



From Quality Assurance to Digital Quality Engineering: The Future of Software Testing

The Kairos Whitepaper



What's Inside

- 03 Introduction
- 04 Transitioning from Quality Assurance to Quality Engineering
- 05 Emerging Trends in Quality Engineering
- 08 The Role of Quality Engineering in Digital Transformation
- 09 Best Practices for Implementing Quality Engineering
- 11 Wrapping up

Introduction

In the rapidly evolving software development landscape, the significance of quality engineering is paramount. As organizations endeavor to deliver top-notch software products that cater to the ever-changing demands of their customers, the conventional approach of quality assurance falls short.

The future of software testing hinges on adopting quality engineering practices encompassing the entire software development lifecycle and leveraging the latest technological innovations. The employment of software developers, quality assurance analysts, and testers is projected to grow by 25% from 2021 to 2031, much faster than the average for all occupations [source](#).

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Transitioning from Quality Assurance to Quality Engineering

This post-development troubleshooting often culminated in unforeseen delays in product rollouts and a surge in associated costs. Such an approach, while standard, was inherently reactive and didn't always align with the dynamic needs of modern software development.

Enter quality engineering (QE) – a paradigm shift in how we perceive and ensure quality. Unlike its predecessor, QE is rooted in a proactive philosophy. It champions the idea that quality isn't just a final checkpoint, but an integral component woven into every facet of the software development lifecycle. This means that right from the moment requirements are jotted

down, through the design and coding phases, and up to the deployment, testing and quality checks are continuously in play.

So, what's driving this transition towards quality engineering? A few pivotal factors come into play:

Complexity of Modern Software:

Today's software solutions aren't just about standalone applications. They often involve intricate integrations, function across diverse platforms, and need to cater to a global audience with varying needs. This complexity demands a more holistic approach to quality.

Speed of Deployment: In our fast-paced digital age, 'time-to-market' isn't just a metric; it's a competitive advantage.

Organizations can't afford prolonged delays due to post-development fixes.

Evolving Customer Expectations:

Modern customers aren't just looking for functional software; they seek seamless experiences. Even minor glitches can tarnish a brand's reputation, making proactive quality checks vital.

By embracing quality engineering, organizations are not merely troubleshooting but strategizing. They're ensuring that quality is a consistent thread running through the fabric of their development process. The result? Reduced glitches, elevated product standards, and a user experience that truly resonates with customers.



Emerging Trends in Quality Engineering

Several pivotal trends are shaping the future of quality engineering:

Emergence of Full-Stack Quality Engineers:

The role of quality engineers is broadening to include a wider array of skills and responsibilities. Full-stack quality engineers possess the ability to conduct both front-end and back-end testing, as well as work with diverse programming languages and technologies.

Significance of Non-Functional Risks:

Quality engineering extends beyond functional testing. Non-functional risks, such as security, performance, and accessibility, are gaining prominence. Quality engineers must be equipped to evaluate and mitigate these risks to ensure the holistic quality of software products.

Influence of Cutting-Edge Technologies:

The integration of artificial intelligence (AI), machine learning (ML), and other emerging technologies is revolutionizing the realm of quality engineering. These technologies empower quality engineers to automate testing activities, process vast amounts of data, and discern patterns and trends that can enhance software product quality.

