Human Versus Machine: The State of POS Testing

Manual software testing forces a battle between speed and quality

eBook

KEYSIGHT

Contents

CHAPTER 1

Background

Executive Summary

Despite advancements in AI-augmented testing and its capabilities to overcome issues with scale, coverage, and speed, many retailers persist with manual point-of-sale (POS) testing.

With in-store retail sales expected to hit $4.2 trillion by 2028, retailers must avoid releasing poor software that contributes to long lines at the checkout that erode purchase intent. As a result, ensuring seamless point-of-sale (POS) software functionality and integration with peripheral devices and vital back-end operational systems is crucial.

That is why Keysight Technologies commissioned the National Retail Federation (NRF SmartBrief) to conduct a major survey of North American retailers about their software testing practices.

This report provides a detailed comparison of manual and automation software testing for POS and integrations:

An impossible decision

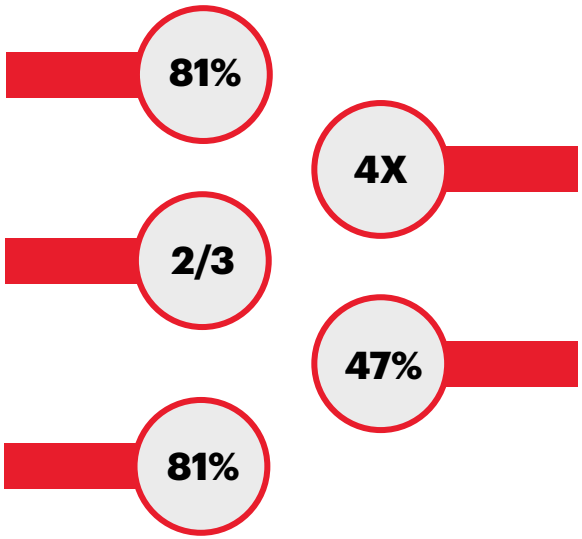
When faced with the choice of faster releases or fewer defects, **81%** of QA leaders favored speed over quality

Missed deadlines

Over **two-thirds** of retailers regularly fail to meet testing requirements before every release

Failed releases

Manual testing is a huge contributing factor to failed releases, with **81%** experiencing delays or cancellations



Full throttle

Testing teams using automation were able to release up to **four times** more compared to manual testers

A future dilemma

As releases increase within three years, testing times required by **47%** of teams will make it impossible to reach the goal of 16+ releases per year

CHAPTER 2

Complexity Creates Bottlenecks

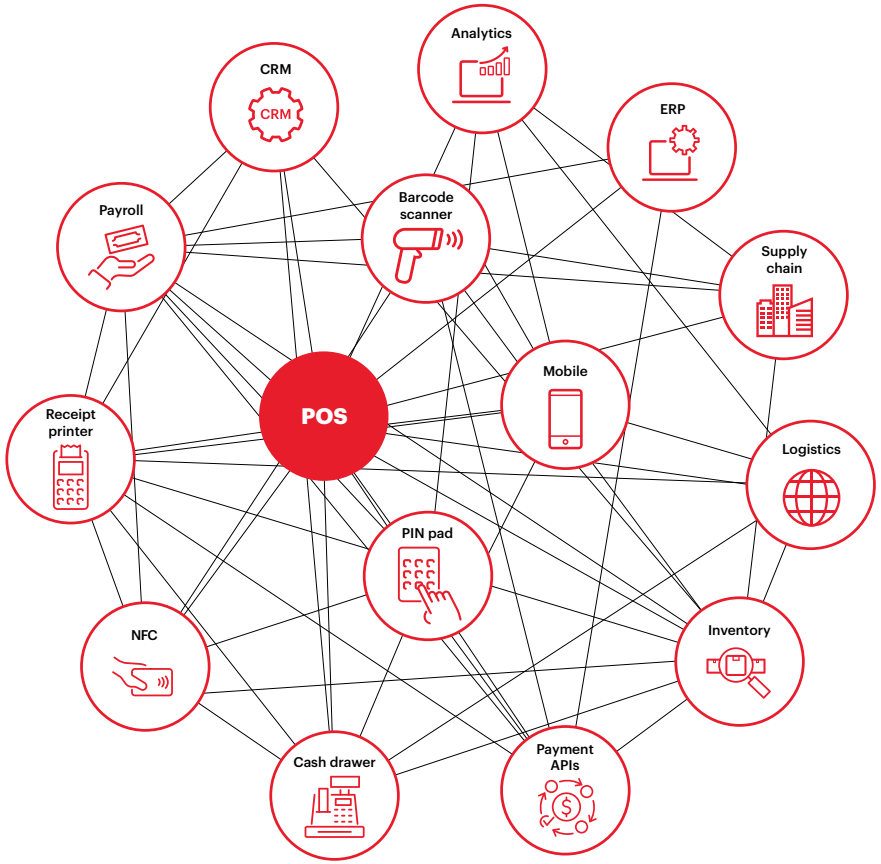
As complex integrations increase, QA leaders constantly face an impossible decision: deploy faster or prolong testing for fewer defects. When faced with this dilemma, 81% choose speed over quality, regardless of the financial implications and impact poor software has on the checkout experience. Despite the availability of automation capabilities, manual testing is ineffective when testing POS complexity, resulting in release delays and cancellations.

The Importance of POS Testing

Predictions that in-store retail sales will reach $4.2 trillion by 2028 highlight the growing importance of fully functioning POS terminals across various retail environments. They include mobile POS solutions, self-service checkouts, convenience stores, and gas station forecourts that use similar technology. However, the ever-expanding complexity of the retail IT ecosystem extends the importance of POS systems beyond customer transactions.

