Comparative Study of Automated Testing Tools: Selenium, SoapUI, HP Unified Functional Testing and Test Complete

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Abstract: Software testing is one of the most important phase of Software Development Life Cycle and main technique to find bugs and ensure quality of the software. Software Testing can be conducted manually as well as automated. In manual testing, testing is done without any tool. In automation testing, testing is done with the help of automated testing tools. These automated testing tools enable developers and testers to easily automate the entire process of testing in software development. There is wide variety of software automated testing tools available in market. But it is important to a user to select a best suitable tool for testing. This research paper provides a feasibility study based on different parameters for commercial tools such as the Selenium, SoapUI and open source automation testing tools i.e. HP Unified Functional Testing (UFT), TestComplete (TC), helping developers or users to pick the suitable tool based on their requirements. The objective of this paper is to analyze the features supported by these four functional testing tools that aid in minimizing the resources in script maintenance and increasing efficiency for script reuse.

Keywords: **SDLC, manual testing, automated testing, Selenium, SoapUI, HP UFT, TC.**

1. INTRODUCTION

Software testing is the process of exercising or evaluating a system or system component to verify that it satisfies specified requirements or to identify differences between expected and actual results. The aim of software testing process is to identify all the defects existing in a software product [30].

Software Testing follows two ways of testing i.e. manual or automation. Manual testing is the basic method of testing done on any software. Manual Testing is a process where in a tester often follows a written test plan that leads them through a set of important test cases [13]. Manual Testing has many drawbacks such as consuming time and cost, require experience, complex reusing, less efficiency and not provide scripting facility for code [18].

Automation Testing is the use of testing tools and reduce the need of manual or human involvement, repetitive or redundant tasks [4]. It increases the test execution speed, more reliable, repeatable, programmable, comprehensive, and reusable. Automation testing covers all the problems of manual testing and reveal all complex Obstacles attached with it.[25] Automation testing automates the steps of manual testing using automation testing tools such as Selenium, SoapUI, HP Unified Functional Testing (UFT), Test Complete (TC) [30].

The software testing tools can be compared on the basis of different parameters.

2. METHODOLOGY

There are a lot of functional testing tools exist on the market commercial or open source. We select the tools that perform the automation testing using record scripts and then playback these scripts as an important feature in testing automation. [18]

2.1 Automated software testing tools

For the selection of right automated software testing tool, it is important to create a list of requirements tore view when choosing a tool for evaluation. If we do not have a list of requirements, we may waste time for downloading, installing and evaluating tools that only meet some of requirements, or may not meet any of them. This study evaluate four major tool vendors that are Selenium, SoapUI, HP Unified Functional Testing, and Test Complete on their test tool characteristics, test execution capability, test reporting capability, scripts reusability capability, play back capability etc. [10]

Because of the more advantages of the automation testing over manual testing, various companies are engaged in developing various automated test tools for various applications on the basis of the license associated with testing tools we can categorized these automated testing tools as follows:

- Open source test tools
- Commercial test tools [26]

Open Source Test Tools: These testing tools however may not require purchase of license and the code of the application is available to the user for further modifications to be performed. These test tools are free for the users to use. It can be downloaded from the internet or can be obtained by the vendor without any charges e.g. Selenium, SoapUI.

Commercial Test Tools: It includes those testing tools which are closed source in nature and license has to be purchased so as to harness their functionalities to full extent. These tools are the commercial software for sale. User should pay for it to use the software. Costs may be as per the functionality of the test tool. Example under this category is HP Unified Functional Testing (UFT) and Test Complete.

