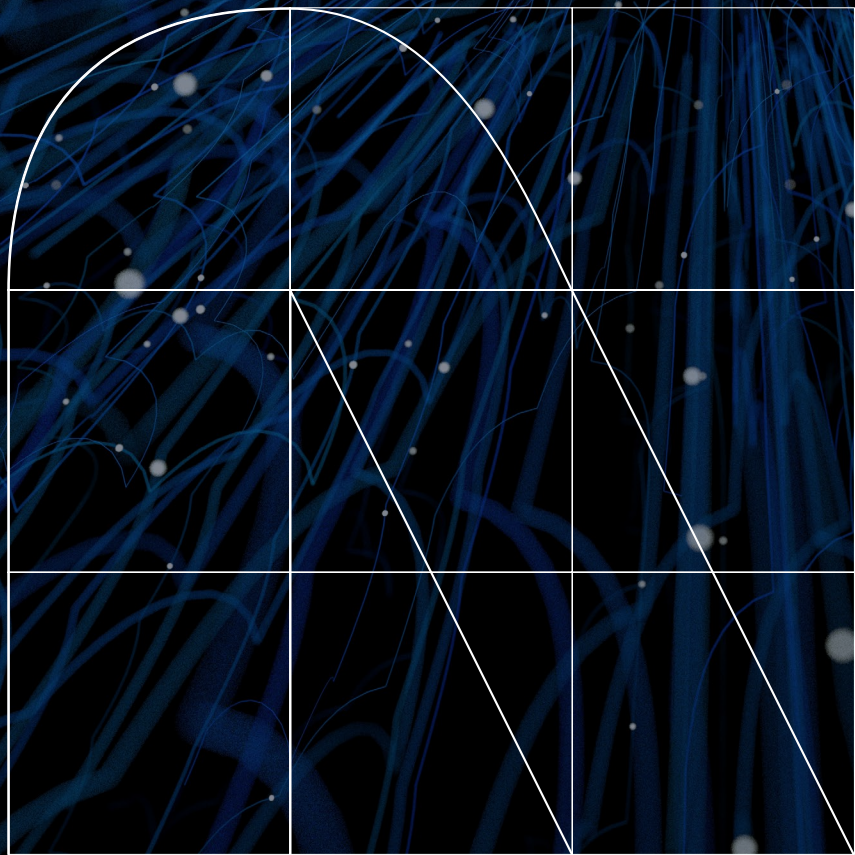


Point of view | Application Services

# The power of AI in application testing: Enhancing quality engineering and assurance



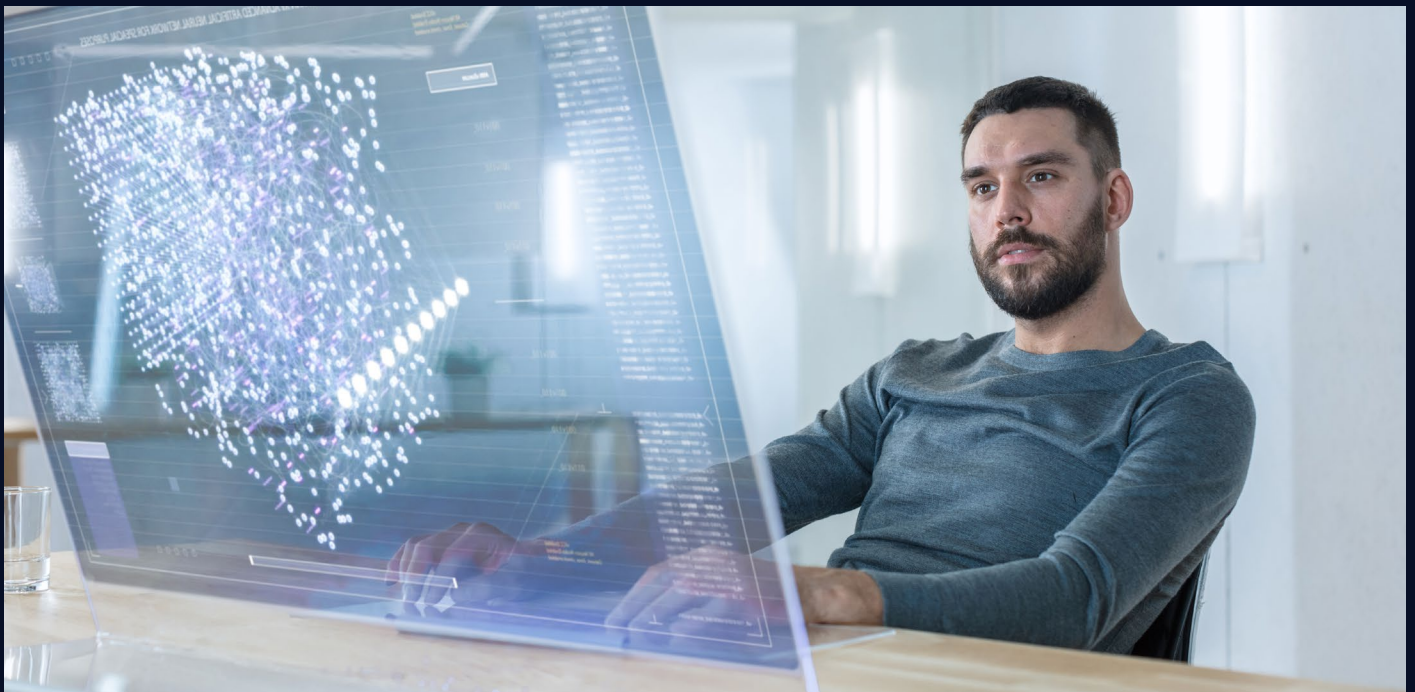
# Executive summary

This paper explores the transformative impact of AI-augmented quality engineering and assurance (QE&A) on application testing services. It emphasizes the growing role of AI and machine learning (ML) in enhancing traditional testing methodologies and the need for businesses to step up their QE&A game. It also highlights the NTT DATA AI Test Engine as a powerful tool for streamlining testing processes, reducing costs and improving accuracy.



Technology never stands still. For businesses, this means constant change and evolution. Application modernization — in particular, continuous modernization — is a big part of that equation. It shows how organizations are shifting their approach to keep pace with the rapidly changing tech landscape.<sup>1</sup> But with continuous modernization comes the need for continuous testing. After all, a modernized application that's riddled with bugs and errors helps no one. That's why we're seeing the rise of quality engineering and assurance (QE&A). This more integrated and iterative approach to testing can keep up with the speed of modern expectations. To realize the benefits of QE&A, however, human intelligence needs a little artificial help.

# Harnessing the power of AI and GenAI



AI and generative AI (GenAI) are taking the world by storm. Within the forecast period of 2022–26, the augmented intelligence market is expected to grow at a compounded annual rate (CAGR) of 25.1%.<sup>2</sup> But what does it mean for QE&A?

## Going beyond conventional testing and coverage

Let's imagine that a software development company is about to release its latest brainchild. Usually, a quality assurance (QA) team would be assigned to detect bugs in the software development lifecycle as and when they arise. But this traditional method of testing involves significant manual effort, which takes time and is prone to human error.