POS systems record employee hours to streamline payroll processes. Capturing information such as customer loyalty numbers and email addresses at checkout enables the creation of unique customer profiles and personalized marketing campaigns. In addition, integrating POS systems with back-end operations unifies data, optimizing inventory management, logistics, and supply chain operations for better stock levels and product shipping. POS software must also facilitate secure payment transactions for credit cards in stores and at the gas pump.

Ensuring the quality of this ever-growing digital landscape requires an enormous investment of expertise, time, and money. As a result, retail quality-assurance (QA) leaders are under immense pressure to release quickly to meet consumer demand; reduce defects that impact the shopping experience; and increase coverage across front-end devices, intricate user interfaces (UI), and back-end applications and platforms.



Complexity and Critical Defects Escalate as Integrations Multiply

Modern POS systems are highly customizable, with complex UIs that require frequent software updates. Although these updates enhance functionality, they often introduce bugs and vulnerabilities. Furthermore, changes to one area of the POS software can create a ripple effect, impacting peripheral devices. Traditional manual testing of these devices demands human intervention, which adds to testing complexity.

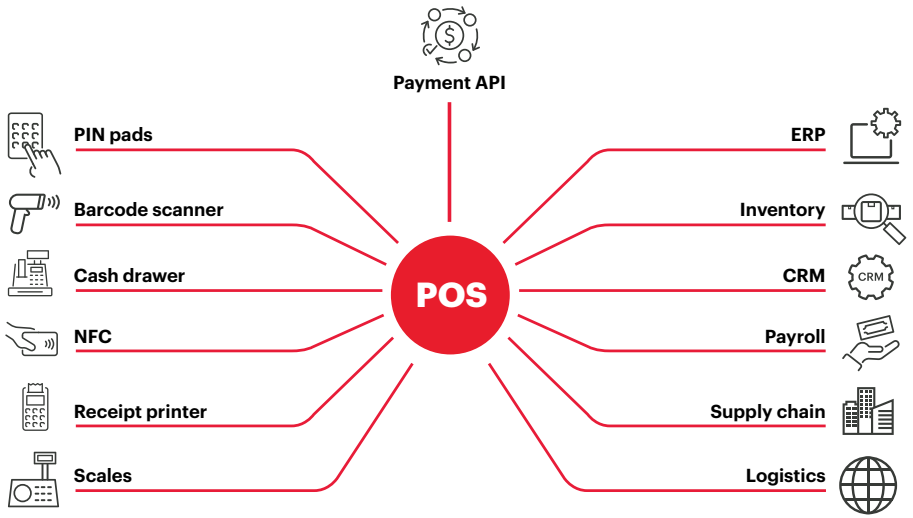
One of the primary testing challenges in this context is payment validation tied to industry regulations. The Payment Card Industry Data Security Standard requires POS software to convert cardholder data into secure payment transaction requests.

Testing Intricate Back-End System Integrations

POS testing becomes increasingly complex as customer data and product information flows through multiple integrated back-end systems. However, the vital role that POS systems play in connecting the back end to the front end to optimize critical systems, like inventory, customer relationship management, and logistics, and boost customer engagement increases testing complexity.

A combination of POS software updates, numerous peripheral devices, and back-end system integrations requiring upgrades and maintenance adds to the testing challenges. **Retailers have an average of 13 additional front-end and back-end integrations; some have more than 25.** Therefore, necessary testing increases, impacting the velocity of software releases.

Retailers average 13 integrations [Q2&3]



QA Leaders Face an Impossible Decision

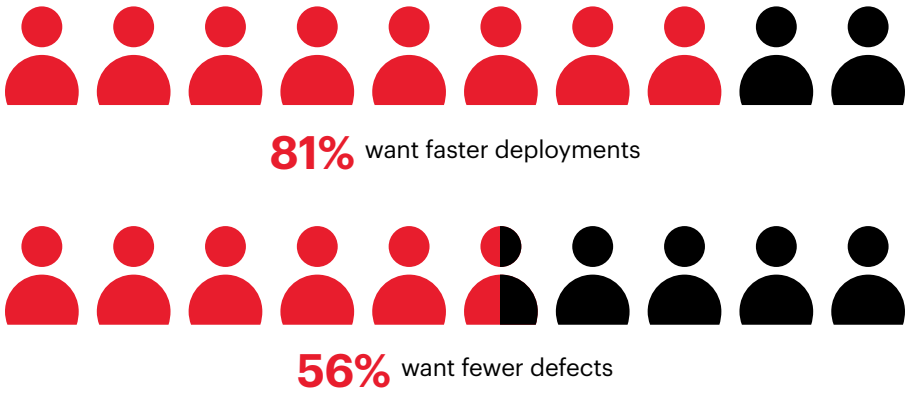
In the fast-paced world of retail, the continuous evolution of POS systems and integrations creates a formidable challenge for QA leaders. Balancing the competing demands of maintaining performance, providing regular updates, and adding features forces a choice between faster releases and fewer defects. When faced with this impossible choice, 81% of senior decision-makers favor speed over quality.

However, rolling out software without adequate testing can have detrimental consequences, such as the following:

- Delayed or canceled releases. Long-term delays can harm POS functionality and performance.
- Missed defects. Buggy releases can disrupt POS software and back-end systems, such as inventory management and logistics, leading to lost revenue and poor customer satisfaction.
- Increased costs. An error found after a release is up to 100 times more costly to fix than one identified during the maintenance phase.

These consequences underscore the dilemma retail QA leads face. On one hand, they are under immense pressure to release quickly to meet customer demands and gain a competitive edge. On the other hand, there is an equally pressing need to ensure the quality of POS software by minimizing defects, bugs, and vulnerabilities.

For long-term success and customer satisfaction, finding ways to prioritize quality alongside speed is imperative.



