testing.** Many vendor solutions support mobile web application testing, but for this assessment, they had to support native mobile app testing as well.

› **Support for both automated and manual tests.** The solutions evaluated in this assessment provide clients with a mechanism for automating mobile front-end tests but also support the ability to execute manual or exploratory tests.

› **At least 150 customers.** Mobile front-end testing is not a new market, but many existing vendors are only now adding mobile capabilities to their existing products, and other mobile testing vendors are just starting to hit their stride.

› **Device lab capabilities.** The vendor solutions had to provide capabilities that allowed tests to be executed on physical devices. This includes on-premises and cloud-based offerings.

New Players Lead The Pack, But The Veterans Are Waking Up

Forrester's evaluation of mobile front-end test automation solutions uncovered a market with two Leaders, three Strong Performers, and five Contenders (see Figure 1):

› **Dynatrace and Perfecto Mobile lead the pack.** The Leaders in our Forrester Wave evaluation are Dynatrace and Perfecto Mobile. The Leaders have high scores in all the key evaluation areas: operating environments, test targets, test creation and management, automation creation, and integration. They specifically shine by providing on-premises, cloud, and hybrid test labs, with rich functional mobile-device-specific testing capabilities. These vendors also have the resources and vision to take advantage of the increasing adoption of front-end mobile testing.

› **HPE, Micro Focus, and TestPlant are Strong Performers with competitive offerings.** The Strong Performers offer robust test creation functionality, but unlike the Leaders, they don't score at the top in all categories. HPE is creating a competitive mobile hub leveraging its mature and functionally rich testing technology; Micro Focus also leverages its traditional testing strength in test management and automation execution; TestPlant thrives as a UI image testing-based tool and also has a respectable mobile device test target environment.

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› **Experitest, Sauce Labs, SmartBear, TestObject, and Xamarin are Contenders.** Contenders scored below the Leaders and Strong Performers in most categories. Experitest offers a flexible device management environment and relies on third-party partners for cloud infrastructure, which some clients prefer. Sauce Labs is the open source champion, offering comprehensive target app types (i.e., Apache Cordova, native, and web). SmartBear offers device emulation and simulation with performing UI recording and replay testing capabilities. TestObject offers a strong device cloud and on-premises environment with good scripting reuse. Xamarin too offers script reuse across tests and efficient record and replay for UI test automation.

Figure 1 Forrester Wave™: Mobile Front-End Test Automation Tools, Q2 '16
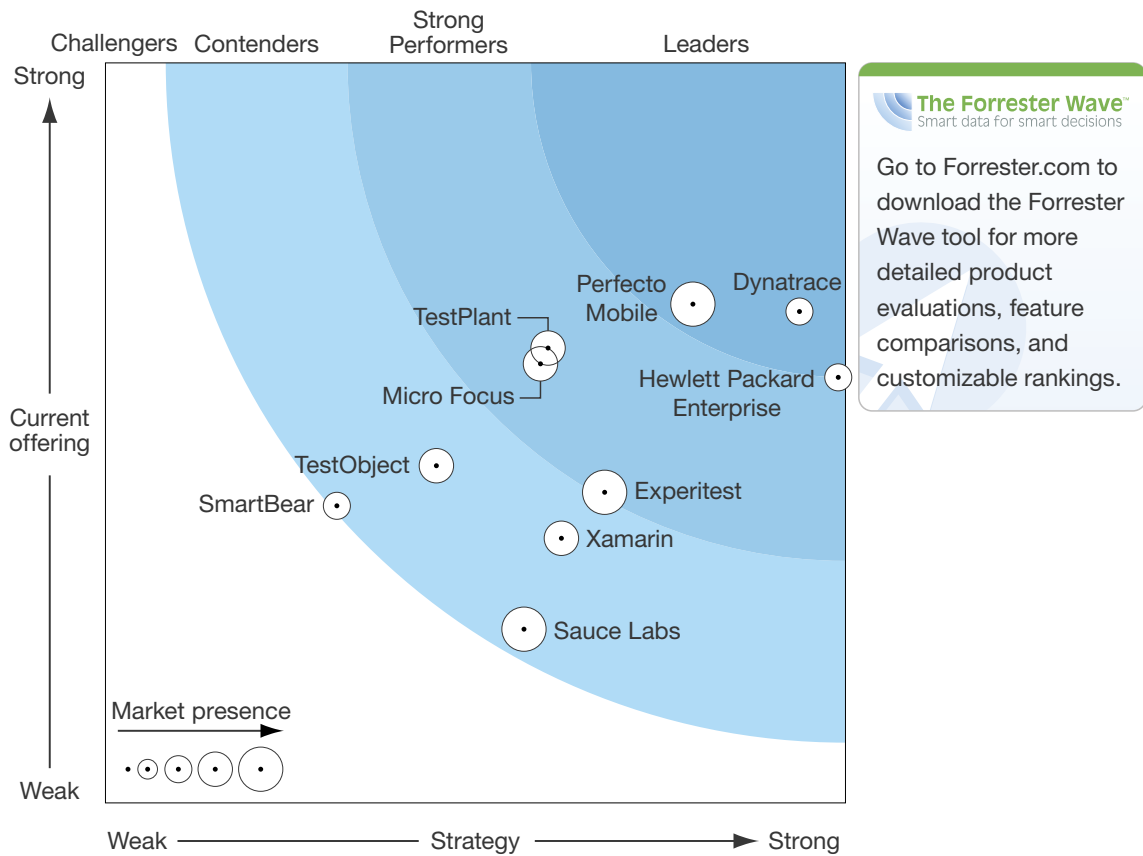
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Figure 1 Forrester Wave™: Mobile Front-End Test Automation Tools, Q2 '16 (Cont.)

