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A COMPARISON BETWEEN MANUAL TESTING AND AUTOMATED TESTING

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Abstract : Automated testing is a way to test the software system using an automation tool. Automated testing was proposed to reduce manual efforts. In this paper , manual testing model and automated testing model have been discussed. These models have been used on web based applications. There were a lot of drawbacks in manual testing ; to overcome these drawbacks automated testing has been performed. A description about the automation tool selenium has been given in this paper. In this paper ,there is a comparison between manual testing and automated testing. And also a trial has been made to show the impacts of automation in testing field.

Index Terms- **Automated Testing , Manual Testing , Web application , Agile Automated Testing , Selenium Tool.**

1. INTRODUCTION

Software testing is the process to make the software system defect free. In this process , a comparision is done between the expected results and actual results. It also gives a hand to identify errors , gaps or missing requirements in contrary to the actual requirements. This process can be done either manually or using some automation tools. Manual testing is a type of software testing where execution of test cases takes place manually without using any automation tool. Before automation , application must be manually tested. Although manual testing needs more efforts , but there is always a necessity to check automation feasibility. Since this testing technique requires more human intervention , adoption of latest technology trends should be done. Adoption of technology trend would help to eliminate the manual efforts and the expenses of actual testing. A fulfillment of this requirement is necessary , for that automated testing should be performed. To perform an automated testing on web applications , unavoidable knowledge of automation testing tool for software is required. Choice of tools takes place on the basis of type of application to be tested.

In automated testing, the tester has to write scripts on his own by making use of special software for execution of test cases. It is a formalised testing process where no manual involvement is required. The objective of automation is to decrease the number of testcases to be run manually. Detailed test reports are generated through automated testing. Extension of test coverage is done. Automated testing gives a brief of brilliance guarantee gain on in software testing. The test automation effects the three immense features of software dimensions i.e time , expenses and quality positively.

2. SOFTWARE TESTINNG TECHNIQUES

2.1Manual Testing

Manual testing is the most basic and rigorous type of software testing. It is the most crucial phase of all testing types. In this software testers writes the test cases using human resources without making use of any special software. Manual testing can never be eliminated altogether. The primary step to test the application manually, then possibility of automation should be checked. There is no requirement of knowledge related to testing tool. In this technique , software testers create testsuits on excel sheet using his own knowledge and logics.

A. Goals of Manual Testing

- The first objective of manual testing is to prepare software product which should be defect free. It should work according to the specified functional requirements put by the customers.
- Testcases which are designed during testing phase has large percentage test coverage.
- It promises that reported defects will be tested by the developers. Retesting should be performed manually by testers on the fixed defects.

B. Disadvantages of Manual Testing

- Manual testing gives a hactic schedule to the software tester.
- It is a time consuming task.

- For same release , running same testcases again and again , leads to immense boredness. In such situations , automation becomes a right hand to the customer.
- Risk of errors increases when it comes to test the software manually.
- Manual testing takes a whole lot of the day for the tester to be attentive.

C. Testcase

It is a test which checks the functionality of specific module or code. It gives a description of what is to be tested. It also gives a description about the type of data to be given as input and the activities done to check the result. The actual result is checked to know whether it matches to the expected result or not. A test case consists of input , action or event and an expected response. A test case also determines if the feature of an application is working according to the certain requirements put up by the customer. The objective of writing test case is mainly to validate the test coverage of the application.