2.1.1   Selenium

Selenium is a one of the efficient open-source automated testing tool which provide a nice testing framework for testing wide variety of applications exporting scripts in almost every language including java, .net, c#. The main feature of Selenium is multi browser supports for execution of test cases [10].
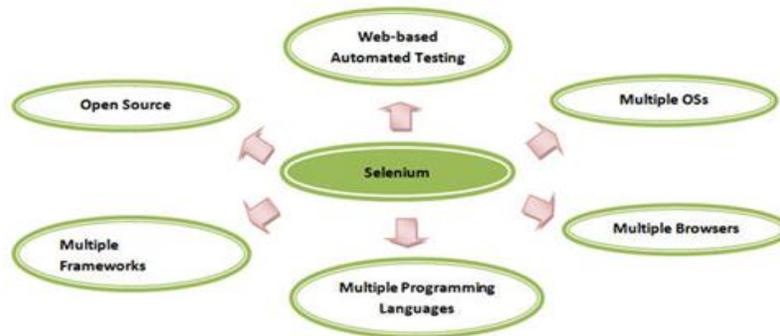

Fig 2.1: Selenium supported browsers, technologies and platforms

2.1.2   SoapUI

SoapUI is an API testing tool that's both free, open source, and cross-platform. With an easy-to-use graphical interface, and enterprise-class features, it allows you to easily and rapidly create and execute automated functional, regression, compliance, and load tests. SoapUI is not just a functional API testing tool but also lets us perform non-functional testing such as performance and security test.
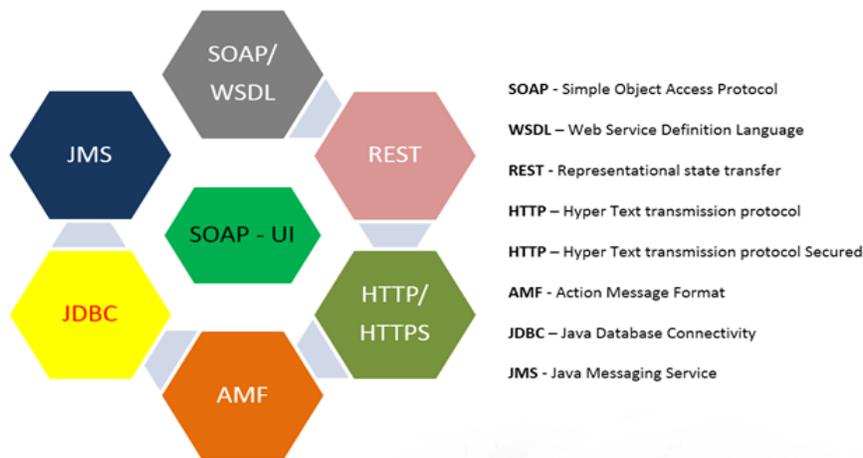

Fig 2.2: Protocols/Technologies Supported by SoapUI

2.1.3   HP Quick Test Pro (QTP) or HP Unified Functional Testing (UFT)

HP UFT is a Functional testing tool which is best suited for regression testing of the applications. It is a licensed/commercial tool owned by HP, one of the most popular tools available in the market. It compares the actual and expected result and reports the results in the execution summary details.

It is an easy and extremely user-friendly tool that works well with Windows & Web based applications. It is a functional testing tool which has the feature for storing screenshot of each and every page navigated during the execution. So it can be used as a proof for completion of testing, and also you can refer the screenshots of previous executions if there is any need to refer them. [21]
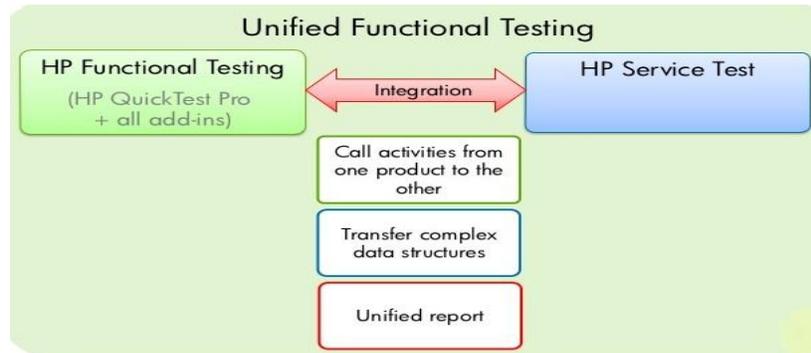

Fig 2.3: Functioning of UFT

2.1.4   TestComplete

TestComplete is a functional automated testing tool developed by smartbear software that gives testers the ability to create automated tests for Microsoft Windows, Web, Android (operating system), and iOS applications.

