RESEARCH ARTICLE OPEN ACCESS

A Study on Issues, Challenges and Comparison of Various Automated Testing Tools

Dr. K B Priya Iyer [1], Sharmili V[2]

[1]Associate Professor, [2]Student - M.Sc. Information Technology
Department of Computer Science
M.O.P. Vaishnav College for women (Autonomous), Chennai, India.

Abstract:

Testing is a one of the important activity in Software Development Process for a software project and produces high quality software if tested effectively. Software Testing can be conducted manually as well as Automated. The increasing complication of software development like estimation and scheduling, productivity issues, technical risks and so on demands that developers to use Automated Software Testing Tools. This study explores and analyses benefits of different kinds of automated software testing tools to increase software quality assertion. Benefits are presented for software engineers and classified it in relation to quality factors, requirements and their features.

Keywords **— Software Testing, Effective Testing, Automated Software Testing.**

I. INTRODUCTION

The ultimate aim of software development process is to produce high quality software. Bigger quality software has characteristics like low cost, consistent, user satisfactory, time efficient etc. Testing is a process of executing a program with target of finding errors. This is an important activity to notice all errors early in an software development process(SDP). Categorical and abundant testing reduces system cost.

Software development process reports recruit testing and quality assurance team for performing testing activity. Test means program's response to each and every possible input and should test for every valid & invalid input. Testing activity can be conducted in to two ways which are Manual testing &Automation testing. Any type of software testing can be executed both manually as well using an automation tool.

Manual testing is one of the type of software testing which test the software product manually to find out the defects and bugs present in it. Manual software testing is executed without using any automated tools and techniques for testing the software product. For achieving manual testing, a test plan is used which describe the systematic and detailed approach of testing a software product. The motive of this testing is to make sure that software product under this testing is bugs-free.

Manual testing is a lengthy activity that needs to maintain a definite set of qualities such as patient, creative, innovative, open-minded, resourceful, skilful etc. In order to completely test all the requirements of an

application, there must be at least two test cases for each requirement such as one positive test and one negative test. Manual testing is not suitable for large projects as it requires more resources and time than small projects.

Automation test interface is a platform which offers a single workspace for incorporating multiple testing tools and techniques. Automated testing is a process which execute a pre-defined scripted test on software to find defects and bugs. Automated testing is the finest way to increase the effectiveness and efficiency of software testing. Automation testing can does what manual testing does not.

Automation testing also improves the accuracy and saves the time of the tester & organization's money. It is best for the environment where the requirements are continually changing & huge amount of detailed regression testing is required to be performed. The automation software testing consists of a sequence of activities, processes and tools that processed in order to execute the test on software and to keep the record of the result of tests.

II. REVIEW OF LITERATURE

[5]Performs a comparative study on automated testing tools for Mercury QTP&QA TestComplete based on measures like efforts, result reports, speed, cost, time etc. [5] Also analyses features maintained by these functional testing tools. [4]Evaluates three automated testing tools to find their usability, reliability and effectiveness.[2]Examines features and concepts of these two testing tools in order to access pros and cons of the tools and what could be the recommendations for its additional expansion.

[10]Provides a feasibility study based on diverse parameters for automated testing tools like Selenium, Soap UI, HP Unified Functional Testing (UFT), Test Complete (TC), for developers or users to pick the appropriate tool based on their requirements.[7] Presents a study on various automated testing tools that are used on different platforms and environment. It helps the tester to easily automate the whole testing process. [7] Also analyses accuracy and time used by the tester while using automated testing as compared to the manual testing.

[6] Analyses automated testing tools with their features like recording capabilities, Efficiency, Supporting Languages, Test &Code Reusability that determine the effectiveness of testing tool under these parameters.[3]Conducts a comparative study of automated testing tools like Selenium and Quick test professional (QTP).Evaluates automated software testing tools to decide their features like usability, maintenance and effectiveness.

