

ECONOMIC VALIDATION

Analyzing the Economic Benefits of Sauce Labs for Mobile Testing and TestOps

By Nathan McAfee, Senior Economic Analyst
Enterprise Strategy Group

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Executive Summary

Website, mobile, and performance testing are among the most challenging tasks that developers face. The growth of iterative and decentralized development, along with increasing integration of microservices and APIs, compounds the complexity of testing until it exceeds the capabilities of most organizations. With the average organization needing to maintain and test on an average of 80 iterations of hardware and browser configurations, the cost and complexity of managing physical or on-premises real devices is immense and, with remote and hybrid work becoming the norm, the challenge is only getting tougher.

Through customer interviews, custom research, case studies, and TCO/ROI models, TechTarget's Enterprise Strategy Group (ESG) has validated that Sauce Labs provides an extremely effective platform for continuous testing during the mobile application development process, as well as ongoing test and device maintenance and OS updates. Sauce Labs

customers report that they are able to deliver better quality mobile applications, shift a higher majority of testing to pre-release to minimize the impact on end users, accelerate time to release, and lower overall costs associated with testing. Sauce Labs customers also report that their end users and developers experience a higher level of satisfaction. With Sauce Labs, developers are able to spend a higher percentage of their time creating code, knowing that their work is being tested with greater coverage, efficiency, and reliability.

Validated Benefits of Sauce Labs



Accelerated Product Releases

50% Accelerated time to release through smoother handoffs and granularity in testing



Improved Insight and Agility

75% Reduction in breaking changes in released applications



Lower Costs

\$200K Elimination of test hardware farms and lower FTE costs saved our sample organization annually