In contrast, quality engineering and assurance (QE&A) represents a proactive and end-to-end ecosystem approach, where the engineering team actively shapes the development of high-quality products and efficient processes. By incorporating intelligent and automated QA for both legacy and digital systems, QE&A delivers both quality and speed, accelerating business and technology change, improving customer experiences (CX) and fostering digital success.

With AI in place, there's a clear path to overcoming these challenges and ramping up productivity for the entire team. Exciting strides in generative AI (GenAI) promise to revolutionize QE&A even more. Boosting synthetic data creation, unstructured data processing and automated testing fast-forward application testing roadmaps. The advantages are significant — from reducing manual intervention and mitigating risks of human error to accelerating time to market during a launch period.

# The impact on functional and non-functional testing

Quality engineering deals with a product's functionality in diverse scenarios and specific parameters, such as performance, responsiveness and resilience. This capability is imperative when customer expectations are nothing short of perfection. Even the tiniest delay in executing a function can cause significant losses for businesses. So too can failure to adhere to an end-customer's perception of a product's look and feel.

AI-driven QE&A can preempt such pitfalls. It's carried out through intelligent tools of deep learning, ML and natural language processing (NLP). This practice extends across both functional and non-functional test scenarios.

Delving into some of the functional aspects, ML algorithms can extract historical data to replicate autonomously diverse use cases. An ecommerce platform, for instance, can leverage AI to predict user behavior patterns and simulate real-world scenarios.<sup>3</sup> Doing so provides comprehensive coverage of possibilities while devising an application upgrade or a change in code.