III. SOFTWARE TESTING

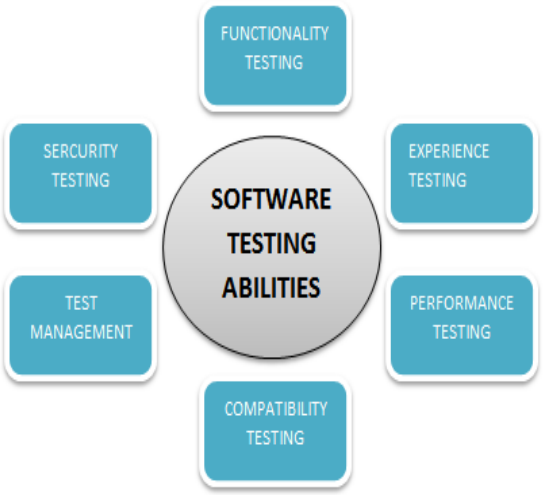
A software development life cycle (SDLC) is structure enforces on the development of a software product. Software testing refers to process of evaluating the software with intention to find error in it. Software testing is a technique aimed in valuing an attribute or capability of a program product and determining that it meets its quality. It is also used to test its quality factors such as reliability, usability, integrity, security, capability, efficiency, portability, functionality, reusability etc.The aim is to find all the defects present in a software product. It is the process of exercising and evaluating a system components by

manual or automated to verify that it satisfies specific requirements or to find difference between expected and real results.Testing identifies faults and increases the software quality by increasing the software's potential reliability. Testing is the process of measuring the quality of software project.

SOFTWARE QUALITY FACTORS:

The software testing quality factors are:

Reliability: It Measure whether the product is reliable enough to sustain in any



condition and should give consistently correct results.

Maintainability: Different versions of the product should be easy to maintain. Maintenance should be cost effective and easy. System should be easy to maintain and correct defects or make a change in the software.

Usability: This can be found in terms of ease of use. Application should be user-friendly and should be easy to learn.

Portability: It can be measured in terms of Cost issues related to Technical issues and Behavioural issues related to porting.

Correctness: It should be correct in terms of its functionality, calculations used internally. This means application should follow to functional requirements of that application.

Efficiency: Measured in terms of time needed to complete any task which is given to the system. If it is not efficient then it can't be used in real time applications.

Security: System security should be adequate to prevent unauthorized access to system functions, preventing information loss and ensure that the software is protected from virus and protecting the privacy of data which is entered.

Testability: System should be easy to test and find defects and If needed it should be easy to divide in different modules for testing.

Flexibility: The tool should be flexible to modify and adaptable to other products with which it requires interaction.

IV. TYPES OF TESTING

There are two ways of testing that are manual or automation. Table 1 gives the comparison of manual and automated testing.

Table 1: Manual Testing Vs Automated Testing

FEATURES	TYPES OF TESTING	
	MANUAL TESTING	AUTOMATED TESTING
Accuracy	Less accuracy.	More accuracy than manual testing.
Cost	Highly expensive	Less expensive
Effort	More effort needed.	Less effort is enough.
Consistency	Less-consistent.	Consistent.
Ease of use	Partially complex.	Easy to learn and use.
Code coverage	Partial	Complete
Maintainability	May cause fake reports during maintenance.	Maintenance is good.
Bug density	High	Low
Man power	Man power is more compared to automated testing.	Less man power.
Tools	No tools used.	Tools are available.
Speed	Low speed.	High speed.
Quality	High quality for smaller projects. Low for larger projects.	High quality for smaller as well as larger projects.
Reliability	Less reliable.	More reliable.
Performance	Low performance.	High performance.
Security	Partially secured.	Highly secured.

V. AUTOMATED TESTING TOOLS:

Automation testing programmes the steps present in manual testing using automation testing tools such as Selenium, QTP and Test Complete, Watir, SoapUI, Robotium etc. It rises and improves test execution speed, reliability, efficiency, programmable, comprehensive, reusable than the manual testing. This paper compares the top four automated testing tools such as Selenium, QTP and Test Complete, Ranorex.

1. SELENIUM:

Selenium is one of the popular free and open-source web testing tool which is used to test the web browsers through different platforms. It is primarily used by Web development community to implement automated testing of web applications. The main feature of Selenium is a multi-browser Support for execution of test cases in web applications. It can be divided into four components, they are Selenium IDE which is used as a prototyping tool and programming languages is not required. Selenium Remote Control that allow users to use the programming languages. Web Driver which implement a firm approach by direct communication between test scripts and browsers. Selenium Grid that helps to execute parallel tests on different browsers by using with Selenium Remote Control (SRC).

