



Vital Signs

Key trends and projections for software testing in healthcare
A Keysight study in collaboration with HIMSS

eBook

 **KEYSIGHT**



Contents



CHAPTER 1

Background





Executive Summary

Today's electronic medical records (EMR) system holds the key to a person's health history. But with great responsibility comes great risk — one tiny flaw can derail compliance and put patients in peril. That's why Keysight Technologies commissioned the Healthcare Information and Management Systems Society (HIMSS) to conduct a study of major US healthcare providers about their software testing practices and plans. This report provides vital signs of current challenges and trends in healthcare software testing. It highlights the following:

A paradox that places patients at risk:

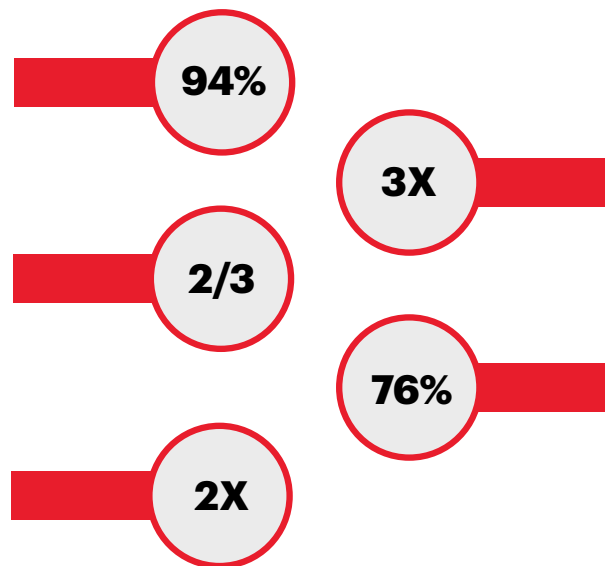
Although healthcare providers have zero room for error, **94%** of decision-makers acknowledge that insufficient testing threatens patient lives.

A silent epidemic:

Manual and do-it-yourself (DIY) approaches are hindering **two-thirds** of organizations' scalability in testing.

A cure in sight:

Test automation platforms improve quality, consistency, and coverage where it matters most. Early adopters achieve satisfaction rates over testing scalability and analytics that are **twice** as high as manual or DIY testing approaches.



A grand ambition:

Predictions are that the adoption rate for automated software testing and advanced test analytics will **triple** in five years.

A wave of new regulations:

Interoperability testing is the most important capability of a test automation tool, according to **76%** of respondents.

At Keysight, we share your dedication to bringing quality care to everyone and are committed to building intelligent test automation solutions tailored to your specific objectives. With this report, we have identified three critical considerations for those who are transitioning to automated testing for the first time or seeking to upgrade their current tools with a platform approach:

- Understanding evolving healthcare quality assurance requirements.
- Ensuring tools' capabilities to test interoperability.
- Focusing on long-term productivity improvement.





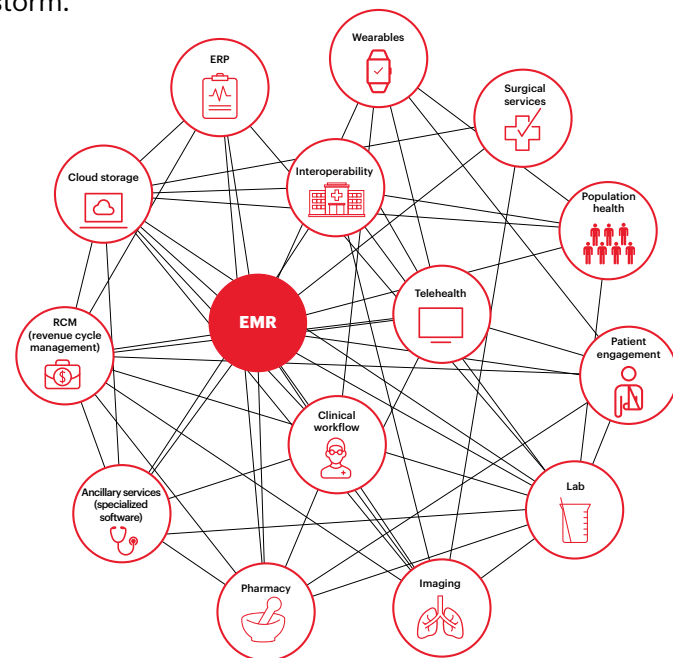
Background

A Digital Perfect Storm

Driven by a pandemic-related surge in virtual connectivity, an increasing number of healthcare organizations strive to accelerate their digital transformation to gain a competitive edge. Those that can effectively harness new technologies such as virtual care, data analytics, and artificial intelligence can expect to tap into \$1.6 trillion in business value.¹ Against the backdrop of a high-stakes digital race, organizations are facing exponential software growth.

Today's healthcare software ecosystem, including electronic medical record (EMR) systems, picture archiving and communication systems, telehealth applications, and wearables, contributes approximately 30% of the world's data.² Ensuring the quality of this ever-growing digital landscape requires an enormous investment of expertise, time, and money.

Healthcare quality assurance (QA) leaders are under immense pressure to scale up testing, tackle acute talent shortages, and prepare for increasingly strict regulations on protected health information. However, there is a path for healthcare QA leaders to weather the digital storm.



About the Study

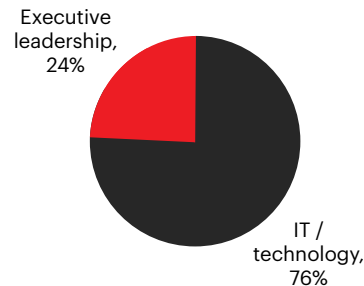
Demographics

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

- Seventy-six percent of the participants work in IT or technology roles
- Eighty-two percent hold positions at or above the manager level.
- Thirty-three percent are primary decision-makers in software testing; the remaining respondents have significant involvement in and influence over decisions.

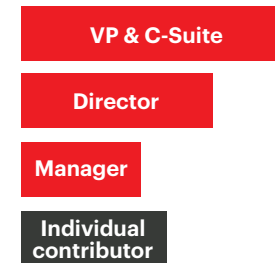
Job role (Q2)

76%
work in IT or
technology
function



Seniority (Q3)

82%
hold a position at
or above the man-
ager level



Responsibility (Q4)

33%
are primary
decision-makers in
software testing



Firmographics

The firmographics of the study encompass the following three aspects.

Firstly, over half of the participants use Epic as their primary electronic medical record (EMR) software vendor, followed by Oracle Cerner (18%) and MEDITECH (15%). This characteristic is consistent with KLAS Research's 2022 report on EMR purchasing activity, which identified Epic, Cerner, and MEDITECH as US healthcare providers' top three EMR choices.³

Secondly, forty-seven percent of respondents work at organizations that operate multiple hospitals or healthcare facilities. HIMSS Analytics reports that US hospitals, especially those with affiliated practices, have multiple EMR instances in use.⁴ This finding suggests that our study holds relevance for QA teams grappling with numerous systems.

Finally, sixty-two percent of organizations have more than \$1 billion in annual net revenue, indicating that the findings include large healthcare organizations.