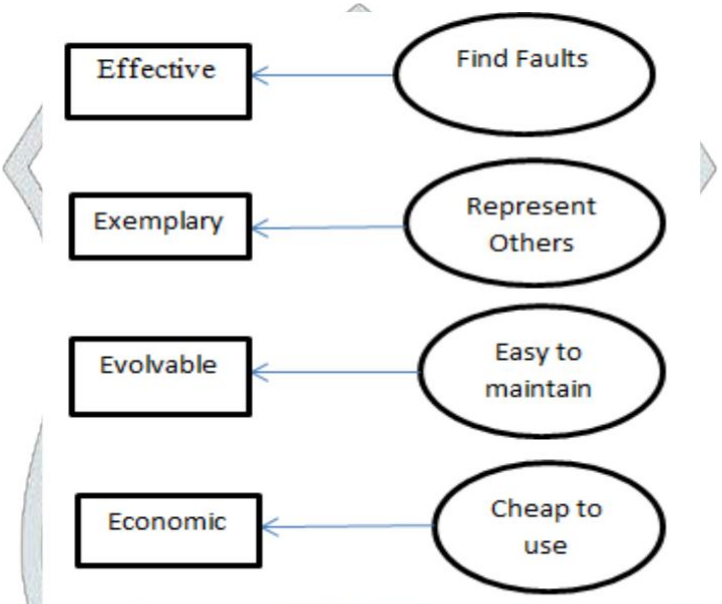

Figure 1 : Characteristics of a good testcase

D. Structure of Testcases

It contains the following parameters :-

1. Test Scenario Id
2. Test Scenario Description
3. Test Case Id
4. Test Case Description
5. Test Steps
6. Preconditions
7. Test Data
8. Postconditions
9. Expected Result
10. Actual Result
11. Status
12. Testcase executed by
13. Testcase executed date
14. Comments

1. Test Scenario Id : It is a unique identification number for reproducing the bugs or conditions.
2. Test Scenario Description : It is a description for the steps to reproduce the bug or conditions.
3. Test Case Id : It is a unique identification number of test case.
4. Test Case Description : It is the description of testcases.

5. Test Steps : They are the steps to execute testcases.
6. Preconditions : The conditions required initially for preparation of testcases.
7. Test Data : The data used as input for testing.
8. Postconditions : It is the result that must be true which displayed after following test steps.
9. Expected Result : It is the functionality that is expected for correct functioning of the application.
10. Actual Result : Actual Result is what we observe in the application while testing.
11. Status : It shows the status of the test cases.
12. Test case executed by : It is the name of the tester.
13. Test case executed date : It is the date when test cases are executed by tester.
14. Comments : It mention comments regarding test cases formation.

Table 2 : Structure of test cases

Test Scenario Id	Test Scenario Description	Test Case Id	Test Case Description	Test Steps	Pre Conditions

Test Data	Post Conditions	Expected Result	Actual Result	Status	Test Case Executed By

Test Case Executed Date	Comments (if any)

E. Test Case Execution Process

To execute test cases and its consequences play a significant role in software testing. It enhances quality of product. Each an every action is justified by the records. The following activities must be considered by software tester at the time of test cases execution.

- Total no. of test cases executed.
- No. of defects found in the testing process.
- Record of success and failure execution of test cases in word document.
- Record of time taken to execute the testsuite.

2.2 Automated Testing

The automatic technique to write and execute test cases , where no human intervention are involved. This process is known as Automated Testing. In this process , the tester writes scripts with use of suitable software to test the application. It is basically an automation process of a manual process where no human intervention is required. Automated Testing is a simplified process of manual testing.

A. Goals of Automated Testing

- The aim of automated testing is to make the testing process more productive and to improve software value. The objective of automation is to lesson the number of test cases to be run manually.

- The automation software inputs the test data into the system , then contrast with estimated and actual outcomes. It results into generated detailed test reports.

B. Benefits of Automated Testing

- Execution of automated test cases is 70% faster than execution of manual test cases.
- Wider test coverage of application features.
- Savings of time and cost.
- Extends reliability.
- Ensures consistency.
- Provides more accurate results.
- No usage of human resources while executing test cases.
- Better speed of test execution.
- At some interval of time , manual testing becomes boring , on the other hand automation makes the process much more interesting.
- Possibility of record testsuite and replay it as required.

