CHAPTER 6

RUN TIME DYNAMIC ADAPTIVE AUTOMATION TESTING TOOLS

# 6.1 Introduction

These are some tools and technologies available to achieve results on run time dynamic adaptive automation testing (RTDAA) with cloud storage networks. These automation tools has specific features to offer in addressing the growing challenges of software automation in the years ahead.

They provide capabilities for continuous testing and integration, management, and reporting. These instruments underpins constant expanding computerization requirements for Web and Mobile testing. Keen confirmation and savvy investigation for versatile and heterogeneous conditions are to be wanted for mechanization apparatuses and advances. We will discuss about Open Source/Free and Commercial Tools and methods to choose right tools.

# 6.2 List of RTDAA Tools

* Selenium
* Test-Complete
* Q-Metry Automation Studio
* HP QTP/UFT
* Testim.io
* HP Quality Center (HP ALM)
* Test Studio
* Katalon Studio
* IBM Rational Functional Tester
* Ranorex
* Appium
* Robotium
* Cucumber
* EggPlant
* SilkTest
* Watir
* Sauce labs
* Sahi Pro
* Sikuli
* IBM Performance Tester
* Apache JMeter
* Blaze-Meter
* HP Load-Runner
* WAPT by Soft-Logica
* NeoLoad
* Perfecto Mobile
* WebLOAD
* Test Anywhere
* Visual Studio Test Professional
* FitNesse
* TestingWhiz
* Tosca Testsuite
* WatiN
* SoapUI

# 6.3 Open Source Tools

## 6.3.1 SELENIUM WEBDRIVER

Selenium is an open source library with ties in numerous dialects (Java, C#, Python, and so on.) that enables an architect to compose code that is then converted into human-like communications with different programs and cell phones. At its center Selenium turns up a lightweight server on a machine that sends directions in the JSON arrangement to a program or gadget. These JSON directions ordinarily incorporate data, for example, the activity to be performed (click, enter content, submit shape, and so on.) just as data about how to distinguish the component for the activity to be performed on.

These bits of recognizing data depend on the Document Object Model (DOM) or a website page or application and, in every way that really matters, can be thought of as the HTML of a page.

## 6.3.2 SELENIUM

It is test automation structure for Web applications. Selenium is a computerization structure of decision for Web mechanization engineers, especially for the individuals who have propelled programming and scripting aptitudes. Selenium turn into a center structure for other open-source automation devices, for example, Katalon Studio, Watir, Protractor, and Robot Framework. Selenium bolsters different working frameworks (Windows, Mac, and Linux) and numerous programs (Chrome, Firefox, IE, and Headless programs). Also, it tends to be customized with contents can be written in different programming dialects, for example, Java, Groovy, Python, C#, PHP, Ruby, and Perl. Designers have adaptability with Selenium, can compose mind boggling and propelled test contents to meet different dimensions of multifaceted nature, it requires propelled programming aptitudes and exertion to assemble automation systems and libraries for explicit testing needs.

It is the well-known mechanization testing device for web applications. Selenium can be kept running in different programs and working frameworks. It is perfect with other mechanization testing structures.

With selenium, a program focused computerization test contents can be made which are versatile crosswise over various conditions. Contents can be made utilizing Selenium that is of incredible help for incite propagation of bugs, relapse testing, and exploratory testing.

## 6.3.3 KATALON STUDIO

This is an incredible test automation answer for web application, versatile, and web administrations. This is based over the Selenium and Appium systems. This backings distinctive dimensions of testing abilities. Manual Testing Engineers can think that it’s simple to begin a mechanization testing, while automation specialists can spare time from building new libraries and keeping up their contents. Katalon Studio can be incorporated into CI/CD procedures and works with devices in the QA procedure including qTest, JIRA, Jenkins, and Git. It offers a component called Katalon Analytics which gives clients exhaustive perspectives of test execution reports through dashboard including measurements, outlines, and charts.

## 6.3.4 WATIR

It is an open-source testing device for web automation testing dependent on Ruby libraries. It underpins cross program testing including Firefox, Opera, headless program, and web voyager. It bolsters information driven testing and coordinates with BBD apparatuses Cucumber, and Test/Unit.