EMR platform

51%

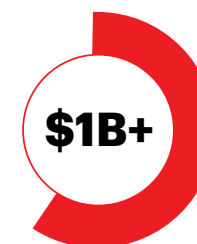
of the organizations
use Epic, 18% use
Cerner, and 15% use
MEDITECH^(Q13)



Worksite

47%

of the
respondents
are from multi-
hospital systems^(Q1)



Annual net revenue

62%

of organizationsⁱ
have \$1B+
in annual net
revenue^(Q5)



CHAPTER 2

A Paradox Putting Lives at Risk



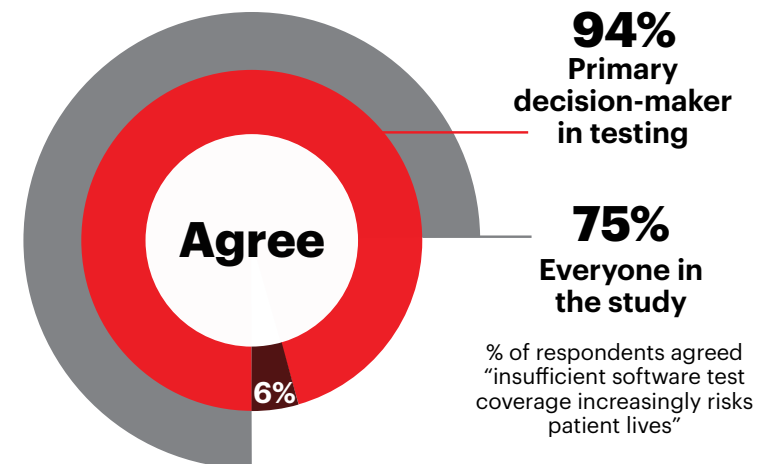
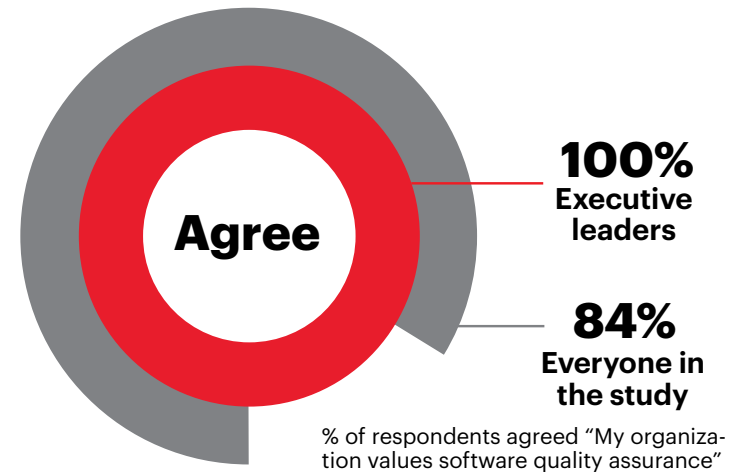
A Paradox Putting Lives at Risk

Healthcare software quality is paramount to quality care and patient safety. However, a troubling paradox exists at the heart of today's healthcare software testing practices.

Although 100% of healthcare executive leaders claim software quality assurance is a priority, just 6% of primary decision-makers in testing are confident that testing coverage is sufficient to minimize the risk to patient lives.

Executive leaders claim quality assurance is a top priority, but only **6%** are confident that their testing practices are thorough enough to minimize patient risks.

A paradox in the field of healthcare software testing ^(Q7)



The Significance of EMR Testing

One area where inadequate healthcare software testing can have disastrous consequences is electronic medical record (EMR) systems, which play a central role in storing, tracking, and sharing crucial patient data.

Today's EMR systems are becoming increasingly customized and interfaced, with quicker upgrade cycles. Each patch or upgrade can introduce bugs or vulnerabilities. Furthermore, changes to one part of the system could have interdependent effects across modules and instances from disparate vendors. The increasing integration of EMR systems with connected medical devices and other healthcare software compounds the risks. Thus, patient safety risk is increasingly tied to software glitches, user errors, or other flaws.⁵

For instance, a 2020 study found that EMR systems failed to detect up to 33% of drug interactions and medication errors that could injure or kill patients.⁶ One reason is that hospitals customize their EMR systems to meet their unique requirements, making it difficult to keep up with the latest updates. Consequently, a serious drug interaction that triggers an EMR system warning at one hospital could fail to do so at another.

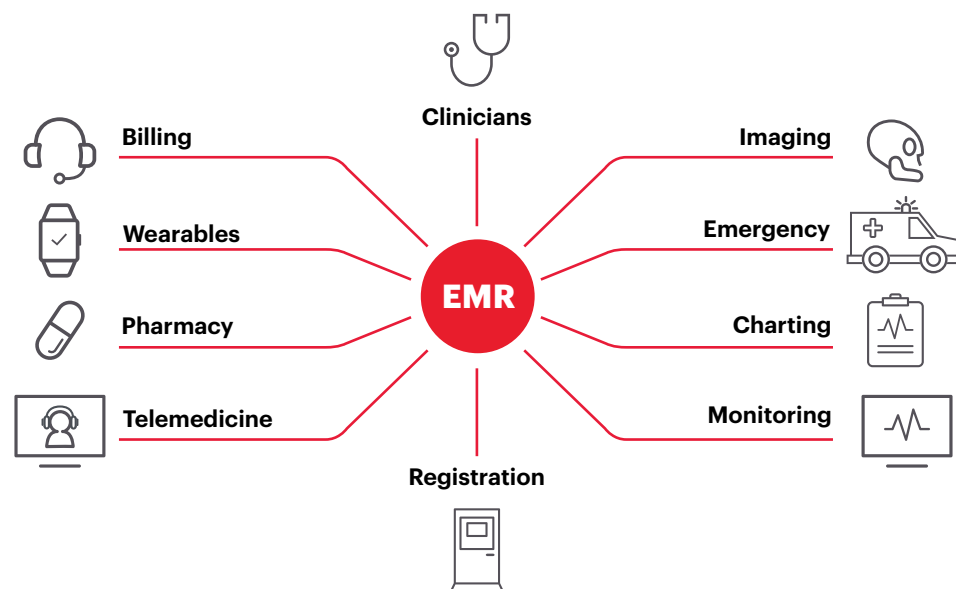


Moreover, healthcare software testing is becoming increasingly complex as patient information flows through multiple integrated systems, not just EMR systems. High-volume patient data must be reliably accessible from disparate systems through Health Level Seven (HL7) and Fast Healthcare Information Resources (FHIR) interface messages. There are too many components for an army of human testers to cover. But the digital challenges are not insurmountable. Latest advancements in automation intelligence are key to unlocking greater efficiency in software testing.

A 2020 study finds electronic medical records (EMR) systems missed up to **33%** of dangerous drug interactions and other errors.

Source: JAMA Open Network

EMR systems operate as a central hub of data for healthcare organizations



Impact goes beyond patients

The reliance of physicians and nurses on healthcare software systems to provide care exacerbates the risks associated with the healthcare software testing paradox.

According to the survey findings, software quality affects physicians and nurses the most. This issue is even more significant at smaller organizations with annual revenue of less than \$1 billion, where 52% of respondents indicate that the software they test primarily affects physicians and nurses.

