Comparative Analysis of Automated Functional Testing Tools

Lavkesh

Research Scholar, Dept. of Computer Science, Sat Priya Group of Institutions, Rohtak, Haryana, India.

Dr. Harish Mittal

Director, Sat Priya Group of Institutions, Rohtak, Haryana, India.

Abstract – This paper presents the techniques for automated testing - Software testing provides a means to reduce errors, cut maintenance and overall software costs. Testing has become most important parameter in the case of software development lifecycle (SDLC). Testing reduces the cost, time to rework and error free software that is delivered to the client. This paper explores the automated testing techniques.

Index Terms – Testing, Automation Techniques.

1. INTRODUCTION

Automated testing is process through which thorough and fast testing can be done. This quality of automated testing has made it an essential part of software development. This has become more important than ever before given the need to accelerate software development and reduce the time to market in the fast changing business environment. Automated testing is also preferred from software engineering point of view because a well-organized approach to automated functional software testing can achieve significant cycle-time and quality improvements. By integrating automated testing into the software development program, you gain a number of benefits as follows:

- Reduced cycle time by decreasing product and integration test time.
- Improved quality.
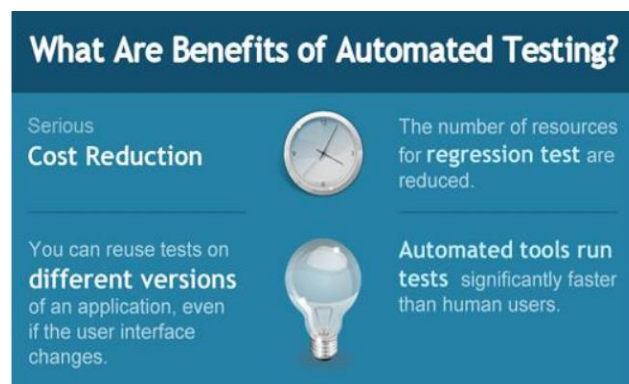- Standardized testing and reproducible results.

Fig 1.1: Benefits of Automated Testing

Automation software testing is the automated version of manual software testing. It covers all the problems of manual testing. In automation testing, tester runs the script on the Automation software testing is the automated version of manual software testing. It covers all the problems of manual testing. In automation testing, tester runs the script on the testing tool and testing is done. The tester may or may not know the inside details of the software module under test. Therefore either white box testing or black box testing can be used.

2. RESEARCH PROBLEM

Selecting an automated testing tool is essential for test automation. There are a lot of automated testing tools in the market, and it is important to choose the tool that best suits your overall requirements.

And it is difficult to select the best tool among different automated testing tools. Consider these key points when selecting an automated testing tool:

1. Support for your platforms and technology.

2. Flexibility for testers of all skill levels.

3. Feature-rich but also easy to create automated tests.

4. Create automated tests that are reusable, maintainable and resistant to changes in the applications UI.

Thus to select a best suited automated testing tool for a common user, we compare the features of different tools with these key points and find out the best one among them.

3. SOFTWARE TESTING

Software testing refers to process of evaluating the software with intention to find out error in it. It is a technique aimed at evaluating an attribute or capability of a program or product and determining that it meets its quality. Software testing is also used to test the software for other software quality factors like reliability, usability, integrity, security, capability, efficiency, portability, maintainability, compatibility, testability etc. [13]

The aim of software testing process is to identify all the defects existing in a software product. It is the process of exercising and evaluating a system or system components by manual automatic means to verify that it satisfies specified requirements or to identify differences between expected and actual results [2].

The major objective of the tester is to find the defects in the software. The success of the tester is on the level of defects identified during testing phase. Testing a product is to removal of faults to increase the software quality [4].

4. SOFTWARE TESTING APPROACHES

In order to test the whole software application sufficiently it is necessary to determine what types of tests, when and to what extent shall be performed. There are many ways how to test a software application. These are based on several aspects and divided into different categories. Not every category of tests is suitable for testing of each specific application. Incorrectly chosen testing approach may result in a failure to detect large number of software errors or errors will be detected too late.

➢ Black vs. White Box Testing These two approaches are based on two opposing concepts. First concept ignores internal mechanism of the application or its components and focuses entirely on the outputs generated as a response to executed commands. This approach is called Black box testing, or functionality testing.

Black box testing identifies bugs only according to software malfunctions as they are revealed in its erroneous outputs. In a case that the outputs are found to be correct, black box disregards the internal path of calculations and processing performed. From the tester's point of view black box testing is testing when he does not need to know how software works internally. On other hand White box testing or structural testing relies just on internal structure of software and its calculations. This approach examines internal calculation paths in order to identify bugs.

Both mentioned approaches have some advantages and also disadvantages which are often solved by using method with combining both of them called Gray box testing. In the first step of testing using gray box, tests are developed with emphasis on functional aspects of the application. This means that the application will be tested according to its real utilization. In the second step procedures utilized in the process of white box testing are used. The main goal of using these testing approaches is to increase effective coverage of the application code. [24]

Automated vs. Manual Testing There is another way how to distinguish approaches for software testing based on who or what executes tests. Manual testing can be described as a process where a person initiates each test, interacts with it, and

interprets, analyzes and reports the results. As the name suggests, manual testing has done manually that is it requires human input, analysis and evaluation. This testing carried out by the testers. Testers test the software manually for the defects. It requires a tester to play the role of an end user, and use most of all features of the application to ensure its correct behavior. The testers follow a written test plan that leads them through a set of important test cases [15].