## 6.3.5 ROBOT FRAMEWORK

Robot Framework executes the watchword driven methodology for acknowledgment testing and acknowledgment test-driven advancement (ATDD). Test ability can be reached out by executing extra test libraries utilizing Python and Java. Selenium WebDriver is an outer library in Robot Framework. Test specialists can use Robot Framework as an automation structure for web testing just as for Android and iOS test mechanization. Robot Framework can be anything but difficult to learn for specialists who know about catchphrase driven testing.

## 6.3.6 [JBehave](http://jbehave.org/)

JBehave is an open source BDD (Behaviour Driven Development) library that allows users to write their test cases in plain English and have them automatically translated into chunks of Java code to be executed.

JBehave allows someone like a product owner or scrum master to write test cases, hand them off to automation engineers and have those engineers write the automation scripts.

JBehave also creates easily digestible and human readable reports after execution, including information such as what test cases were run, how many test cases passed/failed and provides screenshots for any failed test cases.  Everything in JBehave is customizable and flexible, giving each team the power to define their own test runs and even create custom reports.

## 6.3.7 [RestAssured](http://rest-assured.io/)

RestAssured is an open source framework that allows for easy and flexible testing of API based applications.

## 6.3.8 [PhantomJS](http://phantomjs.org/)

An extension of Selenium WebDriver that allows users to run tests on their local machine in a headless state, meaning they do not have to have a particular browser installed to run a test against it.

## 6.3.9 [Docker](https://www.docker.com/)

Docker is an open source tool that allows users to "containerize" applications and environments.

Using a simple Docker image and 1-2 commands a user can instantly deploy an environment on their local machine with a set of predefined conditions such as installed browsers with specific versions, specific applications installed or preconfigured network settings.

## 6.3.10 [TestNG](http://testng.org/doc/)

TestNG is a lightweight testing framework in between JUnit and JBehave/Cucumber.  TestNG is ideal for teams that don't want to deal with the overhead of configuring BDD frameworks or are writing tests (such as API level) that do not lend themselves to BDD concepts such as stories or features.

## 6.3.11 CUCUMBER

Cucumber is another regularly utilized BDD library. It is fundamentally the same as JBehave yet will be progressively well-known to those originating from a non-Java coding foundation.

It is planned over the idea of BDD (Behaviour-driven improvement). It plays out the computerized acknowledgment testing by running the tales that best portray the conduct of the application. It gets a solitary a la mode living report that is having both determination and test documentation. Cucumber is scripted in Ruby. It likewise underpins Java and .NET. It additionally has cross-stage OS bolster.

## 6.3.12 SIKULI

It takes a shot at picture acknowledgment and has the ability of computerizing whatever is seen on the screen. Right now, it bolsters work area applications which keep running on windows, Mac or Unix/Linux. This device is great at replicating bugs and its clients have revealed it to be exceptionally valuable when contrasted with different apparatuses when will mechanize an application which isn't online.

## 6.3.13 APACHE JMETER

It is Java work area application intended for load testing. It principally centres on web applications. This apparatus can be utilized for unit testing and constrained useful testing.

Its engineering is fixated on modules with the assistance of which JMeter gives a great deal of out of box highlights. It bolsters numerous kinds of uses, servers and conventions like Web, SOAP, FTP, TCP, LDAP, SOAP, MOM, Mail Protocols, shell contents, Java items, and database. It additionally incorporate Test IDE, dynamic detailing, direction line mode, movability, multithreading, reserving of test outcomes and exceptionally extensible center.

It bolsters numerous sorts of uses, servers and conventions like Web, SOAP, FTP, TCP, LDAP, SOAP, MOM, Mail Protocols, shell contents, Java items, and database.

## 6.3.14 BLAZEMETER

You can without much of a stretch make load and execution tests. It is perfect with JMeter instrument. JMeter tests well with Blaze-Meter too. With Blaze-Meter, API tests can be setup effectively, to do client intelligent site testing, perform adaptable load testing utilizing virtual client traffic and complete much more. This instrument bolsters local just as portable web applications.

## 6.3.15 APPIUM

This Test computerization system is proposed for portable applications, and mechanization of local, cross breed and versatile web applications worked for iOS and Android. This tool uses seller gave automation structures and depends on customer/server design. Appium is anything but difficult to introduce and utilize.

## 6.3.16 ROBOTIUM

It is an open-source test automation system basically implied for Android UI testing? It bolsters both local and cross breed applications. Utilizing Robotium, efficient, lucid and simple to utilize computerized dark box UI tests planned for android applications can be composed. Framework testing, useful testing, and client acknowledgment testing over Android-based applications with the assistance of Robotium can be performed.