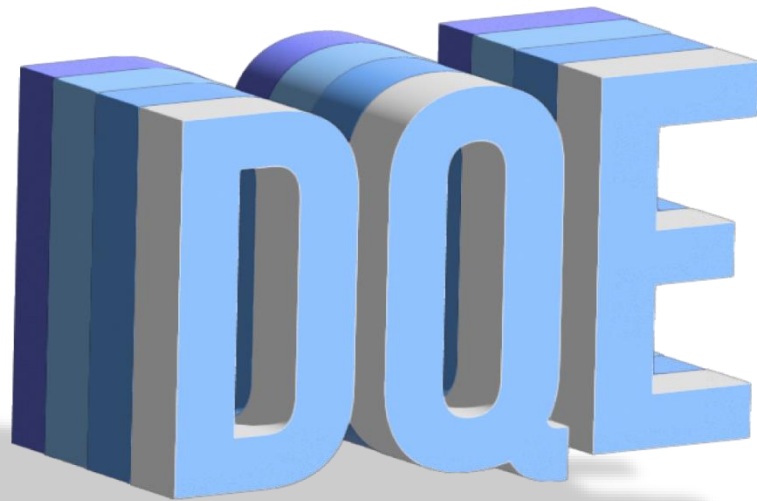
Generative AI in Quality Engineering:

[Generative AI](#) is transforming Quality Engineering by automating the creation of test cases, test data, and test scripts. This not only diminishes the time and effort required for testing but also augments the coverage and efficacy of testing. Generative AI can also be employed to simulate various user behaviors and scenarios, facilitating more comprehensive and realistic testing.

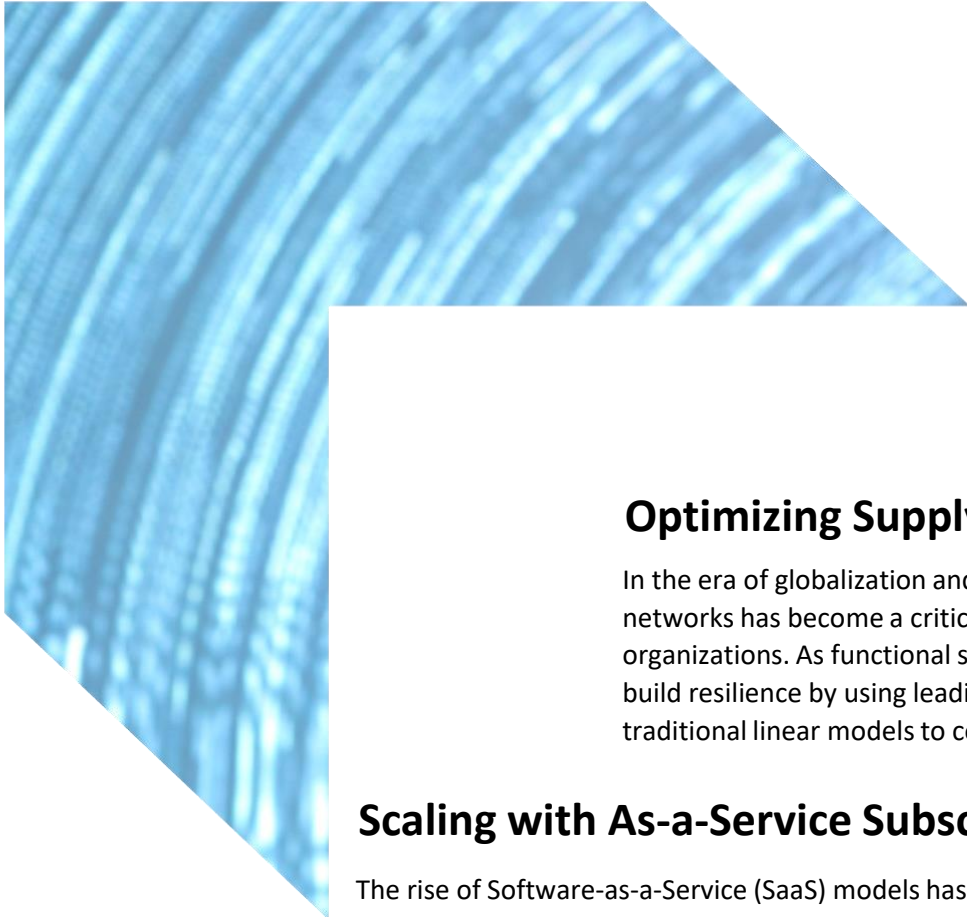
Mainstreaming the Metaverse:

The metaverse is poised to fundamentally transform how we live, work, and play, much like the launch of the internet. It is a new concept that offers a unique opportunity for organizations to refine their Quality Engineering (QE) strategies and execution. The metaverse can be leveraged to transcend the physical barriers that are used to limit digital interactions.