2. QUICK TEST PRO:

Quick Test Professional (QTP) is a graphical interface record and playback automation tool. Trial version of QTP can be downloaded from the official web site of HP. we can analyse the Integrated Development Environment (IDE) of QTP a Software testing tool. It captures, verifies and replays user interaction automatically and helps tester to quickly identify and

report on application effects, while providing highly developed functionalities for tester collaboration. It works by identifying the objects in application user interface (AUI) or a web page which perform its desired operations. It can also capture object properties like name or handler ID. HP QTP scripting language is VB Script. Toper form more complex actions, users may need to manipulate the essential VB Script.

3. TEST COMPLETE:

TestComplete is an automated testing tool that provides an ability to build & implement tests for Microsoft Windows, Web, Android OS, iOS applications etc. It is used to create & automate different software test types for different applications. It is used for functional testing, database testing, data driven testing, SAP testing, regression testing and so on. It has a flexible architecture that is creating, maintaining, & executing automated tests across desktop, web, and mobile applications easy, speedy, and cost effective. Some key features of TC Platform are like Support for multiple scripting languages, ability to record automated tests, Regression tests with UI changes, Custom plugins &allowances.

4. RANOREX :

Ranorex is a GUI test automation framework. This framework is used for testing desktop, web-based and mobile applications. It is used for testing of desktop-based, web-based, mobile applications etc. It supports many user interface (UI) technologies that includes Java, HTML, C#, Flex/Flash, Android etc. It covers a wide range of operating systems and browser environments such as Internet Explorer, Mozilla Firefox. Its objective is to provide possible acknowledgement for all types of software applications.

VI. COMPARISON BETWEEN AUTOMATED TESTING TOOLS

The popular automated testing tools are studied based on their features in Table 2 and Table 3and with respect to quality factors in Table 4.

Table 2: Comparison Based On Features of Automated Testing Tools

FEATURES	AUTOMATED TESTING TOOLS			
	SELENIUM	**TESTCOMPLETE**	**QTP**	**RANOREX**
Application support	Web application only.	Web, Desktop, and Mobile applications	Client-Server applications	GUI test automation Framework.
Browser support	Supports IE, Firefox, Opera, Safari, etc.	Chrome, Firefox, IE, Opera.	Supports only IE and Firefox.	Supports Any Browser.
Operating system/platform	Windows PC, MAC, UNIX platforms.	Windows 7 and latter.	Windows only.	Any desktop or mobile software.
Technical support	No technical support needed.	Need Good technical support through phone, mail, web forum etc.	Need Good technical support through phone, mail, web forum etc.	Need Good technical support.
Licence cost	It is open source. So it's free of cost.	Licensed.	Licensed and very Expensive.	Less Expensive than QTP. Proprietary.
usage	Selenium needs quite a bit of expertise	Support for all 32-bit and 64-bit window application.	QTP is quite easy to learn in a short time.	Easy to use and learn.
Test Development Environment	Developed using several IDEs like Eclipse, Visual Studio, Net beans, etc.	Developed using IDEs like Visual Studio, Eclipse etc.	Test scripts can be developed in QTP only.	Developed using IDE like Visual Studio.
Database application	Not convenient.	Convenient.	Convenient.	Convenient.
Report generation	HTML	HTML, XML	HTML	XML
Ease of installation and use	Experience required.	Experience required.	Easy to use and access.	Little complex to use due to more features.
Programming skills	For using Selenium one needs to have programming skills.	It is good for both web based and desktop application.	It is quite easy to use and edit the script, parameterize, playback & certify the results.	Not required
Scripting languages	Java, c# , Ruby, Python, PHP	VB Script, c#, C++, JavaScript	JavaScript	C++, Python, C#,VB.NET
Platform dependency	Here all tasks can be accomplished.	It is hard to deploy applications.	Here It is difficult to organise smoke tests for web application.	It is little complex to organise applications.
Debugging support	Strong	Strong	Strong	Strong

Table 3: Comparison Based On Requirements Of Automated Testing Tools:

REQUIREMENTS	AUTOMATED TESTING TOOLS			
	SELENIUM	**TESTCOMPLETE**	**QTP**	**RANOREX**
API TESTING	NO	YES	YES	YES
UNIT TESTING	YES	YES	YES	NUnit is used
INTEGRATION TESTING	YES	QA Complete tool is required	YES	YES
CROSS-BROWSER TESTING	YES	YES	YES	YES
MOBILE TESTING	YES	YES	YES	YES
DATA-DRIVEN TESTING	YES	YES	YES	YES
SAP TESTING	NO	YES	YES	YES
END-END TESTING	NO	YES	YES	YES
RISK-BASED TESTING	NO	NO	Require HP QC/ALM	NO
REGRESSION TESTING	YES	YES	YES	YES
FUNCTIONAL TESTING	YES	YES	YES	YES
SANITY TESTING	YES	NO	YES	YES
IMAGE-BASED TESTING	Additional libraries are required to install	Built in support is present	Built in support & image-based object recognition is available.	Built in support is present
LOAD AND PERFORMANCE TESTING	YES	Load Complete tool is required	YES	YES
EXCEPTION HANDLING	YES	PARTIAL	YES	YES
SCRIPT CREATION TIME	SLOW	QUICK	QUICK	QUICK
BUG-MANAGEMENT	PARTIAL	YES	YES	YES
RECOVERY	SLOW	FAST	FAST	FAST
RECORD AND PLAYBACK	NO	PRESENT	PRESENT	PRESENT

Table 4: Comparison Based On Software Quality Factors

QUALITY FACTORS	AUTOMATED TESTING TOOLS			
	SELENIUM	**TEST COMPLETE**	**Quick test professional**	**RANOREX**
RELIABILITY	No	Yes	Yes	Yes
MAINTAINABILITY	Yes	No	Yes	No
USABILITY	Yes	No	Yes	No
PORTABILITY	Yes	Yes	No	Yes
CORRECTNESS	Yes	No	Yes	Yes
EFFICIENCY	No	No	Yes	Yes
SECURITY	No	No	Yes	Yes
TESTABILITY	Yes	Yes	Yes	Yes
FLEXIBILITY	Yes	Yes	Yes	Yes

VII. CONCLUSION

One can select a testing tool based on the type of application which is need to be tested, cost and the efficiency required for that. Each tool has its own pros and cons. If your test automation requirements are satisfied with Ranorex, there is no need to go for QTP at a highly expensive. Both tools are for the same purpose, but it is just that QTP is a flexible tool for a critical and more uncertain Application Under Test. TestComplete has easy to use UI and effective playback and will be best for applications with lesser security needs. Selenium can also be used if you don't want to spend on testing tool. In conclusion, QTP is the best tool for desktop and web based application.

REFERENCES

1. *Comparative study and evaluation of web based automation testing tools. sonia chhabra,sanjeev kumar singh 2250-1797 Volume 7– No.2, March - April 2017*

2. *Studying and comparing automated testing tools: Ranorex and testcomplete. neha dubey,savita shiwani. ISSN:2319-7242Volume 3 Issue 5 may, 2014*

3. *Comparative study on automated web testing tools:Selenium and Quick Test Professional. S.Rajeevan, B.Sathiyance ISSN:2319-7242 Volume 3 Issue 7 July, 2014*

4. *Comparative study of automation testing tools:TC and QTP. manjit kaur ,raj kumara 0975 – 8887 Volume 24– No.1, June 2011*

5. *Comparative analysis of open source automated software testing tools : selenium, sikuli and watir inderjeet singhISSN 0974-2239 Volume 4.*

6. *A Study on Various Software Automation Testing Tools. Neha Bhateja Volume 5, Issue 6, June 2015 ISSN: 2277 128X*

7. *Quantitative Analysis of Manual and Automation Testing and Comparative Study of Selenium and Load Runner Automated Testing Tools Krutika Kamble, Jyoti Kharade ISSN(Online): 2320-9801 Vol. 4, Issue 5, May 2016*

8. *Comparative Study Of Automated Testing Tools: Rational Functional Tester, Quick Test Professional, Silk Test And Loadrunner Rifa Nizam Khan, Shobhit Gupta Volume No 03, Special Issue No. 10 , February 2015 ISSN (Online): 2348 – 7550*

9. *Comparative Study of Automated Testing Tools: Selenium, SoapUI, HP Unified Functional Testing and Test Complete Meenu Yogesh Kumar September 2015, Volume 2, Issue 9 JETIR (ISSN-2349-5162)*