Comparative Analysis of Automated Software Testing Tools

Majid Khan, Abdus Salam, Javed Iqbal, Syed Irfan Ullah

Abstract: The most significant segments of software development is software testing. Automated software testing is an effective testing process that reduces the effort and cost of manual testing. However, it is difficult to select a suitable software testing tool from the huge list of freely available tools. The main contribution of this work is to conduct a comparative study of three readily available automated software testing tools such as QTP, Silk-4j and Load Runner. The selected tools are evaluated and compared on the basis of their usability, maintenance and effectiveness. For this purpose we have taken an existing JAVA based applications to perform automated testing on these three tools. The results will assist testers to effectively select the best automated software testing tool for related applications.

Keywords: significant segments, However, Automated software, QTP, JAVA based,

I. INTRODUCTION

Software testing is the process of detecting the differences between existing and required situations (that is, bugs) and to evaluate the features of the software item [1]. In other words it is the process of executing a program to find errors. Software testing is an activity that should be done throughout the entire software development process. The objective of software testing is to indicate that a computer program will perform proposed functionality correctly. This testing process adds some value to a program and hence testing incurs some cost. While adding value through testing means raising the quality or reliability of the computer program. Raising the reliability of the program means finding and removing errors. Hence, software testing is one of the crucial activities for software quality assurance.

The goal of testing process is to uncover as many defects as possible with as little testing efforts to minimize the cost associated with testing and with software failures. In other words, we want to write test cases that have a high likelihood of uncovering the faults that are the most likely to be observed as a failure in normal use. It is simply impossible to test every possible input-output combination of the system; there are simply too many permutations and combinations. As testers, we need to consider the economics of testing and strive to write test cases that will uncover as many faults in as few test cases as possible.

II. LITERATURE REVIEW

There are number of open source automated software testing tools available in the software market for testing web-based and window-based applications. Although the core functions of these tools are similar, they differ in functionality, Features, and usability. Shaveta et al.[3], conducted a comparative study of automated software testing tools such as the Mercury Quick Test Professional and the Mercury Load Runner. The comparison criteria is based upon the efforts involved in generating test scripts, capability to playback the scripts, result reports, speed and cost. Their fundamental goal is to analyze the features supported by these two functional testing tools that aid in minimizing the resources in script maintenance and increasing efficiency for script reuse. Rifa Nizam Khan and Shobhit Gupta [4] have evaluated four major software testing tool vendors that are IBM’s Rational Functional Tester (RFT), Quick Test Pro (QTP), Silk Test and LoadRunner on their test tool features, test performance ability, test resorting ability, scripts reusability ability, play back ability and seller qualification.

Amandeep et al. [7], conduct a comparative study of automated tools such as Selenium free source, HP Quick test professional (QTP) and Test Complete (TC). The authors evaluated and compared three automated software testing tools to determine their usability and effectiveness. The authors have not highlighted the specific testing type and not mentioned enough information about the selection of automated testing tools. The authors have only illustrated the weaknesses and strong areas of these tools. Their study has also not determined the parameters of the automatic testing tools.

III. METHODOLOGY

There are lot of automated testing tools exist on the market available commercially or freely as open source. The automated software testing comparison study is conducted focusing on tools description and common features concerning each of the activity. In this study, the selected testing tools that perform the automated testing using record scripts and then playback these scripts as an important feature in testing automation [18].

3.1. Automated Software Testing Tools

Automation is the use of strategies, tools, and artifacts that augment or reduce the need of manual or human involvement or interaction in repetitive or redundant tasks [2]. Automated testing is the process of testing software with different data sets without human involvement. In other words automated testing is automating the process of manual testing. Automated testing covers all the problems.
Comparative Analysis of Automated Software Testing Tools

of manual testing using automated tools such as Quick Test Professional (QTP) [2], Record and Replay (R&R) [3,4], RFT, Silk Test and Load Runner [5]. This increases the speed of testing process, reliability, repeatability, easy programming, comprehensiveness, and reusability.