TestComplete is used to create and automate many different software test types. Record and playback test creation records a tester performing a manual test and allows it to be played back and maintained over and over again as an automated test. [9]

Fig 2.4: Application types supported by TestComplete

3.   EVALUATION STUDY

There are a number of open source and commercial web testing & window application tools available in the software market. Although the core functions of these tools are similar, but differ in functionality, features, usability. With above mentioned aspects, we have selected four functional testing tools for comparison which are Selenium, SoapUI, HP Quick Test professional/Unified Functional Testing and TestComplete. [24]

For this comparative study we have used the current version of selenium that is 2.9.0, HP QTP/UFT 12.02, SoapUI 5.2.0 and current version TestComplete 11.0.

Comparison between these four tools is made on the basis of different parameters. These parameters can be Record-playback capability, Script generation capability, Script languages support, Application support, Technical support, Data-driven testing capability, Report generation capability, Debugging support, Easy to learn, License and Training cost etc. Table below list all evaluation parameters with the meaning of parameters.

Table 3.1: Evaluation Parameters

Features	Explanation
Pricing	License cost of the tools if paid
Cross platforms.	To what degree tool supports operating system
Applications support	Which type of applications are supported by tools
Cross –Browsers	How many browsers tools able to work with
Record-Playback.	The ability of tool to record scripts to be run under different conditions.
Script-language.	Programming language used to edit testing scripts or for the creation of testing scripts
Ease of Learning.	Working with GUI easy or not
Technical support	Tools provide any technical support or not
Data-Driven Framework.	The ability of tool to reduce efforts.
Programming skills.	Require programming skills or based on predefined steps
Training-Cost (USD).	The training cost for tool if exist
Debugging support.	Does the tool has the mechanism to handle error and provide debug or not
Report Generation.	Effective analysis for test script with tool
Product support	Tools supported by which software company

4. Comparison of automated testing tools based on the listed features

Tools/Criteria	Selenium	SoapUI	HP QTP/UFT	TestComplete
Pricing (USD)	Open source and Free of cost	Open source as well Commercial licensed version available that costs 499	Licensed and very Expensive i.e. 8000	Licensed and it costs 1999
Cross Platform	Windows, Linux, Unix, MAC	Window XP and later	Windows Only	Windows 7 and later
Application support	Web applications only.	Web applications as well as Client server applications	Client server applications, Mobile applications	Web, Desktop, and Mobile applications
Browsers-support	Chrome-Firefox-IE-Opera	IE-Firefox-Chrome	IE-Firefox-Chrome	IE-Firefox-Opera-Chrome
Record-Playback	Support	Support	Support	Support
Ease of Use	Experience needed	Easy to learn in a short time	Easy to learn in a short time	Experience needed
Script-language.	Java, C#, Ruby, Python, PHP,	Groovy or JavaScript	VBScript	VBScript, Delphi, C++, C#, and

	JavaScript			JavaScript
Technical support	No official technical support	Good technical support via phone, mail, web forum.	Good technical support via phone, mail, web forum.	Good technical support via phone, mail, web forum.
Data-Driven Framework	Excel-CSV	Excel files, XML, JDBC	Excel files, text files, XML, DB files	Excel, CSV, SQL
Training-Cost (USD)	350	99	250	449
Debugging support	Strong	Strong	Strong	Strong
Report Generation	HTML	HTML	HTML	HTML,XML
Product Support	Open Source Community	Smartbear support with support forums	Dedicate HP support along with support forums	Smartbear support with support forums