Percentage of responses indicating their preferred benefits from automation [Q15]

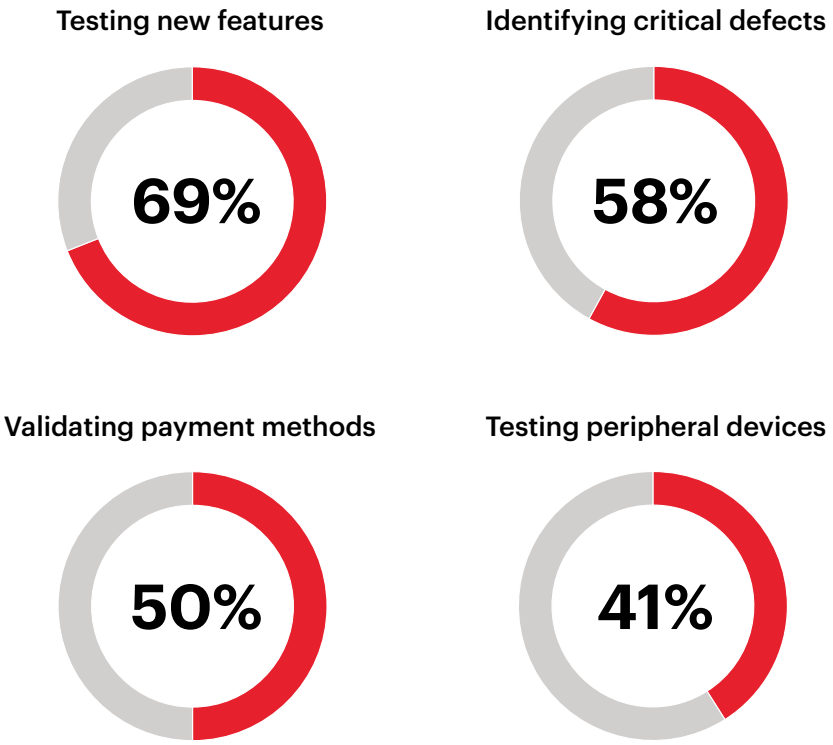
Manual Testers Fight a Losing Battle

Despite the battle between speed and quality, manual testing methods dominate retail QA practices. As a result, simulating real-world scenarios is time-consuming, increases the risk of defects, and delays testing new functionality. As systems and integrations grow, the pressure to scale and meet appropriate levels of coverage becomes more challenging.

The survey data reflects these challenges:

- Sixty-nine percent of manual testers struggle to test new features before release deadlines.
- Fifty-eight percent of manual testers miss critical defects.
- Fifty percent of manual testers find validating payment methods challenging.
- Forty-one percent of manual testers cannot adequately test peripheral device integrations.

The top challenges faced by manual testers [Q11]



Time wasted on manual testing

A key reason for the challenges is that manual testing fails to keep pace with the required release frequency. Test requirements constantly change, and developers add software updates and new features, preventing retailers from responding swiftly enough to meet customer expectations.

Our study shows that, on average, retailers invest 34 hours of testing per release. That is nearly five working days dedicated to testing activities. Manual testing bottlenecks delay new feature releases, POS functionality improvements, and bug fixes, impacting the customer.

Nearly five days are dedicated to testing activities for every release [Q7]

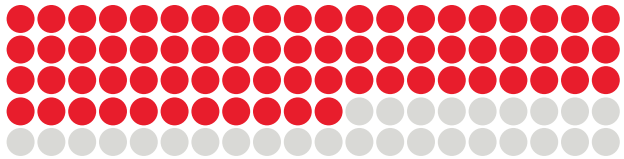
Regressions Increase the Testing Burden

Manual testing takes a substantial amount of time, with a considerable proportion dedicated to the crucial but often labor-intensive task of regression testing.

The regression testing burden is evident as manual testers must execute an average of 103 regressions every release. The 24 hours spent on regressions represent 71% of the total testing effort per release, leaving only a limited amount of time to test new POS features and system enhancements.

71%

of all testing focuses on regression testing



Manual testers spend too much time focusing on regression testing [Q9]

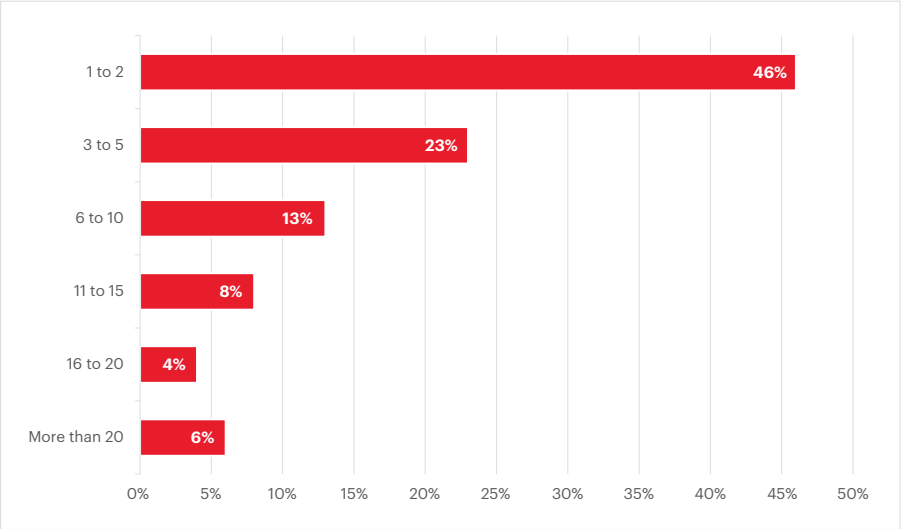
Putting the Brakes on Release Speed

Insufficient testing poses enormous challenges for retail QA teams as time-consuming regressions limit the ability to test new features, preventing testers from keeping pace with the required number of releases.

As a result, 69% of teams using manual testing can release only five times or fewer every year. Consequently, most retailers are unable to achieve elite or high DevOps performance.

> Google Cloud and DORA state that organizations that deploy on-demand (multiple times a day) are elite DevOps performers.