	Forrester's Weighting	Dynatrace	Experitest	Hewlett Packard Enterprise	Micro Focus	Perfecto Mobile	Sauce Labs	SmartBear	TestObject	TestPlant	Xamarin
Current offering	50%	3.32	2.10	2.88	2.98	3.37	1.17	2.00	2.28	3.07	1.79
Operating environment	10%	5.00	3.90	2.50	4.70	4.20	1.50	1.10	3.60	4.20	1.10
Test targets	30%	4.35	3.70	2.80	2.45	4.80	0.95	1.95	2.45	3.60	2.00
Test creation and management	20%	4.40	2.60	3.80	4.70	3.80	1.50	3.70	1.80	4.20	3.00
Test management and execution	30%	3.90	1.80	4.85	4.80	4.10	1.75	3.50	3.55	3.90	3.05
Integration	10%	3.40	0.60	3.30	3.30	2.80	2.10	2.50	1.20	4.00	1.60
Strategy	50%	4.69	3.37	4.94	2.94	3.97	2.83	1.57	2.23	2.99	3.08
Product road map	40%	5.00	3.00	5.00	3.00	3.00	3.00	1.00	1.00	3.00	3.00
Product vision	40%	5.00	3.00	5.00	3.00	5.00	3.00	1.00	3.00	3.00	3.00
Pricing model	10%	5.00	5.00	5.00	3.00	3.00	3.00	5.00	5.00	3.00	3.00
Partners	10%	1.90	4.70	4.40	2.40	4.70	1.30	2.70	1.30	2.90	3.80
Market presence	0%	2.52	4.72	2.88	3.52	4.60	4.08	2.08	3.48	3.04	3.36
Installed base	40%	2.00	5.00	3.00	4.00	5.00	5.00	1.00	4.00	2.00	4.00
Reference accounts	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Geographical presence	20%	3.00	5.00	5.00	3.00	5.00	3.00	5.00	5.00	5.00	3.00
Financial strength	40%	2.80	4.30	1.70	2.30	4.00	3.70	1.70	2.20	3.10	2.90

All scores are based on a scale of 0 (weak) to 5 (strong).

Vendor Profiles

This evaluation of the mobile front-end test automation market is intended to be a starting point only. We encourage clients to view detailed product evaluations and adapt criteria weightings to fit their individual needs through the Forrester Wave Excel-based vendor comparison tool. Clients can also schedule an inquiry with the authors to have a conversation about the market and specific vendors and products.

Leaders

› **Dynatrace delivers solid capabilities with access to cloud and local test devices.** Keynote, which merged with Dynatrace in 2015, is an early provider of cloud-based device labs. The solution has evolved into a complete automated mobile testing solution. Keynote offers both app testing and app monitoring capabilities, leveraging some of the same script components for each, thereby allowing developers to test both how well the app works and how well it performs. As a mobile-only solution, it is not saddled with legacy desktop metaphors, instead providing a clear, mobile-focused environment for testers. The Keynote Mobile Testing Studio is a full-featured editing

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environment that provides testers with a drag-and-drop interface for building and maintaining tests. From a vision standpoint, Dynatrace is focusing on openness and streamlining the testing process, giving enterprises the capabilities they need to address more complicated testing scenarios.