Improved Risk Management

Sauce Labs helps harden code, including APIs and microservices

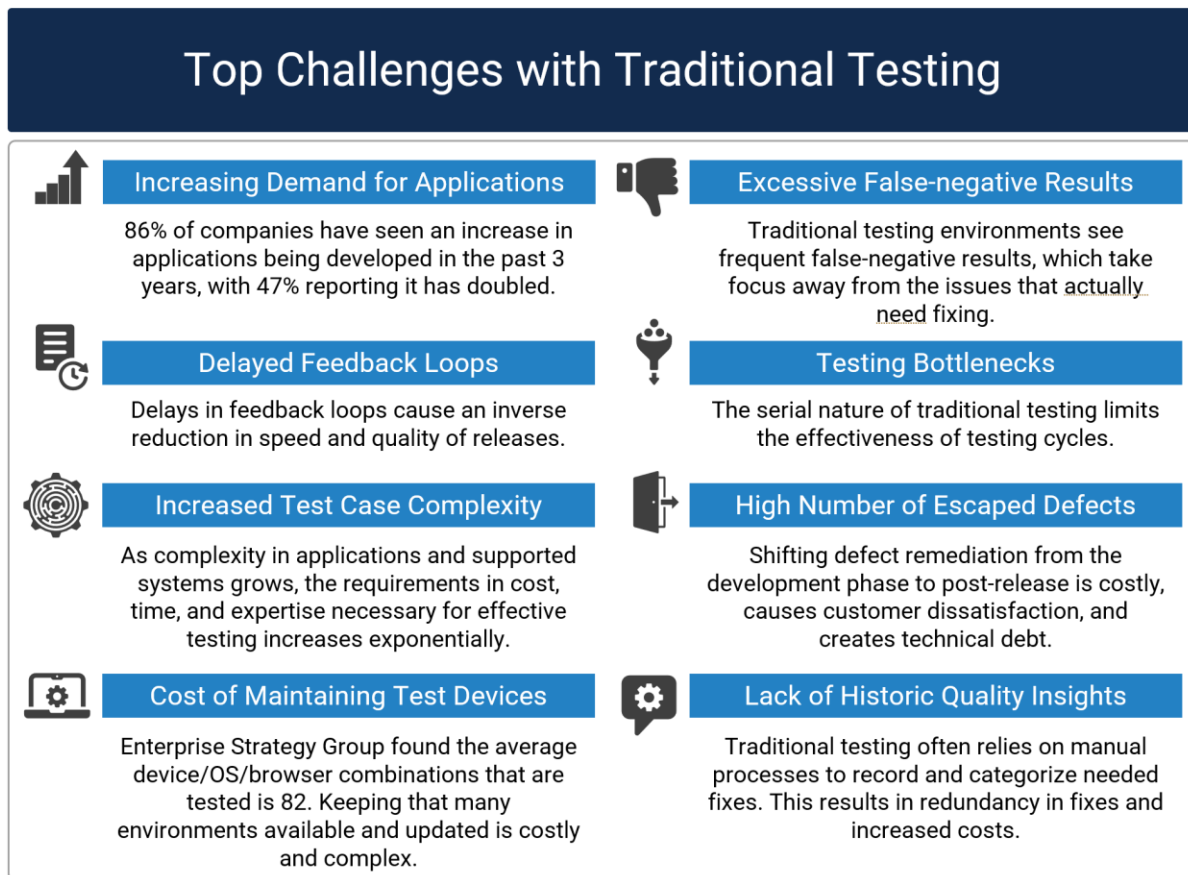
Introduction

This Enterprise Strategy Group Economic Validation Report focuses on the quantitative and qualitative benefits organizations can expect from using Sauce Labs for continuous testing, with an emphasis on the economic impact Sauce Labs can have for website and mobile testing and TestOps.

Challenges

Developers spend too much development time on testing web and mobile apps. A key blocker is the cost and immense complexity of maintaining a hybrid or complete on-premises test infrastructure. While many organizations have put continuous integration and continuous deployment (CI/CD) pipeline tools in place, and have tried to streamline or automate manual QA processes with low/no-code and machine learning (ML)-driven tools, testing continues to sap a great deal of developers' time. For this analysis, Enterprise Strategy Group (ESG) studied the challenges faced by software development organizations and found the items listed in Figure 1 to be consistent across most companies.¹

¹ Source: Enterprise Strategy Group Custom Research survey commissioned by Sauce Labs, *Application Testing and QA Market Insights*, December 2022. All Enterprise Strategy Group research references and charts in this economic validation report have been taken from this custom research.

Figure 1. The Top 8 Challenges with Traditional Testing

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

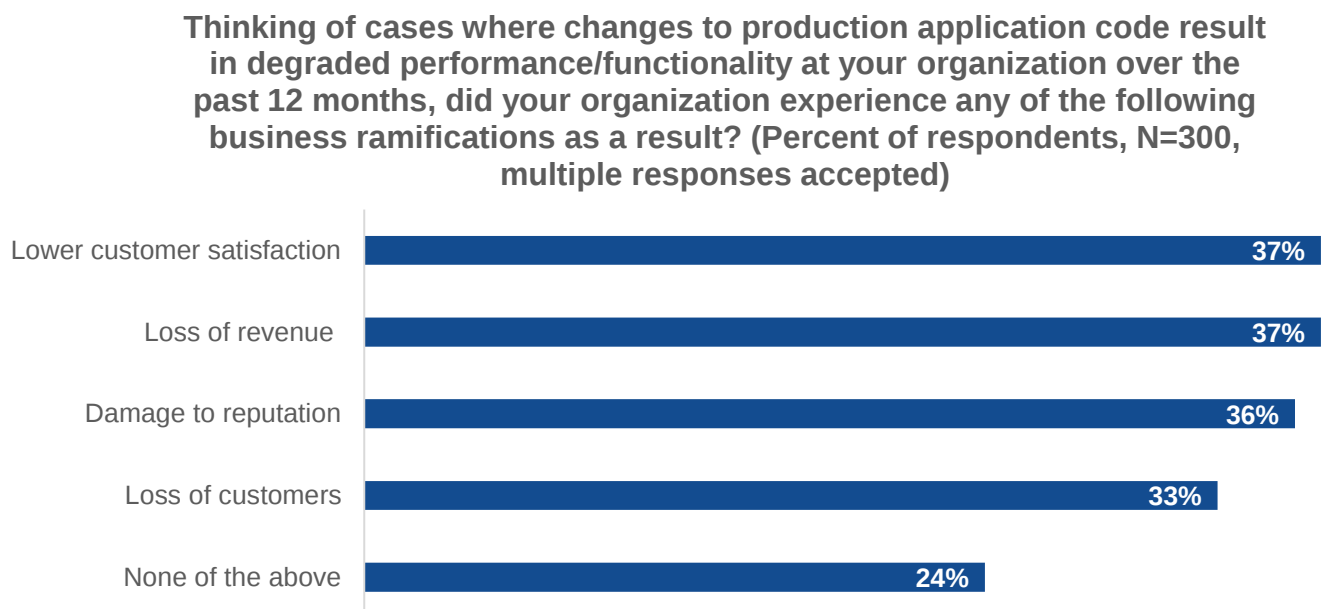
- **Increase in Demand for Mobile Applications** – ESG research found that 86% of survey respondents have seen the number of mobile applications being developed rise over the past 3 years, with 47% reporting that it has at least doubled over that timeframe.
- **Delayed Feedback Loops** – The amount of delay that is injected into the testing and feedback process has inverse relationships to both the speed and quality of the product. Interviews with customers show that each day that is injected in the feedback loop adds up to an additional 5% to the effort needed for the remediation of an issue due to staleness that develops while the developer is working on other items.
- **Increasing Test Case Complexity** – 30% of research respondents listed testing complexity as a top challenge to their mobile application development efforts. APIs and microservices can bring a level of integration and capability that helps drive digital transformation. However, with each of these integrations come security and compliance scenarios that substantially increase the complexity of testing. Many organizations have found that their need to test for vulnerabilities and use case scenarios far exceeds their ability to test and often exceeds their time and budget requirements when they are able to effectively test. This limits their willingness to explore the capabilities of APIs and microservices.
- **Cost of Maintaining Test Devices** – The high cost and operational burden of maintaining a pool of real devices for browser and mobile testing can be substantial, 37% of respondents reported this as a top challenge to their mobile application development efforts, making it the most frequently reported issue. This may hamper an organization's ability to test. ESG research found that respondents test on an average of 82

