Katalon

White Paper

Continuous Testing Navigator for 2021

Contents

Introduction

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"The quality assurance (QA) landscape and its related testing approaches have experienced rapid and ongoing transformation over the past few years, proving continuous testing methodologies as an indispensable framework for teams of all sizes.

This white paper serves to identify today's essential continuous testing methodologies, offer a concise and comprehensive overview of continuous testing trends, detail common roadblocks that enterprises looking to transition can expect to encounter, and share insights from experts to help you progress in your continuous testing maturity.

Leveraging data collected from our survey of over 2,000 IT professionals and practitioners working across various industries, this paper dives deep into how teams can assess their current stage of continuous testing adoption, and experience thriving business outcomes grounded in today's tried-and-tested practices from experts in effective team management and collaboration."

Executive Summary

The following are the key findings and inferences derived from the data:

Today's ever-changing quality assurance landscape has put achieving "quality at speed" top of the list for every organization.

With the rapid emergence of shift-left testing, DevOps, agile methodologies, and new technologies such as AI/ML, **80%** of QA teams have now applied CI/CD as an integral part of their Software Development Life Cycle (SDLC) and **70%** emphasized the need to shorten the "daily" or "weekly" release deployment intervals.

Navigating your team to maturity with continuous testing.

The Continuous Testing Maturity Model is a foundational reference designed to enable teams to assess their current stage of continuous testing maturity. Up to two-thirds of respondents said they were at the Defined level. This hints at conclusive, positive progress in adopting and improving continuous testing for teams.

Challenges faced across different stages of Continuous Testing implementation.

Regardless of the chosen approach, struggles and roadblocks along the adoption journey must be overcome. To support you, our experts reveal their insights on proven techniques to address test failure and bottleneck investigations, improve test automation coverage, reduce test cycle time, mitigate release risks, and standardize and automate release processes.

Test orchestration – A structured approach to Continuous Testing

Alongside full visibility and progress monitoring across the entire CI/CD pipeline and SDLC through proper test results documentation, effective test orchestration speeds up the release pace, provides instant feedback loops with in-sprint testing, and improves team collaboration with toolchain orchestration.

Part 1

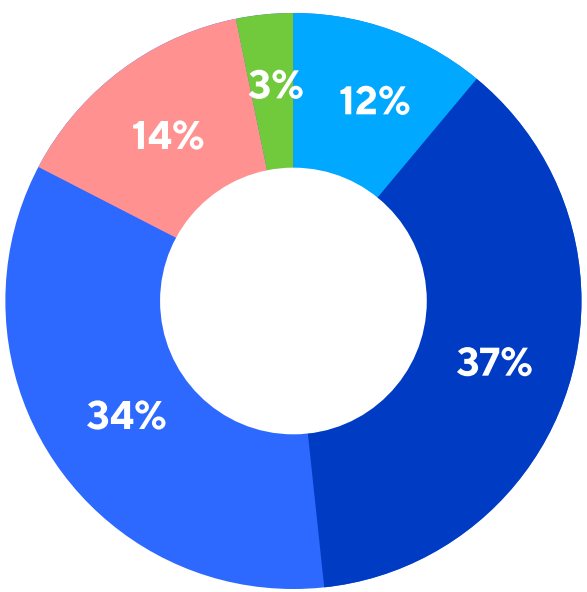
Today's Ever-Changing Quality Assurance Landscape

The software industry is constantly evolving. What was considered cutting edge a few years back might now be obsolete. Regardless of your role or responsibility in the organization, it is imperative that you understand the top quality assurance landscape trends in the industry. This section looks at the key emerging trends, how organizations are shifting in this space, and what keeps them ahead of the competitive game and thriving in a digital transformation world.

Higher standards for customer experience

Capagemini's World Quality Report 2020-21 reveals that testing is no longer just about functionality, it must also ensure that software products are experienced in the same way end users will experience them in real life, before releasing them to the market.

In order to evolve and still meet business needs, organizations now leverage agile/DevOps/continuous testing to reduce time to market and deliver top-tier software quality with greater flexibility. Of the QA teams that participated in the survey, more than 70% reported having "daily" or "weekly" release intervals, placing a high priority on speeding up the software development life cycle.



The frequency at which your team deploys new builds to production

- Hourly
- Daily
- Weekly
- Monthly
- More than 2 months

To reach these goals and enable frequent code deployments, test automation and continuous testing are integral parts of the QA process because they reduce the dependency on manual testing.

The emergence of AI/ML technologies

Artificial intelligence (AI) and machine learning (ML) not only offer the ability to fully automate test creation, they are forecast to be extensively used in the development of test automation tools to ease instances such as page object identification and Document Object Model (DOM) analysis. As anticipated, AI will be ubiquitously present across all areas of technology.

Fortune Business Insights' **Artificial Intelligence Forecast 2020-2027** reports that the global AI market value is expected to see an 880% increase in value, at a compound annual growth rate (CAGR) of 33.2%, from just under $30 billion USD (2019) to $266.92 billion USD (2027).

Accelerating momentum with orchestration

Coordination is essential in order to ensure efficiency and transparency throughout the testing cycle. Having worked with projects and QA teams of all sizes, we've identified the two most common testing dilemmas: delivering quality at speed and maintaining coherence and effectiveness in team management and collaboration.

The drastic increase in large-scale projects today has correspondingly raised the workflow orchestration to centralize large volumes of test data across the entire pipeline. Capgemini reports "organizations are shifting towards a connected ecosystem that integrates release management, requirements, design, build, test, and deploy, bringing teams together in a single source of truth - visibility of all stages." This underscores the need for coordination to ensure efficiency and transparency throughout the testing cycle.

Smarter testing: Doing more with less

In general, enterprises are better at structuring their entire testing scope. Diverting their focus **from defect detection to defect prevention** to meet business goals. Large corporations, including early-stage startups, are advancing towards frequent use of **DevOps and shift-left p**ractices to attain more continuous feedback in the product release.

Additionally, we have also seen the shift towards advanced test automation solutions to scale up testing processes and achieve higher return on investment, particularly with:

- *Test case prioritization,* helping teams to focus on critical issues and priorities and minimize the extra effort and costs associated with a large amount of regression testing
- *Self-healing and self-learning technologies,* reshaping the means of quality validation and smart detection

Key Takeaway

To make a difference among the pool of thriving competitors, every organization recognizes the need to adopt more modern and agile approaches.