Software developers might find problems in performing testing since it is somewhat difficult for them to manage both the development of a module and testing of it [5]. The use of automated testing tools tries to solve this problem to some extent and provides a convenient way to perform testing. There are two types of Testing tools [15], i) Open source test tools, and ii) Commercial test tools. Open source test tools- These test tools are free of cost for the users. These can be obtained from their official websites through internet or can be downloaded by the merchant free of cost. Commercial test tools- These test tools are costly. Because some companies settled their own tools and use their scripting language.

3.2. Quick Test Professional
Quick Test Pro (QTP) is a graphical interface based, record & playback automated testing tool. It is a tool used for automation of functional and regression tests for various software applications and environments. HP’s Quick Test Professional uses VBScript scripting language to specify the test procedures and to manipulate the objects and controls of the application under test. Quick Test Professional also enables us to test Java applets and applications, and multimedia objects on Applications as well as standard Windows application, Java, Visual Basic applications and .NET frame work applications. It works by identifying the objects in the application user interface or a web page and performing desired operations (such as mouse clicks and keyboard events). Although HP’s Quick Test Professional is usually used for “UI Based” test case automation, it can also automate some “Non-UI Based” test cases such as file system operation and database testing [6].

3.3. Silk 4jTest
It is a code performance testing tool used across web, mobile and business applications. First advanced by Segue Software and later it is attained by Borland in year 2006. In year 2009 Borland was picked up by Micro Focus International. It also embodies an object oriented language like C++. It can also ensure database authentication by DB Tester. Silk Test held extensions like: Windows GUI, DOM, Java, IE, Google chrome, Firefox, and .NET.

3.4. Load Runner
HP’s Load Runner is a test automation product from Hewlett-Packard for application load testing: examining system behavior and presentation while generating real load. Load Runner works by creating virtual users which take the place of actual users’. The operative user such as Internet Explorer, transfers requests using the HTTP protocol to IIS or Apache web servers. Load Runner can make thousands of simultaneous operators to put the application through the severities of actual user load, although gathering information from key setup mechanisms. Production would be examined in aspect to realize the motives for specific conduct. Load Runner supports numerous set of instructions packages for load testing: such as Database, GUI Virtual Users, Java Replay, DCOM, Remote Access, .NET Record ,Remote Desktop, Network, Internet Application, Web 2.0, Web and Multimedia and Wireless.

IV. EVALUATION STRATEGY
There are number of open source and commercial window application tools available in the software market. Although the core functions of these tools are similar, however, they differ in functionality, features, and usability. With the above mentioned aspects, three automated testing tools that are Load Runner, Silk4j and Quick Test professional/Unified Functional Testing were in this study. The current versions of 12.50.1096.0 (Loadrunner), 12.52.6851.0 (HP QTP/UFT), and 16.5.0.7764 (Silk4jTest) were used. Comparison between these tools was made on the basis of different parameters. These parameters were record-playback capability, script generation capability, script languages support, application support, technical support, data-driven testing capability, report generation capability, debugging support, easy of learning, and license and training cost. Table 1 below lists all evaluation parameters with brief explanation of each.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing</td>
<td>License cost of the tools if paid</td>
</tr>
<tr>
<td>Cross platforms</td>
<td>To what degree tool supports operating system</td>
</tr>
<tr>
<td>Application support</td>
<td>Which type of application are supported by tools</td>
</tr>
<tr>
<td>Cross-Browsers</td>
<td>How many browsers tools able to work with</td>
</tr>
<tr>
<td>Record-Playback</td>
<td>The ability of tool to record scripts to be run under different condition.</td>
</tr>
<tr>
<td>Script-language</td>
<td>Programming language used to edit testing scripts testing scripts</td>
</tr>
<tr>
<td>Ease of Learning</td>
<td>Working with GUI easy or not</td>
</tr>
<tr>
<td>Technical support</td>
<td>Tools provide any technical support or not</td>
</tr>
</tbody>
</table>

Table 1: Evaluation Parameters.