Quality Engineering is critical to making the metaverse a more helpful tool for businesses, optimizing service quality, and streamlining operations. The metaverse has a bright future, but quality engineering ensures it lives up to its potential [source](#).



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Unlocking the Power of 5G Computing:

The advent of 5G technology has revolutionized the Quality Engineering (QE) field. With its high-speed data transfer and low latency, 5G has enabled QE leaders to test and optimize their products and services in real time. New 5G and IoT testing solutions create greater visibility, faster time-to-market, and optimized 5G revenue streams.

This presents a unique opportunity for QE leaders to leverage the power of 5G computing to enhance their testing capabilities and drive business growth. By harnessing the power of 5G, QE organizations can achieve faster time-to-market, reduce testing costs, and improve the overall quality of their products and services [source](#).

Optimizing Supply Chain Networks:

In the era of globalization and digitalization, optimizing supply chain networks has become a critical task for Quality Engineering (QE) organizations. As functional silos become obsolete, QE organizations can build resilience by using leading-edge tech to enable the shift from traditional linear models to connected, digital supply networks.

The tasks of logistics and supply chain managers have evolved to include analyzing manufacturing efficiency, managing inventory control processes, procuring global suppliers and manufacturers, onboarding new IT and dashboards to monitor performance, and optimizing a return system for defective or unwanted products. [source](#).

Scaling with As-a-Service Subscriptions:

The rise of Software-as-a-Service (SaaS) models has transformed how businesses operate and deliver value to their customers. Quality Engineering (QE) plays a crucial role in ensuring the success of SaaS models by introducing adjusted data-driven, analytically based test models to assess customer conversion rates and lifetime value. Atlassian, a leading provider of team collaboration and productivity software, has

evolved from a traditional Quality Assurance model to a Quality Assistance model to deliver "Quality at Speed." Atlassian's Quality Assistance model has enabled the company to scale its quality practices and continuously adapt to changing contexts. As a result, Atlassian has become a \$93.25 billion company, demonstrating the importance of quality engineering in the success of SaaS models. [source](#).

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Keeping Up with Specialized Devices:

The proliferation of intelligent products with embedded devices has transformed the marketplace. These devices are pervasive in various industries, including automotive, healthcare, and consumer electronics.

Quality Engineering (QE) is crucial as ecosystem complexity increases in enabling an environment to test embedded software and firmware across devices.

State-of-the-art techniques and best practices in developing embedded software apply not only to high-integrity devices, such as those for safety-critical applications like aircraft flight controllers, car braking systems, or medical devices but also to lesser-integrity

applications. To optimize the effectiveness of the available test time and budget, pragmatic decisions should be made. Many software test techniques and tools are available to automate them.

These tools are commonplace in developing safety-critical applications, but not everyone has the budget to buy all or any of them. In addressing these issues, the concepts behind the techniques are presented, along with some "case study" software code examples to illustrate how some of them are implemented in practice [source](#).

Leading Through Disruption:

The Quality Engineering (QE) market is undergoing a significant transformation, driven by rapid technological advancements and the proliferation of artificial intelligence in quality engineering. As the pace of change accelerates, existing playbooks have become ineffective, and the QE market is ripe for change. This disruption offers new opportunities for employees and new efficiency plays.

To capitalize on this pivotal shift, QE organizations must adapt to the changing landscape by embracing new technologies, adopting innovative strategies, and fostering a continuous learning and improvement culture. By staying ahead of the curve and leading through disruption, QE organizations can position themselves for long-term success and drive business growth [source](#).