› **Perfecto Mobile focuses on open source and a large physical device catalog on cloud.** While Perfecto pioneered mobile device testing in the cloud, it is now expanding to include support for desktop browser and enterprise testing capabilities, giving it more ammunition for multichannel apps testing. Perfecto's wind tunnel approach is a unique capability in this space, enhancing the impact of a test suite by enabling testers to execute tests multiple times across a varying set of device/network conditions. Perfecto offers full compatibility with Appium and Selenium and an open platform that gives customers maximum flexibility in their vendor tool choices.

Strong Performers

› **HPE adds new mobile testing capabilities to its comprehensive testing suite.** HPE only recently entered the mobile test market with its Mobile Center product. This new solution provides value through the completeness of the offering coupled with some additional capabilities not available from mobile-only vendors. For example, there are security testing capabilities to help developers identify vulnerabilities earlier in the life cycle and sentiment analysis capabilities that enable post-deployment monitoring to provide feedback directly into the testing process. Both of these help development organizations better understand what needs to be tested. In addition, analytics capabilities in the testing solution help identify faulty or incomplete tests. HPE will need to expand its current on-premises-only offering to the cloud to remain competitive. Finally, it remains to be seen whether HPE can execute on its vision with the determination and speed it needs to become a leader in this category.

› **Micro Focus delivers a capable suite of tools for driving mobile test automation.** Micro Focus offers a wide variety of products that go beyond front-end mobile testing. For test automation, Silk Mobile is a white-label offering of Experitest's SeeTestAutomation; Silk excels through the additional capabilities that it wraps around the Experitest product. The Silk Central management console delivers a single interface for managing most aspects of a front-end mobile testing process, including managing manual tests and tracking issues identified during testing. The solution supports Agile development methodologies through its sprint-focused approach to management. Additionally, we expect additional partnerships to expand its options into cloud-based offerings.

› **TestPlant's focus on image-based recognition sets it apart from other vendors.** TestPlant offers a capable and feature-rich environment. An early entrant in the device cloud space, TestPlant started with image-based recognition of app UI elements and, when other vendors branched out into object-based recognition, it enhanced its product with new and interesting approaches to image-based testing. Its parameter-based adjustment of tolerance for image recognition enables developers to adjust to achieve higher hit rates. Its performance and network testing capabilities

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give development organizations a wider view into their app's quality and the reliability and scalability of the associated server infrastructure. One of this vendor's strengths is the ability to support cross-platform testing in one script through an awareness of the target platform. The easy-to-use GUI testing approach for testing SMEs has evolved in adding more developer-focused tools; TestPlant's vision focuses on quality and efficiency, working to help optimize and increase the level of automation.[6] Going forward, it will focus on scripting productivity plus management capabilities, ultimately enabling testers to follow a less rigid flow through an application during testing.

Contenders

› **Experitest has rich device management but is not a complete testing solution.** The solution provides an easy-to-use environment for managing and testing applications on multiple devices on-premises, while device testing in the cloud is provided through third-party solutions. SeeTestAutomation supports a wide variety of languages for coding test scripts, so developers should be able to find an option that makes them happy. While recording tests, its recorder offers a wide variety of identification elements for app components. Experitest products provide useful capabilities for automated testing and test recording. It is limited to on-premises solutions, which is important for security-conscious organizations.

› **Sauce Labs delivers on open source and automation with BYOT.** Sauce Labs successfully embraces the bring-your-own-tools (BYOT) and pick-your-favorite-language approaches to mobile app testing, which should make most developers happy. Focusing on automation and CI, it offers a robust, cloud-only testing solution that includes virtual machines for testing web and mobile applications as well as real devices. Its focus on open source and support of parallel testing to streamline delivery of tests on time is a plus. It satisfies security-conscious environments through a secure connection back into the data center using Sauce Connect. The Sauce Labs Real Device Cloud is a brand-new offering; its initial implementation is focused on only two types of devices (two Android phone models and the Apple iPhone 6), which can be quite limiting. We know Sauce Labs will add more types of devices to its cloud as it matures.

› **SmartBear delivers testing, quality, and performance tools plus a local device lab.** SmartBear is one of the broad-spectrum test tool vendors focused more on the developer side of the room. It provides API, functional, and load testing tools as well as common capabilities across multiple types of tests. It delivers a clean and simple interface during test recording, which allows developers to focus on the task at hand, but can quickly augment recorded actions in a more robust interface. The product manages tests in a drag-and-drop test editor and includes the ability to define data sets for data-driven testing. SmartBear's view seems to be shifting testing even more to the left, fitting with the trend toward Agile and DevOps, as its future tooling gets closer to developers.