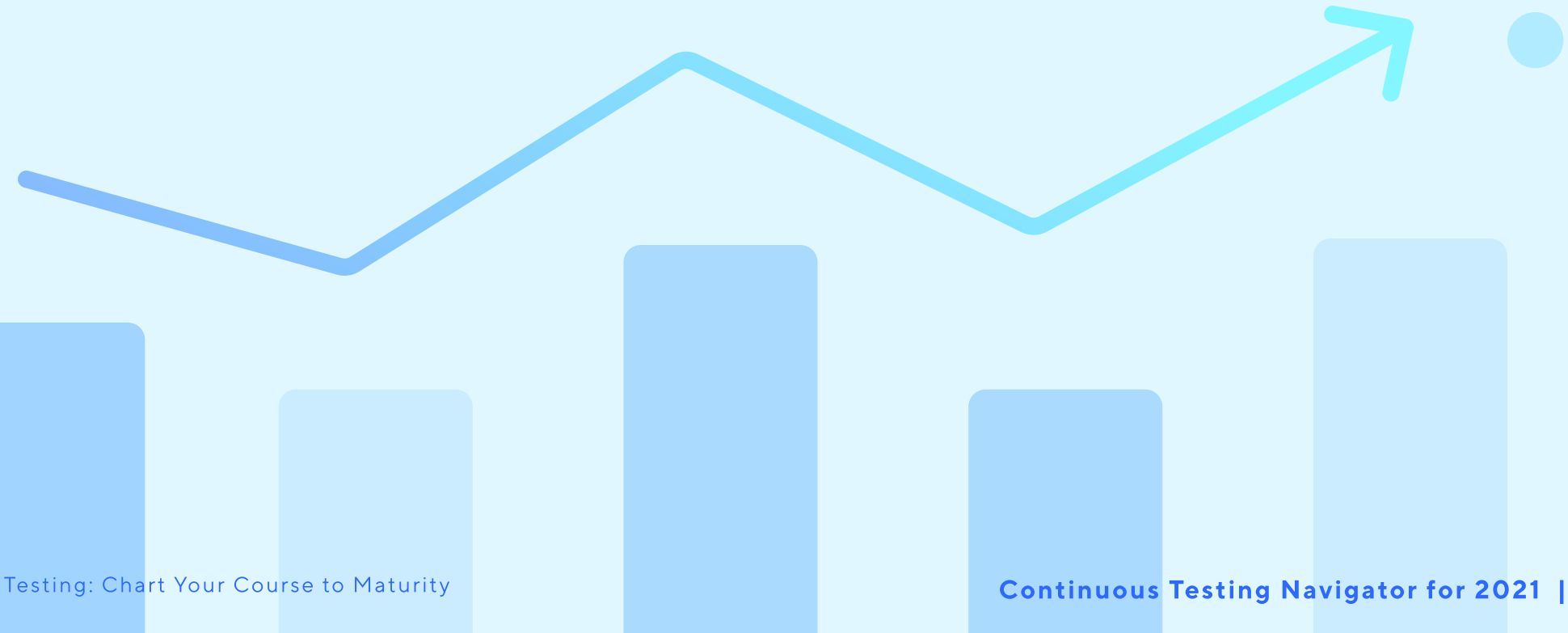
Efforts to date validate the necessity of continuous testing, advance the next-gen revolution, and showcase the top key strategies for accelerating releases and simultaneous quality assurance.

However, its adoption can sometimes be complicated due to the lack of a proper road map or strategic plan. As a result, it hinders the ability to achieve comprehensive test coverage and efficiency, and also poses difficulties in maintaining more demanding requirements from stakeholders and customers.

With a better understanding of the team's struggles with the continuous testing journey, the next section introduces you to an innovative Continuous Testing Maturity Model.

Part 2

Continuous Testing: Chart Your Course to Maturity



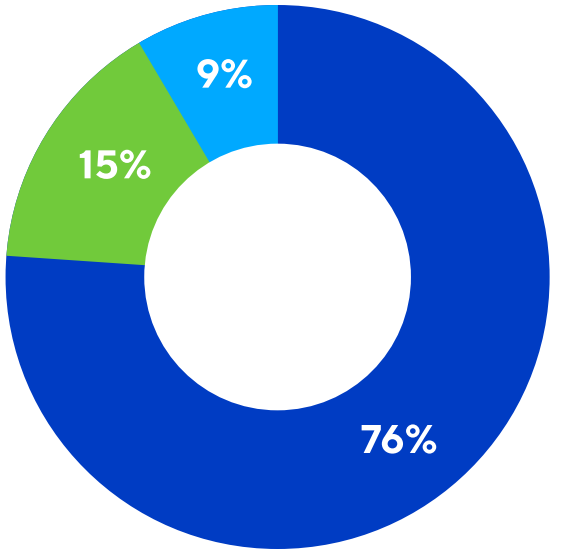
How continuous testing is reshaping quality assurance in 2021

Continuous testing is a software testing type in which the product is evaluated early, often, and throughout the entire delivery pipeline process. Playing an integral part in the software delivery pipeline, continuous testing enables teams to receive rapid and early feedback, allowing thorough risk evaluation throughout the entire process.

As previously mentioned, the need for responsive development cycles was the driving factor for organizations to adopt DevOps and CI/CD cultures. While this can provide security through daily, or even hourly, software updates, applying these approaches on their own can eventually impact the operation's overall speed. To avoid the potential for slow down, teams need to incorporate automated continuous testing in order to:

- Eliminate testing bottlenecks in DevOps and CI/CD
- Provide useful, risk-based feedback
- Make more informed release decisions
- Enable collaborative teams and reduce working in silos
- Integrate into the software delivery pipeline and DevOps toolchain seamlessly
- Deliver actionable feedback appropriate for each stage of the delivery pipeline