Impact No. 1: EMR-triggered burnout

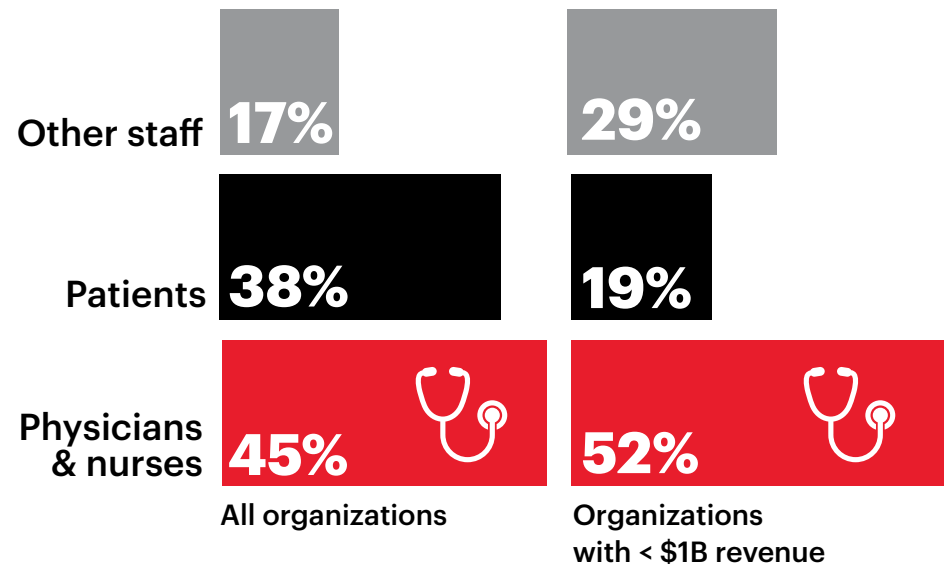
Studies have shown that EMR functionality and usability issues have a statistically significant positive correlation with physicians' stress and burnout.⁷ Given that physicians work long hours, often in stressful situations, the percentage of US doctors experiencing symptoms of burnout reached an all-time high of 63% in 2021.⁸ To alleviate the burden of dealing with EMR quality issues, it's crucial to conduct thorough testing for the optimal end-user experience.

Studies have shown that EMR functionality and usability issues have a statistically significant positive correlation with physicians' stress and burnout.

Impact No. 2: Disrupted clinical operations

The impact of inadequate software testing on physicians and nurses goes beyond frustration with the software and lost productivity. Malfunctioning EMR systems or downtime can cause significant disruptions to clinical workflows, resulting in delayed treatment, misinterpretation of data, incorrect diagnoses, and, ultimately, loss of patients' trust in the providers.

% of respondents indicated which users were impacted by the quality of the software they used ^(Q15)





CHAPTER 3

A Silent Epidemic

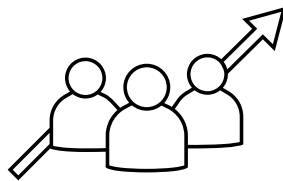


A Silent Epidemic

The increasingly rapid pace of updates in electronic medical record (EMR) systems presents a formidable challenge for quality assurance teams across the healthcare industry.

The common symptom

Software testing leaders must keep up with evolving requirements, from functionality and interoperability to usability and performance. Unfortunately, amid this expanding to-do list are limited testing resources.



3 in 4

Providers have increased time and money spent on testing since 2021 ^(Q7)

In the past few years, healthcare providers have made concerted efforts to invest in software testing. Three-quarters of survey respondents indicate that they have been allocating more resources to this critical area.

Despite these efforts, nearly two out of three respondents said their team did not have enough resources (time, budget, or talent) to scale software testing for the future. This bottleneck could manifest in various ways, such as slow software delivery times, critical EMR defects, EMR-triggered burnout, and more.

2 in 3

Providers lack the resources to scale testing for the future ^(Q7)



Two out of three providers surveyed face significant scalability challenges in software testing.

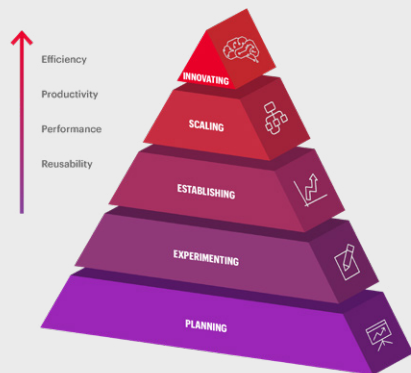
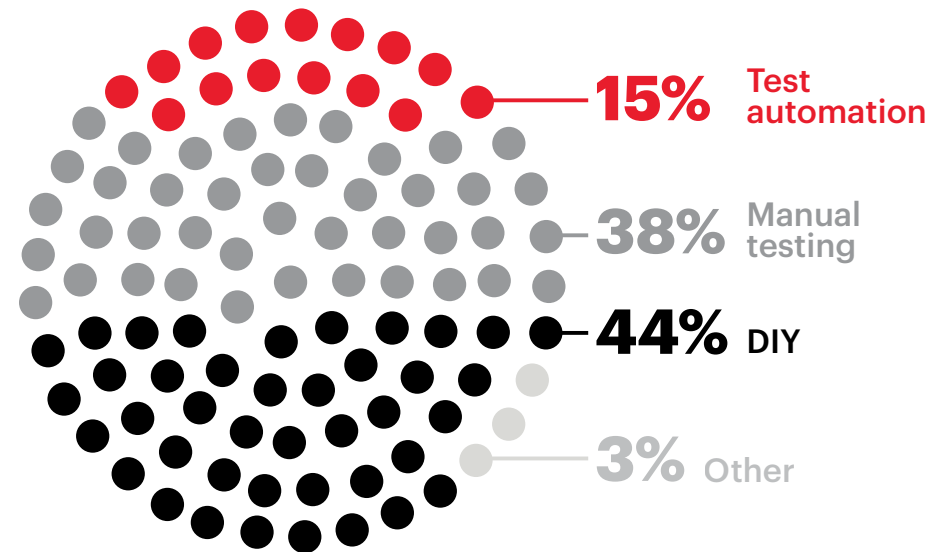
The main cause

A closer examination of the underlying causes of the scalability issue reveals that the healthcare industry's heavy reliance on manual and do-it-yourself (DIY) testing methods could be one major contributing factor.

- Only 15% of the providers surveyed can access third-party test automation platforms.
- Forty-four percent use a DIY approach, maintaining in-house testing solutions.
- Thirty-eight percent use manual approaches, where the software testing teams go through repetitive tasks from test case creation to maintenance to identify defects.

The healthcare industry lags other industries in applying software test automation practices. Most US healthcare providers (over 80%) cling to traditional approaches created 15 to 20 years ago, inevitably leading to scalability issues.

Distribution of software testing approaches across US healthcare providers ^(Q14)



Healthcare customers benefit from Eggplant Test to unlock HIPAA-compliant AI-powered test automation, freeing up to **92%** of testing hours.

EBOOK. Discover the five proven steps



A detailed diagnosis

While healthcare quality assurance (QA) teams widely use manual and DIY approaches to test electronic medical (EMR) systems, both present significant challenges.

How manual testing bruises QA teams

The manual testing approach faces three significant challenges: scalability, test data generation, and cross-platform testing coverage.

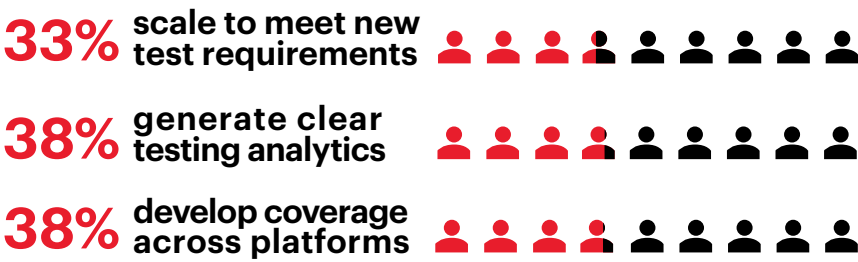
The first challenge arises from more frequent releases of EMR systems. Fine-grained manual scripts detailing every step of the test case present serious scalability problems. Only 33% of manual testers are satisfied with their organizations’ ability to scale to address emerging test requirements.