› **TestObject employs professional services to accelerate adoption of its device lab.** A mobile-only vendor, TestObject is a German company that offers an on-premises device lab with a browser-based environment for managing test execution, delivering results, and collecting data.

TestObject provides a test engineer with every project to help ensure quality of tests and get customers up and running as quickly as possible. Testers can identify hard-to-find bugs using TestObject's automated monkey testing capabilities, where random taps and swipes exercise an app in ways a structured script cannot. It is an optimal solution for clients looking for an efficient device lab with automation capabilities focused to enable test execution in their environment.

› **Xamarin tackles the entire dev life cycle and was recently acquired by Microsoft.** Xamarin is unique in this analysis as the only vendor that also provides a mobile development platform. The Xamarin Test Cloud is a new offering, bought as part of a recent acquisition. The solution has a solid framework for creating and executing mobile application tests; the lower scores in the Forrester Wave are the result of the product's "1.0" nature and limited time in the market. Its device lab is cloud-based, supporting a large catalog of physical devices, but the solution also supports emulators/simulators on-premises. For physical device testing, it offers thousands of devices and a wide range of device models. Xamarin offers a functional test script recorder and editor. It supports parallel execution of tests for maximum scalability; one cool feature is the ability to show test results for all devices for each test step. This makes it very easy to quickly scan results to identify visually where tests failed on certain devices. Open source support is through its own sponsored framework, Calabash.

Note: Microsoft announced its acquisition of Xamarin after we completed our product evaluations. Due to the timing of those events, we were unable to directly address the impact the acquisition will have on Xamarin's products. We expect dramatic expansion of its offering under the Microsoft umbrella as well as tighter integration with other products in the Microsoft product portfolio.[7]

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Supplemental Material

Online Resource

The online version of Figure 1 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings.

Data Sources Used In This Forrester Wave

We evaluated the vendors participating in this Forrester Wave, in part, using materials that they provided to us by March 31, 2016.

› **Vendor surveys.** Forrester surveyed vendors on their capabilities as they relate to the evaluation criteria. Once we analyzed the completed vendor surveys, we conducted vendor calls where necessary to gather details of vendor qualifications.

› **Product demos.** We asked vendors to conduct demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.

› **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with two of each vendor's current customers.

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The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria to be evaluated in this market. From that initial pool of vendors, we then narrow our final list. We choose these vendors based on: 1) product fit; 2) customer success; and 3) Forrester client demand. We eliminate vendors that have limited customer references and products that don't fit the scope of our evaluation.

After examining past research, user need assessments, and vendor and expert interviews, we develop the initial evaluation criteria. To evaluate the vendors and their products against our set of criteria, we gather details of product qualifications through a combination of lab evaluations, questionnaires, demos, and/or discussions with client references. We send evaluations to the vendors for their review, and we adjust the evaluations to provide the most accurate view of vendor offerings and strategies.

We set default weightings to reflect our analysis of the needs of large user companies — and/or other scenarios as outlined in the Forrester Wave evaluation — and then score the vendors based on a clearly defined scale. We intend these default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs through the Excel-based tool. The final scores generate the graphical depiction of the market based on current offering, strategy, and market presence. Forrester intends to update vendor evaluations regularly as product capabilities and vendor strategies evolve. For more information on the methodology that every Forrester Wave follows, go to http://www.forrester.com/marketing/policies/forrester-wave-methodology.html.

Integrity Policy

We conduct all our research, including Forrester Wave evaluations, in accordance with our Integrity Policy. For more information, go to http://www.forrester.com/marketing/policies/integrity-policy.html.

Endnotes

[1] For more information regarding enterprise functional test automation, please see the "The Forrester Wave™: Modern Application Functional Test Automation Tools, Q2 2015" Forrester report.

[2] For more insights into service virtualization, please see the "The Forrester Wave™: Service Virtualization And Testing Solutions, Q1 2014" Forrester report.

[3] In this report, we put UI automation tools on the decline. While this might be true for non-mobile app testing, it might not be true front-end mobile app testing. See the "TechRadar™: Continuous Software Delivery, Q2 2015" Forrester report.

[4] IDE: integrated development environment.

[5] For more information on this topic, please see the "Vendor Landscape: Front-End Mobile Testing Tools" Forrester report.

[6] GUI: graphical user interface; SMEs: subject matter experts.

[7] Source: Nat Friedman, "A Xamarin + Microsoft Future," Xamarin, February 24, 2016 (https://blog.xamarin.com/a-xamarin-microsoft-future/).

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