



Webomates

AI & QA: What will be real in 2022?

The euphoria around Artificial Intelligence - Hype versus Reality

*You can talk to a machine! - That's a Reality
AI will replace humans in the near future - That's Hype
AI can automate any task - That's disinformation*

Executive Summary

Tech savvy organizations are realizing that Artificial intelligence (AI) holds the key to a new future. From being just a topic of intrigue and niche interest, AI is now seeing the light of the day across domains and organizations - including software testing. But the amount of disinformation about AI and its capabilities is just staggering. Continuous attempts are being made to narrow the gap between hype, disinformation, and reality.

This white paper is written for business leaders seeking practical advice on how to leverage AI in software testing. The purpose of this paper is to investigate the notion of AI in software testing, and understand the technological progress of multiple companies using AI and ML in making the right decisions across the software testing landscape.

“IT leaders responsible for AI are discovering “AI pilot paradox,” where launching pilots is deceptively easy but deploying them into production is notoriously challenging.”

– Chirag Dekate, Senior Director Analyst, Gartner

Why AI?

AI and Test Automation have revolutionized the testing domain. Automation clubbed with AI and ML helps in accelerating the speed of deployment and reducing the common risks and pitfalls that come with continuous delivery.

Today's AI promises one thing - giving us an "intelligent" platform that can perform specific activities much faster and can learn, allowing teams to not only work efficiently and faster but also to free up their time for more productive tasks.

According to Capgemini's research, AI is already transforming how organizations do business, manage customer relationships and stimulate the ideas and creativity that fuel groundbreaking innovation.

AI TRANSFORMING ORGANIZATIONS



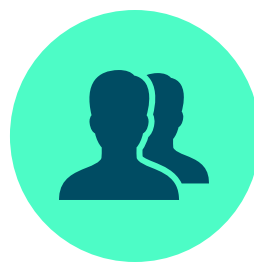
INFLUENCING SALES

3 in 4 organizations implementing AI increase sales of new products & services by 10%



BOOSTING OPERATIONS

78% of organizations implementing AI increase operational efficiency by more than 10%



ENGAGING CUSTOMER

75% of organizations implementing AI enhance customer satisfaction by more than 10%



GENERATING INSIGHTS

79% of organizations implementing AI generate generate new insights and better analysis

Scaling AI in Today's Software Testing Industry

As per the World Quality Report 2021-22 survey, 88% respondents said that AI is now the strongest growth area of their test activities. The report also establishes that QA is becoming the key enabler—even the champion—of quality, not just the custodian.

And in recent times, along with technological changes, the world also had to cope with the COVID-19. Businesses had to continue to provide services from anywhere and at any time. With digital transformation at an all-time high, the testing industry's AI market is also seeing innovations and exploring new solutions.

Over the past year and going into 2022, three broad trends in the Intelligent Test Automation space continue to progress and deliver incredible immediate value:



“While test automation creation with self healing abilities drove the most attention till today; the biggest growing trend that will be driven by AI in testing will be around test impact analysis through test data investigation. Modern algorithms will be used to analyze test failures and classify them properly to reduce noise, suggest high value tests for future cycles and stabilization of the pipeline.”