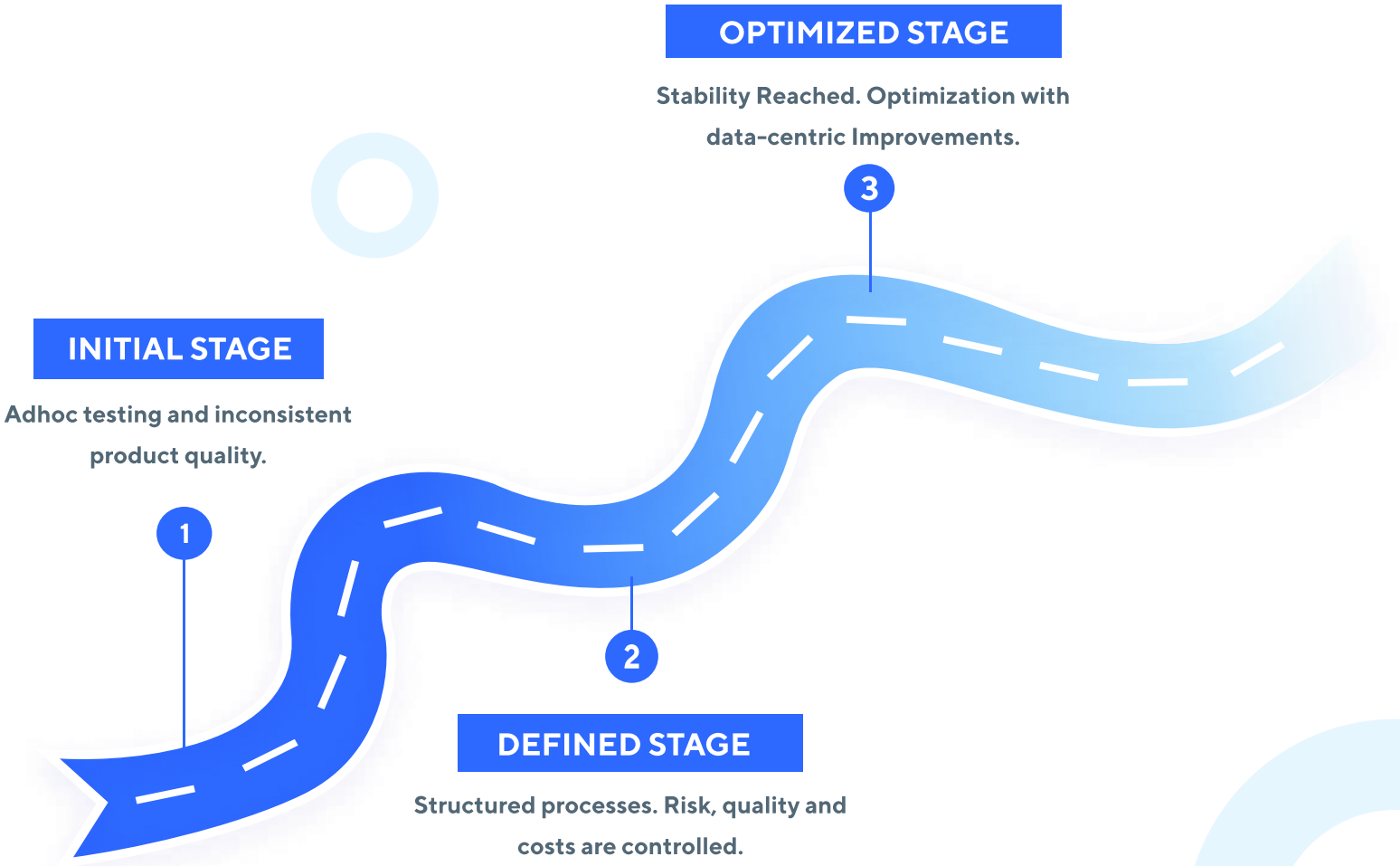
Does your team apply CI/CD?



Katalon's innovative Continuous Testing Maturity Model

Simply put, continuous testing isn't a one-time application. Rather, it's a long-lasting journey toward a more frequent and reliable automated release pipeline and stronger team orchestration between QA, development, and business teams.

Our Continuous Testing Maturity Model gives your team a reference for self-assessment and defines your progress on the automated **continuous testing journey**. The maturity levels are divided into three stages: Initial, Defined, and Optimized.



Stage 1: Initial

Ad hoc testing and inconsistent product quality.

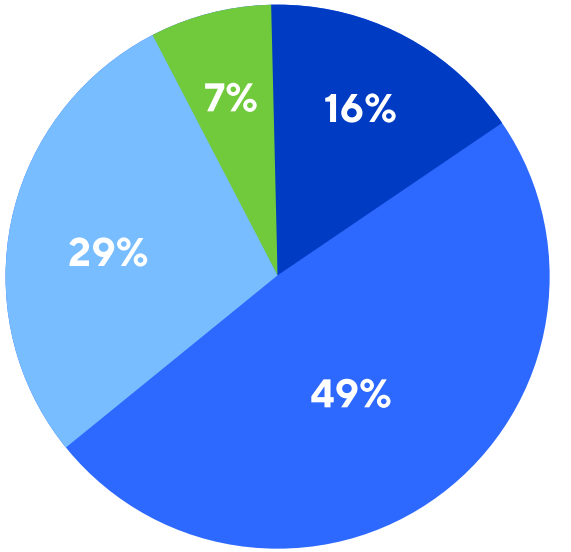
The key characteristic that distinguishes the Initial stage from the others is that your QA team has already adopted CI/CD for your projects, but there are still manual interventions and processes that are unstructured and loosely coupled when it comes to source code management for triggering tests.

The sole focus on minimal defects or issues and on-time releases has the potential to generate unstable delivery in terms of progress and quality. Teams at this stage are typically limited in their expertise in test automation skills or knowledge among team members.

At this stage, teams have only just begun building processes from scratch and have yet to make full use of continuous testing practices. Operations, in general, are still loosely coupled and your teams likely plan and design everything right before the development teams start to code.

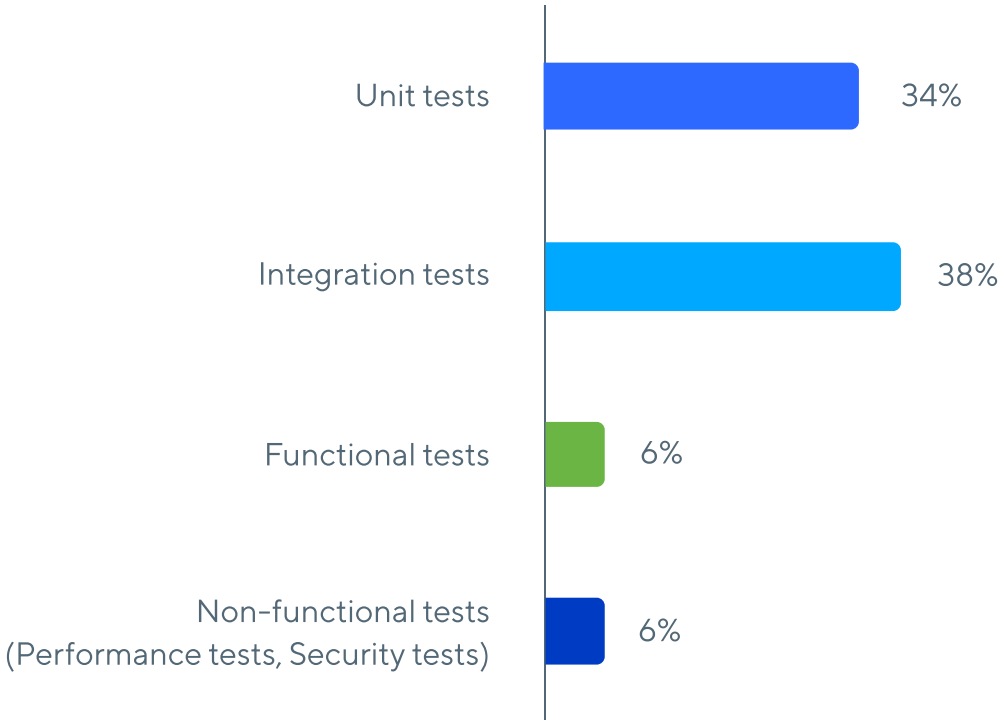
Without a proper plan or roadmap established, testing teams typically deliver applications to production late in the process, leaving preventable defects in place. Furthermore, shift-left testing practices are not likely to be part of the team's overall workflow.