Since complex application demands must be realized through executable scripts, NLP can help streamline test case creation. For instance, pharmaceutical companies conducting compliance testing can use NLP to extract relevant data from medical records and create precise test cases.<sup>4</sup>

When it comes to non-functional scenarios, predictive analytics and ML models can forecast system performance and help in capacity planning. Because software development teams work in shifts and in varied capacities, it's important to identify potential threats and issues beforehand. AI helps recognize patterns and track weaknesses in code so QA teams can plan capacities for debugging accordingly.

Peak performance of an autonomous vehicle, for instance, requires routine software testing that detects and analyzes anomalies in sensor data. This capability is carried out by studying user experience issues and analyzing application usage data. Outliers are identified and the code is corrected before there's significant user impact. Here, too, AI algorithms can predict software bugs, guide QA teams in their testing efforts and increase the reliability of autonomous vehicle programs in real-world circumstances.<sup>5</sup>

# A broader look at the benefits of AI augmentation

AI-augmented application testing has brought forth a paradigm shift across industries. It holds immense promise to transform product development and offers invaluable benefits that work toward enhancing product quality and efficiency. Two standout advantages of AI in QE&A include self-healing and autonomous testing capabilities. Both have a major effect in minimizing false positives in application testing, where AI can be harnessed to address a number of challenges.

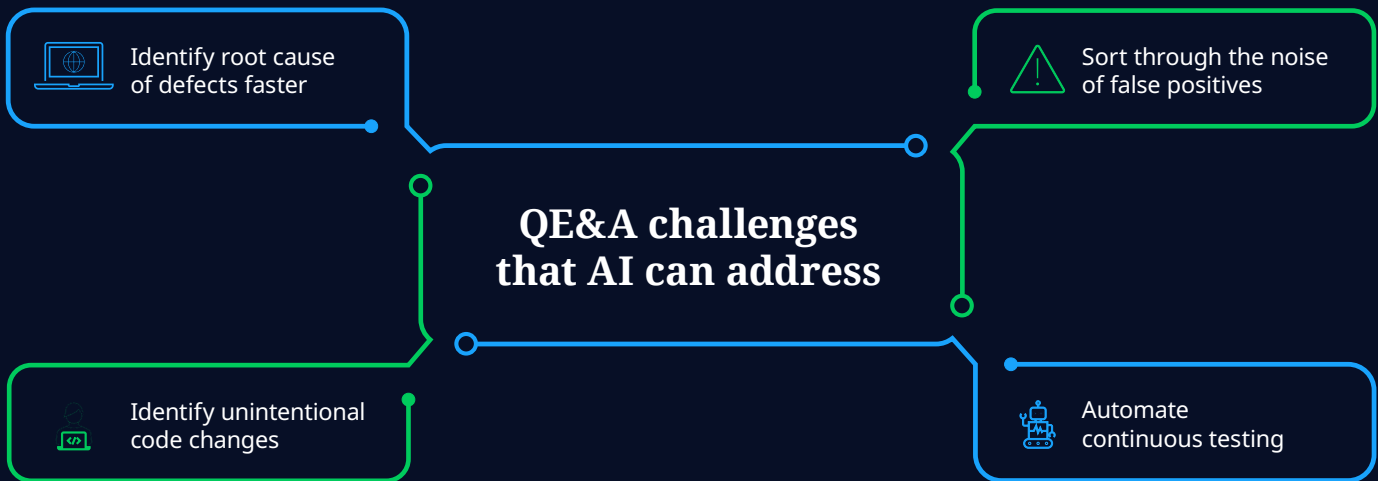


Figure 1: New QE&A challenges that AI can address

Advanced QE&A tools can even self-correct scripts. This saves effort for large organizations that deal with numerous tests and false positives on an everyday basis. While these benefits represent a promising starting point in leveraging AI-enabled QE&A, the full scope of benefits can be unlocked when companies:

- Provision democratized environments through infrastructure as code (IaC)
- Build resilient performance architecture for applications
- Auto-scale cloud adoption to protect performant application architecture and infrastructure

# GenAI, software testing's new frontier

For application testing teams, using generative AI can enhance existing AI capabilities. GenAI also helps establish a solid, low-risk foundation for successful testing.

**Its current usability spans the following functions:**

**Streamlining test case generation.** By analyzing requirements, user stories and business flows in various formats, GenAI identifies key focus areas. It also generates test cases covering all possible scenarios, including non-functional aspects such as localization and scalability.