Manual testing is suitable to be used in cases where tests require execution and evaluation of complex tasks. Contrary to this when tests need to execute a large amount of repetitive tasks or tests generate large amounts of data then it is better to use computers to execute them. In the principle, we could say that the deployment of test automation is appropriate where manual testing is a tedious repetitive activity. The problems with manual testing are, it is very time consuming process, not reusable, has no scripting facility, great effort required, and some errors remain uncovered [3].

	Manual Testing	Automated Testing
Pros	• Anyone can test • Easiest way to improve quality • Great for people who may not have formal testing experience • Focused on the customer's work flow primarily	• Faster test cycles • Able to identify more defects in shorter time frame • Saves companies money after the third time the test cases are run • Is an excellent way to meet the testing needs of agile development • Easy to focus on all possible work flows • Higher product quality over manual testing
Cons	• May not identify all test cases • May not identify all defects • Lower product quality because of higher defect count	• Test scripts typically written by automation testing scripter • Requires manual test cases to be written first that are then automated • Requires automation testing platform • Not cost effective for less than 3 test cycles

Fig 2.1: Pros & Cons of Manual and Automated Testing

On the other hand, it is necessary to remember that automatic tests cannot replace manual tests, because even very similar tests performed manually and automatically have different value and results for testing. It is important to automate only tests that are simple and straight forward. Too complicated tests can be very inefficient and their maintenance costs can overwhelm their benefits.

5. AUTOMATED SOFTWARE TESTING

Test automation is a process in which a testing tool is used to compile and execute a test on a software application. A test suite can be carried out repeatedly with these testing tools.

Automation testing tools execute the complicated and large scale tests, generate the reports, and finally compare with the test results run earlier.

The target of automation testing is to focus on problems mostly occurs in a certain part of the software. A test script can have a few repetitive code patterns in order to test a variety of methods inside a class. In automation testing, no manual intervention is needed when an automated test is running a test suite. [16]

Test automation is more reliable, programmable, reusable, comprehensive and maintainable, saves money and time, decreases cost, has greater test coverage and is faster than human interactions –compared to manual testing.
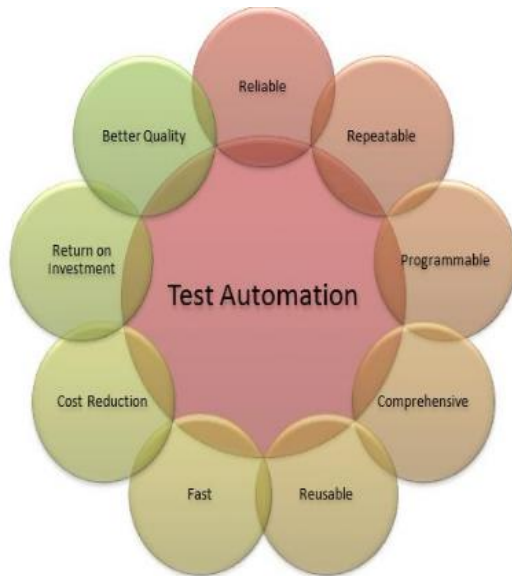

Fig 2.3: Test Automation Features

When to Automate Automation testing can be done if the test Runs frequently in the same application or on a certain portion of the application. It is almost impossible to automate all types of testing, for example, usability testing; however, if the workload and cost are too high for manual testing; automation testing can be taken into consideration. For instance, regression testing, data driven testing and batch testing can be automated. Automation testing can be carried out on any of the application types:

- Large and complicated projects

- Stable software/application

- Frequently testing same test cases

- Software runs on cross platform

- Time consuming application

- High risk of having error in manual testing

How is automated software testing done?

Automation of software testing is similar to a software development process. It goes through the same life cycle as in the development of software product during software development life cycle.

It should be taken care that who is writing the scripts. There is always a conflict on who writes the scripts whether a developer or a testing team member. It is always a good idea and normally followed by many organizations that the effort should be a collaborated effort between tester and the developer. The automation process goes through a lot of effort taking collaborated work because a lot of emphasis is given for the time and financial constraint.
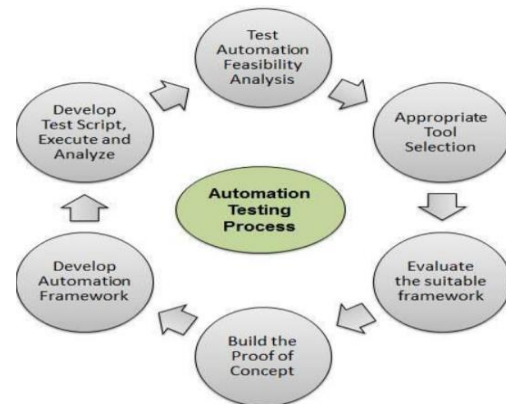
6. TOOLS FOR AUTOMATED SOFTWARE TESTING

For many test managers, the decision of testing tools to use can cause confusion. The first decision to make is which category of tool to use -one that tests specific units of code before the application is fully combined, one that tests how well the code is working as envisioned, or one that tests how well the application performs under stress. And once that decision is made, the team must wade through a variety of choices in each category to determine which tool best meets its needs. Evaluating your needs will narrow down your short list very rapidly. There are many options available in market to choose. Depending on what sort of test it will be used for the choice may become easy.[2]

There are some general categories for testing tools which makes it easy to choose:

1. Developer oriented tools

2. Functional testing tools

3. Load testing tools

4. Performance monitoring and maintenance tools.

7. CONCLUSION

This paper provides a broad idea about the techniques of testing. Observing all techniques we hence conclude that there

is a wide scope. Although there are many challenges to be faced in all techniques but they are good in their own way.

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