QA team size



Nearly one-third (27%) of survey respondents are at the Initial stage, and 65% stated that they are in small or medium-sized QA teams – consisting of 10 testers or less.

Type of tests that were automated by Initial-level teams

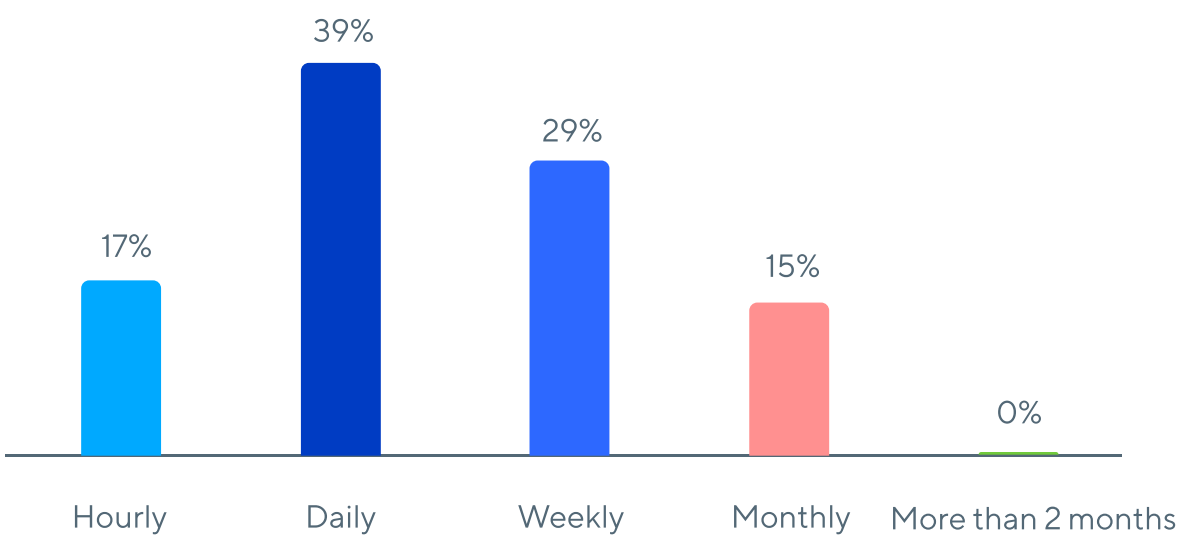


As shown below, Initial stage respondents apply very little automation testing (less than 50%) across different testing types. At this maturity level, this indicates that automation is applied primarily to unit tests (34%) and integration tests (38%), while manual functional tests (6%) and non-functional tests (6%) is the norm for the QA process for some teams.

When asked how often teams deploy new builds into production, “daily” was the top selection by Initial-stage respondents. However, the frequency of deploying new releases is not a key factor to determine a team's continuous testing maturity level because having speedy releases is the norm for any team at any maturity level.

Furthermore, the need for a faster delivery process could boost the shift to a more agile approach for teams.

The frequency at which Initial-stage teams deploy new builds to production



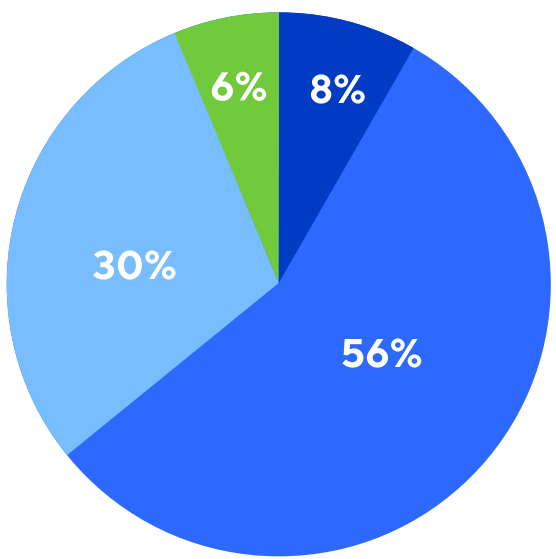
Stage 2: Defined

Structured processes. Risk, quality, and costs are controlled.

With over half of the survey participants in medium-sized QA teams, 6 to 10 members, and one-third in teams of 11 to 20 members, 43% report being in the Defined stage.

At the Initial stage, every CI/CD pipeline trigger is handled manually, putting more burden on developers as code frequently changes.

Teams at the Defined stage have more experience with automation and are better able to schedule and automatically trigger CI/CD pipelines using project-appropriate methods, at hourly, daily, or weekly intervals, without much manual intervention. This makes the source code management process easier and faster, and fosters better collaboration between developers and testers.

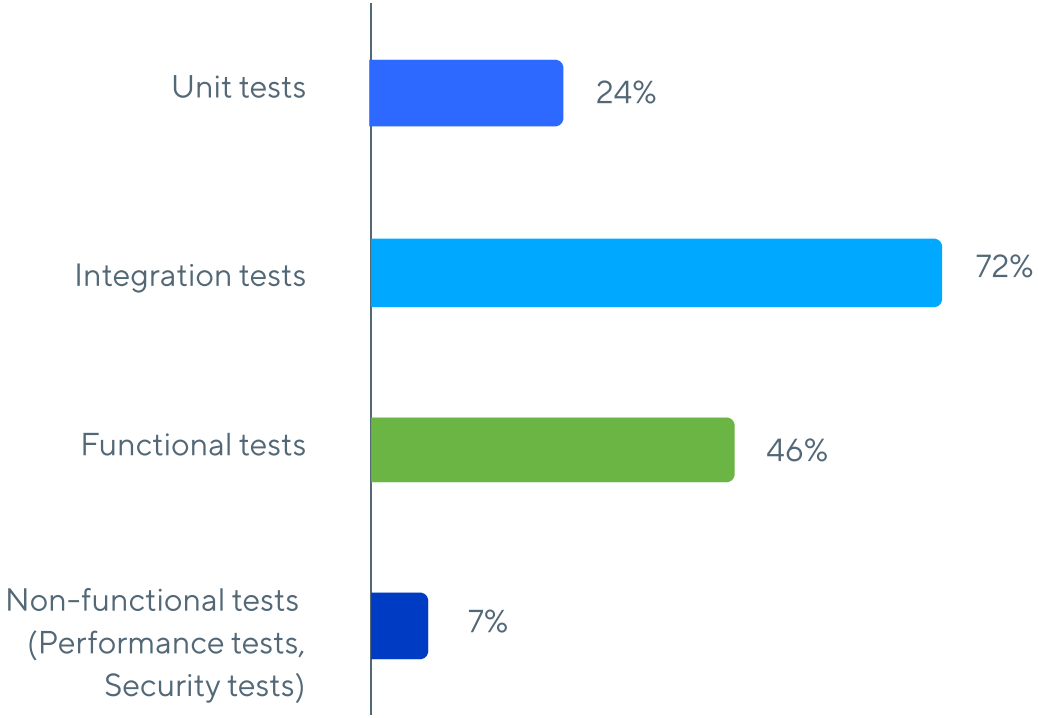


QA team size

- 1-5 members
- 6-10 members
- 11-20 members
- More than 20 members

With over half of the participants in medium-sized QA teams, at 5 to 10 members, and one-third in teams of 10 to 20 members, 43% have reported to be in the intermediate stage.