unique device/OS/browser combinations and found that organizations with a high degree of test automation are able to test 20% more combinations, on average. Additionally, the shift to a remote or hybrid workforce injects a logistical cost and challenge into the process of getting the right device or environment in the hands of the tester.

- **Excessive False-negative Results** – As complexity grows, the number of false-negative tests increases. Understanding the cause of a negative test can be a challenge, and the noise that comes with excessive false-negative results can blind the tester to the issues that will cause the most negative impact in the end-product. Customers find that the result of excessive false negatives is lower user confidence in releases.
- **Testing Bottlenecks** – The lack of ability to do concurrent or parallel testing limits the effectiveness of many test organizations. This can be caused by limited access to appropriate environments or devices, limited experience with ancillary ecosystems, a push to meet planned schedules, and tester bandwidth. When tests have to be held until a previous test is completed, many tests are completely avoided, and releases are delayed.
- **High Number of Escaped Defects** – Issues that escape the development cycle and surface in released products reduce end-user confidence, inject security risk, and increase mean time to recovery (MTTR) to fix those flaws.
- **Lack of Historic Quality Insights** – Most organizations stretch their testing budget as far as they can. The result is that this limits organizations' focus that can be applied to recording issues and post-release reviews. ESG believes that companies that ignore historic insights in development often struggle to make data-driven decisions to improve their change failure rate and overall quality of future releases.

Shortcomings in testing create technical debt, which is the consequence of making short-term decisions to solve long-term problems. Organizations with high technical debt find themselves spending large portions of their current budget to remedy problems caused by past decisions and see a high level of service impact issues with their releases. Service-impacting issues with code have real consequences, as seen in Figure 2.

Figure 2. Service-impacting Issues with Code Have Real Consequences



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Responsible organizations don't set a strategy to release code with issues. However, many feel forced to push code out the door without the desired level of testing. The good news is that ESG research shows that most companies have intentions of increasing testing, with 76% of organizations planning to increase their testing capabilities in the

next 12-24 months. However, two-thirds or more of research respondents agree that they have issues with the scalability, cost, productivity, and completeness of increased testing that will help them get there. A website and mobile testing solution that offers converged testing tools to increase confidence in any stage of development along with unified visibility and insights is needed to optimize test efficiency, automation, and reliability.

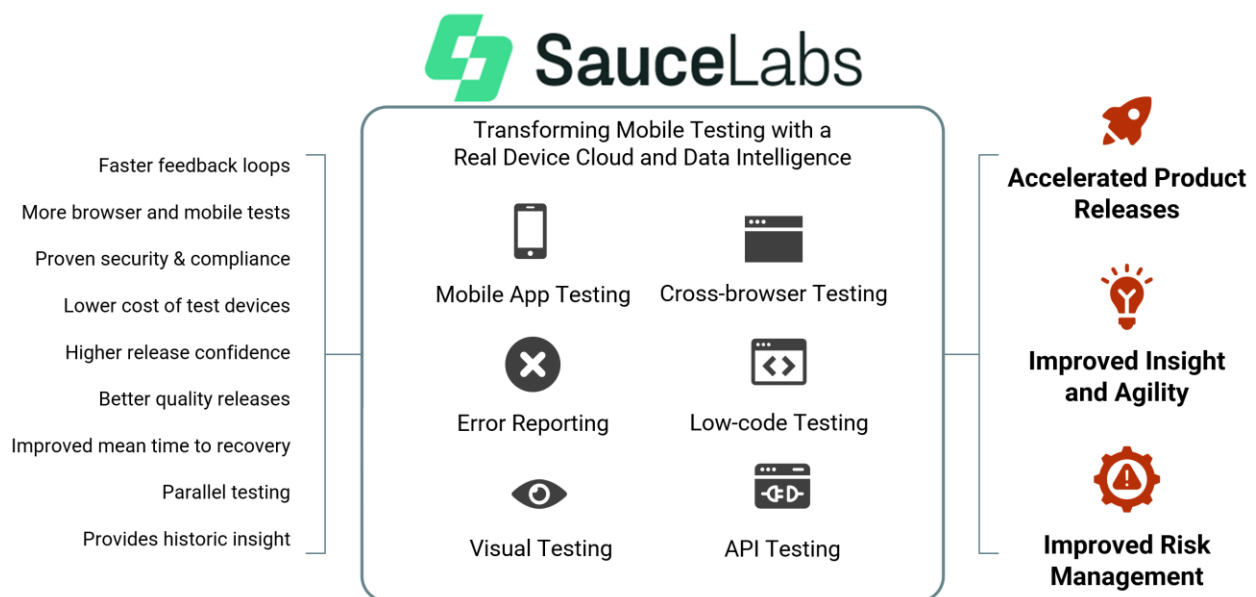
The Solution – The Sauce DevOps Test Toolchain