Nurturing AI/ML:

Artificial Intelligence (AI) and Machine Learning (ML) are moving to the core of the testing delivery life cycle to enable the next generation of intelligent and autonomous digital testers. AI and ML can optimize risk coverage, prevent redundancies, perform portfolio inspection, detect false positives, diagnose defects automatically, and analyze user experience. It is estimated that more than 60% of enterprise test cases portfolio's test cases are redundant.

AI identifies such test cases that are physically and logically identical and eliminates the duplicates, which do not add any business value and can be removed without decreasing the business risk

coverage. AI can maximize defect detection and risk coverage while minimizing costs, execution time, and the number of test cases by identifying the optimal test sets. It can uncover weak spots in test case portfolios by tracking flaky test cases, unused test cases, untested requirements, and those test cases that are not linked to the requirements.

Additionally, AI has self-healing automation properties, which means it can heal broken automated test cases and make test automation better resilient to changes. All in all, AI makes software testing smarter while promoting higher efficiency and effectiveness [source](#).

Engineering Chaos:

Chaos engineering tests a distributed computing system to ensure it can withstand unexpected disruptions. It relies on concepts underlying chaos theory, which focuses on random and unpredictable behavior. Chaos engineering aims to identify a system's weaknesses through controlled experiments introducing random and unpredictable behavior. A primary benefit of chaos engineering is that organizations can use it to identify vulnerabilities before a hacker does or before a system fails.

Changes made due to chaos engineering testing increase confidence in an organization's systems. Some IT groups hold chaos engineering game days where teams try to break or breach systems. They use failure mode and effective analysis or other tactics to get insight into potential points of failure in their organization's systems. The main concept behind chaos engineering is to intentionally break a system to collect information that will help improve the system's resiliency.

The Role of Quality Engineering in Digital Transformation

Digital transformation is changing the way organizations operate and interact with their customers. As organizations embrace new digital technologies, the role of quality engineering becomes even more critical. Quality engineers must be able to test and validate complex digital systems, ensure the security and privacy of customer data, and deliver a seamless user experience across multiple devices and platforms.

Quality engineering plays a crucial role in enabling digital transformation by:

Integrating Testing Activities:

Quality engineering practices emphasize the integration of testing activities into every stage of the software development lifecycle. This ensures that defects are identified and addressed early in the process, reducing the time and cost of fixing issues later on.

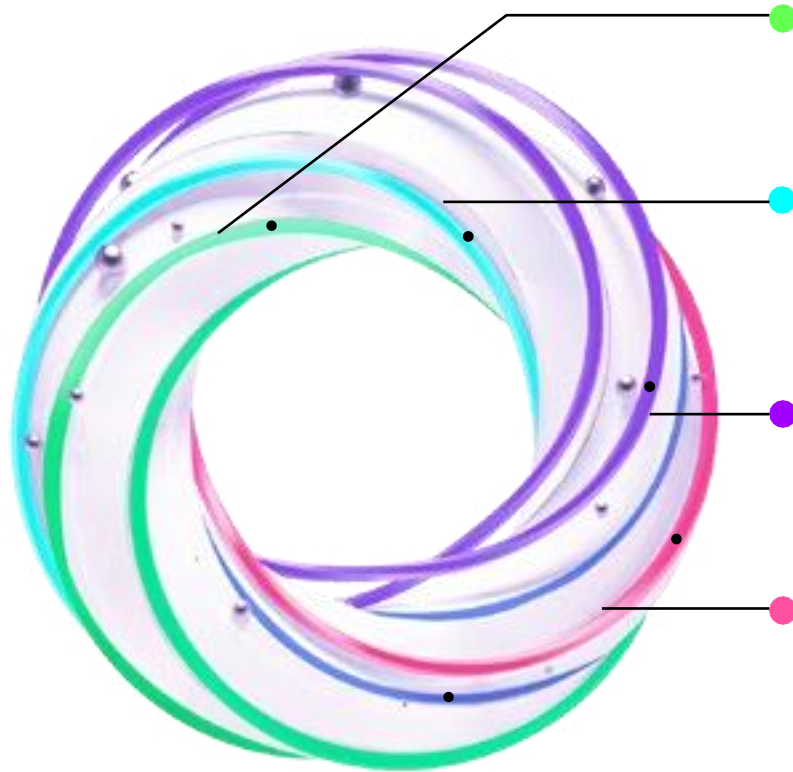
Supporting Agile and Continuous Delivery:

Quality engineering supports agile methodologies and continuous delivery models, which are essential for digital transformation. By automating testing activities and providing continuous feedback to development teams, quality engineers can help organizations deliver high-quality software products faster and more efficiently.

Enhancing Customer Experience:

Quality engineering focuses on delivering a superior customer experience. By identifying and addressing defects, performance issues, and other risks, quality engineers can help organizations deliver software products that meet the needs and expectations of their customers.

Best Practices for Implementing Quality Engineering



Integrate Testing Activities:

Quality engineering emphasizes the integration of testing activities into every stage of the software development lifecycle. By identifying and addressing defects early in the process, organizations can reduce the time and cost of fixing issues later on.

Automate Testing Activities

Automation is a key component of quality engineering. By automating testing activities, organizations can increase the speed and accuracy of testing, reduce the risk of human error, and deliver high-quality software products faster.

Focus on Non-Functional Risks:

Quality engineering is not just about functional testing. Non-functional risks, such as security, performance, and accessibility, are becoming increasingly important. Quality engineers must be able to assess and mitigate these risks to ensure the overall quality of software products.

Embrace Emerging Technologies:

The adoption of AI, ML, and other emerging technologies is transforming the field of quality engineering. Quality engineers should embrace these technologies to automate testing activities, analyze large volumes of data, and identify patterns and trends that can help improve the quality of software products.

Wrapping up

Quality engineering is indeed the future of software testing. Embracing quality engineering practices, as offered by [Kairos Technologies](#), can help organizations deliver high-quality software products that meet customer needs and expectations, reduce the time and cost of fixing defects, and stay competitive in the fast-paced digital landscape.

Kairos Technologies is leading the way in digital quality engineering by providing world-class solutions and experiences through all phases of digital transformation and quality assurance needs. Partnering with Kairos can be a strategic and cost-effective decision for businesses looking to transform their quality engineering practices and achieve unmatched quality in their software products.

At Kairos, we help businesses achieve agility at scale by providing innovative solutions and tools necessary for innovation, development, and long-term success. We use AI and ML-led capabilities to innovate across all digital touchpoints and customize solutions for enterprises aspiring to digital change. One of our notable offerings is the [Kairos Intelligent Test Automation Platform](#) (KiTAP), the industry's first AI-powered test automation platform with source code for

deployment on your premises.

Additionally, we offer a no-code, AI/ML-powered visual Data Quality Tool called "[DQ Gateway for Data Quality | Kairos Technologies](#)" that drives change. Kairos provides end-to-end testing, digital transformation, mobile app testing, smart regression testing, data analytics testing, and Salesforce testing with intelligent automation. Our approach balances standard validation processes with an automation-first approach, helping businesses navigate organizational changes and legacy applications.

Take the first step towards embracing the future of software testing. Visit our website, [Kairos Technologies](#), to learn more about our innovative solutions and how we can help your business achieve digital agility at scale.

Contact us



About Kairos

Kairos Technologies is a leader in Digital Quality Engineering and Digital Transformation, offering strategic "No-code/Low-code" Test Automation, API Testing, and Data Quality Management platforms to navigate the dynamic tech world. We uphold our core values of customer-centricity, enduring partnerships, and forward-thinking as we embrace the possibilities of the Digital Next. Our holistic yet focused approach highlights our commitment to innovation and a purpose-driven journey. Learn more at www.kairostech.com

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