Published By: Blue Eyes Intelligence Engineering & Sciences Publication
Data Driven Framework | The ability of tool to reduce efforts
Programming skills | Require programming skills or based predefined steps
Training cost | 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

The comparison results of automated testing tools based on the listed features are given in the Table 2.

<table>
<thead>
<tr>
<th>Test Criteria</th>
<th>Load runner</th>
<th>HP QTP/UFT</th>
<th>Silk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing (USD)</td>
<td>0.56/Day</td>
<td>Licensed and very</td>
<td>3,557.40</td>
</tr>
<tr>
<td>Cross Platform</td>
<td>Windows and Linux</td>
<td>Windows Only</td>
<td>Windows and Linux</td>
</tr>
<tr>
<td>Application support</td>
<td>Mobile application, client server application, network and web</td>
<td>Client server applications, Mobile applications</td>
<td>Windows, enterprise, web and mobile application</td>
</tr>
<tr>
<td>Browsers support</td>
<td>Chrome and Firefox</td>
<td>IE-Firefox-Chrome</td>
<td>IE, Firefox and Chrome</td>
</tr>
<tr>
<td>Record playback</td>
<td>Support</td>
<td>Support</td>
<td>Support</td>
</tr>
<tr>
<td>Ease of use</td>
<td>Easy to learn</td>
<td>Easy to learn in a short time</td>
<td>Easy to learn</td>
</tr>
<tr>
<td>Script-language</td>
<td>Multiple script language support</td>
<td>VBScript</td>
<td>Multiple script language support</td>
</tr>
<tr>
<td>Technical support</td>
<td>Good technical support via phone, mail, web forum.</td>
<td>Good technical support via phone, mail, web forum.</td>
<td>Good technical support via phone, mail, web forum.</td>
</tr>
<tr>
<td>Data-Driven Framework</td>
<td>Excel files, text files, XML, DB files</td>
<td>Excel files, text files, XML, DB files</td>
<td>Excel files, text files, XML, DB files</td>
</tr>
<tr>
<td>Training-Cost (USD)</td>
<td>3750/-15 days training</td>
<td>3750/-15 days training</td>
<td>2,400/-</td>
</tr>
<tr>
<td>Debugging support</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
</tr>
<tr>
<td>Report Generation</td>
<td>Html</td>
<td>Html</td>
<td>Html</td>
</tr>
<tr>
<td>Product Support</td>
<td>Dedicate HP support along with support forums</td>
<td>Dedicate HP support along with support forums</td>
<td></td>
</tr>
</tbody>
</table>

**V. RESULTS AND ANALYSIS**

For the purpose of rating the comparison parameters, we have used 3-point scale i.e. 30, 20, 10 as Good, Average, and Bad respectively. The value of different parameters was calculated using 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 three automated functional testing tools, shown in the following chart.

One can select a testing tool based on the type of application needed to be tested, financial plan, and the competence required. Loadrunner, Silk4j and HP UFT all three are very good tools for automated testing. Each tool has its own advantages and disadvantages. Loadrunner has easy to use UI and efficient playback. Loadrunner is best to use for applications with lesser training needs. It’s a multi-language automated testing tool. Silk4j does not provide data security while testing. HP’s UFT is best where data security is needed even while testing. But a major disadvantage of HP’s UFT is its cost. As HP’s UFT is a commercial tool, we need to pay a higher cost for this tool.

Silk4j 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. Silk4j is also available as Silk Tester, which includes several time saving features aimed at making your testing faster and easier. QTP’s advanced version can be used with lesser cost than Loadrunner and Silk4j. In conclusion, Loadrunner is the best tool among these three tools. This comparative study is helpful for users who want to select best tool among these four tools according to their requirements.

**VI. CONCLUSION**
REFERENCES