Types of tests that were automated by Defined-level teams



In addition, the way your team triggers automated tests at this stage also differs. With the ability to trigger tests to run automatically via polling or scheduling, your team can implement regression testing daily, sometimes twice a day, reducing time and effort, potential issues, and manual intervention.

From the data collected, automation practices are prioritized for integration (72%) and functional testing (46%) to ensure that every component fits together correctly. In other words, at this stage, QA teams focus on integration and functionality testing, yet still maintain necessary efforts on unit testing.

Stage 3: Optimized

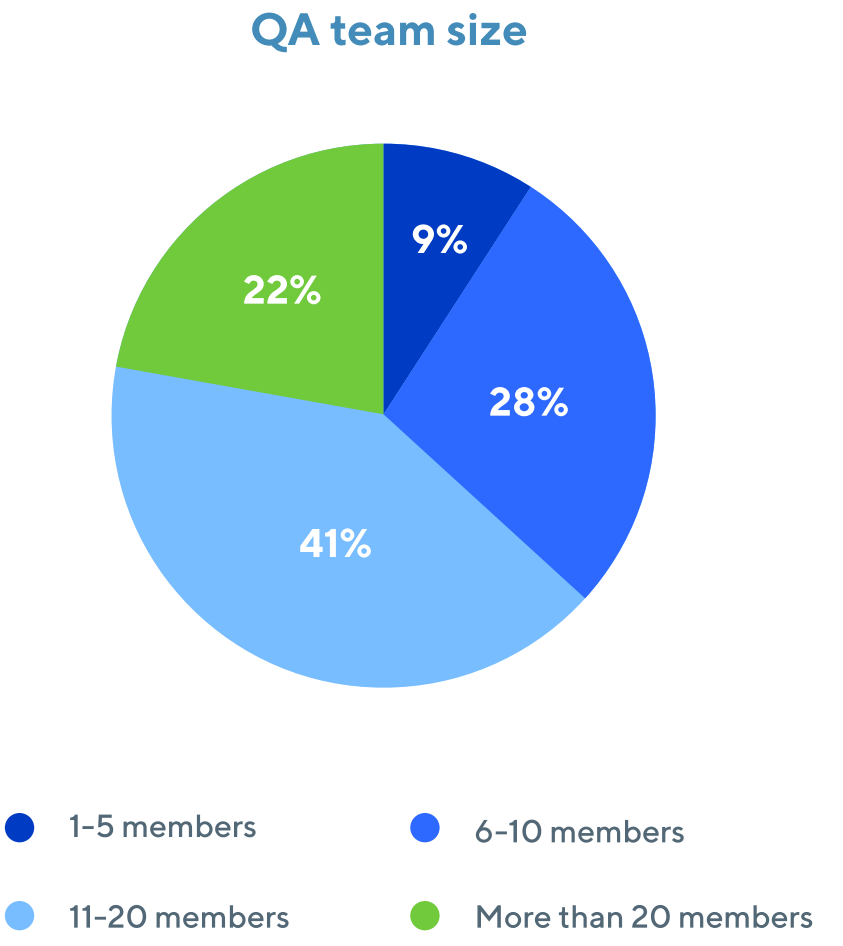
Stability Reached. Optimization with Data-centric Improvements.

With just over 30% of teams identified at this stage, with 91% in teams of 11 to 20 members, the data indicates that there is a positive correlation between team size and maturity level.

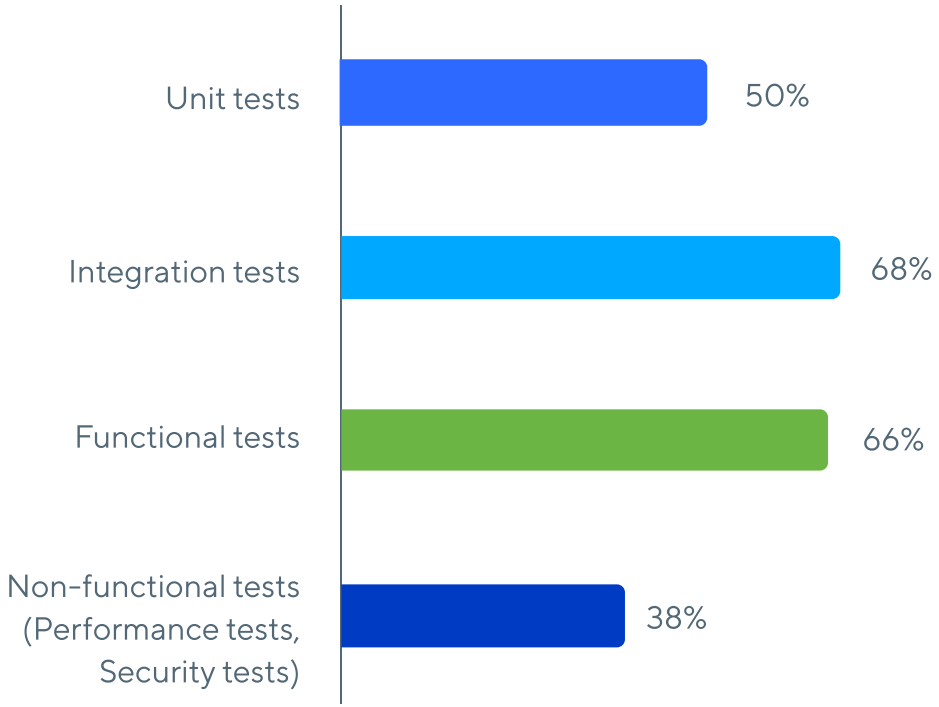
If your team has reached the highest level of continuous testing maturity, automation has expanded beyond solving simple problems, and instead focuses on creating a more effective workflow. Your team is capable of constructing a plan with best-practice techniques and approaches beyond simple trial and error. The ideal next step is to utilize past results and measurements to fine-tune your overall testing process.

Specifically, your team's CI/CD pipeline is triggered through automation for every code that the developer has committed, and automatically deploys every change made in the codebase. Afterwards, environments are set up on the fly, unit tests are run, then API tests, followed by UI end-to-end tests. Each test cycle is automatically promoted to the next, and if all quality benchmarks are passed, the code is automatically deployed to production.

Adherence to the continuous testing approach eliminates wait times, improves efficiency, and provides both visibility and metrics that deliver immediate feedback for continuous improvement.