## 6.3.17 KATALON STUDIO

It is a ground-breaking test automation answer for portable, Web, and API testing it gives a complete arrangement of highlights for test mechanization, including recording activities, making experiments, creating test contents, running tests, detailing produced results, and coordinating with different instruments in the product improvement lifecycle.

Katalon Studio keeps running on Windows and MacOS, additionally supporting mechanized testing of iOS and Android applications, web applications on every single current program, and API administrations. This devices can be incorporated with apparatuses, for example, JIRA, qTest, Kobiton, Git, and Slack.

## 6.3.18 WATIR

It is a contraction for Web Application Testing in Ruby. It is a light-weight apparatus for mechanizing web application testing. It underpins web application paying little respect to considering over which innovation, application is structured. With this, straightforward, adaptable, comprehensible and effortlessly viable robotized tests can be planned. Organizations that utilization Watir incorporates SAP, Oracle, Facebook, and so forth.

## 6.3.19 WATIN

Name of this device means Web Application Testing in .NET. This test automation system bolsters IE and FF programs, and for UI and useful testing of Web applications.

## 6.3.20 SOAPUI

This is a utilitarian testing device which gives finish API Test Automation Framework for SOAP and REST.

# 6.4 Commercial Tools

## 6.4.1 [Perfecto Mobile](https://www.perfectomobile.com/)

Perfecto Mobile is a third party cloud provider that gives “run time dynamic adaptive automation “ users access to hundreds of real mobile devices to test against.

Any Organization has access to the Perfecto public cloud as well as a secure private cloud.  The private cloud can be updated/customized as needed, giving us flexibility to test against specific device/os combinations from physical locations in any country like India, Australia and China.

Additionally, Perfecto supports a private repository where apps can be stored as “.apk” or “.ipa” files and dynamically loaded onto a device at runtime and cleared after execution.

## 6.4.2 [BrowserStack](http://www.browserstack.com/)

BrowserStack is a third party cloud provider that gives RTDAA users access to thousands of OS/Browser/Version combinations. When a user makes a request to Browser Stack they provide an OS (Windows XP - 10, OSX Snow Leopard - El Capitan), browser (Chrome, Firefox, Safari, Opera, Yandex, IE, Edge) and a browser version.

Browser Stack spins up a Virtual Machine (VM) in their private cloud with these specifications and the automation scripts are executed against them as if they were the users local desktop.  This allows Mac users to test on IE, Windows 10 users to test old versions of Chrome, etc.

## 6.4.3 [AppliTools Eyes](https://applitools.com/)

AppliTools Eyes is a visual automation tool allowing users to test the look and feel of an application in a way that Selenium by itself is not capable of.  A user takes a screenshot of an application at various points in the test and creates "gold standard" images of what they expect it to look like.

In subsequent runs engineers will put "checkpoints" into their code where they take another screenshot and send it to AppliTools for comparison against the "gold standard" image.  Using the Eyes, AppliTools can tell you whether a logo is out of place or missing, if the layout of a page is messed up or anything in between.  AppliTools Eyes allows for an incredible amount of flexibility in the comparison and allows the user to tweak the algorithm for each image.  Users can choose to ignore certain areas of the image (for example, if Google Ads are present and always changing) and set the comparison type (pixel to pixel, layout, etc.).

## 6.4.4 [Page Object Model](https://github.com/SeleniumHQ/selenium/wiki/PageFactory)

The Page Object Model is an industry standard best practice for writing test automation scripts that allows the user to represent a page's functionality in a highly intuitive, readable format.

Page Objects allow engineers to define an application's behaviour in single place and reuse it throughout their tests.  The model allows for easy and efficient updating of automation scripts as the application UI changes.  RTDAA provides utilities that assist in writing these objects and take care of many of their commonly pain points users experience with them.

## 6.4.5 UFT

Brought together Functional Testing (UFT) is a business testing instrument for practical testing. It gives a list of capabilities to API, web administrations, and GUI testing of work area, web, and versatile applications crosswise over stages. This apparatus has propelled picture based item acknowledgment include, reusable test segments, and computerized documentation. UFT utilizes Visual Basic Scripting for testing procedures and article control. UFT can be incorporated with Mercury Business Process Testing and Mercury Quality Center. This backings CI with Jenkins. It was recently known as QuickTest Professional (QTP).