C. Automated Testing Process

Automated Testing process consists of five phases :

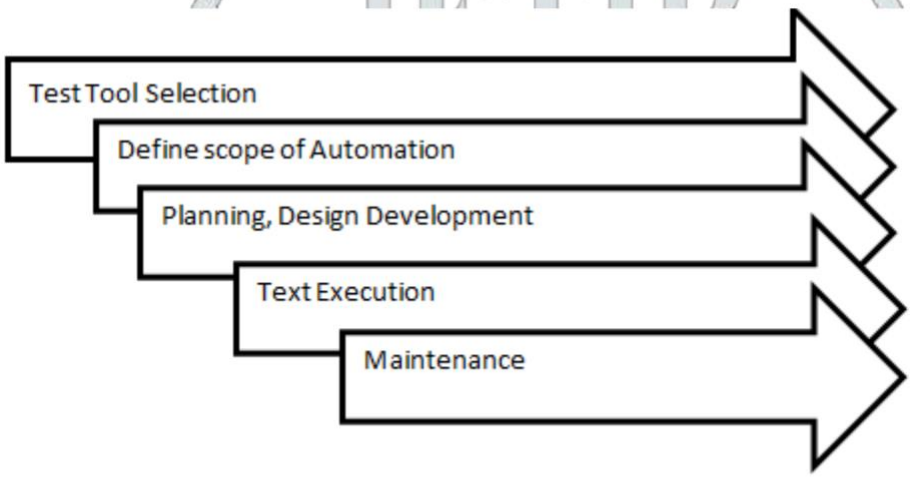

Figure 3: Phases of automated testing process

I. Test tool selection : The selection of automation tool mainly depends on the technology , application.

II. Define scope of automation : The scope of automation is the area of application under test which will be automated.

III. Planning , design and development : During this phase , creation of automation strategy & planning are done which contains following details :

- Automation tools selected.
- Framework design and its features.
- In scope and out of scope items of automation.
- Automation testbed preparation.
- Schedule and timeline of scripting and execution.
- Delieverables of automated testing.

IV. Test execution : Automation scripts are executed during this phase. Script needs input test data before test cases are set to run. Once executed they provide detailed test reports.

V. Maintenance : Since new functionalities keep on adding the system under test with successive cycles , Automation scripts required to be added , reviewed and maintained for each release cycle. Maintenance becomes mandatory to improve productiveness of automation scripts.