The Sauce DevOps Test Toolchain is a cloud-based testing platform that enables developers to run automated tests across desktop browsers, emulators, simulators, and mobile devices (see Figure 3). Sauce Labs enables testing throughout the development lifecycle and allows for error detection and remediation in post-release code. This continuous testing can be done on over 800 browser/OS combinations, nearly 200 mobile emulators and simulators, and more than 2,000 mobile devices.

Sauce Labs tests securely in the cloud and eliminates the need to buy and maintain a hardware test farm of devices. The parallel testing ability of Sauce Labs accelerates testing and overall development while providing depth in testing, including microservices and API tests.

Sauce Labs provides an enterprise-class portfolio of solutions, including web and mobile app testing, error monitoring and reporting, and integrations with popular tools for test automation, CI/CD, test management, and more.

Figure 3. Sauce Labs Cloud-based Testing Platform



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Enterprise Strategy Group Economic Validation

Enterprise Strategy Group's (ESG's) Economic Validation process is a proven method for understanding, validating, quantifying, and modeling the economic value of a product or solution. The process leverages ESG's core competencies in market and industry analysis, forward-looking research, and technical/economic validation. ESG conducted in-depth interviews with Sauce Labs end users to better understand and quantify how Sauce Labs has impacted their organizations, particularly in comparison with previously deployed and/or experienced solutions. In addition to having experience with on-premises testing solutions, some of the customers interviewed used

competitive testing solutions and were able to give detailed feedback on the differences between the two solutions. The qualitative and quantitative findings were used as the basis for a simple economic model comparing the expected costs and benefits of Sauce Labs.

To complement ESG's typical Economic Validation process, ESG also conducted a custom primary research survey to gain further insight into key topics. Respondents to this 2022 research survey included application developers, quality assurance (QA) stakeholders, site reliability engineers (SREs), and other DevOps professionals based in the U.S. (90%) and Canada (10%) knowledgeable both about the software development lifecycle at their organization and the associated key performance indicators of importance to their organization. The survey spanned respondents employed by large midmarket companies (500-999 employees, 14%) and enterprises (1,000+ employees, 86%). Multiple industry verticals were represented, including technology (32%), manufacturing (21%), financial services (11%), and communications and media (8%), among others.

All respondents were provided a financial incentive to complete the survey. After applying screening criteria and data quality control best practices, a final sample of 300 respondents completed the survey. The margin of error of a sample of N=500 is + or – six percentage points. All research data included in this report was collected via this survey, unless otherwise noted.

