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A Study on Software Automation Testing Tools

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ABSTRACT: In software testing, automated testing plays an important role in improving the testing efficiency of software testing teams. Sometimes, manual testing may be invalid due to its anomalies, lack of coverage, and lack of repetition in nature. In order to avoid this kind of test automation being used in the software industry. In this article, we will discuss the prerequisites of automated testing, the work steps, when to use automated testing, the benefits relative to manual testing, and the choice of test cases to be automated. Therefore, there are many testing tools available for us on the market. Information about Selenium automation tools will also be discussed

KEYWORDS: Test automation, Testing tools, Automation testing, Test case, Manual testing, Pre-requisites, Selenium

I. INTRODUCTION

Software testing is a series of activities to find software failures. This is the process used to measure software standards. Manual testing and automated testing are two testing methods. Manual testing is also called static testing. It is performed by testers. Automated testing is also called dynamic testing. But the problem is that this is a very time-consuming process and requires more effort. Therefore, use automated testing to solve these problems. Automated testing is divided into four types, such as reliability testing, safety testing, correctness testing and performance testing. It uses automated tools to automate the steps of manual testing. Automated tests are executed quickly, and they are repeatable in nature. There are various tools on the market that can be used for the testing process and targeted specific testing environments. The environment can be function, performance or special test etc. The test tool should be selected based on the compatibility of the test tool with the list, so that the corresponding tool can be tested for this purpose. Cost is also an important factor in selecting tools.

Automated testing is a process that uses software separate from the software under test to control test execution and compare actual results with expected results [14]. Automated tools are used to automate some parts of manual testing, but not all [11]. Automated testing usually saves time. Testers can effectively run a large number of tests in a short period of time, so important and repetitive tasks and tests that are difficult to complete manually can be automated. In addition to saving time, automated testing also saves money and energy, improves the quality of the test task [12], and also helps improve the accuracy of the software. Test automation requires skilled testers to have knowledge of automation tools and software to be tested in order to establish test cases and execute tests [10].

II. LITERATURE SURVEY

A. AUTOMATION TESTING TOOLS [2]

The automation tool is a kind of software itself, with the help of which can test the actual key software, in other words, the automation tool can be used as the tool of the automation software [28]. Rapid and unparalleled changes in technology affect the way organizations develop, verify, deliver, and operate software products. To meet the requirements of today's software quality standards, the software must be tested, and the success of the test project largely depends on the testing technology and automation tools used [24]. There are multiple test automation tools, each of which has its advantages and disadvantages, and can be used for different purposes. Before choosing any tools, these tools should be analyzed in detail. Budget, application type, testing requirements, and skills required to use the tool are factors that need to be considered [29]. The investigation process requires a lot of energy, time and planning. However, the time and effort spent in the tool evaluation process can greatly ensure a successful test project [30]. Below is an explanation of some of the most commonly used automation tools and their advantages and disadvantages.



I)JUnit

JUnit is a unit testing framework for the Java programming language. JUnit is very important in the development of test-driven development. It allows developers to write an oracle for each test case and automatically execute the test set. JUnit specifically allows automatic regression testing of multiple test sets. If there is a formal specification, it can be converted into an assertion that can be checked at runtime, which can be used as a test prediction [31]. The JUnit framework is one of a series of unit testing frameworks. These frameworks are collectively referred to as xUnit, which originated from SUnit [32].

Table 1: Advantages and Disadvantages of Junit

Advantages	Disadvantages
Facilitate change and simplify integration	Need programming skills and spend time to write and check.
Errors can be found and resolved as early as possible without affecting other code segments.	It can only run tests on one JVM (Java Virtual Machine), because such developers cannot test applications that require multiple JVMs
Make the coding process more Agile	Unit testing tools only automate functional testing at the unit level

II)Selenium

Selenium is a framework for testing web applications, which is compatible with various browsers and platforms (such as Windows, Mac, and Linux). Selenium helps testers write tests in various programming languages such as Java, PHP, C#, Python, Groovy, Ruby and Perl. It provides recording and playback functions for executing tests without having to learn the test script language [33]. Selenium is perhaps the most popular automation framework, it contains many tools and plugins for web application testing. Selenium is known for its powerful performance testing capabilities and is a popular choice in the field of open source test automation, partly because of its large and active development and user community [34].

Table 2: Advantages and Disadvantages of Selenium

Advantages	Disadvantages
Open source, no licensing and maintenance fees.	The new team needs to invest time in the early stages of setup and integration.
Large and active development and user communities, keeping pace with software technology.	Slow support from the community.
Open integration with other tools and frameworks to enhance its functionality	Good programming skills and experience are required to build Selenium and integrate it with other tools and frameworks



III) Unified Functional Testing (UFT)

UFT, formerly QuickTest Professional (QTP), is a test automation tool for functional testing and regression testing. It may be the most popular commercial tool for functional test automation [33]. UFT provides a comprehensive set of functions that can meet the needs of automated testing of most functions on desktops, mobile devices and Web platforms. The tool uses the Visual Basic Scripting Edition scripting language to register the test process, manipulate various objects and control the test of the application [27].

