



BEST DEVOPS PRACTICES FOR YOUR MOBILE APP DEVELOPMENT

E-BOOK

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INTRODUCTION

Born out of the agile development movement in 2001, DevOps represents a fundamental departure from traditional software development culture. DevOps seeks to bring the development and operations parts of the business out of their silos to improve communication and collaboration between teams.

In this ebook, we will review why you should implement DevOps for mobile development and explain the importance of mobile testing and automated testing for your CI/CD pipeline.

Properly tested apps are reliable apps, which leads to happy customers – and that can only be good for business in an increasingly oversaturated marketplace.

THE CURRENT MOBILE LANDSCAPE

MOBILE IS THE NEW BATTLEGROUND FOR CONSUMERS

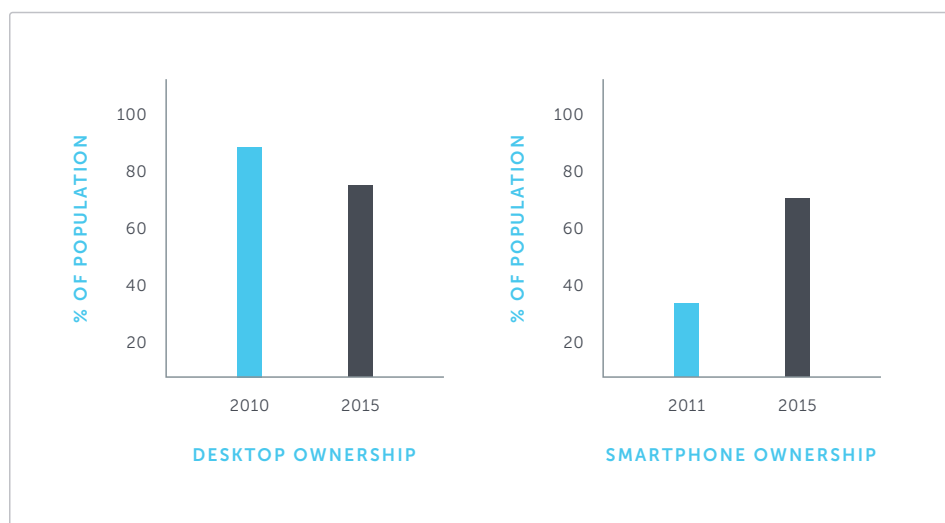
Over the last few years, we have seen explosive growth in mobile app usage, along with the expectation from consumers that they will have access to anything they want from businesses at all times.

This expectation is driving businesses to rethink how their apps are being developed. Even recently, businesses would supply only a small subset of the functionality of the desktop application on a smartphone or tablet. However, tech-savvy consumers now expect much more from businesses, and apps have increasingly become their preferred way of interacting with brands.

THE EXPLOSIVE GROWTH IN THE MOBILE “APP ECONOMY”

According to mobile [data analytics provider App Annie](#), revenues from mobile app stores are predicted to grow to more than US\$100 billion in 2020. During the same time, it is estimated that the number of app store downloads will increase to 284 billion.

Mobile devices are increasingly replacing desktop computers, with many people considering their smartphone to be their “main” computer. By October 2015, nearly 70% of Americans owned smartphones, doubling from 2011. For particular demographics, such as millennials, [smartphone ownership is approaching 97%](#), while [desktop ownership fell to 78%](#) in 2015, down from 88% in 2010.



Now we find ourselves in a mobile-first digital era. The best monetization strategy right now is through apps, and companies know it.

THE UNIQUE CHALLENGES IN MOBILE APP DEVELOPMENT

Mobile development presents a set of unique challenges that do not apply to traditional desktop development.