- DevOps Chief Evangelist at Perforce Software

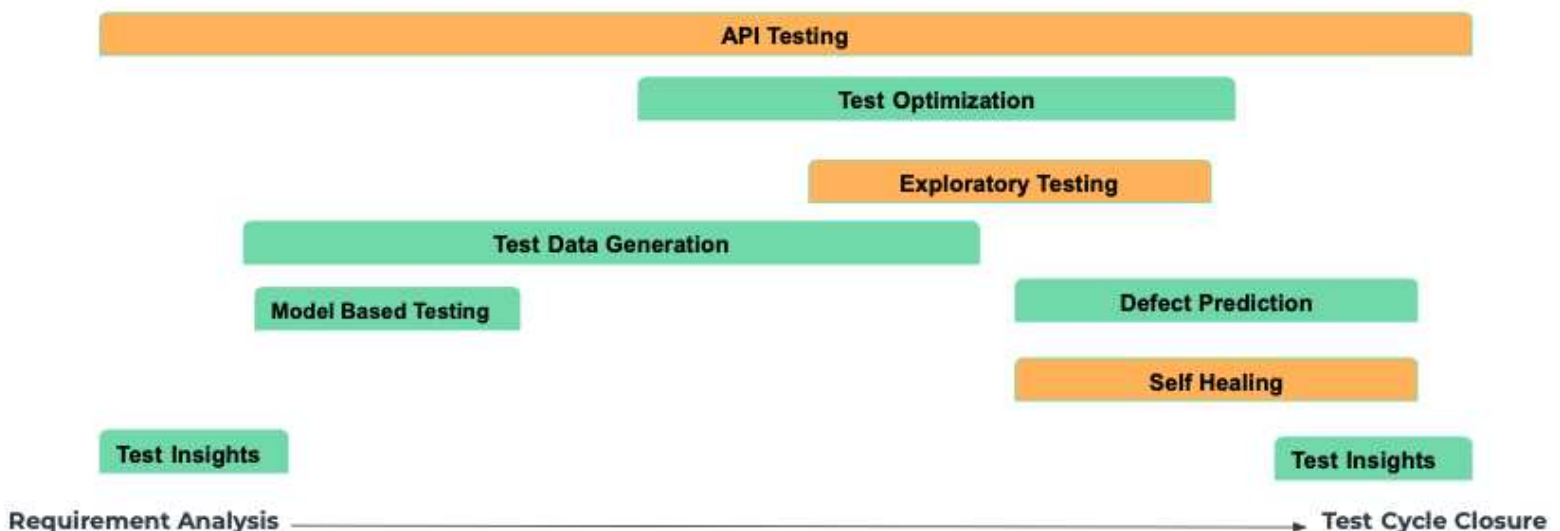
- Model-Based Testing continues to get better and better, decreasing the effort needed to create and maintain automation.
 - (a) Impact - Test Case, and Test Script generation and healing improves 6X
- Test Insight is moving into the mainstream and can help you shape and measure your testing efforts, quality, and product life cycle.
 - (a) Impact - Test Analytics or Insights improve decision making by 2X
- Defect Prediction is moving into the mainstream and can help you share enormous amounts of time in diagnosing and triaging automation Pass/Fails
 - (a) Impact - 7% of Automation Fails are defects. Defect prediction improves Pass/Fail automation review by 10X.

Watch out for these newer Software Testing AI Solutions in 2022!

Given the impact that AI is having, we have undertaken significant research. After a deep analysis of the market, we have evaluated the tools and technologies you can implement to give your teams the technological and competitive edge.

Many organizations have made AI-driven transformations and are making significant progress in driving use cases at scale. In the sections below, we take the categories that Gartner depicts for employing Intelligent Test Automation in QA testing.

Intelligent Test Automation Use Cases





“I think more testers should be involved by 2022 in AI and also in the data science world. If you are an inquisitive, data-driven tester, you can become a great data surfer.”

- Ex Sr Consultant at Deloitte

In addition to these five areas, we have added three more areas to expand the overall scope of Intelligent Test Automation. We also go a step forward and review the various areas in AI which provide the maximum value, new insights, and innovations developed by technologically dexterous companies and provide our estimate of the impact that using AI would have in the near term. We have quantified this prediction with two probabilities:

1. Assistance: The AI system will help the QA tester or QA Automation engineer.
 - Rating “1” equals no assistance
 - Rating “10” equals high amounts of assistance – such as a 50% reduction in work
2. Automation: The AI system will do all the work.
 - Rating “1” equals there is no automation
 - Rating “5” equals 50% of the work will be fully automated (that is, no human assistance is needed)
 - Rating “10” equals 100% of the work will be full automated

Trends	2020		2021	
	Assistance	Automation	Assistance	Automation
Model Based Testing	3	1	6	3
Test Analytics	3	1	5	3
Defect Prediction	3	2	7	5
Test Data Generation	3	1	3	1
Test Optimization	4	2	6	3
Self Healing	N/A	N/A	5	2
API	N/A	N/A	5	3
Exploratory	N/A	N/A	3	2

Model Based Testing 2021

2021	
Assistance	Automation
6	3

And with our systems getting more complex and intelligent, the expected outcomes for each user input and action differs. And this leads to poor quality test cases. The solution? Model-Based Testing!