Table 3: Advantages and Disadvantages of Unified Functional Testing (UFT)

Advantages	Disadvantages
Mature, comprehensive automated test functions are integrated into a single system.	Costly solution: license and maintenance costs are high.
Only basic programming skills are required to start creating and executing tests.	Only VBScript is supported.
Dedicated user support and a large established user community.	Upgrades and additional modules can incur high costs

IV) Katalon Studio

Katalon Studio is an automated testing platform that provides a comprehensive set of features to implement complete automated testing solutions for Web, API, desktop and mobile applications. Based on the open-source Selenium and Appium frameworks, Katalon Studio reduces the workload and expertise required to learn and integrate these frameworks to meet automated testing requirements, enabling the team to quickly start test automation [35].

Table 4: Advantages and Disadvantages of Katalon Studio

Advantages	Disadvantages
No license and maintenance fees are required.	Poor Community support
Integrate the necessary frameworks and functions to quickly create and execute test cases.	Support limited functions
Built on the Selenium framework, but does not require the advanced programming skills required by Selenium	Lack of scripting language selection: only Java / Groovy supported.

V) Test Complete

TestComplete is also a commercial integration platform for desktop, mobile and web application testing. It enables testers to build a powerful testing framework that utilizes various available software testing methods [23]. Like UFT, TestComplete provides some key test automation functions, such as keyword-driven and data-driven testing, cross-browser testing, API testing, and CI integration. The tool supports multiple languages, including JavaScript, Python, VBScript, JScript, DelphiScript, C++ Script and C#Script for writing test scripts [36].



Table 5: Advantages and Disadvantages of TestComplete

Advantages	Disadvantages
	Additional costs for additional modules and additional components.
Only basic programming skills are required.	
Mature, comprehensive automated test functions are integrated into a single system.	Like UFT, TestComplete requires a lot of licensing and maintenance costs.

III. PROPOSED SOFTWARE AUTOMATED TESTING FRAMEWORK

The proposed SAT framework can be expressed as a new layer between testers and existing automation tools. It is a desktop application that can help testers automate the process of generating test scripts [30] [31]. Automating this process will save.

A lot of testing work, thereby reducing the overall project cost [32]. The scope of the proposed SAT framework is limited to only the automated regression software testing phase for web applications. Figure 1 illustrates the proposed SAT framework for Web applications.

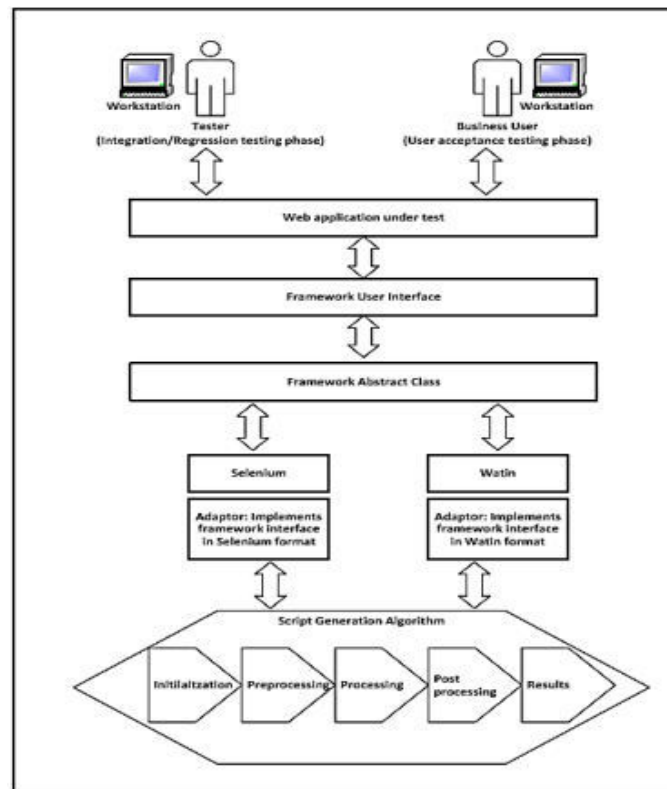


Figure1. Proposed Framework Model



The core framework engine has five main processing steps. The first step is the initialization step, where the SAT framework crawls the SUT webpage to detect all HTML controls in the webpage to be tested, and ensures that each HTML