The second challenge lies in the inefficiency of test data generation. With the adoption of disparate technologies and configurations, managing test data manually has become a resource-heavy task. As a result, more than three out of five manual testers in the study are not satisfied with their organizations’ ability to provide clear and actionable test data for enhancing testing efficiency and accuracy.

The third challenge confronting the manual testing approach stems from its unreliability in an increasingly integrated healthcare software landscape. The integration of legacy systems with different versions of EMR systems and other modern healthcare applications has made software test requirements more intricate. A single software defect can have a far-reaching impact across multiple systems, while different systems must communicate and exchange data seamlessly and securely.

However, manual testing approaches often struggle to keep up with the constant and simultaneous changes in multiple interconnected components. Therefore, only 38% of manual testers are satisfied with their organizations’ ability to develop test coverage across all devices and browsers.

Percentage of respondents using manual approaches who are satisfied with their organizations’ capabilities in specific areas ^(Q10)



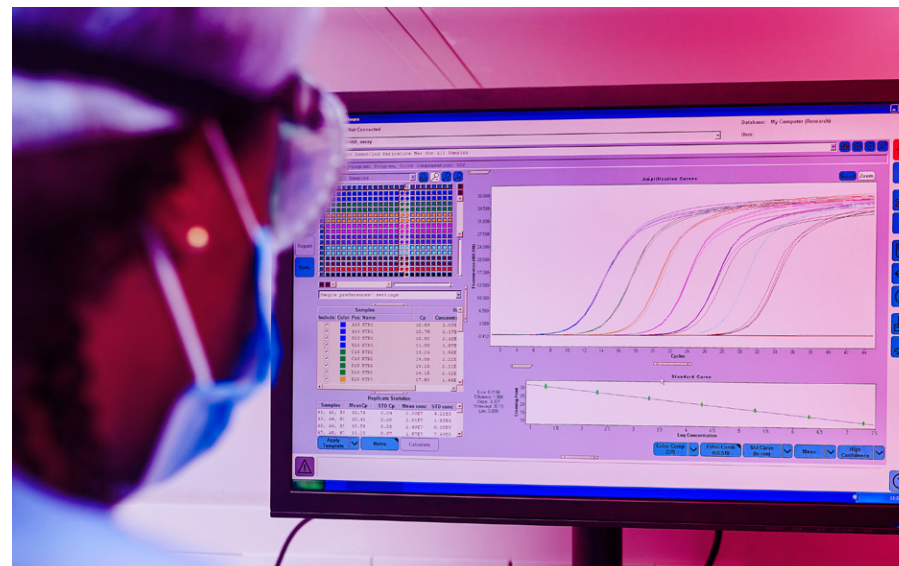
DIY approach: *aegrescit medendo*

The DIY testing approach: adopted by 44% of healthcare organizations, may seem like an attractive option with open-source tools and libraries. However, this approach calls to mind the Latin proverb *aegrescit medendo*, which means the cure is worse than the disease.

The survey finds that hidden costs and unforeseen maintenance challenges can make the DIY testing approach untenable and counterproductive in the long run. One of the biggest hurdles of DIY is the requirement of extensive technical expertise and a steep learning curve.

Healthcare organizations often struggle to find the necessary in-house talent to build test cases from scratch and maintain them effectively. Without substantial expertise in test automation frameworks, handling the intricate processes of test creation, execution, and test case management can be overwhelming.

Aegrescit medendo is a Latin proverb that means the remedy or cure is worse than the disease.



The result is poorly constructed test cases, incomplete test coverage, and inconsistent results.

In some cases, software testing teams may think the DIY is a less expensive option, only to discover invariably wind up needing additional functionalities requiring new custom modules or coding. This can lead to delays in software releases, increased testing costs, and potential risks to patient safety.

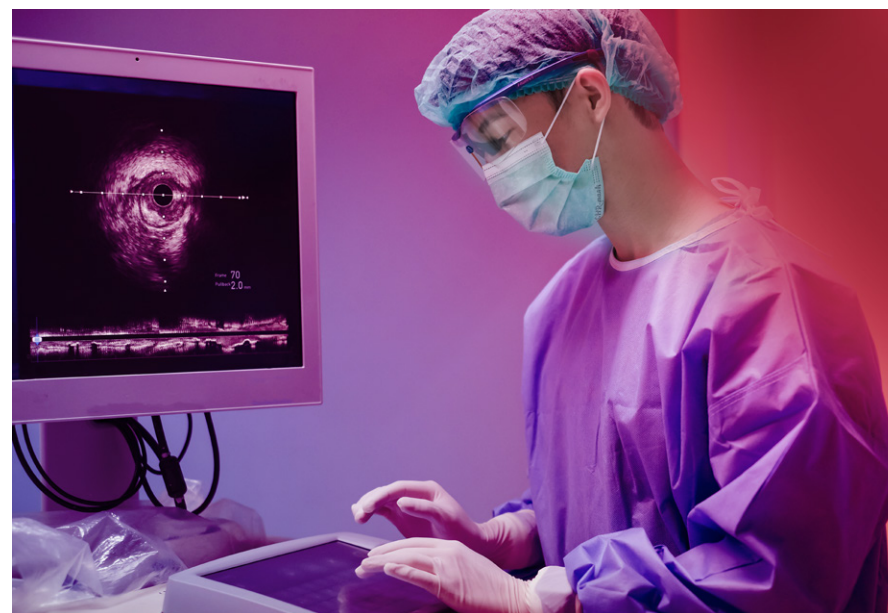
Percentage of respondents using manual (left) and DIY (right) testing approaches who are satisfied with their organizations' capabilities in specific areas^(Q10)

Manual processes	VS.	DIY processes
43%	Increase QA job satisfaction & productivity	38% ↓ 5 pts
48%	Meet all requirements prior to releases	38% ↓ 10 pts
33%	Scale to meet new test requirements	38%
38%	Develop coverage across platforms	46%

Only 38% of the respondents using DIY testing approaches report satisfaction with their organizations' ability to enhance QA team job satisfaction and productivity — 5 percentage points lower than manual testing approaches.

Moreover, as EMR systems adopt more frequent release cycles, test cases require updates to ensure accuracy and efficacy. Maintenance becomes increasingly laborious, especially when the test cases cover multiple devices, operating systems, and platforms.

Thus, only 38% are content with their organization's ability to meet all prerelease requirements — a satisfaction rate 10 points lower than that of organizations using manual approaches.