It brings designers and specialists meeting up under one umbrella and gives great automation testing arrangements. It makes practical testing less unpredictable and cost-accommodating. Its highlights incorporate Cross program and multi-stage similarity, Optimized circulated testing, different testing arrangements, and picture based item acknowledgment and canvas, visual test streams.

## 6.4.6 IBM RATIONAL FUNCTIONAL TESTER

IBM RFT is an information driven testing stage. It bolsters applications, for example, .Net, Java, SAP, Flex, and Ajax. RFT utilizes VB, .Net and Java as programming dialects. RFT has an element called as Storyboard testing in which clients' activities on AUT are recorded and imagined in a storyboard arrange through application screen captures. It tends to be coordinated with IBM Jazz application lifecycle the board frameworks, for example, IBM Rational Team Concert and Rational Quality Manager.

This instrument is expected for computerized practical testing and relapse testing. It permits to perform information driven and GUI testing. The computerized testing depends on content guarantee innovation which exceedingly enhances the productivity of testing and gives simple content support. This device does computerized execution testing over web and server based applications. It has RCA capacities to evacuate execution bottleneck. It gives constant detailing and test information customizations. It likewise offers load and adaptability testing.

## 6.4.7 TESTCOMPLETE

Condition Supported are web, portable, and work area testing. Programming/scripting dialects bolster: JavaScript, VBScript, Python, and C++Script. Testing performed: watchword driven and information driven testing with Test Complete offers simple to-utilize record and playback highlight. Like UTF, TestComplete's GUI object acknowledgment capacity can consequently change with UI objects which decreases the push to keep up test contents when the AUT is changed. It very well may be incorporates with Jenkins in a CI procedure.

This apparatus works for work area, portable and web applications. With TestComplete, Functional UI tests can be manufactured and run by means of powerful record and replay abilities or by scripting in your most loved dialects, including Python, JavaScript, and VBScript with help for applications, for example, .Net, and local and half breed iOS and Android applications, alongside relapse, parallel, and cross-program testing capacities.

## 6.4.8 TESTPLANT

This is a picture based computerized useful testing device, empowers specialists to interface with application under test. Here User's perspective is put rather of the test contents see regularly observed by designers. This enables engineers with less programming abilities to learn and apply test automation naturally. This apparatus bolsters stages like Web, versatile, and POS frameworks. Lab the board and CI combination should be possible with this apparatus.

## 6.4.9 TRICENTIS TOSCA

This is a model-based test mechanization apparatus which gives an expansive list of capabilities to ceaseless testing including dashboards, investigation, and reconciliations to help light-footed and DevOps philosophies. This causes clients to improve the reusability of test resources. It underpins a scope of innovations and applications, for example, web, versatile, and API. This has highlights for combination the executives, hazard examination, and conveyed execution.

## 6.4.10 RANOREX

Ranorex is a very computerization instrument for web, versatile, and work area testing. The instrument highlights for GUI acknowledgment, reusable test contents, and record/playback. Codeless test creation is an element that permits new mechanization specialists to learn and apply test computerization to their undertakings. The device does Selenium combination for web application testing. Designers can disperse the execution of their tests crosswise over stages and programs utilizing Selenium matrix.

## 6.4.11 DOMO

Domo is an examination dashboard enabling groups to total information, for example, test results, sonar filters, test inclusion, and so on into a solitary, effectively coherent and edible dashboard that can give a quick review of an item's wellbeing.

## 6.4.12 QMETRY AUTOMATION STUDIO

This is a main programming mechanization device based on Eclipse IDE and driving open source structures, Selenium and Appium. It brings structure, effectiveness, and reusability to computerization endeavours. The studio bolsters propelled automation technique with coded computerization and empowers manual groups to change into mechanization flawlessly with content less computerization strategies. Notwithstanding test writing, QAS gives a bound together answer for an Omni channel, multi-gadget, and multi-district situation by supporting the web, portable local, versatile web, web administrations, and small scale administrations parts.

This encourages the undertaking to scale computerization along these lines killing the requirement for uncommon reason apparatuses. This is a piece of the Artificial Intelligence empowered QMetry Digital Quality Platform, a standout amongst the most exhaustive programming quality stages offering test the executives, test mechanization, quality examination in a solitary suite.