Automated Testing Model

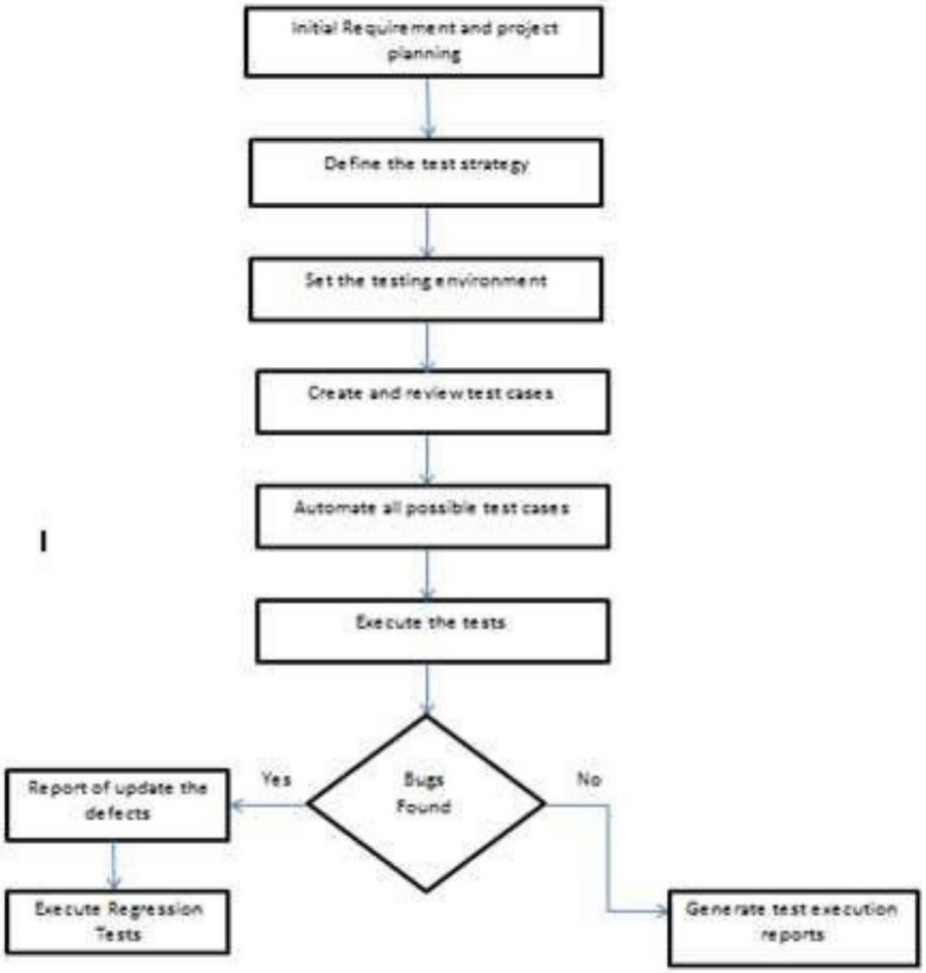

Figure 4 : Automated Testing Model

3. Selenium – An Automation Tool

Selenium is a popular open source webbased automation tool. Scripts were used to perform manually. To overcome this , Selenium was designed to automate web browser interactions so that same interactions can be performed automatically. Testing done for automation using Selenium is referred as Selenium Testing.

Selenium consists of four components:

1. **Selenium Integrated Development Environment (IDE):**The simplest framework in the selenium suite is Selenium Integrated Development Environment (IDE). It is a prototype tool. This firefox extension helps in automation of the browser through a record-and-playback feature. Either Selenium RC or Webdriver is used to create more testcase.
2. **Selenium RC:**The first automated web testing tool that allowed the users to use any programming skill was Selenium Remote Control (RC). The following programming languages like java , c# , PHP , Python , Perl , Ruby can be supported by RC. Faster execution can be done with the help of Selenium IDE. Cross browser and cross platform tool are supported by Selenium RC.
3. **Webdriver:**Implementation of a more modernized and a stable approach to automate the browsers actions is done by webdriver. It looks after the browser by directly communicating with it. The languages supported by webdriver are java , C# , PHP , python , perl , ruby. Interation with browser take place in a more realistic manner with the help of webdriver. It is much better than selenium IDE and selenium RC.
4. **Selenium Grid:**The tool used together with selenium RC to run parallel tests across various machines and various browsers at the same time , is called as Selenium Grid. Multiple tests can be run at the same time with the help of this tool. It saves time enormously. It uses hub-nodes concept. The hub cuts a central source of selenium commands to each node connected to it.

Selenium RC and webdriver merged into a single framework to form Selenium 2. Selenium 1 is referred as Selenium RC.

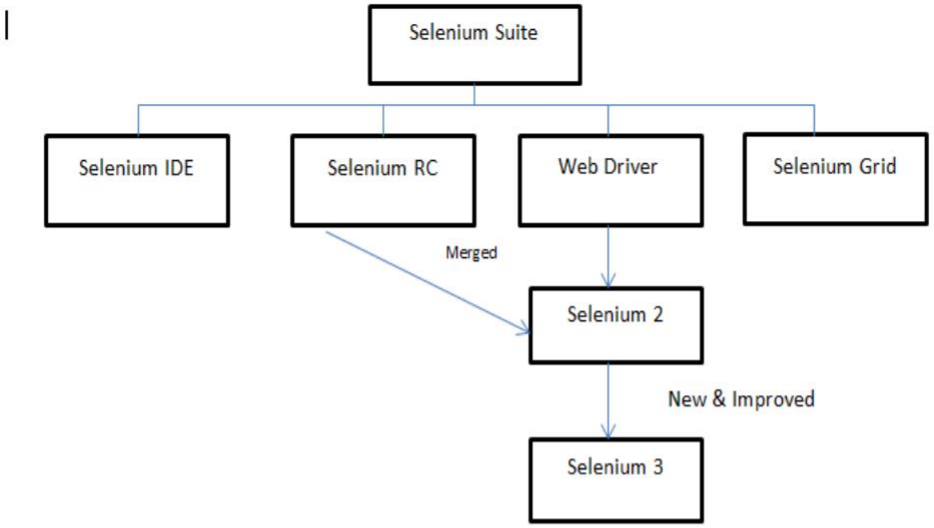

Figure 5 : Selenium Components

Selenium Testing Process

The seven primary steps of Selenium testing are as follows :

- The first step to create a webdriver instance.
- Second is to navigate to a webpage.
- Third is to find an HTML element on the web page.
- Fourth is to perform an action on an HTML element.
- Then , the next step is to predict the browser response to the action.
- Last step is to run and record test results using a test framework.