OPERATING SYSTEMS

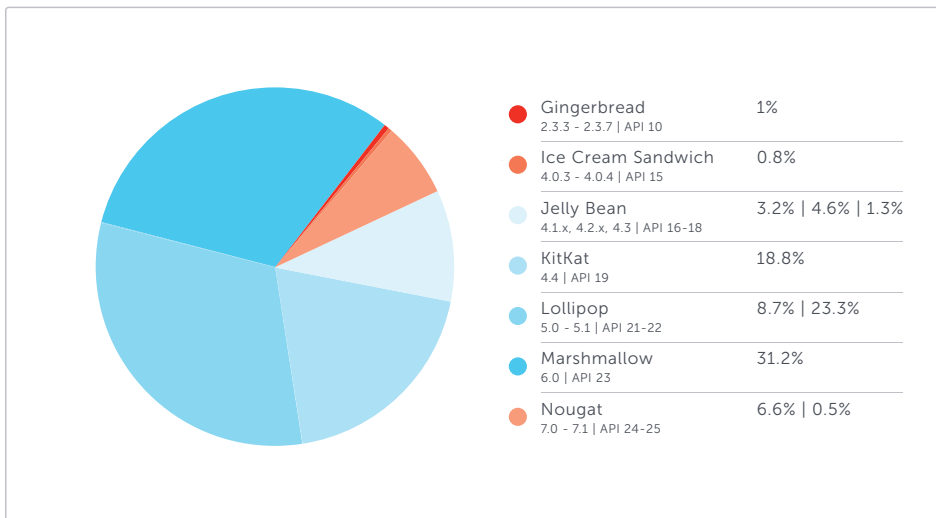
The OS environment for mobiles is much more fragmented than it is for desktops, with over two thirds of mobiles running customized versions of Android, about a third running iOS, and more mobile OSs on the way.

Contrast this with the more than 80% of desktops running the [same operating system](#).

OS VERSIONS

Not only is there fragmentation in the range of OSs out there, but there are different installed versions.

Take Android for example, which now accounts for nearly 70% of the market. The [following table](#) shows the breakdown of installed [Android versions as of May 2, 2017](#).



You can see from the table that Android version 4.x, which is now unsupported, is used by 28.7% of Android users, which is nearly same usage as Android 5.x and 6.x. It demonstrates that some users update as soon as a new version comes along while others don't, or that some manufacturers don't provide their users with OS updates. Moreover, most manufacturers tweak

Android OS slightly, which increases the fragmentation and makes release times of the new OS slower; while all iOS users with compatible devices get OS updates at release and [60% will update to the latest OS within 30 days](#).

HARDWARE

Mobile hardware presents two challenges. Firstly, manufacturers offer a range of chipset, memory and storage options; and above all, different screen sizes.

Secondly, it's not just Apple vs. Samsung anymore. There are new manufacturers entering the market all the time, many of them offering low-cost models. There were more than a dozen new entrants [in Asia](#) alone in 2015.

Localization also adds to the development challenge. Apple and Samsung might dominate in Western markets; however, in China, they [only account for 13.7% and 20.7%](#) of the market.

BALANCING APP QUALITY WITH CONSUMER DEMAND

As the app economy grows, the need for businesses to get their apps to market quickly is obvious, but as consumer expectations increase, the quality of those apps is essential to retaining existing customers and attracting new ones. Particularly given the ease at which users are able to delete apps and/or give an app a poor rating, companies must consistently show added value in their apps to keep their existing user base happy.

Consumers are also demanding quality apps and businesses are under pressure to deliver them. This puts a strain on development teams – a reliance on the traditional “waterfall” development method is not a sustainable approach in today’s “mobile first” world.

WHERE DOES DEVOPS FIT INTO THE PICTURE?

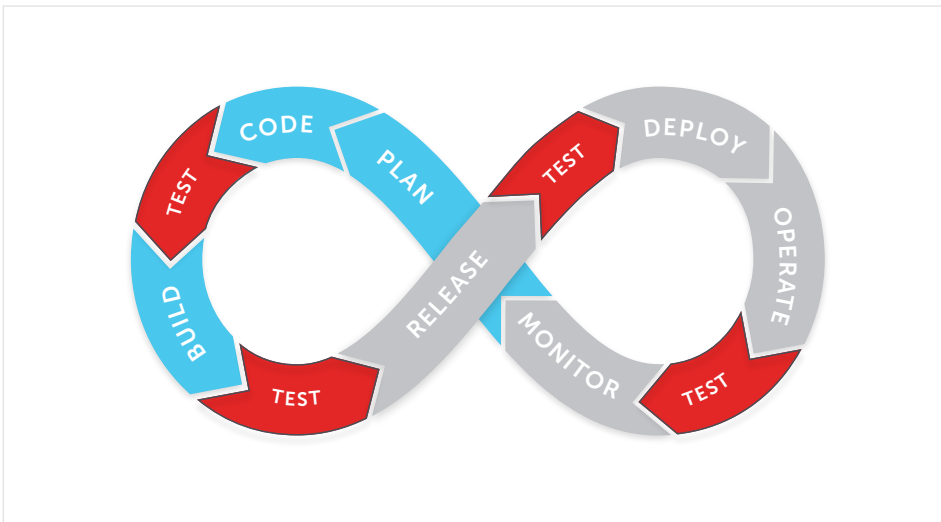
DevOps leaves waterfall methods behind and supports a more agile environment, bringing Development, Operations and Quality Assurance (QA) together with benefits for all teams involved:

- Developers are better able to receive feedback from users, which facilitates Continuous Integration (CI) and Continuous Delivery (CD).

- Operations are better able to support the apps because they have been more closely involved in the development process by providing the feedback to developers.
- Quality Assurance is more closely involved in the development cycle because testing is performed throughout all stages, after every sprint.

CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY

DevOps plays a key role in mobile testing, helping to deliver quality apps to market faster. Further upgrades to agile methodologies include Continuous Integration (CI) and Continuous Delivery (CD), which make developing and testing in a continuous cycle possible.



Continuous Integration means that as a component is coded or developed, it is tested for quality and functionality and then merged into the application's main repository. Automated testing allows for most coding errors to be picked up effortlessly.

Continuous Delivery means getting all the changes into production and ultimately to users quickly and reliably.

Implementing a CI/CD workflow has immense benefits for your mobile app development; by automating manual routines and speeding up your testing process, your app will be ready to hit the market faster and be of higher quality.

AUTOMATED TESTING

Automated testing is a cornerstone of the CI/CD pipeline. It enables the continuous integration between development and QA, speeding up testing time dramatically while minimizing the risk of mistakes from human error.

Automated testing is a critical practice to ensure a faster time to market for your app. Until recently, manual testing was the most effective testing practice. Today, manual testing has become slow and inefficient, slowing down the development process and limiting the releases. Automated testing is the solution to releasing faster. Manual testing is still used for a limited number of edge cases.

The benefits of automated testing include:

- Saves time because testing runs faster and you can reuse the testing scripts.
- Saves money because automated testing uses fewer resources and tests are reusable.
- Catches bugs that are likely to be missed due to human error.
- Allows testing to “shift left” - testing earlier and more often during the development process, as well as across more browsers and devices, so that issues are discovered and resolved more quickly.
- Encourages developers to be more innovative if they know bugs will be caught immediately.
- Offers higher customer satisfaction and retention because the apps are more reliable.

There are basically three types of automated tests that are central to an effective CI/CD pipeline:

1. **Unit testing** done by developers before the new code is added to the repository. It usually involves checking individual functions and making sure that each individual part works correctly.
2. **Integration testing** to make sure that the new modules work as part of the overall application. This should be performed in something that approximates the production environment.
3. **Functional UI testing** that tests the complete functionality of the app, and ensures the common user interactions have been tested thoroughly before reaching the end-user.

APPLYING DEVOPS TO MOBILE APP DEVELOPMENT

While there are benefits, there are also challenges for businesses wanting to implement DevOps for mobile development, including:

- Cultural issues within an organization
- Acquisition of new tools and skills
- Implementing quality system documentation

CULTURAL ISSUES WITHIN AN ORGANIZATION

DevOps is a culture and a process. It requires a change in organizational culture. DevOps is about bringing the development and operations teams closer to each other, which can cause conflict.

One of the major challenges in DevOps implementation is that developers and operations have different goals. Developers need to deliver quality software for customers in a timely manner, while the role of Operations is to keep things running and provide customer support.

DevOps is easier to implement in a startup because agile processes are implemented from the very beginning using best practices, and Development and Operations are unified. On the other hand, enterprises have a more rigid structure and software development typically follows waterfall or fast waterfall practices, which are difficult to update. Moreover, enterprises are often reluctant to overhaul their development methods, preferring to leave everything as it is.