MBT helps in the Test Process Improvement as it involves the QA teams right from the start; it enforces testability within the product design. Hence, MBT has the bulk of the focus of the industry. In addition, you have Webomates, Mabl, Functionize, and SauceLabs that provide you with intelligent test automation platforms that help you find defects.

Model-based testing is an application of model-based design where test scripts are automatically generated, executed, and checked based on formal specifications of the system under test. No human intervention is required to write and maintain the test cases.

The models can be used to:

- Represent the desired behavior of a system under test (SUT)
- Generate automatic test cases
- Represent how we expect the system to behave under test

The Benefits

AI capabilities ensure that your application UI evolves with development, and the comprehensive test results help users quickly and efficiently resolve bugs before they reach production. The tests can also be run on multiple machines and servers to test how the underlying system reacts to the different tests being performed. This quality testing approach allows for a better Customer Experience (CX).

Webomates, Mabl, Functionize, SauceLabs (Autonomic) all have technologies that help with Model-based testing.

2021	
Assistance	Automation
5	3

Software testing is a complex job of making sure new features are working as expected and ensuring that working features are not broken. Side effects defects are another well-known issue in software developments. Therefore, one needs insights into the entire CI/CD pipeline to understand every change's impact on the product and provide guidance and strategic benefits to test management. Areas that AI tools can improve are:

- Defect patterns- It helps find error-prone areas like side effect defects. Once one has insights into the defect-inducing changes, you can facilitate the defect fixing process.
- Defect Density - The number of defects that are found in a particular area as a function of time and models that determine whether the density is high or low compared to the industry
- Coverage models that determine how much of the application is tested by the test cases

- Shift Left Metrics - It's well known that the sooner a bug is found, the cheaper it is to fix. Shift-left testing is "the way" in DevOps and the agile world. Shift left Metrics are "the GPS" that will help one understand where they are in the shift-left process and allow them to define strategy and make decisions to shift further left
- Requirements Traceability - Linking Requirements such as Marketing and Product Requirements (MRD /PRD) with epics, user stories, test cases /scripts, and defects. This used to be an incredibly manual task with last-generation tools such as Rational Requisite Pro. However, this can be auto-generated and constantly updated with AI tools!

AI-based analytics and insights have improved with Capgemini (Perform AI) and Webomates CQ Portal.

Defect Prediction 2021

2021	
Assistance	Automation
7	5

The testing world is not blind to the issues caused by False Failures. A failure can be True Fail; in that case, the product under test has an issue(defect) or a False Fail, which means it's an automation failure or test case failure. A lot of time is spent understanding and identifying True Fails, and False Fails in every automation run.

False Failures fall into two broad categories:

- Automation Script failures - these can be due to Locator changes, timeout errors, input data changes, etc
- Feature changes resulting in test case and test script changes

Quality comes when you have proper defect triaging/reporting and no noise. And this can be improved with Webomates granted patent and tool development in this area.

The AI Defect Predictor tool shares an in-depth analysis of automation failures to help the teams reduce their triage time. As a result, you can Know your defect in 20 seconds!

Healenium is another testing framework that improves the stability of Selenium-based tests. Web applications are constantly updated. So all automated UI tests will face locator changes due to the web page changes. Healenium is an AI-powered library that solves and fixes locator changes. As the locator issues are fixed in run time, it improves the stability of the automated tests and ensures your CI/CD pipeline is always Green.

Test Data Generation 2021

2021	
Assistance	Automation
3	1

Waiting for test data or generating the test data is something that all testers hate! With the advances in AI, we can find bottlenecks and inefficiencies and eliminate them. The biggest challenge for ensuring an excellent testing process and reliability is the lack of quality test data.

The best way to test your system would be against actual production data in an ideal world. But that's not possible. So that's where Test Data comes in!

Test data is the generation of data that comes as close as possible to your production data without revealing any sensitive information - all guided by artificial intelligence and analytics.

The AI-based system analyzes a UI and identifies a series of test cases that predict user behavior. It's also vital to update your test data based on newly added functionalities to the system, along with the ability to identify and prioritize the test cases for execution.

Many companies have been focused in this area and rapid advancements are being achieved.

Test Optimization 2021

2021	
Assistance	Automation
6	3

To speed up and optimize the testing in agile and DevOps environments, World Quality Report recommends a new option - AI to optimize test cases.