4. LITERATURE REVIEW

The summary of various research works done in the field of testing on web based applications using different web applications testing techniques is provided by this section.

Chien-Hung Liu David C.Kung Pei Hsia, proposed data flow testing technique on web based application. The technique called as Structural testing due to this technique based on structure of web. Capturation of white artifacts was done in this technique. That's why it is also known as white box testing. These white box artifacts were captured in a WATM model (Web application testing model). Each component of web application is treated as object in this model whereas the elements of HTML or XML are considered as code variables within an object.

Qian Zhongsheng**,** developed a tool named Reweb and Testweb for testing eb application. Analysis of application is supported by this tool. This tool is useful in understanding the system organization in terms of navigation path and variable usage. Implementation of various specific web application analysis is done through reweb. This testweb generator and executor is used in exploration of system to a satisfactory level. Improvement is much needed in reducing the manual activities. There is requirement of automation in the area of state unrolling & merging. Qian also emerged with an approach to reduce and optimize the test case generation from user request traces.

Ossi Taipale , Jussi Kasurinen , Katja Karhu ,Kari Smolander**,** observed the views of managers , developers and testers. Development of technical software is done for automation in industry. Although automation impacts was found much better than manual workload on software. Reusability of test cases , enhancement in quality and execution of large no. of test cases are the

strong aspects of automation . The cons related to automation are the costs involved in frequently changing requirements at run time. Such questions , as characteristics of tested products ,behavior of employees , less number of resources and customer's impact on test automation have considered. The objective was to notice the results of automation practically.

Satish Gojare , Rahul Joshi , Dhanashree Gaigaware**,** as the web application complexity is keep on increasing , a repetitive trial of software system implementation has done. Automation is much successful in reducing workload of unchangeable requirements , less usage of human resources. In this paper , new automation testing framework for web applications has been purposed i.e Selenium Webdriver tool. This new interface provides customized test cases results. It also helps to test the application by covering large number of test cases efficiently in less amount of time. To get benefits from this framework , it is not mandatory to have detailed knowledge of selenium. Maintainability and reusability appears like a boon through automation. This framework is very useful in changing frequently requirements.

Filippo Ricca and Paolo Tonella, have given a brief description about testing tools. As web applications are playing crucial role in industries due to their complex nature. Testing tools helps the web application in designing how to develop, how to analyse and role of testing. All these needs get fulfilled in better ways by means of testing tools. In this paper , issues have been discussed regarding testing tools. For this , testing tools Reweb and Testweb tools have considered in development process. The effect of dynamic pages during downloading , infeasibility problems in testing phase have presented in this paper.

Ying Li , Minglu Li and Jiadi Yu , as web services development come in action , requirement of web services testing techniques also arrises. The epitome of web services development and testing skills is to achieve target of flexibility, modularity & robustness. Researcher give detailed analysis about testing methodology of web services , that give assistance to testers. It have also made comparision between traditional programming and automated one. The epitome is basically found on performance criteria , authorization and security. Based on these criterias , an automatic web services testing tool developed named as AWSTT. It is an open source unit testing tool which works on dot net languages. The special feature about AWSTT is with the functionality , it also supports security and authorizating testing environment.

Saru Dhir and Deepak Kumar , in this paper automated software testing is performed with agile environment. Enhancement of customer satisfaction is one of the great advantage received from this testing types. Comparision has been made between between traditional automation testing model and proposed model for automated agile testing. Experimental work has been performed on web based application. Evaluation of outcomes considered using the agile testing model. The tool used for testing purpose is Selenium. In this paper , development of product and automated testing's implementation has done in scrum.