Types of tests that were automated by Optimized-level teams



Compared to teams at the other two stages, Optimized-staged teams put more emphasis on the presence of non-functional testing during their testing cycles. With more expertise and more flexible resources, functional testing is used to ensure that the software's functionalities work as expected, and non-functional testing is used to verify how well the application responds.

Key Takeaway

Getting continuous testing right results in enhanced code quality, shortened time to market, and strong synergy among development, testing, and operations. Therefore, evaluating the maturity level of your team on the continuous testing journey is vital to identifying gaps for improvement and growth.

After you take this assessment and have a better understanding of where your team or organization stands, and which areas to invest more or less effort, you and your team can identify the next steps in your continuous testing journey.

It's important to keep in mind that the road to continuous testing maturity, at any stage, is never a straight line. These "stages" are full of success, failures, false starts, and detours. The next section of this white paper arms you with insights to overcome any setbacks or obstacles you may face on your journey ahead.

Bring Katalon on your journey?

Part 3

Challenges in Applying Continuous Testing Across Different Stages

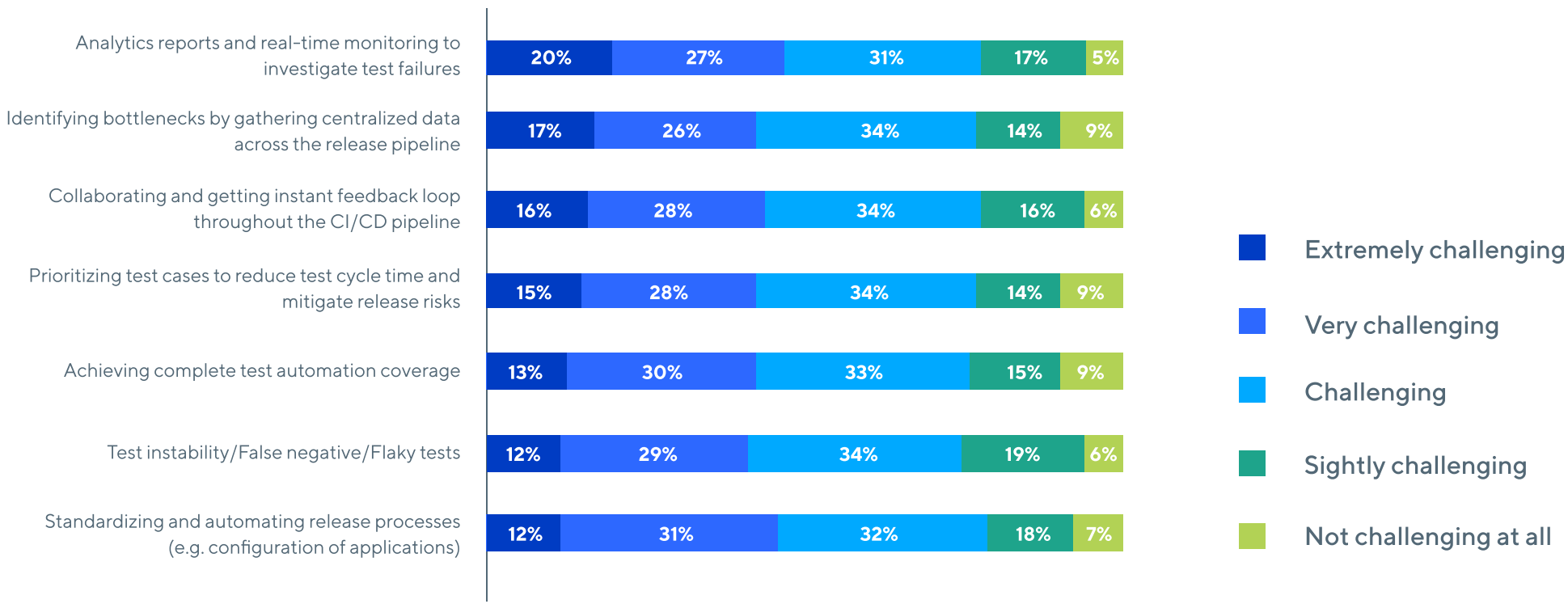
There's no denying that continuous testing is essential, however, making it happen is a challenge in any development environment for a number of reasons. The following section reveals the top challenges across the different stages of continuous testing maturity. By understanding these roadblocks, your team can craft an effective strategy to achieve quality, speed, and efficiency.

Challenges for Initial-stage teams

We asked respondents at the Initial stage of maturity about the challenges they face in applying continuous testing. It was surprising to find that the most common challenge (95% – from extremely challenging to challenging) was difficulty in **analytics reports and real-time monitoring to investigate test failures.**

At this stage, teams are limited in both the tools and experience needed to operate a quality test system. 91% stated that identifying bottlenecks by gathering centralized data across the release pipeline was difficult, and 94% reported that team collaboration and instant feedback loops are their main problems in CI/CD pipelines.

The difficulty levels of the common challenges that your team faces throughout the testing process