NEW TOOLS AND SKILLS

Another challenge to implementing DevOps is the growing need for new tools and workflows. As organizations begin to implement new workflows, they find that the tools they have been using become obsolete, making it necessary to invest in new tools that support these new workflows.

This is especially true for the mobile development environment, where the heightened focus on shrinking release times and pushing apps and updates out faster requires quality DevOps tools to facilitate a stable CI/CD workflow. You can learn more about choosing the right mix of mobile DevOps tools [here](#).

SYSTEM DOCUMENTATION

As an organization implements DevOps, it will move from a traditional hierarchical work or silo-based structure to a more free flowing cross-functional structure. Roles and processes will change and knowledge will need to be shared and the way to do this is with quality system documentation that describes (at a minimum) the purpose, design, operational and maintenance requirements of the app and its hosting environment.

Getting a good set of system documentation together is never easy, but it needs to be done so that everyone knows the rules, where everything is and what it takes to keep things running. The Development team in particular needs to be mindful that their documentation will also be used by Operations.

THE ROI OF MOBILE DEVOPS

Implementing DevOps costs time and money, but the long term benefits can be immense for your business. If you're able to implement DevOps successfully, your organization:

- has improved customer experience and satisfaction
- is able to deliver better digital services faster
- becomes more innovative
- achieves better software quality and stability
- reduces operational risk

IMPROVED CUSTOMER EXPERIENCE AND SATISFACTION

The goal of every business is to provide better services and products to its customers. Through continuous automated testing, DevOps produces higher quality apps for customers. It keeps the customers happy and therefore loyal, which in turns helps make the business more profitable.

As recently noted by Apptentive; "ratings and reviews continue to play a major role in your app's growth long after consumers have found their way to your app store product page. They serve as social proof to indicate your app's quality in an otherwise blind evaluation process." We know apps with higher ratings appear higher in app stores, making them easier to discover for users.

Apps that are able to maintain a 4-5 star rating hold approximately 75% of the market.

Testing is a prerequisite for releasing a good quality product. Improving your testing speed enables you to shrink time to market and simultaneously deliver a better experience for your end users, and we know user feedback has a direct effect on user acquisition and retention rates.

BETTER AND FASTER DELIVERY OF DIGITAL SERVICES THROUGH DIGITAL TRANSFORMATION

All business are finding that they have to go through digital transformation in order to stay competitive. It involves applying digital technologies through all parts of the business, especially how they interact with their customers.

Quality mobile (web) apps play an important role in this. Customers want to do business on their mobiles and have high expectations of apps. DevOps helps bring about that quality.

MORE INNOVATION

Successful digital transformation requires innovation and when DevOps is properly implemented, software development becomes a hub for innovation rather than a cost center.

Your organization is truly innovative when it is able release new products to market quickly, knowing that they have been tested and are of the highest quality. Not only that, your organization is able to respond to both customer feedback and a changing market quickly.

Implementing DevOps will help to ensure your organization's dev team is able to develop and deliver quality apps that have been tested so that they meet the needs of real users.

BETTER SOFTWARE QUALITY AND STABILITY

Not only can DevOps lead to faster development and more frequent releases, it also leads to better quality and more stable software.

First, thanks to Agile methodologies, everyone is accountable. No one can hide! User stories are allocated to everyone in the team, including testing. Thanks to the storyboard and daily stand ups, everyone knows who's doing what. Better still, Agile and DevOps provide a framework for better collaboration and problem solving.

Secondly, a proper DevOps approach means that everything is monitored: user experiences, performance, security - even how long it took to get the app to market. The results of that monitoring can be fed back into the software development cycle, which in turn leads to even more quality and stability.

DOWNTIME ELIMINATED THROUGH BETTER INFRASTRUCTURE USE

Under the waterfall approach, software platforms used to run on just one large system. If one essential component crashed, often the rest of the application went down with it.

Through DevOps, businesses can implement as many microservices as they need, linking them via APIs meaning that if one microservice goes down, the rest stay up, resulting in no downtime.