The number of releases manual testing teams can achieve in a year [Q4]

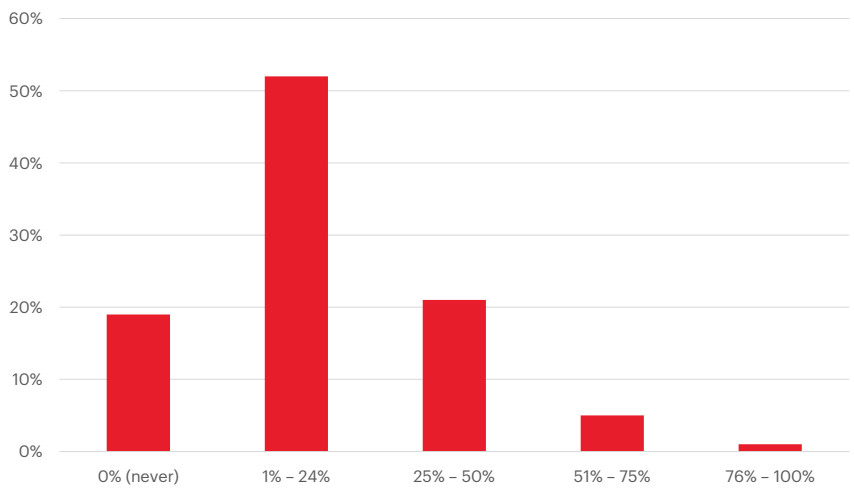


Release frequency in peril

Slow deployments are just one obstacle manual testers face, with release frequency also in jeopardy. Our study shows that 81% of respondents encounter delays or cancellations in their release cycles.

This statistic highlights the severity of manual testing's impact on POS software delivery, emphasizing the need for more efficient and comprehensive testing across highly integrated POS systems.

Percentage of delayed or canceled releases every year [Q6]



CHAPTER 3

Elevate Testing with Automation

While retail QA leaders focus on faster releases, the actual benefits of automation transcend these goals. This chapter examines how test automation can deliver speed and quality while improving test coverage across the POS ecosystem.

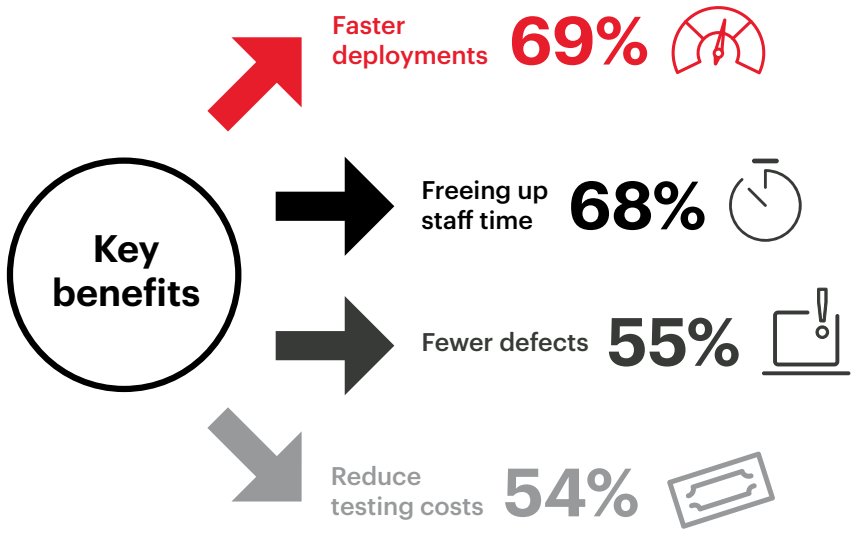
In an environment where release delays and cancellations are common for manual testers, automation emerges as a solution to facilitate rapid deployments, improve quality, and reduce testing time.

CHAPTER 3: ELEVATE TESTING WITH AUTOMATION

Full Throttle with Automation

The desire to deploy faster (69%) and the need to free up staff time (68%) are intrinsically linked to the limitations of manual POS testing. Manual methods, especially labor-intensive regression testing, are time-consuming, leaving limited capacity to deploy new features and identify critical defects. Automation is vital to addressing these challenges. It enables faster deployments while freeing up more time for essential test cases.

Fewer defects (55%) and reduced testing costs (54%) are less pressing but critical objectives. By automating repetitive and time-consuming testing, retailers can improve defect detection and experience cost savings. In addition, QA teams can test and deploy new features to enhance POS functionality, improving the checkout process for consumers.



Top benefits of test automation for retail organizations [Q15]