The control has a predefined list of values in the framework repository. If a control in the SUT does not have a corresponding data value, the framework will ask the tester to create a list of suggested values that match the new HTML control. These additional values will be used when the framework proposes data values for the HTML control in the future. In the preprocessing step, the SAT framework selects a value for each HTML control, which will be used during the execution of the test script. In the processing steps, the "Test Case Steps" (TCS) table and test scripts are based on

HTML controls in SUT and Web automation tools. This is the core step in the framework engine. In the post-processing step, the tester should use the automatically generated test script and run it on the SUT web page. In this step, the framework will always verify that each input control in the test script still exists in the SUT. Finally, in the results step, the results of running the test script (representing test cases) are listed to testers or business users. The SAT framework we propose has the functions of some existing automation tools [21] [26] [23] [27] [28] [29]. It reduces the cost of the automation process by enhancing the creation, reusability and maintainability of test scripts, which is the main goal behind test automation. Reducing the cost of test automation is very important, because manual testing cannot be repeated in different test phases. Therefore, it is very necessary to convert these manual test cases into automatic test scripts. Our recommended SAT

The framework automates the automation process by reducing the workload in the creation of test scripts [23] [1]. Unlike the author who proposed an avionics system test automation framework in [33], the framework we propose is independent of the internal business details of SUT. Therefore, the proposed framework can be used to automate any SUT without any additional cost.

The activity diagram in Figure 2 illustrates the sequential activities of the proposed SAT framework. The tester should provide the SUT URL to the framework. Then, the framework opens the URL, and automatically generates the TCS table and the corresponding test script. Testers can update the two files after they are generated. Finally, testers (or business users) can run automatically generated scripts on SUT.

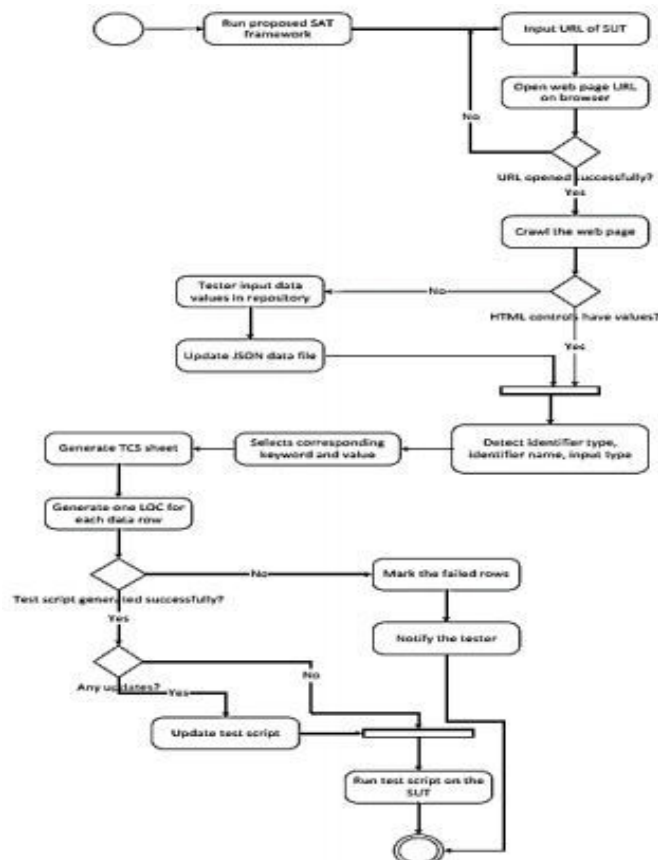


Figure 2. Proposed Framework Activity Diagram



IV. ADVANTAGES

1. Capability of performance testing You can quickly simulate a large number of users.
2. It is cheap in the long run-when the test cases are used you only need to run them and don't need to spend time to develop them
3. Long-term speed-automated tests can be run automatically without the help of actual users
4. Reusability-the test program can be run as many times as needed.

V. DISADVANTAGES

1. Expensive tools and developers-automated testing tools are expensive, and automated quality inspection engineers are more expensive than labor
2. Development time – it takes some time to write a software test
3. You can never test the product like a real user
4. It is difficult to test UI/UX products;
5. We need to support the test program-if you change some logic, you need to change the way of the test program.

VI. CONCLUSION

The correct choice of automation tools, testing processes and teams is essential to the success of automation. Manual and automated methods go hand in hand for successful testing. The seminar report provides users or readers with information about the automated testing framework and its various tools and technologies, under what circumstances it is beneficial to use automated testing as a project management method for project development, and under what circumstances should avoid Automated testing is used as a project management method. Project management methods. The seminar report can also help users understand some basic functions that distinguish automated testing from traditional testing.

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