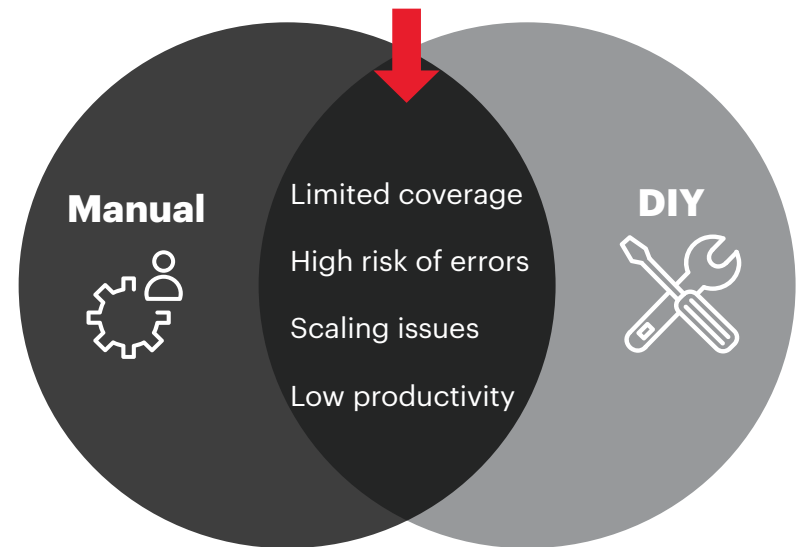
Both data points indicate that the DIY testing approach may not be as efficient as initially thought and could ultimately lead to productivity loss. In addition, consider the opportunity cost of allocating constrained technical resources to build an in-house testing solution.

The reality is that the shortage of IT workers in the US will reach 1.2 million across industries by 2026.⁹ Moreover, experts in specific domains, such as EMR systems and healthcare interoperability, are even more scarce. It is crucial to allocate limited time to things software engineers are uniquely qualified for to ensure the organization's long-term digital transformation progress.

Did you know you can let AI-powered test automation tools drive the software the same way a clinician does now? See how Eggplant Test leverages a **digital twin model** and machine learning to realize end-to-end EMR test automation.

Product tour. See how it works

Common issues with manual & DIY approaches (where satisfaction rate < 50%)^(Q10)



Manual testing: Trained testers create and execute test cases through various testing techniques, such as regression testing, integration testing, and performance testing, to ensure that the EMR systems perform properly and meet regulatory requirements.



DIY approach: In-house teams develop and execute test cases using open-source tools and test automation frameworks such as Selenium. Though it allows for lower upfront costs, DIY requires significant technical expertise and time investment.



CHAPTER 4

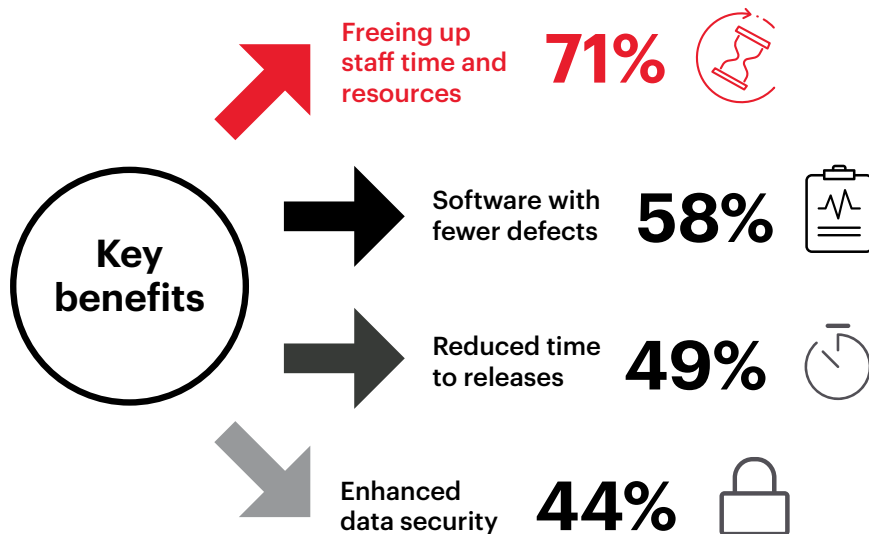
A Cure in Sight



A Cure in Sight: Test Automation

While healthcare organizations are in dire need of testing scalability and efficiency, the true benefits of test automation transcend these goals. The study reveals what healthcare software testing professionals consider the most critical benefits to their organizations today.

Top benefits of test automation for healthcare ^(Q1)



Freeing up staff time and resources

Seventy-one percent of respondents say the top benefit of test automation is freeing up staff time and resources, a critical advantage for healthcare providers facing workforce shortages in technical and nontechnical areas.

By eliminating repetitive tasks and simplifying workflows, test automation enables software testing professionals to expedite the time to release. In addition, automation allows business testers to concentrate on pressing clinical tasks that demand their expertise. According to McKinsey, healthcare organizations can unlock more than \$1 trillion in value by proactively redesigning their processes for speed, accelerating productivity improvements, and reallocating constrained resources.¹⁰ Embracing test automation can be critical to achieving these objectives in the digital health era.

Fewer defects and reduced time to releases

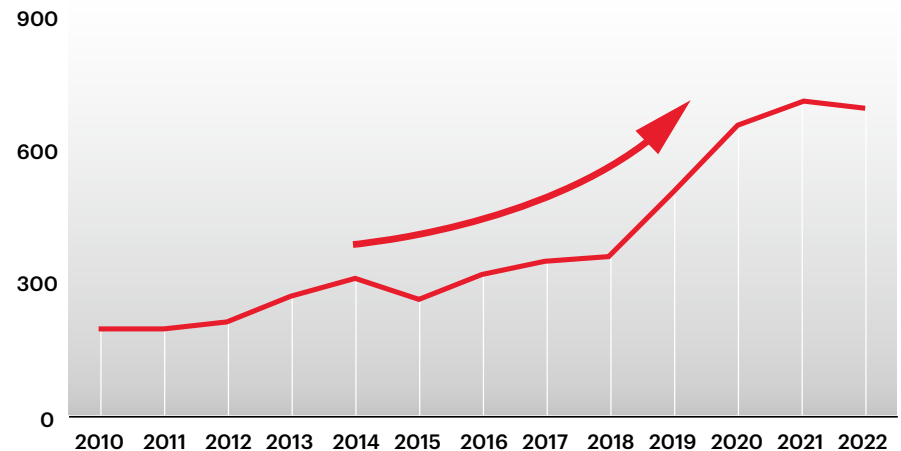
The second and third perceived benefits of test automation solutions are enhanced quality (58%) and speed (49%).

Modern test automation platforms with features powered by automation intelligence streamline the EMR testing process, from test case creation to execution and reporting. In addition, these tools can quickly address gaps in providers' testing practices, enabling QA teams to perform their existing tests more consistently and test more extensively than with manual or DIY approaches. For example, tools like Eggplant Test use low-code models, intelligent vision, and machine learning to test the patient journey from the end user's perspective. This process ensures coverage and minimizes patient risks associated with software issues.

Enhanced data security

Healthcare is more at risk of data breaches than ever, with more than 300 million healthcare records reportedly exposed or impermissibly disclosed in the past decade. According to the *HIPAA Journal*, in 2022, organizations reported almost two healthcare data breaches of 500 or more records each day.¹¹ Concerns about patient data security and privacy are at an all-time high, putting tremendous pressure on healthcare IT leaders, particularly those with lean QA teams that lack proper test automation tools to ensure sufficient EMR testing coverage.