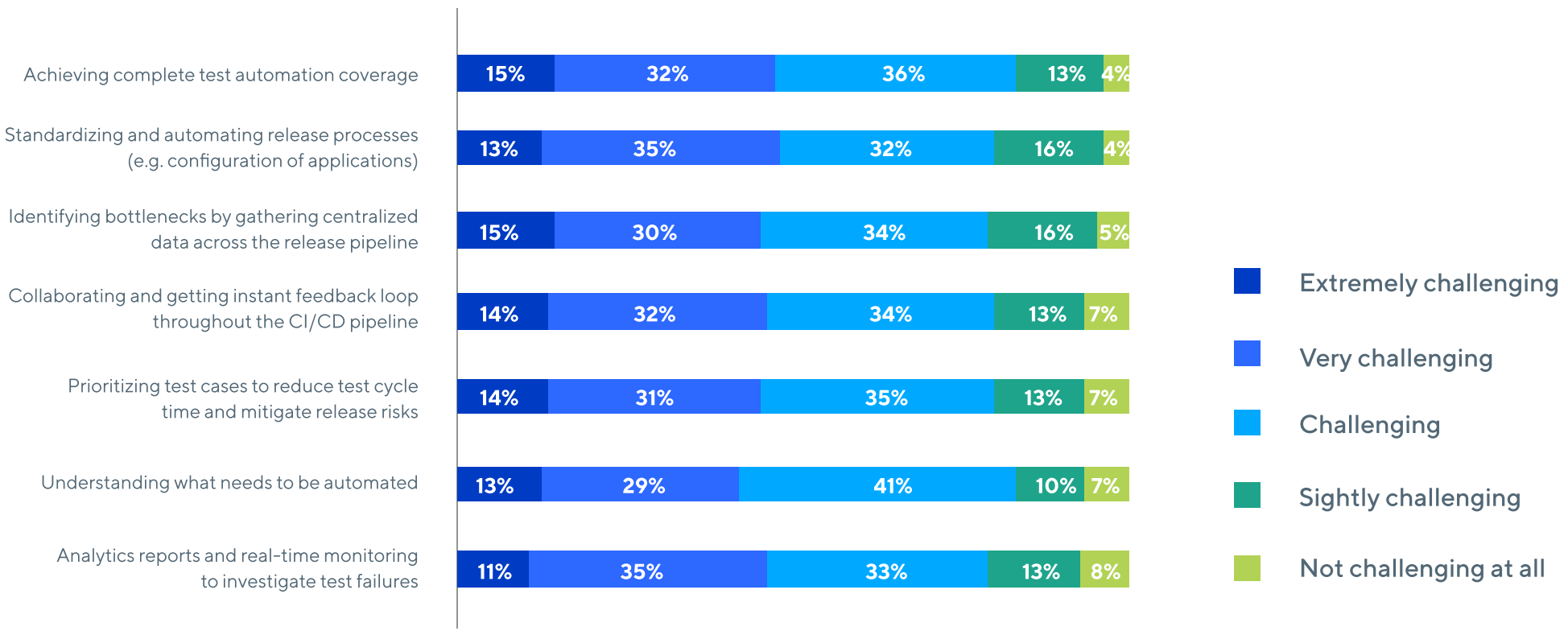


Challenges for Defined-stage teams

The top three responses for the common challenges of Defined-stage QA teams are **achieving complete test automation coverage (96%)**, **standardizing and automating the release processes, and lack of centralized data to identify bottlenecks** – which hasn't strayed too far from the Initial stages challenges.

At this stage, test automation plays a more significant role and has the potential to improve scale and coverage.

The difficulty levels of the common challenges that your team faces throughout the testing process

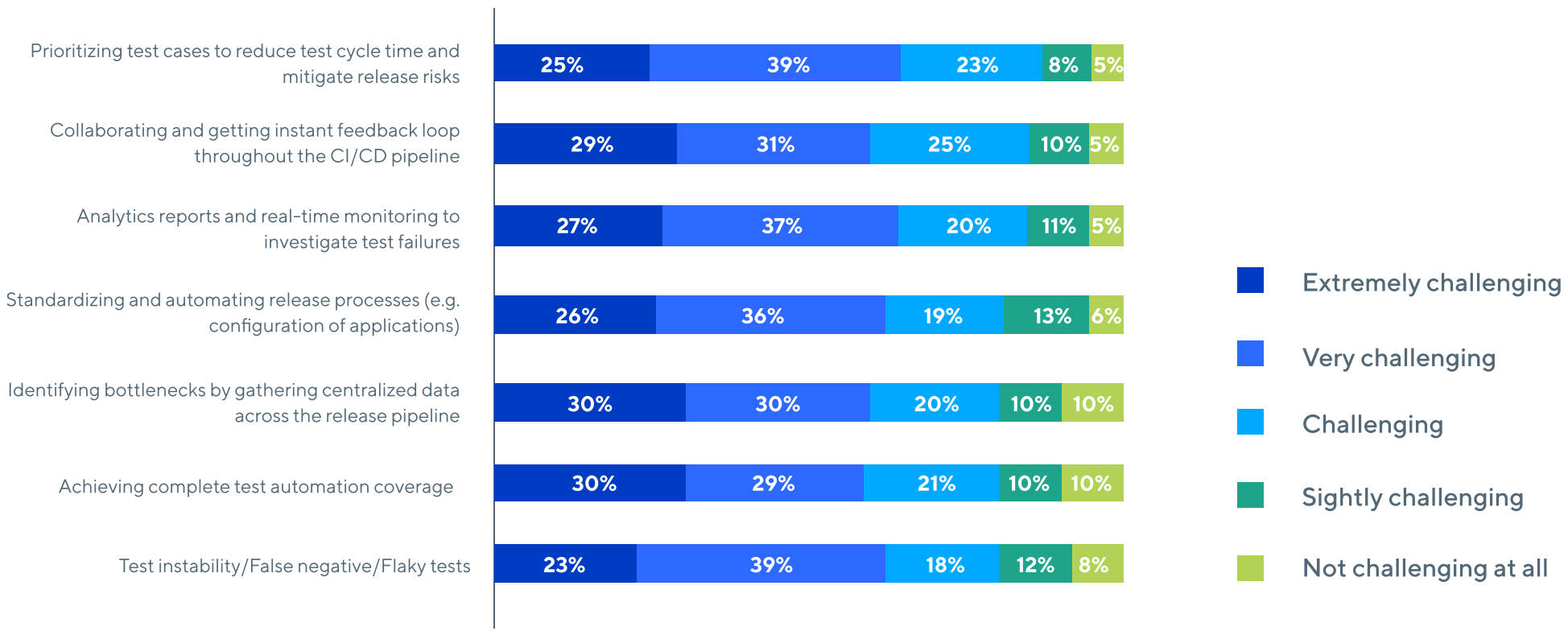


Challenges for Optimized-stage teams

95% of respondents stated that they were stuck with **the test case prioritization** technique, which, if successfully implemented, can reduce test cycle time and release risks.

The data also revealed that **collaborating and getting an instant feedback loop through the entire CI/CD pipeline** and **gathering analytics for real-time reports for test failure investigation** are a challenge.

The difficulty levels of the common challenges that your team faces throughout the testing process



Key Takeaway

While there are challenges across each stage of maturity, there are clear signs that teams are taking advantage of the opportunity to improve their performance, with a shared sense of commitment and determination to succeed. Using the right continuous testing tool is also beneficial to your overall testing and delivery success. **Check out this list** of the 10 most popular continuous testing tools available in the market today.

Addressing these challenges is far from straightforward, and requires organizations to undertake a long, well-planned journey. The good news is that several organizations have a road map in place, and are making steady progress. In the next section, one of the key solutions is revealed!

Part 4

Test Orchestration: A Structure Approach to Continuous Testing

The adoption of continuous testing is steadily increasing, but there are still challenges that may hinder the maturity across organizations. The following provides organizations with expert advice and guidance, designed to foster collaborative QA teams with more standardized processes and test orchestration tools.

Unfortunately, there's no one-size-fits-all solution to address continuous testing roadblocks. Every business should take a holistic approach, have a clear understanding of the constraints in their current software delivery process, and maintain focus on their short and long-term goals.

For futher information, visit ***www.katalon.com/testops/***

Test orchestration capabilities to solve common challenges across teams

Test orchestration is the process of scheduling a series of automated tests in a predefined sequence, to make sure that it can be controlled and optimized at ease. If test automation focuses solely on handling a single task, test orchestration looks at the bigger picture, streamlining the testing cycles to reach a more efficient level.