BUSINESS GOALS AND IT PLANS LINE UP

Because DevOps uses the Agile principles, the rest of the business can see and apply those principles too. Agile doesn't just have to drive software development: it can be applied to the rest of your business operations, leading to continuous business process improvement and quality throughout your company.

REDUCED RISK

IT, in particular IT Operations, has always resisted change. Traditional change management processes slowed down implementation because no one was willing to handle the risk of putting something new out there.

DevOps reduces risk because, although the changes are more frequent, they are smaller and tested before being released to customers. Automating that testing ensures that all bugs are captured and fixed before release and your organization doesn't have to use its customers as unsuspecting beta testers.

All this leads to greater satisfaction for your customers, and if your customers are happy, your business will thrive.

MEASURING THE ROI OF DEVOPS

By this stage, you might be thinking that DevOps and automated testing sound like a good idea, but is it worth the disruption? Where is the proof? The good news is that you can actually measure the success of your DevOps implementation through a series of metrics.

If you have yet to implement DevOps, it's a very good idea to get some current state data so that you have something to compare with after the implementation.

FASTER TIME TO MARKET

In the increasingly competitive mobile app marketplace, businesses need to get their apps into production before their competitors do. Failure to do so can be worth millions in lost revenue. By having more frequent release cycles, DevOps allows you to get your apps to market faster.

To measure time to market, compare your cycle times under the waterfall model with what you achieve with DevOps.

By implementing DevOps and automated testing, Dollar Shave Club was able to move from 30 hours/ week of manual testing time to 10 min automated testing with parallelization, deploying 15 times a day and delivering better quality software to customers faster.

HIGHER EFFICIENCY AND PRODUCTIVITY

DevOps makes much more efficient use of your resources, which ultimately leads to greater productivity from your teams.

Automated testing not only releases staff from monotonous and boring manual testing, but it also makes the testing more reliable with more targeted test cases, allowing developers to spend less time chasing bugs and more time developing new code.

In other words, you can keep the same number of staff, but enable them to produce more and be more efficient.

REDUCED DOWNTIME

DevOps produces much more reliable and stable code through Continuous Integration (CI) and Continuous Delivery (CD), and automated testing. When combined with a cloud-based network and implementing microservice, downtime is nearly eliminated.

It is easily measured through stronger customer retention and a less busy complaints department.

REDUCED INFRASTRUCTURE COSTS

When deployed in a cloud-based environment, DevOps leads to reduced infrastructure costs because microservices can be spread over multiple virtual machines (VMs), which cost less to run than physical servers.

When customer demand is expected to peak, say during a sales campaign, VMs can be rolled out quickly to meet that demand and later removed when the demand subsides. The business only pays for the computing power it needs when it needs it.

IMPROVED QUALITY AND PERFORMANCE OF APPLICATIONS

DevOps leads to better quality software, but for many businesses, the ROI on “quality” is often hard to measure.

When compared to waterfall development and deployment, Continuous Delivery lessens the impact on users, partly because there are fewer new features per release, but also because they have been thoroughly tested before they are released. How this reflects in cost metrics depends on how your business operates.

Examples of how quality impacts metrics include:

- The number of support tickets for releases under DevOps compared to releases under waterfall.
- Increased user activity.
- Improving app store rating leading to more users downloading and installing your app.

CONCLUSION

Throughout this ebook we have looked at the world of mobile app development from a DevOps perspective, and explained how automated testing can be utilized to ensure better quality apps and improved ROI.

While challenges are involved in implementing DevOps, particularly at the enterprise level, it's clear there are tangible and measurable benefits that will make the DevOps journey worth it. Organizations making the transition to continuous delivery should simultaneously evolve their testing efforts from being predominantly manual to being increasingly automated. Despite the initial pains, the benefits of automated testing make it worthwhile to invest in the right tool, the right framework, and the right technical approach.



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Sauce Labs ensures the world's leading apps and websites work flawlessly on every browser, OS and device. Its award-winning Continuous Testing Cloud provides development and quality teams with instant access to the test coverage, scalability, and analytics they need to deliver a flawless digital experience. Sauce Labs is a privately held company funded by Toba Capital, Salesforce Ventures, Centerview Capital Technology, IVP and Adams Street Partners. For more information, please visit saucelabs.com.



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