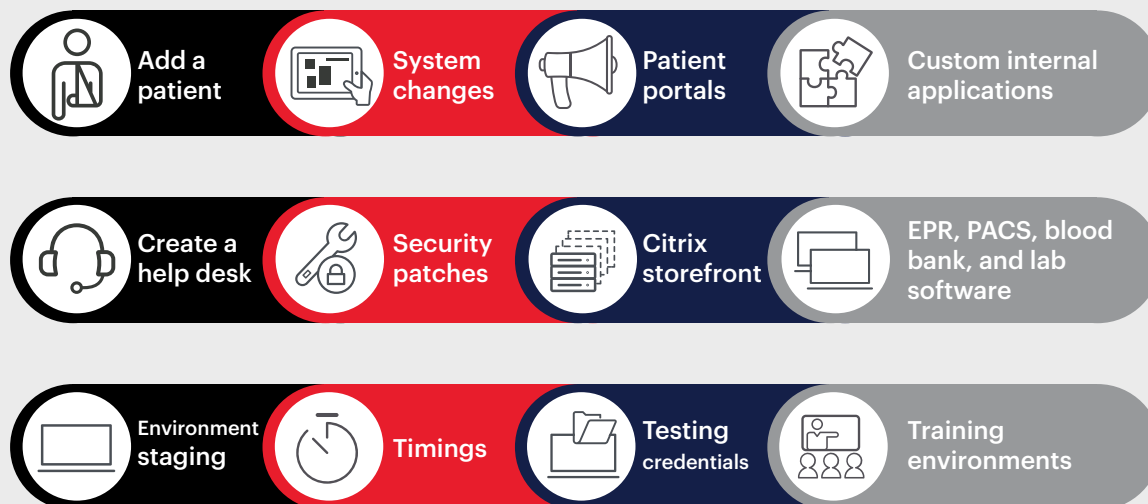
Number of data breaches of 500+ records



Source: HIPAA Journal

According to the study, 44% of respondents believe that test automation platforms are vital to enhancing data security. By integrating test automation tools into a continuous integration and continuous deployment pipeline, QA teams can run security tests whenever code changes occur. This process enables them to detect and address security issues early in the development process. In addition, cybersecurity tools such as breach and attack simulation applications can help find these issues by simulating a range of cyberattack-based tactics, techniques, and procedures (TTPs), such as MITRE ATT&CK, to measure network, email, and endpoint security posture.

Test EMR and beyond ☒



Healthcare organizations that use **Eggplant Test** achieve greater efficiency beyond automated EMR testing. Eggplant Test enables domain experts to access, test, and stage various activities in minutes, bringing automation benefits at the enterprise scale.

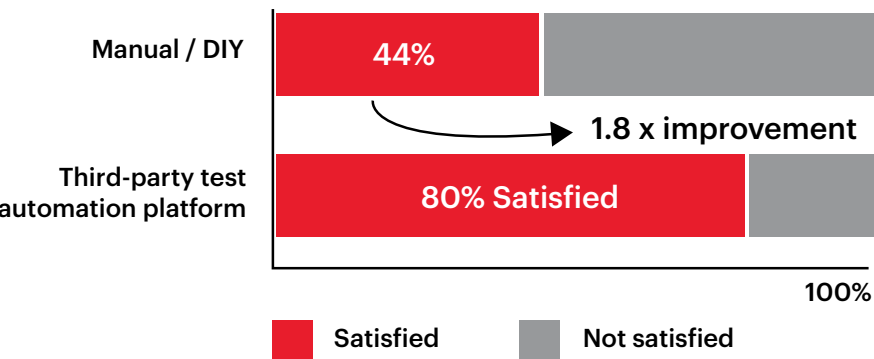
Demo. Get a customized demonstration



Test Automation Manual / DIY

In the digital age, healthcare organizations stay competitive by unlocking the value of data analytics and adapting to new requirements — more effectively and securely than their peers. The study uncovers how third-party test automation platforms have significantly affected these two areas.

% of respondents satisfied with their organizations' ability to generate clear testing analytics ⁱⁱ (Q10)



Putting test data to work

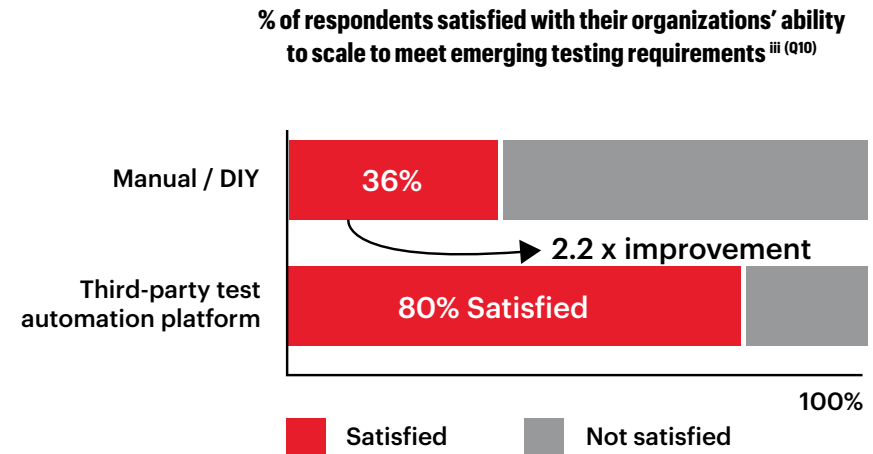
Test automation platforms can provide reliable, easy access to actionable test data, allowing quality assurance teams to identify issues and develop more effective test cases quickly. Organizations adopting test automation platforms experience a significant increase (1.8x) in the percentage of respondents satisfied with test analytics compared to those using manual or DIY testing approaches.

Furthermore, the latest automation intelligence and big data advancements enable test automation platforms like Eggplant Test to generate predictive insights on release readiness and identify critical areas to prioritize resource allocation, further enhancing testing efficiency and accuracy.

Scaling to meet new requirements

Even simple clinical processes like patient registration have become complex, often crossing multiple systems and platforms. An average healthcare application could have tens of thousands of user journeys that need testing. When multiplied by hundreds of devices, platforms, and operating systems, the result is massive test requirements that can be overwhelming to tackle with manual or DIY approaches.

The study shows that fewer than 40% of the respondents using manual or DIY testing approaches are satisfied with their organizations' scalability to meet emerging testing requirements. However, test automation platforms can boost respondents' satisfaction by 2.2 times.



These platforms can handle complex testing requirements efficiently for large organizations with multiple hospitals and affiliated facilities. Large organizations often have different EMR instances across various sites. With test automation platforms in place, they can reuse test assets, eliminating repetitive processes and saving testing costs.

Test automation platforms also benefit smaller organizations with limited resources or budgets. They can expand their testing coverage to meet new requirements and remain resilient in the ever-evolving digital healthcare markets.



Success story: The University of Michigan Health System (UMHS) needed a low-code test automation platform to roll out its EMR system on Citrix. With Eggplant Test, UMHS' QA team succeeded in accelerating multiple processes. For instance, it has reduced the time to create a single new patient registration from 10 minutes to 90 seconds.

Case Study. [Read more.](#)

Ready or Not, Interoperability Is Here

In recent years, interoperability in healthcare has gone from a best practice to a mandate. Countries like the US and Canada have extensively implemented Fast Healthcare Information Resources standards as a healthcare data standard framework to facilitate interoperability. This has led to a significant shift in priorities when selecting test automation tools for healthcare software.

76% of respondents identify the most important capability of a test automation platform as interoperability testing, followed by cross-platform testing and performance testing at 51% each.