Divya Kumar and K.K.Mishra, inspite of having large no. of quality assurance teams and testing tools , still software testing is the process which consumes a lot of time. Test automation effects other phases of development as test automation has its own pros and cons. In this paper researchers have tried to discover some of adverse circumstances related to automated testing. As automation is an expensive activity , it needs efforts during development and notable time. Efforts has been made to evaluate impacts of test automation on software's expense , quality and time on three versions of software. Experimental work has shown positive results of test automation on software's expenses , budget , quality and time to market analysis.

Bin Zhu , HuaiKou Miao and Lizhi Cai, in 2009 , proposed an approach to generate test cases for web application testing using a navigation tree considering the web browser history mechanisms and user interface facilities.

Shauvik Roy Choudhary Husayn Versee Alessandro orso**,** in 2010 , proposed a tool for development of a cross browser web application testing tool. It's usage is to find difference between corresponding elements of a web page opened in various browsers.

Mohd. Ehmer khan and Farmeena Khan, Software testing is a series of actions to display bugs , errors in the product . It is a way to fulfill missing requirements , designing issues. It is used to improve many factors like accuracy , totality of specifications , reliability & quality. To attain effectiveness in testing process , investigation plays an important role in complex product , rather than creating or to follow procedures. It is quite impossible to get all the defects , gaps in program. Due to these conflicts , there is an open question for better strategy. In this paper , software testing techniques have been discussed. Comparision have been made among white box testing , black box testing and grey box testing.

Ritu Patidar , Anubha Sharma , Rupali Dave**,** In digital critical scenario , software agencies & organizations centred the quality and reliability goals of product via techniques and technologies. Quality demands focus , attention which leads less errors , gaps , bugs in program. In trend of software engineering , software testing has its own importance. Software testing is not an

independent process ; it is sequence of steps maintained by tester in order to match expected result and actual result. A theoretical description of techniques related to software testing reviewed in this paper. Consideration of different testing tools and their working style with the help of practical example. We have also learned about preparation of test cases and usage of test cases in manual as well as automation testing.

Claus Klammer and Rudolf Ramler, As the agile methodology comes in action , scope of test automation has extended in industries. The main objective of test automation is to make the process of test execution more faster as well as manual involvement is to be decreased. In this paper , test automation has extended to one level , practical implementation has done on GUI based application. Journey from manual to automated has been focused here. The facts resulted are as follows : [1] As agility getting popular , high level GUI testing importance has reduced . [2] As automation environment is not reduced workload on test cases but it converts to write adapters of test cases. [3] The outcomes analysed practically by test limits generation.

5.Comparisions and Results

Based on literature review , some parameters have investigated in order to compare between manual testing and automated testing. As a result, it was found that automated testing is much successful.

Table 5.1: Comparision of manual testing and an automated testing

Parameters	Manual Testing	Automated Testing
1. Time consuming	√	X
2. Human Observation	√	X
3. Recording of test cases	X	√
4. Automated test scripts	X	√
5. Tools availability	X	√
6. More Accuracy	X	√
7. Faster processing time	X	√
8. Exploratory testing	√	X
9. Higher initial investment	X	√
10.Better ROI	X	√
11.Reliability	X	√
12.Cost effective for low volume regression	√	X
13.Cost effective for high volume regression	X	√
14.Report visibility	X	√
15.Performance test compulsion	X	√
16.Easy parallel execution	X	√
17.Programming Knowledge	X	√

6.CONCLUSION AND FUTURE SCOPE

Referred papers have performed experimental work on web applications. Manual testing and automation testing was implemented on web applications using many software testing tools like selenium , reweb , testweb. Based on comparisions ,it is concluded that automated testing has its own importance , benefits over manual testing. Automated testing works on accuracy of wide variety of testcases as well as it shows great impact of dimensions like software's expenses, time management and quality. It also improves the delievery of product. Automated testing is successful in reducing workload of regression testing. The concept of automatic test case generation can be combined with agile testing.

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