Sauce Labs Economic Overview

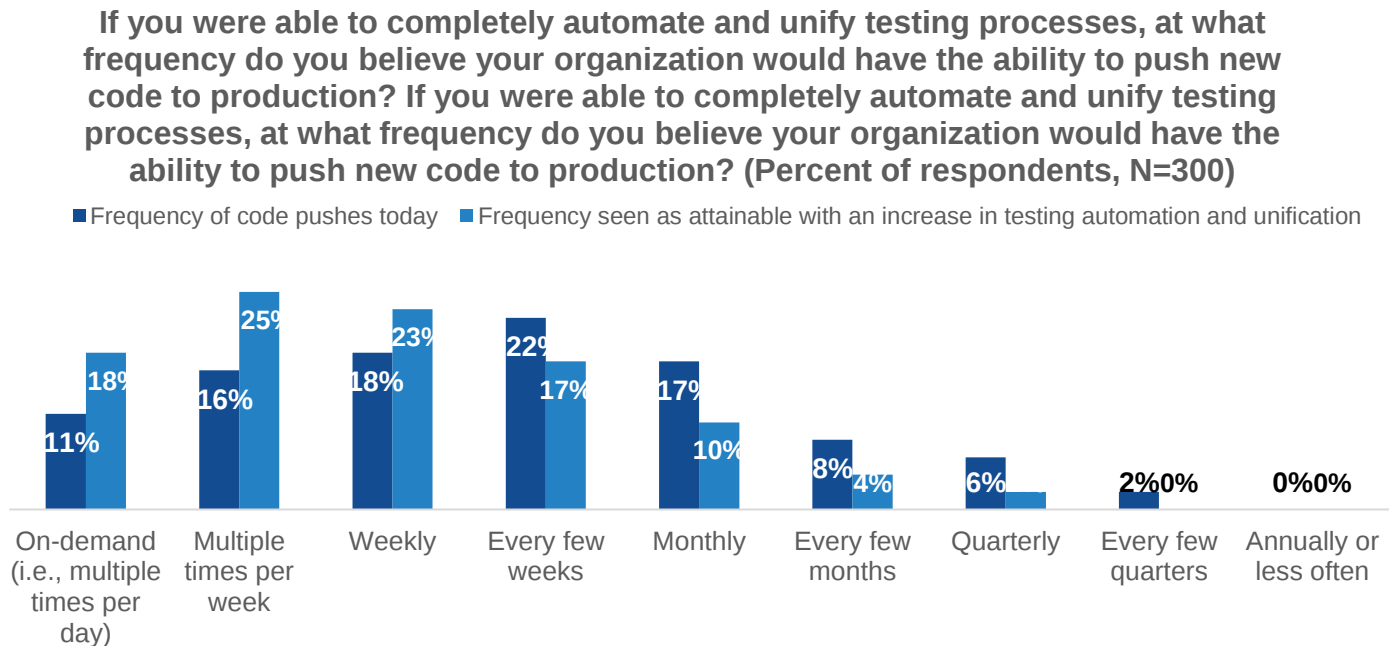
Enterprise Strategy Group's (ESG's) economic analysis revealed that Sauce Labs customers can realize substantial benefits in areas, including the following:

- **Accelerated Product Releases** – Sauce Labs enables developers to increase the speed with which software gets released, which lowers costs and better facilitates the intended impact of the product.
- **Improved Insight and Agility** – Sauce Labs provides feedback to developers that is more concise, specific, inclusive, and timely than most in-house or competitive offerings.
- **Improved Risk Management** – Sauce Labs enables developers to more effectively improve the security posture of deliverables.

ESG analysis shows that Sauce Labs can improve time to release when compared to both in-house testing environments and the competitive environments studied for this EVV. Sauce Labs provides benefits in accelerating product release in areas, including:

- **Time to Release** – Improving time to release is a three-way balancing act between quality, cost, and speed. Often, organizations are trading off quality and/or cost to minimize the time to release. When considering the tradeoffs between speed to release and stability of released code, ESG research found that 44% prioritized speed over quality, and only 33% preferred the opposite. ESG customer interviews found that Sauce Labs can accelerate time to release by **between 25 - 50%** when compared to in-house testing environments, **between 75 - 100%** with API over UI testing, and **between 50 - 70%** with API testing and mocking, real device cloud (RDC) with API testing, and browser and mobile testing. As seen in Figure 4, ESG research found an expected 47% increase in organizations' ability to push code to production on a weekly basis (or more often) through testing automation and unification (i.e., an increase in incidence from 45% to 66%).

“Sauce Labs has dramatically expedited our time to release. We are in a compliance industry; this means that important changes are in the hands of our customers much sooner than we could do without Sauce Labs.”

Figure 4. Organizations Can Increase Code Deliveries Through Testing Automation and Unification

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

- **Improving Pre-release Testing** – ESG research found that 41% of developer time is spent on testing apps, which leaves only 59% for coding applications. When asked where they see the greatest opportunity for improved efficiency in application development, testing was listed as equally important as development in the opportunity to improve. These respondents were also split evenly when they were asked whether there is a greater opportunity to improve efficiency and agility in pre- or post-release testing processes. Emphasizing the identification and remediation of issues pre-release has multiple benefits, the most obvious of which is that it improves the experience of the end user. One interviewed customer shared, “Our customer satisfaction rate went up quite a bit because of Sauce Labs and the increase in quality of our code.” The second benefit of improved pre-release testing that was quickly apparent during the analysis was the improvement in developer efficiency when organizations are able to address issues in the natural development cycle instead of having to fix things intermittently as they are reported by users. In each of the customer interviews conducted for this analysis, ESG found that Sauce Labs contributed to a higher level of developer job satisfaction, and, as stated by a customer, “....happier developers work more efficiently, create better products, and are less likely to leave our company.”
- **Lower Costs** – Even when priority is given to time to release or quality, cost always matters. Customers reported that their accelerated development cycles and streamlined testing processes resulted in fewer full-time equivalent (FTE) hours spent on a product. ESG models show a reduction in FTE spending of between 15 - 38%, depending on the mobile application. Additionally, ESG found that Sauce Labs customers are able to reduce, and, in many cases, eliminate, in-house device farms. In one case, a lottery software customer stated they “were able to eliminate approximately \$200K of annual cost by eliminating the need and effort of maintaining a hardware farm. This amount alone gave Sauce Labs a net positive ROI. Plus, the quality of our product has increased substantially.” ESG found the flexibility of the Sauce Labs environment also eliminates the need to maintain one-off testing software and hardware that is often necessary with competitive offerings. Along with lowered costs, improved testing and code quality can drive additional