Most required capabilities of test automation platforms in healthcare software testing^(Q12)



Percent of respondents who indicated specific feature of a test automation tool as most important

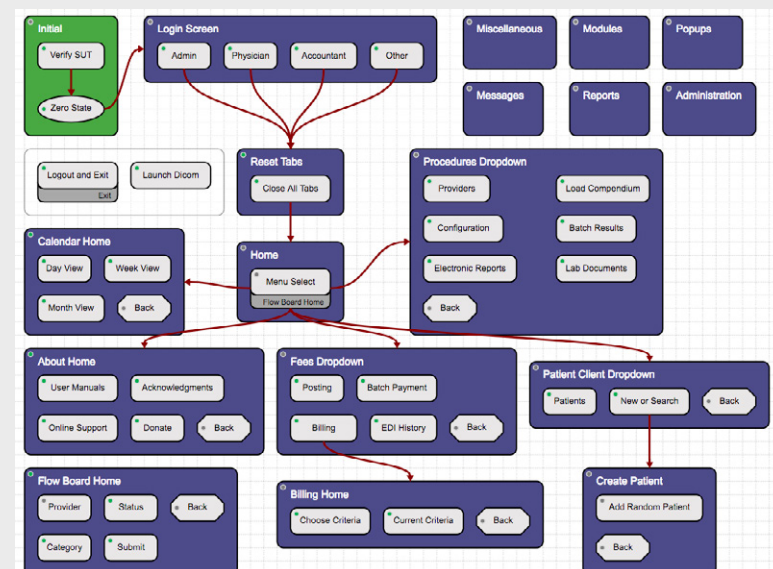
These three capabilities play a critical role in ensuring that healthcare software performs correctly on various platforms while maintaining seamless data exchange:

- Interoperability testing assesses the ability of various healthcare software to exchange data smoothly and securely, regardless of underlying technologies or architectures.
- Cross-platform testing ensures that every healthcare software and its components work properly on different devices, platforms, and operating systems.
- Performance testing allows developers to detect the speed, scalability, and stability issues of EMR systems under peak load conditions. As patient data grows exponentially, this process helps them avoid potential scaling problems and plan adjustments to their infrastructure accordingly.

By using test automation platforms with these capabilities, healthcare providers can ensure their EMR systems and other supporting healthcare software are well-equipped to face emerging interoperability regulations.

To meet the demand for interoperability, healthcare organizations use technology-agnostic test automation platforms like Eggplant Test. QA teams can test various applications on any device or operating system at any layer, from the UI to APIs to the database, to ensure seamless data exchanges between disparate systems.

Video. See it live.





CONCLUSION

Looking into the Future





Looking into the Future: A Five-Year Ambition

As healthcare organizations continue to push digital initiatives, manual and do-it-yourself (DIY), testing approaches become increasingly unsustainable. Quality assurance leaders face increasing pressure to automate software testing and implement advanced test analytics.

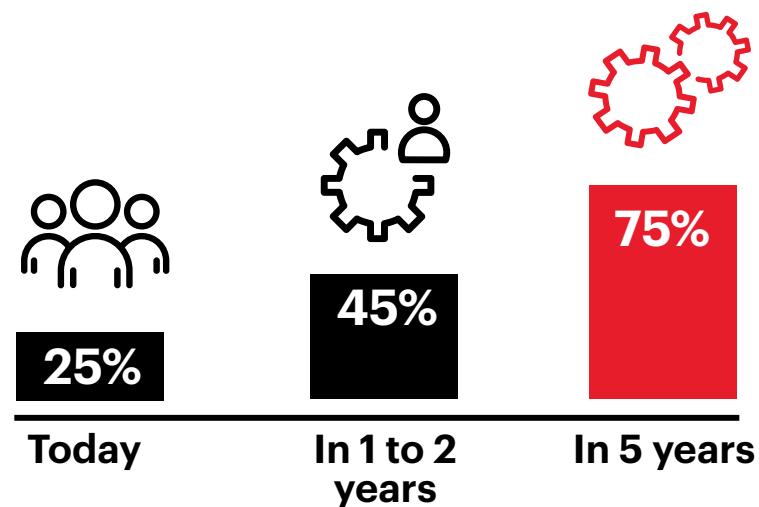
Adopting test automation

Projections indicate that in the next five years, the percentage of healthcare providers using mainly automated software testing will jump from 25% to 75%.

Currently, only a quarter of the respondents use a primarily automated approach to software testing. Moreover, smaller providers face even greater challenges in testing efficiency, as more than one out of five providers with fewer than 7,500 employees report a completely manual testing approach.

Despite economic uncertainties, 81% of healthcare professionals say they are aiming towards a heavier focus on automated software testing in the next one to two years, and 45% believe their organizations will achieve primarily automated testing within this timeframe.

Percentage of healthcare providers using primarily automated software testing will triple ^(Q8)



Advancing test analytics

For healthcare software testing teams, test data can be both an asset and a liability.

On the one hand, when properly managed, it can provide valuable insights into software performance and help prioritize testing efforts. As the permutations of intricate parameters of EMR systems grow rapidly, measuring what matters is becoming increasingly critical. With automation intelligence, testing teams can better understand software performance and prioritize tests based on real-time analytics.

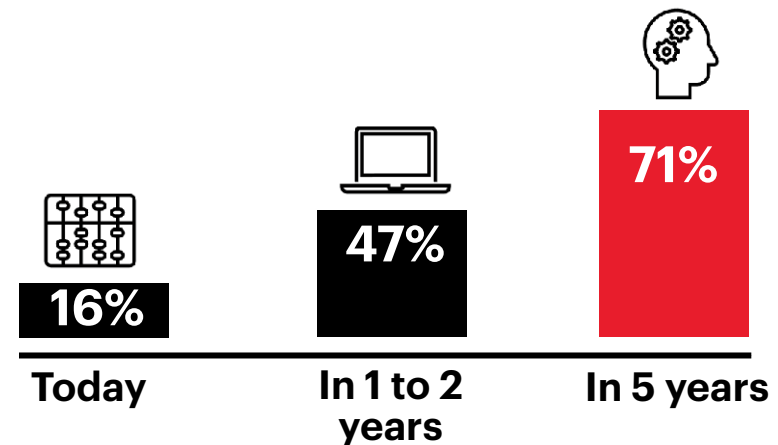
On the other hand, poor test analytics quality can lead to inaccurate results as testing scenarios fail to resemble real-world situations. Unfortunately, there is a major gap between what healthcare providers want regarding test data quality and what they are doing to address it.

Only 16% of respondents can access automated, real-time analytics to manage tests, and none use artificial intelligence-driven analytics to inform testing strategies. In addition, nearly 60% of those who use manual testing approaches do not have centralized dashboards to manage test data.

But there is hope on the horizon. Nearly half of the healthcare providers surveyed aim to achieve real-time analytics or more advanced test analytics in the next one or two years. That percentage is set to increase to 71% in the next five years.

The study also highlights that executive leaders are significantly more optimistic than respondents with IT / technology positions about unlocking advanced and AI-powered test analytics within five years. While 85% of executive leaders believe their organizations can achieve this goal, only 43% of IT / technology respondents share this sentiment. This contrast suggests that there could be a top-down approach to establishing a data-driven culture in healthcare software testing.

**Percentage of healthcare providers managing tests with real-time analytics
leaping from 16% to 71% ^(Q9)**





Final Thoughts: An Inflection Point

Healthcare quality assurance teams are at an inflection point.

Both manual and do-it-yourself testing approaches are no longer scalable enough to meet all test requirements for the more complex healthcare software ecosystems, increasing patient risk and hindering innovation. A platform approach leveraging automation intelligence is necessary, as our study has shown earlier adopters of test automation platforms gaining significant improvements in testing scalability and efficiency.