## 6.4.13 TESTIM.IO

This instrument use machine learning for the writing, execution, and upkeep of computerized test cases. Utilizations dynamic locators and learn with each execution/reiteration of Steps.

This produces super-quick writing and stable tests that adapt, therefore disposing of the need to consistently keep up tests with each code change. Organizations like Netapp, Verizon Wireless, and Wix.com keep running more than 300,000 tests utilizing Testim.io consistently. Testim, a Heavy piece portfolio organization, has double workplaces in San Francisco and Israel (R&D) and is supported by Spider Capital (Appurify, PagerDuty), Foundation Capital and different U.S. based speculators.

## 6.4.14 HP QUALITY CENTER

HP Quality Center programming institutionalizes testing. It is a coordinated IT quality administration programming application. Mechanized testing is one of its key highlights which continually permits to test prior and faster. Offering to reusability permits HP QC to have without bug and dependable applications.

## 6.4.15 TELERIK TEST STUDIO

Is an extensive test computerization arrangement. It is for GUI, execution, and API testing. It permits to test work area, portable and web applications. Its highlights incorporate Point-and-snap test recorder, bolster for genuine coding dialect, focal article store and nonstop joining with source control.

## 6.4.16 RANOREX

It is adaptable, across the board GUI testing device where you can execute mechanized tests immaculately all through all situations and gadgets. It has too keen item acknowledgment include that naturally recognizes any adjustment in the UI and props the test up.

Other huge highlights of Ranorex incorporate reusable code modules, early bug finding, and consistent mix with different instruments, basic test recording and simple to utilize the manager.

## 6.4.17 EGGPLANT

EggPlant is (By TestPlant) principally went for application testing and GUI testing. For designers, Eggplant offers an assortment of test automation devices utilizing which diverse sorts of testing can be performed. This has two segments, Eggplant useful for practical testing and eggplant execution for execution, load and stress testing.

EggPlant takes a shot at picture based methodology rather object-based methodology. Utilizing a solitary content, testing on various stages like Windows, Mac, Linux, Solaris, can be performed.

## 6.4.18 SILK TEST

It is an authorized result of Micro center goes for computerized utilitarian and relapse testing. It crosses program bolster and bound together test mechanization for an assortment of uses including work area applications, versatile applications, web applications, rich-customer applications and venture applications. It empowers proficient, expedient and fantastic computerization testing.

## 6.4.19 SAUCE LABS

This is a selenium cloud-based ideas that offers computerized testing over cross-programs and numerous stages. It works with portable and work area applications. It is known for altogether quickening test cycles. Organizations incorporates Yahoo, Zillow, and OpenDNS have ensured that they have decreased testing time by a tremendous degree with the assistance of SauceLabs.

## 6.4.20 SAHI

It is an analyser driven web computerization instrument. This cross-program/stage apparatus accompanies highlights, for example, shrewd frill distinguishing proof, record and playback on any program, no ajax timeout issues, start to finish revealing, amazing scripting and inbuilt exceed expectations system.

## 6.4.21 HP LOAD RUNNER

This is again a robotized load and execution testing device given by Hewlett Packard. It works in various conditions and over various sorts of utilizations. It bolsters portable and cloud testing too. HP Load Runner estimates framework execution, permits to do the RCA and fix the bugs previously the application is discharged to live condition.

## 6.4.22 NEOLOAD

It is additionally exceptionally prevalent and computerized execution testing instrument. It reproduces client exercises and discovers the framework bottlenecks. It underpins both portable and web applications. This backings both versatile and web applications.

## 6.4.23 PERFECTO

This computerized application testing over cross programs and cell phones. It very well may be stopped with other test automation systems.

## 6.4.24 WEBLOAD

This is a heap, execution, and stress testing instrument for portable and web applications. It incorporates with testing apparatuses like Selenium, Perfecto versatile, and so on. It gives dashboards to give clear picture of tests run.

## 6.4.25 TEST ANYWHERE

It is an instrument for frontend robotized testing apparatus that imitates the genuine client activities and don't have to compose any code.

## 6.4.26 VISUAL STUDIO TEST PROFESSIONAL

This device gives exploratory program based testing. This device for streamlining quality and nonstop conveyance. It has the free preliminary accessible also.

## 6.4.27 TESTINGWHIX

It is an authorized device which offers mechanization answers for relapse testing, web testing, portable testing, cross-program testing, web administrations testing and database testing. It has design which underpins nonstop incorporation exceptionally well.