revenue based on the fact that, in the ESG research survey, 75% of participants with highly automated testing processes say their test/QA team is seen as a competitive differentiator.

- **Parallel Testing** – Conducting multiple tests at once, or parallel testing, accelerates time to release, increases the testing surface to improve product quality, and helps organizations explore scenarios that can harden the security posture of a release. However, the level of thought required and the hardware necessary to conduct parallel testing often exceed the ability of most organizations to conduct it. Too often, the result is manual testing. 65% of research respondents say that their testing is comprised at least 50% of manual workflows and tasks. ESG found that Sauce Labs customers were able to realize a dramatic improvement in the ability to do parallel testing, with many examples of interviewed customers conducting **over 100 test sessions concurrently**.
- **Increased Device/Browser Testing** – The ability to easily and quickly test software across multiple devices, browsers, and operating systems accelerates release schedules and increases release confidence. ESG found that customers using Sauce Labs experienced a 75 - 100% reduction in testing bottlenecks as compared to in-house solutions, as well as better device and browser coverage.

Improved Insights and Agility

Sauce Labs customers are able to run more tests throughout their development and release cycle. This helps them identify more issues before release and accelerates the identification and remediation of items that impact users post-release. Enterprise Strategy Group (ESG) found that Sauce Labs customers benefit in areas, including:

- **Reduced Breaking Changes** – Sauce Labs helps developers find and fix issues more efficiently because developers have the ability to quickly test components as they are being developed. The capability to target testing toward specific microservices allows developers to get quick results, often faster than in their pre-Sauce Labs environment by orders of magnitude. The ability to test consistently and throughout the development lifecycle leads to fewer major breaks and streamlines the overall development process. ESG believes that Sauce Lab organizations can see up to 75% improvement in reducing breaking changes, 50 - 75% improvement in code rollbacks, and up to 150% improvement in feature rollbacks.
- **Improved Visibility into Testing Methodology Results** – ESG found that Sauce Labs customers have a clearer understanding of the scope of their testing than they did in their pre-Sauce Labs environment. This understanding helps identify and test for unique use cases that would often get ignored in the past. Additionally, the machine learning capabilities and shared community insight of Sauce Labs help direct testing to areas in response to changing development and compliance requirements. In the words of an interviewed customer, “Sauce Labs helps us find and fix issues that we never thought of exploring in the past. Because of the visibility that Sauce Labs gives us, we handle things in the development phase instead of reacting to customer-reported issues.” Sauce Labs improves false-negative reporting by up to 150%, which allows companies to focus on issues that cause the most adverse impact.
- **Improved Handoffs to Other Teams** – Most software projects have grown beyond the scope of a single developer or even a single team. With each handoff between teams comes an opportunity for mismatched testing methodology, testing capabilities, or capacity. ESG found that Sauce Labs customers experienced better collaboration between development teams because of a unified vision of testing, as well as consistency in the quality of code at each stage.

“It is all about quality. Sauce Labs has helped us improve the quality of our deliverables and both our internal and external customer satisfaction.”

- **Expanded Project Scope** – ESG found that Sauce Labs customers are able to expand their project scope and roadmaps more aggressively than they were in their previous environments. In an interview, ESG heard, “We are able to incorporate more microservices and APIs than we were in the past because we have a clearer strategy for testing.” ESG also studied Sauce Labs integration into the open source community and believes that the collaboration between Sauce Labs and open source resources leads to expanded opportunities for functionality.

“Sauce Labs allows us to get to projects that would normally be put on the back burner. This allows us to stretch our development deliverables and better provide features for our customers that otherwise would get left out.”