The opportunities are known, and the approaches we describe are proven. The imperative is the action.

We propose three actions for those who are moving into automated software testing for the first time or replacing existing tools with a platform approach:

- Understand evolving healthcare quality assurance requirements.
- Ensure tools' capabilities to test interoperability.
- Focus on long-term productivity improvement.



To meet regulatory mandates, healthcare organizations need assurance that their testing tools will not jeopardize the security of highly sensitive patient data. A noninvasive test automation platform can offer comprehensive coverage without touching the source code or accessing protected health information.

Healthcare software has become more complex and runs over heterogeneous technologies. To ensure system interoperability, you need a technology-agnostic tool that covers any platform — legacy, mobile, virtualization system (i.e., Citrix, Horizon), desktop, web, and more — to avoid technology fragmentation.

Finally, business testers can bring valuable domain expertise into testing but often have little or no technical know-how. Therefore, healthcare organizations must equip them with easy-to-use tools to lower the learning curves and eliminate tedious testing processes. In addition, by automating many of the tests that business testers are qualified to perform based on their expertise, they can gain time for more strategic initiatives that contribute to the bottom line and improve patient outcomes.

Appendix

The findings presented in the report draw from an online survey conducted by HIMSS in February 2023.

Methodology

HIMSS collected responses from 55 qualified US healthcare professionals holding positions in IT and technology or executive leadership.

Participants met specific criteria, including holding decision-making or influencing positions in software quality assurance, testing, and testing strategies and working at organizations with more than 1,000 employees or annual revenue exceeding \$100 million.

This data collection effort was anonymous, and HIMSS did not disclose Keysight as a research sponsor.

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.

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Endnotes

- i. This percentage excludes those who could not disclose their revenue information, but the remainder of the article includes everyone in the study.
- ii. This is based on a low base size, for directional use only.
- iii. Low base size, insights directional only.

Survey Questions

1. Which of the following best describes your worksite?

- a. Academic medical center
- b. Integrated delivery network
- c. Multi-hospital system
- d. Stand-alone hospital
- e. Specialty hospital / Children's hospital
- f. Clinic / practice setting
- g. Ambulatory/outpatient practices (including behavioral/mental health, orthopedics)
- h. Long-term care facility/skilled nursing w
- i. Other type of acute care or inpatient facility
- j. Another worksite type

2. How would you characterize your job role or function

- a. IT / Technology
- b. Quality Assurance / Testing / Compliance
- c. Executive leadership
- d. Clinician leadership (e.g., CMO, CMIO, CNIO, CNO, VP Physician Practices, VP Clinical Transformation)
- e. Clinician (e.g., physician, nurse, health practitioner)
- f. Strategy / Innovation
- g. Finance / Procurement
- h. Operations
- i. Data analytics
- j. Quality metrics or reporting
- k. Another role

3. What is your current role?

- a. MD / DO
- b. C-Suite Exec (e.g., CEO, CTO, CIO)
- c. EVP / SVP
- d. VP / Head
- e. System Director / Director
- f. Sr. Manager / Manager
- g. Individual Contributor (e.g., Engineer, Analyst, Administrator)
- h. Another role

4. Which of the following best describes your role in decision making regarding software quality assurance, testing, and testing strategies at your organization?

- a. I am the primary decision maker or part of a group making decisions
- b. I have significant involvement in and/or influence over decisions
- c. I have visibility into decision-making, but have no influence over decisions
- d. None of the above, I am not involved

5. What is your organization's annual net revenue?

- a. Less than \$100 million
- b. \$100 million to \$250 million
- c. \$251 million to \$500 million
- d. \$501 million to \$1 billion
- e. \$1.1 billion to \$3 billion
- f. \$3.1 billion to \$5 billion
- g. \$5.1 billion to \$10 billion
- h. Greater than \$10 billion
- i. Don't know / Can't disclose

6. Please tell us the total number of employees in your organization.

- a. Less than 1,000
- b. 1,000 – 2,499
- c. 2,500 – 7,499
- d. 7,500 – 14,999
- e. More than 15,000

7. Please rate your level of agreement with each of the following statements:

- 1. Strongly disagree
 - 2. Somewhat disagree
 - 3. Neutral
 - 4. Somewhat agree
 - 5. Strongly agree
- a. Time and money spent on software testing have increased compared to 1-2 years ago.
 - b. My organization values software quality assurance
 - c. Insufficient software test coverage increasingly risks patient lives
 - d. I don't think my team has enough resources (time, budget, or talent) to scale software testing

8. Which of the following best describes the approach your organization uses today for software testing? Which best describes your organization's goal for its approach to software testing in the next 1-2 years? What about in 5 years?

- 1. Manual
- 2. Manual with some automation
- 3. Half automation & half manual
- 4. Automation with some manual
- 5. Fully automated

- 6. Don't know/Unsure
- a. Today
 - b. In the next 1-2 years
 - c. In 5 years

9. Which of the following best describes the method your organization uses to manage test analytics today? Which best describes your organization's goal for managing test analytics in the next 1-2 years? What about in 5 years?

- 1. No aggregation of analytics
 - 2. Ad-hoc analytics
 - 3. Managed with dashboards
 - 4. Automated real-time analytics
 - 5. Advanced analytics and/or Artificial Intelligence (AI)
 - 6. Don't know/Unsure
- a. Today
 - b. In the next 1-2 years
 - c. In five years

10. How satisfied are you with your organization's capabilities in each of the following areas?

- 1. Very dissatisfied
 - 2. Somewhat dissatisfied
 - 3. Neutral
 - 4. Somewhat satisfied
 - 5. Very satisfied
- a. Scalability of current platform(s) to meet emerging testing requirements
 - b. Ability to meet all test requirements prior to product releases
 - c. Ability to develop test coverage across all devices and/or browsers
 - d. Ability to automate workflows to increase QA team's job satisfaction and productivity
 - e. Generation of clear and actionable testing data

11. Below are some potential benefits software testing automation may have on IT teams in healthcare organizations. Which of the following, if any, do you see as most relevant to your organization today? Please rank up to three items from the list below or write in your own response.

- a. Software with fewer defects
- b. Reduced time-to-release
- c. Decreased testing costs (i.e., budget)
- d. Freeing up staff time and resources
- e. Enhanced data security
- f. Enhanced data compliance
- g. More agile development cycles
- h. Something else – please explain

12. In considering a test automation tool, which of the following features would be most important for your organization? Please rank up to three top features.

- a. Low-code testing
- b. Cross-platform testing
- c. Non-invasive testing
- d. API testing
- e. Mobile testing
- f. Performance (load) testing
- g. Data compliance assessments
- h. Data security assessments
- i. Interoperability testing
- j. Something else – please explain

13. What is your organization's primary EHR (electronic health records) platform?

- a. Allscripts
- b. Athenahealth
- c. Cerner
- d. CPSI
- e. eClinicalWorks
- f. Epic
- g. GE Healthcare
- h. McKesson Corporation
- i. MEDHOST
- j. MEDITECH
- k. NextGen
- l. Another EHR, please specify

14. What testing solution is your organization using today?

- a. Manual
- b. A DIY approach
- c. Third-party test automation platform
- d. Something else – please explain.

15. Who will be primarily impacted by the quality of the software you test?

- a. Patients
- b. Physicians or nurses
- c. Administrators / Back-office staff
- d. Something else – please explain.



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