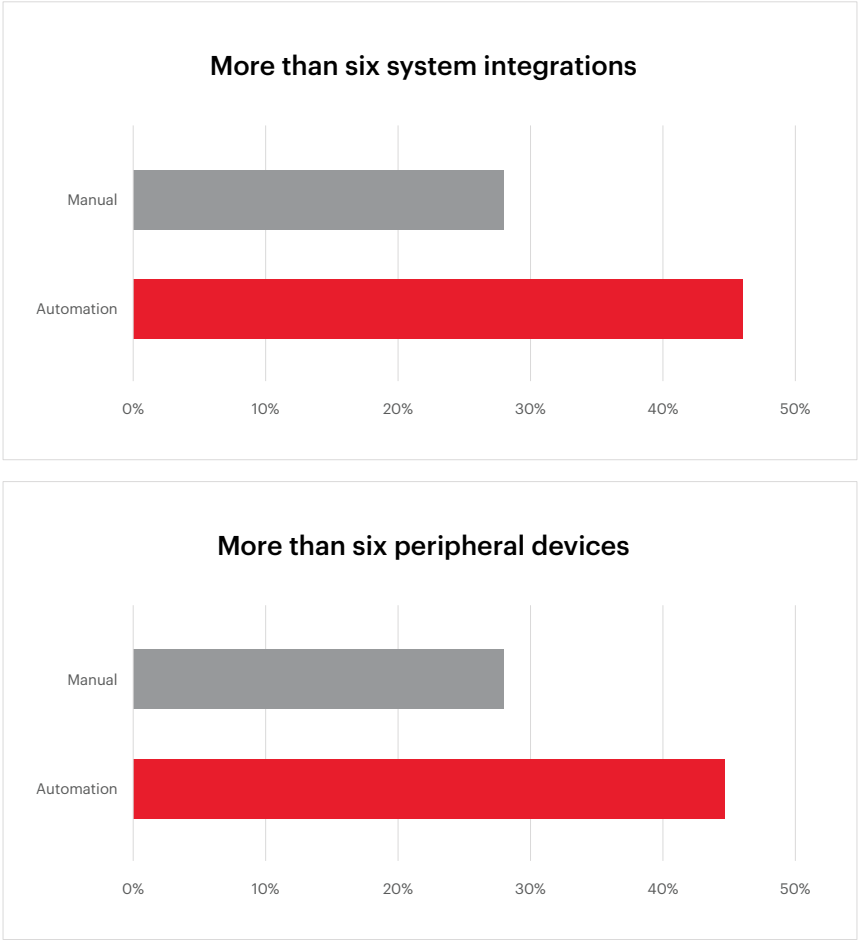
Test more with greater accuracy

Compared to manual QA, teams that use automation excel in their ability to test throughout the POS ecosystem, encompassing intricate integrations.

When considering that retailers have an average 13 integrations, 46% said that they can test more than six back-end systems, highlighting automation's ability to test core functionality in various applications critical to optimal POS performance. Similarly, 44% of automation teams can test more than six peripheral device integrations, such as barcode scanners, receipt printers, and payment terminals.

In stark contrast, only 28% of manual teams can test six or more peripherals, highlighting the drawbacks of relying on human intervention to test physical devices. Likewise, just 28% of manual teams said they can effectively test six or more back-end systems, emphasizing the need for more comprehensive testing for critical platforms, such as inventory management, supply chain, and logistics.

This disparity underlines the growing imperative for automated POS testing. Automation increases test coverage and improves scalability, enabling retailers to ensure that POS performance meets customer demands.



A comparison of testing methods' capabilities for front-end and back-end integrations [Q2&3]

Test faster with automation

QA teams that use automation can test faster, increasing the number of releases and improving regression testing efficiency.

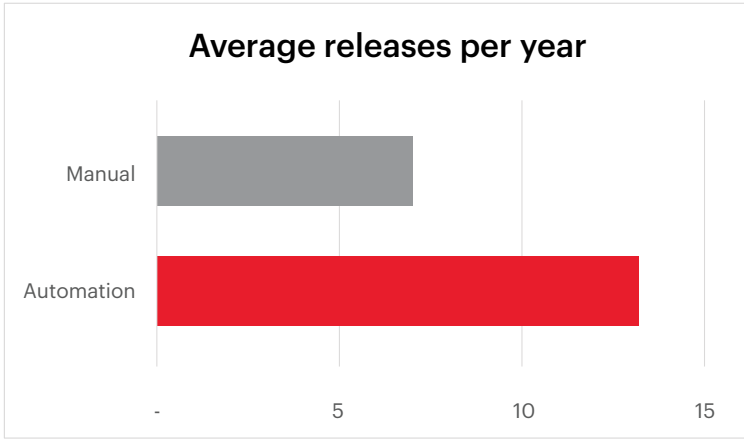
Increased release frequency to enhance the in-store experience

The study shows that automation testing teams achieved double the number of releases per year, with some capable of deploying over 26 times. By accelerating release cycles, retailers can introduce new features, address bugs, and adapt to changing demands, all of which translates to an improved in-store shopping experience.

More regressions improve reliability

Automation's efficiency in regression testing, with an average of 177 regression test cases executed per release (compared to 103 for manual testers), plays a vital role in POS reliability. As a result, retail customers benefit from a stable and quick checkout experience, aided by smoother transactions and increased satisfaction.

Up to 4X more releases per year with 19% able to deploy over 26 times per year



The number of releases automation testing teams can achieve in a year compared to manual testing methods [Q4]

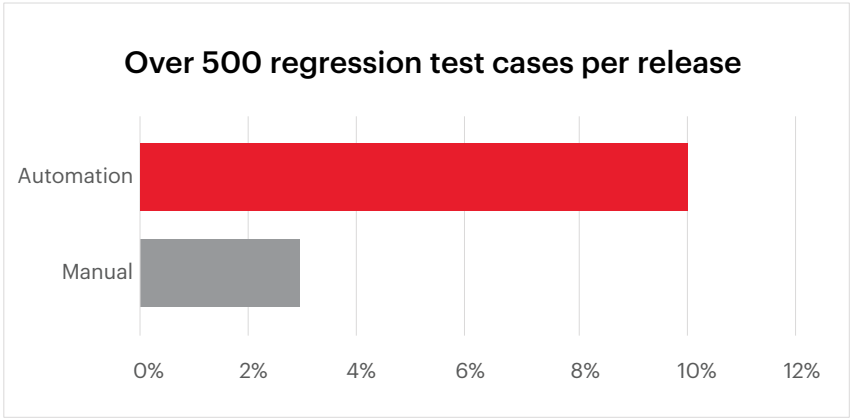
Cracking the code with effortless automated regression testing for POS

Blog. Read more.

Faster regression testing with automation

As retailers look to increase digital capabilities and complex integrations, the number of regression test cases naturally will grow. Automation's ability to test a substantial volume of regressions, as demonstrated by 10% of teams being able to test over 500 test cases (compared to 3% of manual teams), ensures that workflows operate flawlessly. Consequently, testers gain time to examine new features and edge cases that typically remain in the backlog.

By facilitating faster releases, improving POS functionality, and handling complex system integrations with ease, automated testing creates a more satisfying in-store retail experience.