Improved Risk Management

Without security, nothing else matters in software development. Enterprise Strategy Group (ESG) found that Sauce Labs testing reduces the risk exposure of released software products and helps customers best assure leadership and customers that they are using compliant and secure software. Benefit areas include:

- **More Complete Testing** – ESG research finds that the average company has roughly 15 different tools in use to conduct testing. With so many tools to use and support, the complexity involved leads to mistakes and oversights and limits the overall effectiveness of testing. Sauce Labs enables continuous testing in the development process and on released products and helps organizations identify areas to test that were often ignored in the past.
- **Improved Detection and Remediation** – When something is wrong with software, the end user suffers, whatever capability that software delivers is hindered, and, too often, the security posture of an organization is at risk. When something is wrong with software, there are three distinct phases. Dwell time, debugging, and remediation. During issue dwell time (the period of time between a problem starting and the detection of that problem), users are at risk of either reduced functionality or unintended exposure. Once an issue is detected or reported, debugging occurs, which examines the code for errors. Finally, remediation corrects the issue and delivers an updated version. ESG found that Sauce Labs users realize substantial value in each of these three phases. Sauce Labs’ error reporting and diagnostics help shed light on the issues that are impacting users the most and prioritize the fixes that will provide the highest level of positive impact. The in-depth insights provided not only help identify issues, they also contribute to more efficient debugging and regression testing. Sauce Labs users report that the code updates are faster, more complete, and better quality, specifically because of the level of insight that Sauce Labs gives them into their code.
- **Sauce Labs Support** – Sauce Labs uses artificial intelligence, machine learning, and internal analytics to understand threats and create tests to explore potential vulnerabilities in software. Interviewed customers shared that Sauce Labs support was extremely responsive to issues, as well as proactive in helping the organization identify areas that can improve the overall quality of the applications being developed. One user shared, “Sauce Labs is very proactive in keeping us updated in understanding new trends and in developing tests to better protect our code. They usually see things sooner than we have in the past, and they are able to detect threats they see across their customer base that help us create more secure code.”

- **Hardened Code** – Often, code security seems like a catch-up game. The sophistication and frequency of threats far exceed the ability of most companies to identify and understand them. Sauce Labs customers report a lower level of risk in their deliverables, specifically because of Sauce Labs.

"Sauce Labs allows us to enable more junior people. We no longer have to worry about maintaining a testing infrastructure. This reduces our staffing risk."

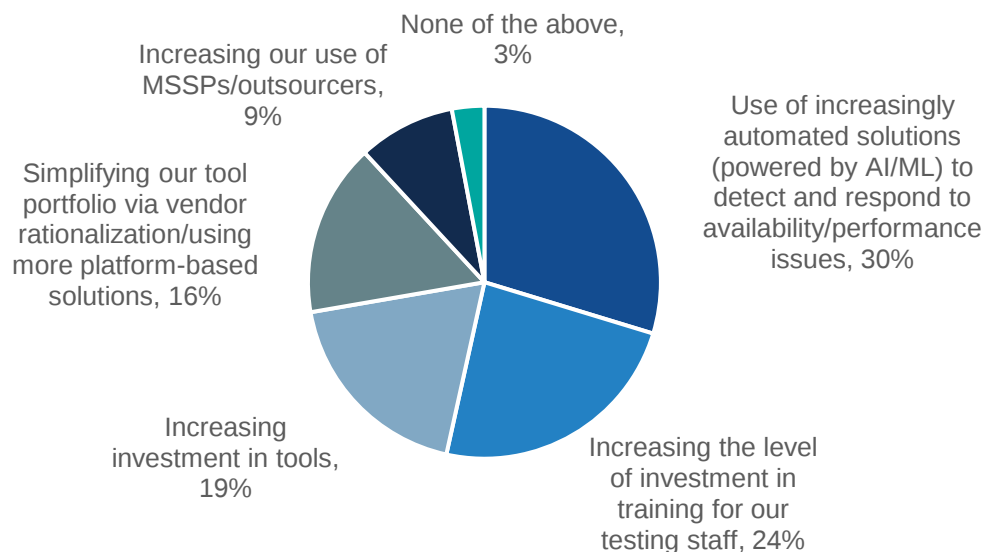
- **Staffing Risk** – According to customers interviewed for this analysis, the average tenure of a developer has shortened in the past 24 months. This means that quite a bit of development is being done by people with months of experience instead of years. One interviewee explained how Sauce Labs reduces their organization's risk by enabling less experienced employees to produce higher quality code, and another said that the testing governance that Sauce Labs helps create allows new employees to quickly adapt to their testing standards. As seen in Figure 5, ESG research finds that testing automation and simplifying tool testing portfolios have a positive impact on staffing challenges.