**Efficient test data generation.** GenAI models excel in producing diverse and realistic data essential for effective vulnerability and behavior testing. They leverage historical data to generate synthetic data, providing realistic scenarios, all while maintaining data security.

**Optimizing test processes.** By creating models based on specific requirements, GenAI removes repetitive test paths. It also prioritizes unique paths for maximum coverage. Using feedback loops and past executions, it identifies paths based on potential impact and vulnerability.

**Agile regression test identification.** GenAI, fueled by change management, analyzes changes and identifies vulnerable areas. It suggests relevant test cases and generates missing ones to provide comprehensive regression coverage.

**Powerful vulnerability and behavior testing.** GenAI proves invaluable in generating a diverse range of expected and unexpected inputs, exploring values, file formats and network protocols. Learning from the past, it identifies untested areas, uncovering unexpected behaviors and vulnerabilities within the code and overall system.

**Simplified automation script generation.** Leveraging outputs from earlier scenarios, GenAI aids automation engineers in generating scripts. While excelling in basic scenarios, it provides building blocks and approaches for complex automation scripts.

**Enhanced defect analysis.** Post-test cycles, GenAI analyzes defects, creating test cases for unresolved issues. It amends existing cases to cover additional scenarios, strengthening the testing process by identifying gaps and enhancing overall robustness.



# What does the road ahead look like?



Within the next three years, AI for application testing service engagements is expected to grow exponentially. This anticipated growth points to a seismic shift in testing methodologies, where advanced AI technology will become an indispensable partner in delivering high-quality software at unprecedented speed.

However, this comes with its own set of challenges:

- One potential hurdle is resource allocation. While the promise of AI is enticing, securing the necessary infrastructure and technology investments can be daunting.
- Skill gaps pose another challenge. As AI-augmented testing gains momentum, there's a growing demand for professionals well-versed in both software testing and AI technologies. Bridging this gap requires concerted efforts in training and upskilling the workforce.
- Human resistance to change can hinder adoption, too. Unfamiliarity with newer tools and technologies can be a formidable obstacle in a business environment where innovation is the result of a top-down implementation approach. This reluctance often stems from fear of job displacement or lack of understanding about how AI can augment rather than replace human roles.

That's why the focus should be on creating a roadmap for the transformative journey with clear goals and purpose. When implementing AI and GenAI in QE&A, businesses must identify the exact nature of the problems they want to override with the upgrade. And, once implemented, validate its effectiveness with specific metrics or meaningful milestones.

A 2023 Statista survey revealed that 23.87% of developers currently use AI technologies in code testing, while 55.17 are interested in adopting it in the future. This means that businesses are already embracing AI to augment application testing and make the most of the first-mover advantage. The involvement of GenAI will only add to the momentum. In conclusion, the adoption of AI in application testing requires a strategic roadmap with clear objectives and purpose. Businesses must carefully identify the problems they are facing in their QE&A processes that they think the integration of AI and GenAI will be able to solve. For that, they would be required to validate its effectiveness through specific metrics or milestones to ensure that these technological implementations turn out to be successful.

# Keep the momentum going with NTT DATA

We understand what it takes to deliver real outcomes and exceed expectations in the pursuit of quality. As a [leader in Quality Engineering and Assurance Services](#), NTT DATA can be the perfect partner for propelling your business toward the next big leap in AI and GenAI augmented QE&A.

Our QE&A capabilities deliver agile pre-production controls that provide stable and secure applications critical to smooth business operations. As part of our Digital Application Services, the NTT DATA AI Test Engine is powered by analytics and intelligent robotic automation. It streamlines testing by reducing costs and time while enhancing accuracy. This responsive web-based tool serves as not only a test accelerator and test case optimizer but also a predictor of the quality of future releases based on data from current and past releases.

With the AI Test Engine in place, application testing teams:

- Identify gaps in quality and defect targets using predictive analytics
- Minimize redundancy using real-time or offline analysis of test cases
- Improve the effectiveness and efficiency of testing processes with actionable insights

By collaborating with NTT DATA, enterprises can harness the power of AI to achieve their QE&A goals. [Contact](#) us today to learn how we can fast-track your transformation journey.

## About the author



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Drew's previous experience across a spectrum of IT services, including multiple levels in leadership, has enabled him to holistically support connectivity between business strategies and IT solutions.

Today, he leads NTT DATA's Digital Application Services offering, which includes application management, application modernization, quality engineering and assurance, performance monitoring and observability, security and portfolio management.

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