A comparison of testing capabilities in achieving a high level of regression test cases [Q8]

Automation requirements

Manual testing challenges align closely with the advantages of using an automation tool, which resonates particularly with the in-store experience.

Expanding test coverage

The intricacy of POS system integrations and peripheral devices causes severe problems for manual testing teams. Seventy-seven percent of these teams expressed the need for automation to assist with testing across various applications and platforms to help increase test coverage.

Fewer defects for smoother transactions

In the retail environment, regression testing is vital because of missed defects' impact on the in-store experience. Consequently, 71% of manual testers admitted they want automation to help increase the testing accuracy of repetitive tasks.

Most required capabilities of test automation platforms in retail software testing [Q16]

Neglecting to test from the user's perspective

One surprising discovery is that most retailers have little interest in automating the testing of the intricate graphical user interfaces (GUI) of their POS terminals. Only 22% expressed a desire to automate GUI testing, meaning most retailers miss the opportunity to automate data verification and ensure accurate representation of API requests at the cash register. Limitations on installing automated testing tools for POS systems and the presence of locked-down hardware devices, such as PIN pads without accessible code, may lead retailers to think that automation is not feasible. An automation tool that uses computer vision and robotics addresses these challenges, so any physical device and POS terminal, regardless of the operating system, codebase, or manufacturer, can be tested.

Addressing the challenge of peripheral device testing

Testing peripheral devices like barcode scanners, receipt printers, and PIN pads has always required human intervention. Fifty-six percent of manual testing teams seek automation to help test these crucial components of the checkout process. An automation tool that can drive robotics to test like a synthetic human ensures disruptions don't occur at the point of purchase. Implementing an automation platform with robotics improves repeatability, as these tasks are repetitive and mundane, which can lead to human error. In addition, automating the testing of peripheral devices accelerates software delivery as testing is possible 24/7/365.

When manual testing falls short, automation delivers

The satisfaction levels recorded by automation testers regarding testing capabilities directly align with the key challenges manual testing teams face.

Achieving comprehensive test coverage

Automation platforms effectively overcome the challenges of manually testing new features and identifying critical defects, with 81% of respondents achieving appropriate levels of test coverage. Automation enables a more robust and dependable POS system by identifying bugs quickly, aiding the deployment of new functionality, and validating payment methods.

Scaling testing efforts

QA teams using automation showed a strong satisfaction rate of 79% in their ability to scale testing efforts. Manual testing teams need help to accommodate the growing complexity of POS systems and integrations resulting from highly detailed manual scripts detailing every step of a test case. Changing test requirements complicates the issue further, causing release delays or rollbacks. By effortlessly scaling testing with automation, QA teams can have confidence in the reliability of fully functioning POS systems when integrations increase.

Meeting test requirements consistently

Consistently meeting test requirements before a release is another crucial challenges for 63% of manual testers, which impacts the speed and frequency of deployments. In contrast, 73% of teams using automation platforms are highly satisfied with their ability to meet test requirements. This capability contributes to the stability of POS systems and integrations, ensuring that customers encounter minimal disruptions at the checkout.

Percentage of respondents using automated testing who are satisfied with their organizations' capabilities in specific areas [Q14]

CHAPTER 4

The Future Dilemma: A Three-Year Projection

Retailers are under immense pressure to increase their release cadence in the next few years despite manual testing's failure to release fast enough, identify critical defects, and meet test requirements.

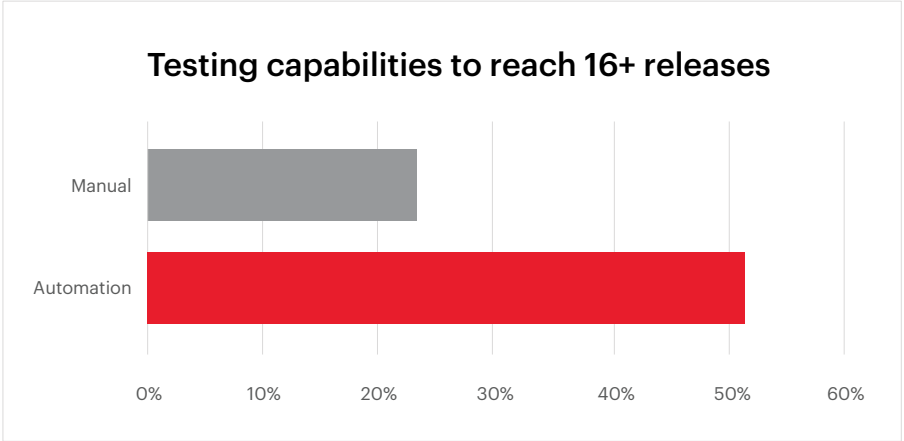
Surges in Release Cycles Spell Disaster

Manual testing methods are ill-equipped to meet the expected surge in releases and will face an uphill battle to meet demand.

Existing issues with delays and cancellations that have plagued manual testing teams pose a formidable challenge, especially considering that 72% of senior decision-makers expect annual releases to reach 16 or more within three years.

72% of decision-makers expect releases to increase [Q3&9]

Assessing teams' readiness to handle more releases mirrors the disparity in testing effectiveness. Fifty-one percent of teams using automation have the capabilities to reach the target of 16 or more, compared to only 23% relying on manual techniques.