Area To Test

Imagine you have created five web pages. In the next development phase, you make changes in only 2 of those web pages. Do you need to run all test cases? No! You identify the modified test cases and run only those cases! Of course, you need to run the right tests at the right time. But that's just not enough!

How To Test

Another aspect of test Optimization is determining the ideal method for executing a test case. Automation execution is not always the correct answer. Manual testing or crowdsourcing are perfectly viable options when used correctly. Additionally, there are many different test automation systems with differing capabilities. It often makes sense to execute a test case on one automation system, and if it fails - try it on another system. Webomates has a patent granted in this area.

AI systems are ideal for determining the area to test and the method to test and failover. Webomates has a granted patent in this space. Many traditional automation systems deploy Test Optimization, particularly for the Area To Test. So you have Webomates, Tricentis Tosca, Sauce Labs, Browserstack, and many other automation companies.

You just need to follow - **Right tests at the right time, in the right way!**

New areas being added in this report

With the advancements in Artificial Intelligence (AI), Automation, Internet of Things (IoT), this is the first time that the World Quality Report is mentioning quality engineering in the Intelligent Industry.

Read on to learn about the key findings and recommendations in the world of testing that are making experts most excited for the future of AI in these areas.

Self Healing 2021

2021	
Assistance	Automation
5	2

Self-Healing test cases and test scripts are updated when the UI or API changes.

For an example of User Interface (UI), the system detects a variety of changes like:

- Changes in the UI that have caused scripts to break due to technical issues such as element Locator ID changes
- Changes in the functionality of the User Interface

Similarly, for API testing, there are two categories

- Script failure caused due to test data change etc
- Feature change where the development team has changed the API

Webomates has granted patents in this space and offers time delimited healing as a service. As a result, test cases and test scripts are never out of date!

API Testing 2021

2021	
Assistance	Automation
5	3

API testing emphasizes the testing of business logic, data responses and security, and performance bottlenecks. Therefore, testing at the API level requires deep knowledge of the application architecture, specialized technical skills, and tools to get comprehensive test coverage.

Using Artificial Intelligence will help take these challenges out of API testing. API testing lends itself to AI-based tools, particularly when Swagger files are involved.

Exploratory testing 2021

2021	
Assistance	Automation
3	2

Under the usual scripted testing process, you first design the test cases and then proceed with test execution. However, in a rush to release features on time, teams miss out on the edge cases leading to defects in the release.

Exploratory Testing helps reveal bugs that would go undiscovered during the structured phase of Testing. It's a simultaneous process where you can perform test design and test execution at the same time.

Typically human lead testing and AI tools are considered incompatible. However, Exploratory testing centers around charters (read Elisabeth Hendrickson's book *Explore It!*) that the human tester should focus on. AI systems focused on requirements traceability are excellent sources for automatically generating and measuring the efficacy of exploratory charters. In addition, exploratory defects are an excellent input to Intelligent analytics.

Webomates has a unique patent-pending offering where Exploratory Testing with AI is included as part of the service.

The bottomline for future proofing AI success

The testing industry has made a strong start realizing the potential benefits of AI if thought through and implemented correctly. AI in QA has reached a level of maturity that all software organizations should start experimenting with these tools and deploying them and reaping the significant benefits that this new generation of tooling brings to the development process.

As the testing landscape matures, organizations can further benefit from these AI and ML-powered intelligent test solutions due to the enhanced sophistication and increased efficiency that they bring.

However, for AI to flourish, one must not stop here - organizations must continue to ensure sustainable innovation. As the AI wheels move forward, business and technology leaders must build this momentum to garner business transformations and achieve new levels of customer experience.



Marcus Merrell : “I believe that 2022 will continue to see the inexorable march toward test case generation and maintenance: no-code/low-code test generation, self-healing, and innovation in visual testing. I think progress will be steady and rather un-dramatic, and that these tools will continue to serve basic needs, while still being far from replacing human testers.

One area that will take a leap will be AI/ML testing as applied to SaaS and “walled garden” applications such as Salesforce, SAP, etc. every day more tools are hitting the market, and their widespread adoption will help the general functionality of AI testing tools for custom apps.”

- Sr Director of Technology at SauceLabs

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