5. RESULT AND ANALYSIS OF STUDY

For the purpose of rating the comparison parameters, we have used 3-point scale i.e. 3, 2, 1 as Good, Average, and Bad respectively. So the value of different parameters has been calculated with this 3-point scale. It results the different value for different parameters with selected automated tools. The calculated value of parameters is used for result and analysis of this comparative study. There is an overall comparison graph based on the result for all four automated functional testing tools, shown in Fig 5.1.
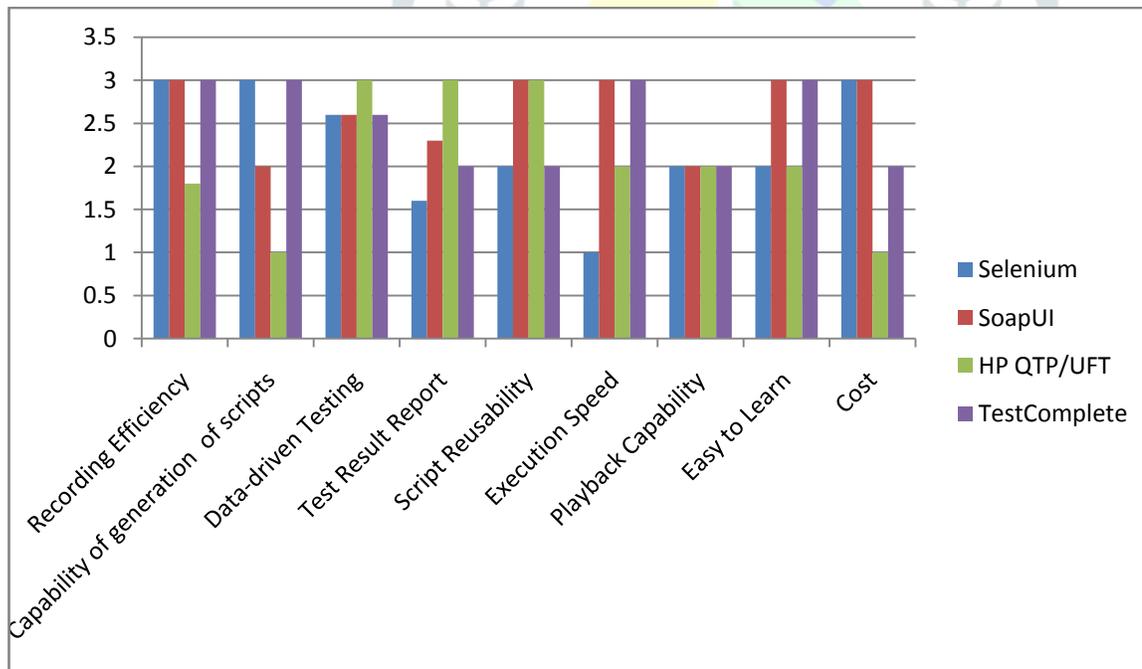

Fig 5.1: Comparison Graph based on selected parameters results

6. CONCLUSION AND FUTURE WORK

One can select a testing tool based on the type of application need to be tested, budget, and the efficiency required. Selenium, SoapUI, HP UFT and TC all four are very good tools for test automation. Each tool has its own pros and cons.

Selenium can reduce the cost as it is open source but the efforts involved in scripting for selenium increased by about 15% than HP UFT and other tools in initial stages. TestComplete has easy to use UI and efficient playback. TestComplete will be best to use for applications with lesser security needs. Thus it does not provide data security while testing. HP UFT is best where data security is needed even while testing. But a major disadvantage of HP UFT is its cost. As HP UFT is a commercial tool, we need to pay a higher cost for this tool.

SoapUI is not just a functional API testing tool but also lets us perform non-functional testing such as performance and security test. There is no issue of high cost. SoapUI is also available as SoapUI Pro, which includes several timesaving features aimed at making your testing faster and easier. SoapUI is open source while we can use its advanced version SoapUI Pro with lesser cost than TC and HP UFT. In conclusion, SoapUI is the best tool among the four.

The future work will encounter more tools and more features also that will help in building a user based requirement model. This comparative study will help users to select best one among these four tools according to their requirements.

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