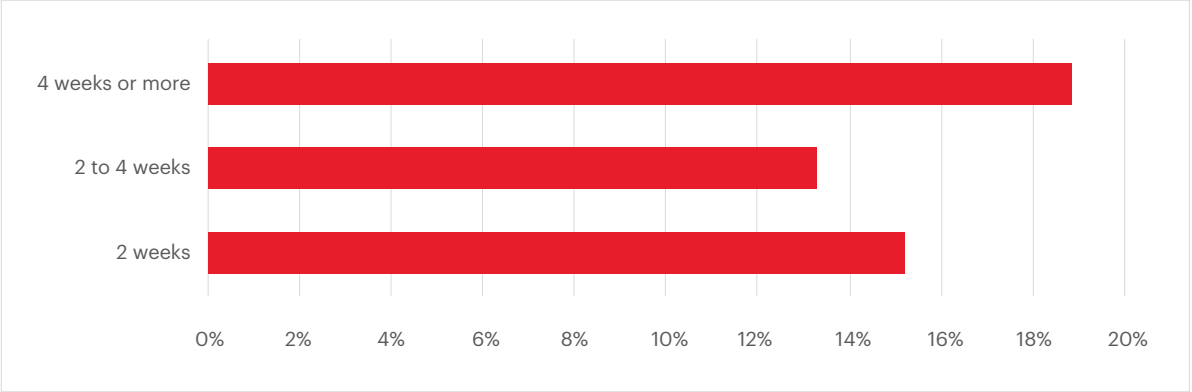


Automation testing teams are better equipped to reach 16 releases within three years [Q5 & Q9]

The lack of capabilities for manual testers is compounded by the time required for testing to reach this target. Currently, 47% of manual testing teams will need at least an additional 32 weeks of testing, meaning that it will be impossible to reach the proposed annual release cycle within three years. As a result, manual testing teams will have to reduce the number of required releases if their testing methods do not change.

Current manual testing time will prevent retailers from reaching the goal of 16 releases

[Q9 & Q11]



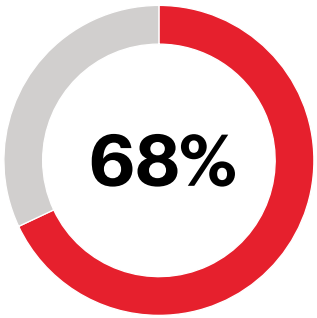
The expectation of more releases also carries implications for testing across systems and the need to improve regression testing accuracy. Sixty-eight percent of retailers with six or more back-end systems and 66% with six or more peripheral devices also expect to release 16 times or more every year.

Considering that most manual testing teams can release seven times a year, more than doubling the frequency highlights the critical role automation must play now and in the future.

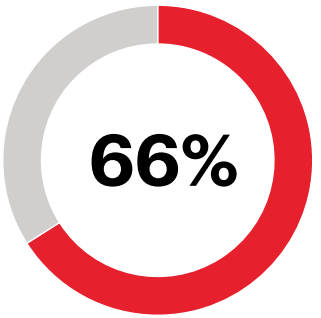
Automation not only overcomes the challenges posed by increased frequency but also delivers more comprehensive testing across all integrations and improves accuracy when identifying critical defects.

Percentages of retailers with six or more integrations expecting releases to increase in the future [Q6, 7, & 9]

Six systems or more



Six peripheral devices or more



CONCLUSION

Checkout Success: Speed, Quality, and Cost Savings

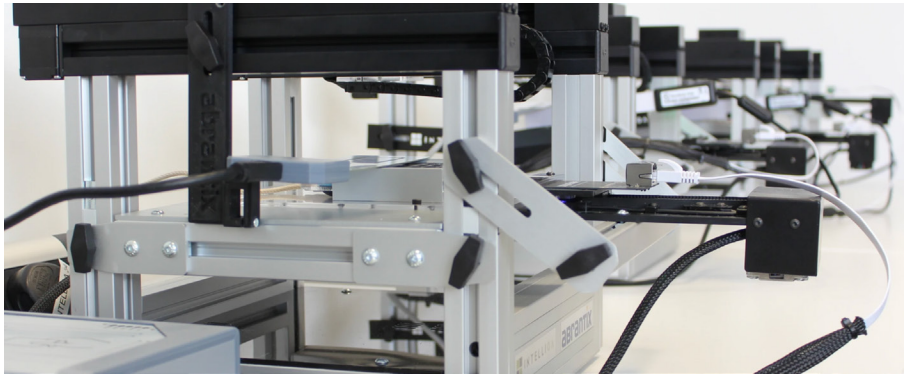
Checkout Success: Speed, Quality, and Cost Savings

The evidence in this report strongly suggests that automation capabilities can overcome manual testing obstacles to meet the increasing demand on QA teams. In an industry where customer and business stakeholders have high expectations for software teams, achieving speed and quality is often impossible.

Retailers need a technology-agnostic solution to eliminate this conflict. They must deliver bug-free software at speed while meeting requirements and adequately testing any platform — inventory, mobile, fuel pumps, payment devices, and more — to avoid technology fragmentation associated with POS integrations.

The adoption of Keysight Eggplant, combined with robotics, has empowered retailers to meet and exceed these expectations. Eggplant's automation capabilities have saved retailers time, accelerated releases, and aligned testing more closely to the demands of consumers and business stakeholders.

When comparing the average of 177 regression test cases achieved by some automation platforms, Eggplant is an outlier. One of Keysight's customers, grocery store chain Albertsons, has automated over 800 tests for its core POS regression suite and payment certification.



Moreover, by removing the need for human intervention with integrated robotics from IntelliQA, QA teams can test a broader range of transaction types, payment methods, and peripheral devices with precision and repeatability.

> Watch *Transforming the Checkout Experience with AI and Robotics* to see how Albertsons achieved such a feat.

Automated exploratory testing enables retailers to increase test coverage by uncovering every critical path and defect. This approach ensures that any release has been rigorously tested and optimized for the in-store experience.

Finally, the ability of Keysight Eggplant to significantly reduce the number of defects and test new features and capabilities delivers dramatic cost savings of $6.6 million over three years.

> To automate end-to-end POS testing, try Eggplant today.

Appendix

About the study

The findings presented in the report draw from an online survey conducted by NRF SmartBrief in September 2023.