Why This Matters

Employee turnover, both voluntary and involuntary, creates instability in development organizations. Customers interviewed for this analysis reported that employee satisfaction has increased because of Sauce Labs, while employee turnover numbers have decreased. More experienced, happier employees create better software.

Figure 5. Organizations Can Increase Code Deliveries Through Testing Automation and Unification

Aside from hiring more people, which of the following holds the most promise to helping your organization overcome its staffing challenges over the next 12-24 months? (Percent of respondents, N=300)



Source: Enterprise Strategy Group, a division of TechTarget, Inc.

Enterprise Strategy Group Analysis

Enterprise Strategy Group (ESG) conducted direct customer interviews with current Sauce Labs customers and leveraged the information collected through vendor-provided material, public and industry knowledge of economics and technologies, and existing case studies to create a three-year TCO/ROI model that compares the costs and benefits of Sauce Labs to DIY testing solutions and commercially available competitive offerings. ESG's interviews with customers who have recently made the transition, combined with experience and expertise in economic modeling and technical validation of Sauce Labs helped to form the basis for our modeled scenario.

The sample organization created for this analysis is based on custom research with 300 respondents, as well as information gathered from the current Sauce Labs customers interviewed for this study. This sample organization generates \$630M annually with 3,500 employees. It maintains 82 active mobile applications (in development and in production) with 61 developers. Its priority is slightly skewed toward the speed of delivery over the quality of delivery, and it has an equal split of time between testing and coding operations. The applications are evenly split between business-critical and those which support/enhance.

This organization uses an even mix of automated and manual testing workflows and relies on 23 different internal or commercially available testing solutions. Developer testing efforts are split 47% pre-release, 53% post-release, using a physical pool of testing hardware that has 80 devices. For post-release testing, the organization's remediation period averages 4 days per issue (hotfix, rollback, fix forward, or patch).

The organization is challenged with both the quantity and quality of development/testing staff it can find, and it sees an average turnover of 28% annually in its development teams.

While the insights in this paper are the result of specific and custom research, combined with current customer feedback and existing material, and are generated by applying findings to a sample company, they represent a combination of changes in technology, methodology, and best practices and may vary based on your actual scenario. ESG did validate the findings across sample companies of multiple sizes and found the resulting benefits to scale somewhat linearly in all cases.

Conclusion

The demand for mobile applications is increasing at a rapid rate. Almost half of the companies Enterprise Strategy Group (ESG) studied for this analysis have seen the number of mobile applications they develop double over the past 3 years. However, the challenges with creating quality applications seem to be growing faster than the organizations' ability to produce them. As mobile applications become more complex, the number of developers and the time it takes to develop applications grow, sometimes exponentially. These longer projects involve handoffs between development teams, bottlenecks in multi-step workflows, and frequent delays that inject inefficiencies and risk. While every responsible developer understands the benefit of testing throughout the development cycle, most companies struggle to provide their teams with testing environments that support more complex applications in an effective and secure way while working within budget constraints.

The result is a shift from proactive testing during the development phase to an attitude of post-release fixes. This shift leads to frustrated customers, inflated development costs due to staleness injected between initial development and final remediation of the issue, and increased risk by putting code with flaws in the hands of users. The solution is to make testing more efficient, secure, and complete throughout the lifecycle of a mobile application.

The Sauce DevOps Test Toolchain removes many of the constraints found in traditional development and testing environments. Sauce Labs offers parallel testing across a broad range of devices and browsers, as well as depth in testing, which facilitates testing in code that incorporates microservices and APIs. The result is increased test coverage when compared with traditional testing methods.

ESG analyzed the impact that Sauce Labs can have on the ability of organizations to develop, release, and support mobile applications. ESG interviewed current Sauce Labs customers, conducted custom research to determine the challenges faced by application developers and the opportunities that more effective testing can bring, and examined existing case studies and publicly available information.

ESG found that Sauce Labs customers experience accelerated product releases, improved insight and agility, and improved risk management when compared to their pre-Sauce Labs environments. ESG created a representative sample company and found that, with Sauce Labs, an organization can realize a 46% improvement in its time to push code (with confidence) to production, a 15 - 38% reduction in FTE costs for developing and maintaining mobile applications, a \$200K annual savings by eliminating hardware testing farms, a 75 -100% reduction in testing bottlenecks, a 75% improvement in reducing breaking changes, and a 150% improvement in feature rollbacks. In addition to these savings, ESG found that Sauce Labs users had improved customer satisfaction, developer satisfaction, and better overall security posture in their released mobile applications.

While each situation is different, ESG believes that Sauce Labs capabilities apply to most development environments and would scale across organizations of all sizes. If you are in the business of code development for mobile applications, ESG strongly recommends you consider Sauce Labs for your testing needs.

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 contact@esg-global.com

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