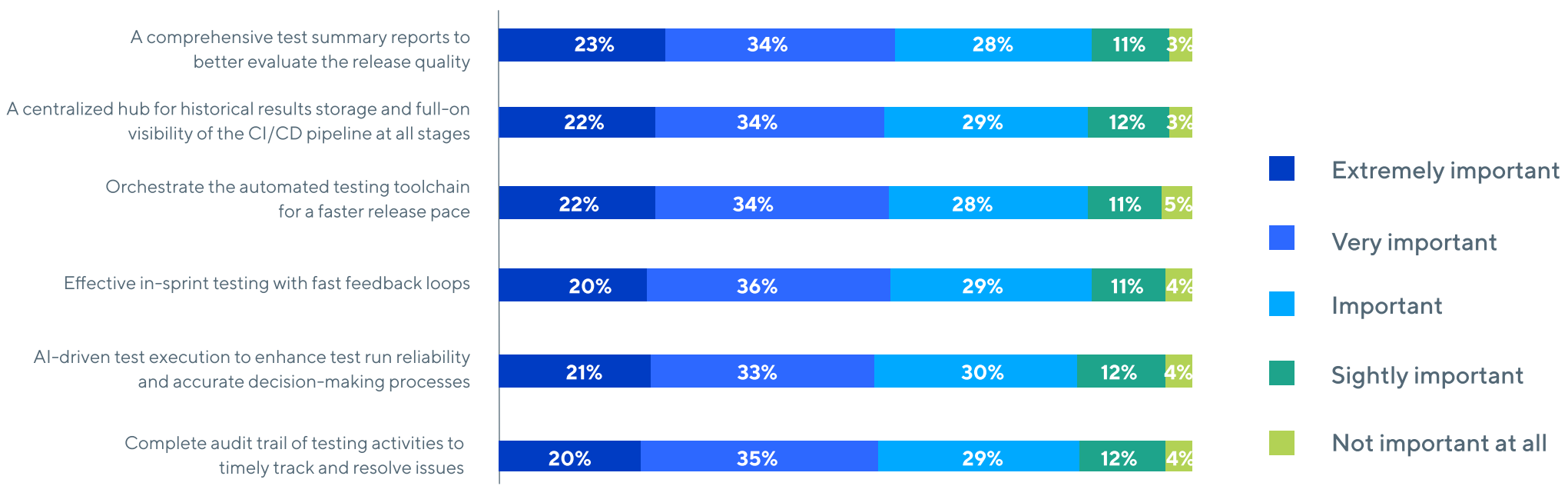
When asked about the solutions to accelerate the continuous testing process, 97% of respondents identified:

- **Test summary reports for release readiness evaluation**
- **A centralized hub for historical results storage and full-on visibility across all stages**
- **Orchestrate the automated testing toolchain for a faster release pace**

These three solutions reflect the importance placed on the flow of information across the testing toolchain.

With the right **test orchestration platform,** teams can perform projects with customized real-time dashboards for transparency, combining test cases across different frameworks and environments.

The importance of CI/CD process-maximization solutions



Key Takeaway

Test orchestration is a practical method that delivers cost reduction, better connections, and workflow optimization for all teams at any stage of continuous testing maturity. Through test orchestration, organizations can achieve:

- Comprehensive test summary reports and dashboards across all CI/CD pipelines
- Centralized hub for historical data with full visibility of quality entire SDLC
- Toolchain orchestration for better collaboration and faster release pace
- Effective in-sprint testing with the instant feedback loop
- AI and ML technologies to continuously and automatically optimize test suites
- Complete audit trail of testing activities for timely tracking and monitoring

Katalon TestOps is the first comprehensive platform with test execution, team collaboration, and project management capabilities. With TestOps, your team has a centralized testing ecosystem, with the orchestration ability for intensive control across continuous testing processes. Try it for free!

Katalon TestOps

Orchestrate Tests. Connect DevOps

Act on Insights

Start for free

Appendix

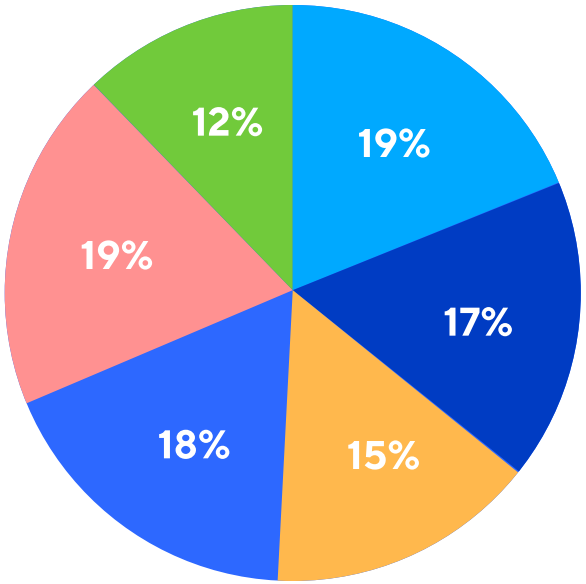
Methodology

The findings from this report are based on our survey of **2,500+** respondents with different professional titles working in various industries. The survey consists of 13 questions focusing on the participants' experience with test automation in the context of their teams and organizations. Our survey is distributed via various channels with the support of the global software testing community.

Please note that Katalon does not describe this as a scientific study. All data and findings are compiled and concluded based on various responses from the communities. The percentages in this report were rounded to the nearest whole number for the analysis.

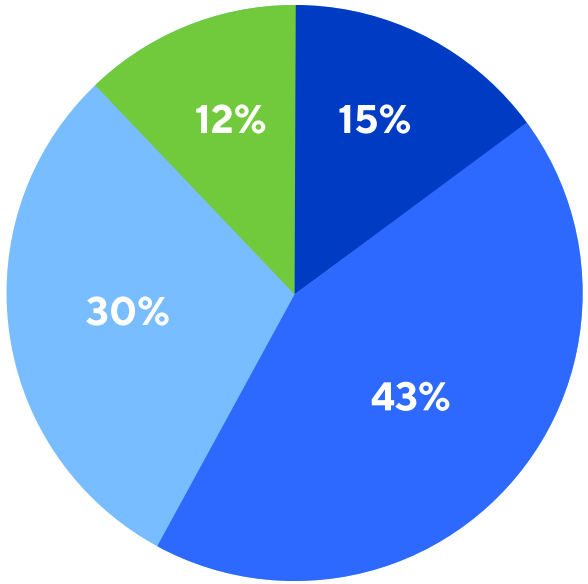
Respondents' Background Information

Professional role



- Automation QA Engineer
- IT Engineer/Analyst/Consultant
- Manual QA Engineer
- QA Lead/Project Manager
- Software Engineer
- Director/VP/CTO

Testing team size



- 1-5 members
- 5-10 members
- 10-20 members
- More than 20 members

About us

Katalon is a leading provider in software test automation solutions. The company offers a flexible platform for web, API, mobile and desktop testing that fits teams and projects of any size, for any purpose – from creating tests, execution, and reports to seamless integration with the CI/CD ecosystem.

Our product:

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