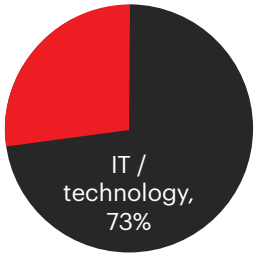
Demographics

The study analyzes the perspectives of individuals who play significant roles in shaping their organizations' software testing strategies:

- Seventy-three percent work in software or retail systems and application roles.
- Seventy-five percent hold positions at or above the manager level.
- Sixty-seven percent are primary decision-makers or have significant involvement in software development and testing.

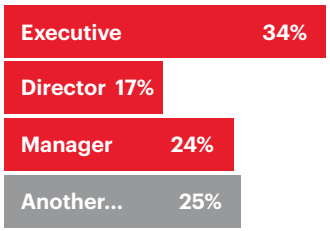
Job role (Q17)

73%
work in IT or technology function



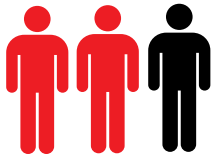
Seniority (Q18)

75%
hold a position at or above the manager level



Responsibility (Q19)

67%
are primary decision-makers in software testing



Current testing approach

This study examines the effectiveness of testing approaches for POS software across retailers in North America.

- Seventy-two percent use manual methods, while 28% use a third-party automation tool.
- While the most common team size is between 1 and 10 people, the average team size is 21 people.

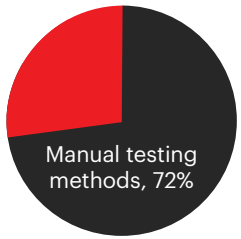
Methodology

NRF SmartBrief collected responses from 573 qualified US retail professionals in IT and technology or executive leadership positions. Participants met specific criteria, including holding decision-making or decision-influencing positions in software quality assurance, testing, and testing strategies.

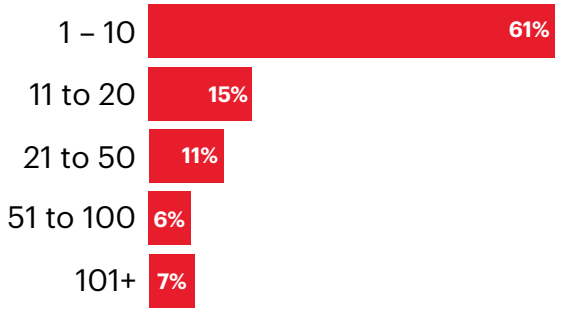
We made every effort to ask the most relevant questions to the software testing community and share the valuable insights we received from their responses. While we do not present this report as scientific research, these findings can provide helpful information and stimulate further discussions and collaborations on continuous improvement and innovation in this area.

Testing methods (Q1)

72%
work in IT or technology function



Testing team size (Q10)



Survey Questions

1. What testing solution is your organization using for POS today?

- Manual
- Third-party test automation platform

2. How many systems integrate with your POS platforms, such as inventory, CRM, and logistics?

- 1 – 2
- 3 – 5
- 6 – 10
- 11 – 15
- 16 – 20
- 21 – 25
- 25+

3. How many peripheral devices integrate with your POS platform?

- 1 – 2
- 3 – 5
- 6 – 10
- 11 – 15
- 16 – 20
- 21 – 25
- 25+

4. How many POS releases do you deploy per year?

- 1 – 2
- 3 – 5
- 6 – 10
- 11 – 15
- 16 – 20
- 21 – 25
- 26 – 49
- 50+

5. What do you expect your release cadence to be three years from now?

- 1 – 2
- 3 – 5
- 6 – 10
- 11 – 15
- 16 – 20
- 21 – 25
- 26 – 49
- 50+

6. How often are releases delayed or canceled due to critical defects?

- 0%
- < 25%
- 25% – 50%
- 51% – 75%
- 76% – 100%

7. How many worker-hours are necessary for testing per typical release?

- Half day
- 1 day
- 2 – 4 days
- 1 week
- 2 weeks
- 2 – 4 weeks
- 4 weeks+

8. On average, how many regression test cases do you typically perform for each release?

- < 50
- 50 – 100
- 101 – 200
- 201 – 500
- 500 – 1,000
- 1,000+

9. How many worker-hours are necessary for regression testing per typical release?

- Half day
- 1 day
- 2 – 4 days
- 1 week
- 2 weeks
- 2 – 4 weeks
- 4 weeks+

10. How large is your testing team?

- 1 – 10
- 11 – 20
- 21 – 50
- 51 – 100
- 101+

11. What is the biggest challenge when manually testing your POS systems?

- Testing new features
- Payment method validation
- POS usability
- Peripheral device integration
- Identifying critical defects
- Front-end to back-end testing

14. How satisfied are you with your existing testing capabilities (1 [not very satisfied] to 5 [very satisfied])?

- Scalability of current testing framework
- Ability to meet all test requirements before release dates
- Ability to develop test coverage across POS and connected devices
- Ability to automate workflows to increase job satisfaction and productivity
- Generation of testing analysis data
- Integration with existing stack
- Data-driven testing

15. What benefits are you seeking to improve by introducing automation?

- Fewer defects
- Faster deployments
- Reducing testing costs
- Freeing up staff time and resource
- Increase feature releases
- Front-end to back-end testing

16. When considering a test automation tool, which of the following would be most important?

- Low-code testing
- Peripheral device testing
- Testing across multiple systems, devices, and browsers
- Increased accuracy for repetitive tasks
- GUI testing
- Mobile testing

17. How would you describe your job function?

- Software development
- IT / technology
- Quality assurance / testing
- In-store systems
- Retail applications
- Operations

18. What is your current position?

- Executive leadership
- Director
- Manager
- Another role

19. Which best describes your role in decision-making regarding software quality assurance and testing?

- I am the primary decision-maker.
- I have significant involvement.
- I have visibility but no influence.
- None of the above; I am not involved.

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