## 6.4.28 TOSCA TESTSUITE

It is a mechanized device for performing utilitarian testing, relapse testing. Furthermore, business dynamic directing.

# 6.5 Tools used for Cross Platform Testing

* 1. Browser-stack: this is based on cloud and tests websites on multiple browsers and OS combinations. Trial version may be tested and thereafter fee need to be paid as number of users licenses.
  2. Testize: This tool works on standards and analyze websites identifying issues in performance, site rendering and compatibility.
  3. Test Plant: This is cross browser testing automation tool to test Websites in different Operating system environments and configurations.
  4. Browser shots: this is a free Open source tool which creates screenshots of website to run on different browsers. These screenshots are tests n real browser on different operating systems.

# 6.6 How the Right tool be chosen

* 1. Market Research: Search tool available whether Free Open Source, Community versions or Paid one fit in the requirements.
  2. Experts View: Get feedback from the users and experts or from Forum of experts to get experiences on the features of tools.
  3. Personal Experience: Do some research on your personal experience and shortlist some best tools that best suits requirements and affordability.
  4. Prepare comparison chart and do SWOT Analysis to select the best tool.
  5. Have at least 2 tools for the requirements we have to get experience and backup.

# References

[Ajamo Adams, Stop Coding, Learn to test automate without coding and get that automation testing job,](https://www.amazon.in/Stop-Coding-automate-without-automation-ebook/dp/B07B74V474/ref=sr_1_3?ie=UTF8&qid=1539174045&sr=8-3&keywords=automation+software+testing)

[Feroz Pearl Louis,](https://www.amazon.in/Mastering-Mobile-Automation-Feroz-Pearl/dp/1782175423/ref=sr_1_3?s=books&ie=UTF8&qid=1539171133&sr=1-3&keywords=automation+testing+tools" \o "Mastering Mobile Test Automation)[[Gaurav Gupta](https://www.amazon.in/Mastering-Mobile-Automation-Feroz-Pearl/dp/1782175423/ref=sr_1_3?s=books&ie=UTF8&qid=1539171133&sr=1-3&keywords=automation+testing+tools" \o "Mastering Mobile Test Automation)](https://www.amazon.in/Gaurav-Gupta/e/B00J65JPNI/ref=sr_ntt_srch_lnk_3?qid=1539171133&sr=1-3)[, Mastering Mobile Test Automation,](https://www.amazon.in/Mastering-Mobile-Automation-Feroz-Pearl/dp/1782175423/ref=sr_1_3?s=books&ie=UTF8&qid=1539171133&sr=1-3&keywords=automation+testing+tools" \o "Mastering Mobile Test Automation)11 May 2015,

Gennadiy Alpaev, Test Complete Cookbook, 16 December 2013

http://www.seleniumhq.org/

<https://www.katalon.com/>

<http://www.robotframework.org/>

<http://watir.com/>

<https://software.microfocus.com/fr-ca/software/uft>

[https://www.ibm.com/](https://www.ibm.com/us-en/marketplace/rational-functional-tester)

[https://smartbear.com/](https://smartbear.com/product/testcomplete/overview-b/)

<https://www.testplant.com/>

https://www.tricentis.com/

<https://www.ranorex.com/>

https://en.wikipedia.org/wiki/Software\_testing

https://en.wikipedia.org/wiki/Debugging

[MR Navneesh Garg, Test Automation Using HP Unified Functional Testing: Explore Latest Version of QTP,](https://www.amazon.in/Automation-Using-Unified-Functional-Testing/dp/0992293502/ref=sr_1_21?s=books&ie=UTF8&qid=1539172399&sr=1-21&keywords=automation+testing+tools) 1 August 2013

[Rahul Shende, Software Automation Testing Tools for Beginners,](https://www.amazon.in/Software-Automation-Testing-Tools-Beginners/dp/1619030454/ref=sr_1_2?s=books&ie=UTF8&qid=1539171133&sr=1-2&keywords=automation+testing+tools" \o "Software Automation Testing Tools for Beginners)26 April 2012

[Rex Black](https://www.amazon.in/Rex-Black/e/B001I9QBYQ/ref=sr_ntt_srch_lnk_1?qid=1539173989&sr=1-1) and Erik van Veenendaal, Foundations of Software Testing ISTQB Certification, February 2015